

Version 8.4 and later, and SaaS

IBM

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IBM® Maximo® Manage documentation

Maximo Manage overview

IBM® Maximo® Manage is an asset lifecycle and workflow process management application that manages your asset operations and business processes and integrates with your existing enterprise applications.

Maximo Manage delivers a comprehensive view of all asset types, their conditions and locations, and the work processes that support them, to provide you with optimal planning, control, audit, and compliance capability.

Maximo Manage can help your organization optimize many aspects of your business.

Optimize asset efficiency

Manage and optimize the efficiency and use of all assets to maximize asset availability and performance, reduce downtime, and extend the life of the asset.

Increase productivity

Organize planned and unplanned work for assets and locations based on priority, urgency, and available resources to streamline work for increased productivity.

Improve inventory processes

Plan and manage inventory across multiple storerooms, providing visibility and availability of materials to meet and support maintenance operations.

Optimize schedules

Lower maintenance costs and optimize the use of your resources by scheduling maintenance work in a single graphical view.

Improve business intelligence

View scheduled reports and KPIs to analyze and understand information about the lifecycle and the maintenance of your assets.

Capture information at the right time

Optimize your workforce and data by using mobile solutions and device-specific capabilities, such as, photos and voice-to-text features that capture the right information at the right time.

Integrate applications and systems

Integrate enterprise applications and create business flows with external systems.

Overview video



Check out the video to learn more about Maximo Manage:

Navigating IBM Documentation functions video

Check out the video to learn more about how to use the function in IBM Documentation:



- [Introduction to Maximo Manage](#)
IBM Maximo Manage is an asset management life cycle and workflow process management system. With Maximo Manage, you can manage your asset operations and business processes. You can also integrate with your existing applications.
- [What's new in Maximo Manage](#)
Learn more about what's new and changed in Maximo Manage.
- [What's new in Maximo Mobile](#)
Learn more about what's new and changed in Maximo Mobile.
- [Maximo Manage components](#)
When you deploy and activate IBM Maximo Manage, you can optionally include additional components, such as add-ons and industry solutions during the deployment and activation process.
- [Accessibility features for Maximo Manage](#)
Accessibility features for Maximo Manage assist users who have disabilities, such as restricted mobility or limited vision, to use information technology content successfully.
- [Documentation conventions](#)
The following table describes the conventions that are used in this documentation.

Introduction to Maximo Manage

IBM® Maximo Manage is an asset management life cycle and workflow process management system. With Maximo Manage, you can manage your asset operations and business processes. You can also integrate with your existing applications.

Streamline, customize, and integrate

Maximo Manage provides insight for all your enterprise assets, their conditions and work processes, for better planning and control. With Maximo Manage you can:

- Manage which users can log in to the system and which sites, applications, and menu options each user can access.
- Transfer product configurations and customizations from development to test to production environments. Migration Manager facilitates management of regulatory compliance efforts.
- Integrate Maximo Manage with your external financial applications to use your financial application to access and track Maximo Manage data and transactions.
- Develop and implement workflow to automate your business and management processes.
- Maximo Manage is highly customizable and both the user interface and the help can be adapted to suit your business requirements. You can change applications to meet your specific business needs. The Application Designer provides a graphical user interface for configuring applications without editing a line of code.
- Integrate enterprise applications and create business flows between Maximo Manage and your framework applications.

Choose your database and application server

Maximo Manage uses multiple software servers. You can install the servers on the same server or on a different server. System requirements depend on your operating system, database platform, and site configuration.

Maximo Manage comprises features that have different purposes but function in a similar way. Information that you enter into an application is stored as data in the Manage database. The relational structure of the database means that you can view the same data in different ways, from different applications.

Maximo Manage supports the following database servers:

- Db2®
- Oracle
- Microsoft SQL Server

The application server manages the Maximo Manage JavaServer Pages (JSPs), XML, and business logic components. Maximo Manage uses a Java™ 2 Platform, Enterprise Edition (J2EE) application server:

Maximo Manage supports the J2EE server, WebSphere® Application Server.

Select standard or custom reports

BIRT (Business Intelligence and Reporting Tools) is the embedded reporting tool in Maximo Manage. BIRT has standard reports that cover many applications.

- BIRT report types are analysis, detail, hierarchical, and drill down reports.
- Reports can update the database, hyperlink to one another to enable more detailed analysis, and refresh data dynamically.
- You can customize the BIRT reports or develop new reports to suit your business needs.

With ad hoc reporting, you can quickly create your own custom reports from any application. You can select what type of report you want to create, which fields to include, and whether to group and sort the results. You can also define unique report parameters, and specify whether you want the report to run on the records of the application. You can then save and share the reports with others, or run the report only once. If you save a report, it can be scheduled and automatically emailed to other users. You can also download the contents of the report to other file formats for additional analysis.

What's new in Maximo Manage

Learn more about what's new and changed in Maximo Manage.

- [../com.ibm.mam.doc/overview/c_wn_manage_87.html](#)
- [What's new in Maximo Manage 8.6](#)
Learn more about what's new and changed in Maximo Manage.
- [What's new in Maximo Manage 8.5](#)
Learn more about what's new and changed in Maximo Manage.
- [What's new in Maximo Manage 8.4](#)
Learn more about what's new and changed in Maximo Manage.
- [What's new in Maximo Manage 8.3](#)
Learn more about what's new and changed in Maximo Manage.
- [What's new in Maximo Manage 8.2](#)
Learn more about what's new and changed in Maximo Manage.
- [What's new in Maximo Manage 8.1](#)
Learn more about what's new and changed in Maximo Manage.
- [What's new in Maximo Manage 8.0](#)
Learn more about what's new and changed in Maximo Manage.

What's new in Maximo Manage 8.6

Learn more about what's new and changed in Maximo Manage.

New applications

IBM® Cognos® Analytics integration

Maximo Manage 8.6 includes integration with Cognos Analytics to provide Business Intelligence tools. For more information, see [Integrating with Cognos Analytics server](#).

Operational dashboard enhancements

KPIs

You can now track overdue preventive maintenance and emergency work, the rate of closure of preventive maintenance work orders, and the number of work orders that are awaiting approval. You can also see trend information for each KPI and whether your organization is over or under your target.

Favorites and Quick actions

You can now use the Favorites card to quickly access other applications. You can also use the Quick actions card to create a work order, service request, job plan, and more.

Workflow assignment actions

You can now accept, reject, route, and reassign workflow assignments on the Workflow assignments due soon card on the Operational dashboard.

Work Orders application enhancements

Rich text support

You can now add images, links, and text formatting to the long description of each work order.

Scheduling dashboard enhancements

Resource leveling tab

Use the Resource leveling tab to view resource allocation and planned work by craft. For more information, see [Viewing resource leveling on the Scheduling dashboard](#).

Optimization report

Use the optimization report to view optimization progress and to see details of the last run optimization. For more information, see [Monitoring optimization progress on the Scheduling dashboard](#).

Calendar and shift breaks

New shift break options are available in the Calendars application that update labor and crew availability to more accurately reflect calendar and shift information. For more information, see [Specifying shift breaks in calendars](#).

IBM Maximo Optimizer updates

Scheduling enhancements

Optimization rules were updated to support high priority work, work records locked by date or time, and modified availability from shift breaks. New constraints were added to support custom fields in the Graphical Scheduling and Graphical Scheduling-Large Projects applications.

Dispatching enhancements

New optimization rules were introduced for the Graphical Assignment application, including the support of global routing breaks, assigning related work records to the same technician, and allowing for uninterruptible tasks to be scheduled across shift breaks.

Technical updates

New interface for Java™ or automation scripts

Maximo Manage now has an interface that you can implement with Java™ or automation scripts. This interface accesses the store and reads, writes, or deletes documents from the store. For more information, see [Creating scripts to manage attachments](#).

Rolling upgrade

You can complete a rolling upgrade from a previous version of Maximo Manage to a later version of Maximo Manage. With a rolling upgrade, the interruption to Maximo Manage is minimal when you upgrade both operators and operands and has zero downtime when you upgrade only the operators but not the operands.

Advanced search added to the Work Orders and Workflow Assignments applications

You can now click the Filter icon to see extra search fields including target start, target finish, priority, job plan, and more.

User assistance improvements

Documentation for integrating with IBM Maximo Connector for Envizi

Topics added to learn about integrating the Maximo Manage with the Envizi ESG Suite. For more information, see [Integrating with Maximo Connector for Envizi](#).

Documentation for integrating with IBM Maximo Connector for TRIRIGA®

Topics added to learn about integrating the Maximo Manage with the TRIRIGA Application Suite. For more information, see [Integrating with Maximo Connector for TRIRIGA](#).

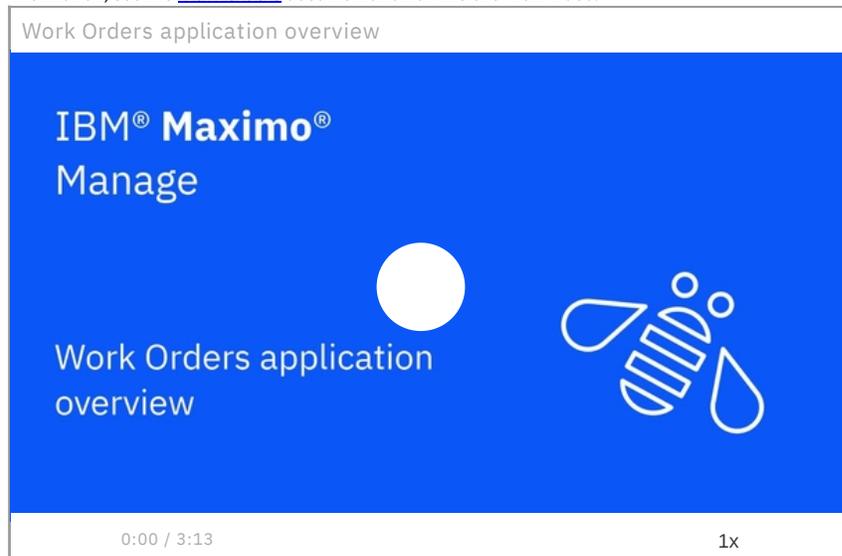
What's new in Maximo Manage 8.5

Learn more about what's new and changed in Maximo Manage.

New applications

Work Orders application

The Work Orders application contains a modernized, simplified view of the most important work order actions and information. You can also organize your work orders into custom views, track the status of each work order in the status bar, and enhance your productivity with type-ahead search. For more information, see the [Work Orders](#) documentation or this overview video.



Workflow Assignments application

You can use the Workflow Assignments application to monitor KPIs, such as the number of overdue assignments, and organize your assignments into custom views. You can also take advantage of productivity enhancements, such as type-ahead search and the ability to accept, reject, or reassign multiple assignments at once. For more information, see [Workflow Assignments](#).

Manage Monitoring Information application

The Manage Monitoring Information application replaces the Maximo Management Interface tool that was available in previous versions. This application, which is in the System Configuration module, provides information about your system's database, MBO counts, memory, JVMs, threads, and operating system. It also includes details about queues, object structures, the user who is logged in, classes, crontasks, and appservices. For more information, see [Manage Monitoring Information](#).

New dashboards

Scheduling dashboard

On the Scheduling dashboard, you can see all your schedules at a glance and conveniently view all upcoming work. KPIs show important information, including scheduling problems and resource utilization. You can update work records, view resource allocation, fix scheduling problems, and run optimization from one convenient location. You can publish your changes when your adjustments are complete. For more information, see the [Scheduling dashboard](#) documentation. For information on setting up your Scheduling dashboard, see [Adding schedules to the Scheduling dashboard](#) or this video.



Operational dashboard

The Operational dashboard is a modernized landing page that is similar to the Start Center. You can use the Operational dashboard to see your workflow assignments that are due soon. For more information, see [Operational dashboard](#).

IBM Maximo Optimizer

The Maximo Optimizer includes an integration with the new Scheduling dashboard and includes an SRE metrics dashboard. The SRE dashboard reports the following metrics:

- Execution services CPU and memory usage
- API services CPU and memory usage
- Job creation rate by model
- In progress job count

The Graphical Scheduling optimization model detects and reports infeasible work records and generates a partial schedule, which minimizes unscheduled work. The model extracts critical path information to identify bottlenecks in schedules, including limited resource capacity. For more information, see [Optimizing schedules](#).

Monitoring metrics added

The monitoring agent provides metrics for application usage and performance. More metrics are available in Maximo Manage.

For more information, see [Monitoring metrics](#).

Ability to require electronic signatures based on record status

You can now require electronic signatures based on the status of a record. For example, you can require an electronic signature for a work order only when it is completed. For more information, see [Electronic signatures, audit records, and login tracking](#).

Technical updates

Swagger interface for API integrations

To access the Swagger interface, enter the URL for the interface into a browser or an API client, such as Postman, as shown in the following example:

<https://<host>:<port>/toolsapi/oas3/api.html>

For more information, see [Integration APIs](#).

Stored procedures for text searches in Microsoft SQL Server databases

Because Microsoft deprecated the `sp_fulltext_table` stored procedure that is related to indexing in Microsoft SQL Server databases, that stored procedure is removed in this release. This programming update does not affect the user experience, and full text search continues to function as it did in previous releases. For more information, see [Searching](#).

KafkaErrorsCleanup cron task removed

The KafkaErrorsCleanup cron task is no longer used for reprocessing expired messages that have errors.

New integrations

There are two new integrations, ENVIZI and IBM® TRIRIGA® Application Platform integration. You can now view documentation for these Maximo Manage components. For more information, see [Maximo Manage components](#).

User assistance improvements

Onboarding assistance

Onboarding assistance is available to help you find your way around the Maximo Manage Start Center. You can also watch an overview video for Manage. Click Take a tour to get started.

Documentation improvements

To optimize and improve content retrievability, the documentation is now organized and streamlined to identify information by product and version. For more information, see [Documentation conventions](#).

What's new in Maximo Manage 8.4

Learn more about what's new and changed in Maximo Manage.

Support for Java Servlet Specification 3.1

To enhance security, Maximo Manage now uses Java™ Servlet Specification 3.1 for all web modules.

Database encryption updates

The following features are added for database encryption:

Ability to view encryption history

When you encrypt or reencrypt the database, an entry is logged in the `syschangetracker` table, and you can view the history for database encryption. For more information, see [Viewing database history](#).

Automatic generation of encryption keys

By default, if encryption keys are not specified when you activate Maximo Manage with a fresh database, new encryption keys are automatically generated. If you do not want to automatically generate encryption keys, you can set the `autoGenerateEncryptionKeys` property to `false`. For more information, see [Disabling auto-generation of encryption keys](#).

Ability to reset fields with crypto and cryptox encryption

If you inadvertently lose your crypto and cryptox encryption keys, you can run a reset script that clears the fields with crypto and cryptox encryption. Then, you can then restart the server and reset your data. For more information, see [Resetting encryption keys](#).

User management updates

In Maximo Application Suite 8.7 and earlier, users were created with a single username. Effective with Maximo Application Suite 8.8, when a user is created in Maximo Application Suite, a display name and a user ID are created. The user ID is a primary key that identifies a user, and it cannot be changed after the user is created. An option is also available to make a user's login ID be the same as the unique user ID or to create a custom login ID such as an email address. Login IDs can be updated if necessary. When user synchronization occurs, the Login ID that is specified in Maximo Application Suite becomes the login ID in Maximo Manage. The user ID in Maximo Application Suite becomes the user ID and the person ID in Maximo Manage.

New Count Books application

You use the new Count Books application to select inventory for periodic counting and to record the results of physical counts. You can then reconcile discrepancies between expected and actual quantities. For more information, see [Count Books application](#).

Ability to stream WebSphere Application Server Liberty logs

You can stream WebSphere® Application Server Liberty logs for server bundles by constructing a URL that you can use in a browser or other tool that you use for REST API calls. For more information, see [Sending log output to S3 Cloud Object Storage](#).

Ability to scale Java Message Service (JMS)

You can now configure multiple JMS servers and add custom message queues as needed. For more information, see [Configuring JMS server](#).

Documentation for automation scripting

Scripting allows you to customize the product without going through system downtime and a steep learning curve. You can customize Maximo using the Maximo scripting framework. For more information, see [Maximo autoscripting](#).

Ability to test automation scripts

You can test automation scripts after you create them. It is possible to test different types of scripts like object launch scripts, attribute launch scripts, integration scripts, and REST scripts. For more information, see [Testing automation scripts](#).

Ability to configure requests and limits for ephemeral storage

By default, ephemeral storage is allocated for the administrative and server bundle builds when Maximo Manage is deployed. Effective with this release, administrators can modify the requests and also limit the amount of ephemeral storage that is provisioned. For more information, see [Configuring ephemeral storage](#).

Metrics are added to the monitoring dashboard

The monitoring agent provides metrics for application usage and performance. Additional metrics were added in Maximo Manage 8.5. For more information, see [Monitoring metrics](#).

OAuth access is supported for the WEBSERVICE-JAX-WS web service handler

If you use the WEBSERVICE-JAX-WS web service handler, you can configure an OAuth authentication service to provide secure delegated access to Maximo Manage data. For more information, see [Configuring OAuth access](#).

Ability to provide Java virtual machine (JVM) options when you deploy Maximo Manage

You can now specify JVM options when you specify additional configurations for a server bundle in the Maximo Manage workspace. For more information, see [Configuring JVM options](#).

Documentation for configuring Grafana dashboards

Maximo Manage includes a monitoring agent that collects statistics about application usage and performance. Administrators can configure the Prometheus monitoring service and then use Grafana visualization software to view usage data that the agent collects. For more information, see [Configuring Grafana dashboards](#).

What's new in Maximo Manage 8.3

Learn more about what's new and changed in Maximo Manage.

New Asset Data Dictionary for integrating and synchronizing data across applications

The Asset Data Dictionary repository of data and metadata facilitates data sharing and integration between Maximo Manage and other applications. Using predefined artifacts in the Maximo Manage integration framework, you can synchronize data in Maximo Manage with the Asset Data Dictionary, which in turn integrates the data into other applications, such as Maximo Monitor. Synchronization can be performed manually when needed, at regularly scheduled intervals, or as event-based updates when data changes.

[Learn more about the Asset Data Dictionary.](#)

Support for initial data loads from Maximo Monitor to Maximo Manage

You can use the Asset Data Dictionary to load data for organizations, sites, assets, and locations from Maximo Monitor into Maximo Manage. Use this integration only for a one-time, initial load of data into Maximo Manage. After the initial data is loaded, Maximo Manage takes ownership of the data and manages any subsequent changes to the data.

[Learn more about adding Maximo Monitor data to Maximo Manage.](#)

New process for integrating metrics data from IoT sensor devices

You can add metric data that IoT monitoring systems gather from sensor devices to meters in Maximo Manage applications.

[Learn more about integrating metrics data from IoT sensor devices.](#)

Ability to use OAuth access standards

If you want to use an OAuth authentication service to provide secure delegated access to Maximo Manage data, you can configure OAuth access in the End Points application.

[Learn more about configuring OAuth access.](#)

Integration framework support for OR and AND operators in the same OSLC WHERE clause

You can now use both AND and OR operators in the same OSLC WHERE clause. For more information, see the Maximo Manage REST API documentation.

Upgrade to Business Intelligence and Reporting Tools (BIRT) 4.8

Maximo Manage 8.3 uses BIRT version 4.8.0. To design your reports, use version 4.8 of the report designer tools for BIRT.

[Learn more about BIRT 4.8 in Maximo Manage 8.3.](#)

Update feature is removed from inventory analysis reports

Effective with Manage 8.3, the Update button is removed from the following inventory analysis reports:

- Inventory ABC Analysis
- Inventory EOQ Analysis
- Inventory ROP Analysis
- Inventory ABC Transaction Date Analysis
- Inventory EOQ Transaction Date Analysis
- Inventory ROP Transaction Date Analysis

Although you can still run the reports to obtain an analysis of your inventory, you cannot update the Manage database with the analytic values that the reports calculate.

Support for configuring Grafana dashboard visualization software for monitoring services

Maximo Manage 8.3 includes new features to help you configure Grafana dashboards. You can use Grafana to display data that is collected from the Prometheus monitoring service.

[Learn more about configuring Grafana dashboards for Maximo Manage.](#)

Ability to add multiple customization archive files

You can now add multiple customization archive files to customize Maximo Manage.

[Learn more about adding customization archive files.](#)

New server bundle type for deploying a JMS server

You can use the new standalonejms server bundle type to configure and deploy a Liberty server for JMS messaging.

[Learn more about deploying a JMS server.](#)

Enhanced features for persistent volume storage

The following enhancements are added for configuring persistent storage:

Dynamic provisioning for persistent volume claims

When a persistent storage volume is declared, if you do not specify a persistent volume claim, the workspace operator creates a persistent volume claim that is dynamically provisioned based on the storage class.

[Learn more about persistent storage.](#)

Ability to configure persistent volume storage for specific server bundles

You can now create persistent volume claims for specific server bundles. For example, you can deploy a server for processing JMS messages and create a persistent volume claim to provide persistent storage just for that server.

[Learn more about configuring persistent volume claims for storage bundles.](#)

What's new in Maximo Manage 8.2

Learn more about what's new and changed in Maximo Manage.

Ability to add files to IBM® WebSphere Application Server Liberty

Administrators can now customize the WebSphere® Application Server Liberty application server for a server bundle by adding directories and files to the customization archive for the bundle. For example, if you use an IBM MQ service for messaging, you can add an RAR file for your IBM MQ resource adapter to the additional-server-files directory in the customization archive for a server bundle. The file is added to the application server for that bundle when Maximo Manage is deployed.

[Learn more about adding files to the application server.](#)

External certificates can be imported using API calls

Administrators can now issue an API call to import external certificates. This feature is useful if you do not have access to the Maximo Application Suite user interface.

[Learn more about importing external certificates.](#)

JDBC driver options can be added when you configure the Manage database

When you deploy Maximo Manage, you can now configure more JDBC driver options using the Maximo Application Suite user interface.

[Learn more about adding JDBC driver options.](#)

Bulk export feature is added to the integration framework

To export multiple batches of message data to an external system, you can use the new Bulk Data Export action in the External Systems application. When you use this feature, exports are processed in order based on the sequence that you specify for the publish channels.

[Learn more about bulk data exports.](#)

SMTP configurations in Maximo Application Suite apply to Maximo Manage

The SMTP configurations that you define in Maximo Application Suite are now also automatically applied to Maximo Manage. No additional configuration is required in the Manage application.

[Learn more about configuring SMTP for Maximo Application Suite.](#)

What's new in Maximo Manage 8.1

Learn more about what's new and changed in Maximo Manage.

Maintenance cost rollup in the Assets application

A new feature is added to the Assets application to help you calculate maintenance costs for your assets. After you close a work order that is associated with an asset, you can roll up costs that you incur for labor, materials, tools, and services to the top-level asset in the hierarchy that the asset belongs to. You can roll up costs manually or configure a system property to roll up costs automatically when work orders are closed.

In previous releases, the Maintenance Cost Rollup Report was used to calculate maintenance costs for assets. Use the new rollup feature in the Assets application instead of the report. The report is still available to allow existing users to roll up pending maintenance costs. If you upgrade to Maximo Manage 8.1, run the report to roll up pending maintenance costs before the upgrade.

[Learn more about asset cost rollup.](#)

APIs for administrative utilities

APIs to run script commands for administrative utilities are now available. The API requests can run the integrity checker utilities, start and stop the Maximo Manage pods, download log files or a list of log files, and upload logs to Simple Storage Service (S3) Cloud Object Storage. [Learn more about APIs for administrative utilities.](#)

Adding trusted external certificates

Administrators can add trusted external certificates for Maximo Manage in the Suite administration panel of Maximo Application Suite. [Learn more about adding trusted external certificates](#)

Log output to S3 Cloud Object Storage

You can send server bundle logs for Maximo Manage to your provisioned Simple Storage Service (S3) Cloud Object Storage. You also can redirect logs from the administrative server to S3 Cloud Object Storage. [Learn more about sending log output to S3 Cloud Object Storage](#)

External registry for build images

You can now configure Maximo Manage to send the images that are created when you deploy or update the application to an external repository. The external build images are useful if you want to test or review the application before you deploy it in the Maximo Application Suite. [Learn more about configuring an external registry.](#)

Deploying Maximo Manage on a local computer

After you configure Maximo Manage to send build images to an external registry, you can deploy the images to a Docker container on a local computer. You can use these images to review content or to customize the application. [Learn more about deploying Maximo Manage on a local computer.](#)

Configuring JVM options

You can now configure JVM configuration options for the WebSphere Application Server Liberty server on which a server bundle runs. For example, you can specify memory options to improve performance or specify logging options for the server bundle. You configure JVM options by adding them to the custom resource definition in the Red Hat® OpenShift® console. [Learn more about configuring JVM options.](#)

Parts Identifier add-on for Maximo Mobile

Parts Identifier is an IBM Cloud® service add-on for Maximo Mobile that enables technicians to search for and identify industrial parts from their mobile device by using a combination of visual and text-based search approaches. You add the Parts Identifier add-on in IBM Maximo Application Suite. After you add Parts Identifier in Maximo Application Suite, you must integrate it with Maximo Manage.

[Learn more about configuring the Parts Identifier integration with Maximo Manage.](#)

What's new in Maximo Manage 8.0

Learn more about what's new and changed in Maximo Manage.

Product name change

In Maximo Application Suite, IBM® Maximo Asset Management is renamed IBM Maximo Manage. The industry solutions and add-ons that are included in Maximo Application Suite are also renamed. For more information, see [Maximo Manage components](#).

Deploying and activating Maximo Manage

Maximo Manage is an application in Maximo Application Suite. Maximo Application Suite is a suite of asset management and data analytic offerings. Maximo Application Suite is offered as a customer-managed product on Red Hat® OpenShift® and as an IBM Managed solution.

To access and use Maximo Manage, you deploy and activate Maximo Manage in Maximo Application Suite. For more information, see [Deploying in Maximo Application Suite](#).

Upgrading to Maximo Manage 8.0

You can upgrade to Maximo Manage 8.0 from Maximo Asset Management. Before you upgrade, you must have Maximo Asset Management 7.6.1.2 installed. For more information, see [Upgrading from IBM Maximo Enterprise Asset Management to IBM Maximo Manage](#).

Maintaining calibration assets and standards

Calibration is included in the base entitlement for Maximo Manage and no longer requires an additional license or install. When you deploy Maximo Manage, calibration functionality is also included. For more information, see [Managing calibration assets and standards](#).

Maintaining linear assets

Linear is included in the base entitlement for Maximo Manage and no longer requires an additional license or install. When you deploy Maximo Manage, linear functions is also included. For more information, see [Linear assets management](#).

Planning and scheduling work

Scheduler is included in the base entitlement for Maximo Manage and no longer requires an additional license or install. When you deploy Maximo Manage, scheduler functionality is also included. For more information, see [Planning and scheduling work](#).

Maximo Mobile

Maximo Mobile is a next-generation mobile application platform that is supported by Maximo Manage. Maximo Mobile allows users use mobile devices to securely access Maximo Manage functionality. The Maximo Mobile apps provide a mobile user with capabilities to manage work and conduct inspections both when the app is connected and disconnected. For more information, see [Managing Maximo Mobile](#).

User management

Users are added and authenticated in Maximo Application Suite. Users who have an entitlement to Maximo Manage are synchronized to Maximo Manage.

If you are upgrading from Maximo Asset Management to Maximo Application Suite, user records in the Maximo database are imported by Maximo Application Suite if they do not exist there or if they are not managed by an identity provider.

License type updates can be sent to Maximo Application Suite when authorizations change or when the calculated license type has a different entitlement value in Maximo Manage.

Security groups

Authorization enables access to applications, application actions, and data in Maximo Manage. Authorization is provided by assigning users to one or more security groups in Maximo Manage. You can create security groups in Maximo Manage. If you manage users in an LDAP user registry, you create groups in the user registry

and synchronize the data to Maximo Application Suite so that it can be synchronized to Maximo Manage. Map your LDAP groups to Maximo Manage security groups before you synchronize them to the suite. For more information, see [Security group synchronization and default assignments](#).

Logging

Maximo Manage server logs are written to standard output. You can view or process log output using various tools, such as an aggregation of logs in an Red Hat OpenShift cluster-level logging stack.

Electronic signature

Electronic signature keys must conform to the same rules as product passwords. Any key that is manually created or automatically generated from a reset action is validated by using the rules for user passwords, such as password length or excluded words. For more information, see [Electronic signature verification](#).

Kafka updates

You can browse message content in a Kafka queue using a REST API that the product provides. Browse message content to analyze it or to troubleshoot processing. For more information, see [Sample REST API requests for browsing Kafka queues](#).

To reduce the possibility of duplicate message processing, Maximo Manage attempts to keep its offsets synchronized with the offsets that are managed by Kafka. You can reset offsets in Maximo Manage if they are not synchronized with the offsets that are managed by Kafka. For more information, see [Managing Kafka offset values in Maximo Manage](#).

To use Kafka features in the product, you must obtain and configure a Kafka server instance of the provider. The Kafka server that you obtain must be compatible with the Kafka 2.5.0 client libraries.

Other integration updates

Use REST API instead of RMI

You use REST API instead of Remote Method Invocation (RMI) for interactions with the product from custom extensions or external applications. RMI is not supported in the product.

For more information, see [Communication with external applications through REST API](#).

API key authentication for REST API and integration features

API keys for user and group synchronization are generated for you. If you interact with REST API or machine-to-machine integration activities, you must configure an API key. The API key is configured in the Administration Work Center of Maximo Manage.

Added support for the JSON schema in OAS 3.0 documentation

Complete JSON schema content was added to the OAS 3.0, or Swagger, documentation for the Maximo Manage APIs. The existing non-OAS 3.0 JSON schema is still supported.

Support Simple Object Access Protocol (SOAP) 1.1 and SOAP 1.2 in same web server instance for a WebSphere® Application Server Liberty environment

You can use SOAP 1.1 and SOAP 1.2 with the Java™ API for XML Web Services (JAX-WS) endpoint handler to exchange messages in a WebSphere Application Server Liberty environment.

For more information, see [Implementing SOAP 1.1 and 1.2 with JAX-WS web services](#).

New batch parameter to support processing large outbound messages

You can set a batch size parameter to break up large outbound messages into multiple transactions of the size that you specify. Set the batch size in the Data Export window of the publish channel.

New location for REST API documentation

The documents and videos about REST API are now in the Internet of Things community.

[See and bookmark the new location for REST API documentation](#).

API key support for legacy APIs

API keys are supported if you are working with legacy APIs. Legacy APIs are APIs that became available in product versions before Maximo Asset Management 7.1.

Form data support using the HTTP handler

In the integration framework, the HTTP handler now supports a POST of form data, in addition to existing support for JSON and XML data.

Support for nested representation of hierarchical object structures in messages

You can export a nested JSON representation of an object structure and all of its descendant objects by selecting the Complete Hierarchy option for outbound messages. Object structures that were exported as complete hierarchies can be imported as complete hierarchies.

Scripting point for Maximo Manage roles

A scripting point is available to define custom roles and automate communications to users who are associated with the roles.

For more information, see [Example: Automating communication by using a custom role](#).

Sequences for SQL Server

Sequences are database objects that automatically generate unique key values or caches of multiple values. Sequence caches might improve system performance.

For more information, see [Modifying sizes of sequence caches](#).

Redundant Maximo properties

The Maximo properties file is now redundant in Maximo Manage.

For more information, see [Maximo properties](#)

What's new in Maximo Mobile

Learn more about what's new and changed in Maximo Mobile.

- [What's new in Maximo Mobile 8.10](#)
Learn more about what's new and changed in Maximo Mobile 8.10.
- [What's new in Maximo Mobile 8.9](#)
Learn more about what's new and changed in Maximo Mobile 8.9.
- [What's new in Maximo Mobile 8.8](#)
Learn more about what's new and changed in Maximo Mobile 8.8.

Related concepts

- [Managing Maximo Mobile](#)
- [Introduction to Maximo Mobile](#)

What's new in Maximo Mobile 8.10

Learn more about what's new and changed in Maximo Mobile 8.10.

Work orders

- In the work log, you can now expand the Note field to add a summary for your note. You can also add much longer notes than before.
- As you complete the tasks on a work order, you can record observations and measurements.
- You can include comments when you report failures so that you can better describe the details.
- You can now view classifications on a work order.

Assets

- You can now create and edit assets in the app and change the status of the asset.

Inspections

- During an inspection, you can upload a photo and select Analyze photo. You can continue the inspection while the photo is analyzed to detect anomalies. When the analysis is complete, you can review and edit the results. This feature is configured in the Manage Inspection Forms tool. For more information, see [Enabling photo analysis by Maximo Visual Inspection](#)

Onboarding tour

- A short overview tour of the navigator is available to help new users get started with the app.

Data updates

- The Data update page now shows the status of uploads and downloads. The information is divided into four sections: Transaction upload, Configuration data, Functions, and Record data. The four sections are processed in sequence, with each section starting the update only when the previous category is complete.
- Errors are also shown inline on the Data update page instead of a separate page so that users can troubleshoot in context.
- Transactions are grouped by object and an error in one transaction blocks all other transactions that belong to the same object. To continue the upload, you can retry the transaction, go to the object and fix the error, or you can delete the transaction.
- Tap the refresh icon on the Data update page to update data. You can specify the record data to update by tapping the options icon on the Data update page. To fully update your record data, open the navigator and tap Settings.

For more information, see [Refreshing data](#)

Inventory receiving

In the Inventory Receiving function, storeroom clerks can receive materials from purchase orders. As part of the receiving activity, the storeroom clerk can inspect and return items and view or void receipts.

Service requests

Creating service requests is improved in this release. You can select a location by searching and the Asset page has a better layout and search option.

Troubleshooting

The debugging capabilities of Maximo Mobile applications on Android are improved.

For more information, see [Troubleshooting applications on Android](#).

E-signatures

E-signature keys capture and validate work order status changes in the My Schedule function of the Technician application. For more information, see [Recording e-signature keys](#).

Documentation

Documentation developed for application development and upgrade.

For more information, see [Anatomy of an application XML file](#) and [Application upgrade](#)

What's new in Maximo Mobile 8.9

Learn more about what's new and changed in Maximo Mobile 8.9.

Navigation

- When technicians complete the final task in the task list, the Report work page opens automatically. This behavior is controlled by the `maximo.mobile.gotoreportwork` system property.
- When technicians tap Start work, the Work order details page opens automatically, but tapping Stop travel no longer opens another page.

Usability

- To prevent errors, the work order number is displayed when a technician edits a work order.
- Technicians can now specify a name and add a description when they add attachments to a work order.
- The icons for Start work, Start travel, and Start travel with timer are now visually different so that technicians can easily distinguish them on a small mobile screen.

Data

- When a work order specifies both an asset and a location, the Asset and location history page displays any closed and completed work orders for the asset and the location.
- The list of related records now shows the status and type of record, such as work order or service request.
- The asset or location of a task is now displayed when the parent work order has a different asset or location.
- When mobile users are offline, requests are processed on the device by using data that was retrieved during online operations. When connectivity is restored, local data is automatically synchronized. For more information, see [Overview of Maximo Mobile authentication and data flow](#).
- You can create a preloaded database that contains all supporting data to save mobile application users time when they are onboarding. For more information, see [Preloaded data on mobile devices](#).

Approvals

- You can require a physical signature when a user approves work. Specify one or more work order statuses for the `maximo.mobile.statusforphysicalsignature` system property.

Maps

- Technicians can now select a building from the map, then review individual floor plans to see the position of their work orders in the building. Indoor maps are available only to Maximo Spatial customers. For more information, see [Indoor maps](#).

Assets

- Technicians can go to the Assets function in the Maximo Mobile app or on desktop go to Work Orders > Role Based Applications > Asset Manager to see the details of all their assets, including their specifications and associated meters.

Defects

- In the Defects function, customers who have Maximo Civil Infrastructure can now view confidence scores to suggest how close the detected anomalies are to a defect. You can also select one or more anomalies and use the new menu with options such as change the category, show, hide, and delete the anomalies.

Inspection forms

- Inspection supervisors can now review an inspection and update it before the inspection is completed. Use the `mxe.mobile.inspection.features.enablereview` system property to set a review status between the In progress and Complete statuses.
- Inspection supervisors can now see whether a field was hidden or visible when an inspector completed an inspection form.

Inspections

- Inspectors can group inspections to report them as a batch and can open and preview an inspection without starting it.

- Inspectors can search for questions or groups of questions and jump to that part of the inspection form.

Service Requests

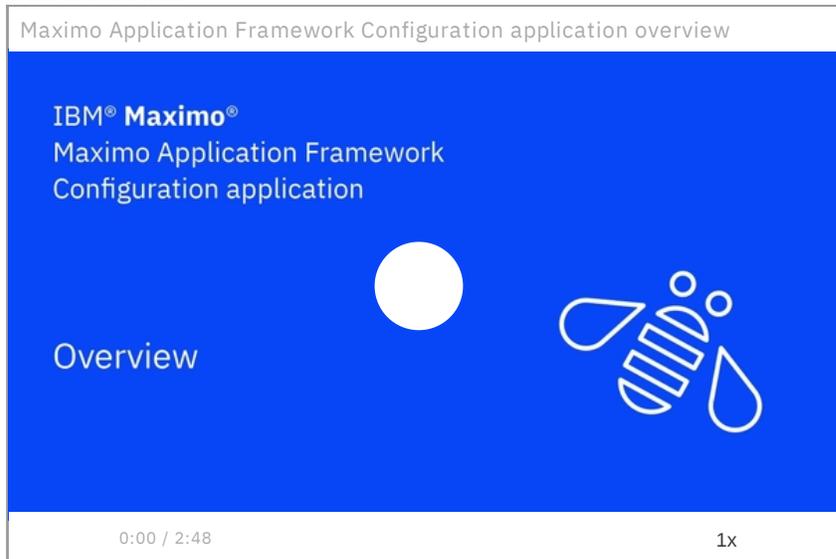
- Users who create service requests can now search through a hierarchy to find the correct location, capture their GPS location on the service request, and can add service address information.

Troubleshooting

- Users can troubleshoot mobile application issues by contacting IBM Support to download the debug version of Maximo Mobile. For more information, see [Troubleshooting applications on Android](#).

Configuration

- Use the Maximo Application Framework Configuration application to configure non-mobile, role-based applications, such as Workflow Assignments. For more information, see the [Configuring and customizing applications with the Maximo Application Framework \(MAF\) Configuration application](#) documentation or this overview video.



What's new in Maximo Mobile 8.8

Learn more about what's new and changed in Maximo Mobile 8.8.

Inventory counting

In the new Inventory Counting function, storeroom clerks can use count books, ad hoc counts, and reconciliation to ensure valid inventory balances.

Work orders

Supervisors can specify relationships between work orders and tasks so that only when a task is completed, the next task in the flow can be started. The sequence can be defined in a work template at the job plan level.

Safety

Safety plan information, including hazards and precautions, is now included on the work order so that technicians can review the details and be fully prepared for their work.

Defects

IBM® Maximo Civil Infrastructure customers can use the new Defects function to create defects and attach photos that can be automatically analyzed to detect anomalies. You can create defects from the new Defects function or from an inspection record. For more information, see [Creating defects](#).

Inspection forms

- In the Manage Inspection Forms tool, inspection supervisors can add validation rules for numeric fields. For example, a supervisor might specify that the number the inspector enters must be within a range, and if the entered value is outside of the range, the value is rejected.

- Inspection supervisors can now link from an existing domain to a single choice field or a multiple choice field. Supervisors configure the link in the Manage Inspections Forms tool. When a supervisor creates an inspection form, they choose Lookup Domain Value - Single Choice or Lookup Domain Value - Multiple Choice as the response type. An inspector can then complete the field by selecting values from a list.

Inspections

- Inspectors can now complete hands-free inspections on their mobile device. The inspection form is read aloud, and verbal responses are recorded on the form. For more information, see [Enabling voice inspections](#).
- When unexpected work arises, inspectors can now create unscheduled inspections to track work.
- When GPS is enabled on their mobile device, the geographical location is saved every time that an inspector updates a field in the inspection form. This feature is controlled by the `mxm.mobile.inspection.features.savegeolocation` system property.

Maximo Manage components

When you deploy and activate IBM® Maximo® Manage, you can optionally include additional components, such as add-ons and industry solutions during the deployment and activation process.

Add-ons

An add-on is a component that extends the capabilities of Maximo Manage.

Industry solutions

An industry solution is a component that provides additional, industry-specific functionality to Maximo Manage.

Maximo Manage components

Table 1 lists the additional components that you can deploy with Maximo Manage, and links to documentation for each component.

Table 1. Maximo Manage components

Component name	Component type	Name in version 7.6	Documentation link
IBM Maximo Anywhere Available only in Maximo Application Suite 8.8 and earlier.	Add-on	IBM Maximo Anywhere	Maximo Anywhere documentation
IBM Maximo Asset Configuration Manager	Add-on	IBM Maximo Asset Configuration Manager	Maximo Asset Configuration Manager documentation
IBM Maximo Aviation	Industry solution	IBM Maximo for Aviation	Maximo for Aviation documentation
IBM Maximo Civil Infrastructure	Industry solution	IBM Maximo for Civil Infrastructure	Maximo Civil Infrastructure documentation
IBM Maximo Connector for SAP Applications	Add-on	IBM Maximo Enterprise Adapter for SAP Applications	Maximo Enterprise Adapter for SAP Applications documentation
IBM Maximo Connector for Oracle applications	Add-on	IBM Maximo Enterprise Adapter for Oracle Applications	Maximo Enterprise Adapter for Oracle Applications documentation
IBM Maximo Connector for Workday Applications	Add-on	Not applicable	Integrating with Workday Connector
IBM Maximo Health, Safety and Environment	Add-on	IBM Maximo Health, Safety and Environment Manager	Maximo Health, Safety, and Environment Manager documentation
IBM Maximo Nuclear	Industry solution	IBM Maximo for Nuclear Power®	Maximo for Nuclear Power documentation
IBM Maximo Oil & Gas	Industry solution	IBM Maximo for Oil and Gas	Maximo for Oil and Gas documentation
IBM Maximo Service Provider	Add-on	IBM Maximo for Service Providers	Maximo for Service Providers documentation
IBM Maximo Spatial	Add-on	IBM Maximo Spatial Asset Management	Maximo Spatial Asset Management documentation
IBM Maximo Transportation	Industry solution	IBM Maximo for Transportation	Maximo for Transportation documentation
IBM Maximo Utilities	Industry solution	IBM Maximo for Utilities	Maximo for Utilities
IBM Maximo Connector for Envizi	Add-on	Not applicable	Integrating with Maximo Connector for Envizi
IBM Maximo Connector for TRIRIGA®	Add-on	Not applicable	Integrating with Maximo Connector for TRIRIGA

Accessibility features for Maximo Manage

Accessibility features for Maximo® Manage assist users who have disabilities, such as restricted mobility or limited vision, to use information technology content successfully.

Accessibility features

For information about IBM accessibility and to view Accessibility Conformance Reports, see [IBM Accessibility](#).

Maximo Manage includes the following major accessibility features:

- Supports interfaces that are commonly used by screen readers.
- Can be operated by using only the keyboard.
- Allows the user to access the interfaces without inducing seizures due to photo-sensitivity.

Maximo Manage uses the latest W3C Standard, [WAI-ARIA 1.0](http://www.w3.org/TR/wai-aria/) (<http://www.w3.org/TR/wai-aria/>), to ensure compliance with [US Section 508](https://www.access-board.gov/ict/about/) (<https://www.access-board.gov/ict/about/>) and [Web Content Accessibility Guidelines \(WCAG\) 2.0](http://www.w3.org/TR/WCAG20/) (<http://www.w3.org/TR/WCAG20/>). To take advantage of accessibility features, use the latest release of your screen reader in combination with the latest web browser that is supported by this product.

Maximo Manage contains a screen reader check box. The Use Screen Reader check box is in the User tab of the Users application. When you select the check box, the user interface is optimized to work with a screen reader. The Accessibility Help window provides details on general navigation, menu navigation, and hot keys. Click Accessibility Help from the toolbar of the product to access the help window. To use the accessibility tools to read reports, you must access the reports in Microsoft Excel. In the reports applications, select the Run Reports option. With this option, you can email an .xls file version of a report to yourself at a scheduled time.

Keyboard navigation

Maximo Manage uses the following keyboard shortcuts.

Table 1. Keyboard shortcuts for general navigation

Action	Keyboard shortcut
Move from one interface element to the next.	Tab key
Select buttons, links, and menu options.	Enter key
Select or clear a check box.	Spacebar
Display field help for the field that is in focus.	Alt+F1

Table 2. Keyboard shortcuts for global navigation

Link name	Keyboard shortcut
Bulletins	Alt+B
Go To	Alt+G
Reports	Alt+R
Start Center	Alt+C
Profile	Alt+P
Sign Out	Alt+S
Help	Alt+H
Return	Alt+R
Return with Value	Alt+W

Table 3. Keyboard shortcuts for application-specific actions

Action	Applications	Keyboard shortcut
Assign Labor	Assignment Manager	Ctrl + Alt + L
Finish Assignment	Assignment Manager	Ctrl + Alt + F
Interrupt Assignment	Assignment Manager	Ctrl + Alt + U
Select Work Date	Assignment Manager	Ctrl + Alt + W
Start Assignment	Assignment Manager	Ctrl + Alt + T
Start Timer	Activities, Changes, Incidents, Problems, Releases, and Service Requests	Ctrl + Alt + B
Stop Timer	Activities, Changes, Incidents, Problems, Releases, and Service Requests	Ctrl + Alt + E

Table 4. Keyboard shortcuts for toolbar actions

Action	Keyboard shortcut
Insert New Record	Ctrl+Alt+I
Save Record	Ctrl+Alt+S
Clear Changes	Ctrl+Alt+C
Previous Record	Ctrl+Alt+P
Next Record	Ctrl+Alt+N
Change Status	Ctrl+Alt+A
Create KPI	Ctrl+Alt+K
Put record in edit mode or release record from edit mode	Ctrl+Alt+L

Table 5. Keyboard shortcuts for tables

Action	Keyboard shortcuts
Next Row	Ctrl+down arrow
Previous Row	Ctrl+up arrow
Open/Close Table Window Filter	Ctrl+Z
Next Page	Ctrl+right arrow
Previous Page	Ctrl+left arrow

Table 6. Keyboard shortcuts for dates

Action	Keyboard shortcuts
Insert today's date	Ctrl+SHIFT+7
Move forward one day	ALT+up arrow
Move back one day	ALT+down arrow
Move forward one month	Ctrl+SHIFT+0
Move back one month	Ctrl+SHIFT+9
Move forward one year	Ctrl+SHIFT+up arrow
Move back one year	Ctrl+SHIFT+down arrow

Table 7. Non-standard keyboard shortcuts

UI element	Action	Standard UI response	Deviation
Radio buttons	To move between radio buttons, press the Right and Left arrows.	The radio buttons are selected as the user moves through them.	The radio buttons are highlighted but not selected as the user moves through them. A radio button is selected only when the user presses Spacebar or Enter on the highlighted radio button.
Tree view	To select a node, press Enter.	When the user presses Enter, the default action is performed for a node.	Nodes might have zero, one, or two actions. If a node has 2 actions and a user navigates to an element by using the arrows, when the user presses Enter the default action is performed. When the user presses Enter a second time, the secondary action is performed.

Interface information

Maximo Manage has the following accessibility characteristics:

- If PDF files are included, the files have limited accessibility support. With PDF documentation, you can use optional font enlargement, high-contrast display settings, and you can navigate by keyboard alone. All PDF documentation is also available in HTML format.
- Maximo Manage online product documentation is available in IBM® Documentation, which is viewable from a standard web browser.
- Maximo Manage does not have audio features in its interface.
- You can use supported screen readers with the user interface.
- You use the Go To menu to navigate to any of the applications that you have access to. The Go To menu is a cascading menu that is three levels deep at its deepest point. You can use the screen reader with the Go To menu.

The following instructions apply to both the standard navigation and the side navigation menu and describe how to get started with the screen reader:

1. To get to the Go To menu press Alt+G.
 2. When you open the menu, the screen reader reads the first application in the menu. If the screen reader does not read the entry, restart the screen reader.
 3. Navigate the list of applications in the menus by using the arrow keys.
 4. The screen reader indicates whether a menu item has submenus. To get to a submenu, press the right arrow or enter.
 5. Press the left arrow to move up a level in the hierarchy. If you press the left arrow at the highest level of the Go To menu, you leave the menu completely.
 6. Press the Enter key to enter an application.
- The Maximo Manage user interfaces do not have content that flashes 2 - 55 times per second.

The Maximo Manage web user interfaces rely on cascading style sheets to render content properly and to provide a usable experience. The application provides an equivalent way for low-vision users to use a user's system display settings, including high-contrast mode. You can control font size by using the device or web browser settings.

The Maximo Manage web user interface includes WAI-ARIA navigational landmarks that you can use to quickly navigate to functional areas in the application.

Related accessibility information

In addition to standard IBM help desk and support websites, IBM has established a TTY telephone service for use by deaf or hard of hearing customers to access sales and support services:

TTY service 800-IBM-3383 (800-426-3383) (within North America)

IBM and accessibility

For more information about the commitment that IBM has to accessibility, see [IBM Accessibility](#).

Documentation conventions

The following table describes the conventions that are used in this documentation.

Icon	Description
	Identifies IBM® Maximo® Manage that is offered as a customer-managed product on Red Hat® OpenShift®.
	Identifies Maximo Manage that is offered as a cloud-based product on Amazon Web Services (AWS).
No icon	For both Maximo Application Suite and (S (SaaS)).

Getting started with Maximo® Manage

After you sign in, you see your start center. The start center contains links to actions, applications, and data records for you to begin the tasks that are relevant to your job.

- [Start Center](#)
A Start Center is a page that gives you quick access to the tools and key performance indicators (KPIs) that you use most frequently. You can change the appearance of the Start Center and can have multiple Start Centers. All your Start Centers are accessible from the main Start Center page.
- [Operational dashboard](#)
The Operational dashboard is a modernized landing page that is similar to the Start Center. You can use the Operational dashboard to monitor KPIs, see your workflow assignments that are due soon, quickly complete tasks, and access other applications.
- [My profile information](#)
Your profile contains the user information specific to you such as your password, electronic signature key, contact details, and time zone. You can change your profile information and default settings. For example, you can modify your default information to ensure that you see records for your site only.
- [Navigation](#)
To navigate the user interface, you use the links on the navigation bar and can use keyboard shortcuts for many actions. You can also navigate location and asset hierarchies.
- [Searching](#)
The search method that you use depends on how much you know about the record that you want to find. For example, you must know the exact record ID to search by using the Find field but need only a partial value to search by using wildcards.
- [Entering data and dates in fields](#)
When you create or edit a record, you can enter values in fields by using different methods depending on the type of field and what you need to enter. You can also use classifications to retrieve historical data.
- [Printing documents](#)
You can print the documents attached to a record or work pack. You can also schedule and print reports in an application.

Start Center

A Start Center is a page that gives you quick access to the tools and key performance indicators (KPIs) that you use most frequently. You can change the appearance of the Start Center and can have multiple Start Centers. All your Start Centers are accessible from the main Start Center page.

To see the most up-to-date data in your key performance indicators (KPI), click Update in the KPI section.

Each Start Center is based on a template. Each security group is assigned a Start Center template. When you log on to the system, you see a Start Center that is based on the template for the security group to which you are assigned. If you belong to more than one security group, you might see more than one tab. Each tab is a Start Center for a different security group.

A user with administrative rights can create and change templates, update portlets, and change the appearance of the Start Center. A user with administrative rights can also control which portlets you see and can configure.

By default, Start Center templates are shown in English. However, a user with administrative rights can create Start Center templates that are shown in languages other than English.

- [Start Center portlets](#)
A portlet is configurable window that provides quick access to applications and actions, and an at-a-glance view into data specific to the job function of an individual.
- [Managing Start Center templates](#)
The portals and content that users see in the Start Center depends on the Start Center template that is assigned to their security group. A user with administrative rights can create Start Center templates, modify or delete existing templates, and create templates that can be shown in multiple languages.
- [Configuring Result Set portlets](#)
You can specify that rows in a Result Set portlet are colored if they meet a condition. For example, the rows for the incidents with a priority of 1 are colored in red. You can also include related attributes in the result set. For example, you can display the given name and surname of a user, rather than their user ID.
- [Changing the content and layout of the Start Center](#)
You can change the content and layout of Start Center pages. For each Start Center, you can specify the column layout, the portlets that you want to display in each column, the order of those portlets, and which portlets to remove from the columns. You can also specify a name for the Start Center, and this name will appear on the Start Center tab.
- [Specifying a default Start Center](#)
When you have more than one Start Center page available to you, the system displays tabs for each page. You can set which Start Centers appear as tabs on the Start Center page, and which you want to open by default when you navigate to the Start Center.
- [Editing portlets in the Start Center](#)
You can change the contents of a portlet in the Start Center to make the information more useful to you. Changes can include adding information to a portlet, removing information from a portlet, changing the order of information in the portlet, and renaming the portlet.
- [Updating Start Centers](#)
When a system administrator notifies you that changes have been made to your start center template, you can update the Start Center page.

Start Center portlets

A portlet is configurable window that provides quick access to applications and actions, and an at-a-glance view into data specific to the job function of an individual.

- [Favorite Applications portlet](#)
Use the Favorite Applications portlet in your Start Center to display the applications that you use frequently. Clicking an application in the portlet takes you directly to the application.
- [Inbox/Assignments portlet](#)
Inbox/Assignments is one of the portlets that you might see on your Start Center. The portlet lists your task assignments. You use the inbox to review assignments, to route assignments, and to complete assignments.
- [KPI Graph portlet](#)
Key Performance Indicators (KPIs) provide the means to track critical performance variables over time. The KPI Graph portlet displays graphical representations of KPIs.
- [KPI List portlet](#)
Key Performance Indicators (KPIs) provide the means to track critical performance variables over time. You use the KPI List Setup Portlet to create a table of KPIs that can be viewed in the Start Center.
- [Quick Insert portlet](#)
You can add actions to the Start Center in the Quick Insert portlet. Clicking an item in the portlet list takes you to the application to carry out the task. In addition, you can associate templates with some actions. When you click an action link that has an associated template, the template is applied to the action.
- [Report List portlet](#)
The Report List portlet displays the reports that you use frequently. Clicking a report in the portlet runs the report.
- [Result Set portlet](#)
The Result Set portlet displays the results of a saved query in either list format or chart format.

Favorite Applications portlet

Use the Favorite Applications portlet in your Start Center to display the applications that you use frequently. Clicking an application in the portlet takes you directly to the application.

A Start Center can have one or more Favorite Applications portlets so that you can organize applications into logical groups. You can change the title of the portlet to one that makes sense to you.

Inbox/Assignments portlet

Inbox/Assignments is one of the portlets that you might see on your Start Center. The portlet lists your task assignments. You use the inbox to review assignments, to route assignments, and to complete assignments.

A task assignment is a record that is routed to you for action, based on information in a workflow process. You must complete the assignments before a record can move to the next step in a workflow process.

KPI Graph portlet

Key Performance Indicators (KPIs) provide the means to track critical performance variables over time. The KPI Graph portlet displays graphical representations of KPIs.

The KPI Graph portlet displays the Actual, Target, and Variance values for each KPI. When one KPI is selected for the portlet, it is shown as a gauge on the Start Center. When more than one KPI is selected, a bar chart is displayed.

Tip: To avoid skewing the graphical presentation, add graphs of only one type, either decimal or percentage.

Colors are used for an at-a-glance estimate of the value, and caution and alert values can be set. When the value of the KPI is in the safe zone, it is green. When the value of the KPI is between the caution and alert values, it is yellow. And when the value of the KPI is above the alert value, it is red.

There is also a status indicator of the directional trend since the last reading. For example, if a KPI is yellow but was previously red, then this trend is good. But if it is yellow and was previously green this trend is cause for concern.

Tip: Consider changing the name that is displayed on the Start Center if you create more than one KPI Graph group. You can use display names to reflect how you work. For example, the display name can indicate how often you perform actions, such as daily, weekly, or monthly. Or a display name can indicate the category to which actions belong, such as personnel or equipment.

The same information is displayed in the KPI List portlet, but in text format. You can display different KPIs in KPI List and KPI Graph.

KPI List portlet

Key Performance Indicators (KPIs) provide the means to track critical performance variables over time. You use the KPI List Setup Portlet to create a table of KPIs that can be viewed in the Start Center.

The KPI List displays the Actual, Target, and Variance values for each KPI.

Colors are used for an at-a-glance estimate of the value. When the KPI is set up, caution and alert values can be set. When the value of the KPI is in the safe zone, it is green. When the value of the KPI is between the caution and alert values, it is yellow. And when the value of the KPI is above the alert value, it is red.

There is also a status indicator of the directional trend since the last reading. For example, if a KPI is yellow but was previously red, then this trend is good. But if it is yellow and was previously green this trend is cause for concern.

Tip: Consider changing the name that is displayed on the Start Center if you create more than one KPI List group. You can use display names to reflect how you work. For example, the display name can indicate how often you perform actions, such as daily, weekly, or monthly. Or a display name can indicate the category to which actions belong, such as personnel or equipment.

The same information is displayed in the KPI Graph portlet, but in graphical format. You can display different KPIs in KPI List and KPI Graph.

Quick Insert portlet

You can add actions to the Start Center in the Quick Insert portlet. Clicking an item in the portlet list takes you to the application to carry out the task. In addition, you can associate templates with some actions. When you click an action link that has an associated template, the template is applied to the action.

Templates associated with actions

You can associate a template with an action by specifying a template. For example, associate a template named `I need to reset my password` with the New Service Request action. When you click the link for that action in the Start Center, a new Service Request record opens with the appropriate fields completed.

Tip: Consider replacing the default description for actions with templates. An action can have several templates associated with it. So change the description to match the template and identify the action in the Start Center. In this example, consider changing the description from New Service Request to Reset Password.

Report List portlet

The Report List portlet displays the reports that you use frequently. Clicking a report in the portlet runs the report.

Use the Report List portlet to run reports from the Start Center. You can add any report to the portlet that you have rights to run. A Start Center can have one or more Report List portlets so that you can organize applications into logical groups. You can change the title of the portlet to one that makes sense to you.

Result Set portlet

The Result Set portlet displays the results of a saved query in either list format or chart format.

If you frequently run the same searches, you can save time by creating saved queries. You can display the results of those queries on the Start Center in the Result Set portlet. A Start Center can have one or more Result Set portlets.

You can interact with the result set from within the portlet:

- Alternate between a list view and a chart view by clicking either List View or Graphical View. The link depends on which view you are in. If you have not set up a chart, you see Set Graph Options instead of Graphical View.
- Display graphical information as a bar chart or a pie chart by clicking the Chart type link.
- View the results of the entire result set in the List tab of the application by clicking the Open result set in the application icon.
- View a subset of the results in the List tab of the application by clicking a bar or a slice of pie graph.
- View a specific record in an application from the list view by clicking the record in the Result Set portlet. For example, if the query involves purchase orders, when you click a list item you are taken to the Purchase Orders application.

Options available from the Result Set portlet

You can change how the portlet is displayed by clicking the Edit Portlet icon:

- Change the default display format of a chart or a list.
- Set the number of rows in the portlet.
- Apply colors to rows in a list view using the Condition Attribute on the Color Options tab.
- Change the fields in a list view on the Field Configuration tab.
- Change details in a graphical view on the Chart Options tab.

Managing Start Center templates

The portals and content that users see in the Start Center depends on the Start Center template that is assigned to their security group. A user with administrative rights can create Start Center templates, modify or delete existing templates, and create templates that can be shown in multiple languages.

- [Creating a start center template](#)
To create a Start Center, you create a template that specifies the column layout, information portlets, and name for the Start Center.
- [Changing start center templates](#)
You can change start center templates to change the column layout, the portlets in the columns, and the name of the Start Center.
- [Changing existing Start Center templates](#)
You can use this window to open an existing template to change it, or you can delete a template.

- [Creating Start Center templates in multiple languages](#)

The Start Center that users see when they log in depends on their security group. By default, Start Center templates are in English. An administrator can create a Start Center template that can be viewed in multiple languages. Then, the administrator can assign the template to the security group whose users require non-English languages.

Creating a start center template

To create a Start Center, you create a template that specifies the column layout, information portlets, and name for the Start Center.

About this task

You must have system privileges to create a template for your Start Center.

Procedure

1. At the top of the Start Center page, click New Template.
2. Select the column layout for the Start Center page.

Option	Description
Equal Width	Divides the page into two equal columns
Narrow-Wide	Places a narrow column on the left and a wide column on the right
Wide-Narrow	Places a wide column on the left and a narrow column on the right

3. In the Description field, type the name that you want to appear on the tab for this Start Center.
4. Select the portlets that you want to appear in the left and right columns of the Start Center, as follows:
 - a. In the section for the column (left or right) to which you want to add portlets, click Select Content.
 - b. In the Available Portlets window, select the check box beside the portlets that you want to add. Although you can add portlets to either column, use the Suggested Format information as guidance.
 - c. Click OK.
5. Click Finished. You are returned to the Start Center where the template is added as a tab at the top of the page.
6. Select the new template tab.
7. Save the new template, delete it, or cancel any changes you made to it. When you save the template, it possibly can disappear from your Start Center. This behavior is determined by the group the new template is assigned to.

What to do next

When the new Start Center page opens, the portlets are shown in the appropriate column but with no content. Click the Edit Portlet icon in the new portlet to specify content for it.

Changing start center templates

You can change start center templates to change the column layout, the portlets in the columns, and the name of the Start Center.

Procedure

1. At the top of any Start Center page, click Modify Existing Template to open the Modify a Template window.
2. Click the link for the template that you want to change to open that template in a tab on your Start Center page.
3. You can now modify the template in the same manner as you would any other Start Center page.
4. Select Save Template when finished.

Changing existing Start Center templates

You can use this window to open an existing template to change it, or you can delete a template.

About this task

The template list contains all of the templates that you have authorization to modify. If the template that you want to modify is not displayed in the list, click Update List to reload the list of available templates.

Procedure

1. To delete a template, click the Delete Template icon in the row containing the template you want to delete.
2. In the template list, click the name of the template that you want to modify to open the template as another tab in your Start Center.

Creating Start Center templates in multiple languages

The Start Center that users see when they log in depends on their security group. By default, Start Center templates are in English. An administrator can create a Start Center template that can be viewed in multiple languages. Then, the administrator can assign the template to the security group whose users require non-English languages.

Before you begin

You must have an administrator account whose default language is the language that you want to use in the Start Center. If you require templates in several languages, you must have an administrator account for each language.

About this task

The content and structure of Start Center templates are stored in .xml files. However, any editable description labels are stored in a separate database table and are referenced in the .xml files by using the contentuid attribute. The description labels in English are stored in the MAXLABELS table, and description labels in other languages are stored with their language codes in L_MAXLABELS table.

To reduce the number of changes that are required in Start Center templates, create the template after you verify that all portlets and content are required.

Procedure

1. Log in as an administrator whose default language is English and create a Start Center template.
2. In the new English-language template, add portlets.
3. Configure the portlets to include the necessary content and provide labels for the editable descriptions.
4. Save the template.
The template is saved in English. The labels in the XML are inserted into the MAXLABELS table.
5. In the Security Groups application, open the relevant group for your users and specify the new template as the Start Center template.
6. Save the record and log out.
7. Log in as an administrator whose default language is not English, click Modify Existing Template, and select the English-language template that you created.
All editable description labels are in English. If a portlet does not provide editable description labels, then those labels are shown in the default language. For example, your default language is Russian and your template includes the KPI Graph portlet and the Inbox portlet. The KPI Graph portlet is entirely in English, but the labels for the Inbox portlet are in Russian.
8. Edit each portlet to include editable description fields in the non-English language.
9. Save the template.
10. To apply the changes for the non-English language, update the Start Center.
The editable description labels are now shown in the non-English language. The description labels are also saved in the L_MAXLABELS table with the language code.

Results

Any user whose default language is the same as the language code in the L_MAXLABELS table can log in and see that language used in the Start Center labels. Users whose default language is English can see the English version of the Start Center.

If the Start Center template requires the addition or removal of portals, you must log in as an administrator whose default language is English and change the English language version of the template.

Configuring Result Set portlets

You can specify that rows in a Result Set portlet are colored if they meet a condition. For example, the rows for the incidents with a priority of 1 are colored in red. You can also include related attributes in the result set. For example, you can display the given name and surname of a user, rather than their user ID.

- [Applying colors to result set rows](#)
You can apply colors to rows in the Result Set portlet to highlight set-points and implement user-defined standards. For example, for all work orders with a status of WAPPR, you can change the row color to blue. You can apply color to only one condition attribute in a result set.
- [Displaying related attributes in Result Set portlets](#)
A number of report object structures are available to provide the data for related attributes in Result Set portlets. However, you might require a new object structure, or you might need to add attributes to an existing object structure.

Applying colors to result set rows

You can apply colors to rows in the Result Set portlet to highlight set-points and implement user-defined standards. For example, for all work orders with a status of WAPPR, you can change the row color to blue. You can apply color to only one condition attribute in a result set.

Procedure

1. From the Result Set portlet, click the Edit Portlet icon.

2. In the Query field, ensure that the relevant query is specified.
3. In the Color Options tab, specify a condition attribute and click Add Color Alert.
4. Complete the fields and click Finished.

Displaying related attributes in Result Set portlets

A number of report object structures are available to provide the data for related attributes in Result Set portlets. However, you might require a new object structure, or you might need to add attributes to an existing object structure.

Procedure

1. Make the attributes available for display in the Result Set portlet:

Option	Description
If the object structure does not exist	Create an object structure or select the action to duplicate an existing report object structure and modify as necessary.
If the object structure exists but does not include the attributes you want	Open the object structure and select the Exclude/Include Fields action.

2. Configure security for the report object structure so that users can see the related attributes in the Result Set portlet and so that you can specify the object structure when you configure the result set.

Changing the content and layout of the Start Center

You can change the content and layout of Start Center pages. For each Start Center, you can specify the column layout, the portlets that you want to display in each column, the order of those portlets, and which portlets to remove from the columns. You can also specify a name for the Start Center, and this name will appear on the Start Center tab.

Procedure

1. On the Start Center that you want to update, click the Change Content/Layout link.
2. Complete a task in the following table to change the content and layout of the Start Center page, as needed. If you want to complete multiple tasks while on the Layout and Configuration page, only click Finished when you have completed all tasks.

Option	Description
Change the column layout of the Start Center page	<ol style="list-style-type: none"> a. In the Layout field, specify the column layout that you want to use. Selecting Equal Width divides the Start Center into two equal columns. Wide-Narrow places the wide column on the left of the Start Center page, and Narrow-Wide places the narrow column on the left. b. Click Finished.
Change the Start Center name that is displayed on the tab	<ol style="list-style-type: none"> a. In the Description field, specify the name of the current Start Center. This name appears on the tab for the current Start Center. b. Click Finished.
Add portlets to the Start Center page	<ol style="list-style-type: none"> a. In the section for the column (left or right) to which you want to add portlets, click Select Content. b. In the Available Portlets window, select the check box beside the portlets that you want to add. Although you can add portlets to either column, use the Suggested Format information as guidance. c. Click OK. d. Click Finished. e. When the Start Center page opens, the portlets are shown in the appropriate column but with no content. Click the Edit Portlet icon in the new portlet to specify content for it.
Change the order of the portlets on the Start Center page	<ol style="list-style-type: none"> a. Enter a sequential number in the Order column for any portlets that you want to display in order. Any portlets that you do not order, will be listed after the ones you do order. b. Click Finished.
Remove a portlet from the Start Center page	<ol style="list-style-type: none"> a. Click the Trash icon for the portlet that you want to remove. A line is drawn through the portlet. b. Click Finished to return to the Start Center page where the portlet is no longer displayed.

Specifying a default Start Center

When you have more than one Start Center page available to you, the system displays tabs for each page. You can set which Start Centers appear as tabs on the Start Center page, and which you want to open by default when you navigate to the Start Center.

Procedure

1. Click Display Settings to open the Display Settings window.
2. Select the check the box next to each Start Center that you want to display or clear the check box next to each Start Center that you want to hide.
3. Select the check box next to the Start Center that you want to open by default when you navigate to the Start Center. You can check only one default Start Center.
4. Click OK.

Editing portlets in the Start Center

You can change the contents of a portlet in the Start Center to make the information more useful to you. Changes can include adding information to a portlet, removing information from a portlet, changing the order of information in the portlet, and renaming the portlet.

Procedure

1. From the Start Center portlet for which you want to make content changes, click the Edit Portlet icon.
2. On the portlet setup page, specify your changes to the portlet content.
3. Click Finished. The portlet is updated with the content changes you made.

Updating Start Centers

When a system administrator notifies you that changes have been made to your start center template, you can update the Start Center page.

Before you begin

You must have access to the Update Start Center option to update a Start Center page.

About this task

You can choose a language when you are logging in but you click Update Start Center to translate the Start Center. When you update the Start Center page, you lose any configurations that you made, for example, specific quick inserts or result sets. If you update the Start Center page and there are no changes to your original template, the latest changes you have made to the Start Center are discarded. Also, the template on which the Start Center was originally based on is reapplied.

Procedure

1. Click Update Start Center on the Start Center page that you want to update.
2. Click Yes in the message that opens.
The new Start Center page displays.

Results

The current Start Center page is deleted and replaced with a page that uses the same template as the deleted page.

Operational dashboard

The Operational dashboard is a modernized landing page that is similar to the Start Center. You can use the Operational dashboard to monitor KPIs, see your workflow assignments that are due soon, quickly complete tasks, and access other applications.

KPIs

The Operational dashboard includes the following KPIs:

Overdue Emergency Work

The number of emergency work orders that are overdue.

Overdue PM Work

The number of preventive maintenance work orders that are overdue.

PM Performance

The rate of closure of preventive maintenance work orders.

Open Work Orders Waiting Approval

The number of work orders with a status of Waiting for approval.

Each KPI includes trend information, so you can see how much it as increased or decreased since the last time the data was refreshed. You can also see how much each KPI is over or under the target that is set by your organization.

You can use KPI Manager to either refresh these KPIs manually, or schedule automatic refreshes by using the preexisting **KPICronTask**. For more information, see [Managing cron tasks](#).

Favorites and Quick actions

The Favorites card contains links to other applications, including Work Orders, Workflow Assignments, Work Order Tracking, and Service Requests.

The Quick actions card contains links to forms for common tasks, such as creating a work order, creating a service request, and creating a purchase request.

Workflow assignments due soon

On the Workflow assignments due soon card, you can see your workflows assignments that are due in the next 24 hours or overdue. You can select one or more of these assignments to accept, reject, route, or reassign them. Clicking a workflow assignment opens it in the application in which it was created.

My profile information

Your profile contains the user information specific to you such as your password, electronic signature key, contact details, and time zone. You can change your profile information and default settings. For example, you can modify your default information to ensure that you see records for your site only.

- [Changing my default information](#)
You can customize several aspects of working with the system that are specific to your user. You can specify the application that opens when you log onto the system, the records that display when you open an application, and the values that are inserted by default on records that you create.
- [Changing my password information](#)
You use the Password Information dialog box to change your password, password hint, or both. The system administrator must enable the password hint question and answer for you to reset your password. If the fields are disabled, the system administrator did not enable the feature.
- [Changing my personal information](#)
You use the Personal Information dialog box to add or change workplace and credit card information that the system uses on certain kinds of records.
- [Specifying the electronic signature key](#)
If your organization requires electronic signature verification, you must create an electronic signature password key for verification.

Changing my default information

You can customize several aspects of working with the system that are specific to your user. You can specify the application that opens when you log onto the system, the records that display when you open an application, and the values that are inserted by default on records that you create.

Procedure

1. From the toolbar, click Profile and select Default Information.
2. In the Default Information window, edit the following fields as needed:

Field name	Description
Default Insert Site	Specify the site from which you most often insert records. When you insert a record, if the Site field is not determined by some other relationship, the system enters the site you specified as the default value. Similarly, if an Organization field is not determined by some other relationship, the system enters the Organization owning this site in the field.
Use Default Insert Site as a Display Filter?	Select this check box to ensure that the system displays records for only the default insert site. If the application is defined at the organization-level, the system displays the records for the organization to which the site belongs. You can clear the check box in applications where you can view records for all the sites for which you have access.
Use Side Navigation?	Select this check box to move the queries, Select Action options, and toolbar actions to a navigation menu on the side of the UI. On the Start Center, the side navigation menu shows the items that are typically in the Go To menu.
Storeroom Site for Self-Service Requisitions	Specify the site and storeroom from which you most often request material. When you create a material requisition in a self service application and the site is not determined by another relationship, the system inserts this site and the default storeroom.
Default Storeroom for Self-Service Requisitions	Specify the storeroom from which you most often request material. You can enter a value for the storeroom site only, but if you specify a default storeroom, you must also specify the storeroom site.
User Default Application	Specify the application that displays when you log on to the system.
Language	Specify the language in which you want to use the system.
Locale	Specify a locale and use this field to configure several system settings such as the currency and date formats.
Calendar Type	Specify the calendar that you use such as Gregorian or Islamic.
Time Zone	Specify the time zone where you are based.
Default Repair Facility	Specify the location that is the default repair facility.
Repair Facility Site	Specify the site where the default repair facility is located.

3. Click OK.

Changing my password information

You use the Password Information dialog box to change your password, password hint, or both. The system administrator must enable the password hint question and answer for you to reset your password. If the fields are disabled, the system administrator did not enable the feature.

Before you begin

If you did not specify a password hint question and answer for your user, you must contact your system administrator and request that your password is reset.

About this task

The system administrator must configure the SMTP property and then enable the property in the System properties application to enable the password, password hint, or both.

Procedure

1. From the toolbar, click Profile and select Password Information.
2. In the Current Password field, enter your current password. The other password fields become editable only after the system validates your current password.
3. Edit the following fields as needed:

Field	Action
New Password	Specify a password that is at least 6 characters long. Your company might have other requirements, such as a longer password or the use of numeric or symbol characters. If the value you enter is not valid, an error message is displayed.
Verify New Password	Reenter your new password.
Password Hint Question	Click Select Value to select from a list of possible questions.
Password Hint Answer	Specify your answer to the question. If you become blocked from using the system, an administrator can use the password question and answer to verify your identity. Answers are case-sensitive.

4. Click OK.

Changing my personal information

You use the Personal Information dialog box to add or change workplace and credit card information that the system uses on certain kinds of records.

Procedure

1. From the tool bar, click Profile and select Personal Information.
2. In the Personal Information dialog box, edit the following fields as needed:

Field name	Description
Primary Phone	List the phone number or numbers where you can be reached. To list multiple phone numbers, click Show/Manage Values and add rows in the dialog box that opens. Specify the Type, for example Home or Work, and select the Primary check box to indicate the number with which you can best be reached. If the Primary Phone field contains more than one phone number, it becomes read-only and you must click Show/Manage Values to see all of them or edit the field.
Primary E-mail	List your e-mail address or addresses. To list multiple addresses, click Show/Manage Values and add rows in the dialog box that opens. Specify the Type, for example Home or Work, and select the Primary check box to indicate the address with which you can best be reached. If the Primary E-mail field contains more than one address, it becomes read-only and you must click Show/Manage Values to see all of them or edit the field.
Primary SMS	List your short message service address or addresses for receiving short text messages. To list multiple addresses, click Show/Manage Values and add rows in the dialog box that opens. Specify the Type, and select the Is this the Primary SMS Address check box to indicate the address where you can best be reached. If the Primary SMS field contains more than one address, it becomes read-only and you must click Show/Manage Values to see all of them or edit the field.
Person's Site	Specify the site where you work.
Person's Location	The specific location where you work may be part of your company's location structure. Click Select Value to select from a list.
Ship to Address	If you specified a site in the Person's Site field, specify the appropriate shipping address.
Drop Point	Specify a drop point for deliveries.
Card #	If you have a company credit card, specify its number.
Card Type	Click the drop down button to select from a list.
Verification Value	Specify the three- or four-digit code on the credit card.
Expiration Date	Specify the date on which the card expires.

3. Click OK.

Specifying the electronic signature key

If your organization requires electronic signature verification, you must create an electronic signature password key for verification.

About this task

To comply with regulatory requirements, some organizations require that users provide credentials and give a reason for changes before they can change records. If your organization requires electronic signature verification, you must create an electronic signature key when you set up your profile. When you perform an action or change a field that requires authentication, enter the key that you created.

Administrators can configure security controls to require that electronic signature keys conform to rules for product passwords.

Procedure

1. From the toolbar in the Start Center, click Profile and select Set or Modify E-Signature Key.
2. In the Set or Modify E-Signature Key window, select from the following options:
 - If you are a first-time user, specify a new key in the New E-Signature Key field and confirm the key in the Verify New E-Signature Key field.
 - If you are modifying an existing key, edit the following fields as needed:

Field name	Description
Current E-Signature Key	Specify the current electronic signature key.
New E-Signature Key	Specify a new electronic signature key.
Verify New E-Signature Key	Specify the new electronic signature key again to confirm its accuracy.

Navigation

To navigate the user interface, you use the links on the navigation bar and can use keyboard shortcuts for many actions. You can also navigate location and asset hierarchies.

- **Bookmarks**
If you frequently view the same records, you can save time by creating bookmarks. You click a bookmark to be taken directly to a record.
- **Navigation bar**
The Navigation bar identifies the current application, shows messages, and has links so you can move among applications.
- **Keyboard shortcuts**
You can use a combination of keys to perform an action without using a mouse. Some of the combinations are standards and adhere to the Web Content Accessibility Guidelines (WCAG) version 2.0 and the Web Accessibility Initiative - Accessible Rich Internet Applications (WAI-ARIA) specification.

Bookmarks

If you frequently view the same records, you can save time by creating bookmarks. You click a bookmark to be taken directly to a record.

There are two ways to add a record to your list of bookmarks. You can click the Add to bookmarks icon from the list tab or you can use the menu item.

The bookmarks you create are saved in My Bookmarks which you can access from the Search toolbar of the list tab. When you delete a bookmark, it is only removed after you close My Bookmarks. Deleting a bookmark does not delete the corresponding record.

Each application has separate bookmarks, for example, work orders bookmarked in Work Order Tracking are not bookmarked in Quick Reporting.

Navigation bar

The Navigation bar identifies the current application, shows messages, and has links so you can move among applications.

Sections of the navigation bar

The Navigation bar has three sections:

- The application icon and name identify the current application.
- The message area shows informational messages. For example, when you create and save a record, a message indicates that the record was saved.
- The navigation links vary depending on the application, but some are common to most applications.

Table 1. Navigation links common to most applications

Navigation link	Function
Bulletins	Shows the bulletin board and broadcast messages
Go To	Shows a menu of modules and applications that you can move to
Reports	Shows a menu of modules so that you can select an application to run reports on
Start Center	Returns you to the start center
Profile	Opens your personal information so you can manage it
Sign Out	Signs you out
Help	Shows a help menu

Keyboard shortcuts

You can use a combination of keys to perform an action without using a mouse. Some of the combinations are standards and adhere to the Web Content Accessibility Guidelines (WCAG) version 2.0 and the Web Accessibility Initiative - Accessible Rich Internet Applications (WAI-ARIA) specification.

Standard keyboard shortcuts

You can navigate among and within the applications by using a combination of keys. You can use the following keyboard shortcuts to navigate the application screens.

Table 1. Keyboard shortcuts for general navigation

Action	Keyboard shortcut
Move from one interface element to the next.	Tab key
Select buttons, links, and menu options.	Enter key
Select or clear a check box.	Spacebar
Display field help for field in focus.	Alt+F1

Table 2. Keyboard shortcuts for global navigation

Link name	Keyboard shortcut
Bulletins	Alt+B
Go To	Alt+G
Reports	Alt+R
Start Center	Alt+C
Profile	Alt+P
Sign Out	Alt+S
Help	Alt+H
Return	Alt+R
Return with Value	Alt+W

Table 3. Keyboard shortcuts for application-specific actions

Action	Applications	Keyboard shortcut
Assign Labor	Assignment Manager	Ctrl + Alt + L
Finish Assignment	Assignment Manager	Ctrl + Alt + F
Interrupt Assignment	Assignment Manager	Ctrl + Alt + U
Select Work Date	Assignment Manager	Ctrl + Alt + W
Start Assignment	Assignment Manager	Ctrl + Alt + T
Start Timer	Activities, Changes, Incidents, Problems, Releases, and Service Requests	Ctrl + Alt + B
Stop Timer	Activities, Changes, Incidents, Problems, Releases, and Service Requests	Ctrl + Alt + E

Table 4. Keyboard shortcuts for toolbar actions

Action	Keyboard shortcut
Insert New Record	Ctrl+Alt+I
Save Record	Ctrl+Alt+S
Clear Changes	Ctrl+Alt+C
Previous Record	Ctrl+Alt+P
Next Record	Ctrl+Alt+N
Change Status	Ctrl+Alt+A
Create KPI	Ctrl+Alt+K
Put record in edit mode or release record from edit mode	Ctrl+Alt+L

Table 5. Keyboard shortcuts for tables

Action	Keyboard shortcuts
Next Row	Ctrl+↓
Previous Row	Ctrl+↑
Open/Close Table Window Filter	Ctrl+Z
Next Page	Ctrl+→
Previous Page	Ctrl+←

Table 6. Keyboard shortcuts for dates

Action	Keyboard shortcuts
Insert today's date	Ctrl+SHIFT+7
Move forward one day	ALT+↑
Move back one day	ALT+↓
Move forward one month	Ctrl+SHIFT+0
Move back one month	Ctrl+SHIFT+9
Move forward one year	Ctrl+SHIFT+↑
Move back one year	Ctrl+SHIFT+↓

Non-standard keyboard shortcuts

There are two keyboard shortcuts that do not conform to standards. It is important that you are aware of these deviations from the standard action so you are aware of the Maximo® Manage UI response.

Table 7. Non-standard keyboard shortcuts

UI element	Standard action	Standard UI response	Maximo Manage UI response
Radio buttons	To move between radio buttons, press the Right and Left arrows.	The radio buttons are selected as the user moves through them.	The radio buttons are highlighted but not selected as the user moves through them. A radio button is selected only when the user presses Spacebar or Enter on the highlighted radio button.
Tree view	To select a node, press Enter.	When the user presses Enter, the default action is performed for a node.	Nodes might have 0, 1 or 2 actions. If a node has 2 actions and a user has navigated to an element by using the arrows, when the user presses Enter the default action is performed. When the user presses Enter a second time, the secondary action is performed.

Searching

The search method that you use depends on how much you know about the record that you want to find. For example, you must know the exact record ID to search by using the Find field but need only a partial value to search by using wildcards.

- [Basic searches](#)
You search for a single record or for a set of records by using the search toolbar. You can also save your queries.
- [Advanced searches](#)
You might want to specify your search by using Structured Query Language (SQL) or by providing examples of the type of records you are searching for. The Advanced Search menu on the search toolbar provides these options.
- [Wildcards and operators for searching](#)
You can use special characters to search when you do not know the entire value that you want to search for or when you want to specify the type of information that you are searching for. The type of value that is used in a field, such as a numeric or string value, determines which operators can be used to filter for values in the field. If you want to change how values are searched for in a specific field, you can edit the SQL where clause for a field.
- [Navigation in location and asset hierarchies](#)
Locations and assets are often defined in hierarchies. When you need to specify a value from one of these hierarchies, you can view a graphical representation of the items to select from.

Basic searches

You search for a single record or for a set of records by using the search toolbar. You can also save your queries.

Searching for single records

You must know the exact record ID to search using the Find field. Entering a partial record ID does not return any results. For example, to search for a work order, enter the exact work order number in the Find field and press enter.

Filtering tables

The table filter is a row of editable fields at the top of the table. If the filter is not visible, click the Filter icon. You can filter one or all of the columns in a table and then press Enter to see the results of your search.

Saving queries

If you frequently perform the same searches, you can save time by creating saved queries. You can also define a default saved query to display every time you open an application. Saved and default queries are specific to each application. For example, a query created in Work Order Tracking is not available in Quick Reporting, unless you also create and save it in Quick Reporting.

The Save Query menu lists saved query options:

Save Current Query

Click to name and save your query so that you can reuse it at a later time.

View/Manage Queries

Click to view and manage your saved queries for your current application.

Advanced searches

You might want to specify your search by using Structured Query Language (SQL) or by providing examples of the type of records you are searching for. The Advanced Search menu on the search toolbar provides these options.

You use the WHERE Clause dialog box to conduct advanced queries of the Maximo® database by using Structured Query Language (SQL). SQL is a language that is commonly used by system administrators to request information from databases. To perform advanced queries, you must be familiar with both SQL and the Maximo database.

You can query by example by clicking Advanced search, More search fields. You do not need to be familiar with any specialized language to perform this kind of search. Querying by example (QBE) means that you enter values in the fields to provide the system with an example of the type of records you are searching for. For example, if you want to find all work orders with a status of waiting for approval, you would enter WAPPR in the Status field. You can give examples of records you want to find by entering values in one or more fields in the dialog box. You can also enter more than one value in a field. The values must be separated by commas,

and cannot exceed the length that is allowed for the field. For example, to find work orders that list either pumps or motors you enter "pump, motor" in the Description field.

- [Searching by using examples](#)
You enter values in the fields of the More Search Fields window to give an example of the type of records you are searching for.
- [SQL WHERE clause searches](#)
A WHERE clause is used to filter records and extracts only those records that fulfill a certain criterion. You can search using the WHERE clause if you know Structured Query Language (SQL).

Searching by using examples

You enter values in the fields of the More Search Fields window to give an example of the type of records you are searching for.

Procedure

1. On the toolbar of the List tab, click Advanced Search.
2. Click More Search Fields.
3. Optional: Click Change Query on the Revise button to open a new window with the same contents as View/Manage Queries window. You can select a query against which the More Search Fields parameters will be applied.
4. Specify the values to search for. Enter more than one value in a field separated by commas. For example, to find work orders that list either pumps or motors, enter `pump, motor` in the Description field.
5. Click Find.

SQL WHERE clause searches

A WHERE clause is used to filter records and extracts only those records that fulfill a certain criterion. You can search using the WHERE clause if you know Structured Query Language (SQL).

To perform queries using the WHERE clause, you must be familiar with both SQL and the database. If you know SQL you can modify the WHERE clause to change your search parameters. Constructing SQL queries is something that is more commonly performed by system administrators and database administrators. The WHERE Clause window shows the SQL where clause for your current query. The Current Query field shows the current query whether you searched using the View/Manage Queries window or the More Search Fields window. The WHERE Clause window is accessed from the Advanced Search menu.

Wildcards and operators for searching

You can use special characters to search when you do not know the entire value that you want to search for or when you want to specify the type of information that you are searching for. The type of value that is used in a field, such as a numeric or string value, determines which operators can be used to filter for values in the field. If you want to change how values are searched for in a specific field, you can edit the SQL where clause for a field.

Rules for Wildcards and Operators

The following rules apply to fields that contain numbers, such as the Priority field or the Work Order Number field:

- By default, commas can be used only to separate numbers that have more than three digits. To use commas as separators for multiple numeric values, in the System Properties application, set the `mxe.system.IntegerQBESearchCommaAsOr` property to 1. If the property is set to 1, commas can be used only as separators for whole numeric values. For example, `1,245` returns records that contain a value of 1 and records with a value of 245.
- You cannot search for a range of numeric values. To search for more than one value, you must separate each individual value by using a comma, use an operator, or use a wildcard.

The following rules apply to fields that contain dates, such as the Target Delivery Date field or the Shipped Date field:

- If you specify a date without a time, the records that are returned have values for times during the date.
- If you specify a date with a time and specify the minute, the records that are returned have values for the 12 hours after the date and time or until the end of the day.
- If you specify a date with a time and do not specify a minute, the records that are returned have values from the specified time until the end of the day.
- You cannot specify a range of dates, and you cannot specify more than one date in a field.
- You can use the TODAY and YTD (Year to Date) keywords to query for information. YTD lists all records with dates for the present year. TODAY lists all records with the present date. You can use operators with the TODAY keyword to determine what times from the present day are shown.

The following rules apply to fields that contain strings, such as the Name field and the Type field:

- Searches are case sensitive.
- If the equal sign (=) is not used, wildcards are added to the beginning and end of the string so that any record that includes the string in the field is found. However, if you add a wildcard to a string, additional wildcards are not automatically added.
- You can use commas to search for more than one term. For example, you could search for `rails, generators` to find all records that have `rails` or `generators` in that field.

The WHERE Clause

You can edit the WHERE clause to change how values are searched for in a specific field. To edit the WHERE clause, add a value to a field and then select Advanced Search > Where Clause. If you are searching for null values by editing the WHERE clause, you use the SQL comparison values IS NULL and IS NOT NULL to select and compare null values.

Wildcards

A wildcard character is used to search for a partial value in a field when you do not know the entire value. You place the wildcard where the unknown characters occur. You can use more than one wildcard character in a single search.

Table 1. Wildcard characters

Wildcard	Use
%	Substitute for a string of characters. For example, 123% find records that start with 123, such as 123, 12345, and 123ABC.
? or _	Substitutes for a single character. For example, 123? or 123_ find any four-character records that start with 123, such as 1234 or 1239.

Operators

An operator is used to specify the type of information that you are searching for. You can only use operators in fields that have a search type of text, such as Description fields.

Table 2. Operator characters

Operator	Use
ampersand (&)	Find records that contain at least one occurrence of all of your query terms. For example, Rail&Line returns records that include both Rail and Line.
hyphen (-)	Find records that contain at least one query term in a set of two or more, and prioritize the results based on the order of terms with the operator. For example, Rail-Line returns records that only include Rail, records that include only Line, and records that include both, but the records that include only Rail are ranked higher on the results page.
pipe (|)	Find records that contain at least one occurrence of any of your query terms. For example, Rail|Line returns records that include only Rail, records that include only Line, and records that include both.
tilde (~)	Find records that contain one query term and not another. For example, Rail~Line returns records that include Rail, but does not return records that include Line.
equals (=)	Find records that are an exact match to your query. For example, filtering records with a status of APPR also returns records that have a status of WAPPR unless you type =APPR in the status field. If you are searching for a set of exact values, separate the values with commas. For example, filtering records with priorities =1, =2, and =3 returns records that have a 1, 2, or 3 priority.
~null~	Find records that do not include a value in a specific field. When using the List tab, the Advanced Search action, or the More Search Fields dialog box to search for records that contain null values, use the following syntax: <ul style="list-style-type: none"> To search for records that contain a null value for a field, enter ~null~ To search for records that do not contain a null value for a field, enter !=~null~ <p>You cannot use the ~null~ or !=~null~ operator in fields that have date values.</p>
<	Find values that are less than the value that is in the field. For example, <3 returns records with values that are less than 3, such as 2 or 1. You cannot use the less than symbol (<) for fields that have string values.
!=	Find all values except for the value that is in the field. For example, !=7 returns records with values such as 4, 5, 6, and 8. You cannot use the not equal operator (!=) for fields that have date values.
>=	Find values that are greater than or equal to the value that is in the field. For example, >=7 returns records with values such as 7, 8, and 9. You cannot use the greater than or equal to symbol (>=) operator for fields that have string values.
<=	Find values that are less than or equal to the value that is in the field. For example, <=3 returns records with values such as 3, 2, or 1. You cannot use the less than or equal to symbol (<=) for fields that have string values.
>	Find values that are greater than the value that is in the field. For example, >3 finds records with values that are greater than 3, such as 4, 5, or 6. You cannot use the greater than symbol (>) for fields that have string values.

Navigation in location and asset hierarchies

Locations and assets are often defined in hierarchies. When you need to specify a value from one of these hierarchies, you can view a graphical representation of the items to select from.

The Drilldown window is available from the DetailMenu on the Asset, Location, and some Belongs To fields. You can use the drill-down feature to complete some fields when you create records. For example, when you create an asset record, you can complete the Parent and Location fields by selecting Detail Menu...Open Drilldown.

The Drilldown window is also available from the More Actions menu.

The location hierarchies that are shown in the Drilldown window are created in the Locations application, and the asset assembly structures are built in the Assets application.

Standard Drilldown window

You use the Drilldown window to view the assets at a particular location or to view the location of an asset.

In the standard Drilldown window, you can select a location, then switch tabs to view the assets at that location. Alternatively, you can drill down to an asset and then switch tabs to see its location and the systems that location belongs to.

Optional single hierarchy view

Administrators have the option to enable a drill-down view that displays both assets and locations in a single hierarchy. The option offers additional features, including the ability to display the following data about assets and locations:

- Locations, which are organized by systems
- Assets
- Spare parts of assets
- Preventive maintenance items for locations
- Preventive maintenance items for assets

You can use drag-and-drop for asset or location nodes in the hierarchy to complete the following actions:

- Move an asset to a new parent asset
- Move an asset to a new location
- Move a location to another location that is in the same system

You can also select an asset or location and right-click to copy and paste it in a different spot in the hierarchy. Only assets and locations can be moved. You cannot move spare parts or preventive maintenance nodes.

When you select a location node, all systems that are associated with the location are displayed. When you select a location node and select a specific system, the hierarchy displays all ancestors of that location in the system that you selected.

When you select the Open Drilldown option from the More Actions menu, you can select an object. Then, in the Drilldown window, you can click OK and choose to go to the selected object. This option is not available when you select Open Drilldown from the Detail Menu for fields.

The optional, single hierarchy view is available only if your administrator configured the system property that implements this option.

Entering data and dates in fields

When you create or edit a record, you can enter values in fields by using different methods depending on the type of field and what you need to enter. You can also use classifications to retrieve historical data.

- [Specifying values](#)
In addition to typing a value in a field, you can select single or multiple values, or you can go to other applications to retrieve values.
- [Keyboard shortcuts for dates](#)
Many records contain more than one date field. Keyboard shortcuts can be used to quickly enter dates in these fields.

Specifying values

In addition to typing a value in a field, you can select single or multiple values, or you can go to other applications to retrieve values.

You perform the following actions to select values:

Table 1. Specifying values for fields

Action	Description	Example of usage
Select a value from a list of valid values	Click the Select value button next to the field.	In an asset, the Type, Bin, Condition Code, Usage, Calendar, and Shift fields have a select value button.
Find a value by using classifications	<ol style="list-style-type: none">1. Click the Detail Menu button and select Classification.2. Click the value you want to insert.	In an asset, the Parent, Location, and Rotating Item fields have a Detail Menu button with a Classification option.
Find a value in another application	<ol style="list-style-type: none">1. Click the Detail Menu button and select Go To <i>application_name</i>.2. Select the value you want to insert.3. Click Return With Value.	In an asset, the Location, Rotating Item, Failure Class, Vendor, Manufacturer, and PO fields have a Detail Menu button with an option to go to another application.

You can define data as the default in any table that has a default data section. Values you enter as default table data are used as field defaults when you insert new rows into the table.

Keyboard shortcuts for dates

Many records contain more than one date field. Keyboard shortcuts can be used to quickly enter dates in these fields.

Table 1. Keyboard shortcuts to enter a date in any date field

Action	Keyboard shortcut
Insert today's date	Ctrl+SHIFT+7
Move forward one day	ALT+ ↑

Action	Keyboard shortcut
Move back one day	ALT+↓
Move forward one month	Ctrl+SHIFT+0
Move back one month	Ctrl+SHIFT+9
Move forward one year	Ctrl+SHIFT+↑
Move back one year	Ctrl+SHIFT+↓

Printing documents

You can print the documents attached to a record or work pack. You can also schedule and print reports in an application.

About this task

Note:

The “.ppt, .pptx” attachment formats are not supported for direct printing with attachments in Linux® or Liberty deployments. You can add a “.ppt” or “.pptx” format attachment, but you cannot print it.

- **Printing individual attachments**
You can select and print an individual document that is attached to a record.
- **Printing all attachments**
You can print all documents included in the work pack of a current record using the Reports application. By default, all attached documents are included in the work pack of a record. A work pack includes all documents attached to the current record as well as all documents attached to associated application records. For example: When you print a work pack for a Work Order record that has an associated Job Plan, you will also print the documents attached to that Job Plan.
- **Running, scheduling, and printing reports within an application**
When you are in an application and you need report information, there are several report actions from which you can choose to get that information. For example, you can run a report and then view its table of contents, print the report, and export the report data. You can open and view a report in a browser. You can directly print out a report, with or without attachments. You can schedule a report and send it using e-mail, and you can view and edit scheduled reports.

Printing individual attachments

You can select and print an individual document that is attached to a record.

Procedure

1. Display the record for which you want to print an attached document.
2. Click the Attachments icon to open the Attachments menu.
3. Click View Attachments to open the View Attachments dialog box.
4. Click the underlined document name in the Document column of the View Attachments table window.
5. The system displays the document in a new browser instance. You might need additional software to view some file types. If you cannot view a document in the Internet browser, you cannot print it.
6. Print the document from the new browser instance.

Printing all attachments

You can print all documents included in the work pack of a current record using the Reports application. By default, all attached documents are included in the work pack of a record. A work pack includes all documents attached to the current record as well as all documents attached to associated application records. For example: When you print a work pack for a Work Order record that has an associated Job Plan, you will also print the documents attached to that Job Plan.

Before you begin

You can preview the attached documents for the record before you print by clicking the Attachments icon and selecting View Documents. You might need additional software to view some file types. If you cannot view a document in the Internet browser, you cannot print it. Only documents that have the Print with a work pack? option selected will print when the system generates a report. If you add an attachment using Manage Library the default for Print with a work pack is one, but if you add an attachment using the paperclip icon, the default is zero.

Procedure

1. In any application that has Attached Documents actions, display the record whose attachments you want to print.
2. From the Navigation Bar, select Reports to access the Reports application. See the Reports application topic for detailed instructions about using the Reports application.
3. Optional: To print all documents that are attached to a group of records, use the List tab to select the records and then click Reports in the Navigation Bar from the List tab.

Running, scheduling, and printing reports within an application

When you are in an application and you need report information, there are several report actions from which you can choose to get that information. For example, you can run a report and then view its table of contents, print the report, and export the report data. You can open and view a report in a browser. You can directly print out a report, with or without attachments. You can schedule a report and send it using e-mail, and you can view and edit scheduled reports.

About this task

Attached document files with the following file extensions cannot be printed:

- .ppt
- .pptx

Procedure

Complete a report-action task in the following table to select, view, print, or export report information, as needed.

Option	Description
Run a report and optionally print it, export report data, and toggle the table of contents view	<ol style="list-style-type: none"> Select the Reports Menu in the application toolbar and select an application, or select the Run Reports action, to open the Reports dialog box to the On Demand Reports tab. In the Reports to Run table window, click the report that you want to run. In the Request Page dialog box, specify any parameters to define the report, and then click Submit to run the report and open it in your browser. From the Reporting toolbar, perform any of the following actions: <ul style="list-style-type: none"> Click the Print Report as PDF icon to print the report. Due to spacing default settings, the page length of your report in .PDF print format can exceed the page length in your report browser. Click the Export Data icon to export the data in .CSV format. Click the Toggle table of contents icon to see the table of contents for the report that you selected.
Open a report in browser view	<ol style="list-style-type: none"> Click the Browser View icon in the application toolbar to open the report in a report browser. From Browser View, print the report or export the report data in .CSV format.
Direct-print a report in .pdf form using the default printer of the browser	<ol style="list-style-type: none"> Click the Direct Print icon on the application toolbar.
Direct-print a report and all its attachments in .pdf form using the default printer of the browser	<ol style="list-style-type: none"> Click the Direct Print with Attachments icon on the application toolbar to view the number of printable attachments that are attached to the report. Printable attachments have a supported file extension. Click Yes to print all printable attachments.
Schedule a report and send the report as PDF in e-mail	<ol style="list-style-type: none"> Click the Reports Menu in the application toolbar and select an application, or select the Run Reports action, to open the Reports dialog box. Click the Scheduling Status tab and select one of the following scheduling options: <ul style="list-style-type: none"> Once - The report runs on a specific date and time in the future. Use this option to schedule complex or lengthy reports to run during off-peak hours. Specify a date in the format (M or MM) / (D or DD) / YY format. Specify a time in HH:MM format and specify a.m. or p.m. Recurring - The report runs at regular intervals. Four fields let you determine when the report runs. In the first field, enter a number from 1 through 365. In the second field, enter the interval (day, week, or month). In the third field, enter the day of the week or date of the month. In the fourth field, enter the time in HH:MM format, along with AM or PM. The following examples show the use of these fields: To run a report every day at 6:00 AM, select 1, and then Day. Leave the third field blank and then 6:00 AM. To run a report every other Friday at 5:00 PM, select 2, then Weeks, then Friday, and then 5:00 PM. To run a report every three months at 11:00 PM, on 15th of the month, select 3, then Months, then Day 15, and then 11:00 PM. Specify one or more e-mail addresses of the recipients for the report. Enter any comments you want to include in the e-mail message. Specify a subject for the report, or use the report name which defaults to this field. Click Submit to run the report and send it to the e-mail address at the scheduled time.
View and edit scheduled reports	<ol style="list-style-type: none"> Click the Reports Menu in the application toolbar and select an application, or select the Run Reports action, to open the Reports dialog box. Click the Scheduling Status tab to open the Scheduling Status dialog box. In the Schedules You Can Edit section, you can view the type of report (once or recurring) and the next run time. You can delete a scheduled report and change schedule information.

Planning for multiple sites

You can use a multisite setup to categorize the facilities in your company into sites and organizations. A multisite setup enables sites to share data from a single database while keeping their operations separate. Before you create multiple sites, you must determine what types of operations are performed at each location

and what data can be shared by each location.

- **Multisite capability**
The multisite capability provides a way to standardize and share certain kinds of data between facilities while keeping other kinds of data, such as work management records, unique to a particular site. The multisite capability also can selectively give users access to data at different sites.
- **Data storage levels**
Application data is stored at the following four levels: enterprise, set, organization, and site. The data that a user can see and use depends on the level at which the data is stored and whether the user is part of an organization or site that can access the data.
- **Data sharing between organizations**
Sets allow for the sharing of data between organizations. An item set allows organizations to share item data, such as inventory. A company set allows organizations to share vendor information.
- **Selective data sharing**
Applications that can store data at the enterprise, organization, and site levels typically store data at the enterprise level by default. Storing data at the organization level means that all sites in the organization can use the data. Storing data at the site level restricts data to just the specified site.
- **Transactions involving multiple sites in site-level applications**
Applications that store data at the site level require that the identifier field for each record is unique within the site. However, an identifier can be used within other sites and organizations. Only users who have security permission for the site and the application can view the records.
- **Limitations when setting up options in the Organizations application**
Except for system settings and autonumber settings, options apply at either the organization or site level, regardless of the level at which the application stores data. Even if an application stores data at the application level, it can have settings that are applied at the organization level.
- **Examples of using the multisite capability**
The multisite capability provides flexibility when you are setting up your implementation. You can create item sets, company sets, organizations, and sites to reflect the structures of your business.

Multisite capability

The multisite capability provides a way to standardize and share certain kinds of data between facilities while keeping other kinds of data, such as work management records, unique to a particular site. The multisite capability also can selectively give users access to data at different sites.

Why the multisite capability is needed

Separate facilities often have common business practices or share common data, which results in the duplication of information in the separate databases. The multisite capability provides a single Manage database while maintaining both data sharing and data separation, depending on your business needs.

You are not required to use the multisite capability. If your business is relatively small and has a single general ledger accounting system, you might consider whether you have a specific reason for using the multisite capability, such as multiple facilities with separate maintenance operations. The minimum implementation requirement is to create a single organization with a single site, one company set, and one item set.

How the multisite capability works

The basic units of a multisite implementation are organizations and sites. An enterprise can have multiple organizations; each organization can have multiple sites. Organizations and sites are virtual entities that can accommodate many different kinds of business practices. Organizations and sites do not necessarily correspond to physical sites or facilities.

To use the multisite capability, the administrator installs the application software once and sets up multiple sites that can access the software and the Manage database. Although a single database is used, the multisite capability provides site-specific independence for certain kinds of data. For example, different sites can share the same vendor list but still keep their work order and inventory records separate.

The multisite capability creates an environment that has the following characteristics:

- All sites use the same Manage database.
- All sites use the same product instance, which runs on an application server.
- Users at any site can access applications by using a Web browser.
- Different sites can keep certain operations separate, according to their business needs and the constraints of the application architecture.
- **Sites**
A site is typically a facility in an organization where work is managed. These activities include managing assets and physical locations by using preventive maintenance schedules and work orders, managing inventory in storerooms, processing stock replenishment, and other supply chain-related activities.
- **Organizations**
An organization is typically a financial entity in an enterprise in which all financial transactions are maintained in one base currency. Each organization maintains its own general ledger account, which is available to all sites that belong to that organization.
- **Product settings**
You must plan the settings you define in the product. Settings can be stored at the system level, the organization level, the site level, or the security level. Depending on where you define settings within the hierarchy, product settings affect the functioning of many applications.
- **When to create multiple organizations and sites**
When using the multisite capability, you must first decide whether you want to set up multiple organizations. Then, for each organization, you must decide whether to set up multiple sites. You can set up multiple sites even if your implementation has only a single organization.
- **Levels in the hierarchy**
Systems, organizations, and sites form a hierarchy that guides how you use and configure the product to fit your organization. When you create an organization, you create at least one site.

Sites

A site is typically a facility in an organization where work is managed. These activities include managing assets and physical locations by using preventive maintenance schedules and work orders, managing inventory in storerooms, processing stock replenishment, and other supply chain-related activities.

A site is not required to be a physical location. For example, you can use sites in any of the following ways:

- Two sites can correspond to two different facilities in two different countries.
- Two sites can correspond to two subdivisions that you want to keep separate for business reasons, even if the sites are located within the same facility.
- Several facilities can correspond to a single site because they all use the same data that the application software treats as site-level data. For example, the facilities all use the same work order data.

Organizations

An organization is typically a financial entity in an enterprise in which all financial transactions are maintained in one base currency. Each organization maintains its own general ledger account, which is available to all sites that belong to that organization.

In a large enterprise, multiple business functions can also be configured as separate organizations. For example, a company can define two organizations: one to maintain its own assets, and another to maintain the assets of its clients.

Product settings

You must plan the settings you define in the product. Settings can be stored at the system level, the organization level, the site level, or the security level. Depending on where you define settings within the hierarchy, product settings affect the functioning of many applications.

- [Site settings](#)
Settings enable each site in your organization to use different business rules, depending on the requirements of each organization.
- [Organization settings](#)
You can create organizations and sites in the Organizations application. You can further configure your organizations using the Organizations, Chart of Accounts, Exchange Rates, and Calendars applications.
- [System settings](#)
You configure system-wide settings based upon your business requirements. At this level, you can create at least one organization, currency code, item set, and company set.
- [Security settings](#)
You can set up user records and security groups to define different levels of access.

Site settings

Settings enable each site in your organization to use different business rules, depending on the requirements of each organization.

You define most site settings in the Organizations application. Most options have default values. You must verify that the defaults correspond to your business rules and change them if necessary.

Table 1. Configuration of site settings

Action in the Organizations application	Function
Work order options	Configure the site settings for work orders, such as numbering for tasks.
Inventory options	Configure the site-level settings for inventory, such as determining how costs are calculated at issue.
PM options	Configure how your sites schedule planned maintenance. For example, scheduling by priority or frequency, or specifying how far in advance to generate work orders.
SLA options	Specify how you want to match service level agreements (SLAs) to records for example, one or multiple SLAs.
Autonumber setup	Configure auto-numbering for items that are numbered at the site level, such as work orders. For example, you can configure starting numbers and prefixes.

Organization settings

You can create organizations and sites in the Organizations application. You can further configure your organizations using the Organizations, Chart of Accounts, Exchange Rates, and Calendars applications.

Several of the organization options have default values. Be sure to verify that the default values correspond to your business rules and change them if necessary.

Table 1. Configuration tasks by application

Application	Tab or action	Function
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Application	Tab or action	Function
Chart of Accounts		Define general ledger accounts and configuring rules surrounding general ledger account code validation. Most companies import their general ledger account codes and use this application to view the import and configure the validation rules. Configure additional chart of accounts options through database configuration.
Exchange Rates		Configure and administer exchange rates for currencies you and your vendors use.
Calendars		Define calendars, holidays, shifts, and work periods for your company. This data is used to schedule in other areas within the system.
Organizations	Addresses tab	Configure addresses for your company.
	Sites tab	Create sites. You must have at least one site to use the system. You can set additional administrative options for each site in a different part of the application.
	Work order options action	Configure the options that your organization uses for work orders. For example, configure editing rules and configure prompts for failure and downtime reporting.
	Inventory options action	Configure the options that your organization uses for inventory. For example, specify options for breakpoints, negative balances, and reorder rules.
	Drill down options action	Configure the appearance of drill down menus.
	Safety plan options action	Specify that the system displays the hazards of a work asset in the select hazards dialog box.
	PO options action	Configure purchase order options for your organization. For example, specify the options for converting purchase requisitions to purchase orders.
	Contract options action	Associate terms and conditions with contract types.
	Tax options action	Configure tax options for your organization, including how multiple taxes are calculated.
	PO labor options action	Configure options for the rules of your organization for outside labor costs, including reporting of actuals and requirements for purchase orders.
	Labor options action	Configure options for labor costs in your organization, including reporting of actuals and requirements for purchase orders.
	Workflow options action	Configure options for workflow processes in your organization, including reporting automated generation of work orders and purchase orders.
	Autonumber setup action	Configure auto-numbering for items that are numbered at the organization level, such as assets. For example, you can configure starting numbers and prefixes. This action facilitates moves from one site to another.

System settings

You configure system-wide settings based upon your business requirements. At this level, you can create at least one organization, currency code, item set, and company set.

Table 1. System settings

Application	Tasks
Database Configuration	Create objects and associate attributes with objects. You can create objects or import objects into the database. Configure the database in administration mode or in command line mode.
Organizations	Define organizations and sites. You must define at least one organization and site. Many organizations and sites can share a single database. Set up the Autonumber feature: Specify autonumber seeds and prefixes for record IDs that are unique at the system level.
Sets	Create item sets and company sets. <ul style="list-style-type: none"> Item sets are groups of items that are shared between organizations to enable features such as inventory sharing. Company sets are groups of vendors that are shared between organizations.
Currency Codes	Define the codes to represent currencies that you and your vendors use. One currency code is the base currency. Define exchange rates if needed.

Security settings

You can set up user records and security groups to define different levels of access.

Table 1. Applications with security settings

Application	Description
Security Groups	A security group defines levels of access to system applications and data.

Application	Description
Users	<p>A user record defines how the system looks and behaves for a user. The record must have an associated person record. You can maintain both records from the Users application.</p> <p>A user must be a member of at least one group to access system applications. Users do not need to be given access to any sites in their groups to access data in system-level applications.</p>

When to create multiple organizations and sites

When using the multisite capability, you must first decide whether you want to set up multiple organizations. Then, for each organization, you must decide whether to set up multiple sites. You can set up multiple sites even if your implementation has only a single organization.

When to create multiple organizations

You create an organization to identify a unique business entity to which one or more sites can belong.

Table 1. Situations in which you can create multiple organizations

Situation	Example	Recommendation
An enterprise has multiple legal entities, each of which maintains its own general ledger account.	An aerospace company has two legal entities: International and North American.	Create an organization for each legal entity.
An enterprise has multiple businesses. The maintenance operations are independent of each other and have their own general ledger accounts.	A large multinational company has two businesses: a utilities operation and a fleet of vehicles.	Create an organization for each business.
An enterprise has two different departments, one of which manages IT assets while one manages general assets. Each department has a unique set of general ledger accounts and cost centers.	A manufacturing company has a facilities department for managing general assets and an information technology department for managing IT assets.	Create an organization for each department.

When to create multiple sites

You typically create multiple sites within an organization when you want to have separate work management practices. When you create multiple sites, each site can maintain its own work orders, assets, inventory, and preventive maintenance orders.

Table 2. Situations in which you can create multiple sites

Situation	Example	Recommendation
An enterprise has a North American organization with facilities in multiple cities, each with independent maintenance operations.	An aerospace company has facilities in Boston, Chicago, and Denver.	Create a site for each facility.
A service enterprise maintains assets in facilities that are located in several countries. The enterprise deals in multiple currencies, but uses one general ledger system with a single base currency.	A large multinational company has facilities in Peru, Chile, and Argentina.	Create a single organization, and then create a site for each facility.
An enterprise has maintenance operations that occur in multiple facilities, but only some of the facilities use the same inventory and work orders.	A manufacturing company has three locations in the state of Ohio, all which share the same inventory and work orders. Two other facilities in another state do not use the same data as the Ohio facilities and also do not use the same data as each other.	Create a site for the three facilities in Ohio, then create a separate site for each of the other facilities.

Levels in the hierarchy

Systems, organizations, and sites form a hierarchy that guides how you use and configure the product to fit your organization. When you create an organization, you create at least one site.

Applications store data at different levels in a multiple site implementation. The following definitions describe the types of levels that can occur in an implementation with more than one site:

System level

A system is a single instance of a database. A single system can contain one or more sets, organizations, and sites.

Set

Sets exist below the system level, but above the organization level. This configuration enables multiple organizations to share company and item data. Each organization can have only one company set and one item set. Each set can be shared by more than one organization.

Organization

An organization identifies a unique legal entity. A large corporation can have different organizations for different companies. A corporation can also group the facilities that exist in a continent or country into an organization. There can be many organizations in a single database.

Site

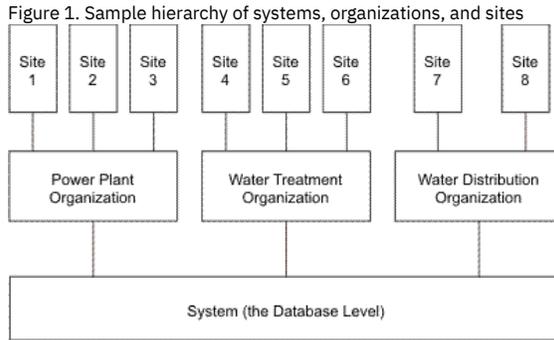
A site identifies a work location, such as a plant or a facility. A site is a division within an organization that maintains certain data independently from other sites. You can also use sites to administer security, and give users different rights at different sites.

Example of a utility company

A utility company owns several power plants, three water treatment plants, and two water distribution systems

- System-level refers to the entire utility company.
- The organizations of the company are grouped into power plants, water treatment, and water distribution facilities.
- Each organization has several sites that track inventory separately. The sites are the individual power plants, the treatment plants, and the water distribution systems.

The following figure shows a sample hierarchy of systems, organizations, and sites at a utility company.



Data storage levels

Application data is stored at the following four levels: enterprise, set, organization, and site. The data that a user can see and use depends on the level at which the data is stored and whether the user is part of an organization or site that can access the data.

Enterprise level

An enterprise represents a single instance of the Manage database. Data that is stored at the enterprise level, which is sometimes referred to as the system level, is available to all organizations and sites in the enterprise. An enterprise can have multiple organizations, and each organization can have multiple sites.

When an application stores data at the enterprise level, the data is unique for the entire implementation. An identifier for a record in an enterprise-level application can be used only once for that application. For example, in the People application, if a person record exists with the identifier 12345, then no other person record in any organization or site can use the identifier 12345.

Set level

The set level is a category below the enterprise level, but above the organization level. The set level allows multiple organizations to use the same item data and vendor data. Item data is stored in an item set. Vendor data is stored in a company set.

An enterprise can have multiple item sets and company sets, but each organization can use only one company set and one item set. Multiple organizations can use the same item set or company set.

For example, a utilities company owns several power plants and several water treatment facilities. The business practices of the power plants are similar, but different from the water treatment facilities. You can create an item set and a company set for use by the power plant organizations. Then you can create a different item set and company set for use by the water treatment organizations.

Organization level

Organizations and sites correspond to logical divisions in the company. An organization contains one or more sites.

If an application stores data at the organization level, then all sites in that organization access and use the same data from that application. For organization-level applications, different organizations can maintain separate data.

For example, the Chart of Accounts application is an organization-level application. Two organizations can each maintain separate general ledger accounts. The corollary is that different organizations can use the identical general ledger account code to refer to different accounts. For example, the account code 2000-300-400® might identify a tax debit account in one organization and an expense account in another organization.

Site level

A site is a division in an organization that maintains certain kinds of data independently from other sites. For example, the Assets application is a site-level application. The same asset number might identify a pump at one site and a computer at another site. Site-level applications primarily involve work management activities.

You can also use sites in administering security. You can give users different rights at different sites. For example, a user with management responsibility at one site might need full rights to the Work Order Tracking application at that site. The same user might only need to view work order data at another site.

- **Applications and their data storage levels**

Records must be unique within the data storage level. For example, the Automation Scripts application stores data at the enterprise level, so you could not have two scripts with the same identifiers in an enterprise. Some applications, such as the Job Plans application, are able to store data at multiple levels.

Applications and their data storage levels

Records must be unique within the data storage level. For example, the Automation Scripts application stores data at the enterprise level, so you could not have two scripts with the same identifiers in an enterprise. Some applications, such as the Job Plans application, are able to store data at multiple levels.

Table 1. Applications and the levels at which they store data

Application	Enterprise level	Set level	Organization level	Site level	Notes
Actions	X				
Activities and Tasks				X	
Application Designer	X				
Asset Templates			X		
Assets				X	Assets are defined at the site level. However, a user can issue items from a storeroom located in one site to an asset located in another site. The user must have access to both sites, and the two sites must belong to the same organization.
Assignment Manager				X	
Automation Scripts	X				
Bulletin Board	X				
Calendars			X		
Catalogs		Item set			
Catalog Orders				X	
Catalog Purchase Requisitions				X	
Chart of Accounts			X		
CI Types	X				
Classifications	X		X	X	Classifications exist at the enterprise level but can be restricted to a particular organization or site.
Cognos® Reporting	X				
Commodity Codes		Item set			Menu item
Company Master		Company set			Company master records are defined at the company set level and are unique at that level.
Companies			X		Company records are defined at the organization level. However, they are unique at the company set level. A company record must exist in the Company Master application before it can be defined for an organization.
Communication Templates	X				
Condition Codes		Item set			All condition enabled items in an item set can use the codes.
Condition Monitoring				X	Condition monitoring points are defined against an asset or location and hence are accessible only in the site where the asset or location is defined.
Conditional Expression Manager	X				
Configuration Items	X				
Conversion Values		Item set			All condition enabled items in an item set can use the codes.
Create Interactions	X				
Crews			X		
Crew Types			X		

Application	Enterprise level	Set level	Organization level	Site level	Notes
Cost Management				X	
Crafts			X		
Create Requisitions				X	Transactions can reside at enterprise, organization, or site level.
Create Service Requests	X		X	X	Transactions can reside at enterprise, organization, or site level.
Cron Task Setup	X				
Currency Codes	X				All sites and organizations can access currency codes.
Database Configuration	X				
Database Information	X				
Domains	X		X	X	Domains are defined at the enterprise level, but individual values can be restricted to an organization or site.
Email Interaction Setup	X				
Email Listeners	X				
End Points	X				
Enterprise Services	X				
Escalations	X				
Exchange Rates			X		Exchange rates are accessible to all sites in the organization in which the exchange rates were defined.
External Systems	X				
Failure Codes			X		The problems, causes, and remedies associated with failure codes are also defined at the organization level and are unique at that level.
Features	X				
Fulfillment Options		Item set		X	
Global Search	X				
Hazards			X		The precautions associated with the hazards are defined at the site level.
Interactions	X				
Inventory				X	Items in a storeroom are defined at the site level. Items can be transferred from a storeroom in one site to a storeroom in another site, provided the two sites belong to the same organization or the organizations of the two sites use the same item set.
Inventory Usage				X	
Incidents	X				Incidents are defined at the enterprise level. The incident can specify an asset or location that belongs to any site. The incident can also be handled at any site, not just the site specified for the asset or location.
Integration Modules	X				
Invocation Channels	X				
Invoices				X	
Issues and Transfers				X	
Item Master		Item set			Items are defined at the item set level and the identifiers are unique at that level. An organization can use only one item set, and all sites in that organization can access all the items defined in that item set.
Job Plans	X		X	X	Job plans can be defined at the enterprise level, organization level, or site level. When a job plan is defined at the enterprise level, the identifier is unique at that level. No other job plan at the site level or the organization level can have the same identifier. When a job plan is defined at the organization level, the identifier is unique at the organization level. No other job plan at the site level within that organization can have the same identifier.
KPI Manager	X				
KPI Viewer	X				
Labor			X		
Labor Rate Contracts			X		Labor rate contracts are accessible to all the sites in the organization in which the contract was created.
Labor Reporting				X	

Application	Enterprise level	Set level	Organization level	Site level	Notes
Launch in Context	X				
Lease/Rental Contracts			X		Though lease/rental contracts are defined at the organization level, you must explicitly specify the sites to which a lease/rental contract applies using the Authorize Sites action. The sites must belong to the organization in which the contract is created or to an organization that uses the same item set and company set as the organization in which the contract is created.
Locations				X	Though locations are defined at the site level, a user can issue items from a storeroom located in one site to a location in another site. The user must have access to both sites, and the two sites must belong to the same organization.
Lock Out/Tag Out				X	
Logging	X				
Logical Management Operations	X				
Master Contracts			X		Though master contracts are defined at the organization level, you must explicitly specify the sites to which a master contract applies using the Authorize Sites action. The sites must belong to the organization in which the contract is created or to an organization that uses the same item set and company set as the organization in which the contract is created.
Master PM	X				PM records from any site can be associated with a master PM.
Maps			X		
Message Reprocessing	X				
Message Tracking	X				
Meter Groups	X				Defined items, assets, and locations can access all the meters defined in the Meter Groups application. Defined items, assets, and locations can access all the meters defined in the Meters application.
Meters	X				Defined items, assets, and locations can access all the meters defined in the Meter Groups application. Defined items, assets, and locations can access all the meters defined in the Meters application.
Migration Collections	X				
Migration Groups	X				
Migration Manager	X				
Object Structures	X				
Offerings Catalog		Item set			
Offerings		Item set			
Organizations	X				
OSLC Providers	X				
OSLC Resources	X				
People	X				
Person Group	X		X	X	Person group records are defined at the enterprise level and the identifiers are unique at that level. Person groups contain people records, which can be restricted to a site or an organization.
Precautions				X	
Preventive Maintenance				X	
Priority Matrix	X				
Process Requests	X				
Publish Channels	X				
Purchase Contracts			X		Though purchase contracts are defined at the organization level, you must explicitly specify the sites to which a purchase contract applies using the Authorize Sites action. The sites must belong to the organization in which the contract is created or to an organization that uses the same item set and company set as the organization in which the contract is created.

Application	Enterprise level	Set level	Organization level	Site level	Notes
Purchase Orders				X	You can create purchase orders (both internal and external) for storerooms that belong to the site in which you create the purchase order. For an external PO, you can request items for storerooms in multiple sites, provided the PO site and all the storeroom sites belong to the same organization. When you create an internal PO, you can request items from a storeroom belonging to a different site than the one in which you create the PO, provided the two sites are in the same organization or the organizations for the two sites use the same item set.
Purchase Requisitions				X	You can create purchase requests (both internal and external) for storerooms that belong to the site in which you create the request. When you create an internal PR, you can request items from a storeroom belonging to a different site than the one in which you create the PR, provided the two sites are in the same organization or the organizations for the two sites use the same item set.
Qualifications			X		
Quick Reporting				X	
Receiving				X	
Release Records				X	
Relationships	X				
Request for Quotations				X	
Report Administration	X				
Report Viewer	X				
Response Plans	X				
Roles	X				
Routes				X	Only assets and locations that belong to the specified site can be part of that route. Any specified job plans must either belong to the site for the route or be at the enterprise level.
Safety Plans				X	
Search Solutions	X		X	X	Transactions can reside at enterprise, organization, or site level.
Security Group	X				
Service Addresses			X		
Service Fulfillment		Item set			
Service Groups		Item set			
Service Items		Item set			Service items are defined at the item set level and the identifiers are unique at that level. An organization can use only one item set, and all sites in that organization can access all the service items defined in that item set.
Service Level Agreements	X				SLA records can be defined at the enterprise level, organization level or at the site level. The SLA identifier is unique at the enterprise level.
Service Requests	X		X	X	Service requests are defined at the enterprise level. The requested service can specify an asset or location that belongs to any site. The service request can also be handled at any site, not just the site specified for the asset or location.
Service Request Manager Search	X				
Sets	X				
Shipment Receiving				X	
Software License View	X				
Solutions	X				
Stocked Tools				X	Tools can be transferred from a storeroom in one site to a storeroom in another site, provided the two sites belong to the same organization or the organizations of the two sites use the same item set.
Storerooms				X	
System Properties	X				
Tax Codes			X		Menu item
Tenants	X				
Terms and Conditions			X		Terms and conditions are accessible to all sites in the organization in which the terms and conditions were created.
Ticket Templates	X				Ticket templates can contain job plans that can be from any level.

Application	Enterprise level	Set level	Organization level	Site level	Notes
Time Zone Rule	X				
Tools		Item set			Tools are defined at the item set level and the identifiers are unique at that level. An organization can use only one item set, and all sites in that organization can access all the tools defined in that item set.
Units of Measurement	X				Menu item
Users	X				
View Catalog Requests				X	
View Drafts				X	
View Requisitions				X	
View Service Requests	X		X	X	Transactions can reside at enterprise, organization, or site level.
View Shopping Carts				X	
View Templates				X	
Warranty Contracts			X		Though warranty contracts are defined at the organization level, you must explicitly specify the sites to which a warranty contract applies using the Authorize Sites action. The sites must belong to the organization in which the contract is created or to an organization that uses the same item set and company set as the organization in which the contract is created.
Web Services Library	X				
Work Order Tracking				X	
Work View	X				
Workflow Administration	X				
Workflow Designer	X				

Data sharing between organizations

Sets allow for the sharing of data between organizations. An item set allows organizations to share item data, such as inventory. A company set allows organizations to share vendor information.

- [Item sets and data sharing between organizations](#)
Item sets group information about assets, materials, spare parts, service items, and tools. Records created in the Item Master application are stored at the set level. You can specify a unique identifier, assign properties, and add the item to the inventory of one or multiple sites.
- [Company sets and vendors shared between organizations](#)
The Company Master application, in which you maintain a master list of vendors, stores data in the company set. The vendors that you do business with are unique within the company set. One or more organizations can share the same company set.

Item sets and data sharing between organizations

Item sets group information about assets, materials, spare parts, service items, and tools. Records created in the Item Master application are stored at the set level. You can specify a unique identifier, assign properties, and add the item to the inventory of one or multiple sites.

Assets and inventory items shared between organizations

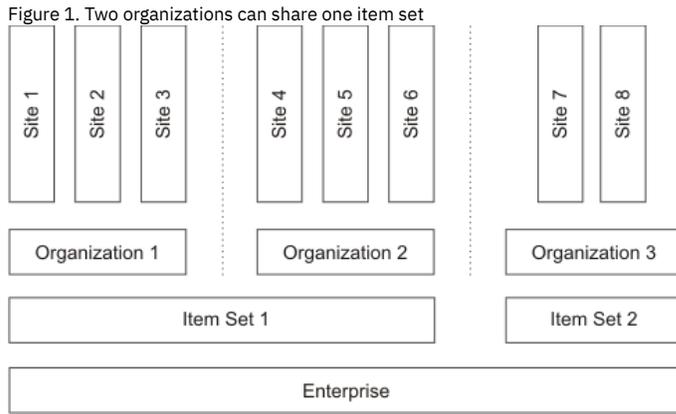
When you create an item master record, it becomes part of the item set of the organization to which your default site for new records belongs. The items are unique within the set. Because you can assign the same item set to multiple organizations, you can use the same item definitions for all sites within those organizations.

Using item sets provides the following benefits:

- You can transfer items between organizations.
- You can standardize your item definition so that all organizations and their sites share the same item catalog and item assembly structure.
- The Item Master application provides an item catalog from which to set up inventory at multiple sites.

If more than one organization in your enterprise requires its own item definition, you can create multiple item sets. You can assign a separate item set to each organization, or to each group of organizations that you want to share the same item definition.

The following figure illustrates an example of an enterprise with three organizations and eight sites. Two organizations and their six sites share the same item set. The third organization has its own item set.



Service items and tools shared between organizations

Service items and tools records are also stored at the item set level. Service items and tools are unique to the item set. Any organization assigned to the item set can use the service items and tools records in the item set.

Some of the data on a service item record may be specific to a single organization or site. For example, the companies listed in the Vendors window are at the organization level.

Company sets and vendors shared between organizations

The Company Master application, in which you maintain a master list of vendors, stores data in the company set. The vendors that you do business with are unique within the company set. One or more organizations can share the same company set.

Using company sets provides the following benefits:

- You can standardize your list of approved vendors.
- You can create global contracts that can be shared by multiple organizations.

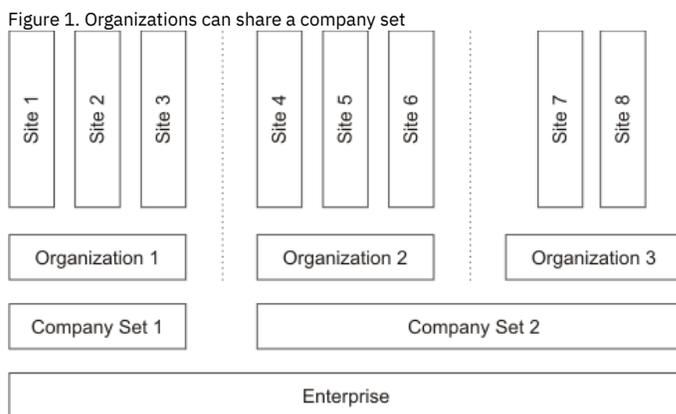
The relationship between the Company Master application and the Companies applications is like the relationship between the Item Master application and the Inventory application. In the Company Master application, you create a catalog of companies and you associate individual companies with specific organizations. In the Companies application, which stores data at the organization level, users can access the vendor information associated with their organization.

The companies records and company master records have many fields in common. A user can edit these fields in the Companies application without changing the values in the Company Master application. For example, while the Ship Via field in the Company Master record might be one shipping vendor, one of the organizations using that company set might want to specify a different vendor.

When you create a company set in the Sets application, you have the option of automatically adding the companies to the Company Master application. By default, this option is not enabled, which means that users must manually enter new companies in the Company Master application. However, you can enable the options so that the record is automatically added in the Company Master application.

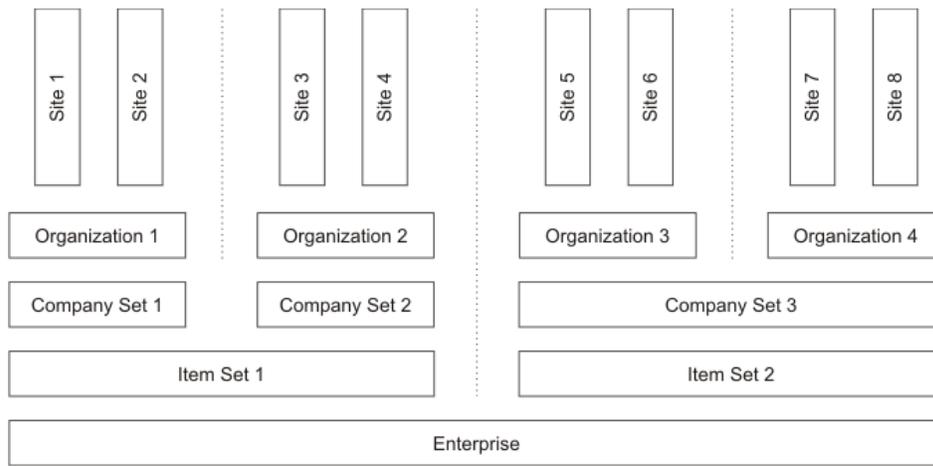
You apply a company set to one or more organizations. If an organization requires its own list of vendors and contracts, you can create a separate company set for it.

The following figure illustrates an example of an enterprise with three organizations and eight sites. Two organizations, and their five sites, share the same company set. The third organization has its own company set.



Item sets and company sets are independent of each other. The following figure illustrates such an example. There are four organizations and eight sites. Organizations 1 and 2 share Item Set 1; Organizations 3 and 4 share Item Set 2. Organizations 1 and 2 each have their own company set. Organizations 3 and 4 share Company Set 3.

Figure 2. Organizations can share an item set while having separate company sets



Selective data sharing

Applications that can store data at the enterprise, organization, and site levels typically store data at the enterprise level by default. Storing data at the organization level means that all sites in the organization can use the data. Storing data at the site level restricts data to just the specified site.

Job Plans application

When you create a job plan, you can specify an organization, a site, or neither. If you specify neither, the job plan is stored at the enterprise level, which makes it available to all sites and organizations. If you specify an organization, the job plan is available to all sites within the organization but cannot be accessed by other organizations. If you specify a site, the job plan is available only to that site and cannot be accessed by other sites.

When you create enterprise-level job plans, you also have the option of specifying organization-specific or site-specific tasks, labor, materials, services, and tools. Organization-specific tasks, such as labor records, are copied only to those work orders that are created in a site belonging to that organization. Site-specific tasks are copied only to those work orders created at that site.

Classifications application

By default, classification records are at the enterprise level and can be accessed by all organizations and sites. However, when you add a new classification record, you have the option of specifying an organization or site, but only if the Items check box in the Use With section is not selected. Any classification used with items must be at the enterprise level.

You can similarly add child classifications. If the parent classification is stored at the enterprise level, you can restrict the child classification to an organization or site. But if the parent classification is restricted to an organization or site, then all the children must be restricted to the lowest level of the parent classification. For example, if the parent classification is restricted to an organization, a child classification can be further restricted to a specific site. If the parent classification is restricted to a site, then all the children must be restricted to that site.

Domains application

The Domains application enables you to create several kinds of domains, including value lists and crossover fields. By default, domains apply at the enterprise level and all sites can access them. You have the option of applying domain values to a particular organization or site.

The synonym domain works differently from other domain types when you specify an organization or site for a domain value:

- For a synonym domain, if you add a new value and specify an organization or site, the records in that organization or site that access that domain show the new value as well as the existing enterprise-level values. This behavior occurs because synonym domains are part of the product and have existing business rules. You cannot add new synonym domains, only new synonym values.
- For other domain types, after you specify an organization or site for one value in a domain, records in that organization or site no longer have access to values in that domain that have no organization or site specified. Therefore, the best practice for non-synonym domains is either to leave the Organization and Site fields empty for all values in a domain or to specify an organization or site for all values in the domain.

Person Groups application

Person groups apply at the enterprise level and can be accessed by all sites, but you can restrict individual persons in the group to particular organizations or sites. When you add a person to a person group, you can specify an organization or site for that person. You can add multiple rows for the same person to specify multiple sites or organizations. If you add multiple rows, you must use multiple sites or multiple organizations. You cannot use a mixture of sites and organizations.

Transactions involving multiple sites in site-level applications

Applications that store data at the site level require that the identifier field for each record is unique within the site. However, an identifier can be used within other sites and organizations. Only users who have security permission for the site and the application can view the records.

Transactions that involve multiple sites can be performed in applications that store data at the site level.

Purchase requisitions

You can create a purchase requisition at one site that requests items from a storeroom at a different site. The storeroom site must belong to the same organization as the requesting site, or the requesting site and the supplying site must belong to organizations that share the same item set.

Purchase orders

You can create an internal purchase order at one site that requests parts from a storeroom at a different site. The storeroom site must belong to the same organization as the requesting site, or the requesting site and the supplying site must belong to organizations that share the same item set.

To facilitate centralized purchasing, the system allows you to create a purchase order at one site that requests items from a storeroom at a different site. The storeroom must belong to a site that is in the same organization as the site in which you create the purchase order.

Asset transfers

You can transfer assets from one site to another. The destination site can belong to a different organization if the asset is not a rotating asset.

If the asset is rotating, the organizations for the originating and destination sites must share the same item set. If the site to which you want to move an asset already has an asset with the same asset identifier, the system prompts you to assign a new asset identifier to the asset you are moving.

Issues

You can issue an item from a storeroom in Site A, for example, to a work order created in Site B. When performing this transaction you must have access to both sites and the storeroom. The two sites must belong to the same organization.

If you need to issue an item to a site in a different organization, you must use the internal transfer capability to transfer the item and then issue the item.

Work planning

You can specify the storeroom from which to obtain an item. The storeroom site can be different than the work order site if both sites belong to the same organization and you have access to both sites.

Limitations when setting up options in the Organizations application

Except for system settings and autonumber settings, options apply at either the organization or site level, regardless of the level at which the application stores data. Even if an application stores data at the application level, it can have settings that are applied at the organization level.

For example, the Work Order Tracking application stores data at the application level. However, edit rules for the Work Order Tracking application apply at the organization level. All the sites in an organization use the same edit rules. The Preventive Maintenance application stores data at the application level and its options are also applied at the application level.

If you are able to select or specify a site in an option dialog box, then the settings apply at the site level. When you see a list of sites in a dialog box, the sites all belong to the organization that you selected on the List tab. For settings that apply at the site level, you can specify different settings for different sites. For example, you can apply different inventory cost options for different sites.

If you do not see a list of sites in an options dialog box, then the settings apply at the organization level, specifically to the organization you selected on the List tab. The settings you make apply to all the sites in the selected organization. You can select a different organization on the List tab to specify option settings for that organization.

The following table shows the options and the levels to which they apply.

Table 1. Options that apply at the organization level or the site level

Menu action	Menu sub-action	Organization	Site	Options description
Work Order Options	Work Type	X		Define work order class and type including a description and the prompts for failure or downtime.
	Edit Rules	X		Specify which fields on the work order are editable for each work order status.
	Other Organization Options	X		Set default start for downtime, the actual start date, the prompts that are displayed, when material reservations are cleared, and when duplicate warnings are displayed.
	Site Options		X	Specify default starting number and increment for task numbering.
Inventory Options	Inventory Defaults	X		Set ABC breakpoint options.
	Reorder	X		Specify when external and internal requests are created and also the maximum number of reorder lines on each purchase order or purchase requisition.
	Inventory Costs		X	Set whether issue cost is standard or average and whether non-capitalized rotating is an issue cost or an asset cost.
Asset Options		X		Specify when the asset history is recorded.

Menu action	Menu sub-action	Organization	Site	Options description
Drilldown Options		X		Set order for the top-level asset on the Asset tab.
PM Options			X	Specify how preventive maintenance work orders are issued.
Safety Plan Options			X	Determine whether the hazards appear in the Select Hazards action for an asset.
Purchasing Options	PO Options	X		Specify purchasing options such as whether purchase requisitions require approval, when purchase requisitions are closed, whether standard service costs are added to direct issue lines, and whether the generation of special order items is allowed.
	Contract Options	X		Add and modify contract types.
	Tax Options	X		Specify the general ledger options for tax, such as the rate and effective date.
	PO Labor Options	X		Determine whether a purchase order is required to approve inside labor.
Labor Options		X		Specify whether inside and outside labor transactions are automatically approved, whether mismatched craft and labor are permitted when reporting actuals, whether invoices from labor transactions are automatically approved, and the number of hours for future labor transaction tolerance.
Service Desk Options	Global Ticket Solution Options	X		Specify whether solutions are applied to related global tickets.
SLA Options			X	Specify whether multiple service level agreements are allowed and, if so, how multiple are ranked.
Ownership Assignment Options			X	Specify whether person availability is checked.
Workflow Options			X	Determine which workflow processes are initiated automatically.

The following table shows the levels for the autonumber settings and the system settings.

Table 2. Levels for the autonumber settings and system settings

Menu action	Menu sub-action	Enterprise	Company Set	Item Set	Organization	Site
Autonumber Settings	System Level	X				
	Set Level		X	X		
	Organization Level				X	
	Site Level					X
System Settings		X				

Examples of using the multisite capability

The multisite capability provides flexibility when you are setting up your implementation. You can create item sets, company sets, organizations, and sites to reflect the structures of your business.

- **Example: Multisite configuration with separate general ledger accounts**
You can create two organizations that share a company set but maintain separate item sets. This example illustrates a way to reflect the structure of your enterprise with sites, organizations, and sets.
- **Example: Multisite configuration with separate maintenance and IT operations**
The multisite capability allows you to create organizations with sites in different locations. These organizations can share an item set and a company set.

Example: Multisite configuration with separate general ledger accounts

You can create two organizations that share a company set but maintain separate item sets. This example illustrates a way to reflect the structure of your enterprise with sites, organizations, and sets.

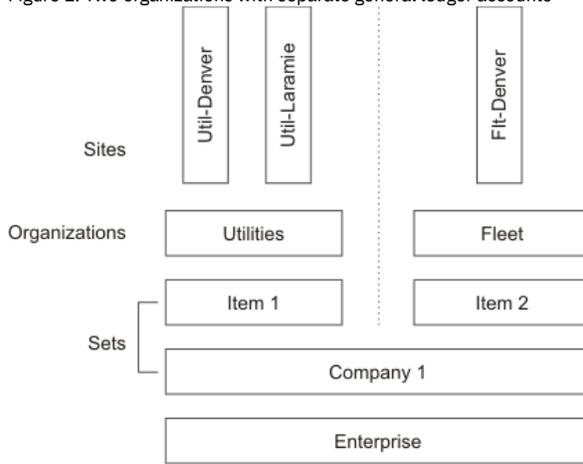
Your enterprise has two distinct business operations: a utilities operation and a fleet of vehicles. Both are run from a central location in Denver, Colorado, and both use the same list of vendors. Each operation has its own general ledger accounts.

The utilities operation also has a facility in Laramie, Wyoming. All operations and locations use the same vendors, although the utilities and fleet operations maintain different items and storerooms.

You can accommodate your enterprise structure by doing the following:

- Create two organizations: Utilities and Fleet.
- Create two sites for the Utilities organization: Util-Denver and Util-Laramie.
- Create one site for the Fleet organization: Flt-Denver.
- Create one company set for use by both organizations.
- Create an item set for the Utilities organization.
- Create an item set for the Fleet organization.

Figure 1. Two organizations with separate general ledger accounts



Example: Multisite configuration with separate maintenance and IT operations

The multisite capability allows you to create organizations with sites in different locations. These organizations can share an item set and a company set.

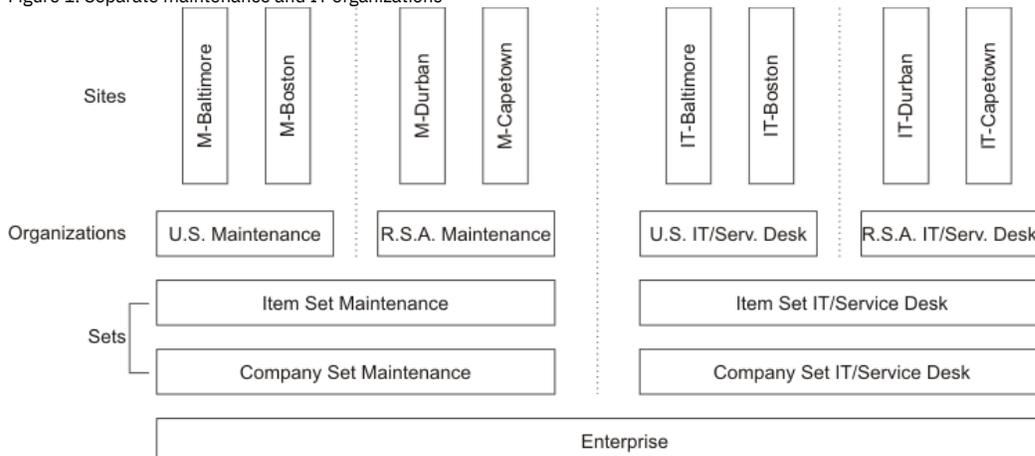
Your enterprise has production facilities in the United States (U.S.) and in the Republic of South Africa (R.S.A.). Both production facilities have separate maintenance and service desk operations, each with its own general ledger account. Both production facilities also have two locations that maintain separate work orders.

You want to maintain two item sets: one for maintenance operations and one for the service desk departments.

You also use different sets of vendors for maintenance and for service desk. You want to be able to create global contracts so that, for example, the South African and United States maintenance facilities can buy from the same vendors.

- Create four organizations:
 - U.S. Maintenance
 - U.S. Service Desk
 - R.S.A. Maintenance
 - R.S.A. Service Desk
- Create two sites in the U.S. Maintenance organization:
 - M-Baltimore
 - M-Boston
- Create two sites in the U.S. Service Desk organization:
 - IT-Baltimore
 - IT-Boston
- Create two sites in the R.S.A. Maintenance organization:
 - M-Capetown
 - M-Durban
- Create two sites in the R.S.A. Service Desk organization:
 - IT-Capetown
 - IT-Durban
- Create an item set for use by both maintenance organizations.
- Create an item set for use by both service desk organizations.
- Create a company set for use by both maintenance organizations.
- Create a company set for use by both service desk organizations.

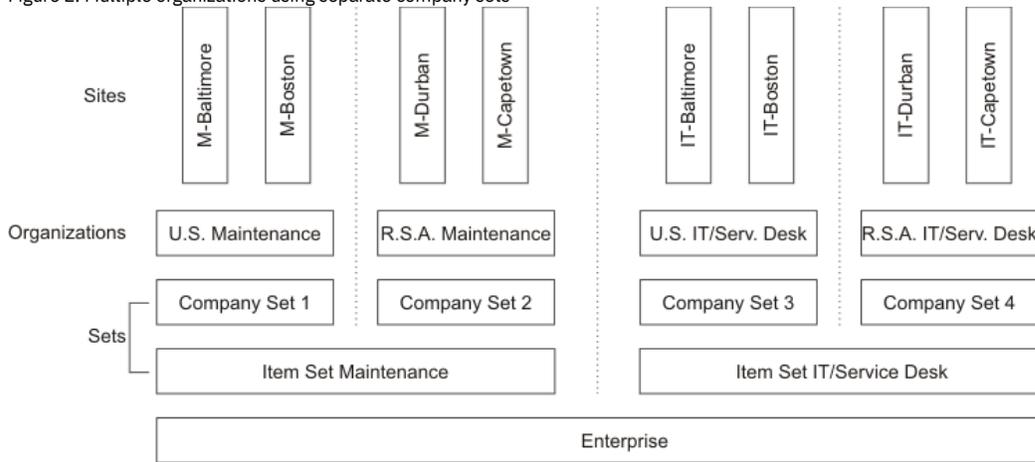
Figure 1. Separate maintenance and IT organizations



Local vendors

If each organization uses separate vendor lists, then you can create separate company sets for each organization.

Figure 2. Multiple organizations using separate company sets



Deploying in Maximo Application Suite

By deploying and activating Maximo Manage, Maximo Manage is available for use in IBM® Maximo Application Suite.

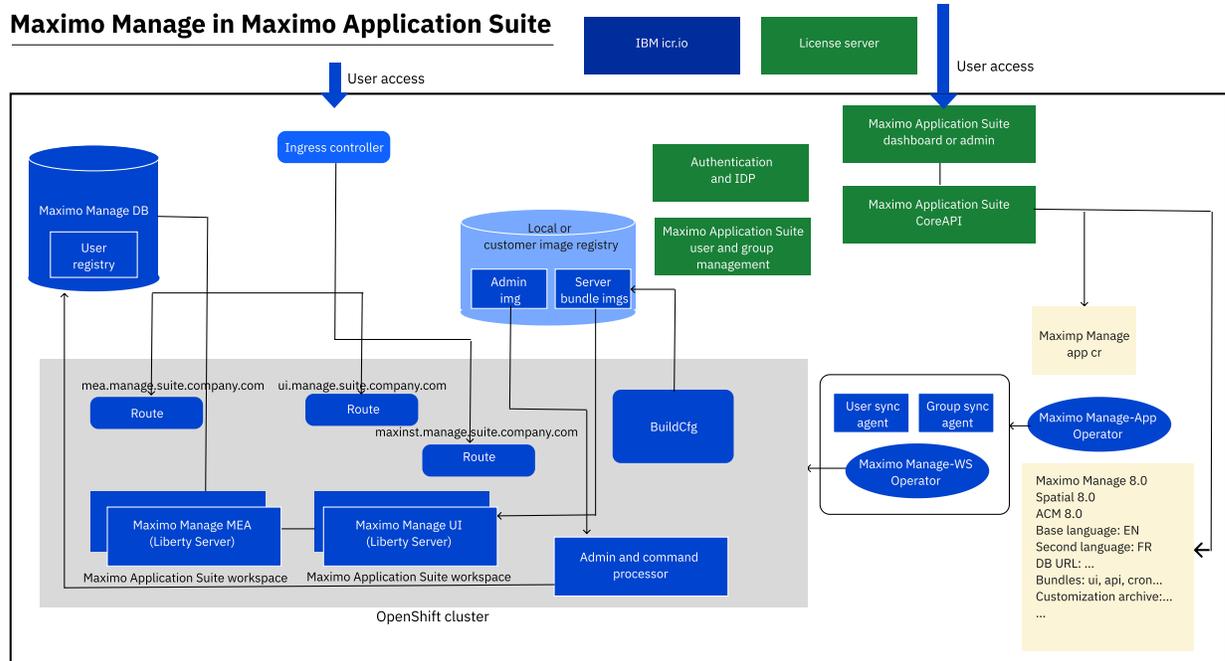
A system administrator can do the following tasks:

- Configure your database for Maximo Manage
- Select and deploy industry solutions and add-ons with Maximo Manage
- Set up additional configurations.
- Grant users access permission to use Maximo Manage after the deployment is completed.
- Complete additional post deployment and administration tasks.

Maximo Application Suite is a suite of asset management and data analytic offerings. Maximo Application Suite is offered as a customer-managed product on Red Hat® OpenShift® and as an IBM Managed solution. It is also available as a SaaS offering.

As a system administrator, you can deploy and activate Maximo Manage and related industry solutions and add-ons in Maximo Application Suite. After you install Maximo Manage, the architecture is as shown in the following figure.

Figure 1. Maximo Manage in Maximo Application Suite



When you want to connect to a particular database or install an add-on, a customer resource is generated to specify exactly what you want to do. The Maximo Manage operator generates the admin image and the server bundle images. The server bundle images are the Liberty servers because, for example, if you want to install industry solutions, the server must be deployed there. The operator completes these tasks. Then, those finalized images are placed in the local image

registry or a customer-provided image registry. The operator issues commands to the Admin pod and the database to configure the database. When the configuration is done, the operator starts the Liberty servers and makes the routes available, so users can start to connect to it. The operator automates the whole deployment.

Before you deploy, verify that the following tasks are complete:

- Verify that your environment meets the [system requirements](#).
- Verify that Maximo Application Suite is installed and configured according to your requirements. For more information about planning and installing, see the [Maximo Application Suite online product documentation](#).

Complete the following tasks to deploy and access a in Maximo Application Suite:

1. Review the [Plan and prepare Maximo Manage](#) for the deployment section. It provides instructions, such as preparing your database, provisioning persistent storage if you want to, configuring your customization archive, and other tasks.
2. Review the [Deploying and activating Maximo Manage](#) section, which provides the necessary steps to deploy and activate Maximo Manage and how to monitor its deployment progress. The following steps are a summary:
 - a. Deploy Maximo Manage application.
 - b. Configure Maximo Manage to connect to your database and for example, select industry solutions and add-ons to co-deploy with Manage, set the languages, configure the customization archive, configure external file storage, and other tasks.
 - c. Activate Maximo Manage for use in Maximo Application Suite.
 - d. Monitor the Maximo Manage deployment and when completed, do the [Post-deployment configurations](#).

Note:

You can also upgrade to Maximo Manage from Maximo Asset Management. Before you upgrade, you must have and 7.6.1.10 or 7.6.1.2 installed. [Learn more about upgrading to Maximo Manage](#).

- **[Planning and preparing to deploy](#)**
To prepare for deployment, you must complete several tasks, such as configuring the database for IBM Maximo Manage, determining the compatibility of the industry solutions and add-ons in case you want to deploy, and other preparation steps. If you are deploying in multiple languages, review the support languages that are available.
- **[Deploying and activating Maximo Manage](#)**
As a system administrator, you deploy and activate Maximo Manage in Maximo Application Suite by selecting the application version, connecting to the configured database and applying the Java database connectivity (JDBC) configurations.
- **[Configuring Maximo Manage after deployment](#)**
You must give users access to the and application. Application administrators can configure the application to set up the required data structure for managing assets, including an organization, general ledger account structure, and configuring email notifications. You can also perform other post-deployment configurations.

Planning and preparing to deploy

To prepare for deployment, you must complete several tasks, such as configuring the database for IBM® Maximo® Manage, determining the compatibility of the industry solutions and add-ons in case you want to deploy, and other preparation steps. If you are deploying in multiple languages, review the support languages that are available.

- **[System requirements](#)**
To deploy in Maximo Application Suite, your environment must meet all of the hardware and software requirements for Maximo Manage and Maximo Application Suite.
- **[Configuring an internal image repository](#)**
You must create a repository for storing images.
- **[Setting up your database](#)**
Before you can deploy, you must configure your database and determine how your database is encrypted.
- **[Deployment of industry solutions and add-ons](#)**
When you deploy Maximo Manage, you can also include industry solutions and add-ons for deployment.
- **[Language support](#)**
Maximo Manage is available in a number of languages. You can specify languages when you activate the application.
- **[Server bundle overview](#)**
The application can be deployed in one or more workloads called server bundles. A server bundle isolates the workload processes so that they can be independently managed.
- **[Provisioning storage](#)**
Maximo Manage supports both ephemeral storage and persistent storage.
- **[Monitoring agent for Maximo Manage](#)**
Maximo Manage includes a monitoring agent that collects statistics about application usage and performance. Administrators can configure Prometheus service monitoring and then use visualization software, such as Grafana, to view usage information that the agent collects.
- **[Backing up and restoring Maximo Manage](#)**
To avoid disruptions to service and unplanned downtimes, create regular Maximo Manage backups that you can restore as needed.
- **[Storing images in an external registry](#)**
When Maximo Manage is deployed or updated, the build process generates an administrative image and a server bundle image for each bundle type. Bundle types are specified in the custom resource for the workspace. Images are stored in an internal registry. In some cases, you might want to store the build images in an external repository. For example, you might want to run security scans on images that have customizations, or you might want to test builds independently before you deploy the application in Maximo Application Suite. Administrators can configure Maximo Manage to store images in an external repository.
- **[Configuring Java Message Service \(JMS\) servers](#)**
If you use Java™ Messaging Service (JMS) to integrate data, you can deploy one or more server bundles with a Liberty server that supports JMS messaging.
- **[Deployment planning worksheet](#)**
Use the planning worksheet to record the information that you need when configuring and during the deployment process, such as database parameters, server bundle files, and customization archive location.

System requirements

To deploy in Maximo® Application Suite, your environment must meet all of the hardware and software requirements for Maximo Manage and Maximo Application Suite. For more information, see [IBM® Maximo Application Suite system requirements](#).

Check the detailed system requirements. For more information, see [Software Product Compatibility Reports](#).

Configuring an internal image repository

You must create a repository for storing images.

Procedure

1. Log in to a Bastion host.
2. Create an NFS file system for the image repository.

```
mkdir /disk1/nfs/image-registry && chmod 777 /disk1/nfs/image-registry/
```

3. Edit the /etc/exports file and add an export statement.

```
/disk1/nfs/image-registry 10.176.245.0/24(rw,no_subtree_check,sync,no_wdelay,insecure,no_root_squash)
```

4. Restart the server.

```
systemctl restart nfs-server
```

5. Create the image-storage.yaml file.

```
---
apiVersion: v1
kind: PersistentVolume
metadata:
  name: image-registry-pv
spec:
  capacity:
    storage: 500Gi
  claimRef:
    apiVersion: v1
    kind: PersistentVolumeClaim
    name: image-registry-storage
    namespace: openshift-image-registry
  accessModes:
  - ReadWriteMany
  nfs:
    path: /disk1/nfs/image-registry
    server: 10.176.245.2
  persistentVolumeReclaimPolicy: Retain
---
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  finalizers:
  - kubernetes.io/pvc-protection
  name: image-registry-storage
  namespace: openshift-image-registry
spec:
  accessModes:
  - ReadWriteMany
  resources:
    requests:
      storage: 500Gi
```

6. Apply the image-storage.yaml file.

```
oc apply -f image-storage.yaml
```

7. Edit the operator.

```
oc edit configs.imageregistry.operator.openshift.io
```

8. Change the `spec.managementState` value from `Removed` to `Managed`
9. Update the `spec.storage` value.

```
storage:
  managementState: Managed

pvc:
  claim: image-registry-storage
```

10. Save and quit.
11. Verify that the image repository is available.

```
oc get co image-registry
```

12. Enable the route.

```
oc patch configs.imageregistry.operator.openshift.io/cluster --patch '{"spec":{"defaultRoute":true}}' --type=merge
```

Setting up your database

Before you can deploy, you must configure your database and determine how your database is encrypted.

- [Database deployment planning](#)
Guidelines to consider when you create and configure your database.
- [Preparing your database for deployment](#)
Maximo Manage supports IBM Db2®, IBM Db2 Warehouse, Microsoft SQL Server, and Oracle Database. You must configure your database and gather the information that is needed when you deploy the application.
- [Database encryption](#)
When you deploy Maximo Manage, the fields that require security, such as passwords and API keys, are encrypted or re-encrypted to provide security.
- [Troubleshooting database deployment](#)
When you deploy the Maximo Manage application, issues that are related to database deployment might cause the deployment process to fail.
- [Demo data](#)
When you deploy Maximo Manage, you can add sample data to a demo database.

Database deployment planning

Guidelines to consider when you create and configure your database.

General

Use hard disks that have over 200 MB/second throughput.

If you are using IBM® cloud storage, choose a custom performance block storage of 100+ IOPS.

Configure separate system, data, and backup storage when you create a Db2® instance.

If you are using AWS cloud storage and EFS for your database, consider Provisioned mode for the constant throughput. For more disk options, see [Amazon EFS performance](#).

IBM Db2 and IBM Db2 Warehouse

Increase the maxsequence cache to 50.

Consider running **REORG INDEXERS/TABLES** and **RUNSTATS** daily.

Separate system storage, user storage, back up storage, transaction logs storage, and temporary table space storage on different disks.

Maximo® Manage requires row-organized tables. The IBM Db2 Warehouse database setting used column-based table organization by default. Update the setting if needed.

Maximo Manage does not support MMP or table partitioning. Consider archiving records that are over a year old. InfoSphere® Optim™ Data Growth Solution can be used for archiving. For more information, see [IBM Maximo Archiving 7.5.1 for IBM Maximo Asset Management 7.6](#).

An issue can occur when you load a large amount of data by using Maximo Integration Framework. Increase the concurrently running statements that are allowed for a Db2 application. For more information about tuning, see [How many concurrently running statements allowed for a Db2 Java™ application and how to increase it?](#)

If you use IBM Cloud Pak® for Data, consider the following configuration and deployment options:

- Avoid the IBM operator catalog to install IBM Cloud Pak for Data.
- Use storage services, such as Portworx or OCS, for improved performance.
- Secure operator versions and disable autoupdate for all components.
- Use the IAM and LDAP service instead of the default authentication methods.

For more information, see [Maximo 7.6.x Best practice](#) and [DB2® Performance Insight®](#).

Oracle Database

For more information, see [Best practices for system performance](#).

Microsoft SQL Server

If the original database was created in a version earlier than Microsoft SQL Server 2019, set the compatibility level to the older version to maintain the execution plan.

Set the transactions isolation level by using the following commands:

```
ALTER DATABASE MyDatabase
SET ALLOW_SNAPSHOT_ISOLATION ON
```

```
ALTER DATABASE MyDatabase
SET READ_COMMITTED_SNAPSHOT ON
```

For more information, see [Best practices for system performance](#).

Sizing

The storage class that you select can affect the size of your database. For example, if you plan to use OCS, it increases the storage space that you need for your database.

Be aware of space requirements for services, such as IBM Cloud Pak for Data. IBM Cloud Pak for Data space requirements change if you deploy it in a clustered environment.

Managed versus on-premises services, such as MongoDB and Kafka, impact your disk space needs.

All-in-one POD bundles have different disk space requirements when compared to configuring separate resources for UI, Report, Cron, Maximo Integration Framework, and Mobile.

The number of concurrent users affect resource needs. For example, for the UI resource, configure a JVM that has two cores to support 50–75 concurrent users.

Preparing your database for deployment

Maximo® Manage supports IBM® Db2®, IBM Db2 Warehouse, Microsoft SQL Server, and Oracle Database. You must configure your database and gather the information that is needed when you deploy the application.

Before you begin

Tip: Set up your database at the same site as your IBM Maximo Application Suite to reduce chances of database failures because of connection issues and data latency. However, if you have issues to set up the database during Maximo Manage deployment, see [Troubleshooting database deployment](#).

Procedure

1. Confirm that one of the following databases is configured.
 - [Configuring IBM Db2](#)
 - [Configuring IBM Db2 Warehouse](#)
 - [Configuring Oracle Database](#)
 - [Configuring Microsoft SQL Server](#)
 2. Gather the following information for your database:
 - The host and hostname.
 - The port.
 - The database name.
 - The username and password for the database user. These values are created as part of configuring the database.
 - The table space, index space, and schema values. These values are created as part of configuring the database.
- [Creating a database instance](#)
Create a database instance.

Creating a database instance

Create a database instance.

Before you begin

If you intend to use the database instance for production, you can select Deploy database on dedicated nodes and adjust the number of nodes as needed in the Configure page.

About this task

Depending on the type of database, you must configure one of the following:

- [Configuring IBM® Db2®](#)
- [Configuring IBM Db2 Warehouse](#)
- [Configuring Oracle Database](#)
- [Configuring Microsoft SQL Server](#)

- [Configuring Db2](#)
You must configure Db2 for use by Maximo Manage before you deploy Maximo Manage in Maximo Application Suite.
- [Configuring Db2 Warehouse](#)
You must create a new Db2 Warehouse database for exclusive use by Maximo Manage. You cannot reuse the Db2 Warehouse database on Cloud Pak for Data where you already deployed another application from Maximo Application Suite.
- [Configuring Oracle Database](#)
To configure Oracle Database for use with Maximo Manage, you create table spaces, create a database user, and configure database settings.
- [Configuring Microsoft SQL Server](#)
To configure Microsoft SQL Server for Maximo Manage, you create table spaces, create a database user, and configure database settings.

Configuring Db2

You must configure Db2 for use by Maximo® Manage before you deploy Maximo Manage in Maximo Application Suite.

Before you begin

Before you configure the database, install and deploy it. For installation instructions, see [Creating a database instance](#).

For information about supported database versions, generate a [Software Product Compatibility Report](#). Search for IBM® Maximo Application Suite and select the suite version to generate the report. Check for the supported database versions in the Supported Software tab of the report.

Configure your database with the following Operating System (OS):

- Linux® or UNIX
- Microsoft Windows

About this task

The commands in this task can be used to configure a Db2 database outside of the Red Hat® OpenShift® cluster (not Db2 Warehouse), by using different Operating Systems such as Microsoft Windows, Linux , or UNIX .

The commands in this task are examples of the commands that you must run. For example, maxdb80 is the name of the database. If maxdb80 is not your database name, ensure that you replace all instances with the correct database name.

Procedure

1. Log in to the system as a user that has administrative permissions on the system.
2. If system users do not exist on the system, create the system users.
 - Windows
 - db2admin
 - maximo
 - Linux or UNIX
 - maximo (Maximo db user)
 - ctgfenc1 (Db2 fenced user)
 - ctginst1 (Db2 instance owner)

The administrative user being used most is assigned the primary group of the instance owner to perform some of the following steps.

3. At the Db2 installation directory, run the following command to set up the command line environment:

- Windows

```
db2cmd
```

- Linux or UNIX

Ensure that the /opt/ibm/db2/V11.5/bin, /opt/ibm/db2/v11.5/instance, and /opt/ibm/db2/V11.5/adm directories are added to your PATH.

4. Run the following commands to create the database instance.

- Windows

Tip: Replace the variable <administrator_password> with the Db2 administrator password.

```
db2icrt -s ese -u db2admin,<administrator_password> -r 50005,50005 ctginst1
set db2instance=ctginst1
db2start
db2 update dbm config using SVCENAME 50005 DEFERRED
db2stop
db2set DB2COMM=tcPIP
db2start
```

- Linux or UNIX

```
db2icrt -s ese -u ctgfenc1 -p 50005 ctginst1
. /home/ctginst1/sqllib/db2profile
db2start
db2 update dbm config using SVCENAME 50005 DEFERRED
db2stop
db2set DB2COMM=tcPIP
db2start
```

5. Run the following commands to create the database:

```
db2 create db 'maxdb80' ALIAS 'maxdb80' using codeset UTF-8 territory US pagesize 32 K
db2 connect to 'maxdb80'
db2 GRANT DBADM ON DATABASE TO USER db2admin (windows only)
db2 GRANT SECADM ON DATABASE TO USER db2admin (windows only)
db2 connect reset
```

6. Run the following commands to configure the database:

```
db2 update db cfg for maxdb80 using SELF_TUNING_MEM ON
db2 update db cfg for maxdb80 using APPGROUP_MEM_SZ 16384 DEFERRED
db2 update db cfg for maxdb80 using APPLHEAPSZ 2048 AUTOMATIC DEFERRED
db2 update db cfg for maxdb80 using AUTO_MAINT ON DEFERRED
db2 update db cfg for maxdb80 using AUTO_TBL_MAINT ON DEFERRED
db2 update db cfg for maxdb80 using AUTO_RUNSTATS ON DEFERRED
db2 update db cfg for maxdb80 using AUTO_REORG ON DEFERRED
db2 update db cfg for maxdb80 using AUTO_DB_BACKUP ON DEFERRED
db2 update db cfg for maxdb80 using CATALOGCACHE_SZ 800 DEFERRED
db2 update db cfg for maxdb80 using CHNGPGS_THRESH 40 DEFERRED
db2 update db cfg for maxdb80 using DBHEAP AUTOMATIC
db2 update db cfg for maxdb80 using LOCKLIST AUTOMATIC DEFERRED
db2 update db cfg for maxdb80 using LOGBUFSZ 1024 DEFERRED
db2 update db cfg for maxdb80 using LOCKTIMEOUT 300 DEFERRED
db2 update db cfg for maxdb80 using LOGPRIMARY 20 DEFERRED
db2 update db cfg for maxdb80 using LOGSECOND 100 DEFERRED
db2 update db cfg for maxdb80 using LOGFILSIZ 8192 DEFERRED
db2 update db cfg for maxdb80 using SOFTMAX 1000 DEFERRED
```

7. Run the following command according to your operating system and bit size:

Operating system	Command
32-bit Microsoft Windows	db2 update db cfg for maxdb80 using MAXFILOP 32768 DEFERRED #32-bit Windows
64-bit Windows	db2 update db cfg for maxdb80 using MAXFILOP 65335 DEFERRED #64-bit Windows
32-bit UNIX	db2 update db cfg for maxdb80 using MAXFILOP 30720 DEFERRED #32-bit UNIX
64-bit UNIX	db2 update db cfg for maxdb80 using MAXFILOP 61440 DEFERRED #64-bit UNIX

8. Run the following commands to continue to configure the database:

```
db2 update db cfg for maxdb80 using PCKCACHESZ AUTOMATIC DEFERRED
db2 update db cfg for maxdb80 using STAT_HEAP_SZ AUTOMATIC DEFERRED
db2 update db cfg for maxdb80 using STMTHEAP AUTOMATIC DEFERRED
db2 update db cfg for maxdb80 using UTIL_HEAP_SZ 10000 DEFERRED
db2 update db cfg for maxdb80 using DATABASE_MEMORY AUTOMATIC DEFERRED
db2 update db cfg for maxdb80 using AUTO_STMT_STATS OFF DEFERRED
db2 update db cfg for maxdb80 using STMT_CONC LITERALS DEFERRED
db2 update alert cfg for database on maxdb80 using db.db_backup_req SET THRESHOLDSCHECKED YES
db2 update alert cfg for database on maxdb80 using db.tb_reorg_req SET THRESHOLDSCHECKED YES
db2 update alert cfg for database on maxdb80 using db.tb_runstats_req SET THRESHOLDSCHECKED YES
db2 update dbm cfg using PRIV_MEM_THRESH 32767 DEFERRED
db2 update dbm cfg using KEEPFCENCED NO DEFERRED
db2 update dbm cfg using NUMDB 2 DEFERRED
db2 update dbm cfg using RQRIOBLK 65535 DEFERRED
db2 update dbm cfg using HEALTH_MON OFF DEFERRED
db2 update dbm cfg using AGENT_STACK_SZ 1000 DEFERRED
db2 update dbm cfg using MON_HEAP_SZ AUTOMATIC DEFERRED
db2set DB2_SKIPINSERTED=ON
db2set DB2_INLIST_TO_NLJN=YES
db2set DB2_MINIMIZE_LISTPREFETCH=Y
db2set DB2_EVALUNCOMMITTED=YES
db2set DB2_FMP_COMM_HEAPSZ=65536
db2set DB2_SKIPDELETED=ON
db2set DB2_USE_ALTERNATE_PAGE_CLEANING=ON
```

9. For Linux or UNIX, log in to the system, for example as the `ctginst1` user, and then restart the Db2 command line environment:

```
su - ctginst1
db2
```

10. Run the following command to stop the database:

```
db2stop force
```

11. Run the following command to start the database:

```
db2start
```

12. Run the following command to reconnect to the database:

```
db2 connect to 'maxdb80'
```

13. Run the following commands to create a buffer pool:

```
db2 CREATE BUFFERPOOL MAXBUFFERPOOL IMMEDIATE SIZE 4096 AUTOMATIC PAGESIZE 32 K
db2 CREATE REGULAR TABLESPACE MAXDATA PAGESIZE 32 K MANAGED BY AUTOMATIC STORAGE INITIALSIZE 5000 M BUFFERPOOL
MAXBUFFERPOOL
db2 CREATE TEMPORARY TABLESPACE MAXTEMP PAGESIZE 32 K MANAGED BY AUTOMATIC STORAGE BUFFERPOOL MAXBUFFERPOOL
db2 CREATE REGULAR TABLESPACE MAXINDEX PAGESIZE 32 K MANAGED BY AUTOMATIC STORAGE INITIALSIZE 5000 M BUFFERPOOL
MAXBUFFERPOOL
db2 GRANT USE OF TABLESPACE MAXDATA TO USER MAXIMO
```

14. Run the following command to create the schema:

```
db2 create schema maximo authorization maximo
```

15. Run the following commands to grant authority to the Maximo user:

```
db2 GRANT
DBADM, CREATETAB, BINDADD, CONNECT, CREATE_NOT_FENCED_ROUTINE, IMPLICIT_SCHEMA, LOAD, CREATE_EXTERNAL_ROUTINE, QUIESCE_CONNE
CT, SECADM ON DATABASE TO USER MAXIMO
db2 GRANT USE OF TABLESPACE MAXDATA TO USER MAXIMO
db2 GRANT CREATEIN, DROPIN, ALTERIN ON SCHEMA MAXIMO TO USER MAXIMO
```

16. Run the following command to break the database connection:

```
db2 connect reset
```

- [Configuring IBM Cloud Pak for Data](#)

Configuring IBM Cloud Pak for Data

About this task

If you select Db2® as your database, you must configure Cloud Pak for Data.

Procedure

1. Open the Red Hat® OpenShift® console to log in to IBM Cloud Pak® for Data.
If you do not have the Cloud Pak for Data `admin` password the first time you log in, you can get it through the Red Hat OpenShift console:
 - a. In the Red Hat OpenShift console, go to Workloads/Secrets.
 - b. Select a Cloud Pak for Data namespace from the Project field.
For Amazon Web Services, the customer-managed, automated deployment, the Cloud Pak for Data namespace is `cpd-services-uniqueid`
 - c. Filter by `admin-user-details`.
 - d. In the Secrets list, click the name of the administrator account.
 - e. Copy the value of the `initial_admin_password` field.
2. In the Red Hat OpenShift console, go to Networking/Routes.
3. Select a Cloud Pak for Data namespace from the Project field.
For Amazon Web Services, the customer-managed, automated deployment, the Cloud Pak for Data namespace is `cpd-services-uniqueid`
4. Click the Location link to open the Cloud Pak for Data login page in a new browser tab.
5. Log in to Cloud Pak for Data as `admin`.
6. Select Databases and then click Create Database.
7. From the Select a database page, click Next.
8. From the Configure page, select Single location for all data, and then click Next.
9. From the Advanced page, click Next.
10. From the Storage page, select the storage class and then Next.
For Amazon Web Services customer-managed Red Hat OpenShift clusters that are provisioned through an automated deployment offering, select `oc-storagecluster-cephs`.
11. From the Finalize page, update the Display name if needed, and then click Create.

Results

After the instance is created, a green icon appears with the display name of the database tile.

Configuring Db2 Warehouse

You must create a new Db2® Warehouse database for exclusive use by Maximo® Manage. You cannot reuse the Db2 Warehouse database on Cloud Pak for Data where you already deployed another application from Maximo Application Suite.

Before you begin

Create a Db2 Warehouse database on IBM Cloud Pak® for Data. For more information, see [Creating Db2 instance by using IBM Cloud Pak for Data console](#).

After Db2 Warehouse databases are provisioned, a parameter is configured to specify user table organization on creation set as a column-organized table. However, to successfully deploy Maximo Manage on Db2 Warehouse, you must change this parameter so that the tables are created as row-organized tables.

Db2 Warehouse can have more than one database instance provisioned. You must ensure that you choose the one that is used by Maximo Manage to set this configuration and the remaining along this document. If your Db2 Warehouse was installed through Cloud Pak for Data, you can follow these steps to find the Db2 administrator pod:

1. Log in to the Cloud Pak for Data interface as an administrator.
2. Select Databases.
3. On the tile of the Db2 Warehouse database instance that you provisioned for Maximo Manage, select Details from the menu.
4. Search for the deployment ID value, for example, `db2wh-1652220906500619`.

5. Copy the suffix of the deployment ID, for example, 1652220906500619.
6. Search for the database name. The name of the database is the value that you use in place of `$DB_NAME` variables in command-line examples.
7. Open the Red Hat® OpenShift® console, and then open Workloads > Pods.
8. From the Project menu, select your Cloud Pak for Data namespace.
For Amazon Web Services, the customer-managed, automated deployment, the Cloud Pak for Data namespace is `cpd-services-uniqueid`.

9. In the Filter field, enter the portion of the deployment ID you that copied and append it to the administrator pod value, for example, 1652220906500619-db2u-0. The pod that is displayed is the db2u administrator pod where you run the `db2inst1` command.

Note: The following commands use the variable `$DB_NAME` to indicate the name of the database that you defined. Before you run the commands, ensure that you replace the `$DB_NAME` with the name of your database at least in the `export` command available in the list of the commands.

```
su - db2inst1
export DB_NAME=$DB_NAME
db2 connect to $DB_NAME
db2 update db cfg for $DB_NAME using dft_table_org row
db2 terminate
db2 deactivate db $DB_NAME
db2stop
db2start
db2 activate db $DB_NAME
db2 connect to $DB_NAME
db2 get db cfg | grep DFT_TABLE_ORG
```

About this task

The following information is an example of the steps that you must complete and applies only to Cloud Pak for Data. If you complete different steps, ensure that a database schema, and table spaces are configured and that the `ddl_constraint_def` parameter is set to `yes`.

The following steps and commands also use the variable `$DB_NAME` to indicate the name of the database that you defined. Before you run the commands, ensure you replace the `$DB_NAME` with the actual name of your database.

Procedure

1. Confirm that the database is created.
 - a. As an administrator, log in to Red Hat OpenShift and from the Red Hat OpenShift cluster, from the navigation menu, click Workloads > Pods .
 - b. Locate and open the `db2wh-string-db2u-0` pod. `string` is a randomly generated set of numbers.
 - c. On the Terminal tab, run the following commands:

```
su - db2inst1
export DB_NAME=$DB_NAME
db2 connect to $DB_NAME
```

If the database is configured, the database connection information is returned. The following text is an example of this information, where `BLUDB` is the name of the database. You need these values later in the configuration.

```
sh-4.2$ su - db2inst1
Last login: Tue May 26 14:29:55 UTC 2020
[db2inst1@db2wh-1589293563350-db2u-0- Db2U db2inst1]$ db2 connect to BLUDB

Database Connection Information

Database server = DB2/LINUX8664 11.5.2.0
SQL authorization ID = DB2INST1
Local database alias = BLUDB
[db2inst1@db2wh-1589293563350-db2u-0 - Db2U db2inst1]$
```

2. Create an administrative Cloud Pak for Data user.
To set Maximo Manage to connect to the database, you can use the `db2inst1` user that comes by default with Db2 Warehouse or you can create a different administrative user.

If you installed Db2 Warehouse without Cloud Pak for Data, you can create a different administrative user. For more information, see [Authentication options for Db2U](#).

If you installed Db2 Warehouse through Cloud Pak for Data, you can create a new administrative user through Cloud Pak for Data.

- a. As an administrator, log in to Cloud Pak for Data and from the navigation menu, click Administration > User management.
- b. Create a user by specifying the following information:
 - Specify a `user` and `username`.
 - Specify an email address and password.
 - Select the Administrator role.
- c. From the navigation menu, click Data > Databases.
- d. Open the three-dot menu for your Maximo Manage database and then click Details.
- e. From the drop-down menu, click Manage access.
- f. In the Maximo user row, click the edit icon.
- g. In the Role field, select Admin and then click Save.

Note: Take note of this `username` because it is used as the value of the `$DB_USERNAME` variable in commands in this procedure.

3. Prepare the database for the `maxinst` program. Run the following commands from a database browser or command-line:
 - a. Run the following command to connect to the database as the `db2inst1` user:

```
su - db2inst1
```

- b. Run the following command to connect to the database:

```
export DB_NAME=$DB_NAME
db2 connect to $DB_NAME
```

- c. Optional: For administrators who connect from outside Red Hat OpenShift, run the following command to connect to the Db2 pod. Replace the variable with the string value for your db2wh-string-db2u-0 pod, which was accessed during step 1.

```
oc rsh -n <db2wh namespace> c-db2wh-*<string>*-db2u-0 /bin/bash
```

Note: The name of the c-db2wh-*<string>*-db2u-0 pod can be different if you installed Db2 Warehouse without Cloud Pak for Data. For example, if you installed the DB2u operator through [Db2](#), the name of the pod is similar to c-\$DB2_INSTANCE_NAME-db2u-0.

4. Run the following commands.

- a. Run the following commands to configure the database:

Note: Choose the APPHEAPSZ db2 value to use in the following commands and replace the value of the \$HEAPVALUE variable by at least 2048 in its specific **export** command line. If you intend to install many Manage extensions at the same time, set the \$HEAPVALUE variable to 16384 to prevent failure of the **maxinst** or **updated** processes.

```
su - db2inst1
export DB_NAME=$DB_NAME
export HEAPVALUE=$HEAPVALUE
db2 connect to $DB_NAME
db2 update db cfg for $DB_NAME using "APPHEAPSZ $HEAPVALUE AUTOMATIC DEFERRED"
db2 update db cfg for $DB_NAME using "AUTO_MAINT ON DEFERRED"
db2 update db cfg for $DB_NAME using "AUTO_TBL_MAINT ON DEFERRED"
db2 update db cfg for $DB_NAME using "AUTO_RUNSTATS ON DEFERRED"
db2 update db cfg for $DB_NAME using "AUTO_REORG ON DEFERRED"
db2 update db cfg for $DB_NAME using "AUTO_DB_BACKUP ON DEFERRED"
db2 update db cfg for $DB_NAME using "CATALOGCACHE_SZ 800 DEFERRED"
db2 update db cfg for $DB_NAME using "CHNGPGS_THRESH 40 DEFERRED"
db2 update db cfg for $DB_NAME using "DBHEAP AUTOMATIC"
db2 update db cfg for $DB_NAME using "LOCKLIST AUTOMATIC DEFERRED"
db2 update db cfg for $DB_NAME using "LOGBUFSZ 1024 DEFERRED"
db2 update db cfg for $DB_NAME using "LOCKTIMEOUT 300 DEFERRED"
db2 update db cfg for $DB_NAME using "LOGPRIMARY 20 DEFERRED"
db2 update db cfg for $DB_NAME using "LOGSECOND 100 DEFERRED"
db2 update db cfg for $DB_NAME using "LOGFILSIZ 8192 DEFERRED"
db2 update db cfg for $DB_NAME using "SOFTMAX 1000 DEFERRED"
db2 update db cfg for $DB_NAME using "MAXFILOP 61440 DEFERRED"
db2 update db cfg for $DB_NAME using "PCKCACHESZ AUTOMATIC DEFERRED"
db2 update db cfg for $DB_NAME using "STAT_HEAP_SZ AUTOMATIC DEFERRED"
db2 update db cfg for $DB_NAME using "STMTHEAP AUTOMATIC DEFERRED"
db2 update db cfg for $DB_NAME using "UTIL_HEAP_SZ 10000 DEFERRED"
db2 update db cfg for $DB_NAME using "DATABASE_MEMORY AUTOMATIC DEFERRED"
db2 update db cfg for $DB_NAME using "AUTO_STMT_STATS OFF DEFERRED"
db2 update db cfg for $DB_NAME using "STMT_CONC_LITERALS DEFERRED"
db2 update alert cfg for database on $DB_NAME using "db.db_backup_req SET THRESHOLDSCHECKED YES"
db2 update alert cfg for database on $DB_NAME using "db.tb_reorg_req SET THRESHOLDSCHECKED YES"
db2 update alert cfg for database on $DB_NAME using "db.tb_runstats_req SET THRESHOLDSCHECKED YES"
db2 update dbm cfg using "PRIV_MEM_THRESH 32767 DEFERRED"
db2 update dbm cfg using "KEEPFENCED NO DEFERRED"
db2 update dbm cfg using "NUMDB 2 DEFERRED"
db2 update dbm cfg using "RQRIOBLK 65535 DEFERRED"
db2 update dbm cfg using "HEALTH_MON OFF DEFERRED"
db2 update dbm cfg using "AGENT_STACK_SZ 1000 DEFERRED"
db2 update dbm cfg using "MON_HEAP_SZ AUTOMATIC DEFERRED"
db2 update db cfg using "DDL_CONSTRAINT_DEF YES"
db2set DB2_SKIPINSERTED=ON
db2set DB2_INLIST_TO_NLJN=YES
db2set DB2_MINIMIZE_LISTPREFETCH=Y
db2set DB2_EVALUNCOMMITTED=YES
db2set DB2_FMP_COMM_HEAPSZ=65536
db2set DB2_SKIPDELETED=ON
db2set DB2_USE_ALTERNATE_PAGE_CLEANING=ON
```

- b. Run the following command to create the buffer pool:

```
db2 CREATE BUFFERPOOL MAXBUFPOOL IMMEDIATE SIZE 4096 AUTOMATIC PAGESIZE 32 K
```

- c. Run the following commands to create the table spaces:

```
db2 CREATE REGULAR TABLESPACE MAXDATA PAGESIZE 32 K MANAGED BY AUTOMATIC STORAGE INITIALSIZE 5000 M BUFFERPOOL
MAXBUFPOOL
db2 CREATE TEMPORARY TABLESPACE MAXTEMP PAGESIZE 32 K MANAGED BY AUTOMATIC STORAGE BUFFERPOOL MAXBUFPOOL
db2 CREATE REGULAR TABLESPACE MAXINDEX PAGESIZE 32 K MANAGED BY AUTOMATIC STORAGE INITIALSIZE 5000 M BUFFERPOOL
MAXBUFPOOL
```

- d. Run the following command to create the schema:

Note:

- The **DB_SCHEMA** variable is defined by user.
- The **DB_USERNAME** variable is the user with administrative rights that was created in step 2.

```
export DB_SCHEMA=$DB_SCHEMA
export DB_NAME=$DB_NAME
export DB_USERNAME=$DB_USERNAME
db2 CREATE SCHEMA $DB_SCHEMA AUTHORIZATION $DB_USERNAME
```

- e. Run the following commands to grant authority to the database user:

```
db2 GRANT
DBADM,CREATETAB,BINDADD,CONNECT,CREATE_NOT_FENCED_ROUTINE,IMPLICIT_SCHEMA,LOAD,CREATE_EXTERNAL_ROUTINE,QUIESCE
```

```
CONNECT,SECADM ON DATABASE TO USER $DB_USERNAME
db2 GRANT USE OF TABLESPACE MAXDATA TO USER $DB_USERNAME
db2 GRANT CREATEIN,DROPIN,ALTERIN ON SCHEMA $DB_SCHEMA TO USER $DB_USERNAME
```

f. Run the following command to break the database connection:

```
db2 connect reset
```

5. Verify that the configuration is successful.

- Go to Red Hat OpenShift console, > Workload, > Pods.
- In your Db2 Warehouse database instance, click the Db2u pod.
- Select the Terminal tab and run the following commands:

```
su - db2inst1
Export DB_NAME=<yourdbname>
Export DB_USERNAME=<yourdbusername> db2 connect to $DB_NAME user $DB_USERNAME using <password>
```

Tip:

- Replace <yourdbname> by the database name that you obtained in a previous step.
- Replace <yourdbusername> by the username that you obtained in a previous step.
- Replace <password> by the username password that you set when you created and configured the user in a previous step.

The database connection information details are displayed after the database is connected. The following text is an example of this information, where BLUDB is the database name and MAXIMO is the username.

```
sh-4.2$ su - db2inst1
Last login: Tue May 26 14:29:55 UTC 2020
[db2inst1@db2wh-1589293563350-db2u-0- Db2U db2inst1]$ export DB_NAME=BLUDB
[db2inst1@db2wh-1589293563350-db2u-0- Db2U db2inst1]$ echo $DB_NAME BLUDB
[db2inst1@db2wh-1589293563350-db2u-0- Db2U db2inst1]$ export DB_USERNAME=MAXIMO
[db2inst1@db2wh-1589293563350-db2u-0- Db2U db2inst1]$ db2 connect to $DB_NAME user $DB_USERNAME using MAXIMO
```

Database Connection Information

```
Database server      = DB2/LINUX8664 11.5.2.0
SQL authorization ID = MAXIMO
Local database alias = BLUDB
```

```
[db2inst1@db2wh-1589293563350-db2u-0 - Db2U db2inst1]$
```

d. Run the following command to list the table spaces:

```
db2 list tablespaces
```

Confirm the Db2 MAXINDEX, MAXTEMP, and MAXDATA table spaces are listed. The following text is an example of the table spaces details:

```
NAME = MAXDATA
TYPE = Database Managed Space
CONTENTS = All permanent data. Regular table space.
STATE = 0x0000
Detailed explanation = Normal
```

```
TABLESPACE ID = 5
NAME = MAXTEMP
TYPE = System Managed Space
CONTENTS = System Temporary data
STATE = 0x0000
Detailed explanation = Normal
```

```
TABLESPACE ID = 6
NAME = MAXINDEX
TYPE = Database Managed Space
CONTENTS = All permanent data. Regular table space.
STATE = 0x0000
Detailed explanation = Normal
```

```
[db2inst1@db2wh-1589293563350-db2u-0 - Db2U db2inst1]$
```

e. Run the following command to view the default table organization:

```
db2 get db cfg | grep DFT_TABLE_ORG
```

Confirm that the configuration db2 get db cfg | grep

DFT_TABLE_ORG is set to ROW. The following text is an example of the configuration:

```
[db2inst1@db2wh-1589293563350-db2u-0 - Db2U db2inst1]$ db2 get db cfg | grep DFT_TABLE_ORG
Default table organization (DFT_TABLE_ORG) = ROW
[db2inst1@db2wh-1589293563350-db2u-0 - Db2U db2inst1]$
```

f. Run the following command to view the default application heap:

```
db2 get db cfg | grep APPLHEAPSZ
```

Confirm that the value for APPLHEAPSZ in db2 get db cfg | grep APPLHEAPSZ is the same that you set. The following text is an example of the configuration:

```
[db2inst1@db2wh-1589293563350-db2u-0 - Db2U db2inst1]$ db2 get db cfg | grep APPLHEAPSZ
Default application heap (4KB) (APPLHEAPSZ) = AUTOMATIC(16384)
[db2inst1@db2wh-1589293563350-db2u-0 - Db2U db2inst1]$
```

6. Disable the non-SSL Db2 database instance port for security.

- Run the following command to edit the Db2 service configuration:

```
oc edit svc -n project c-service_name-db2u-engn-svc
```

Where,

- Project is the name of the Red Hat OpenShift project where Db2 is deployed.
- **Service_name** is the identifier for the Db2 service instance.
For example, `c-db2o1tp-1605022957148004-db2u-engn-svc`.

b. Remove the following code block from the `spec.ports` section:

```
- name: legacy-server
  nodePort: 30279
  port: 50000
  protocol: TCP
  targetPort: 50000
```

c. Save the service.

Configuring Oracle Database

To configure Oracle Database for use with Maximo® Manage, you create table spaces, create a database user, and configure database settings.

Before you begin

For information about installing and deploying Oracle Database, review the Oracle Database product documentation.

For information about supported database versions, generate a [Software Product Compatibility Report](#). Search for IBM® Maximo Application Suite and select the suite version to generate the report. Check for the supported database versions in the Supported Software tab of the report.

Configure your database with the following Operating System (OS):

- Linux® or UNIX
- Microsoft Windows

Procedure

1. Log in as the Oracle software user. Typically, this user is named `oracle`.
2. To manage requests to connect to the database, create the database listener.
3. Create a database for use by Maximo Manage.
For the database initialization parameters, change the values of the following parameters:

```
nls_length_semantics
  Change this value to CHAR.
open_cursors
  Change this value to 1000.
cursor_sharing
  Set this value to FORCE.
```

Note: Ensure that the database character setting is set to `AL32UTF8` character set, which is required for Oracle Database.

4. In SQL*Plus, create a table space by running the following command. Replace the directory with the path to the database location.

```
Create tablespace maxdata datafile
'C:\oracle\product\12.1.0.1\db_1\dfs\maxdata.dbf'
size 1000M autoextend on;
```

To create table spaces for indexes, repeat the command and use a similar syntax.

5. Create a temporary table space by running the following command. Replace the directory with the path to the database location.

```
create temporary tablespace maxtemp tempfile
'C:\oracle\product\12.1.0.1\db_1\dfs\maxtemp.dbf'
size 1000M autoextend on maxsize unlimited;
```

6. To create the Maximo user and grant permissions, run the following command:

```
create user maximo identified by maximo default tablespace maxdata temporary
tablespace maxtemp;
grant connect to maximo;
grant create job to maximo;
grant create trigger to maximo;
grant create session to maximo;
grant create sequence to maximo;
grant create synonym to maximo;
grant create table to maximo;
grant create view to maximo;
grant create procedure to maximo;
grant alter session to maximo;
grant execute on ctxsys.ctx_ddl to maximo;
alter user maximo quota unlimited on maxdata;
```

If you created a separate table space for indexing, you must also grant access to that index table space to the Maximo user.

For example, if you created a separate table space for indexing that is called `TSI_MAM_OWN`, then run the following command:

```
alter user maximo quota unlimited on TSI_MAM_OWN
```

7. Create an Oracle preference arbitrary that is called MAXIMO_STORAGE and store the Oracle text indexes in dedicated table spaces.

- Store implicit indexes in MAXINDX table space.
- Store implicit tables in MAXDATA table space.
- Store implicit LOB tables in LOB table space.

For example, run the following preference definition to split the implicit objects in a text index across three table spaces; MAXDATA, MAXINDX, and MAXLOBS.

```
begin
ctx_ddl.create_preference('MAXIMO_STORAGE', 'BASIC_STORAGE');
ctx_ddl.set_attribute('MAXIMO_STORAGE', 'I_TABLE_CLAUSE',
'tablespace MAXDATA LOB(token_info) store as (tablespace MAXLOBS
enable storage in row)');
ctx_ddl.set_attribute('MAXIMO_STORAGE', 'I_INDEX_CLAUSE',
'tablespace MAXINDX compress 2');
ctx_ddl.set_attribute('MAXIMO_STORAGE', 'K_TABLE_CLAUSE',
'tablespace MAXINDX');
ctx_ddl.set_attribute('MAXIMO_STORAGE', 'R_TABLE_CLAUSE',
'tablespace MAXDATA LOB(data) store as (tablespace MAXLOBS
cache)');
ctx_ddl.set_attribute('MAXIMO_STORAGE', 'N_TABLE_CLAUSE',
'tablespace MAXINDX');
end;
```

To create an Oracle text index, the preference definition must be specified in the CREATE INDEX clause as shown here.

```
create index pm_ndx6 on pm (description) indextype is
ctxsys.context parameters ('lexer global_lexer language column
LANGCODE storage MAXIMO_STORAGE');
```

8. Set up Oracle text preferences and sub-lexer definitions.

- a. Use a SQL query tool to log on to the database, as maximo, which is the schema owner and execute the following set of calls.

```
call ctx_ddl.drop_preference('global_lexer');
call ctx_ddl.drop_preference('default_lexer');
call ctx_ddl.drop_preference('english_lexer');
call ctx_ddl.drop_preference('chinese_lexer');
call ctx_ddl.drop_preference('japanese_lexer');
call ctx_ddl.drop_preference('korean_lexer');
call ctx_ddl.drop_preference('german_lexer');
call ctx_ddl.drop_preference('dutch_lexer');
call ctx_ddl.drop_preference('swedish_lexer');
call ctx_ddl.drop_preference('french_lexer');
call ctx_ddl.drop_preference('italian_lexer');
call ctx_ddl.drop_preference('spanish_lexer');
call ctx_ddl.drop_preference('portu_lexer');
call ctx_ddl.create_preference('default_lexer', 'basic_lexer');
call ctx_ddl.create_preference('english_lexer', 'basic_lexer');
call ctx_ddl.create_preference('chinese_lexer', 'chinese_lexer');
call ctx_ddl.create_preference('japanese_lexer', 'japanese_lexer');
call ctx_ddl.create_preference('korean_lexer', 'korean_morph_lexer');
call ctx_ddl.create_preference('german_lexer', 'basic_lexer');
call ctx_ddl.create_preference('dutch_lexer', 'basic_lexer');
call ctx_ddl.create_preference('swedish_lexer', 'basic_lexer');
call ctx_ddl.create_preference('french_lexer', 'basic_lexer');
call ctx_ddl.create_preference('italian_lexer', 'basic_lexer');
call ctx_ddl.create_preference('spanish_lexer', 'basic_lexer');
call ctx_ddl.create_preference('portu_lexer', 'basic_lexer');
call ctx_ddl.create_preference('global_lexer', 'multi_lexer');
call ctx_ddl.add_sub_lexer('global_lexer', 'default', 'default_lexer');
call ctx_ddl.add_sub_lexer('global_lexer', 'english', 'english_lexer', 'en');
call ctx_ddl.add_sub_lexer('global_lexer', 'simplified chinese', 'chinese_lexer', 'zh');
call ctx_ddl.add_sub_lexer('global_lexer', 'japanese', 'japanese_lexer', null);
call ctx_ddl.add_sub_lexer('global_lexer', 'korean', 'korean_lexer', null);
call ctx_ddl.add_sub_lexer('global_lexer', 'german', 'german_lexer', 'de');
call ctx_ddl.add_sub_lexer('global_lexer', 'dutch', 'dutch_lexer', null);
call ctx_ddl.add_sub_lexer('global_lexer', 'swedish', 'swedish_lexer', 'sv');
call ctx_ddl.add_sub_lexer('global_lexer', 'french', 'french_lexer', 'fr');
call ctx_ddl.add_sub_lexer('global_lexer', 'italian', 'italian_lexer', 'it');
call ctx_ddl.add_sub_lexer('global_lexer', 'spanish', 'spanish_lexer', 'es');
call ctx_ddl.add_sub_lexer('global_lexer', 'portuguese', 'portu_lexer', null);

commit;
```

What to do next

If you modified default role sets assigned to the user ID used to connect to the database, or restricted the default privileges that are granted to user IDs, then you must explicitly grant the role sets to the Maximo user. For example, if you do not grant a role such as the select_catalog_role role, you must explicitly grant that role to the Maximo user. Make the assignment by running the following SQL*Plus command:

```
grant select_catalog_role to maximo
```

Configuring Microsoft SQL Server

To configure Microsoft SQL Server for Maximo® Manage, you create table spaces, create a database user, and configure database settings.

Before you begin

For information about configuring Microsoft SQL Server, review the Microsoft SQL Server product documentation.

For information about supported database versions, you can generate a [Software Product Compatibility Report](#). Search for IBM® Maximo Application Suite and select the suite version to generate the report. Check for the supported database versions in the Supported Software tab of the report.

Procedure

1. Configure the listener port.
The default instance of the Microsoft SQL Server Database Engine listens on TCP port 1433. Named instances of the Microsoft SQL Server Database Engine and Microsoft SQL Server Compact Edition are configured for dynamic ports, which means they select any available port when the service starts. When you connect to a named instance across a firewall, configure the Database Engine to listen on a specific port to open this port in the firewall.
2. Verify that you enabled the Full-text Search setting during the installation of Microsoft SQL Server.
3. Create a Microsoft SQL Server database.
 - a. From Microsoft SQL Server Management Studio, select New Database from the databases folder.
 - b. Specify a unique database name.
For example, enter `maxdb80`.
 - c. For the `maxdb80` Logical Name, change the Initial Size (MB) attribute to 500 (MB), and also set the value of the Autogrowth / Maxsize field to By 1 MB, Unlimited.
 - d. Optional: Modify the log settings to accommodate your production environment.
 - e. To deploy Maximo Manage in a specific language, choose the default collation for the database.
For example, to deploy the application in English, select `Latin1_General_CI_AI`.
Although Maximo Manage does not support a Microsoft SQL Server database using Unicode, it is possible to deploy Maximo Manage in multiple languages if the chosen languages support the same Microsoft SQL Server collation. For example, English and French can be installed because both support the same Microsoft SQL Server collation. However, English and Japanese cannot be installed together because they have different Microsoft SQL Server collations.
For more information, review the Microsoft SQL Server Collation and Unicode support documentation.
4. Create the Maximo user for Microsoft SQL Server.
 - a. Open Microsoft SQL Server Management Studio.
 - b. From the SQL Server Configuration Manager navigation, click Databases.
 - c. Right-click the `maxdb80` database and select New Query.
 - d. Enter the following command to create the Maximo database user `MAXIMO` with a password that adheres to the password policy of the system.

```
sp_addlogin MAXIMO,password  
go
```

This value is case-sensitive.

- e. Enter the following command to change the database owner to `MAXIMO`.

```
sp_changedbowner MAXIMO  
go
```

Database encryption

When you deploy Maximo® Manage, the fields that require security, such as passwords and API keys, are encrypted or re-encrypted to provide security.

- [Database encryption overview](#)
When you configure Maximo Manage, specify encryption keys and encryption algorithms to determine how the fields that require security are encrypted.
- [Database encryption scenarios](#)
Your encryption and reencryption options are determined by your deployment scenario. Scenarios include deploying a new database, deploying a previously encrypted database, or changing the encryption keys for deployment.
- [Viewing database encryption history](#)
You can view the history for database encryption. Whenever you encrypt or reencrypt the database, a new entry is logged in the `syschangenracker` table in the Maximo database.
- [Disabling automatic generation of encryption keys](#)
By default, if encryption keys are not specified when you activate Maximo Manage with a fresh database, new encryption keys are automatically generated. If you do not want to automatically generate encryption keys, you can set the `autoGenerateEncryptionKeys` property to `false`.
- [Resetting the crypto and cryptox fields in the database](#)
If you inadvertently lose your crypto and cryptox encryption keys, you can run a reset script that clears the crypto and cryptox fields in the Maximo Manage database. Then, you can then restart the server and reset your data.

Database encryption overview

When you configure Maximo® Manage, specify encryption keys and encryption algorithms to determine how the fields that require security are encrypted.

Important: You must save the encryption secret, which contains the encryption keys after Maximo Manage deployment is completed. The same keys are used for configuration when you reinstall Maximo Manage with the same database.

The following table describes the Crypto and CryptoX encryption keys for Maximo Manage:

Table 1. Encryption keys

Key	Description
MXE_SECURITY_CRYPTO_KEY	Used to encrypt Crypto fields, such as passwords. For Crypto encryption, if you specify a MXE_SECURITY_CRYPTO_KEY value that matches the MXE_SECURITY_OLD_CRYPTO_KEY value that was used in the previous deployment, no reencryption occurs. If you specify a key value during deployment that does not match the MXE_SECURITY_OLD_CRYPTO_KEY value, the database is reencrypted.
MXE_SECURITY_OLD_CRYPTO_KEY	Specifies the value for the previous Crypto encryption key that was used for the database.
MXE_SECURITY_CRYPTOX_KEY	Used to encrypt CryptoX fields, including API keys, such as the electronic signature key. For CryptoX encryption, if you specify a MXE_SECURITY_CRYPTOX_KEY value that matches the MXE_SECURITY_OLD_CRYPTOX_KEY value that was used in the previous deployment, no encryption changes occur. Because CryptoX values cannot be decrypted and the original value cannot be determined, if you specify a key value in a deployment that does not match the MXE_SECURITY_OLD_CRYPTOX_KEY value, CryptoX values are set to null when encryption is run.
MXE_SECURITY_OLD_CRYPTOX_KEY	Specifies the value for the previous CryptoX encryption key that was used for the database.

The following encryption properties are also supported:

- MXE_SECURITY_CRYPTO_ALGORITHM
- MXE_SECURITY_CRYPTO_MODE
- MXE_SECURITY_CRYPTO_MODULUS
- MXE_SECURITY_CRYPTO_PADDING
- MXE_SECURITY_CRYPTO_SPEC
- MXE_SECURITY_CRYPTOX_ALGORITHM
- MXE_SECURITY_CRYPTOX_MODE
- MXE_SECURITY_CRYPTOX_MODULUS
- MXE_SECURITY_CRYPTOX_PADDING
- MXE_SECURITY_CRYPTOX_SPEC

Note: After the database is installed, only the Crypto and CryptoX encryption keys can be changed.

You can add a value for the MXE_SECURITY_CRYPTO_KEY or MXE_SECURITY_CRYPTOX_KEY encryption keys when you configure the database settings for deployment before you activate the application. If you do not specify a value, a value is generated, and the database is encrypted. To learn how to specify the keys in the Maximo Manage configuration, see [Deploying in Maximo Application Suite](#).

If you do not specify an encryption key secret in the Maximo Manage configuration when you activate, the system automatically generates keys and names the secret in the keys by using the following naming convention:

`<workspaceId>-<appId>-encryptionsecret`

Because your database does not function without valid encryption keys, consider implementing the following best practices:

- Maintain your encryption keys in a vault or other secure management system for secrets.
- Specify your own values for encryption keys instead of using system-generated values. If you use system-generated values and do not create a backup, you cannot retrieve the keys. Without the keys, you cannot use your database.

Database encryption scenarios

Your encryption and reencryption options are determined by your deployment scenario. Scenarios include deploying a new database, deploying a previously encrypted database, or changing the encryption keys for deployment.

Deploying a new database

If you deploy a new database, you have two options for database encryption:

Table 1. Encryption for deploying a new database

Option	Action	Result
Provide your own values for the encryption keys.	Specify the values that you want for the Crypto and CryptoX encryption keys when you configure your database during deployment.	The database is then encrypted by using the key values that you provide.
Use system-generated keys.	Do not specify key values when you configure your database.	If you do not specify keys, a secret is automatically generated that contains the new MXE_SECURITY_CRYPTO_KEY and MXE_SECURITY_CRYPTOX_KEY encryption keys. Later, if you need the keys, you can view the keys in the secret.

Deploying a previously encrypted database

The following scenarios can occur if your deployment includes a database that was previously encrypted. For example, you might be upgrading from IBM® Maximo® Asset Management 7.6.0.10 or 7.6.1.2, which are not installed on Red Hat® OpenShift® but can be upgraded to Maximo Manage. You might also be upgrading from a previous Maximo Manage version. Therefore, the scenarios apply both to a database that previously implemented the default encryption for Maximo Manage or a database that was encrypted by using a different algorithm or keys.

An existing database that used the default encryption for Maximo Manage and no values were provided for the Crypto or CryptoX key

The database for Maximo Manage no longer uses a default set of keys for encryption. If you have an existing database that used the default encryption, you need to provide the MXE_SECURITY_CRYPTO_KEY and MXE_SECURITY_CRYPTOX_KEY values so that the database can be reencrypted. If your database

was previously encrypted by using keys other than the default encryption for Maximo Manage, you must provide the old MXE_SECURITY_OLD_CRYPTOX_KEY and MXE_SECURITY_OLD_CRYPTOX_KEY encryption keys so that the database can be decrypted and then reencrypted. When you configure the database, select one of the following options for reencryption:

Table 2. Encryption for existing databases where no values were provided for the encryption keys.

Option	Action	Result
Provide your own values for the encryption keys.	<ol style="list-style-type: none"> 1. Enter the MXE_SECURITY_CRYPTOX_KEY and MXE_SECURITY_CRYPTOX_KEY values. 2. Do not specify values for the MXE_SECURITY_OLD_CRYPTOX_KEY and MXE_SECURITY_OLD_CRYPTOX_KEY encryption keys. 	The database is reencrypted by using the values that you specified.
Use system-generated keys.	<ol style="list-style-type: none"> 1. Do not specify MXE_SECURITY_CRYPTOX_KEY or MXE_SECURITY_CRYPTOX_KEY values. 2. Do not specify values for the MXE_SECURITY_OLD_CRYPTOX_KEY and MXE_SECURITY_OLD_CRYPTOX_KEY encryption keys. 	The system generates new keys, and the database is reencrypted with the system-generated keys.

Note: Reencryption always occurs in this scenario.

An existing database that used values from your own Crypto or CryptoX keys

When you configure the database, select one of the following options for encryption:

Table 3. Encryption for existing databases where you provided your own values for the encryption keys.

Option	Action	Result
Do not reencrypt the database.	<ol style="list-style-type: none"> 1. Specify the Maximo Manage security properties, including the MXE_SECURITY_OLD_CRYPTOX_KEY and MXE_SECURITY_OLD_CRYPTOX_KEY encryption keys. 2. Specify the same values for the MXE_SECURITY_CRYPTOX_KEY and MXE_SECURITY_CRYPTOX_KEY encryption keys. 	Because you specified the same values for the old and new keys, the database is not reencrypted.
Reencrypt the database.	<ol style="list-style-type: none"> 1. Specify the Maximo Manage security properties, including the MXE_SECURITY_OLD_CRYPTOX_KEY and MXE_SECURITY_OLD_CRYPTOX_KEY encryption keys. 2. Select one of the following options: <ul style="list-style-type: none"> • Specify values for the new MXE_SECURITY_CRYPTOX_KEY and MXE_SECURITY_CRYPTOX_KEY encryption keys. • To use system-generated keys, do not specify encryption key values. 	The database is reencrypted.

Note: The first option is less likely to result in errors. You can change the keys later.

Changing the encryption keys for deployment

The following table describes the tasks to complete to reencrypt the database when you want to change the MXE_SECURITY_CRYPTOX_KEY and MXE_SECURITY_CRYPTOX_KEY encryption keys.

Table 4. Encryption by using new encryption keys

Option	Action	Result
Reencrypt the database by using new encryption keys.	<ol style="list-style-type: none"> 1. Set the MXE_SECURITY_OLD_CRYPTOX_KEY and MXE_SECURITY_OLD_CRYPTOX_KEY encryption keys to the values that the database currently uses for the MXE_SECURITY_CRYPTOX_KEY and MXE_SECURITY_CRYPTOX_KEY encryption keys. 2. Select one of the following options: <ul style="list-style-type: none"> • Specify values for the new MXE_SECURITY_CRYPTOX_KEY and MXE_SECURITY_CRYPTOX_KEY encryption keys. • To use system-generated keys, do not specify values for the MXE_SECURITY_CRYPTOX_KEY and MXE_SECURITY_CRYPTOX_KEY encryption keys. 	The database is reencrypted by using new encryption keys.

Viewing database encryption history

You can view the history for database encryption. Whenever you encrypt or reencrypt the database, a new entry is logged in the syschangetracker table in the Maximo® database.

The syschangetracker table contains the following columns:

- PROCESSNAME
- MESSAGE
- CHANGEBY
- CHANGEDATE
- WORKSPACEID
- APPID
- INSTANCENAME
- SYSCHANGETRACKERID
- ROWSTAMP

If you have issues with encryption keys, the record in the straightjacket table helps to identify whether reencryption occurred and when it occurred. The MESSAGE column provides the first 2 bytes and last 2 bytes of the encryption key, which can help you identify the encryption keys that are currently being used. The following

image shows an example of the syschangetracker table:

Figure 1. The syschangetracker table

PROCESSNAME	MESSAGE	CHANGEBY	CHANGEDATE	WORKSPACEID	APPID	INSTANCENAME
ReEncryptFromS...	..... Start to re-encrypt CRYPTO..... with key fe*****qO	maximo	2022-03-25 1...	masdev	manage	vitizumiaut1
ReEncryptFromS...	..... Complete re-encrypt CRYPTO.....	maximo	2022-03-25 1...	masdev	manage	vitizumiaut1
ReEncryptFromS...	..... Start to re-encrypt CRYPTO..... with key Aw****Dd	maximo	2022-03-25 1...	masdev	manage	vitizumiaut1
ReEncryptFromS...	..... Complete re-encrypt CRYPTO.....	maximo	2022-03-25 1...	masdev	manage	vitizumiaut1
ReEncryptFromS...	..... Start to re-encrypt CRYPTO..... with key cn*****in	maximo	2022-03-25 1...	masdev	manage	vri123
ReEncryptFromS...	..... Complete re-encrypt CRYPTO.....	maximo	2022-03-25 1...	masdev	manage	vri123
ReEncryptFromS...	..... Start to re-encrypt CRYPTO..... with key pb****Al	maximo	2022-03-25 1...	masdev	manage	vri123
ReEncryptFromS...	..... Complete re-encrypt CRYPTO.....	maximo	2022-03-25 1...	masdev	manage	vri123

Disabling automatic generation of encryption keys

By default, if encryption keys are not specified when you activate Maximo® Manage with a fresh database, new encryption keys are automatically generated. If you do not want to automatically generate encryption keys, you can set the `autoGenerateEncryptionKeys` property to `false`.

About this task

The `autoGenerateEncryptionKeys` property controls whether encryption keys are automatically generated when you activate Maximo Manage with a fresh database. By default, this property is set to `true`, and encryption keys are automatically generated if no value is specified for them. You can set the property to `false` if you do not want to generate keys automatically. If you set the `autoGenerateEncryptionKeys` property to `false` and you do not provide encryption keys, deployment fails, and you receive an error message that the property is set to `false` and encryption keys are missing.

If encryption keys are automatically generated, you can easily lose track of them, especially in development and test environments where databases are reused. If you set the `autoGenerateEncryptionKeys` property to `false`, users are forced to enter the key. Users are more likely to keep track of the keys and less likely to lose them.

Note that this property takes effect when you activate the application by using an API call. If you update the property for an instance that is already activated, the property does not take effect until you make a change that is related to the encryption keys, for example, when you delete keys to trigger reencryption.

Procedure

1. In the Red Hat® OpenShift® console, in the Administration section, select Custom Resource Definitions.
2. In the CustomResourcesDefinitions window, select the ManageWorkspace custom resource definition record.
3. In the CustomResourceDefinition details window, on the Instances tab, select the instance for which you want to disable automatic generation of encryption keys.
4. On the YAML tab for the instance, in the `spec.settings.deployment.autoGenerateEncryptionKeys` section, specify `false`.
5. Save the custom resource.

Resetting the crypto and cryptox fields in the database

If you inadvertently lose your `crypto` and `cryptox` encryption keys, you can run a reset script that clears the `crypto` and `cryptox` fields in the Maximo® Manage database. Then, you can then restart the server and reset your data.

About this task

When you run the `resetcryptocryptox.sh` script, the `crypto` and `cryptox` fields are cleared. After you restart the server, you can review the data that was cleared and reset the values that were cleared, such as properties or API keys.

Procedure

1. In the Red Hat® OpenShift® Container Platform, in the Workloads section, select Pods.
2. From the Pods panel, open the `maxinst` pod.
3. On the Terminal tab, enter `resetcryptocryptox.sh`.
4. Restart the Maximo Manage server.
5. Add any variables, such as API keys or properties, that were cleared by the `resetcryptocryptox.sh` script.
6. After you reset your data, redeploy or reactivate the application.

Troubleshooting database deployment

When you deploy the Maximo® Manage application, issues that are related to database deployment might cause the deployment process to fail.

Both to prevent or solve some database configuration issues that might result in stuck or failed Maximo Manage deployment, you can follow these best practices:

- Review the database settings that you used to configure Maximo Manage. If something is wrong with the values, edit your database configuration on the Manage StatusHealth Status page and activate again.
- Ensure that the JDBC URL format and details are correct and are using the correct JDBC protocol, database URL, name, and port. Test your connection to the database by using a database tool.
- If you are using the SSL-enabled database and port, verify whether you selected the SSL option.
- To ensure that your database is ready, verify that you are using the correct username, password, schema name, tablespace name, and index tablespace name.
- Do not skip preparations steps. For example, the deployment process on Maximo Manage databases will not work if you skip the step to set its table organization to be row-based instead of column-based.
- Make sure you configured your database properly if you plan to deploy languages. Set the configuration to support Maximo Manage, SQL, or Maximo Manage for the language that is used for the databases.
- Confirm that you put the correct database certificate for the database in the Maximo Manage configuration and that is not expired.
- If you are running a Maximo Manage Maximo Manage deployment and reusing a database that had Maximo Manage previously, make sure you passed the encryption keys that are saved from the previous deployment. Otherwise, the process generates new keys, which will not match the ones that are used to encrypt the database, and the deployment process will not proceed.
 - For example, you deactivated Maximo Manage and deleted its application. Now you are redeploying the Maximo Manage application and activating it again, but you are still using the previously deployed Maximo Manage database.
- To deploy multiple Maximo Manage components at the same time, if you are using IBM® Db2® Warehouse databases or other Db2 versions, increase the *APPHEAPSZ* value to at least 16384 to avoid failures during the database deployment. Alternatively, you can deploy fewer components simultaneously, by trying to deploy first one and then another Maximo Manage component.
- For the best Maximo Manage deployment performance, the ideal location for your database is the same as the one for your Maximo Manage. If the location site of your database is different, the chances of database failures during the Maximo Manage deployment due to connection issues and latency are higher.

If the update of your database during the Maximo Manage deployment is interrupted by a situation, such as lost connection, the problem is usually automatically resolved by the Maximo Manage operator reconciliation process.

If the failure persists, make sure that your database connection is working correctly. Before you remove, re-create the database, and retry the Maximo Manage deployment, you can try the following procedures:

1. Select the Bypass upgrade version checkbox and then reactivate the Maximo Manage application. If you select this option, the deployment can run, regardless of the current version of the installed database. It skips version validations that might be preventing deployment to progress.
2. If the failure still persists, review the log files to assess the situation and note the script number for the failed deployment. To review the log files, complete the following steps:
 - a. In the Red Hat® OpenShift® console, expand Workloads and select Pods.
 - b. In the Project field, select the Manage project.
 - c. In the Pods window, select the administrative pod. The administrative pod includes `manage-maxinst` in the pod name, as shown in the following example:


```
env-managedev-manage-maxinst-7fd3c77492-kmj6z
```
 - d. To review the logs, in the Pod Details window, first select the Logs tab for the `manage-maxinst` pod to look at the messages. If you want to look at all the logs, select the Terminal tab for the `manage-maxinst` pod and look at the logs in the `/opt/IBM/SMP/maximo/tools/maximo/log` directory.
 - e. After you review the log files, manually correct the problem or problems and run the database installation again.

Demo data

When you deploy Maximo® Manage, you can add sample data to a demo database.

The sample data in the demo database is useful for development or test environments.

To set up a test or development environment with demo data, install an instance of Maximo Application Suite specifically for testing or development. Then, when you configure the database settings for your Maximo Manage deployment, select the option to install demo data.

Note: You cannot add this sample data after Maximo Manage is deployed as the database is updated without the sample data. To add the sample data after deploying Maximo Manage, recreate or clean your database, and reconfigure Maximo Manage to deploy with the sample data.

Deployment of industry solutions and add-ons

When you deploy Maximo® Manage, you can also include industry solutions and add-ons for deployment.

Before you select any Maximo Manage industry solutions or add-ons for deployment, it is important that you check the [system requirements](#). Choose the IBM® Maximo Application Suite version from the list and see the IBM Maximo Application Suite - Manage Application Compatibility Report to validate that the selected components can be deployed together.

You can deploy the following industry solutions and add-ons with Maximo Manage:

Industry solutions

- Maximo Aviation
- Maximo Civil Infrastructure
- Maximo Nuclear
- Maximo Oil & Gas
- Maximo Transportation
- Maximo Utilities

Add-ons

- Maximo Asset Configuration Manager
- Maximo Connector for Oracle Applications
- Maximo Connector for SAP Applications
- Maximo Health, Safety and Environment
- Maximo Service Provider
- Maximo Spatial
- Maximo Connector for Workday Applications
- Maximo Anywhere

Maximo Health

You can deploy Maximo Health as part of Maximo Manage to automatically connect and share data between both applications. When deployed as part of Maximo Manage, all deployment settings are shared with Maximo Health.

Note: If you deploy Maximo Health component as part of Maximo Manage, you cannot deploy the Maximo Health stand-alone application on the same Maximo Application Suite instance and vice versa.

Language support

Maximo® Manage is available in a number of languages. You can specify languages when you activate the application.

Languages that are displayed in the user interface are controlled by the following settings:

Browser language setting

If content is available for the language that users select for their browser, the application displays that language. If the language that is selected in the browser is not available, the application displays the base language.

Preferred language setting

In the IBM® Maximo Application Suite, users can select a preferred locale, language, and time zone when they set up their profile. If you change the user's preferred language setting in Maximo Manage, it is not overwritten by a future synchronization from Maximo Application Suite.

Application language settings

When Maximo Manage is deployed, you can select a base language, which is the default language for the application. By default, the base language is English. If you select a different language, the language is permanently set as the base language, and you cannot change it in subsequent deployments. However, if you do not specify a base language when you first deploy the application and use the default value instead, you can change the base language when you redeploy.

The base language can be changed only once. After it is changed, it cannot be changed back to English or any other language.

You can select other languages when you activate the application. You cannot remove languages after the application is activated.

If you use IBM Db2® and plan to install a language other than English, ensure that you select the checkbox for the Db2 Vargraphic field when you configure your database.

Although Maximo Application Suite does not support bidirectional languages, Maximo Manage provides language support for bidirectional languages. To add a language, on the Activation page, in the Base field and the Additional field, select the language code.

The following languages are supported:

Note: If you want to use the database to deploy Maximo Manage in English only, you can choose Latin1_General_CI_AI collate for SQL Server. If you plan, for example to deploy Maximo Manage in Japanese, the choice would be Japanese_CI_AI. Refer to the [SQL Server documentation](#) to know what collate to use for each language. While SQL Server might support Unicode, Maximo Manage does not support yet for SQL Server, so you cannot set it. Therefore, you cannot deploy Maximo Manage with multiple languages in case those languages require different collates, for example: simplified Chinese and Russian.

Language	Language code
Arabic	AR
Brazilian Portuguese	PT-BR
Croatian	HR
Czech	CS
Danish	DA
Dutch	NL
English	EN
Finish	FI
French	FR
German	DE
Hebrew	HE
Hungarian	HU
Italian	IT
Japanese	JA
Korean	KO
Norwegian	NO
Polish	PL
Russian	RU
Simplified Chinese	ZH-TW
Slovak	SK

Language	Language code
Slovenian	SL
Spanish	ES
Swedish	SV
Traditional Chinese	ZH-TW
Turkish	TR

Note: Maximo Manage supports Db2, Oracle Database, and Microsoft SQL Server. However, it cannot support Microsoft SQL Server when the database collation is set to Turkish.

Because Maximo Manage does not handle Turkish *i* characters that are stored in Db2 and Oracle Database, those characters are not supported.

Server bundle overview

The application can be deployed in one or more workloads called server bundles. A server bundle isolates the workload processes so that they can be independently managed.

Server bundles can be independently scaled and managed based on your needs. For example, the user interface server bundle `ui` allows users to access the user interface by using a web browser. A cron task server bundle allows users to run background jobs. When a user interface workload and cron task workload are deployed as two separate server bundles, the CPU and memory that are consumed by these workloads do not affect each other.

A pod can be composed of one or more server bundles. The server bundles in a pod share the same database, network interface, storage volume, and resources, such as CPU and memory.

One server bundle that you deploy is designated as the default server. The server bundle that you designate as the default is used to establish the default URL, or route, that links to the app application in the workspace.

Keep in mind the following requirements and behaviors when you create your server bundles:

- You cannot have two server bundles that have the same bundle type. For example, you can specify only one server bundle of type `ui`. However, you can create a server bundle of type `all` in addition to another bundle type.
- If only one server bundle is specified, you must specify a bundle type of `all`. If you have only one bundle and do not specify type `all` for the default, the deployment might appear successful, but the application will not function properly.
- The default server bundle must have a bundle type of either `all` or `ui`. If you do not specify one of these types for the default, the deployment might appear successful, but the application will not function properly. If your default server bundle is a `ui` bundle, you must also have a server bundle of type `mea` because the `mea` server bundle is required for user synchronization.
- If you create only one server bundle and do not specify a default, that bundle is selected as the default.
- If you create multiple server bundles and do not specify a default, a server bundle that has the type `all` is randomly selected as the default server.

When you deploy the application, you specify parameters that control deployment of the server bundle pods and their associated services and routes.

You can specify the following server bundle parameters to configure the deployment:

Name

The user-defined name for the server bundle. You can also specify whether the server bundle is the default server bundle.

Pod count

The number of pods to deploy for the server bundle.

Type

The type of the server bundle. The following six bundle types are available:

- `all` - includes `ui`, `cron`, `mea`, and `report` bundle types.
- `ui` - includes the user interface components.
- `cron` - includes components that are required for cron tasks.
- `mea` - includes the enterprise web services API. This server bundle type is required for user synchronization.
- `report` - includes components for reports.
- `standalonejms` - for more information, see [Configuring JMS servers for Maximo Manage](#).

Additional server properties

As an option, you can add the following properties:

Route subdomain

If you specify a subdomain, it is added as a prefix to the main domain when the route is created for the server bundle. For example, if you specify `maximoui` as a subdomain, your full domain is similar to the following example: `maximoui.workspaceid.manage.domain.com`.

Additional server configurations

To configure the WebSphere® Application Server Liberty application server, you can provide custom parameters, as shown in the following example:

```
server-custom.xml: |-
  <!-- Enable features -->
  <featureManager>
    <feature>jsp-2.3</feature>
  </featureManager>

  <!-- To access this server from a remote client add a host attribute to the following element, e.g.
  host="*" -->
  <httpEndpoint
  id="home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_manage_deploy_c_mas_man_overview_de
  faultHttpEndpoint"
    httpPort="9080"
```

```
        httpsPort="9443" />
<!-- Automatically expand WAR files and EAR files -->
<applicationManager autoExpand="true"/>
```

Bundle-level properties

To add app system properties to specific server bundles, you can specify property names and values when you deploy the application.

Provisioning storage

Maximo® Manage supports both ephemeral storage and persistent storage.

Ephemeral storage is transient and does not persist when you redeploy or reactivate applications.

Persistent storage is used for data, such as file attachments, that you want to persist throughout multiple deployments.

- [Ephemeral storage](#)
By default, ephemeral storage is allocated for the administrative and server bundle builds when Maximo Manage is deployed. Administrators can modify the requests and also limit the amount of ephemeral storage that is provisioned.
- [Configuring ephemeral storage](#)
To configure ephemeral storage, you can add parameters to the ManageWorkspace custom resource definition by using the Red Hat® OpenShift® administrative console.
- [Persistent storage](#)
You use persistent volume storage for data, such as file attachments, that you want to persist across multiple deployments. Administrators must provision the persistent storage systems that are needed for your applications.
- [Configuring persistent volume claims](#)
You can configure a persistent volume claim (PVC) through the deployment process or by manually updating the ManageWorkspace custom resource.

Ephemeral storage

By default, ephemeral storage is allocated for the administrative and server bundle builds when Maximo® Manage is deployed. Administrators can modify the requests and also limit the amount of ephemeral storage that is provisioned.

By default, the administrative and server bundle builds request 30 GB of storage, and the builds assign a limit of 100 GB of storage, as shown in the following sample:

```
ephemeralStorage:
  requests:
    adminBuild: 30Gi
    serverBundleBuild: 30Gi
  limits:
    adminBuild: 100Gi
    serverBundleBuild: 100Gi
```

Administrators can configure different requests and limits by specifying different values in the custom resource for the application. For more information, see [Understanding ephemeral storage](#) in the Red Hat® OpenShift® documentation.

Configuring ephemeral storage

To configure ephemeral storage, you can add parameters to the ManageWorkspace custom resource definition by using the Red Hat® OpenShift® administrative console.

About this task

By default, the administrative and server bundle builds request 30 GB of storage and assign a limit of 100 GB of storage. You can configure different requests and limits by specifying different values in the custom resource for the application.

Procedure

1. In the Red Hat OpenShift console, in the Administration section, select Custom Resource Definitions.
2. In the CustomResourcesDefinitions window, select the ManageWorkspace custom resource definition record.
3. In the CustomResourceDefinition details window, on the Instances tab, select the instance for which you want to specify ephemeral storage.
4. On the YAML tab for the instance, in the spec.settings.deployment.ephemeralStorage section, specify values for the storage request and storage limits, as shown in the following example:

```
    "deployment": {
      "buildTag": "latest",
      "mode": "up",
      "persistentVolumes": [],
      "serverBundles": [
        {
```

```

        "name": "default",
        "bundleType": "all",
        "isDefault": true,
        "isUserSyncTarget": true,
        "isMobileTarget": true,
        "routeSubDomain": "all",
        "replica": 1
      },
    ],
    "ephemeralStorage": {
      "limits": {
        "adminBuild": "100Gi",
        "serverBundleBuild": "100Gi"
      },
      "requests": {
        "adminBuild": "30Gi",
        "serverBundleBuild": "30Gi"
      }
    }
  },
},
}

```

5. Save the custom resource.

Persistent storage

You use persistent volume storage for data, such as file attachments, that you want to persist across multiple deployments. Administrators must provision the persistent storage systems that are needed for your applications.

Creating persistent volumes gives you greater control over your storage and can make it easier to increase the amount of storage or to add existing files. Creation of external file storage systems for data and objects is outside the scope of the Maximo® Manage deployment. To provision persistent storage for Maximo Manage, you can use the Kubernetes persistent volume (PV) framework.

You can learn more about persistent storage. For more information, see [Understanding persistent storage](#).

Set up persistent volume storage before you deploy the application.

The following guidelines describe how to set up Network File System (NFS) storage. A similar process can be applied to other types of persistent storage.

1. Ensure that an NFS server is deployed and that it is enabled and started.
2. Ensure that you exported an NFS share and that it is accessible.
3. Ensure that you completed the following tasks:
 - Deployed a persistent volume provisioner.
 - Defined a storage class. Record the storage class name. When you deploy Maximo Manage, you must supply the class name for the persistent volume storage that you created.
 - Created a volume for the storage. Record the name of the volume so that you can use that name for the persistent volume claim when you deploy Maximo Manage.
 - Set the persistentVolumeReclaimPolicy for your storage volume to Retain to ensure that the data is not deleted when a persistent volume claim is released. Then, you can reclaim the content manually. For example, for test environments, you can use the Retain option to manually reclaim and reuse storage assets. For more information, see [Persistent Volumes](#) in the Kubernetes documentation.

For more information about setting up persistent storage volumes, see [Understanding persistent storage](#) in the Red Hat® OpenShift® documentation.

You can configure persistent volume claim for deployments on different platforms, such as IBM Cloud®, in Maximo Manage. For more information about Persistent Volume Claims configuration, see [Setting Persistent Volume Claims \(PVC\)](#).

You can configure a persistent volume claim through the deployment process or by manually updating the Maximo Manage Workspace custom resource (CR).

If you declare a persistent volume and do not specify a persistent volume claim in Maximo Manage, a persistent volume claim is dynamically provisioned by using the storage class that you configured for the volume.

If necessary, you can configure a persistent volume claim for a specific server bundle. The mount path that you specify for a server bundle overrides any default mount path that was specified for the deployment.

After deployment, if you want to adjust the size of a persistent volume claim, you can specify a new value for the size and redeploy the application.

If the amount of storage that you need exceeds the amount available for the storage volume and you want to add more storage capacity after deployment, you must create a new volume for the storage and move your data to the new volume. Then, you can redeploy the application and provide the persistent volume claim parameters for the new storage.

Configuring persistent volume claims

You can configure a persistent volume claim (PVC) through the deployment process or by manually updating the ManageWorkspace custom resource.

Before you configure a PVC, ensure that you prepared a persistent storage volume and can provide the volume name, class name, mount path, and size for your persistent volume claim.

If you declare a persistent volume and do not specify a persistent volume claim when you deploy Maximo® Manage, a persistent volume claim is dynamically provisioned by using the storage class that you configured for the volume.

If you configure a (PVC) when you deploy the application, the storage in the volume that you provisioned is available to all server bundles in the workspace. You can also configure persistent volume claims for specific server bundles in a deployment. If you configure a PVC for a server bundle, the mount path that you specify for the server bundle PVC overrides the path that you specify for the deployment.

- [Configuring persistent volume claims during deployment](#)
When you configure a persistent volume claim (PVC) during deployment, the storage in the volume that you provisioned is available to all server bundles in the workspace.
- [Configuring persistent volume claims for server bundles](#)
To configure a persistent volume claim for a specific server bundle, you can add parameters to the ManageWorkspace custom resource by using the Red Hat® OpenShift® administrative console. The mount path that you specify for the server bundle PVC overrides any default path that you configured for a persistent volume during deployment.

Configuring persistent volume claims during deployment

When you configure a persistent volume claim (PVC) during deployment, the storage in the volume that you provisioned is available to all server bundles in the workspace.

Before you begin

Ensure that you prepared a persistent storage volume and can provide the volume name, class name, mount path, and size for your persistent volume claim.

Configuring persistent volume claims for server bundles

To configure a persistent volume claim for a specific server bundle, you can add parameters to the ManageWorkspace custom resource by using the Red Hat® OpenShift® administrative console. The mount path that you specify for the server bundle PVC overrides any default path that you configured for a persistent volume during deployment.

Procedure

1. In the Red Hat OpenShift console, in the Administration section, select Custom Resource Definitions.
2. In the CustomResourcesDefinitions window, select the ManageWorkspace custom resource definition record.
3. In the CustomResourceDefinition details window, on the Instances tab, select the instance for which you want to create persistent storage.
4. On the YAML tab for the instance, in the spec.settings.deployment.persistentVolumes section, specify values for the volume name and storage class name. You can also specify a PVC name and size for the PVC, or you can provide those parameters for specific server bundles in step 5. The following example shows how to add persistent volume parameters for the deployment:

```
spec:
  settings:
    deployment:
      persistentVolumes:
        pvcName: my_pvc_name
        volumeName: my_volume
        size: 1G
        storageClassName: my_storage_class_name
```

5. In the spec.settings.deployment.serverBundles section, specify the PVC name and mount path for a server bundle, as shown in the following example:

```
spec:
  settings:
    ...
    serverBundles:
      - name: server_bundle_name
        bundleType: bundle_type
        pvcMount:
          - pvcName: my_server_bundle_pvc_name
            mountPath: /mount_path_for_the_server_bundle_storage
```

6. Save the custom resource.

Monitoring agent for Maximo Manage

Maximo® Manage includes a monitoring agent that collects statistics about application usage and performance. Administrators can configure Prometheus service monitoring and then use visualization software, such as Grafana, to view usage information that the agent collects.

The Maximo Manage monitoring agent provides a set of REST APIs that enable HTTP-based clients to access information that is related to the current state of a deployment. Administrators can configure Prometheus to use the data that is available in Manage.

Use the following guidelines when you configure Prometheus:

- The Maximo Manage monitoring agent uses the following ports:

Port 9444

Port 9444 is used for HTTPS.

Port 9081

Port 9081 is used for HTTP.

- You must configure Prometheus user-defined projects enablement after an Red Hat® OpenShift® instance is created. You can complete the configuration either before or after Maximo Manage is deployed.
- After Maximo Manage is deployed, you must configure PodMonitor or Service Monitor.

The open source Prometheus service monitoring and alerting toolkit is available with Red Hat OpenShift version 4.3 and later.

For more information about how to configure monitoring in Red Hat OpenShift Container Platform version 4.8, see [Enabling monitoring for user-defined projects](#) in Red Hat OpenShift documentation.

For more information about monitoring in Red Hat OpenShift, see [Understanding the monitoring stack](#) in Red Hat OpenShift documentation about monitoring.

For more information about setting up Grafana dashboards, see [Configuring Grafana dashboards](#).

- [Monitoring metrics](#)
The monitoring agent for Maximo Manage provides metrics for application usage and performance.
- [Configuring Grafana dashboards](#)
Maximo Manage includes a monitoring agent that collects statistics about application usage and performance. Administrators can configure the Prometheus monitoring service and then use Grafana visualization software to view usage data that the agent collects.

Monitoring metrics

The monitoring agent for Maximo® Manage provides metrics for application usage and performance.

Monitoring Metrics for Maximo Manage 8.4.0 and earlier

Table 1. Server level monitoring metrics for Maximo Manage 8.4.0 and earlier versions

API	URL template	Description
Database	http://<host>:<port>/maximo/oslc/members/<memberid>/dbinfo	Provides information about the database that is used by the application. Some of the information that is provided includes the database version or vendor information, and driver information. The resource also provides links to the database connection pool details.
MBO count	http://<host>:<port>/maximo/oslc/members/<memberid>/mbocount	Provides MBO count information. The resource also provides links to the MBO and MboSet class. This class can be useful when you are trying to resolve out of memory (OOM) or performance issues.
Memory	http://<host>:<port>/maximo/oslc/members/<memberid>/memory	Provides information about the server heap and non-heap memory usage. All units are in Megabytes (MB).
Threads	http://<host>:<port>/maximo/oslc/members/<memberid>/threads	Provides information about the threads in the JVM, such as the current thread count, peak thread count, and if there are any deadlocks. It also provides a link to enumerate the threads in the system at that instant. The API consumer can check for thread states and lock information about each thread.
Thisserver	http://<host>:<port>/maximo/oslc/members/thisserver	Provides information about the total number of concurrent users on a particular server.
Thread pool	http://<host>:<port>/maximo/oslc/members/<memberid>/threadpoolinfo	Counts total thread pool size and total active thread pool count

Table 2. Server level monitoring metrics for Maximo Manage 8.5 and earlier versions

Metric name	URL template	Description
mas_manage_db_connectionused_total	http://<host>:<port>/maximo/oslc/members/<memberid>/dbinfo	Provides information about the database that is used by the application. Some of the information that is provided includes the database version or vendor information, and driver information. The resource also provides links to the database connection pool details.
mas_manage_db_connectionfree_total	http://<host>:<port>/maximo/oslc/members/<memberid>/dbinfo	Provides information about the database that is used by the application. Some of the information that is provided includes the database version or vendor information, and driver information. The resource also provides links to the database connection pool details.
mas_manage_uiservlet_total	http://<host>:<port>/maximo/oslc/members/thisserver/servletstats	Provides information about the total number of concurrent users on a particular server.
mas_manage_oslcservlet_total		
mas_manage_restservlet_total		
mas_manage_concurrentuser_total	http://<host>:<port>/maximo/oslc/members/thisserver/	
mas_manage_crontask_total	http://<host>:<port>/maximo/oslc/memb	Provides total count of crontask threads.

Metric name	URL template	Description
mas_manage_cronthread_peak_total		Provides peak count of crontask threads within one minute.
mas_manage_mbo_total	http://<host>:<port>/maximo/oslc/members/<memberid>/mbocount	Provides MBO count information. The resource also provides links to the MBO and MboSet class. This class can be useful when you are trying to resolve out of memory (OOM) or performance issues.
mas_manage_mboaset_total		
mas_manage_heapmemory_used_total	http://<host>:<port>/maximo/oslc/members/<memberid>/memory	Provides information about the server heap and non-heap memory usage. All units are in Megabytes (MB).
mas_manage_heapmemory_max_total		
mas_manage_thread_deadlock_total	http://<host>:<port>/maximo/oslc/members/<memberid>/threads	Provides information about the threads in the JVM, such as the current thread count, peak thread count, and if there are any deadlocks. It also provides a link to enumerate the threads in the system at that instant. The API consumer can check for thread states and lock information about each thread.
mas_manage_thread_peak_total		
mas_manage_thread_total		
mas_manage_threadpool_size_total	http://<host>:<port>/maximo/oslc/members/<memberid>/threadpoolinfo	Counts total thread pool size and total active thread pool count.
mas_manage_threadpool_active_total		
mas_manage_sessionstats_active_total	http://<host>:<port>/maximo/oslc/members/<memberid>/sessionstatsinfo	Provides information on total sessions, active sessions and live sessions.
mas_manage_sessionstats_live_total		
mas_manage_sessionstats_create_total		

Additional monitoring metrics for Maximo Manage 8.5.0 and later

Maximo Manage 8.5.0 provides the following additional metrics.

Table 3. Additional instance level monitoring metrics for Maximo Manage 8.5.0

API	URL template	Description
Table size	http://<host>:<port>/maximo/oslc/members/<memberid>/tablesize	Provides information about the five database tables that have the largest table size per day. The table size is measured in MB per day.
DB connection and average response time	http://<host>:<port>/maximo/oslc/members/<memberid>/pingdb	Checks the database connection and calculates the average response time that is required to run 10 recent queries. These queries are obtained from the system tables. The queries are run on Db2® and DB2® databases.

Table 4. Additional instance level monitoring metrics for Maximo Manage 8.5

Metric name	URL template	Description
mas_manage_db_top5tablesize_bytes	http://<host>:<port>/maximo/oslc/members/<memberid>/tablesize	Provides information about the five database tables that have the largest table size per day. The table size is measured in MB per day.
mas_manage_pingdb_totaltime_seconds	http://<host>:<port>/maximo/oslc/members/<memberid>/pingdb	Checks the database connection and calculates the average response time that is required to run 10 recent queries. These queries are obtained from the system tables. The queries are run on Oracle and DB2 databases.
mas_manage_pingcos_totaltime_seconds	http://<host>:<port>/maximo/oslc/members/<memberid>/pingcos	Provides the response time for connecting to COS and the status for COS connectivity.
mas_manage_pingkafka_totaltime_seconds	http://<host>:<port>/maximo/oslc/members/<memberid>/pingkafka	Provides the response time for connecting to Kafka and the status for Kafka connectivity.
mas_manage_pingdb_availability	http://<host>:<port>/maximo/oslc/members/<memberid>/pingdb	Checks the database connection and calculates the average response time that is required to run 10 recent queries. These queries are obtained from the system tables. The queries are run on Oracle and DB2 databases.
mas_manage_pingcos_availability	http://<host>:<port>/maximo/oslc/members/<memberid>/pingcos	Provides the response time for connecting to COS and the status for COS connectivity.

Metric name	URL template	Description
mas_manage_pingkafka_availability	http://<host>:<port>/maximo/oslc/members/<memberid>/pingkafka	Provides the response time for connecting to Kafka and the status for Kafka connectivity.
mas_manage_report_total	http://<host>:<port>/maximo/oslc/members/<memberid>/report	Provides the total number of reports that have run for the hour before.

Table 5. Additional server level monitoring metrics for Maximo Manage 8.5

API	URL template	Description
Cron thread	http://<host>:<port>/maximo/oslc/members/<memberid>/cronthread	Counts total concurrent thread count for cron tasks and the peak count of total cron threads in each server per minute.
Integration and UI objects exchanged	http://<host>:<port>/maximo/oslc/members/<memberid>/objexchanged	Provides number of integration and UI objects that are exchanged in each server per minute.
Servlet stats	http://<host>:<port>/maximo/oslc/members/<memberid>/servletstat	Provides request and response information about the OSLCServlet, RESTServlet and UIServlet for each deployed application. The response time is measured in milliseconds.
Thread stats	http://<host>:<port>/maximo/oslc/members/<memberid>/threads	Provides runtime thread count information that includes concurrent thread count and deadlocked thread counts.

Table 6. Additional server level monitoring metrics for Maximo Manage

Metric name	URL template	Description
mas_manage_cron_thread_total	http://<host>:<port>/maximo/oslc/members/<memberid>/cronthread	Counts total concurrent thread count for cron tasks and the peak count of total cron threads in each server per minute.
mas_manage_integration_mbo_total	http://<host>:<port>/maximo/oslc/members/<memberid>/objexchanged	Provides number of integration and UI objects that are exchanged in each server per minute.
mas_manage_ui_mbo_total		
mas_manage_systemexception_total	http://<host>:<port>/maximo/oslc/members/thisserver/errcountmetrics	Provides the total count of MXSystemException created
mas_manage_applicationexception_total		Provides the total count of MXApplicationException created
mas_manage_uiservlet_responsetime_seconds	http://<host>:<port>/maximo/oslc/members/<memberid>/servletstats	Provides request and response information about the OSLCServlet, RESTServlet and UIServlet for each deployed application. The response time is measured in milliseconds.
mas_manage_oslcservlet_responsetime_seconds		
mas_manage_restservlet_responsetime_seconds		
mas_manage_thread_deadlock_total	http://<host>:<port>/maximo/oslc/members/<memberid>/threads	Provides runtime thread count information that includes concurrent thread count and deadlocked thread counts.
mas_manage_thread_total		
mas_manage_thread_peak_total	http://<host>:<port>/maximo/oslc/members/<memberid>/threads	Provides runtime thread count information that includes concurrent thread count and deadlocked thread counts.

Configuring Grafana dashboards

Maximo® Manage includes a monitoring agent that collects statistics about application usage and performance. Administrators can configure the Prometheus monitoring service and then use Grafana visualization software to view usage data that the agent collects.

To configure the monitoring dashboard, complete the following tasks:

- Configure a Red Hat® OpenShift® monitoring service.
- Configure the PodMonitor custom resource for the Maximo Manage application to monitor pods.
- Verify IBM® Maximo Monitor data.
- Configure Grafana.
- Load the Maximo Manage dashboards into Grafana.
- [Prerequisites](#)
Before you can configure the Grafana dashboards in Red Hat OpenShift, check the storage classes available in your cluster in the Red Hat OpenShift Container Platform console.
- [Configuring Red Hat OpenShift monitoring service](#)
Configure the Red Hat OpenShift monitoring service in the Red Hat OpenShift Container Platform console.
- [Configuring PodMonitor for Maximo Manage](#)
In the Red Hat OpenShift Container Platform console, configure the PodMonitor custom resource to monitor your pods for Maximo Manage.
- [Verifying the monitoring data](#)
In the Red Hat OpenShift Container Platform console, verify the monitoring data.

- [Installing and configuring Grafana](#)
Install and configure the Red Hat OpenShift Grafana operator into the openshift-user-workload-monitoring project by using the OperatorHub.
- [Loading Maximo Manage dashboard into Grafana for Maximo Manage](#)
Load the Maximo Manage dashboard in Grafana.
- [Troubleshooting monitoring issues](#)
Enable Prometheus in debug mode to troubleshoot monitoring issues. If the data source connection is not working in Grafana, you can reset the value for the authentication header.

Prerequisites

Before you can configure the Grafana dashboards in Red Hat® OpenShift®, check the storage classes available in your cluster in the Red Hat OpenShift Container Platform console.

The ocs-storagecluster-cephfs storage class that is used for Single user (RWO) and Shared Access (RWX) access modes for file system volumes is used as an example to configure Grafana dashboards.

Configuring Red Hat OpenShift monitoring service

Configure the Red Hat® OpenShift® monitoring service in the Red Hat OpenShift Container Platform console.

Procedure

1. Select your project from the Workloads > ConfigMaps and click Create ConfigMap.
2. Run the following command.

```
oc describe configmap cluster-monitoring-config -n openshift-monitoring
```

3. If the enableUserWorkload parameter is false, set the parameter to true.
When the enableUserWorkload parameter is set to true, user-defined projects in a cluster are monitored.
4. Increase the Prometheus retention policy, add storage class ocs-storagecluster-cephfs, and specify the size.
The default retention policy is 24 hours.
5. Change the Alertmanager's ocs-storagecluster-cephfs storage class and size.
To configure the core Red Hat OpenShift Container Platform monitoring components, you must create the cluster-monitoring-config ConfigMap object in the openshift-monitoring project.
The following text is an example of the cluster-monitoring-config.yml file for configuring cluster monitoring:

```
kind: ConfigMap
apiVersion: v1
metadata:
  name: cluster-monitoring-config
  namespace: openshift-monitoring
data:
  config.yaml: |
    enableUserWorkload: true
    prometheusK8s:
      retention: 90d
      volumeClaimTemplate:
        spec:
          storageClassName: ocs-storagecluster-cephfs
          resources:
            requests:
              storage: 300Gi
    alertmanagerMain:
      volumeClaimTemplate:
        spec:
          storageClassName: ocs-storagecluster-cephfs
          resources:
            requests:
              storage: 20Gi
```

6. Create or update the user-workload-monitoring-config.yml file.
To configure the components that monitor user-defined projects, you must create the user-workload-monitoring-config ConfigMap object in the openshift-user-workload-monitoring project.

```
apiVersion: v1
kind: ConfigMap
data:
  config.yaml: |
    prometheus:
      logLevel: info
      enforcedSampleLimit: 50000
      retention: 90d
      volumeClaimTemplate:
        spec:
          storageClassName: ocs-storagecluster-cephfs
          resources:
            requests:
              storage: 300Gi
```

```

alertmanagerMain:
volumeClaimTemplate:
  spec:
    storageClassName: ocs-storagecluster-cephfs
    resources:
      requests:
        storage: 20Gi
metadata:
  name: user-workload-monitoring-config
  namespace: openshift-user-workload-monitoring

```

7. To verify the status of the pods, run the following command.

```
oc get pods -n openshift-user-workload-monitoring
```

8. Check that the output matches the following sample:

NAME	READY	STATUS	RESTARTS	AGE
prometheus-operator-576bf85cc6-jdrfm	2/2	Running	0	15d
prometheus-user-workload-0	5/5	Running	1	15d
prometheus-user-workload-1	5/5	Running	1	15d
thanos-ruler-user-workload-0	3/3	Running	0	15d
thanos-ruler-user-workload-1	3/3	Running	0	15d

9. Check the PVC status to determine whether the prometheus-user-workload pods are bound or any issues exist in the bindings.

Configuring PodMonitor for Maximo Manage

In the Red Hat® OpenShift® Container Platform console, configure the PodMonitor custom resource to monitor your pods for Maximo® Manage.

Before you begin

Maximo Manage 8.x must be installed.

Procedure

1. In the Red Hat OpenShift Container Platform console, select the Maximo Manage project.
2. Create the following pod monitors to monitor the server-level serverBundle pod and instance-level monitorAgent pod.

Note:

- The port 9444 for `https` is available for your use.
- Connect to the Prometheus server without specifying certificates by using the `insecureSkipVerify` flag to disable the target certificate validation.
- Ensure that you provide a correct and valid selector because any pod in your cluster that matches the labels in the PodMonitor selector field is monitored based on the podMetricsEndpoints that are specified in the Pod Monitor custom resource.

Note: You can search for the PodMonitor using only two selectors, `appType` and `appTypeName`, or only a single selector `appType`. Other selectors are no longer required for searching.

Note: If the `appTypeName` is UI, MEA, Report, or Cron, you can skip specifying the `appTypeName: all` parameter. It is sufficient to use `appType: serverBundle` only.

```

apiVersion: monitoring.coreos.com/v1
kind: PodMonitor
metadata:
  labels:
    k8s-app: maximo-monitoragent
  name: maximo-serverlevel-monitoragent
  namespace: mas-grafana-manage
spec:
  podMetricsEndpoints:
    - interval: 30s
      scheme: https
      targetPort: 9444
      tlsConfig:
        insecureSkipVerify: true
  selector:
    matchLabels:
      mas.ibm.com/appType: serverBundle

```

```

apiVersion: monitoring.coreos.com/v1
kind: PodMonitor
metadata:
  labels:
    k8s-app: maximo-monitoragent
  name: maximo-instancelevel-monitoragent
  namespace: mas-grafana-manage
spec:
  podMetricsEndpoints:
    - interval: 30s
      scheme: https
      targetPort: 9444
      tlsConfig:
        insecureSkipVerify: true
  selector:
    matchLabels:

```

```

mas.ibm.com/appType: monitorAgent

apiVersion: monitoring.coreos.com/v1
kind: PodMonitor
metadata:
  labels:
    k8s-app: maximo-monitoragent
  name: maximo-serverlevel-monitoragent
  namespace: mas-grafana-manage
spec:
  podMetricsEndpoints:
  - interval: 30s
    scheme: https
    targetPort: 9444
    tlsConfig:
      insecureSkipVerify: true
  selector:
    matchLabels:
      mas.ibm.com/appType: serverBundle
      mas.ibm.com/appTypeName: all

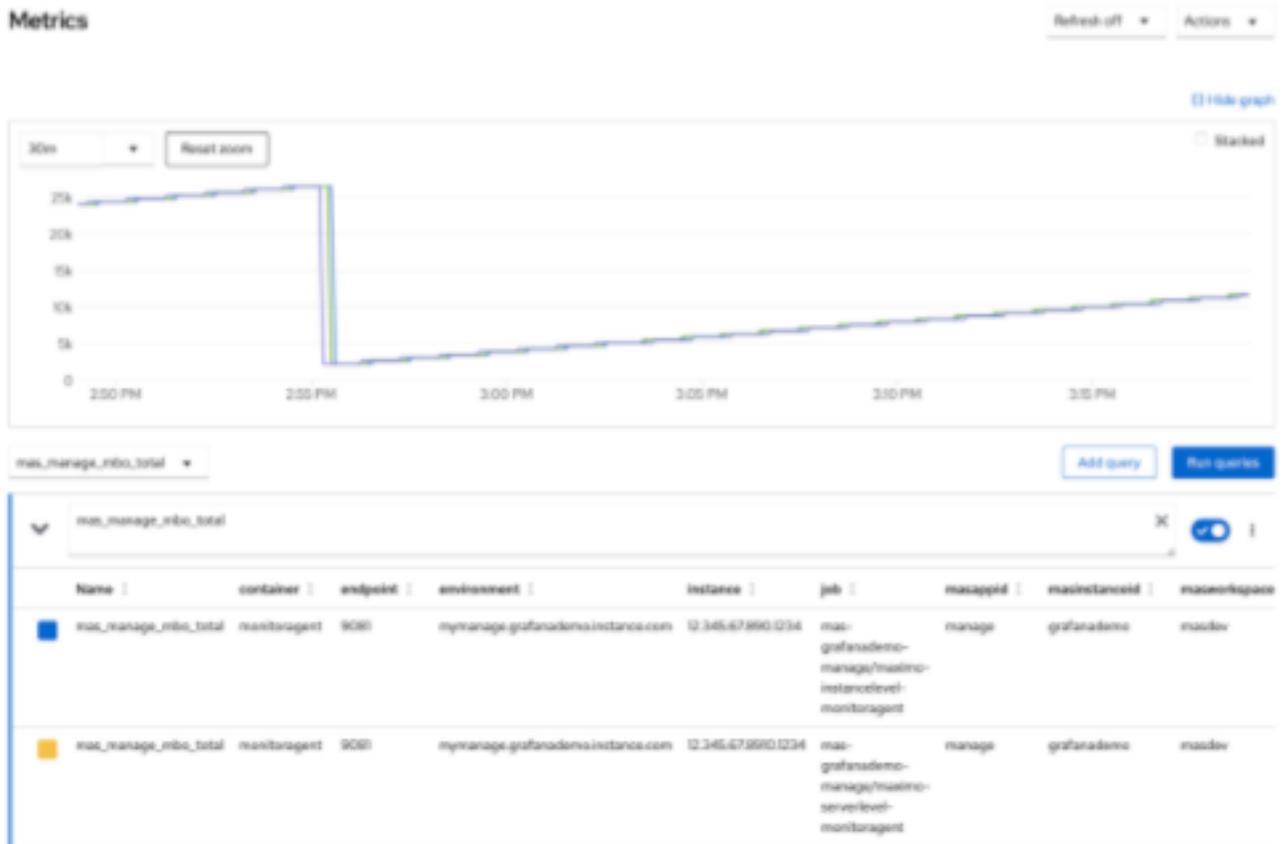
```

Verifying the monitoring data

In the Red Hat® OpenShift® Container Platform console, verify the monitoring data.

Procedure

1. Log in to the Red Hat OpenShift Container Platform console and select your Maximo® Manage cluster.
2. Select **Observe** > **Metrics**.
3. Type `mas_manage_mbo_total`.
4. Click **Run queries** and verify that the data is displayed, which is shown in the following example.



Installing and configuring Grafana

Install and configure the Red Hat® OpenShift® Grafana operator into the openshift-user-workload-monitoring project by using the OperatorHub.

Procedure

1. In the Red Hat OpenShift Container Platform console, select Operators > OperatorHub and search for the Grafana operator that is provided by Red Hat OpenShift.
2. Install the Grafana operator for the openshift-user-workload-monitoring namespace.
3. Create an instance of Grafana.
 - a. Select Operator > OperatorHub > Grafana Operator and then select the Grafana tab.
 - b. Click Create Grafana.
 - c. On YAML tab, enter the following text:

```

apiVersion: integreatly.org/v1alpha1
kind: Grafana
metadata:
  name: mas-grafana
  namespace: openshift-user-workload-monitoring
spec:
  ingress:
    enabled: true
  dataStorage:
    accessModes:
      - ReadWriteOnce
    size: 10Gi
    class: ocs-storagecluster-cephfs
  config:
    log:
      mode: "console"
      level: "warn"
    security:
      admin_user: "root"
      admin_password: "secret"
    auth:
      disable_login_form: False
      disable_signout_menu: True
    auth.anonymous:
      enabled: True
  dashboardLabelSelector:
    - matchExpressions:
      - {key: app, operator: In, values: [grafana]}

```

A route is created, and the public URL is included in that route definition in the openshift-user-workload-monitoring namespace project.

4. Remember to update the subscription.yaml file and add the following configuration so that Grafana scans for the dashboard across the whole cluster:

```

Config:
  env:
    - name: "DASHBOARD_NAMESPACES_ALL"
      value: "true"

```

After an update, the subscription.yaml file looks like the following:

```

apiVersion: operators.coreos.com/v1alpha1
kind: Subscription
metadata:
  name: grafana-operator
  namespace: "{{ grafana_namespace }}"
  labels:
    operators.coreos.com/grafana-operator.{{ grafana_namespace }}: ''
spec:
  channel: v4
  installPlanApproval: Automatic
  name: grafana-operator
  source: community-operators
  sourceNamespace: openshift-marketplace
  config:
    env:
      - name: "DASHBOARD_NAMESPACES_ALL"
        value: "true"

```

5. Run the following command to grant the user permission.


```
oc adm policy add-cluster-role-to-user cluster-monitoring-view -z grafana-serviceaccount
```
6. Run the following command to obtain the BEARER_TOKEN.


```
- oc serviceaccounts get-token grafana-serviceaccount -n openshift-user-workload-monitoring
```
7. Create the GrafanaDataSource, which points to the Prometheus instance that you installed earlier.
 - a. Select the Grafana Operator > Installed operators > GrafanaDataSource tab.
 - b. Enter the following text and replace the \${BEARER_TOKEN} value with the value that you obtained in a previous step.

```

apiVersion: integreatly.org/v1alpha1
kind: GrafanaDataSource
metadata:
  name: prometheus-grafanadatasource
  namespace: openshift-user-workload-monitoring
spec:
  datasources:
    - access: proxy
      editable: true
      isDefault: true
      jsonData:
        httpHeaderName1: 'Authorization'
      timeInterval: 5s

```

```

    tlsSkipVerify: true
    name: Prometheus
    secureJsonData:
      httpHeaderValue1: 'Bearer ${BEARER_TOKEN}'
    type: prometheus
    url: 'https://thanos-querier.openshift-monitoring.svc.cluster.local:9091'
    name: prometheus-grafanadatasource.yaml

```

Note: Instead of following manual steps, you can run a playbook to install and setup Grafana. For more information, see [cluster monitoring](#).

Loading Maximo Manage dashboard into Grafana for Maximo Manage

Load the Maximo® Manage dashboard in Grafana.

Procedure

- Log on to Grafana.
- In the Red Hat® OpenShift® Container Platform console, select Networking > Routes.
 - Note: Manage operator provides the maximo-dashboard.json file during deployment without requiring to import it explicitly.
 - Warning: Rename and backup your dashboard before you import it to avoid overwriting the custom dashboard. After you import the dashboard, it is not necessary to import it again, except if you upgrade. If you upgrade Maximo Manage, you might have to import the dashboard and apply the changes again.
- Load the Grafana dashboards in two ways.
 - If you install Red Hat OpenShift Container Platform monitoring before you install Maximo Manage, the dashboards are installed automatically.
 - If you install Red Hat OpenShift Container Platform monitoring after you install Maximo Manage, you must import the dashboard.
 - Open a terminal in the Maximo Manage workspace operator pod, which has a **-ws** in its name.
 - Find the dashboard at:

```

sh-4.4$ cd roles/manage-deployment/files/
sh-4.4$ ls
health-dashboard.json maximo-dashboard.json maximo-dashboard84.json points_catalog.yml

```

- Use the **oc rsync** command to copy the file from the Maximo Manage workspace operator pod and import it through the Grafana user interface.

```

oc project < namespace >
oc rsync <pod name>:<filename> <destination>

```

For example:

```

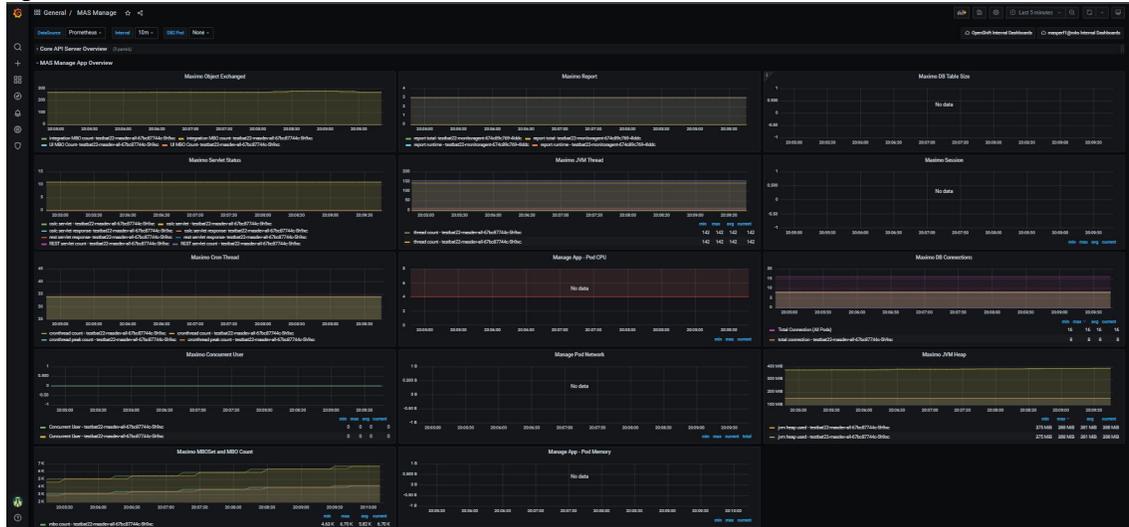
oc project mas-latest-manage
oc rsync latest-entitymgr-ws-8587cbb588-ngxwg:/opt/ansible/roles/manage-deployment/files/maximo-dashboard.json

```

- Select Import from the side menu.

Note: You can see the import option only when you log on as the admin user that you specified during Grafana instance creation.

Figure 1. Grafana dashboard



Troubleshooting monitoring issues

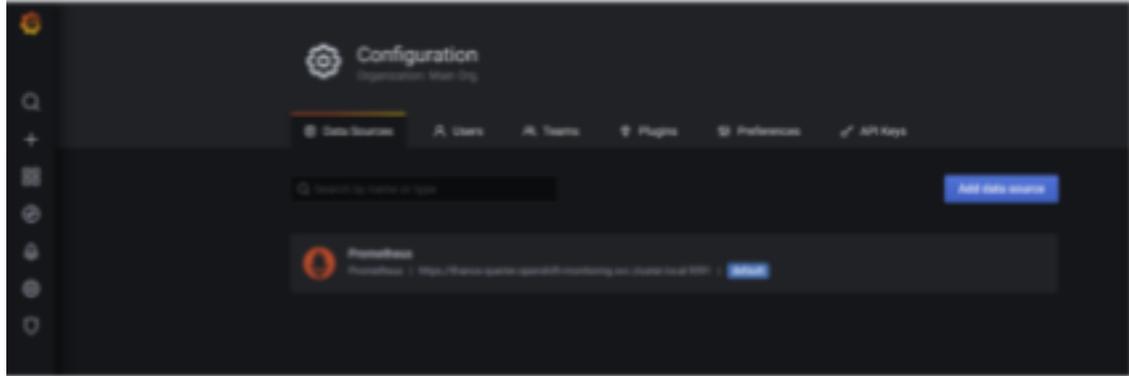
Enable Prometheus in debug mode to troubleshoot monitoring issues. If the data source connection is not working in Grafana, you can reset the value for the authentication header.

- Enable the debug mode in config.yaml file in "user-workload-monitoring-config" configmap.

```
prometheus:  
  logLevel: debug
```

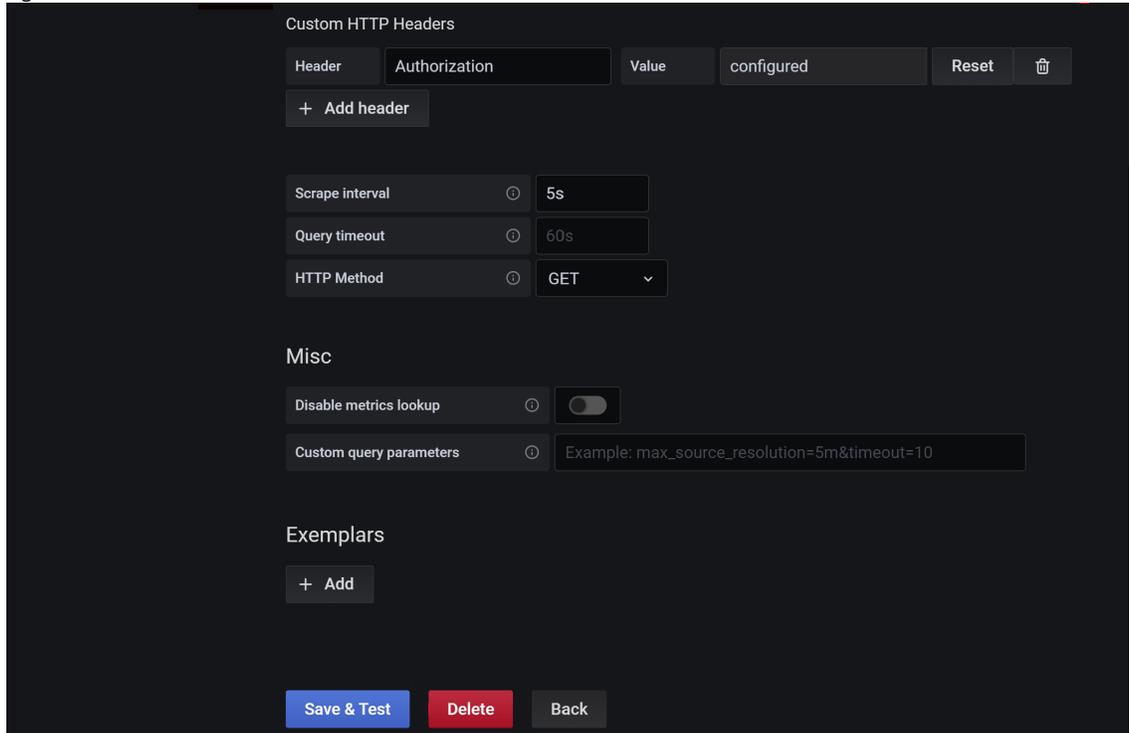
- Check the data source connection in Grafana. If you see any issue with the metrics in the Grafana chart, reset the value for the authentication header to BEARER_TOKEN.
 1. To reset the value, click Add data source from the Configuration menu.

Figure 1. Check data source - 1



2. Click Reset and provide a valid value. For more information, see [Installing and configuring Grafana](#).
3. Click Save & Test.

Figure 2. Check data source - 2



For more information, see [Troubleshooting monitoring issues](#).

Backing up and restoring Maximo Manage

To avoid disruptions to service and unplanned downtimes, create regular Maximo® Manage backups that you can restore as needed.

For more information, see [Back up and restore the Manage application in Maximo Application Suite](#).

Storing images in an external registry

When Maximo® Manage is deployed or updated, the build process generates an administrative image and a server bundle image for each bundle type. Bundle types are specified in the custom resource for the workspace. Images are stored in an internal registry. In some cases, you might want to store the build images in an external repository. For example, you might want to run security scans on images that have customizations, or you might want to test builds independently before you deploy the application in Maximo Application Suite. Administrators can configure Maximo Manage to store images in an external repository.

Creating a secret based on Docker credentials

Before you can configure Maximo Manage to store builds in an external registry, you must create a secret for the external registry repository.

Procedure

1. Log in to the Red Hat® OpenShift® console.
2. In the workspace where the Maximo Manage custom resource is located, use the command line interface or the Red Hat OpenShift dashboard to create an image pull secret.

For example, you can use the command line interface to enter the following secret:

```
kubectl create secret docker-registry regcred
--docker-server=your_docker_registry_server
--docker-username=your_your_docker_registry_account
--docker-password=your_your_docker_registry_api_key
```

Adding images to an external registry

To add build images for Maximo Manage to an external registry, configure the custom resource for the Maximo Manage workspace.

About this task

To configure Maximo Manage to add build images to an external registry, you must add the `registryForGeneratedImages` properties to the `spec.settings` section of the custom resource and specify values for the following fields:

- `registryPath` - The path to the repository where you want to store the image.
- `secretName` - The secret that contains the credentials for accessing the repository.

Procedure

1. In the Red Hat OpenShift console, in the Administration section, select Custom Resource Definitions.
2. Select the Maximo Manage workspace and then select the instance for your external registry.
3. On the YAML tab, in the `spec.settings` section, add the following lines:

```
registryForGeneratedImages:
  registryPath:
  secretName:
```

4. Specify values for the `registryPath` and `secretName` fields, as shown in the following example:

```
spec:
  settings:
    ...
  languages:
    baseLang:
    secondaryLangs:
  registryForGeneratedImages:
    registryPath: your_docker_registry_server
    secretName: your-image-pull-secret-for-the-repository
```

5. Save the custom resource.

Results

The Maximo Manage workspace operator automatically picks up the change to the custom resource. A build is started, and the new image or images are pushed to the external registry. You can use the images to deploy Maximo Manage on a local computer.

If you no longer want to push image builds to an external repository, you must remove the lines that you added for the external registry from the custom resource for the workspace.

Configuring Java Message Service (JMS) servers

If you use Java™ Messaging Service (JMS) to integrate data, you can deploy one or more server bundles with a Liberty server that supports JMS messaging.

- [Configuring JMS servers for Maximo Manage](#)
To add a JMS server bundle, you specify `standalonejms` for the server bundle type when Maximo Manage is deployed.

- [Scaling JMS servers](#)

By default, the server bundle for JMS servers is a single pod or server bundle in Maximo Manage. You can add server bundles if you need them.

Configuring JMS servers for Maximo Manage

To add a JMS server bundle, you specify `standalonejms` for the server bundle type when Maximo® Manage is deployed.

About this task

This configuration creates a single-pod Liberty JMS server.

By default, ephemeral storage for the JMS server uses the `/jmsstore` directory in the container. Generally, users require persistent storage for messaging. To provide persistent storage, provision a persistent storage volume for Maximo Application Suite. Then, configure a persistent volume claim for the JMS bundle when you deploy the application. You can specify a different directory for the JMS storage while setting server configuration through the additional server configuration parameters for the bundle.

Procedure

1. Log in to Maximo Application Suite as a system administrator.
2. From Suite administration, select Workspaces from the side navigation menu and then select the Manage tile.
3. On the Manage workspace details page, click Actions, and select Update configuration.
4. In the Server bundles row, click the edit icon.
5. In the Server bundles section, if the System managed checkbox is selected, clear it. Click Add bundle.
6. In the Name column, enter a name for the bundle, such as `jmsserver`.
7. In the Type column, select `standalonejms`.
8. To configure the queues, complete the following steps:
 - a. In the Additional properties column for your JMS server bundle, click View.
 - b. Optional: Set a different route subdomain.
 - c. In the Additional server config section, use XML to specify both the default queues and the custom queues that you want to add. This step adds the default queues and two custom queues:

```
<?xml version="1.0" encoding="UTF-8"?>
<server description="new server">
  <messagingEngine>
    <fileStore path="/jmsstore"/>
    <queue
id=" _home_markdown_jenkins workspace Transform in SSLPL8 cd com.ibm.mam.doc_manage_deploy_t_configure_jms_serve
r_sqoutbd" maintainStrictOrder="true" maxMessageDepth="100000" failedDeliveryPolicy="KEEP_TRYING"
maxRedeliveryCount="-1"/>
    <queue
id=" _home_markdown_jenkins workspace Transform in SSLPL8 cd com.ibm.mam.doc_manage_deploy_t_configure_jms_serve
r_sqinbd" maintainStrictOrder="true" maxMessageDepth="200000" failedDeliveryPolicy="KEEP_TRYING"
maxRedeliveryCount="-1"/>
    <queue
id=" _home_markdown_jenkins workspace Transform in SSLPL8 cd com.ibm.mam.doc_manage_deploy_t_configure_jms_serve
r_cqinerrbd" maxMessageDepth="100000" failedDeliveryPolicy="KEEP_TRYING"/>
    <queue
id=" _home_markdown_jenkins workspace Transform in SSLPL8 cd com.ibm.mam.doc_manage_deploy_t_configure_jms_serve
r_cqinbd" maxMessageDepth="100000" exceptionDestination="cqinerrbd"/>
    <queue
id=" _home_markdown_jenkins workspace Transform in SSLPL8 cd com.ibm.mam.doc_manage_deploy_t_configure_jms_serve
r_notfererrbd" maxMessageDepth="100000" failedDeliveryPolicy="KEEP_TRYING"/>
    <queue
id=" _home_markdown_jenkins workspace Transform in SSLPL8 cd com.ibm.mam.doc_manage_deploy_t_configure_jms_serve
r_notfbd" maxMessageDepth="100000" exceptionDestination="notfererrbd"/>
    <queue
id=" _home_markdown_jenkins workspace Transform in SSLPL8 cd com.ibm.mam.doc_manage_deploy_t_configure_jms_serve
r_custsqoutbd" maintainStrictOrder="true" maxMessageDepth="100000" failedDeliveryPolicy="KEEP_TRYING"
maxRedeliveryCount="-1"/>
    <queue
id=" _home_markdown_jenkins workspace Transform in SSLPL8 cd com.ibm.mam.doc_manage_deploy_t_configure_jms_serve
r_custsqinbd" maintainStrictOrder="true" maxMessageDepth="200000" failedDeliveryPolicy="KEEP_TRYING"
maxRedeliveryCount="-1"/>
  </messagingEngine>
</server>
```

Note: The `fileStore` path can be modified to use a different directory to store JMS messages. If you are using persistent volumes, make sure that the `fileStore` path is configured correctly under the persistent volume directory. For example, if your persistent volume is mounted on `directory/nfs`, then the `fileStore` path might be `/nfs/jmsstore`.

- d. Click Save to save the additional server bundle properties.
9. If you have a single server (all) bundle or for the `mea` bundle, to prepare the other Maximo Manage server bundles for the JMS queues, complete the following steps:
 - a. In the Additional properties column for the server bundle, click View.
 - b. In the Additional server config section, specify features for both the default queues and the custom queues that you want to add, as shown in the following example:

```
<?xml version='1.0' encoding='UTF-8'?>
<server description="new server">
  <featureManager>
    <feature>jndi-1.0</feature>
    <feature>wasJmsClient-2.0</feature>
    <feature>jmsMdb-3.2</feature>
    <feature>mdb-3.2</feature>
  </featureManager>
  <jmsQueueConnectionFactory jndiName="jms/maximo/int/cf/intcf" connectionManagerRef="mifjmsconfact">
    <properties.wasJms remoteServerAddress="<InstancesId>-<workspaceId>-<serverbundlename>.mas-<instanceId>-
manage_svc:7276:BootstrapBasicMessaging"/></jmsQueueConnectionFactory>
    <connectionManager
id=" _home_markdown_jenkins workspace Transform in SSLPL8 cd com.ibm.mam.doc_manage_deploy_t_configure_jms_serve
r_mifjmsconfact" maxPoolSize="20"/>
    <jmsQueue jndiName="jms/maximo/int/queues/sqout"><properties.wasJms queueName="sqoutbd"/></jmsQueue>
    <jmsQueue jndiName="jms/maximo/int/queues/sqin"><properties.wasJms queueName="sqinbd"/></jmsQueue>
    <jmsQueue jndiName="jms/maximo/int/queues/cqin"><properties.wasJms queueName="cqinbd"/></jmsQueue>
    <jmsQueue jndiName="jms/maximo/int/queues/cqinerr"><properties.wasJms queueName="cqinerrbd"/></jmsQueue>
```

```

    <jmsQueue jndiName="jms/maximo/int/queues/notf"><properties.wasJms queueName="notfbd"/></jmsQueue>
    <jmsQueue jndiName="jms/maximo/int/queues/notferr"><properties.wasJms queueName="notferrbd"/></jmsQueue>
    <jmsQueue jndiName="jms/maximo/int/queues/custsqout"><properties.wasJms queueName="custsqoutbd"/>
</jmsQueue>
    <jmsQueue jndiName="jms/maximo/int/queues/custsqin"><properties.wasJms queueName="custsqinbd"/></jmsQueue>
    <jmsActivationSpec
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_manage_deploy_t_configure_jms_serve
r_maximo-all/mboejb/JMSContQueueProcessor-1" maxEndpoints="5"><properties.wasJms
destinationLookup="jms/maximo/int/queues/cqin" maxConcurrency="5" maxBatchSize="20"
connectionFactoryLookup="jms/maximo/int/cf/intcf"/></jmsActivationSpec>
    <jmsActivationSpec
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_manage_deploy_t_configure_jms_serve
r_maximo-all/mboejb/JMSContQueueProcessor-2" maxEndpoints="1"><properties.wasJms
destinationLookup="jms/maximo/int/queues/cqinerr" maxConcurrency="1" maxBatchSize="20"
connectionFactoryLookup="jms/maximo/int/cf/intcf"/></jmsActivationSpec>
</server>

```

10. If you have report, cron, or UI bundles, complete the following steps for each of them:
 - a. In the Additional properties column for the server bundle, click View.
 - b. In the Additional server config section, specify features for both the default queues and the custom queues that you want to add, as shown in the following example:

```

<?xml version='1.0' encoding='UTF-8'?>
<server description="new server">
<featureManager>
<feature>jndi-1.0</feature>
<feature>wasJmsClient-2.0</feature>
<feature>jmsMdb-3.2</feature>
<feature>mdb-3.2</feature>
</featureManager>
    <jmsQueueConnectionFactory jndiName="jms/maximo/int/cf/intcf" connectionManagerRef="mifjmsconfact">
<properties.wasJms remoteServerAddress="<InstancesId>-<workspaceId>-<serverbundlename>.mas-<instanceId>-
manage.svc:7276:BootstrapBasicMessaging"/></jmsQueueConnectionFactory>
    <connectionManager
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_manage_deploy_t_configure_jms_serve
r_mifjmsconfact" maxPoolSize="20"/>
    <jmsQueue jndiName="jms/maximo/int/queues/sqout"><properties.wasJms queueName="sqoutbd"/></jmsQueue>
    <jmsQueue jndiName="jms/maximo/int/queues/sqin"><properties.wasJms queueName="sqinbd"/></jmsQueue>
    <jmsQueue jndiName="jms/maximo/int/queues/cqin"><properties.wasJms queueName="cqinbd"/></jmsQueue>
    <jmsQueue jndiName="jms/maximo/int/queues/cqinerr"><properties.wasJms queueName="cqinerrbd"/></jmsQueue>
    <jmsQueue jndiName="jms/maximo/int/queues/notf"><properties.wasJms queueName="notfbd"/></jmsQueue>
    <jmsQueue jndiName="jms/maximo/int/queues/notferr"><properties.wasJms queueName="notferrbd"/></jmsQueue>
    <jmsQueue jndiName="jms/maximo/int/queues/custsqout"><properties.wasJms queueName="custsqoutbd"/>
</jmsQueue>
    <jmsQueue jndiName="jms/maximo/int/queues/custsqin"><properties.wasJms queueName="custsqinbd"/></jmsQueue>
</server>

```

For steps 9 and 10:

The queueName values must match the queue names that you specified in step 8.c. Also, the difference between all bundles or mea bundle XML versus the report, cron, UI bundles XML is that the second category does not have the jmsActivationSpec lines.

When you enter the connection properties, supply the following variables:

```

<InstanceId>
    Name of your Maximo Application Suite instance.
<workspaceId>
    Name of your workspace.
<serverbundlename>
    Name of your JMS server bundle, for example, jmsserver.

```

Note: Your *remoteServerAddress* must be in the following format:

```

remoteServerAddress="<InstanceId>-<workspaceId>-<serverbundlename>.mas-<InstanceId>-
manage.svc:7276:BootstrapBasicMessaging"

```

For example:

```

remoteServerAddress="mngrel84-masdev-jmsserver.mas-mngrel84-manage.svc:7276:BootstrapBasicMessaging"

```

11. Click Save again to save the additional server bundle properties.
12. After you complete the workspace updates, activate the changes.

What to do next

After you configure the stand-alone JMS servers, you can log in to Maximo Manage and configure your JMS queues. For more information, see [JMS queue configuration](#).

Scaling JMS servers

By default, the server bundle for JMS servers is a single pod or server bundle in Maximo® Manage. You can add server bundles if you need them.

You can select one of the following options to add JMS server bundles:

- Complete the following steps to create more instances of the standalonejms server bundle and the mea server bundle:
 1. Create another instance of the standalonejms server bundle.
 2. Create the same set of queues that existed in your first server bundle.
 3. Create another instance of the mea server bundle that uses the new standalonejms server bundle.

You can then configure an external system to use either of the mea cluster URLs to send the messages, which distributes the processing load across multiple servers.

- You can add more mea server instances for the same standalonejms server. This process effectively creates message-driven beans (MDB) that can consume messages in parallel from the JMS server.

Deployment planning worksheet

Use the planning worksheet to record the information that you need when configuring and during the deployment process, such as database parameters, server bundle files, and customization archive location.

The following table contains settings for deployment

Table 1. Settings for deployment

Setting	Default	Your value
Db2® hostname		
Db2 port		
Oracle hostname		
Oracle port		
SQL Server hostname		
SQL Server port		
Db2 Warehouse hostname		
Db2 Warehouse port		
Maximo® Manage database name		
Maximo Manage database username		
Maximo Manage password		
Database schema name	maximo	
Database table space	MAXDATA	
Database index space	MAXINDEX	
Industry solution and add-on components	See Deployment of industry solutions and add-ons	
Languages	EN See Language support	
Server bundles	All See Server bundles	
Customization archive location	See Customizing the application	
Mode	On	
Persistent volume claim (PVC) name	See Persistent storage	
PVC volume name		
PVC size		
PVC mount path		
PVC storage class name		
Build tag	Latest	
Import certificates		
Server timezone	GMT	

Deploying and activating Maximo Manage

As a system administrator, you deploy and activate Maximo® Manage in Maximo Application Suite by selecting the application version, connecting to the configured database and applying the Java™ database connectivity (JDBC) configurations.

Before you begin

- Confirm that the database is configured and you have its information available, including the correct JDBC URL specified in the correct format. It is also very important to make sure you review and understand the section about [Database encryption](#). It helps you choose the best strategy for database encryption and understand how to avoid losing the encryption keys after the database is encrypted for the first time.
- Confirm that you have your customization archive properly configured if you use it for your Maximo Manage deployment.
- Make sure that you prepare to configure persistent storage if you need it. For more information, see [Provisioning storage](#).

To record the information that you need during the deployment process, you can also use the [Deployment planning worksheet](#).

Before you select industry solutions or add-ons, review the [compatibility matrix](#) to validate that these selected components are compatible to be deployed together.

About this task

Enabling Maximo Manage in Maximo Application Suite is a two-step process. First, you deploy Maximo Manage in Maximo Application Suite by selecting the application version. This selection deploys the application controller, which includes the Maximo Manage operator and other entity managers that are essential to the deployment process and are also used to control and maintain the application after deployment. This part of the process usually takes a few minutes to complete.

Then, when you activate the application, you configure Maximo Manage for use in Maximo Application Suite. During this configuration process, you add your database settings and select the industry solutions or add-ons to co-deploy with Maximo Manage. You can also specify other configuration settings, such as language preferences, customization archive, external file storage, server bundle options, and others.

After you configure and confirm the Maximo Manage activation, the main deployment process starts. This part of the process takes longer to complete and involves building the Maximo Manage and server bundle images based on your chosen settings, configuring the data in the database by running the Maximo Manage installation scripts for a new installation or an upgrade from an existing database, and finally deploying the application in the configured server bundle. This process takes a couple of hours or more to finish. It depends on your infrastructure, database location, network, the number of industry solutions that are co-deployed with Maximo Manage, the number of included languages, and whether you are installing for the first time or upgrading.

- **[Deploying the Manage application](#)**
You deploy the Maximo Manage operator responsible to control the Maximo Manage deployment process and to maintain and update the application as necessary.
- **[Configuring the database](#)**
You must configure the database connection information for Maximo Manage.
- **[Selecting Manage components](#)**
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- **[Setting customizations](#)**
You can include specific customizations.
- **[Setting server mode](#)**
You can set the server mode.
- **[Setting Persistent Volume Claims \(PVC\)](#)**
You can connect to persistent volume claims (PVC).
- **[Setting build data interpreter \(BDI\)](#)**
You can set BDI for aviation or ACM components.
- **[Setting build tag](#)**
You can specify an earlier build for deployment.
- **[Setting certificates for integration](#)**
You can connect to external systems using certificates.
- **[Setting server time zone](#)**
You can specify the time zone of your database server.
- **[Setting asset investment optimization](#)**
You can enable asset investment optimization.
- **[Monitoring Manage application deployment by using the Maximo Application Suite interface](#)**
You can monitor the Maximo Manage operator deployment through the Application details page in Maximo Application Suite.
- **[Activating Maximo Manage](#)**
You must activate Maximo Manage before you can use it.
- **[Monitoring Maximo Manage activation by using the Maximo Application Suite interface](#)**
Monitor the IBM Maximo Manage activation from the Maximo Application Suite user interface.

Deploying the Manage application

You deploy the Maximo® Manage operator responsible to control the Maximo Manage deployment process and to maintain and update the application as necessary.

Procedure

1. From the Suite catalog, on the Applications tab, select the Manage tile, and review the information on the Setup page.
 - a. Optional: If you plan to co-deploy industry solutions or add-ons with Manage, select the Show all option and then click the plus icon on the respective tile of each industry solution or add-on that you want to co-deploy to reserve the necessary [AppPoints](#) for them.
 - b. Click Continue.
2. In the Administer application upgrades window, in the Upgrade strategy field, select one of the following upgrade strategies.

Option	Description
--------	-------------

Option	Description
Channel subscription	<p>a. To make sure that updates are automatically offered when an updated version is added to a channel, select Channel subscription. You can choose whether this update occurs automatically with a new version or requires manual approval. If you choose an automatic upgrade strategy through Channel subscription, required downtime might occur before you have a chance to review changes in the new version or fix pack, back up the database, or take other preparatory action. Therefore, for production Maximo Manage deployments, set the approval mode to Manual. You can then be alerted about the availability of an update directly in the IBM® Maximo Application Suite application catalog, in the Maximo Manage tile. However, the update is not started until you trigger it yourself. In this case, you can be better prepared by reviewing the changes, running backups of the Maximo Manage configuration and custom resource definitions, scheduling the update, and communicating the scheduled downtime to users.</p> <p>b. In the Channel field, select a channel.</p> <p>c. In the Custom source field, specify a source.</p> <p>d. In the Channel details section, select whether to approve the update automatically or to require manual approval.</p> <p>e. Click Subscribe to channel.</p>
Manual	<p>a. To manually update the application when you are notified that an updated version is available, select Manual.</p> <p>b. In the Version field, select a version.</p> <p>c. Click Deploy version.</p>

You can monitor the progress of the deployment of the Maximo Manage application in the Application details page. For more information, see the monitoring section in [Deploying and activating Maximo Manage](#).

What to do next

To configure Maximo Manage for use, click Activate to open the activate application page for Maximo Manage.

Configuring the database

You must configure the database connection information for Maximo® Manage.

About this task

Note: For security purposes, it is highly recommended that you use Transport Layer Security (TLS) connection protocols instead of connections that are not secure.

Procedure

1. In the "Integrations and dependencies" section, on the Database connection tile, select Configure.
2. In the Database connection page, click Configure.
3. Under JDBC connection information, specify the following fields:
 - a. If you want to use an SSL-enabled connection, you can specify this field by using one of the following JDBC URL formats. Ensure that the Port that is used contains the SSL-enabled port of the database.

Oracle Database

TCPS is the protocol to use for Oracle SSL connections. For Oracle SSL database connections in Maximo Manage, you must specify `SID=<TNS Service ID>`. You can use the following URL as an example:

```
jdbc:oracle:thin:@(DESCRIPTION=(ADDRESS=(PROTOCOL=TCPS)(Host=mymaximodb.com)(Port=2484))(CONNECT_DATA=(SID=MAXDB)))
```

Microsoft SQL Server Database

For SQL Server SSL database connections in Maximo Manage, you must specify `encrypt=true`. Ensure that you use a semicolon to end the JDBC connection string. You can use the following URL as an example:

```
jdbc:sqlserver://mymaximodb.com:1433;databaseName=MAXDB;encrypt=false;
```

IBM® Db2® database

For Db2 SSL database connections in Maximo Manage, you must specify `sslConnection=true`. Ensure that you use a semicolon to end the JDBC connection string. You can use the following URL as an example:

```
jdbc:db2://mymaximodb.com:50001/MAXDB:sslConnection=true;
```

- i. In the User name field, specify the database username.
- ii. In the Password field, specify the database user password.
- iii. Ensure that you select the SSL Enabled option.

- b. If you want to use non-SSL enabled connection, specify the Connection string field by using one of the following JDBC URL formats, depending on the database you are using.

Oracle Database

You can use the following URL as an example:

```
jdbc:oracle:thin:@mymaximodb.com:1521:MAXDB
```

Microsoft SQL Server database

You can use the following URL as an example:

```
jdbc:sqlserver://mymaximodb.com:1433;databaseName=MAXDB;integratedSecurity=false;encrypt=false;
```

IBM Db2 database

You can use the following URL as an example:

```
jdbc:db2://mymaximodb.com:50001/MAXDB
```

- i. In the User name field, specify the database username.
 - ii. In the Password field, specify the database user password.
 - iii. Ensure that you do not select the SSL Enabled option.
4. Optional: In the "Additional driver options" section, in the Driver options field, add more driver options, which are separated by a semicolon.
- Typically, you can specify JDBC options as part of the URL for the database. However, in some cases you might want to specify JDBC options in the Driver options field.
- For example, your URL might exceed the maximum length that is allowed, or you might want to configure a JDBC option that cannot be included in the connection URL. You cannot specify the same JDBC option in both the URL and the Driver options field. If you do, JDBC driver errors might cause the connection to fail.
- If you specify an extra JDBC option for your database, the CustomProxyDriver acts as a proxy driver that routes the database requests to the actual driver for your type of database.
5. If you chose to use an SSL-enabled database connection, in the "Security > Certificates (optional)" section, click Add+ to display the fields to include in your database certificate.
- a. In the Alias field, specify an alias name to identify the certificate, for example, DB2WHcert.
 - b. In the Certificate content field, copy and paste your certificate in the format that is mentioned in the field content. You can retrieve a PEM certificate for your database. The file must be a Base-64 encoded X.509 file. You do not need to retrieve a private key. For more information, see the documentation for your database. After you copy and paste the text into the field, including the BEGIN CERTIFICATE, and END CERTIFICATE text, click Confirm.
6. Click Save. The Database connection page is closed.
7. Click in the Database connection tile to verify your database connection.
- a. Expand the Status icon that is loading in the "Configuration-scope-Workspace-application" section to display some tiles. Click Select once the Status icon is ready to close the page.
Note: Click Save and Select in the previous step if you do not want to wait for the database connection verification after you complete the fields.
8. If you plan to deploy Maximo Optimizer, see [Deploying Maximo Optimizer](#).

What to do next

Now you can start to select the [Manage components](#).

Selecting Manage components

You can select the version of the Maximo® Manage Base component to deploy and include industry solutions or add-ons and set their respective versions to co-deploy.

Procedure

In the Components section, select the industry solutions or add-ons and the version that you are also activating with Maximo Manage.

- If you select latest from the New version list for the selected industry solution or add-on, the version of the component that is supported by the current Maximo Manage application version is co-deployed with Maximo Manage base component.
Note: If your configurations settings were set to the latest for the components before you upgrade the application, the components will be automatically updated after the upgrade. If you select a specific version instead, then the components are not updated until you change their versions to the current, supported version of the new application version that was now updated, both by selecting the exact version or by selecting latest.
- If you select one component that is going to be deployed by selecting the latest option, you must select latest for any other component you co-deploy. If you select one component that is going to be deployed with an exact version number, you must select the exact version number for any other extra component that you co-deploy. You cannot mix exact version numbers and the latest version in the components you want to co-deploy.
- You also can click in the New version column for a component and select Select version. In the Select unlisted version dialog, you can specify a valid version that is supported by the current application version that is deployed in the Version field and click Save.

For more information, see [Deployment of industry solutions and add-ons](#) section, including access to the compatibility matrix that shows the compatibility between application version and components versions. Some components might not be compatible with each other.

- You also can check the actual supported matrix of your current Maximo Manage application that is deployed and the matrix of compatibility between the components, through the Red Hat® OpenShift® console:
 - a. Go to the Red Hat OpenShift console, in the Workloads/Pods section, select the namespace of your Maximo Manage instance in Projects, for example, `mas-<yourmasinstancename>-manage`, and then click the `ibm-mas-manage-operator-somestring` pod.
 - b. On the Terminal tab, select to connect to webhook container.
 - c. Open the supported matrix JSON file that displays the components version that is supported by each Manage application version and look for the version that you installed. If you are not sure what the version is, click Details and click Manager in the Containers section. The version is displayed in the Image version tab or field. When you go back to the terminal, you can use this command to open the file:

```
cat /manage-admission/metadata/supported-versions-matrix.json
```

The file has a format like this:

```
"8.3.1": [
  {
    "name": "anywhere",
    "versions": [
      "8.0.1",
      "8.0.0"
    ]
  }
]
```

```
]
}
```

Note: In this example, the Manage application version is 8.3.1. The following list shows the Anywhere versions that are supported by this version. When you select latest, the page displays a section that states the current Manage application version:

```
"latest": {
  "base": "8.3.1",
  "anywhere": "8.0.1"
```

- d. Open the dependency matrix JSON file that displays the compatibility between each component by using the following command: **cat dependency-matrix.json** The file displays the components with the following attributes:

```
"aviation": {
  "description": "Maximo Aviation",
  "includesForbidden": [
    "hse",
    "serviceprovider"
  ],
  "includesCoexist": [
    "acm",
    "transportation"
  ],
  "conflict": [
    "civil",
    "health",
    "oilandgas",
    "oracleadapter",
    "nuclear",
    "sapadapter",
    "spatial",
    "utilities"
```

Note: **includesForbidden** The component cannot be co-deployed with the listed components.

includesCoexist The component can be co-deployed with the listed components.

conflict The component cannot be co-deployed with the listed components.

What to do next

Now you can configure [Optimizer](#) or [expand the advanced configuration](#) to specify at least some database configuration parameters.

Expanding the advanced configurations

You must expand the advanced configurations to set additional required and optional settings.

Procedure

1. Click Show advanced settings to view and specify the configuration settings, such as database, server bundle, language settings, and others.
2. In the Database section, clear the System managed checkbox and manually configure the database.

Schema

Enter the name of the schema that is configured in your database. For more database configuration information for Maximo® Manage, see [Setting up your database](#).

Encryption secret (optional)

This value is optional if you are deploying Maximo Manage in your database for the first time, and your database is not encrypted. You must enter your encryption keys for this parameter. For more encryption settings information, see [Database encryption](#). In the Key/Value table, click Add property +. In the Key column, enter `MXE_SECURITY_CRYPTOX_KEY` and in the Value column, enter your encryption key value.

In the Key/Value table, click Add property +. In the Key column, enter `MXE_SECURITY_CRYPTOX_KEY` and in the Value column, enter your encryption key value.

Table space

If the default value does not match your database configuration, enter the name of the table space that was configured in your database. For more database configuration information for Maximo Manage, see [Setting up your database](#).

Index space

If the default value does not match your database configuration, enter the name of the index table space that was configured in your database. For more database configuration information for Maximo Manage, see [Setting up your database](#).

Install demo data

If you are deploying a test or demonstration environment for Maximo Manage, you can install sample data. For more information, see [Demo data](#).

Db2® Vargraphic

If you use Db2 and you plan to install a language other than English for your base language or as an additional language, select this option. If you intend to add more languages later, select this option during your initial deployment. This option does not affect the Maximo Manage deployment if it is selected and you are using a database other than Db2.

Bypass upgrade version check

Select this option to skip validation of the IBM® Maximo Asset Management version you are upgrading to Maximo Manage. Select this option to continue a failed upgrade that failed during the maxinst or updatedb process.

What to do next

Setting the other advanced configurations is optional. You can use the default configurations to activate a standard Maximo Manage deployment. For more information, see [Activating Manage](#). Alternatively, you can customize some or all the options by clearing the System managed checkbox in each configuration and start by [selecting languages](#).

Selecting languages

You can select languages other than English.

Procedure

If you want to set Maximo® Manage with a language different from English or include other languages in your Maximo Manage deployment, clear the System Managed checkbox in the Languages section.

Then, in the Base field, select your preferred language to be the base language and in the Additional field, order the list of other languages. For more information, see [Language support](#).

Note: If you are selecting other languages, make sure that you do not select a language in the Additional field that was selected in the Base field. For example, if you set the base as EN, do not select EN in the Additional field.

What to do next

Now you can [activate](#) Maximo Manage or optionally [set the server bundles](#).

Setting the server bundles

You can configure server bundles for your deployment.

Procedure

1. If you want to deploy Maximo® Manage with more than one server bundle or with customized configurations for it, under the "Server Bundles" section, clear the System managed option.

A table with Name, Pod count, Type, and Additional Properties is displayed. This table has the Default, User synchronization, and Mobile optional fields available.

When you clear the System managed option, a line with the server bundle named as *all* is set with one Pod with the Type *all* and Route subdomain as *all*.

2. Click Add bundle + to add more server bundles.
3. Select which server bundle to set as respectively the Default, the server bundle to be used for user synchronization, and the server bundles for Mobile.
4. Optional: Change the name, pod count, type, route subdomain name and other customized configurations according to your preference.
5. Click the View label under Additional Properties column to view the Route subdomain value.

The Additional server bundle properties page for your selected server bundle is displayed with the Route subdomain and Additional server config fields available and a list of properties you can define by selecting Add property + option in the Bundle level properties table. For more information, see [Server bundle overview](#).

A standard four-bundle setting that you could configure for your deployment would look like:

Figure 1. Four bundle setting

Server bundles

Add the server bundles for your deployment by providing the server bundle name, pod count, and type. You can also add server bundles or increase the pod count after the initial deployment is complete. [Learn more](#)

System managed ⓘ

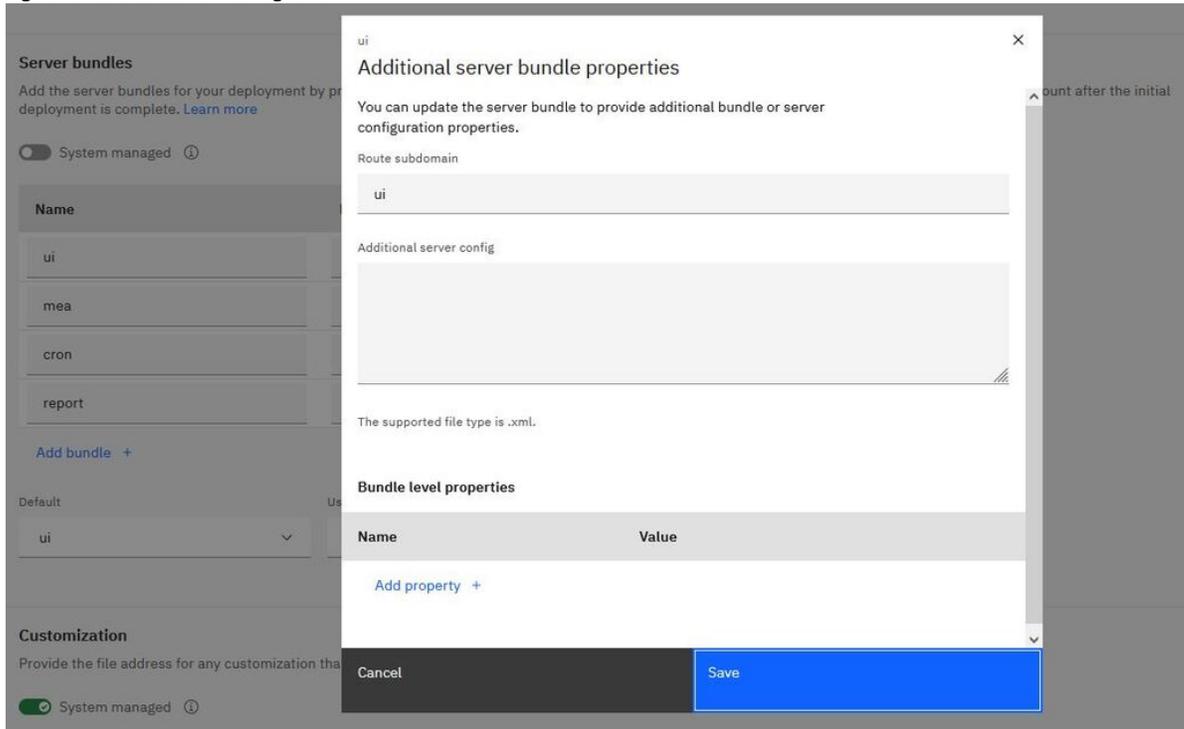
Name	Pod count	Type	Additional properties
ui	1	ui	View
mea	1	mea	View
cron	1	cron	View
report	1	repc	View

[Add bundle +](#)

Default: User synchronization: Mobile (optional):

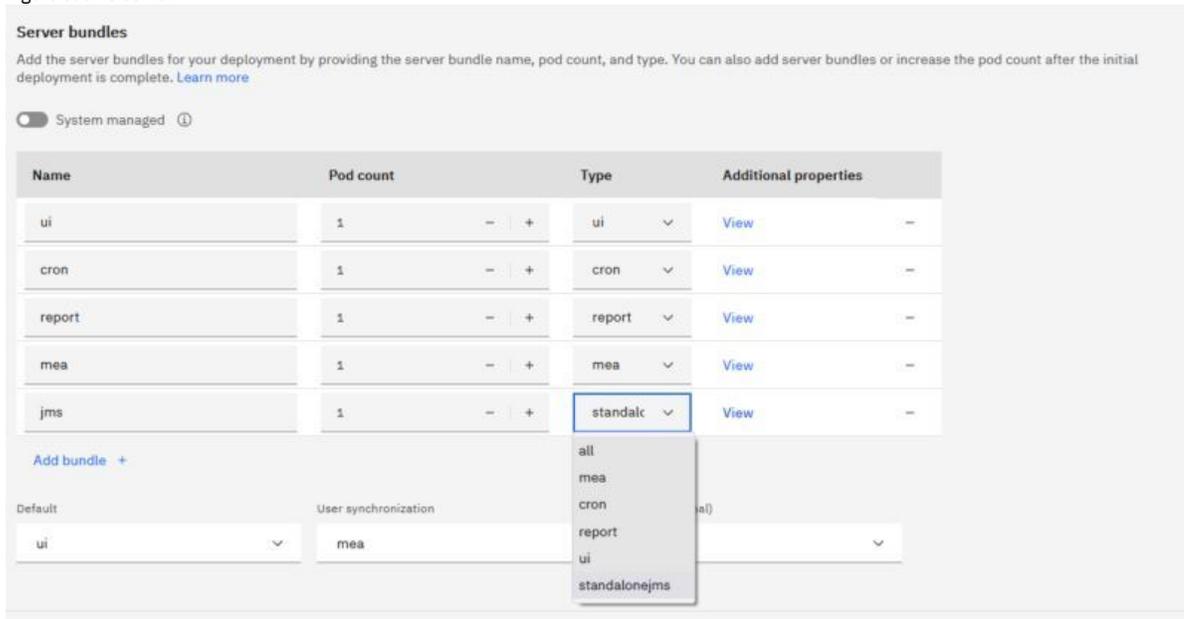
In Figure 1, for each server bundle, the route subdomain name is set with the same name as the server bundle. The route subdomain configuration can also be set like:

Figure 2. Route subdomain configuration



You can also include a stand-alone JMS server. For more information, see [Configuring a JMS server for Maximo Manage](#).

Figure 3. JMS server



What to do next

Now you can [activate](#) Maximo Manage or optionally [set customizations](#).

Setting customizations

You can include specific customizations.

Procedure

1. If you want to include specific customizations through a customization archive, clear the System managed checkbox in the Customizations section. In the File address field, specify the location of the customization archive and if you must enter credentials to access the file, specify them in the Credentials (optional) field. For more information, see the related sections in [Customizing the application](#).

2. In the Customization section of the configuration window, specify the URL for the customization archive file.

The following URL protocols are supported:

- HTTP
- HTTPS
- FTP
- FTPS

To include more customization archive files, click Add customization archive.

3. Optional: If you applied password security to the file, in the Credentials field, specify the user ID and password in the following format:

```
user=your user name password=your password
```

What to do next

Now you can [activate](#) Maximo Manage or optionally [set server mode](#).

Setting server mode

You can set the server mode.

Procedure

If you do not want the server bundles to start after the database operations of the Maximo® Manage deployment are completed, clear the System managed checkbox in the Server mode section.

Then, set Mode to Off to prevent access to the Maximo Manage application after deployment. You can restart the server bundle or bundles when you change the configuration to On and activate Maximo Manage again.

Setting Persistent Volume Claims (PVC)

You can connect to persistent volume claims (PVC).

Procedure

To connect to PVCs under the Persistent volume claims section, clear the System managed to Off, and click Add PVC. A table with the following columns is displayed.

Table 1. PVC details

Option	Description
PVC name	User-defined name of the persistent volume claim, maximum of 63 characters
Volume name	Leave blank as it is provisioned dynamically
Size	Amount of storage that is required for this persistent claim, for example, 60G
Mount path	Mount path for the volume within the Maximo® Manage pod

When you configure the PVCs in OCP cluster on deployments, use the default storage class name `StorageClasses ocs-storagecluster-cephfs` to create a ReadWriteMany (rwx) PVC. The storage in the volume that you provisioned are available to all server bundles in the workspace. You can also configure a PVC for specific server bundles in a deployment. If you configure a PVC for a server bundle, the mount path that you specify for the server bundle PVC overrides the path that you specify for the deployment.

Tip: To configure a PVC in OCP cluster on IBM Cloud® platform, use the default `StorageClasses ibmc-file-gold-gid` (instead of `StorageClasses ocs-storagecluster-cephfs`) to create a ReadWriteMany PVC.

What to do next

Now you can [activate](#) Maximo Manage or optionally, if you selected Asset Configuration Manager or Aviation to be co-deployed with Manage, you can set the [Build data interpreter \(BDI\)](#). If you did not select one of these components, this option is not available to you. In that case, you can [set the build tag](#).

Setting build data interpreter (BDI)

You can set BDI for aviation or ACM components.

Procedure

If you select Asset Configuration Manager or Aviation in the list of components, the "Build data interpreter" section is displayed. If you want to customize the configuration for the build data interpreter (BDI), clear the System managed checkbox. You can then specify a BDI version instead of latest. In the BDI version field, click Add instance+. You can customize each instance by selecting View in the Configuration column. The BDI Configuration page is displayed. You can change and save the configuration. Then, you can return to the BDI configuration page, select Reset to Defaults, and click Save to return to the default settings.

What to do next

Now you can [activate](#) Maximo Manage or optionally, you can [set the build tag](#).

Setting build tag

You can specify an earlier build for deployment.

Procedure

If you want to use an earlier build for deployment, in the Build section, set System managed to Off. Then, in the Build tag field, specify the build tag. Build images are tagged with a timestamp, for example `buildtag: 202011092887843`.

What to do next

Now you can [activate](#) Maximo Manage or optionally, you can [set certificates for integration](#).

Setting certificates for integration

You can connect to external systems using certificates.

Procedure

To connect to any external systems that Maximo® Manage is integrated with, import the certificate for the system.

What to do next

Now you can [activate](#) Maximo Manage or optionally, set the [database server time zone](#).

Setting server time zone

You can specify the time zone of your database server.

Procedure

You might want to specify the time zone that your database server is configured to use. In the "Server time zone" section, clear the System Managed checkbox. In the Time Zone field, select the time zone of your database server.

What to do next

Now you can [activate](#) Maximo Manage or optionally, [set asset investment optimization](#).

Setting asset investment optimization

You can enable asset investment optimization.

Procedure

If you are deploying Maximo® Health as part of Maximo Manage and plan to deploy Maximo Health and Predict - Utilities, If you plan to deploy Maximo Health and Predict - Utilities, enable asset investment optimization. In the "Asset investment optimization" section, clear the System managed checkbox. Then, select Asset investment optimization. When asset investment optimization is enabled, the Asset investment optimizer page is available in Maximo Health and Predict - Utilities. Ensure that you deploy and configure Maximo Scheduler Optimization before you enable asset investment optimization.

What to do next

Now you can [activate](#) Maximo Manage or optionally, set any other advanced configuration option that you want.

Monitoring Manage application deployment by using the Maximo Application Suite interface

You can monitor the Maximo® Manage operator deployment through the Application details page in Maximo Application Suite.

Procedure

If you did not log out, you are now in the Application details page. If you left the page, for example, logged out, access it again by following the steps:

- a. Log on to the Maximo Manage Administration page with your administration user ID and password.
Note: Find the link of the Maximo Manage Administration page by using the Red Hat® OpenShift® console from Networking/Routes. Select `mas-<yourinstancename>-core` in the Project list. The link is under the Location column of the listed routes.
- b. Click the gear icon in the Suite navigator page.
- c. Click Applications option from the menu in the Suite navigator page.
The Maximo Manage application is listed and if the deployment is still under progress, you can see that in the Status column.
- d. Click Manage under the Name column. You are back in the Application details page.
You can see the Application details page with tiles that show the status of each step of the Maximo Manage deployment process.
 - i. In the Operator tile, you can see the version of the Maximo Manage operator that is being deployed.
 - ii. Some messages are displayed inside the tiles while it is in progress and after some time all of them display a green icon to indicate that they are ready and display Activate.
 - iii. Click Activate and follow the steps to configure the application and confirm the activation.

Monitoring Maximo Manage application deployment by using the Red Hat OpenShift console

You can monitor the Maximo Manage operator deployment by using the Red Hat OpenShift console.

Procedure

1. Go to the Red Hat OpenShift console, under Workloads/Pods, select the `mas-<yourinstancename>-manage` namespace in the Project list.
2. Click in the Created column, in the pods list, to change the order of the pods that are displayed to be descending to see the most recent pods created at the beginning of the list.
When Maximo Manage deployment starts, you can see an `ibm-mas-manage-operator` pod and an `ibm-truststore-mgr-controller-manager` pod. After some time, more pods are created like the `usersyncagent`, `groupsyncagent`, and other `entitymgr` pods.
3. Confirm the completion of the Maximo Manage operator deployment by using the Red Hat OpenShift console.
 - a. Go to Administration > Custom Resource Definitions.
 - b. In the Search field of the custom resource definitions list, specify ManageApp and click ManageApp in the Name column of listed custom resource definitions.
 - c. Go to the Instances tab and click the name of the Custom Resource of your instance.
 - d. Check the Conditions section. As soon as you see the Ready line with True in the Status column, Ready in the Reason column, and Ready to enable workspace in the Message column, it means that the Maximo Manage operator deployment is complete and you can configure Manage.
Note: If some error occurred, you can see the error message displayed in the Conditions section. You can also look for error messages in the Red Hat OpenShift console. Go to Workloads/Pods, select `mas-<yourinstancename>-manage` project, click the `ibm-mas-manage-operator` pod, and access the Logs tab. You can download the logs until the current point and then search for keywords like error, FAIL, or FATAL.
 - e. After you confirm that the Maximo Manage operator CR status is ready, you can configure Maximo Manage and activate it.
Note: You might be deploying using some automated deployment mode, where the Maximo Manage configuration was already passed through automation scripts at an earlier point. If that is the case, the deployment process may progress automatically from this point, depending on how your automated process was configured. If that is not the case, the process waits for the configuration to be completed and Maximo Manage to be activated.

Activating Maximo Manage

You must activate Maximo® Manage before you can use it.

About this task

Procedure

1. Review your Maximo Manage configuration and confirm that your settings meet the needs of your Maximo Manage deployment. Then, on the Maximo Manage Activation page, click Activate.
Note: You might see a warning message to confirm the activation with incomplete prerequisites. For example, a message is displayed when you do not include the database settings for database configuration. In this case, select Configure and add your [database configuration](#).
You can monitor the Maximo Manage activation progress in the Workspace details page. For more information, see the monitoring section in [Deploying and activating Maximo Manage](#).
2. In the Confirmation page, you can expand the Summary to reconfigure view and then click Activate on this screen to start the activation process. The Maximo Manage Workspace Details page is displayed. You can now monitor the Activation process.
Note: You can reconfigure the activation process as needed. Follow these steps.
 - a. Select Actions, > Workspace Details, > Update configuration.
 - b. Select the specific configuration that you want to change in the Update Manage Configuration screen.
The configuration option is displayed again in the screen. You can reconfigure that option and other options as you need.
 - c. Click Activate again.
If you click Exit, you are redirected again to the Application Details page. You can continue to monitor the status through this screen, scrolling down the page to see the Workspace Activation detailed process, or under Activate in workspace, you can click Go to workspace details page link.

Results

Maximo Manage is activated, the second part of its deployment process starts, and is eventually completed. To access Maximo Manage, first you must configure at least the admin user to have permission to access Maximo Manage so that you can connect to Maximo Manage with it.

What to do next

Do the post-deployment configuration, such as giving permission to the Maximo Manage admin user to connect to Maximo Manage. After the Maximo Manage admin user is synchronized, log out and log in again to Maximo Application Suite with the admin user and access Maximo Manage.

If you deployed Maximo Health as part of Maximo Manage, after the applications are activated, you must configure some system properties. For more information, see the [Configuring the system properties](#).

When new versions are available, system administrators can update the deployed application. To update to a new version, in Maximo Application Suite, go to Suite administration, select Applications from the side navigation menu, and click Update available for ManageMaximo Health.

When updates are required, system administrators can also reconfigure and update initial implementations on the Manage workspace detailsMaximo Health page. To reconfigure and update changes, select Workspaces from the side navigation menu, and click ManageMaximo Health. On the Manage workspace detailsMaximo Health page, click Actions, and select Update configuration.

- [IBM Maximo Manage tool](#)
When Maximo Manage is deployed, some tools become available.

IBM Maximo Manage tool

When Maximo® Manage is deployed, some tools become available.

- An admin pod gets deployed when Maximo Manage is deployed.
- The command "`kubectl exec`" can be run on the admin pod container or directly use the container console to run the tools such as integrity checker.
- Tools logged to stdout are forwarded to Elasticsearch, Fluentd, and Kibana (EFK) stack, if configured.

Monitoring Maximo Manage activation by using the Maximo Application Suite interface

Monitor the IBM® Maximo Manage activation from the Maximo Application Suite user interface.

Procedure

Monitor the Maximo Manage activation through the Manage Status page in the Maximo Application Suite.

- a. If you didn't log out and are following the previous step by step to deploy Maximo Manage, you are now in the Workspace details page. But if you leave the page, you can access it again by following these steps:
 - i. Login in the Maximo Application Suite Administration page with your administrator username and password.
Tip: You can find the link of the Administration page in the Red Hat® OpenShift® console from Networking > Routes > Projects and select `mas-
<yourinstancename>-core`. The link is under the Location column of the listed routes.
You are redirected to the Maximo Application Suite navigator page.
 - ii. In the Maximo Application Suite, click the gear icon to go to the Administration page, then click the Applications tile.
You can see the Maximo Manage application, and if the deployment is in progress, you can see that in the Status column.
 - iii. Select the Maximo Manage application.
 - iv. Under Active in workspaces section, click the Go to workspace details page link.
 - v. The status of each step of the Maximo Manage activation process is shown in the tiles view.
 1. Detailed information such as the current activation status beginning with the build in progress, phase of deployment process where the Maximo Manage image is created, the ear or war files are generated to deploy the application in the Server Bundle later, and the Server Bundle images are created is shown.
 2. When the build is completed, a green icon and a message with the build tag is shown on the Workspace tile.
 3. After some minutes, the Deployment ready tile starts to change the message displayed and eventually shows the `maxinst/updatedb` is in progress.
 4. After the `maxinst/updatedb` process is completed, the server bundles are started, deploying the Maximo Manage war or ear files. When this last deployment step is completed, you can see all tiles displaying green icons and all the Maximo Manage components in Ready status. The Maximo Manage tile also displays a green icon and Active status.

Monitoring Maximo Manage activation by using the Red Hat OpenShift console

Procedure

After the Maximo Manage activation starts, confirm if the ManageWorkspace cr of the Maximo Manage instance is created from the Red Hat OpenShift web console.

- a. Go to Red Hat OpenShift console Administration > Custom Resource Definitions.
- b. In the CRD list search field type *ManageWorkspace*, click *ManageWorkspace* under the Name column of the listed CRD's.
- c. Go to the Instances tab and click in the Name of the cr of your instance.

For Amazon Web Services customer-managed automated deployment, the name is *mas-`<uniqueid>-wsmasocp`*.

- d. Check the section conditions.

In case you see error messages wait some minutes to see if they are not solved automatically by the Maximo Manage operator. Go to Workloads > Pods view in Red Hat OpenShift console and check whether the new pod *admin-build-config* was started after some time. Otherwise, review the logs of the *entity-mgr-ws* pod, looking for keywords like "error", *FAIL*, *FATAL* strings. These messages might clarify the reason that the process is stuck.

- e. If no errors occurred at preventing the deployment process to move, forward after activation, an *admin-build-config* pod is created where the Maximo Manage image is created based on settings that you chose.

Tip:

- You can check the progress of the build of the image by clicking the name of the *admin-build-config* pod and going to the Logs tab. You can view the Log stream or download the full logs during the process. You can view the information about the image version being pulled and built, and messages that are related to the generation of war or ear files that are used for the deployment in the server bundle pod later.
- If it takes too long to view the *admin-build-config* pod that is being created, you can access other pod, *entitymgr-ws* pod, and its tab Logs, and look for error messages in that log (look for "level": "error", *FATAL*, *FAIL*, or error strings).

- f. After the *admin-build-config* pod changes its status to complete, the server bundle build config pods are created. Their quantity and names might vary depending on how you configure the server bundle options before activating Maximo Manage. After some minutes the pod or pods change status to Complete, and the deployment process creates the *maxinst* pod, which installs Maximo Manage in the previously configured database.

- i. You can monitor the status of these additional build config pods by accessing the Red Hat OpenShift console, Workloads > Pods > Project and selecting the *mas-`<yourinstance>-manage`* namespace.

Tip: Click in the Created column by sorting on descending order so you see the latest pod created in the top of the list of pods displayed.

- ii. If your existent database is empty, the *maxinst* pod installs a new database. Otherwise, the *maxinst* pod performs validation that updates the database if updates are supported in that version.

Tip:

- You can check the progress of the *maxinst* process, or *updatedb* process through the *maxinst* pod, by accessing the pod and going to the Logs tab. After some time, the logs should start to move fast showing several commands and output of scripts running. You also can go to the Terminal tab and type these commands that will show you the latest logs been updated along the process:
 - `cd log`
 - `ls -ltr`
- If it is taking too much time to update the Logs tab after the *maxinst* pod is created, you can check the *entity-mgr-ws* pod, on its tab Logs, looking for keywords like "level": "error", *FAIL*, *FATAL*. You also can search for *ManageDeployment* crd through Administration/Custom Resource Definition in the Openshift console, clicking on its name, going to the Instance tab and clicking in the cr of your instance (the name should be *manage-maxinst* and the namespace column should show the namespace of your Manage instance). Then, you can go to its Conditions section and check if there is any error message.
- If completed successfully, after some time (this may take a couple of hours or more depending of your specific configuration chosen for the deployment), you should see a message "maximo install/ update completed." as one of the latest messages shown in the tab Logs of the *maxinst* pod.

- g. After completing the *maxinst* process, its pod continues to show the status Running, but after some time, new server bundle pods are created. If you sorted the Pods view in descending order, these new pods appear listed in the top of the *maxinst* pod. Their names and number may vary depending on how you configured them before activating Maximo Manage. As soon as all the containers of each one of these server bundle pods appear as ready (usually you will see 2/2 under the Ready column of the pod view in standard server bundle configuration which uses only one pod), the Maximo Manage deployment has been completed.

Tip:

- If you go to Administration/Custom Resource Definitions through the Openshift console, search for *ManageWorkspace*, click on its name and move to the tab Instances, then select the cr of your Maximo Manage instance, checking the Conditions, when all done you should see:
 - Line Ready with the column Status True, Reason Ready and Message: "Manage deployed in workspace `<yourworkspace>`"
 - Line Failure with the status False
 - Line BuildReady with the status Build completed.
 - DeploymentReady with the status True and Reason Ready and Message: "UpdateDB/Maxinst Completed, all - X of X pods ready..." specifying that the *updatedb* or *maxinst* done was completed and the server bundle are all started and ready.
- You can check the logs of the server bundle pod (or pods) looking for error messages in case it does not become ready after several minutes. You can also check the logs of the *entity-mgr-ws* pod looking for error messages in case it does not become ready after several minutes.

Configuring Maximo Manage after deployment

You must give users access to the and application. Application administrators can configure the application to set up the required data structure for managing assets, including an organization, general ledger account structure, and configuring email notifications. You can also perform other post-deployment configurations.

- [Administering users](#)
Maximo Manage users are created and authenticated in Maximo Application Suite. User data is synchronized to Maximo Manage at scheduled intervals.
- [Configuring initial data after deployment](#)
After Maximo Manage is deployed, you must complete several data configuration tasks before you use Maximo Manage.
- [Changing database credentials](#)

If you change the username and password of your database after you deploy Maximo Manage, you must update the database connection in Maximo Application Suite to synchronize the change to the new credentials and prevent database connection errors.

Administering users

Maximo® Manage users are created and authenticated in Maximo Application Suite. User data is synchronized to Maximo Manage at scheduled intervals.

For more information about administering users, see the following topics:

- [Administering user access in Maximo Application Suite](#)
- [Configuring authentication in Maximo Application Suite](#)
- [Understanding application points](#)

Configuring initial data after deployment

After Maximo® Manage is deployed, you must complete several data configuration tasks before you use Maximo Manage.

Before you begin

- Create security groups and add users to the security groups.
- If you are using a directory server as part of your deployment, ensure that the user names are created in your LDAP repository.
- To ensure that you have the accounting information that you need, consult your organization's financial department.

Procedure

- To send users email notifications of system events, first [configure the SMTP server in Maximo Application Suite](#) and then enable the mail.smtp.host and mx.adminEmail system properties in Maximo Manage.
 - From the Go To menu, select System Configuration > Platform Configuration > System Properties.
 - In the Global Properties section, use the filter feature to search for and expand the mail.smtp.host property.
 - In the Global Value field, specify the SMTP host name.
 - Select the mail.smtp.host check box.
 - From the Common Actions menu, select Live Refresh and click OK.
 - In the Global Properties section, use the filter feature to search for the mx.adminEmail property.
 - Expand the mx.adminEmail property and in the Global Value field, specify the email address for the user.
 - Select the mx.adminEmail record check box.
 - From the Common Actions menu, select Live Refresh and click OK.
- Define a currency code.
 - From the Go To menu, select Financial > Currency Codes
 - Add a row and specify a currency code and a description.
For example, enter USD for United States of America Dollar.
- Define item sets and company sets.
 - From the Go To menu, select Administration > Sets.
 - Add a row and specify an item set name.
For example, enter IT Items.
 - In the Type field, specify ITEM.
 - Add a row and specify a company set name.
For example, enter IT Comps.
 - In the Type field, specify COMPANY and save your changes.
- Create an organization.
 - From the Go To menu, select Administration > Organizations.
 - From the toolbar, click New Organization and specify an organization name and a long description.
For example, enter EAGLENA.
 - Specify the base currency that you defined in step 3.
 - Specify the item set and the company set that you defined in step 4.
 - In the Default Item Status field, set the status to PENDING.
 - Click the Sites tab and in the Sites section, select New Row and specify a site name.
For example, enter Factory01 and enter a long description.
- Create a general ledger account component.
 - From the Go To menu, select System Configuration > Platform Configuration > Database Configuration.
 - From the More Actions menu, select GL Account Configuration.
 - Add a row and specify a component name, length for the component, and a type for the component.
For example, enter the name MYCOMPONENT, the length 5, and the type Alphanumeric.
- Apply changes to the database.
 - From the More Actions menu, select Manage Admin Mode.
 - Select Turn Admin Mode ON and click OK.
This task takes several minutes to complete. You can click Refresh Status to view the progress.
 - From the More Actions menu, select Apply Configuration Changes.
Ensure that the status To Be Changed does not appear in the status column of the listed objects.
 - From the More Actions menu, select Manage Admin Mode.
 - Select Turn Admin Mode OFF and click OK.
If you do not turn off Admin Mode, cron tasks fail.
- Create a general ledger account.
 - From the Go To menu, select Financial > Chart of Accounts.
 - In the Organizations section, select your organization.
 - From the More Actions menu, select GL Component Maintenance.
 - In the Components section select the component that you entered in step 6.
 - Add a row and specify a GL component value and a description, and then click OK.
 - In the GL Accounts section, add a row and specify a general ledger account.
 - From the Go To menu, select Administration > Organizations.
 - Find your organization and select the record.
 - In the Clearing Account field, specify the general ledger account that you created.

- j. Select Active and save your changes.
8. Authorize a security group to modify a general ledger component type.
 - a. From the Go To menu, select Security >> Security Groups.
 - b. Select the group that provides authorization.
For example, select FINANCE.
 - c. On the GL Components tab, for each GL component, select the Authorized check box.
 - d. For each GL Component that is listed, select the Authorized check box and save your changes.
You can select Authorize Group to Change All GL Component Types.
9. Update the company-related accounts.
 - a. From the Go To menu, select Financials >> Chart of Accounts.
 - b. Select your organization and from the More Actions menu, select Company-Related Accounts.
 - c. Click New Row and specify the company type *Courier*.
 - d. Enter an account number in the RBNI Account, AP Suspense Account, and AP Control Account fields.
You can specify the same account number in each field.
 - e. Click OK.
 - f. From the More Actions menu, select Update Database and click OK.
10. Create a default insert site.
 - a. From the Go To menu, select Security >> Users.
 - b. Find maxadmin and select the record.
 - c. In the Default Insert Site field, specify the site name that you created in step 5.
 - d. In the Storeroom Site for Self-Service Requisitions field, specify the same site name.
 - e. Click Save User.
11. Define work types, denote the importance of the work task.
 - a. From the Go To menu, select Administration >> Organizations.
 - b. Find your organization and select the record.
 - c. From the More Actions menu, select Work Order Options >> Work Type.
 - d. Click New Row.
 - e. In the Work Order Class field, select *WORKORDER* and specify a Work Type..
For example, enter *MAJOR*.
 - f. Set the start status to In Progress.
 - g. Set the complete status to Completed.
 - h. Click New Row and repeat steps f-i to create another work order class that has a different work type.
For example, enter *MINOR*.
 - i. Click New Row and repeat steps f-i to create a *CHANGE* work order class that has a different work type.
For example, enter *SIG* to represent a significant change.
 - j. Click OK and click Save Organization.

Changing database credentials

If you change the username and password of your database after you deploy Maximo® Manage, you must update the database connection in Maximo Application Suite to synchronize the change to the new credentials and prevent database connection errors.

Procedure

1. Log in to Maximo Application Suite as a system administrator.
2. From Suite administration, select Workspaces from the side navigation menu and then select the Manage tile.
3. On the Manage workspace details page, click Actions and select Update configuration.
4. Click the Edit icon for Database connection.
5. On the Database connection tile, in the Integrations and dependencies section, select View and click the edit configuration icon.
6. Enter the new database username and password and save your changes.
7. Click Apply changes to update the deployment with the new database credentials.

Upgrading from IBM Maximo Enterprise Asset Management to IBM Maximo Manage

Previously known as Maximo® Enterprise Asset Management, Maximo Manage is part of IBM® Maximo Application Suite and has enhanced and new features.

Maximo Asset Management 7.6.1.10 or 7.6.1.2 or later is required before you upgrade to Maximo Manage.

Maximo Mobile is a next-generation mobile application platform that allows users to securely access Maximo Manage functionality from a mobile device. For more information about Maximo Mobile, see [Managing Maximo Mobile](#).

- [Maximo Manage in Maximo Application Suite overview](#)
In Maximo Application Suite, Maximo Enterprise Asset Management is named Maximo Manage.
- [Enterprise Asset Management to IBM Maximo Manage summary](#)
Maximo Manage adds enhancements and introduces new features to support integration.
- [Architecture and deployment models](#)
Explanation of the architecture of IBM Maximo Application Suite, and deployment models for IBM Maximo Manage and Maximo Enterprise Asset Management.

- [Upgrading the Maximo environment](#)
Prerequisites, process, considerations, checking deployment status, results and how to manage users post upgrade.
- [Configuring Maximo Manage for upgrade](#)
Information on how to configure IBM Maximo Manage and connectors, customization capabilities, and how to manage users, security, and licenses.
- [Useful information](#)
Additional information regarding lic licensing model, docker image, how to add third-party JAR files, and debugging.

Maximo Manage in Maximo Application Suite overview

In Maximo® Application Suite, Maximo Enterprise Asset Management is named Maximo Manage.

IBM® Maximo Application Suite is an integrated suite of applications that is built on Red Hat® OpenShift® environment to provide multi-cloud portability, including support for Hybrid Cloud or On-premises deployments. For more information, see [IBM Maximo Application Suite architecture](#).

Maximo Application Suite also contains other applications such as IBM Maximo Health, IBM Maximo Predict, and IBM Maximo Monitor.

Maximo Application Suite is based on the Red Hat OpenShift deployment model. Red Hat OpenShift is a platform-as-a-service system that is built around containers and uses container orchestration that is provided by Kubernetes. It is designed to integrate well with IBM Cloud Pak® for Data components.

This document provides information about the technical consideration and the upgrade process from Maximo Asset Management to Maximo Manage in Maximo Application Suite.

After you upgrade to Maximo Manage, user licenses are managed in Maximo Application Suite.

- In IBM Maximo Application Suite, subscription term or perpetual license is managed through app points.
 - Contact IBM account team about app points and IBM Maximo Application Suite license file.
 - Buy a pool of app points.
 - The same app points can be applied to any application in IBM Maximo Application Suite.
 - For more information, see [Administering license and app points](#).

Available user entitlements:

- Limited
- Base
- Premium
- Self-Service

Enterprise Asset Management to IBM Maximo Manage summary

Maximo® Manage adds enhancements and introduces new features to support integration.

Overall changes to Enterprise Asset Management

Your current Enterprise Asset Management database is upgraded to Maximo Manage database.

In Maximo Enterprise Asset Management, authentication and user management are configured through Enterprise Asset Management or application server level. In Maximo Manage, the authentication is configured at the IBM® Maximo Application Suite level.

Deployment is now based on Red Hat® OpenShift®.

Technology changes

The Red Hat OpenShift operator does the installation, configuration, deployment, and upgrade.

For more information, see [Red Hat OpenShift deployment](#).

Authentication and user management

The authentication and user management are configured in Maximo Application Suite. All users are synchronized into Maximo Manage from Maximo Application Suite.

For more information, see [Authentication and user management](#).

Application server

WebSphere® Application Server Liberty is used as a runtime to run the code in a containerized environment in Red Hat OpenShift. WebSphere Application Server Network Deployment and WebLogic Server are not supported.

Integration

REST API replaces RMI.

For more information, see [REST API replacing RMI](#).

Message queue

If you are using SIBus, migrate to Kafka or any other supported JMS provider.

For more information, see [Migrating to Kafka](#).

For more information, see [Migrating to JMS provider](#).

Modernized user experience

Maximo Manage has a new appearance and navigation, and new mobile experience.

Serviceability

Maximo Manage has logging options like Elasticsearch, Fluentd, and Banana, and monitoring options like Prometheus and Grafana. For more information about logging and monitoring options, see the following topics.

- [Maximo Manage logging](#)
- [Monitoring](#)

Architecture and deployment models

Explanation of the architecture of IBM® Maximo® Application Suite, and deployment models for IBM Maximo Manage and Maximo Enterprise Asset Management.

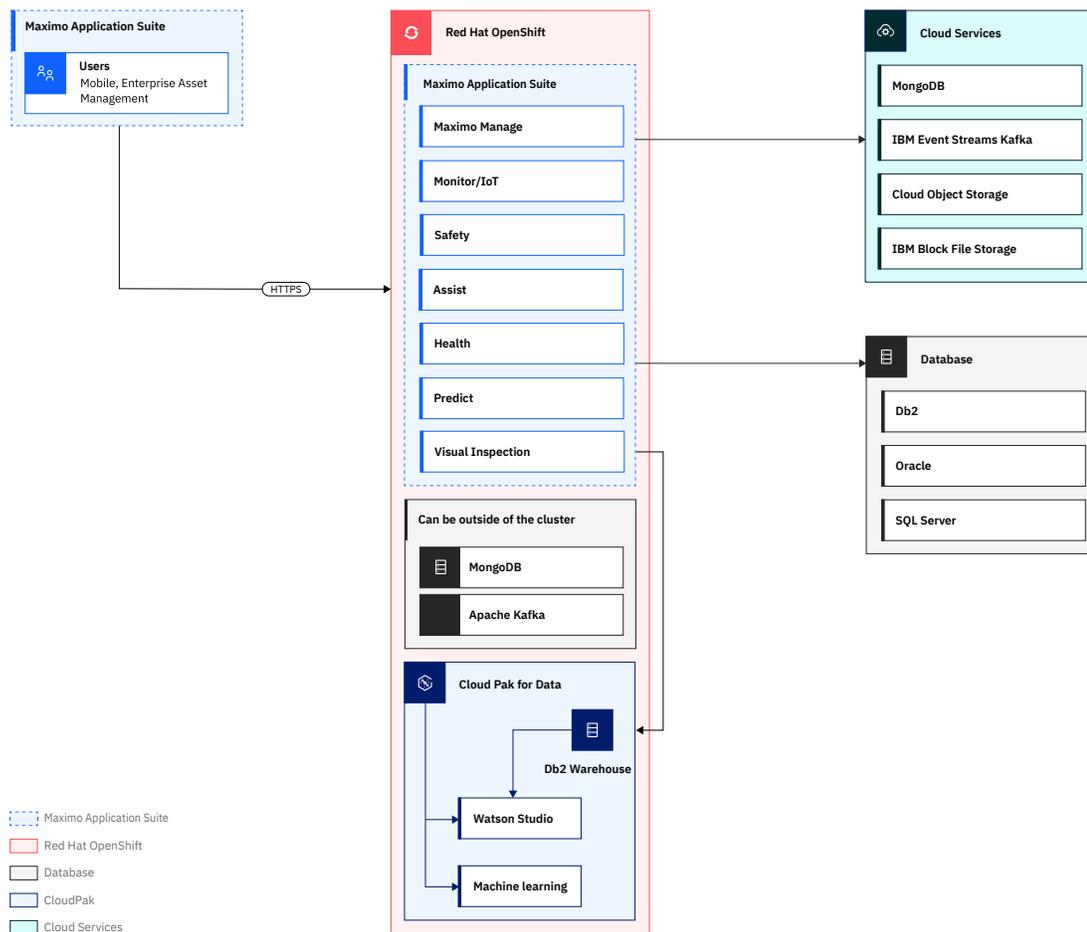
- **IBM Maximo Application Suite architecture**
IBM Maximo Application Suite helps drive operational resiliency and reliability. With expanded access to enterprise asset management, Maximo Manage, Maximo Health, Maximo Predict, Maximo Monitor, and Maximo Asset Performance Management On-Premises applications, your team can reach across the enterprise to unify operations and maintain business continuity.
- **Maximo Manage deployment model**
In Maximo Manage deployment is done in Red Hat® OpenShift® clusters.
- **Maximo Asset Management deployment**
Deployment and explanation of Maximo Asset Management 7.6.
- **Maximo Manage deployment in Red Hat OpenShift Container Platform**
When you deploy Maximo Manage in Red Hat OpenShift Container Platform, the Maximo Manage operator pulls the images from the IBM Entitled Registry and, if any customization exists, pulls the customization archive from the customer repository. The operator builds an Maximo Manage administrative image and configures images or workloads, such as UI, Cron, BIRT reporting.

IBM Maximo Application Suite architecture

IBM® Maximo® Application Suite helps drive operational resiliency and reliability. With expanded access to enterprise asset management, Maximo Manage, Maximo Health, Maximo Predict, Maximo Monitor, and Maximo Asset Performance Management On-Premises applications, your team can reach across the enterprise to unify operations and maintain business continuity.

Maximo Application Suite has the following capabilities:

- Integrated suite of applications. For example, Maximo Manage, Maximo Health, Maximo Predict, and Maximo Monitor.
- Simplified licensing model.
- Hybrid-cloud deployment.
- Comprehensive view of your assets.



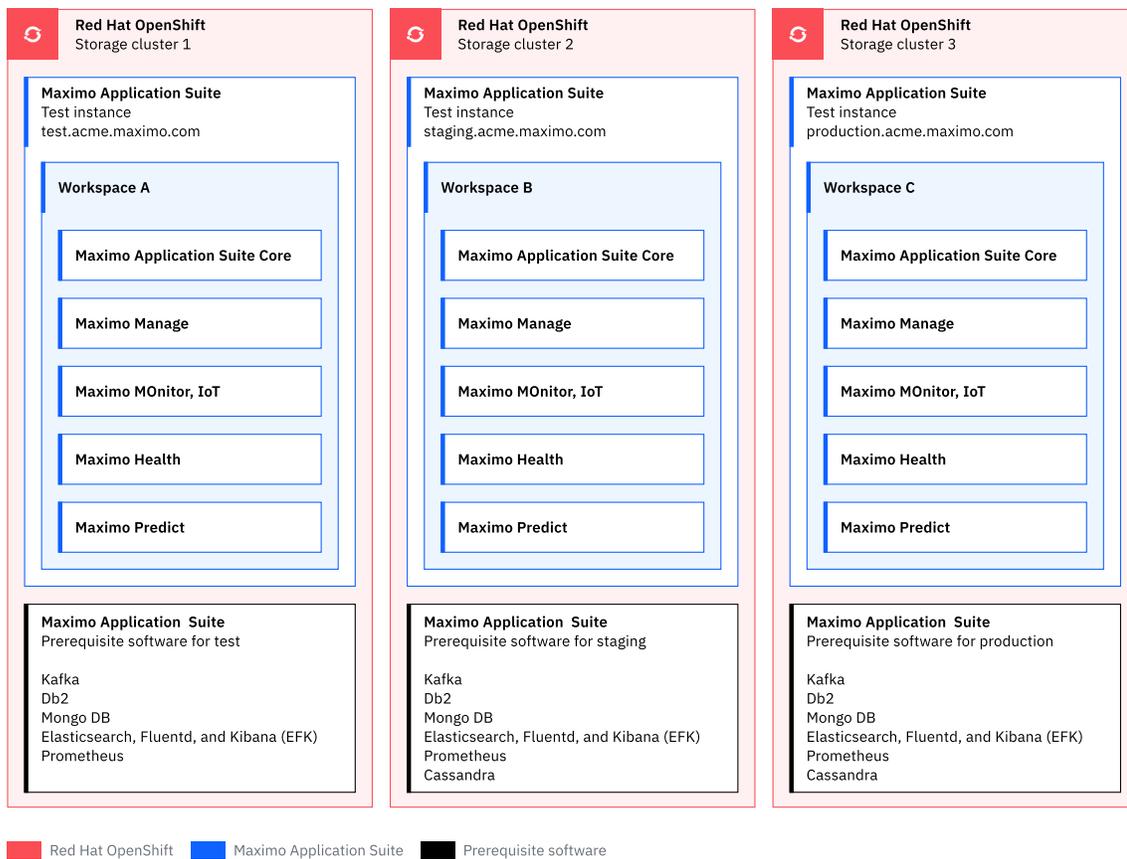
- Maximo Application Suite includes applications, such as Maximo Manage, Maximo Monitor, Maximo Health, Maximo Predict, Maximo Visual Inspection, Maximo Assist, and Maximo MRO Inventory Optimization.
- [IBM Cloud Pak® for Data](#) can run on your Red Hat® OpenShift® cluster. It offers AI-infused services for business and IT operations, development, data science, and management.
Note: If you intend to integrate Maximo Manage with other application suites, you must install [IBM Cloud Pak for Data](#). Otherwise, install only the IBM Db2® Warehouse stand-alone operator that can be one of the supported database options for Maximo Manage.
- MongoDB can exist in a cluster, cloud, or outside a cluster.
 - User, application, and entitlement metadata, such as OpenID Connect (OIDC) registration and user management is stored in MongoDB.
- IBM Event Streams is a fully managed Apache Kafka-As-A-Service Platform for Cloud. The Maximo Manage application in the suite can be configured to use Kafka service.
- Maximo Manage support for all three databases, such as IBM Db2, Oracle Database, and Microsoft SQL Server.
- Maximo Manage can be configured to use cloud services, such as Cloud Object Storage, block, or file storage.

Maximo Manage deployment model

In Maximo® Manage deployment is done in Red Hat® OpenShift® clusters.

The following diagram shows a sample Maximo Manage deployment model.

Figure 1. Maximo Manage deployment model sample



- Each cluster can run multiple Maximo Application Suite instances.
- Each instance runs its own set of pods and runtime code.
- All instances within the cluster can share a license pool.
- Each instance has its own workloads.
- Worker nodes capacity management is done per instance.
- Prerequisites stack is defined at the instance level.
- Independent storage clusters per instance.

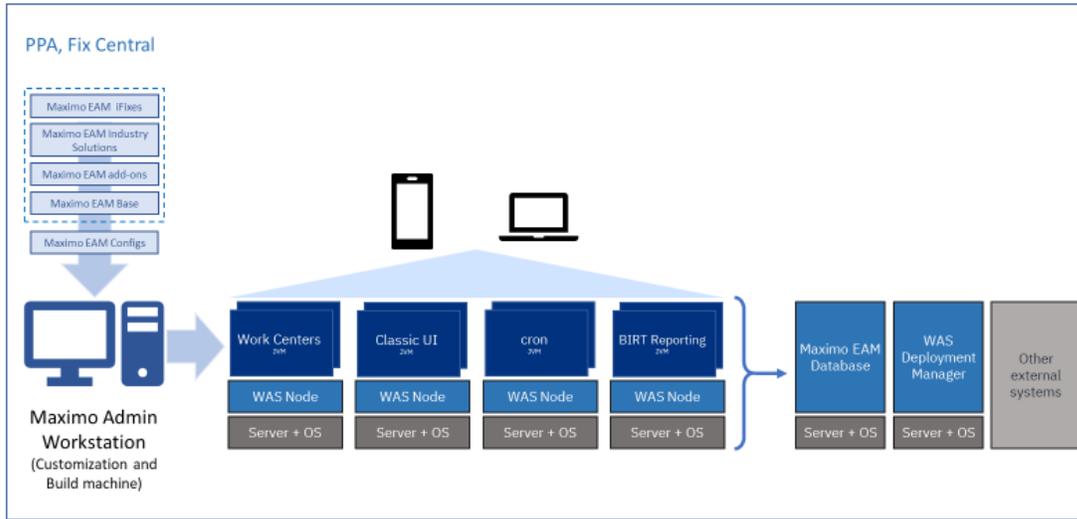
Maximo Asset Management deployment

Deployment and explanation of Maximo® Asset Management 7.6.

In Maximo Asset Management deployment, the software is downloaded on the admin workstation. The ear and war files are generated on the admin workstation and deployed on an application server. In this deployment example, the cluster is running multiple servers for Classic UI, Work Centers, Cron, and BIRT reporting to distribute the load in a WebSphere® Application Server Network Deployment. The Maximo Asset Management database and other external systems for integration are running on separate servers.

The following architectural diagram shows a typical Maximo Asset Management 7.6 deployment.

Figure 1. Maximo Asset Management 7.6 deployment architecture



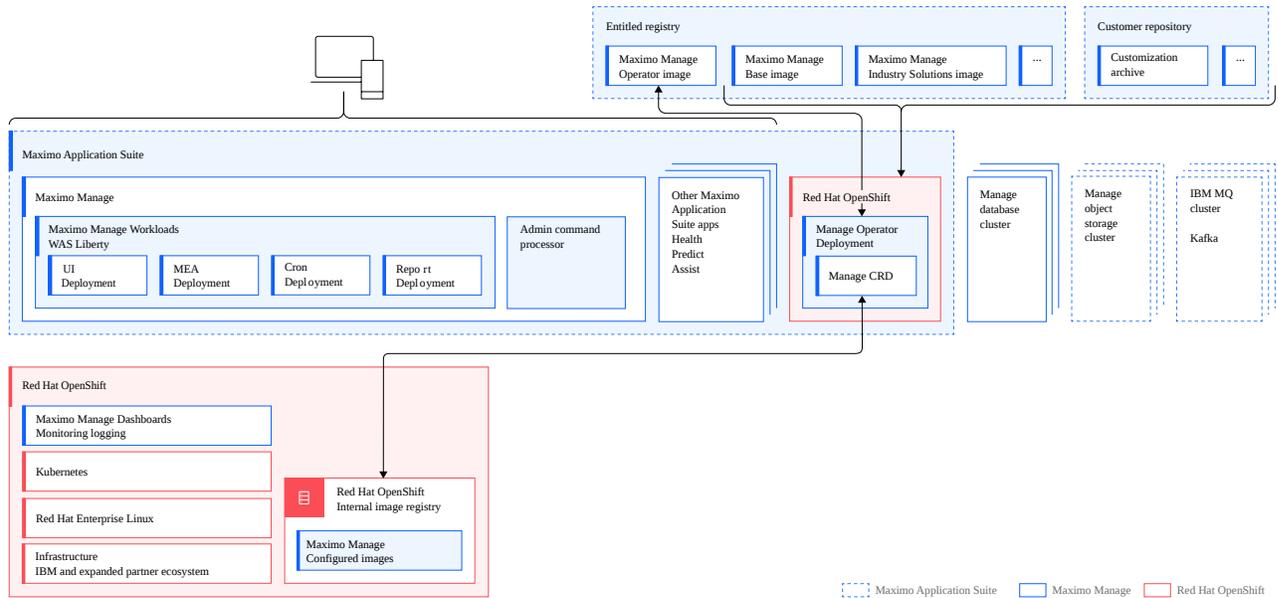
Maximo Manage deployment in Red Hat OpenShift Container Platform

When you deploy Maximo® Manage in Red Hat® OpenShift® Container Platform, the Maximo Manage operator pulls the images from the IBM Entitled Registry and, if any customization exists, pulls the customization archive from the customer repository. The operator builds an Maximo Manage administrative image and configures images or workloads, such as UI, Cron, BIRT reporting.

The configured images and workloads are deployed to the Maximo Application Suite containers.

The built images are stored in the Red Hat OpenShift internal image registry repository.

The following diagram shows an example of a Maximo Manage application deployment in Red Hat OpenShift Container Platform:



Red Hat OpenShift

Red Hat OpenShift contains the infrastructure layer, a Red Hat Enterprise Linux® operating system, Kubernetes software for deploying and managing containers, and an internal image registry to store Maximo Manage configured images and services. Maximo Manage dashboards are provided in Red Hat OpenShift. You can use the dashboards to review logs and monitor Red Hat OpenShift and other applications that are deployed in Maximo Application Suite.

Images

The images for the Maximo Manage operator, Maximo Manage base, industry solutions, and add-ons are provided by the Entitled Registry. These images contain software application classes, deployment descriptors, XML, and scripts.

Maximo Manage operator

The Maximo Manage operator is similar to an installer. The operator pulls the images from the Entitled Registry. This process is similar to downloading software from Passport Advantage® and Fix Central.

Maximo Manage workloads or server bundles

Maximo Manage supports All, UI, Cron, Report, and Maximo Enterprise Adapter workloads. You can configure the workloads during the application deployment. In the diagram, the UI, Cron, Report, and Maximo Enterprise Adapter workloads are deployed.

Customization archive

The customization archive is stored in the customer repository and can be accessed from Maximo Application Suite by using HTTPS.

Admin command processor

The admin command processor pod runs Maximo Manage tools, such as the integrity checker.

Other Maximo Application Suite applications

You can deploy other Maximo Application Suite applications, such as Maximo Assist, Maximo Health, Maximo Predict, and Maximo Monitor.

Maximo Manage database

You can deploy the Maximo Manage database, such as IBM® Db2® Warehouse, in a cluster.

Maximo Manage object storage

You can configure IBM Cloud Object Storage for document storage. For example, you can configure doc-links to use IBM Cloud Object Storage for storing documents.

Maximo Manage IBM MQ or Kafka

You can configure a messaging provider, such as JMS, IBM MQ, or Kafka, in a cluster.

Deployment from operator

The following steps describe how Maximo Manage is deployed by using the operator:

1. Create a custom resource (CR).

An administrator selects, configures, and deploys the Maximo Manage application. The deployment creates a CR. A CR contains a user-entered configuration for the application, for example, the name, version, number of pods, database type and connection, type of workloads, and location of customization archive.

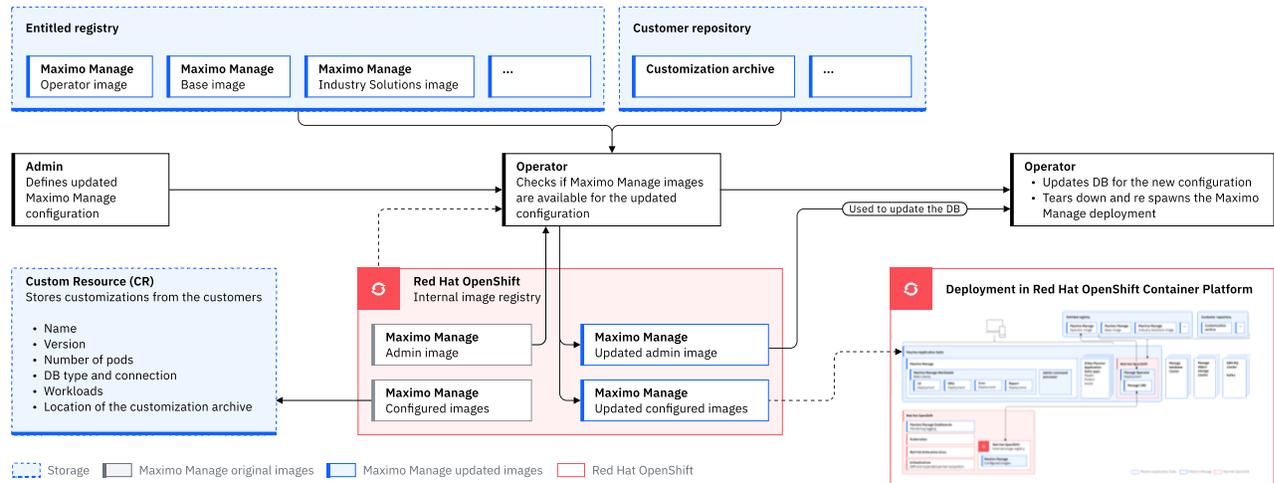
2. Create the image.

The Maximo Manage operator pulls the images from the Entitled Registry and, if any customization exists, pulls the customization archive from the customer repository. The operator deploys the industry solutions or add-on images and the customization archive over the Maximo Manage base image to create the final images. The operator also validates for the dependency matrix. The operator creates an Maximo Manage administrative image and the Maximo Manage configured images or workloads. The final images are stored in the image registry repository.

3. Update the configuration.

If the Maximo Manage database does not exist, the operator installs the Maximo Manage administrator image. If the database does exist, the operator upgrades the Maximo Manage database for a new configuration and restarts the Maximo Manage deployment. Maximo Manage configured images or workloads are deployed to containers in Maximo Application Suite.

The following diagram shows how the operator is used to deploy Maximo Manage.



Upgrading the Maximo environment

Prerequisites, process, considerations, checking deployment status, results and how to manage users post upgrade.

- [Upgrade prerequisites](#)
Check your Maximo Asset Management version and get your environment ready for upgrading by configuring your Red Hat® OpenShift® cluster.
- [Upgrade process overview](#)
The IBM Maximo Application Suite upgrade process consists of an initial test deployment, which is followed by the production deployment after successful testing. Install and configure Maximo Application Suite, create a customization archive if you find it necessary, and finally deploy and activate Maximo Manage.
- [Authentication, security, and SMTP configuration](#)
Before you upgrade to Maximo Manage, you must be familiar with authentication, encryption and security, and SMTP configuration.
- [Upgrading to IBM Maximo Application Suite](#)
You can upgrade to IBM Maximo Application Suite and then activate and deploy Maximo Manage.
- [Managing users post upgrade](#)
User management and consumption reports in IBM Maximo Application Suite.

Upgrade prerequisites

Check your Maximo® Asset Management version and get your environment ready for upgrading by configuring your Red Hat® OpenShift® cluster.

Product version and Red Hat OpenShift cluster

Before you upgrade to Maximo Manage, you must have Maximo Asset Management 7.6.1.10 or 7.6.1.2 or later installed.

Configure the Red Hat OpenShift cluster based on the following requirements:

1. Refer to the Maximo Application Suite and Maximo Manage documentation.
For more information, see [Maximo Application Suite](#).
2. Determine the capacity needed to upgrade the product.
For more information, see [Capacity Planning](#).
3. Secure a Red Hat OpenShift cluster for development, testing, or production.

Important things to check for before the upgrade

- Check that the `mxe.int.dfltuser` property is set to a user with administrative privileges. By default, this admin user is used to synchronize the Maximo Application Suite users to Maximo Manage.
- Run Integrity checker in Maximo Asset Management 7.6.1.0 or 7.6.1.2. Fix any inconsistencies in indexes, and in Maximo metadata before you upgrade to Maximo Application Suite. Object structure is used during the initial user synchronization between Maximo Application Suite and Maximo Manage. Inconsistency in indexes and metadata can result in failures.
- If you are upgrading to Maximo Application Suite 8.0, or 8.1 and Maximo Manage 8.2, you must use the database configuration to make the person ID and login ID fields the same length as the email address fields. The default length is 100. In Maximo Application Suite, the email address becomes the login ID.
- Check that each user has only one primary email address. Maximo Application Suite business logic does not allow multiple primary email addresses. However, you must double-check it, in case the data is altered by using SQL Server.
- Correct the user's login ID, if multiple users have the same login ID but differing in uppercase or lowercase letters. Two users cannot have the same login ID with only differences in case.
- Configure SMTP in Maximo Application Suite before you create the admin user. Otherwise, the email with the generated password cannot be sent.
- [Working with on-premises deployment calculator](#)
You can view environment calculation details using the Maximo Application Suite on-premise deployment calculator.

Related information

- [Plan and prepare your environment](#)

Working with on-premises deployment calculator

You can view environment calculation details using the Maximo® Application Suite on-premise deployment calculator.

About this task

Use the following steps to download and view environment calculation details.

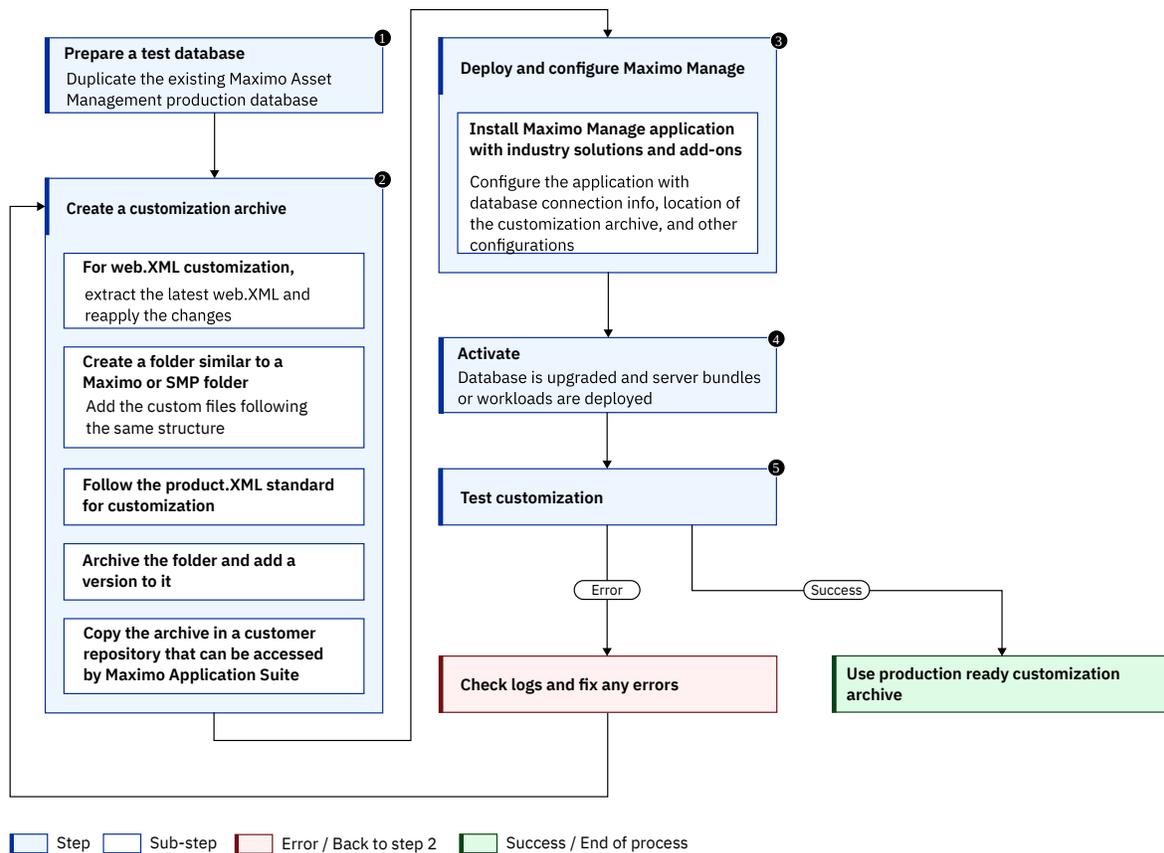
Procedure

1. Use the Capacity Planning calculator to size your environment.
2. Download the [sizing calculator](#).
3. Update your configuration on the calculator tab.
For example, select the applications and the number of concurrent users.
4. Go to the Detailed Report tab to view the environment calculation details.

Upgrade process overview

The IBM® Maximo® Application Suite upgrade process consists of an initial test deployment, which is followed by the production deployment after successful testing. Install and configure Maximo Application Suite, create a customization archive if you find it necessary, and finally deploy and activate Maximo Manage.

The following diagram shows the upgrade process flow.



Upgrade process flow

Prepare a test database

Duplicate the existing Maximo Asset Management production database to use as a test database.

Install and configure Maximo Application Suite

Install and configure a Maximo Application Suite instance in your Red Hat® OpenShift® environment. For more information, see [Installing Maximo Application Suite](#).

Customization

Create a customization archive.

For more information, see [Customization archive guidelines](#).

Deploy

Use the Maximo Application Suite user interface to configure Maximo Manage, industry solutions, and add-ons to use the new upgraded database, and other configurations. Specify the location of the customization archive. Deploy the Maximo Manage application. For more information, see [Deploying the Manage application](#).

Activate

Activate the Maximo Manage application. Activation updates the database and deploys workloads to the containers. For more information, see [Activating Maximo Manage](#).

Authentication, security, and SMTP configuration

Before you upgrade to Maximo® Manage, you must be familiar with authentication, encryption and security, and SMTP configuration.

Authentication

- The local identity provider, which is the username or password that is registered in MongoDB, is used by default for authentication.
- LDAP or SAML can be configured for authentication before or after the installation of Maximo Manage by using the Configuration page in Maximo Application Suite.
 - Only LDAP registries that are supported by Liberty runtime can be used. For more information, see [LDAP User Registry 3.0](#)
 - If you are currently using LDAP or SAML, your existing configuration can be used in Maximo Application Suite.

For more information, see [Configuring authentication](#).

Encryption and security

If you are using custom encryption keys for CRYPTO and CRYTOX attributes, then the custom keys must be provided during the Maximo Manage application installation.

Custom encryption properties are specified in the `maximo.properties` file. After the Maximo Manage application installation, the keys are stored as a `{instance_id}-manage-encryptionsecret` secret in the Maximo Manage project in Red Hat® OpenShift®. The keys must be saved in a secured vault. If the keys are lost, the database cannot be used. For more information, see [Encryption and security](#).

For more information, see [Database encryption](#).

SMTP configuration

SMTP configuration is retained in the database during the upgrade. It is used by Maximo Manage for sending emails. Maximo Application Suite also provides SMTP configuration. This configuration is used for sending welcome emails and user password emails.

For more information, see [Configuring SMTP](#).

Industry solutions and add-ons

All the industry solutions and add-ons that are currently installed must be manually selected to be upgraded. All the industry solutions and add-ons are preselected based on the existing environment.

Upgrading to IBM Maximo Application Suite

You can upgrade to IBM® Maximo® Application Suite and then activate and deploy Maximo Manage.

Before you begin

Plan and prepare your environment. For more information, see [Upgrade prerequisites](#).

Procedure

1. Prepare your database by duplicating or backing up the existing production database.
2. Install and configure Maximo Application Suite.
3. On the Suite administration page, click the Configurations tile to configure LDAP or SAML for authentication and SMTP.
 - LDAP authentication
 - a. In the Users and identity section, click Not configured in the Status column for LDAP authentication.
 - b. Click Configure and enter your LDAP server details.
 - c. Click Save.
 - SAML authentication
 - a. In the Users and identity section, click Not configured in the Status column for SAML authentication.
 - b. Follow the instructions on the SAML Authentication page.
 - c. Click Save.
 - SMTP configuration
 - a. In the Users and identity section, click Not configured in the Status column for SMTP.
 - b. Click Configure and enter your SMTP settings.
 - c. Click Save.
4. Create the admin user and log on to Maximo Application Suite as the admin user.
5. Optional: Create the customization archive. For more information, see [Customizing Maximo Manage](#).
6. Deploy and configure Maximo Manage.
 - a. On the Catalog page, click the Manage tile.
 - b. Select Maximo Manage Industry Solutions and Add-ons.
 - c. Click Deploy Manage.
 - d. Click Actions and then click Configure workspace.
 - e. Configure the database.
 - Click Configure.
 - f. Configure schema, table space, certificates. To configure custom certificates, see [Configuring custom certificates](#) in Maximo Application Suite online product documentation. To add customizations, see [Adding customizations to the application](#).
 - g. Optional: Add your encryption keys.
 - h. Configure languages.
 - i. Configure server bundles.
 - For more information about bundle level properties, see [Configuration](#).
 - j. Optional: Configure the customization archive.
 - k. Optional: Import the external certificate.
7. Click Activate.

Results

If you want to check the deployment status, on the Catalog page, click the Maximo Manage tile. The green circle on the Manage tile shows that Maximo Manage is ready. You can also check the deployment status by using the [Red Hat® OpenShift® console](#).

- [Checking IBM Maximo Manage deployment status](#)
 - Verify that IBM Maximo Manage is deployed successfully by checking the Custom Resource Definitions page on the Red Hat OpenShift console.

Checking IBM Maximo Manage deployment status

Verify that IBM® Maximo® Manage is deployed successfully by checking the Custom Resource Definitions page on the Red Hat® OpenShift® console.

Before you begin

Maximo Manage must be activated first.

Procedure

1. In the Red Hat OpenShift console, select Administration > Custom Resource Definition.
2. In the Name field, search for `manageworkspace` and then click the Manage Workspace custom resource definition to open it.
3. To select your project instance, select the Instances tab.
4. Check the project status on the Details tab of the Custom Resource Definitions page.
The project status can be either true or false based on various conditions.
For example, the project is build ready when the build is completed, or it is deployment ready if all the server bundles are running.

Migrating users to IBM Maximo Application Suite

Create IBM® Maximo® Application Suite users or migrate from the previous version of the application.

Migrated users

Users are migrated to Maximo Application Suite from IBM Maximo Asset Management during the upgrade.

Users are created with the **Set in Manage** access type. The user access is managed in the IBM Maximo Manage application by using security groups. For more information, see [Configuring security groups](#).

If SMTP is configured, the migrated users receive the following emails:

- Welcome to IBM Maximo Application Suite.
- Your IBM Maximo Application Suite password.

On the Users page, you can replace passwords in edit mode by using the Replace forgotten password link. A MAXADMIN user is created by default. User authorization or application access is done in the Maximo Manage application by using security groups. .

Entitlementment

The following entitlementments are available in Maximo Application Suite:

- Premium is set to 15 AppPoints.
- Base is set to 10 AppPoints.
- Limited is set to 5 AppPoints.
- Self-Service is set to 0 AppPoints.

For more information about entitlement calculation details, see [Maximo Application Suite licensing model](#)

Migrating users - troubleshooting

Use the database logs to fix errors after you migrate the users from IBM® Maximo® Asset Management to Maximo Application Suite during upgrade.

Before you begin

You must have administrator rights to fix the errors.

About this task

If the users are not migrated to Maximo Application Suite, check the database log and fix any errors.

Procedure

1. Create MAXADMIN user in Maximo Application Suite from the Users page.
2. Log in to Maximo Application Suite as MAXADMIN user.
3. Select the Maximo Manage application.
4. Select the user sync crontask **MASUSERSYNC** from the crontask application.
5. Create a crontask instance.
6. Run the crontask.

Accessing Manage and troubleshooting

Ways to access Manage.

Accessing IBM Maximo Manage

From IBM® Maximo® Application Suite Admin link, you can select Manage application from the App Switcher  or click the gear icon in the navigation bar.

The Red Hat® OpenShift® console also has a Manage link.

- You can use `ui` bundle or `a11` bundle location link. Append `/maximo` to access Manage.
- You can go to IBM Maximo Application Suite by clicking IBM Maximo Application Suite on the header (upper left).

Troubleshooting

Link to [logging](#).

Validating customization archive

Use the Manage Assets application to validate customization archive.

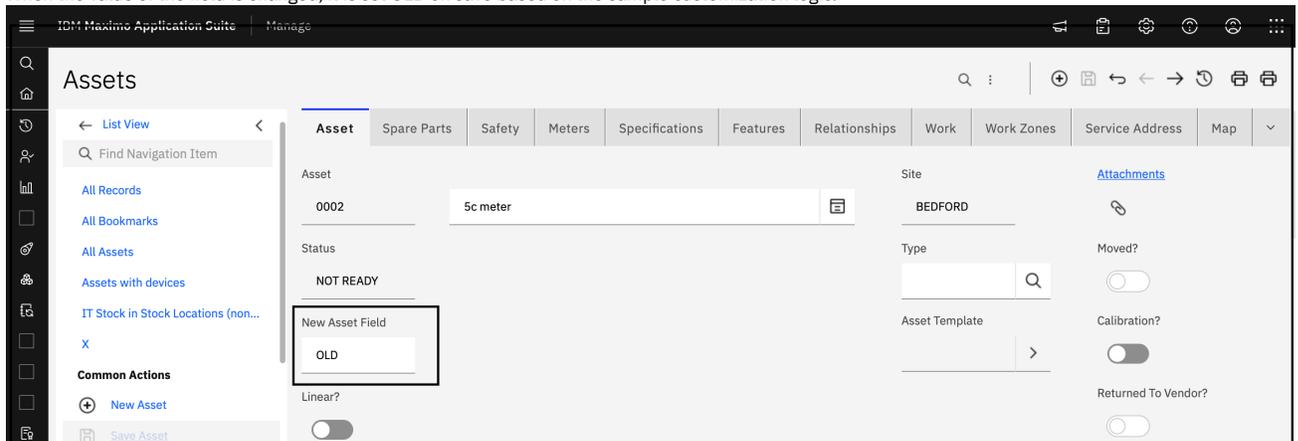
About this task

A sample [Customization archive](#) has the following.

- **classes**
 - `applications\maximo\businessobjects\classes\cust\app\asset\Asset.class`
 - `applications\maximo\businessobjects\classes\cust\app\asset\AssetSet.class`
 - `applications\maximo\businessobjects\classes\cust\app\asset\FldAssetNewField.class`
- **product.xml**
 - `applications\maximo\properties\product\a_customer.xml`
- **script**
 - `tools\maximo\en\cust\V7612_01.dbc`
- **servlets**
 - `applications\maximo\commonweb\classes\com\ibm\tivoli\maximo\oslc\provider\MyPingServlet.class`
- **deployment descriptors (web.xml)**
 - `deployment\was-liberty-default\config-deployment-descriptors\maximo-mea\meaweb\webmodule\WEB-INF\web.xml`
 - `deployment\was-liberty-default\config-deployment-descriptors\maximo-ui\meaui\webmodule\WEB-INF\web.xml`

Procedure

1. Go to Manage Assets application.
The customized "New Asset Field" is added in the Manage Assets application.
When the value of the field is changed, it is set OLD on save based on the sample customization logic.



2. Use any REST client.
For example, Postman
3. Copy the Maximo Enterprise Adapter web link from "Routes" (see Manage page) and append `\meaweb\myapi`.
4. In the response header `pingmaximo` value is set to `hello`.

GET ▼ https://ui.masdev.manage.upgcustom.apps.mando.cp.fyre.ibm.com/maximo/myuiapi Send ▼

Params Authorization **Headers (8)** Body Pre-request Script Tests Settings Cookies

<input checked="" type="checkbox"/>	Cache-Control	no-cache
<input checked="" type="checkbox"/>	Postman-Token	<calculated when request is sent>
<input checked="" type="checkbox"/>	Host	<calculated when request is sent>

Body Cookies (1) **Headers (8)** Test Results Status: 200 OK Time: 308 ms Size: 242 B Save Response ▼

x-Content-Type-Options	nosniff
Access-Control-Allow-Credentials	true
X-XSS-Protection	1
pingmaximo	hello
Content-Language	en-US
Content-Length	0
Date	Sun, 09 May 2021 17:49:19 GMT

- On any REST client, copy the user interface web link from "Routes" (see Manage page) and append \maximo\myuiapi.
- In the response header **pingmaximo** value is set to **hello**.

GET ▼ https://mea.masdev.manage.upgcustom.apps.mando.cp.fyre.ibm.com/meaweb/myapi Send ▼

Params Authorization **Headers (6)** Body Pre-request Script Tests Settings Cookies

<input checked="" type="checkbox"/>	Cache-Control	no-cache
<input checked="" type="checkbox"/>	Postman-Token	<calculated when request is sent>
<input checked="" type="checkbox"/>	Host	<calculated when request is sent>
<input checked="" type="checkbox"/>	User-Agent	PostmanRuntime/7.28.0

Body Cookies (1) **Headers (6)** Test Results Status: 200 OK Time: 433 ms Size: 263 B Save Response ▼

KEY	VALUE
pingmaximo	hello
Content-Language	en-US
Content-Length	0
Date	Sun, 09 May 2021 17:47:46 GMT
Set-Cookie	84849622bafd21147741b6f7bb4964c4=7432028da41b08c306dd3578c028df02; path=/; Http...

Managing users post upgrade

User management and consumption reports in IBM® Maximo® Application Suite.

About this task

User management is done in Maximo Application Suite, from the Users tile in the Suite administration dashboard, which synchronizes into IBM Maximo Manage.

Procedure

User entitlement.

- The crontask **MasUserAnalyzer** in Maximo Manage, calculates the user entitlement (Limited, Base, Premium, or Self-Service).
- The crontask **MasUserReporting** in Maximo Manage, sends the entitlement change to Maximo Application Suite (for example: user authorization changed).

Note: If the entitlement is higher in Maximo Manage, a message is displayed on Suite administration dashboard.

- [License type information.](#)

- [Viewing user synchronization information](#)

View information about user synchronization in IBM Maximo Manage.

Changing user password

About this task

User passwords are changed from the Users tile in the Suite administration dashboard.

Procedure

- Select the user.
- Click the pencil icon on the upper right to edit the user.

3. Click Replace forgotten password.
4. Update it manually or auto-generate.
 - a. Select Send account password in email to receive an email with the generated password.
5. Click Save.

Changing current user password

About this task

Current user password can be changed from Suite administration dashboard.

Procedure

1. Go to User profile on the upper right.
2. Click Manage profile.
3. On the menu on the left, select Change password.
4. Enter the information and click Save.

Generating user license consumption reports

Procedure

To generate License consumption reports, go to the Suite administration dashboard and click License consumption.

Viewing user synchronization information

View information about user synchronization in IBM® Maximo® Manage.

- When a user is created and is assigned the Manage role, it gets synchronized into Manage. The Manage application user sync process pulls the data from IBM Maximo Application Suite (MAS) IDP_>User Registry and pushes it to Manage.
- If a user has the NO_ACCESS role or is deleted in MAS, the user becomes INACTIVE in the Manage application.
- The user synchronization process from MAS to Manage uses the Maximo Integration Framework. It uses integration's Enterprise Service to post data to Manage. If a MAS user is assigned the Manage role and has a sync status of PENDING or DELETE_PENDING, the user sync processes it and upon successful synchronization change the sync status to SYNCED.

Sample of inbound message from MAS

```
{ "id": "joesmith5", "username": "joesmith5", "permissions": { "systemAdmin": true, "userAdmin": true }, "issuer":
"local", "displayName": "Joe Smith", "familyName": "Smith", "givenName": "Joe", "title": "Supervisor",
"preferredLanguage": "EN", "locale": "en_US", "phoneNumbers": [ { "value": "555-555-5555", "type": "work" }, { "value":
"555-555-4444", "type": "work" } ], "addresses": [ { "streetAddress": "100 Universal City Plaza", "locality":
"Hollywood", "region": "CA", "postalCode": "91608", "country": "USA", "formatted": "100 Universal City Plaza\Hollywood,
CA 91608 USA", "type": "work", "primary": true } ], "emails": [ { "value": "joesmith5@us.ibm.com", "type": "work",
"primary": true }, { "value": "joesmith51@gmail.com", "type": "work" } ], "extension": { "employeeNumber": "701984",
"costCenter": "4130" }, "entitlement": { "application": "PREMIUM", "admin": "ADMIN_PREMIUM" }, "workspaces": { "spacel":
{ "permissions": { "workspaceAdmin": true }, "applications": { "manage": { "role": "ADMIN" }, "iot": { "role": "ADMIN" },
"health": { "role": "USER" }, "monitor": { "role": "ADMIN" } } }, "added": { "id": "admin", "timestamp": "2020-08-
10T18:01:36.694331" }, "updated": { "id": "admin", "timestamp": "2020-08-10T18:08:17.455782" }, "sync": { "status":
"SUCCESS", "timestamp": "2020-08-10T18:10:16.731047" }, "applications": { "manage": { "sync": { "state": "PENDING",
"reason": "", "timestamp": "2020-08-10T18:08:49.604430" } }, "monitor": { "sync": { "state": "SUCCESS", "reason": "",
"timestamp": "2020-08-10T18:08:17.471947" } }, "health": { "sync": { "state": "SUCCESS", "reason": "", "timestamp":
"2020-08-10T18:09:18.131171" } }, "predict": { "sync": { "state": "SUCCESS", "reason": "", "timestamp": "2020-08-
10T18:08:17.471947" } }, "token":
"1000:8744077b1411c0601e4912d556d93ff859089bfd16863f16:591949ad7b4d4f7017de846a3f3b2609ac4caef4ebe09448" }
```

Sample of output from default user exit

```
{ "addressline1": "100 Universal City Plaza", "city": "Hollywood", "country": "USA", "displayname": "Joe Smith", "email":
[ { "_action": "AddChange", "emailaddress": "joesmith5@us.ibm.com", "isprimary": 1, "type": "work" }, { "_action":
"AddChange", "emailaddress": "joesmith51@gmail.com", "isprimary": 0, "type": "work" } ], "extension": { "costCenter":
"4130", "employeeNumber": "701984" }, "firstname": "Joe", "language": "EN", "lastname": "Smith", "locale": "en_US",
"maxuser": [ { "groupuser": [ { "_action": "AddChange", "groupname": "MAXADMIN" }, { "_action": "AddChange", "groupname":
"TOOLMGR" } ], "inactivesites": 1, "loginid": "joesmith5", "statusdate": "2020-10-30T15:43:44-04:00", "userid":
"joesmith5" }, { "personid": "joesmith5", "phone": [ { "_action": "AddChange", "isprimary": 1, "phonenumber": "555-555-
5555", "type": "work" }, { "_action": "AddChange", "isprimary": 0, "phonenumber": "555-555-4444", "type": "home" } ],
"postalcode": "91608", "stateprovince": "CA", "statusdate": "2020-10-30T15:43:44-04:00", "title": "Supervisor" }
```

Configuring Maximo Manage for upgrade

Information on how to configure IBM® Maximo® Manage and connectors, customization capabilities, and how to manage users, security, and licenses.

- [Overview of changes](#)
The Enterprise Asset Management data model has no significant changes.

- [Security and user management](#)
View details of security and user management.
- [Integration](#)
The API key authentication is necessary for inbound HTTP or SOAP or REST-based integration to Maximo Manage.
- [Migrating to JMS provider](#)
You must install or provision or configure JMS to migrate to it.
- [Migrating to Kafka](#)
You must install or provision or configure Kafka for migration.
- [Supported JMS provider](#)
There are certain points to consider if you use a supported JMS provider.
- [Moving from JMS to Kafka](#)
If you move from JMS queues to Kafka, there are some differences in the way the messages are processed.
- [RMI replaced by REST API](#)
Remote Method Invocation (RMI) is not supported outside of the Maximo server process.
- [Maximo properties](#)
The Maximo properties file is now redundant in Maximo Manage.
- [Changes in Maximo Application Suite](#)
Refer to the functional area details of IBM Maximo Application Suite.
- [Configuring Maximo Manage for deployment](#)
Certain configurations are required before you can deploy IBM Maximo Manage.
- [Customizing IBM Maximo Manage](#)
All customer-specific changes, such as Java™ classes, XML files, and database scripts, must be included in a customization archive. You create the customization archive in a location accessible to IBM Maximo Application Suite during deployment. The structure of the customization archive is the same as the Maximo Asset Management folder structure. Test the customization archive in a development or test environment before you apply it to the production environment.
- [Creating customization archives](#)
You can create a customization archive, which is a set of files that contain changes and customizations for the application.
- [Deployment descriptors](#)
All deployment descriptors such as web.xml, ejb-jar.xml, and webservices.xml files that are customized by users can be put into the customization archive and overlaid on the files that are supplied by IBM.
- [Using certificates](#)
You can use route or TLS certificates, SSL certificates, external certificates.
- [Configuring Oracle Connector](#)
You must configure Oracle Connector before and after the upgrade.
- [Configuring SAP Connector](#)
You must configure SAP Connector before and after the upgrade.
- [Viewing Maximo Manage Logs](#)
View the IBM Maximo Manage logs for Server, Maxinst and Update database, User sync, Workspace operator, and Build logs from the Red Hat® OpenShift® console.
- [Monitoring](#)
You can enable monitoring for applications in Red Hat OpenShift Container Platform.
- [IBM Maximo Manage tool](#)
When Maximo Manage is deployed, some tools become available.

Overview of changes

The Enterprise Asset Management data model has no significant changes.

- All three databases (IBM® Db2®, Oracle Database, and Microsoft SQL Server) are supported.
- All classic and work center UI/UX are available in Maximo® Manage.
- Only IBM WebSphere® Application Server Liberty is used within Maximo Application Suite.
- Red Hat® OpenShift® deployment.

Security and user management

View details of security and user management.

- Authentication and single sign-on (SSO) are managed by [Maximo® Application Suite Identity Provider](#). The following Identity Providers (IDP) are supported:
 - Local IDP (username and password that is registered in MongoDB)
 - LDAP
 - SAML
- All interactions other than from the user interface (Integration, REST) require API Key for authentication.
- LDAP integration is managed by IBM® Maximo Application Suite.
 - The existing Maximo EAM LDAP/VMM synchronization is not supported and is replaced by the synchronization process in Maximo Application Suite. For more information, see the [LDAP User Synchronization](#) section.
 - Maximo Application Suite uses WebSphere® Application Server Liberty to synchronize with LDAP.
 - Liberty provides a SCIM API for Maximo Application Suite to use the data from LDAP repositories into the Maximo Application Suite user registry. Maximo Application Suite pushes users and groups to Manage from the Maximo Application Suite repository.
- Existing Maximo EAM users are synchronized with Maximo Application Suite User Registry during the upgrade. The details are in the Users Synchronization section.

- Only new users can be created in Maximo Application Suite and synchronized to Manage. If you currently have integration to create or update users in Maximo , you need to integrate users to IBM Maximo Application Suite, not IBM Maximo Manage.

User synchronization

- When a user is created and is assigned the IBM Maximo Manage role, it gets synchronized into Manage. The Manage application user sync process pulls the data from IBM Maximo Application Suite IDP. User Registry and pushes it to Manage.
- If a user has the NO_ACCESS role or is deleted in Maximo Application Suite, the user becomes INACTIVE in the Manage application.
- The user synchronization process from Maximo Application Suite to Manage uses the Maximo Integration Framework. It uses integration's Enterprise Service to post data to Manage. If a Maximo Application Suite user is assigned the Manage role and has a sync status of PENDING or DELETE_PENDING, the user sync processes it and upon successful synchronization change the sync status to SYNCED.

Sample of inbound message from Maximo Application Suite

```
{ "_id": "joesmith5", "username": "joesmith5", "permissions": { "systemAdmin": true, "userAdmin": true }, "issuer":
"local", "displayName": "Joe Smith", "familyName": "Smith", "givenName": "Joe", "title": "Supervisor",
"preferredLanguage": "EN", "locale": "en_US", "phoneNumbers": [ { "value": "555-555-5555", "type": "work" }, { "value":
"555-555-4444", "type": "work" } ], "addresses": [ { "streetAddress": "100 Universal City Plaza", "locality":
"Hollywood", "region": "CA", "postalCode": "91608", "country": "USA", "formatted": "100 Universal City Plaza\nHollywood,
CA 91608 USA", "type": "work", "primary": true } ], "emails": [ { "value": "joesmith5@us.ibm.com", "type": "work",
"primary": true }, { "value": "joesmith51@gmail.com", "type": "work" } ], "extension": { "employeeNumber": "701984",
"costCenter": "4130" }, "entitlement": { "application": "PREMIUM", "admin": "ADMIN PREMIUM" }, "workspaces": { "space1":
{ "permissions": { "workspaceAdmin": true }, "applications": { "manage": { "role": "ADMIN" }, "iot": { "role": "ADMIN" },
"health": { "role": "USER" }, "monitor": { "role": "ADMIN" } } }, "added": { "id": "admin", "timestamp": "2020-08-
10T18:01:36.694331" }, "updated": { "id": "admin", "timestamp": "2020-08-10T18:08:17.455782" }, "sync": { "status":
"SUCCESS", "timestamp": "2020-08-10T18:10:16.731047" }, "applications": { "manage": { "sync": { "state": "PENDING",
"reason": "", "timestamp": "2020-08-10T18:08:49.604430" } }, "monitor": { "sync": { "state": "SUCCESS", "reason": "",
"timestamp": "2020-08-10T18:08:17.471947" } }, "health": { "sync": { "state": "SUCCESS", "reason": "", "timestamp":
"2020-08-10T18:09:18.131171" } }, "predict": { "sync": { "state": "SUCCESS", "reason": "", "timestamp": "2020-08-
10T18:08:17.471947" } }, "token":
"1000:8744077b1411c0601e4912d556d93ff859089bdfd16863f16:591949ad7b4d4f7017de846a3f3b2609ac4caef4ebe09448" }
```

Sample of output from default user exit

```
{ "addressline1": "100 Universal City Plaza", "city": "Hollywood", "country": "USA", "displayname": "Joe Smith", "email":
[ { "_action": "AddChange", "emailaddress": "joesmith5@us.ibm.com", "isprimary": 1, "type": "work" }, { "_action":
"AddChange", "emailaddress": "joesmith51@gmail.com", "isprimary": 0, "type": "work" } ], "extension": { "costCenter":
"4130", "employeeNumber": "701984" }, "firstname": "Joe", "language": "EN", "lastname": "Smith", "locale": "en_US",
"maxuser": [ { "groupuser": [ { "_action": "AddChange", "groupname": "MAXADMIN" }, { "_action": "AddChange", "groupname":
"TOOLMGR" } ], "inactivesites": 1, "loginid": "joesmith5", "statusdate": "2020-10-30T15:43:44-04:00", "userid":
"joesmith5" } ], "personid": "joesmith5", "phone": [ { "_action": "AddChange", "isprimary": 1, "phonenum": "555-555-
5555", "type": "work" }, { "_action": "AddChange", "isprimary": 0, "phonenum": "555-555-4444", "type": "home" } ],
"postalcode": "91608", "stateprovince": "CA", "statusdate": "2020-10-30T15:43:44-04:00", "title": "Supervisor" }
```

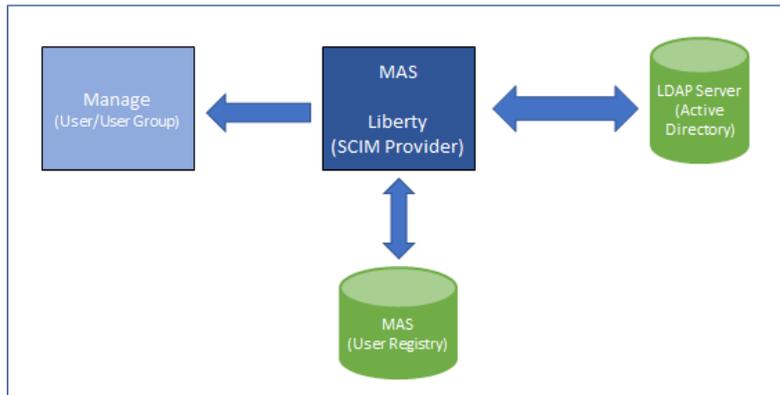
LDAP synchronization

The section tagged “extension” as shown in the samples includes all extra attributes that are not part of default mapping. The default mapping can be customized by creating an Oracle Java™ user exit, automation script, or JSON Mapper.

- IBM Maximo Application Suite synchronizes users and groups from the LDAP server and there is no direct synchronization from LDAP to Manage.
- Maximo Application Suite uses Liberty to synchronize with LDAP. Liberty provides a SCIM API for Maximo Application Suite to use the data from LDAP repositories into Maximo Application Suite User Registry. IDP.
 - SCIM defines the resource (Users, Groups) schema and the REST(CRUD) APIs to manage the resources.
- Maximo Application Suite to use the data from LDAP repositories into Maximo Application Suite User Registry. IDP.
- SCIM defines the resource (Users, Groups) schema and the REST(CRUD) APIs to manage the resources.
- The section tagged “extension” can include all extra attributes that are not part of default mapping.
- The schema attribute mapping can be customized by using user exit, an automation script on user exit, or replacing the standard user exist with JSON Mapper user exit.

Flow

- User configures SCIM User Sync from Maximo Application Suite UI.
- Backend API creates a ScimCfg CR and secret.
- TrustManager operator adds LDAP Server certificate to the truststore.
- SCIM operator deploys Liberty server and the k8s cron job.
- Cron job gets the Users from Liberty server and stores it in Maximo Application Suite User Registry (MongoDB)



Manage group synchronization

- User Groups are synchronized into Manage from Maximo Application Suite.
- Users are added in the group only if they are valid users in Manage.
- The existing users in a group are replaced by the users in the payload same as LDAP group synchronization.

Bulk import users to Maximo Application Suite upgrade

Maximo users and their profiles, which include language, time zone, and locale, are imported to Maximo Application Suite during the upgrade.

- A one-time crontask instance is created during the upgrade to import users to Maximo Application Suite.
- Welcome emails are sent to the users with a password for their account. If the user email is not set, an email is sent to the system administrator email account.
 - The system administrator email is set up from Maximo Application Suite admin dashboard.
 - SMTP can be configured in Maximo Application Suite before upgrade, receive Welcome emails and emails with user password.
 - The user password can be reset by the System Administrator.

Welcome email Templates:

```

To: ${email}
Title: Welcome to IBM Maximo Application Suite
Body: Welcome to IBM Maximo Application Suite, a new account has been registered to ${email} in <a href="#_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_upgrade_${masHomeUrl}">IBM Maximo Application Suite (${instanceName})</a>.
  
```

```
Username: ${username}
```

You will receive your password in a separate e-mail (only show this if emailPassword has been set)

```

To: ${email}
Title: Your new IBM Maximo Application Suite password
Body: Welcome to <a href="#_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_upgrade_${masHomeUrl}">IBM Maximo Application Suite (${instanceName})</a>. your new password is below.
  
```

```
Password: ${password}
```

Integration

The API key authentication is necessary for inbound HTTP or SOAP or REST-based integration to Maximo® Manage.

The API key must be generated from the Administration Work Center. The HTTP request header must include the API key. No other authentication like native authentication is supported.

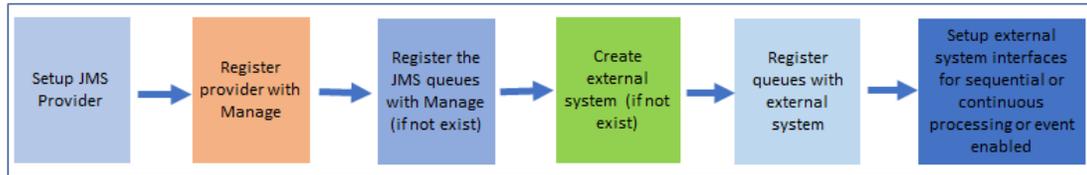
Migrating to JMS provider

You must install or provision or configure JMS to migrate to it.

Procedure

1. Install or provision or configure JMS provider. For example, IBM® MQ. You can also use Liberty messaging engine.
2. Register the JMS provider queues in Maximo Manage.
3. Associate the registered queues with the External Systems application.
4. You must register the queues and connection factories in Maximo Manage in the server. XML file for the JMS provider. Follow the [Liberty documentation](#) for setup.

Figure 1. JMS



Migrating to Kafka

You must install or provision or configure Kafka for migration.

Procedure

1. Install or provision or configure Kafka.
2. Register Kafka as a messaging provider in Manage.
3. Register Kafka topics in Manage.
4. Associate the registered topics with the External Systems application.

For more information, see [Kafka providers](#).

No text support is provided for Kafka in the initial release. Only byte messages are supported. JMS supports both text and byte.

Supported JMS provider

There are certain points to consider if you use a supported JMS provider.

If you are already using a supported JMS provider, for example IBM MQ, keep the following points in mind.

- The queues and connection factories must be registered in server.XML in Liberty server deployment that uses the same JNDI name as registered in Manage.
- The upgrade process does not move your current JMS integration messages. All messages in the queue and error table must be processed and cleared before the upgrade.
- File loading folders must be processed before the upgrade and are not moved.
 - You must configure a volume mount during deployment.
- Web Services that use SOAP 1.1 and 1.2 are supported.

Moving from JMS to Kafka

If you move from JMS queues to Kafka, there are some differences in the way the messages are processed.

For customers who are moving from JMS queues to Kafka, the message processing function is similar but slightly different. For more information, see [Migrating to Kafka](#).

- Kafka message in Manage is always bytes, no option for text.
- Kafka message is always compressed.
- Kafka message size limit is configured in Kafka server and with a Manage system property.
- Kafka messages are not deleted when processed. They are removed from the queue based on retention time.
- Continuous message consumption is done by Manage CRON tasks, not MDBs.
- Browsing messages or View Queue in a queue is done by using a REST API.

RMI replaced by REST API

Remote Method Invocation (RMI) is not supported outside of the Maximo server process.

- Security issues to the containers to open RMI ports.
- Networking issues with K8s services and routes that redirect to RMI ports.

Customers must use Maximo REST APIs instead of RMI.

- Maximo REST API follows open standards and is more secure and scalable.
- Use of REST API with standard HTTPS protocol helps make the client code language independent.
- The Maximo API Key is used for authentication in REST APIs.

Maximo properties

The Maximo® properties file is now redundant in Maximo Manage.

- The maximo.properties) file is no longer used in Maximo Manage.
- The bootstrap properties, such as database username and password and encryption keys, are set in IBM® Maximo Application Suite during deployment or in a custom resource in Red Hat® OpenShift®. These properties are applied to all workload deployments.
- The bundle-level properties for workloads are applied to the specific server and set in IBM Maximo Application Suite and stored as a configmap in Red Hat OpenShift.
For more information, see [Configuring Maximo Manage for deployment](#).
- Use the System Properties application to set the other properties. These properties are applied to all the workloads.

Changes in Maximo Application Suite

Refer to the functional area details of IBM® Maximo® Application Suite.

Functional Area	Details
Attachments	Supported. File system: <ul style="list-style-type: none"> • For users that use the file system mount, same file system mount can be configured in Maximo Application Suite through volume mount in Red Hat® OpenShift®. • No change is needed for the Maximo Manage declines configuration, if the mount point is same as before. Object Storage (S3): <ul style="list-style-type: none"> • No change needed to bring attached documents. • Object storage server public certificate might need to be imported.
Reporting	Business Intelligence and Reporting Tools (BIRT) supported.
Industry solutions and add-ons	All industry solutions and add-ons are supported.
IBM Maximo Anywhere	Updated mobile apps are available for download.
IBM Maximo Mobile	All connected and disconnected functions in one application. Initial version delivers Assist, followed by Technician and Inspections.
IBM Maximo Scheduler Optimization, IBM Maximo Calibration, and IBM Maximo Linear Asset Manager	Supported and are now part of Maximo Manage. IBM Maximo for Life Sciences is covered in Maximo Calibration.
Migration Manager	Supported. <ul style="list-style-type: none"> • All pending migration packages must be migrated before the upgrade (prerequisite). • Configuration options are provided during deployment for persistent volume mount for file-based packages. • Maximo Anywhere APIs are available. • Supports the automation pf package creation and deployment.
Multi Languages	Available in all supported languages.
SAP and Oracle Integration	Supported.
Third party add-On	Third-party changes that exist are moved over only if the changes can be extracted completely in the customization archive.
Maximo Archiving	Not supported.

Configuring Maximo Manage for deployment

Certain configurations are required before you can deploy IBM® Maximo® Manage.

When the IBM Maximo Manage application is deployed in IBM Maximo Application Suite, a Maximo Manage deployment custom resource (CR) is created.

- The Maximo Manage deployment CR contains the configuration that you entered, which includes database URL, server bundle types, deployment size, and other information.
- The database username or password can be specified in Maximo Application Suite and persisted as a secret in the cluster.
- The Maximo Manage crypto or cryptox properties can be updated in Maximo Application Suite and persisted as a secret in the cluster.
- Both secrets, the username or password and the crypt or cryptox values can also be updated in Red Hat® OpenShift®. Any change to the values automatically redeploys the application completely or partially.

Server bundle

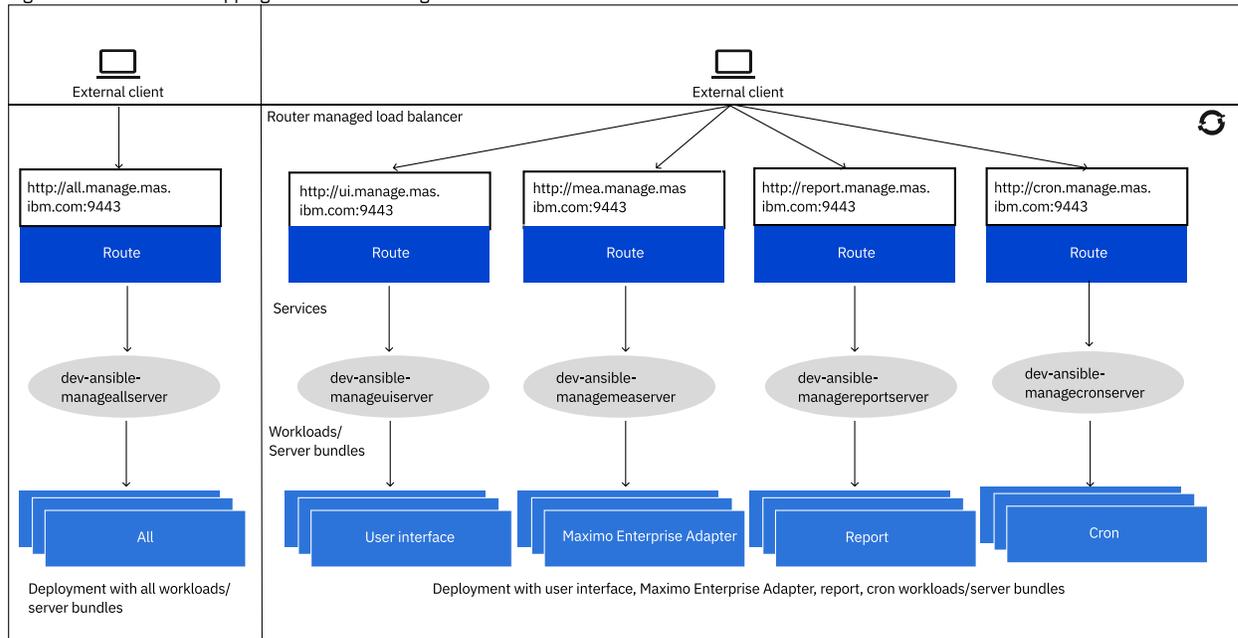
A server bundle or workload is a logical abstraction for a deployed group of point of deployment (pods) in a cluster. These server bundles do the same function and provide an access point as a service. These server bundles can be accessed as a service internally and through a route externally. A route is a way to display a service by giving it an externally reachable hostname. By using a route or service, Red Hat OpenShift balances the load to the pods that are included in a server bundle. Each server bundle defines replica size, subdomain, and other properties.

- For each server bundle, a service is created with name that is appended by **-<serverbundlename>**.

- A route is created with name that is appended by **-<serverbundlename>**.
- A default route is created to point to the service that ends with **-<serverbundlename>**.
 - Maximo Application Suite uses the default route to establish the default URL link to Maximo Manage.
- You can add or update server bundle properties. For more information, see [Adding server bundle properties](#).

The following diagram illustrates how Red Hat OpenShift Container Platform routers provide external hostname mapping and balancing of load for service end points over protocols. The router uses the hostname to determine where to send the external client request.

Figure 1. External host mapping and load balancing



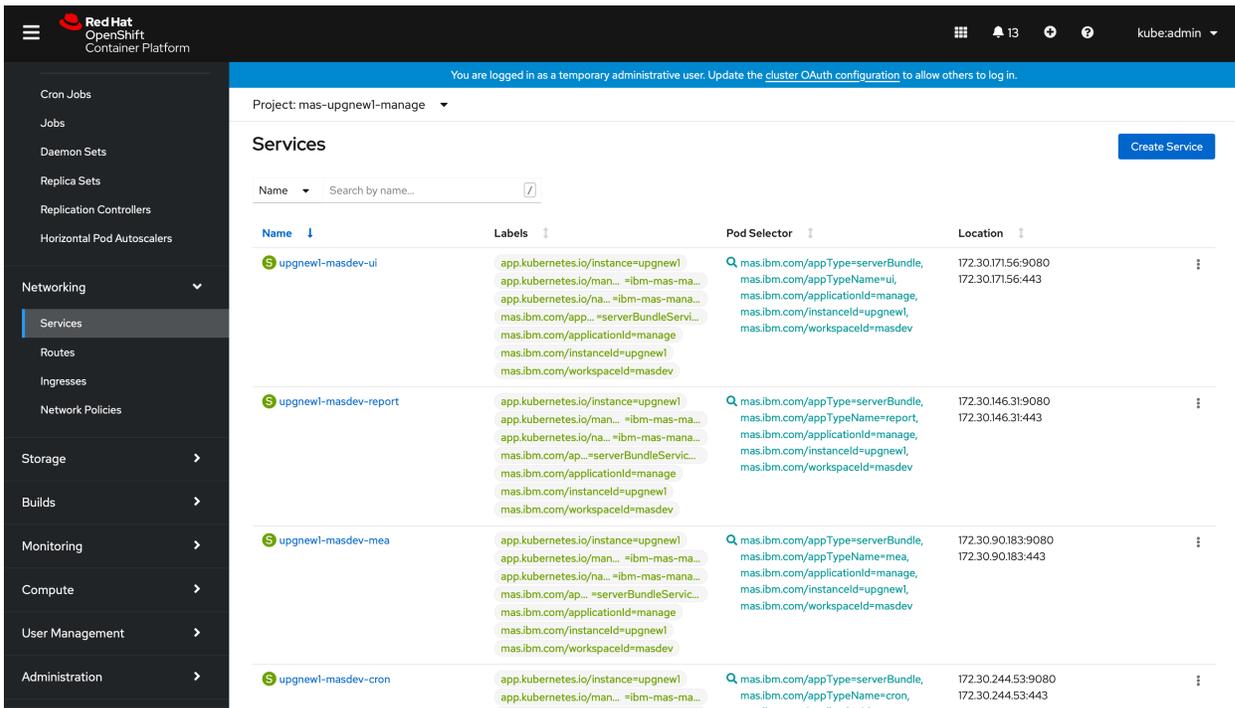
- The Maximo Manage application can be deployed with different server bundles or workloads for the processing and isolation needs.
- The deployment can be All bundle server type or a combination of the four bundle server types: UI, cron, report, and Maximo Enterprise Adapter.
 - If All bundle server type is not deployed, and you used a combination of the four bundle server types, you must use the UI bundle server type.
- Each server bundle can have its own server properties.

The following table shows the five different server bundle types.

Bundle server type	Description
All	Contains all the code.
UI	Contains UI code and supporting code. It is the interface for accessing Maximo Manage application.
Maximo Enterprise Adapter	Displays the enterprise web services API.
report	Contains the code that is needed to enable BIRT Report Only Server (BROS). It is used to separate the work load that is related to the execution of reports that are submitted in Maximo Manage.
cron	This bundle contains the code that is needed to enable BIRT Report Only Server (BROS). Used to separate out the work load that is related to execution of reports that are submitted from the Maximo Manage UI.

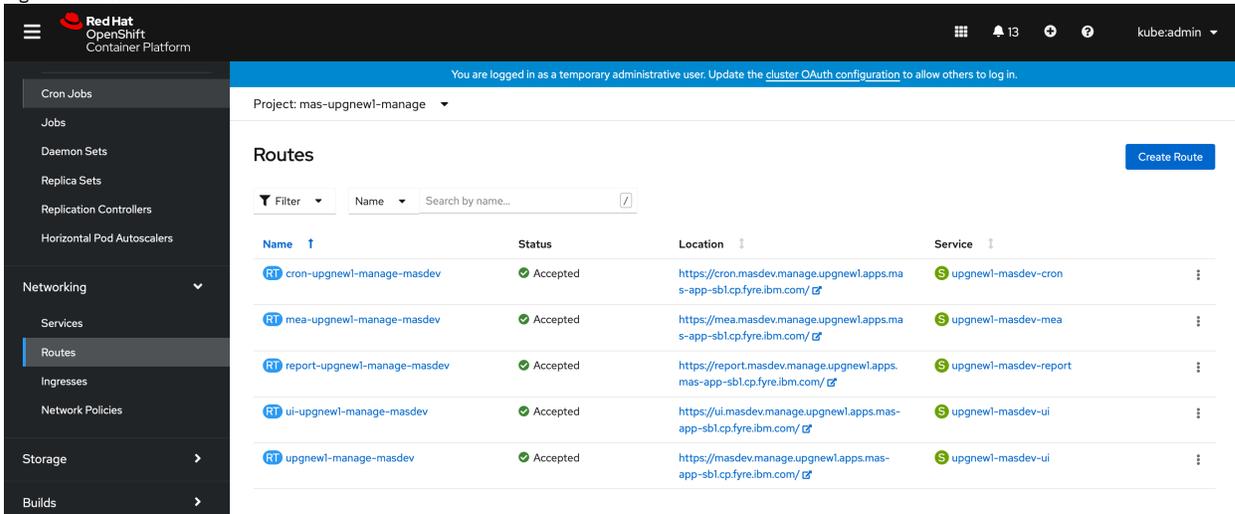
Services

Figure 2. Services



Routes

Figure 3. Service routes



Server bundle properties

The server bundles have the following properties:

- The server bundle properties can be set in Maximo Application Suite UI or in the CR.
- A configmap `<workspaceid>-<serverbundlename>-bundleproperty` is created for the server properties during deployment or operator reconciliation. It is mounted to `/config/manage/properties` on the pod. The `bundleLevelProperties` file on the pod must not be updated manually.
- Maximo Manage server process automatically detects the change and updates the Maximo Manage property cache.
- If the property value needs to be modified, update the CR directly or in Maximo Application Suite. The Maximo Manage Operator reconciles the changes. The Maximo Manage server process updates the Maximo Manage property cache with the updated value.

Liberty server XML

If you need to customize the Liberty server.xml file:

- The custom server XML can be set in Maximo Application Suite UI. For example, to create queues in JMS server.
 - If you create it in the CR directly, then you must create the secret manually. Set this secret to `additionalServerConfig.secretname` for the bundle server in the CR.
- On deployment, a secret is created for the custom server.XML file. It is mounted to `/config/manage/serverxml`. This location is included in Liberty server.xml file. The configuration is applied to the Liberty server.

Sample custom server.xml file:

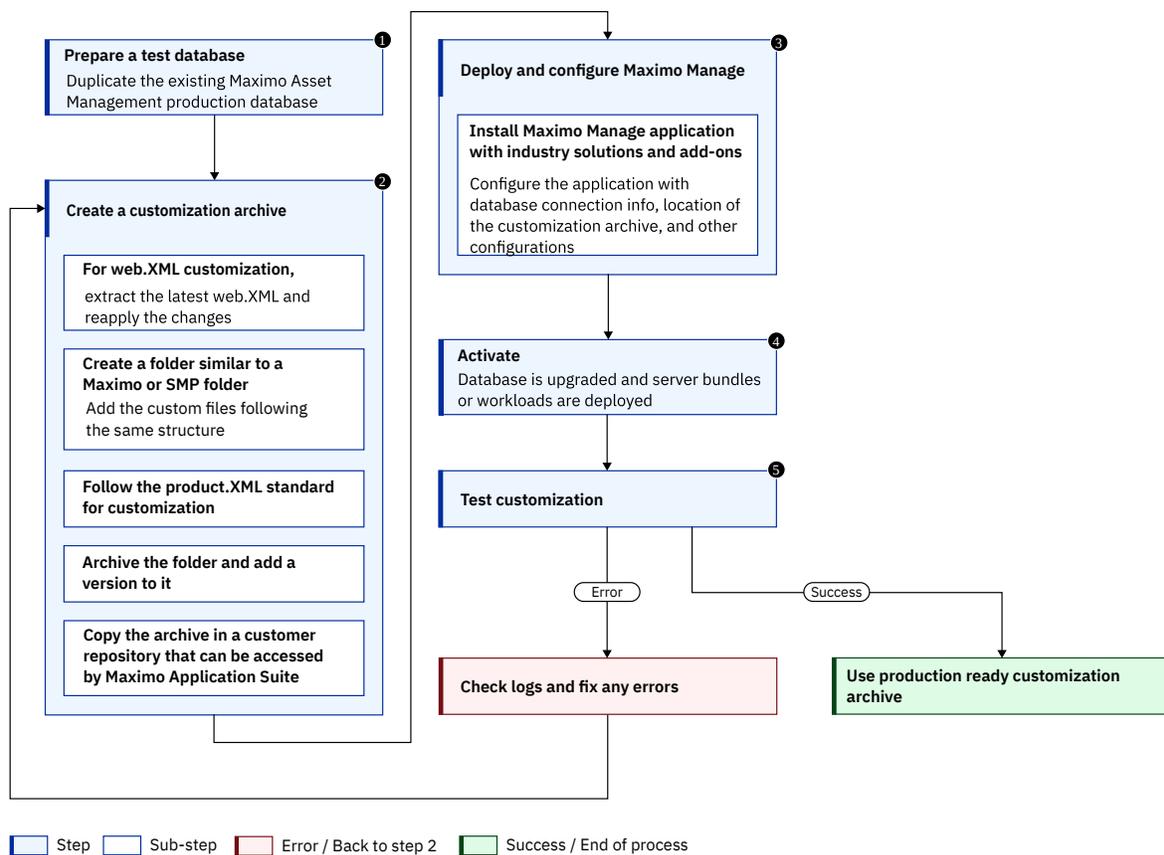
```
<?xml version="1.0" encoding="UTF-8"?>
<server description="new server">
  <featureManager>
    <feature>wmqJmsClient-2.0</feature>
    <feature>jmsMdb-3.2</feature>
  </featureManager>
  <logging traceSpecification="JMSApi=all:WAS.j2c=all"/>
  <variable name="wmqJmsClient.rar.location" value="/wmq/wmq.jmsra.rar"/>
  <jmsConnectionFactory jndiName="jms/maximo/int/cf/intcf" connectionManagerRef="MIFJMS">
    <properties.wmqJms
      transportType="CLIENT"
      hostName="mifjmsmanager-afd7.qm.us-south.mq.appdomain.cloud"
      port="31440"
      channel="CLOUD.APP.SVRCONN"
      applicationName="maxliberty"
      userName="{username}"
      password="{yourpassword}"
      queueManager="MIFJMSMANAGER"/>
  </jmsConnectionFactory>
  <connectionManager
    id="home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_upgrade_c_configuration_MIFJMS"
    maxPoolSize="20"/>
    <jmsQueue
      id="home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_upgrade_c_configuration_sqout"
      jndiName="jms/maximo/int/queues/sqout">
        <properties.wmqJms baseQueueName="sqout" baseQueueManagerName="MIFJMSMANAGER"/>
      </jmsQueue>
      <jmsQueue
        id="home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_upgrade_c_configuration_sqin"
        jndiName="jms/maximo/int/queues/sqin">
          <properties.wmqJms baseQueueName="sqin" baseQueueManagerName="MIFJMSMANAGER"/>
        </jmsQueue>
      <jmsQueue
        id="home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_upgrade_c_configuration_jms/maximo/int/queues/cqin"
        jndiName="jms/maximo/int/queues/cqin">
          <properties.wmqJms baseQueueName="cqin" baseQueueManagerName="MIFJMSMANAGER"/>
        </jmsQueue>
      <jmsQueue
        id="home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_upgrade_c_configuration_jms/maximo/int/queues/cqinerr"
        jndiName="jms/maximo/int/queues/cqinerr">
          <properties.wmqJms baseQueueName="cqinerr" baseQueueManagerName="MIFJMSMANAGER"/>
        </jmsQueue>
    </connectionManager>
  </server>
```

Customizing IBM Maximo Manage

All customer-specific changes, such as Java™ classes, XML files, and database scripts, must be included in a customization archive. You create the customization archive in a location accessible to IBM® Maximo® Application Suite during deployment. The structure of the customization archive is the same as the Maximo Asset Management folder structure. Test the customization archive in a development or test environment before you apply it to the production environment.

About this task

The following diagram shows the customization process:



Procedure

1. Prepare the database.
Prepare a test database as a duplicate of the existing Maximo Asset Management production database.
2. Create a customization archive.
For more information, see [Creating customization archives](#) section. If your customization includes a web.xml file, such as customer servlet, filters, changes in the order of the servlet startup, context parameters, or session timeout:
 - a. Install Maximo Manage with industry solutions and add-ons without customization on an empty database.
 - b. Extract the web.xml file.
Use the **oc rsync** command to retrieve the web.xml file.
 - c. Apply your changes.
 - d. Copy the web.xml file to the customization archive in the appropriate directory.
3. Deploy the application.
Use Maximo Application Suite or an API to configure Maximo Manage, industry solutions and add-ons to point to the database to upgrade and other configurations. Specify the location of the customization archive. Deploy.
4. Activate the application.
Maximo Manage updates the database and deploys workloads to the liberty containers.
5. Test the application.
6. Optional: Using the admin image pod that contains maxinst, in the Red Hat® OpenShift® console, copy the entire build directory with the customization and compile. You can also pull the [Maximo Manage admin image](#) to get the code locally. You can use IDE to build the Maximo Manage project with customizations.

What to do next

After you fix any errors, create a customization archive again with the updated code. Deploy and activate the Maximo Manage application. After successful testing, use the customization archive in the production environment.

Creating customization archives

You can create a customization archive, which is a set of files that contain changes and customizations for the application.

Procedure

1. Follow the existing SMP or Maximo® folder structure to create a customization folder.
2. Copy class files (Java™ customization) in the appropriate directory and extracted with the existing Maximo binary files in the right package or module hierarchy.

The file might include the following information.

- Mbo customization
- Field validation
- Maximo Integration Framework
- Others like customer-specific code

What to do next

- Version your customization archive.
- Customization archive location is specified during Maximo Manage application configuration from IBM® Maximo Application Suite admin dashboard.
- Customization archive location must be accessible from Maximo Application Suite.
- Any database scripts can be added to customer directory and an a_customer.xml file must be used. For more information, see the [Customization archive guidelines](#). All those files need to be part of the customization archive. Update db will run after deployment to apply all customer scripts.
- The IBM Customization Detection tool allows you to detect customization on a client system for IBM Maximo Asset Management, Industry Solution, and Add-on products. For more information, see [IBM Customization Detection tool](#).

Deployment descriptors

All deployment descriptors such as web.xml, ejb-jar.xml, and webservices.xml files that are customized by users can be put into the customization archive and overlaid on the files that are supplied by IBM®.

- The following files need to be created:
 - For deployment of full Maximo® Asset Management in one deployment (Maximo -all)
 - deployment\was-liberty-default\config-deployment-descriptors\maximo-all\maximouiweb\webmodule\WEB-INF\web.xml
 - deployment\was-liberty-default\config-deployment-descriptors\maximo-all\maximo-x\webmodule\WEB-INF\web.xml
 - deployment\was-liberty-default\config-deployment-descriptors\maximo-all\maximo-x\webmodule\WEB-INF\web-guest.xml
 - deployment\was-liberty-default\config-deployment-descriptors\maximo-all\maximo-x\webmodule\WEB-INF\web.xml
 - deployment\was-liberty-default\config-deployment-descriptors\maximo-all\maxrestweb\webmodule\WEB-INF\web.xml
 - deployment\was-liberty-default\config-deployment-descriptors\maximo-all\maximo-x\webmodule\WEB-INF\web.xml
 - deployment\was-liberty-default\config-deployment-descriptors\maximo-all\mboweb\webmodule\WEB-INF\web.xml
 - deployment\was-liberty-default\config-deployment-descriptors\maximo-all\meaweb\webmodule\WEB-INF\web.xml
 - deployment\was-liberty-default\config-deployment-descriptors\maximo-all\mboejb\ejbmodule\META-INF\ejb-jar.xml
 - UI deployment
 - deployment\was-liberty-default\config-deployment-descriptors\maximo-ui\webmodule\WEB-INF\web.xml
 - Maximo Enterprise Adapter
 - deployment\was-liberty-default\config-deployment-descriptors\maximo-mea\meaweb\webmodule\WEB-INF\web.xml
 - deployment\was-liberty-default\config-deployment-descriptors\maximo-mea\mboejb\ejbmodule\META-INF\ejb-jar.xml
 - Report deployment
 - deployment\was-liberty-default\config-deployment-descriptors\maximo-report\webmodule\WEB-INF\web.xml
 - Cron deployment
 - deployment\was-liberty-default\config-deployment-descriptors\maximo-cron\webmodule\WEB-INF\web.xml
- IBM-specific file ibm-ejb-jar-bnd.xml is not used in Liberty deployment.

XSL customization

XSL customizations (that are part of the Maximo ear or war) that are part of customization archive and are copied to final images. Follow existing XSL customization documentation.

Using certificates

You can use route or TLS certificates, SSL certificates, external certificates.

Route or TLS certificates

Maximo® Application Suite uses cert-manager for automatic management and issuance of TLS certificates for application routes. During installation, you can provide a cluster issuer that is based on a trusted certificate authority (CA) for signing the certificates that are generated for your Maximo Application Suite domains.

By default, Maximo Application Suite provides a cluster issuer that generates Maximo Application Suite certificates that are signed by a self-signed CA. To use your own cluster issuer, include the following parameter when you run the Maximo Application Suite installer: `-c myClusterIssuerName`. For more information, see [System requirements](#).

Configuring Oracle Connector

You must configure Oracle Connector before and after the upgrade.

Configuring before upgrade

Procedure

1. Stop all transactions between Maximo and Oracle.
2. Process all transactions in the interface tables and integration queues.
3. Resolve any Oracle integration open or error transaction in Maximo .
4. Disable the External System OA12.
5. Backup PL/SQL user exits and any customization on the EBS side.
6. Stop the MX Maximo server.
7. Backup Maximo 7.6.1.2 database.

Configuring after upgrade

Procedure

1. Define the message provider and queues, which are Kafka or JMS.
2. Assign queues to External System OA12.
3. Configure Kafka crontask. If you are using Kafka, update the settings according to [MIF guide](#).
4. If you are using Kafka, disable **JMSQSEQCONSUMER** crontask .
5. Re-create interface tables and PL/SQL objects in Oracle E-Business Suite12.x MAXORA schema.
6. Reapply customizations on PL/SQL side.
7. Enable the external system.

Configuring SAP Connector

You must configure SAP Connector before and after the upgrade.

Configuring before upgrade

Procedure

1. Stop all transactions between Maximo and SAP.
2. Process all transactions in the queues.
3. Resolve any SAP integration errors in Maximo .
4. Disable the External System SAP2005.
5. Stop the MX Maximo server.
6. Backup Maximo 7.6.1.2 database.

Configuring after upgrade

Procedure

1. Define the message provider and queues as either Kafka or JMS.
2. Assign queues to the external system SAP2005.
3. Configure Kafka crontask. If you are using Kafka, update the settings according to [MIF guide](#).
4. If you are using Kafka, disable **MSQSEQCONSUMER** crontask.
5. Generate **APIKey** for integration user **sapadmin**.
6. Change connection parameters in SAP PO or Maximo HTTP channel.
7. Enable the external system SAP2005.

Viewing Maximo Manage Logs

View the IBM® Maximo® Manage logs for Server, Maxinst and Update database, User sync, Workspace operator, and Build logs from the Red Hat® OpenShift® console.

Procedure

1. Go to your Red Hat OpenShift console.
2. Go to Workload, Pods menu.
3. Select log type.
 - Maximo Manage Server logs.
Server logs are written to the standard output.
 - Select your Maximo Manage project.
 - Check your Liberty server pods.

- Select the server pod to view log.
 - cron
 - mea
 - report
 - ui
 - all
- Click Liberty server pod.
- Select the Logs tab to view the log for the selected server.
You can also configure IBM Maximo Application Suite (MAS) supported log configuration by Red Hat OpenShift. For example, Elasticsearch, Fluentd, and Kibana dashboard (EFK) can be configured for logging. The logs automatically flow to the EFK stack.

Aggregated Maximo Manage logs can be retrieved from the EFK stack.

<https://docs.openshift.com/container-platform/4.6/logging/cluster-logging-deploying.html>

You can also push the logs to any S3 compatible object storage by following these steps.

- Set up S3 credentials.
 - Create the following four environment variables in your Maximo Manage deployment:
 - LOG_BUCKETNAME
 - LOG_S3ACCESSKEY
 - LOG_S3ENDPOINTURL
 For example, <https://s3.us.cloud.object.storage.appdomain.cloud>
 - LOG_S3SECRETKEY
 - Create a log request (POST) by using any HTTP Rest Client. For example, the Postman tool.
Request URL: <http://manageserver:7001/maximo/oslc/service/logging?action=wsmethod:submitUploadRequest>
 - Replace the Maximo Manage server in the URL to your Maximo Manage server host or IP address.
 - A record is created in the Maximo Manage table (LOGREQUEST)
 - Use the S3 browser to view the logs by using your S3 credentials.
 - Each Maximo Manage server handles the latest log request. It compresses the log files in the liberty log directory and uploads it in Cloud Object Storage.
 - The logs can be downloaded from the Liberty server. It is saved in the directory that is set for the system property "server.output.dir".
 - For example, "/opt/was/libert/wip/usr/servers/default/
 - A record is created in the Maximo Manage table (LOGREQUESTDET)
 - The Maximo Manage table records will be removed by crontask (LOGREQUESTCLEANUP) after the logs are posted to the object storage. The crontask needs to be activated manually. It runs one time every day.
- **Maxinst and update database logs**
The maxinst and update database logs can be retrieved from the maxinst pod.
 - Select the maxinst pod for your project.
 - Go to the Terminal tab and `cd log (/opt/IBM/SMP/maximo/tools/log/)` to view logs.
You can also view the log from the Logs tab.
- **User sync logs**
The User sync logs can be accessed from the user sync pod.
 - Click the user sync pod and select Logs tab.
- **Maximo Manage Workspace operator logs**
The Maximo Manage Workspace operator log can be accessed from the Maximo Manage workspace pod.
 - In the Maximo Manage Workspace pod, select Logs tab.
- **Build logs**
The Build log can be accessed from the Maximo Manage build pods.
 - In the Maximo Manage build pod, select Logs tab.

What to do next

You can install OpenShift Logging by deploying the OpenShift Elasticsearch and Red Hat OpenShift Logging Operators. For more information, see [Installing OpenShift Logging](#).

Monitoring

You can enable monitoring for applications in Red Hat® OpenShift® Container Platform.

- [Configuring monitoring and metrics](#)
Configure monitoring and metrics using Red Hat OpenShift Container Platform.
- [Creating config map](#)
Create a config map by using an YAML.
- [Creating service](#)
Create a service.

- [Querying metrics](#)
You can search for metrics in Maximo Manage.
- [Setting up Grafana](#)
Follow the steps to set up Grafana.

IBM Maximo Manage tool

When Maximo® Manage is deployed, some tools become available.

- An admin pod gets deployed when Maximo Manage is deployed.
- The command `kubectl exec` can be run on the admin pod container or directly use the container console to run the tools such as integrity checker.
- Tools logged to stdout are forwarded to Elasticsearch, Fluentd, and Kibana (EFK) stack, if configured.

Useful information

Additional information regarding lic licensing model, docker image, how to add third-party JAR files, and debugging.

- [Maximo Application Suite licensing model](#)
The Maximo Application Suite licensing model has a user-centric view.
- [Manage Admin Docker image](#)
Information on how to install docker and get the Maximo Manage admin docker image.
- [Adding third-party JAR files](#)
You can add third-party JAR files to the Manage lib folder in the Customization Archive.
- [Debugging Maximo Manage application](#)
You can debug the Maximo Manage application.
- [Useful links](#)
Links to the complete documentation for IBM Maximo Application Suite, IBM Maximo Manage, and other helpful resources.

Maximo Application Suite licensing model

The Maximo® Application Suite licensing model has a user-centric view.

User centric view

Table 1. Application concurrent user

Application concurrent user	Limited (5)	Base (10)	Premium (15)	Notes
Manage Limited	Yes	Yes	Yes	Any three Manage modules other than Planning and Scheduling, Administration, Integration, System Config, Security, and the ability to view reports, change status, and update work orders in any module. Includes Linear, Calibration, and Spatial. Spatial requires installation.
Manage Industry Solution or Add-on Limited	Yes	No	Yes	Includes Manage Industry Solutions and Add-nos. If installed and more than three Industry Solutions and Add-on modules selected, it must be a Premium user, cannot be a Base user. The three modules selected cannot be Planning and Scheduling, Administration, Integration, System Config, Security.
Mobile	Yes	Yes	Yes	Maximo Mobile, Maximo Anywhere, and third-party module. The use of requires an installation.
Maximo Monitor	Yes	Yes	Yes	
Manage	No	Yes	Yes	Includes , Linear, Calibration and Spatial. Spatial requires installation.
Maximo Health	No	Yes	Yes	
Safety	No	Yes	Yes	Base users required for Supervisor or Team Lead or Safety Officer.
Industry Solutions	No	No	Yes	Utilities, Nuclear, Aviation, Oil & Gas, Transportation, Civil Infrastructure, APM for EU. CI and APM for EU require installation.
Add-ons	No	No	Yes	Maximo Asset Configuration Manager, Service Provider, Health, Safety and Environment
Maximo Predict	No	No	Yes	
Visual Inspection	No	No	Yes	Install points are required.

Table 2. Administrative concurrent users

Administrative concurrent users	Limited (5)	Base (10)	Premium (15)	Notes
Application	No	Yes	Yes	Application administrators administrate one or more applications, adds and assigns users to these applications, and uses the application-specific user interfaces to manage further user privileges.

Administrative concurrent users	Limited (5)	Base (10)	Premium (15)	Notes
Suite	No	No	Yes	Suite administrator manages overarching system configuration settings from the Suite Administrator pane.

- Administrators are defined as users in the system.
- The app points are reserved to ensure that Administrators always have access.
- Base Administrators can set up users regardless of the application's tier level. For example, A Manage administrator is tagged as an Application Admin User and withdraws 10 app points. This administrator can set up users for Maximo Predict, which is in the Premium group.

Manage Admin Docker image

Information on how to install docker and get the Maximo® Manage admin docker image.

- [Installing Docker](#)
 - [Getting the Manage admin docker image](#)
- Use the following steps to retrieve the IBM® Maximo Manage admin image.

Installing Docker

Procedure

Use the following steps to install Docker.

1. Install Docker from <https://docs.docker.com>.
2. Make sure [docker daemon](#) is running.

Getting the Manage admin docker image

Use the following steps to retrieve the IBM® Maximo® Manage admin image.

Procedure

1. Go to oc login.

```
$ oc login --token=sha256-yLcd9N_ih1UX7tGcq9REywmoliEGvK4R-rtDu_xxxxx --server=https://api.mas-app-sb123.cp.fyre.ibm.com:6443
```

2. Expose the internal registry to external using Route.

```
$ oc patch configs.imageregistry.operator.openshift.io/cluster --patch '{"spec":{"defaultRoute":true}}' --type=merge
```

3. Verify the internal registry route hostname.

```
$ oc get route -n openshift-image-registry
```

NAME	HOST/PORT	PATH	SERVICES	PORT
	TERMINATION WILDCARD			
default-route-registry	default-route-openshift-image-registry.apps.mas-app-sb1.cp.fyre.ibm.com		image-registry	
image-registry	image-registry.openshift-image-registry.svc		image-registry	
registry	5000-tcp			

4. Login using the default registry route hostname.

```
docker login -u <user_name> -p $(oc whoami -t) default-route-openshift-image-registry.apps.<clustername>.<basedomain>
```

```
$ sudo docker login -u kubeadmin -p $(oc whoami -t) https://default-route-openshift-image-registry.apps.mas-app-sb123.cp.fyre.ibm.com
```

5. If you get "x509: certificate signed by unknown authority" error message, then you should place the Router trusted CA on your host.
6. Extract the CA from Red Hat® OpenShift® Container Platform cluster, where the registry is configured.

```
$ oc extract secret/router-ca --keys=tls.crt -n openshift-ingress-operator
```

7. Perform on the node, where the image pulling throws x509 error.

```
$ sudo cp tls.crt /usr/local/share/ca-certificates/.
$ sudo update-ca-certificates
```

8. Make sure that the docker daemon is running.

```
$ ps -aux | grep dockerd
```

```
root      203  0.0  0.0 10508 4232 pts/0    T   01:28   0:00 sudo dockerd
```

```

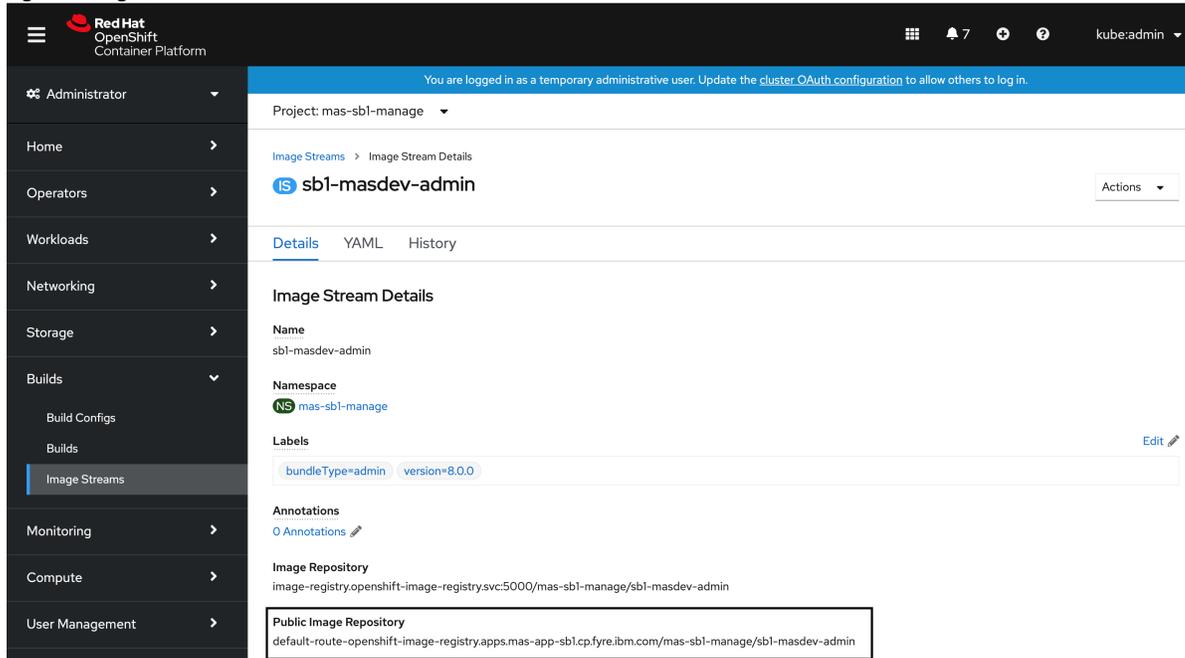
root      2397  0.0  0.0  11016  4612 pts/1    S   16:49   0:00 sudo dockerd
root      2398  0.0  0.4  1538160  111260 pts/1    Sl  16:49   0:07 dockerd
sarika    3999  0.0  0.0   8160    724 pts/1    S+  23:26   0:00 grep --color=auto dockerd

```

9. Pull admin docker latest image: `docker pull <Public image`

`Repository>` From the Manage project in OpenShift console, get the `Public Image Repository` value from the `<instanceid>-<workspaceid>-admin` in ImageStreams under Builds.

Figure 1. Image stream



```

$ sudo docker pull `default-route-openshift-image-registry.apps.mas-app-sbl.cp.fyre.ibm.com/mas-sbl-manage/sb1-masdev-admin`

```

10. Get Image ID: `docker images`

```
$ sudo docker images
```

REPOSITORY	IMAGE ID	CREATED	SIZE	TAG
default-route-openshift-image-registry.apps.mas-app-sbl.cp.fyre.ibm.com/mas-sbl-manage/sb1-masdev-admin	c0e655398e6b	3 weeks ago	7.87GB	latest

11. Run the docker pulled admin image `docker run -d <image id>`.

```

$ sudo docker run -d c0e655398e6b
1f2dfad8d3c813792798dc1f220bf27b7935f604c4817f47346a1f96e2336a92
time="2021-06-26T16:54:46.067182200-04:00" level=info msg="starting signal loop" namespace=moby
path=/run/docker/containerd/daemon/io.containerd.runtime.v2.task/moby/1f2dfad8d3c813792798dc1f220bf27b7935f604c4817f47346a1f96e2336a92 pid=2832

```

12. Get the container ID for the pulled admin image. `docker ps -a`

```
$ sudo docker images
```

REPOSITORY	IMAGE ID	CREATED	SIZE	TAG
default-route-openshift-image-registry.apps.mas-app-sbl.cp.fyre.ibm.com/mas-sbl-manage/sb1-masdev-admin	c0e655398e6b	3 weeks ago	7.87GB	latest

13. Copy the Manage code locally.

```
$ sudo docker cp d3544a11901e:/opt/IBM/SMP/maximo/latest.zip /mnt/c/temp/.
```

14. Optional: Run tools such as integrity checker.

- a. `docker exec -it <container id> /bin/bash`
- b. Update the Maximo properties in `/opt/IBM/SMP/maxio/applications/maximo/propertiesfolder`.
- c. Execute `/opt/IBM/SMP/maxio/applications/maximo/validate_integ.sh`.

Adding third-party JAR files

You can add third-party JAR files to the Manage lib folder in the Customization Archive.

About this task

Use the following steps to add a third-party JAR file name to the Manifest file, if the deployment has an **a11** or **mea** bundle server type.

Procedure

1. Follow the [Maximo® Manage admin Docker Image](#) page to pull the Manage code or go to the admin pod, which is the name of the pod that contains **maxinst**, terminal and get the file.
2. Go to `/opt/IBM/SMP/maximo/deployment/was-liberty-default` deployment folder.
 - a. Get the `maximo-all.xml` file if the deployment is **a11** bundle server type. In `maximo-all.xml`, go to the `maximo.businessobjectclasspath` property name and add the JAR file name in the path. When deployed it will update the classpath in the Manifest file.
 - b. Get the `buildmaximomea-ear.xml` file if the deployment has a **mea** bundle server type and update the classpath.
3. Copy the updated file in the Customization Archive folder in the same path and archive or compress the folder.
The file path for the `maximo-all.xml` file is `<localdrive>\custasset_bin\deployment\was-liberty-default`.
4. Deploy the Customization Archive and activate the changes.
For more information, see [Customizing the application](#).

Debugging Maximo Manage application

You can debug the Maximo® Manage application.

About this task

You must follow some steps to debug the Maximo Manage application.

Procedure

1. Create a server deployment.
 - a. Create a deployment for "All" or "UI" server bundle type, replace the **spec** section with the existing "All" or "UI" server deployment. Update the name. For example, `{instanceid}-{workspaceid}-alldebug`.
 - b. Add the port "7777" in the "Ports" section.

```
` - containerPort: 7777
  protocol: TCP`
```

```
ports:
- containerPort: 9081
  protocol: TCP
- containerPort: 9444
  protocol: TCP
- containerPort: 7777
  protocol: TCP
```

2. Update **cmd args** for the Maximo Manage server.
 - a. Replace `/tmp/startup.sh;` with `/tmp/genJDBCTruststore.sh;`
`/opt/ibm/wlp/bin/server debug defaultServer;`

```
image: >-
  image-registry.openshift-image-registry.svc:5000/mas-sb1-manage/sb1-masdev-
  all@sha256:6e6891b03d9237e64b6a3c4c41fd8dc331da74cf4cb2393a3ba70588599c600f
args:
- >-
  echo generateKeyStore...; openssl pkcs12 -export -in
  /etc/ssl/certs/internal-manage-tls/tls.crt -inkey
  /etc/ssl/certs/internal-manage-tls/tls.key -out ${java_keystore}
  -password pass:${java_keystore_password};
  /tmp/genJDBCTruststore.sh; /opt/ibm/wlp/bin/server debug
  defaultServer;
```

3. Wait for the pod to start.
4. On your local system, open PowerShell.
5. Install Red Hat® OpenShift® Container Platform interface, [OC CLI](#).
6. Log in to cluster with the OC login and switch to the correct project with the `oc project` command.
7. Run `kubectl port-forward <podname>7777:7777`.

```
kubectl port-forward sb1-masdev-alldebug-57d79d4dfc-q82vn 7777:7777

Forwarding from `127.0.0.1:7777 -> 7777`
Forwarding from `[::1]:7777 -> 7777`
```

8. Optional: You can obtain `kubectl` in the [Install Tools](#) page.
9. Create a Debug Configuration or Remote Java Project with **localhost** and port `7777` in your IDE or Eclipse. Start it.
 - a. Set the project with the Manage code. Use the **manageadmin** image to get the classes and libraries of the Manage code. The pod's logs now show the server, which is starting. You can see the "Handling Connection in the PowerShell window.

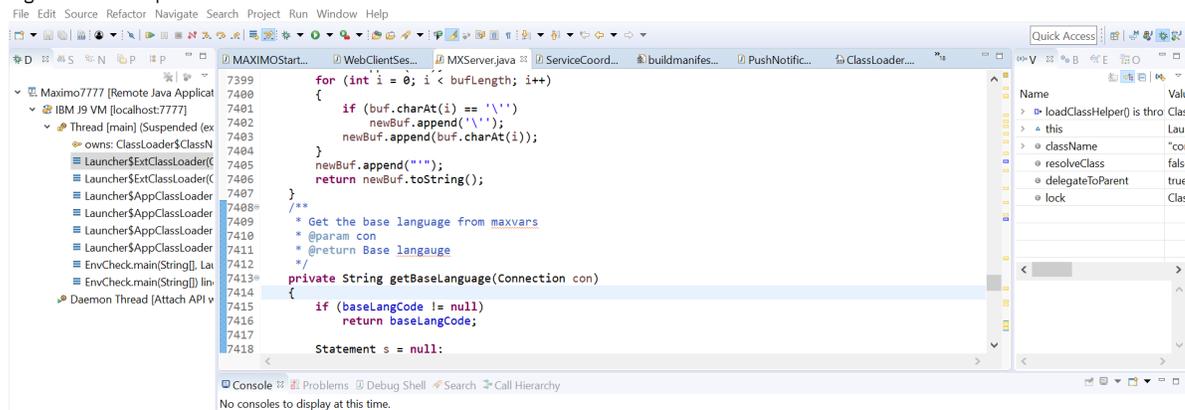
```
kubectl port-forward sb1-masdev-alldebug-57d79d4dfc-q82vn 7777:7777
```

```
Forwarding from `127.0.0.1:7777 -> 7777`  
Forwarding from `[::1]:7777 -> 7777`  
Handling connection for 7777
```

10. Create a service and route for new deployment.

11. If you are creating a new deployment, use the new route location link to go to the Maximo Manage application. Append `/maximoto` the link.

Figure 1. IDE sample



Maximo Manage facts

- The custom resource for the Maximo® Manage workspace provides properties for activating the application. For information about the custom resource, see [Properties for workspace deployment](#).
- One default IBM® Maximo Application Suite skin is available in Maximo Manage.
- The following items are not displayed in Maximo Manage:
 - `mxe.webclient.skin`. It is set to a Maximo Application Suite skin.
 - `mxe.webclient.dynamicFontSize.iot18`. It is set to 0, “false”.
 - `mxe.webclient.verticalLabels`. It is set to 1, “vertical”.
 - “Side navigation menu” option is user’s “Default information” dialog . It is set to “Display”.
- If the electronic signature feature is used, some changes are made due to the new authentication protocol. Refer to product documentation for the updated electronic signature functions.

Connecting to Red Hat OpenShift cluster from Windows

You can connect to Red Hat® OpenShift® cluster from Windows .

Installing Linux command shell for Windows

Procedure

Install WSL.

<https://docs.microsoft.com/en-us/windows/wsl/install-win10#manual-installation-steps>

Installing Red Hat OpenShift CLI or OC

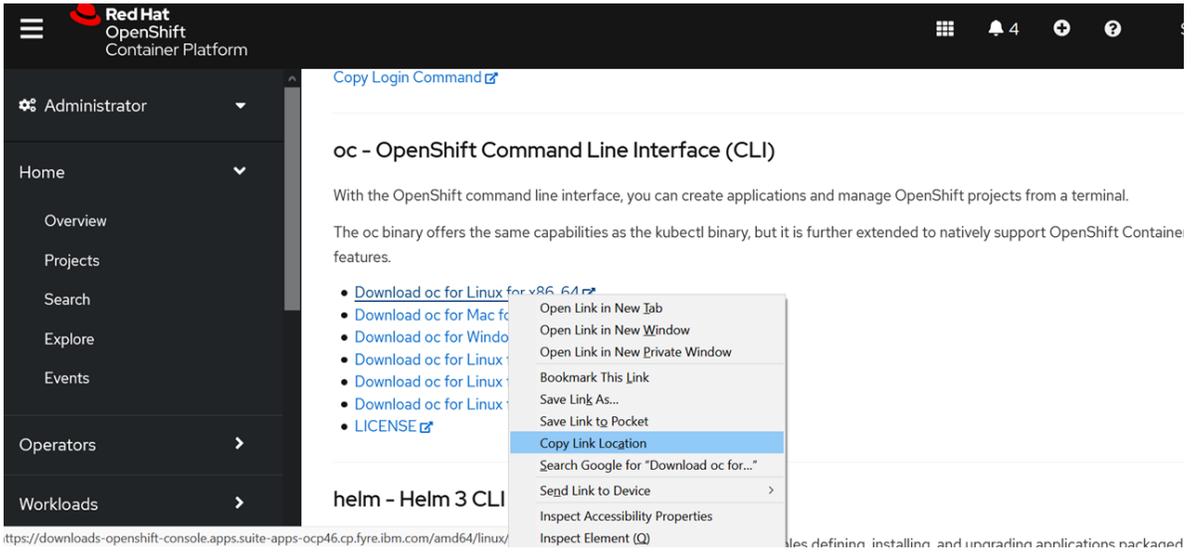
About this task

You can use the OpenShift command-line interface (CLI), and the `oc` command, to create applications and manage OpenShift Container Platform projects from a terminal. For more information, see [Getting started with the OpenShift CLI](#).

Procedure

1. From Red Hat OpenShift console, which is the Infrastructure Provider, go to Command Line Tools.
2. Copy the oc link location.

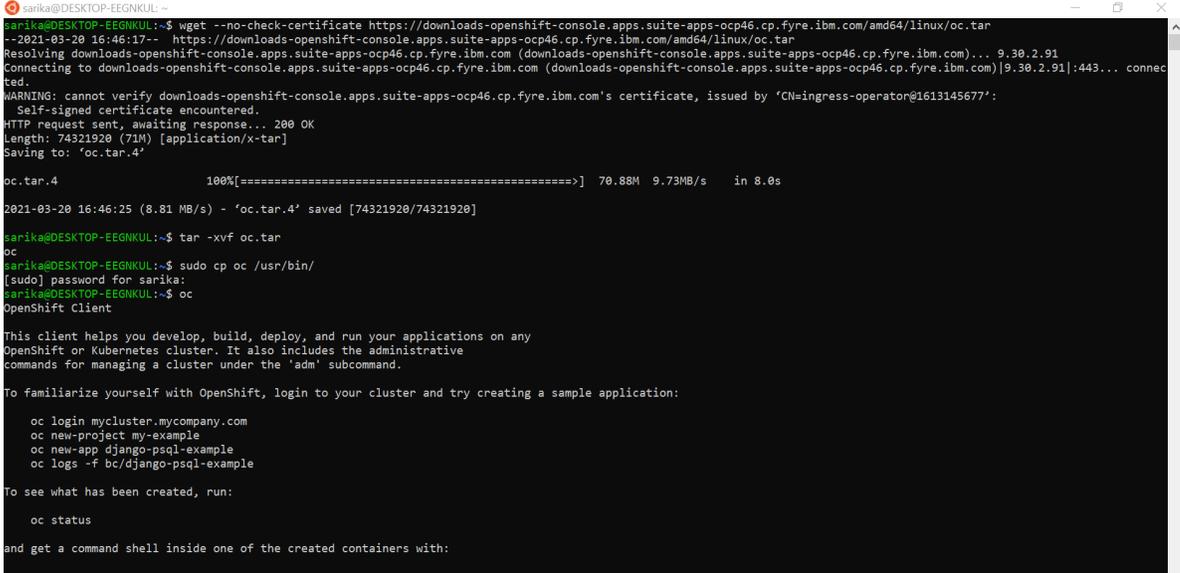
Figure 1. OC link



3. Open your Linux® command shell and install OC tool.

```
wget --no-check-certificate %link location from the previous step%
tar -xvf oc.tar
sudo cp oc /usr/bin/
oc --help
```

Figure 2. Red Hat OpenShift cmd



4. Get your token from Red Hat OpenShift console.
 a. Use oc login command to login to your server.

Figure 3. OC login

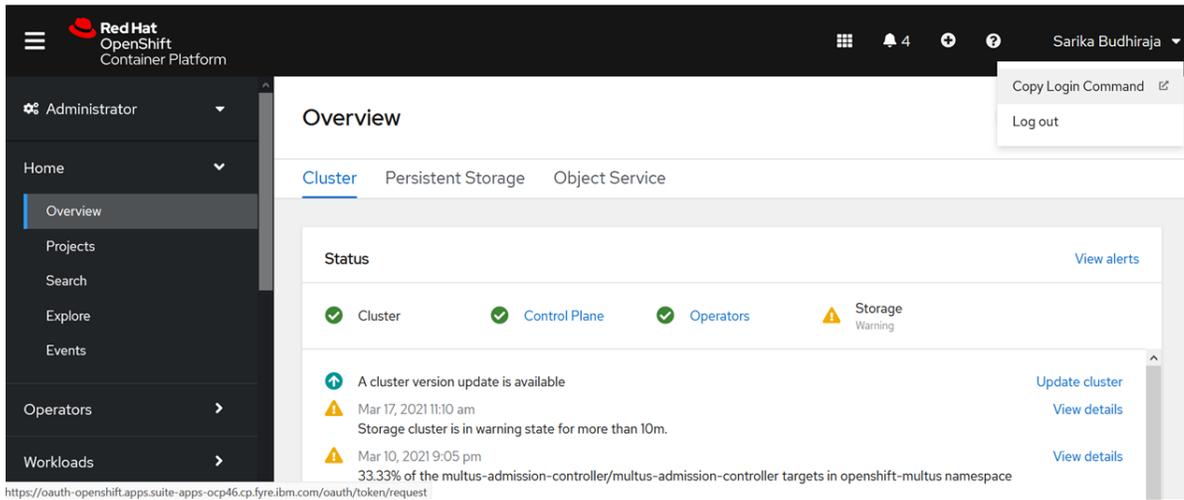
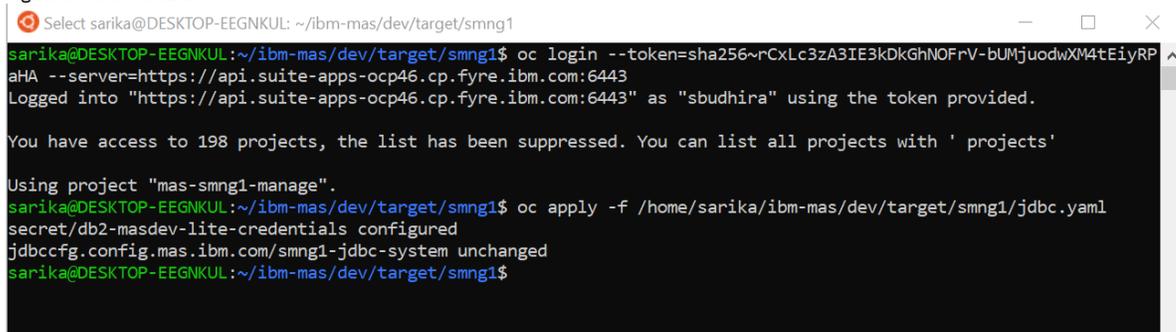


Figure 4. OC token



5. Run your Red Hat OpenShift commands from **oc -- help** . It lists all the commands.

Figure 5. OC command



Useful links

Links to the complete documentation for IBM® Maximo® Application Suite, IBM Maximo Manage, and other helpful resources.

- [Maximo Application Suite and Maximo Manage](#)
- [Customization detection tool](#)
- [Cluster logging \(EFK Sack\)](#)
- [Red Hat OpenShift CLI](#)
- [Persistent storage](#)

Administering the product

After installation, you can configure the system and the database, and schedule backups to ensure that your database is working at optimum performance levels. You can then perform functions such as setting up organizations and specifying chart of accounts and currencies.

- **[Administrative tasks for IBM Maximo Application Suite](#)**
Maximo® Manage provides APIs and administrative features for administrators to get information or complete tasks that are related to files or processes in Maximo Application Suite.
- **[Configuring databases](#)**
When your business needs change, you can create objects to extend the scope of your database before you create additional applications. As configuration changes are based on business rational, you must understand the structure of your database and the business requirements before you begin creating objects.
- **[Migration Manager](#)**
Use Migration Manager to migrate configuration content from one product environment to another.
- **[Managing communication templates](#)**
You use communication templates to standardize frequently used email communications, which are also known as notifications. There are several ways you can use communication templates, such as with the workflow or escalation process. You can also create and send email communications from the ticket applications by using standardized information from communication templates.
- **[Managing escalations](#)**
You use escalations to ensure that critical tasks, such as those defined in service level agreements, are completed on time. You can also use escalations for events that notify you before contracts expire, or to change the status or owner of a record. You can use escalations with any application.
- **[Enabling email updates for objects and workflow assignments](#)**
With email interaction, users without access to a desktop user interface can change objects and workflow assignments. A worker assigned to an object or workflow assignment receives an email that describes the object or workflow assignment. The email recipient replies to the email to change the status of the object, accept or reject the workflow assignment, or update the attributes of the record.
- **[Managing cron tasks](#)**
Cron tasks are behind-the-scene jobs that run automatically and on a fixed schedule. Predefined cron tasks support scheduling activities such as generating preventive maintenance work orders and reordering inventory items on schedules. Predefined cron tasks are provided, and you can also create your own cron tasks.
- **[Managing domains](#)**
To help ensure consistent and valid data input, some fields in the product are associated with domains. Domains enable users to select appropriate values. Administrators can add values to existing domains or add domains.
- **[Linear assets management](#)**
A linear asset is an asset that is defined and maintained using a linear referencing method. Roads, pipelines, and railroad tracks are examples of linear assets. Using measurements along the linear asset, you can locate maintenance activities, identify where characteristics change, and plan monitoring and metering.
- **[Planning and scheduling work](#)**
You can plan and schedule upcoming work in a graphical view.
- **[Configuring default settings in the graphical view](#)**
You can specify the work and resources that appear in the data table of the Gantt view. The settings specified in the Configure Gantt Properties: Default Settings window apply to all schedules or work lists.
- **[Managing calibration assets and standards](#)**
You can manage your calibration assets and the standards that are used to calibrate them.
- **[Administering and configuring attached documents](#)**
As an administrator, you can maintain attached documents for your applications in persistent storage or in cloud object storage.
- **[Enabling edit mode](#)**
You can enable edit mode for records, such as work orders and tickets, that are used frequently by multiple users. Edit mode reduces errors that occur when two users edit a record in the same application at the same time.
- **[Log management](#)**
You can create and manage log files that contain informational, warning, or error messages about various application activities. You also can view log data about for the Maximo Manage server bundles and for processes that are handled by the administrative server.
- **[Managing bulletin boards](#)**
You use bulletin boards to post messages about critical problems and incidents, and to broadcast information throughout an organization. You can also view communication logs from service desk agents and their users, and communications that are generated by workflow processes and escalations.
- **[Working with sets](#)**
You use sets to create item sets and company sets that are shared across multiple organizations.
- **[Managing organizations](#)**
You can set up the organizations and sites that you use. You can set defaults for various options that are related to applications or groups of applications, such as Work Order Tracking, Inventory, Purchasing, Preventative Maintenance, Assets, and so on.
- **[Managing calendars](#)**
You can create and change calendars for organizations and for sites. You can create calendars to define working times as well as shifts. A calendar can also specify non-working time, such as weekends, holidays, and shutdowns.
- **[Managing classifications](#)**
You can use classifications to simplify the task of managing and of retrieving historical data from other applications. You can use classifications to align with external standards, such as vendor standards and industry standards. You can also use classifications to define the escalation path for incidents.
- **[Managing charts of accounts](#)**
You use the Chart of Accounts application to set up default general ledger accounts and resource codes for standard accounting functions.
- **[Working with cost management](#)**
You use the Cost Management application to track the financial resources required to complete the project. You can also link work orders from a project in the Cost Management application to the Work Order Tracking application.
- **[Managing currency codes](#)**
You can define and manage currencies that you can use in purchase orders, purchase requisitions, invoices, and so on.
- **[Setting system properties](#)**
You can set system properties that various components use to control how applications and other aspects of the product work.
- **[Automating routine tasks with automation scripts](#)**
You use automation scripts to implement object rules, attribute validations, workflow or escalation actions, and workflow and security condition logic for applications. Automation scripts can reduce the time that you spend on automating tasks because you do not need to recompile files or restart the server.
- **[Managing building information model data](#)**
Building Information Modeling (BIM) is a process that manages the design and build phases of building construction projects. This process is used as part of the hand-over of the construction building from the contractors to the owners. It is during this process that you can import the data into Maximo Manage so that you can manage your facility and view the data in 3D.

- [Monitoring maintenance budgets](#)
You can create budget records to monitor maintenance-related transactions in a financial period. Monitoring budget costs can help to ensure that projects or activities, such as work orders, are completed within an agreed budget and can improve estimation of the costs of future projects.
- [Removing personal information from records](#)
To remove personal information from people records, you initially specify the information that you want to remove and then delete the information. In some cases, you can also remove personal information that is stored as a transactional reference.
- [Customizing the application](#)
If you make changes to Maximo Manage, such as customized Java™ classes or database scripts, you can copy them to a customization archive. Then, you can apply the customizations to server bundles when you deploy Maximo Manage. This feature is useful for moving customizations from a test to a production environment and for upgrades.
- [Setting up a local Maximo Manage development environment](#)
You can set up a local Maximo Manage development environment to develop and test Maximo Manage Java code locally, without having to deploy development images on a remote Red Hat® OpenShift® cluster.
- [Configuring the Help menu](#)
You can add custom menu links to the Maximo Manage Help menu from Maximo Manage version 8.5 onwards.

Administrative tasks for IBM® Maximo Application Suite

Maximo® Manage provides APIs and administrative features for administrators to get information or complete tasks that are related to files or processes in Maximo Application Suite.

APIs can be used by administrators who do not have full administrative access to Maximo Application Suite to complete some of these tasks or to access certain logs.

Some tasks must be completed by accessing the administrative features in Maximo Application Suite.

- [APIs for administrative utilities](#)
You can run script commands for several key utilities by using API requests. The script commands can run the integrity checker utilities, start and stop the Maximo Manage pods, download log files or a list of log files, and upload logs to Simple Storage Service (S3) Cloud Object Storage.
- [Sending log output to S3 Cloud Object Storage](#)
You can send server bundle logs for Maximo Manage to Simple Storage Service (S3) Cloud Object Storage. You also can redirect logs from the administrative server to S3 Cloud Object Storage.
- [Adding trusted certificates](#)
To enable secure communication with an external server, administrators can add trusted certificates for external sites into the truststore in WebSphere® Application Server Liberty. The list of aliases and certificates represents a complete chain of trust for the host. The certificates are necessary only if the host presents a certificate that is signed by a certificate authority that is not already trusted by Maximo Application Suite.

APIs for administrative utilities

You can run script commands for several key utilities by using API requests. The script commands can run the integrity checker utilities, start and stop the Maximo® Manage pods, download log files or a list of log files, and upload logs to Simple Storage Service (S3) Cloud Object Storage.

Overview

Beginning with Maximo Manage 8.1, an API framework is provided for the APIs that can run script commands for certain utilities. The API framework is in the Maximo Manage administrative server that is in Maximo Application Suite. The Maximo Manage administrative server contains the `smf` folder that contains the `maximo/tools` folder for the scripts. The server also contains an instance of WebSphere® Application Server Liberty that hosts the APIs.

To work with the APIs, you use a browser or an API platform, such as Postman.

Authorization to APIs

Authorized users must have an API key and must belong to the security group that enables the signature options for the APIs for script commands. The object structure that specifies the necessary signature options is available to the default administrator group, such as MAXADMIN. The default administrator group is specified by the value of the `ADMINGROUP` varname in the MAXVARS table.

Administrators give users authorization to access the APIs for script commands by taking the following steps:

1. In the API keys application of Maximo Manage, create API keys for the users. This action registers the keys to the users. Copy the keys and provide them to your users. An API key is displayed only one time and cannot be retrieved later.
2. In the Security groups application, select the administrator group that can work with the APIs.
3. Select the Object Structures tab and grant access to the TOOLSAPI object structure.
4. For the TOOLSAPI object structure, grant access to the signature options that are associated with the APIs.

APIs for script commands

The following table describes the APIs for script commands and their actions, HTTP methods, the associated signature options, and whether the API call waits for an API response before it continues. The `toolslog` and `installexternalcert` API calls are synchronous and wait for an API response before they continue.

API	Action	HTTP method	Signature option	API request type
-----	--------	-------------	------------------	------------------

API	Action	HTTP method	Signature option	API request type
icheckerreport	Generate the integrity checker log.	POST	ICREPORT	Asynchronous
toolslog	Get a specified tools log or get a list of all tools logs.	GET	GETLOG	Synchronous
submitUploadLogRequest	Upload logs from Maximo Manage UI, Cron, Maximo Enterprise Adapter, or Report pods to S3 Cloud Object Storage.	POST	GETLOG	Asynchronous
icheckerrepair	Start integrity checker repair.	POST	ICREPAIR	Asynchronous
managestart	Start all Maximo Manage pods.	POST	MANAGESTART	Asynchronous
managestop	Stop all Maximo Manage pods.	POST	MANAGESTOP	Asynchronous
installexternalcert	Import an external certificate to a server bundle truststore.	POST	INSTALLEXTERNALCERT	Synchronous
validatedbformas	Validate the database for the migration to Maximo Manage.	POST	VALIDATEDBFORMAS	Synchronous

Note: Do not use the SetAdminMode command-line interface from Manage tools to set the admin mode. The SetAdminMode command-line interface is not available in Maximo Application Suite setup as of now. You must use the Maximo Application Suite user interface or use the REST APIs to manage the admin mode.

API request formats and actions

The following table lists the APIs for the commands and the format of the API request. In the header of any API request, supply the API key that is associated with the Manage user.

For the managestart and managestop APIs, an HTTP response code of 200 indicates a successful call.

Stop the Maximo Manage pods before you run the integrity checker utility.

Action	API request
Generate the integrity checker log.	POST <code>https://host:port/toolsapi/toolservice/icheckerreport</code>
Get an integrity checker log.	GET <code>https://host:port/toolsapi/toolservice/toolslog?logfile=name of report from icheckerreport request</code>
Get a list of all tools logs.	GET <code>https://host:port/toolsapi/toolservice/toolslog</code>
Run the integrity checker utility.	POST <code>https://host:port/toolsapi/toolservice/icheckerrepair</code>
Upload logs from Maximo Manage pods to S3 Cloud Object Storage.	POST <code>https://host:port/maximo/api/service/logging?action=wsmethod:submitUploadLogRequest</code>
Stop the Maximo Manage pods.	POST <code>http://host:port/toolsapi/toolservice/managestop</code>
Start the Maximo Manage pods.	POST <code>http://host:port/toolsapi/toolservice/managestart</code>
Import an external certificate to a server bundle truststore.	POST <code>http://host:port/toolsapi/toolservice/installexternalcert</code>
Validate the database for the migration to Maximo Manage.	POST <code>http://host:port/toolsapi/toolservice/validatedbformas</code>

Swagger interface for APIs

To use the Swagger interface for APIs, you can enter a URL into a browser.

To use the Swagger interface, complete the following steps:

1. Enter the URL for the Swagger interface into a browser, as shown in the following example:

```
https://<host>:<port>/toolsapi/oas3/api.html
```

2. After the Swagger interface opens, in the Manage tools api window, click Authorize.
3. In the Available authorizations window, enter the API key for the interface and click Authorize. The available APIs are displayed. To exit the window without submitting an authorization, you can click Done.

Examples: Generate and fetch integrity checker log files

Supply the API key in the header of any API request.

To run the integrity checker tool in report mode and generate a log report, make the following request:

```
POST https://host:port/toolsapi/toolservice/icheckerreport
```

No request body is required. The integrity checker report process starts asynchronously. The JSON response contains the file names of the report, as shown in the following sample:

```
{
  "logfile": "ichecker_report1622050100427.log"
}
```

To fetch one of the logs, make the following request and supply one of the log file names as a parameter. The tools log process runs synchronously. The log file is returned as the response body of the request.

```
GET https://host:port/toolsapi/toolservice/toolslog?logfile=ichecker_report1622050100427.lis
```

The following related links about APIs provide detailed information about many of the APIs that work with this product and related products. The information might describe features that are not available to you.

Sending log output to S3 Cloud Object Storage

You can send server bundle logs for Maximo® Manage to Simple Storage Service (S3) Cloud Object Storage. You also can redirect logs from the administrative server to S3 Cloud Object Storage.

Before you begin

You must provision an S3 Cloud Object Storage location and note its S3 bucket name, endpoint URL, S3 access key properties, and the value of the S3 secret. If you intend to send server bundle logs to S3, you must have or obtain an API key in the Administrative Work Center.

About this task

The Maximo Manage application is deployed in one or more workloads, which are called server bundles. Server bundles include the ui, all, mea, reports, and cron types. Server bundle logs can be uploaded from your log location on WebSphere® Application Server Liberty to your S3 location.

The administrative server handles commands for the updatedb, maxinst, and the integrity checker utilities. Administrative server logs can be redirected to your S3 location.

Procedure

1. In your Red Hat® OpenShift® Container Platform deployment, go to Workloads > Secrets and add a key and value secret for your S3 configuration.
 - a. For the secret name, specify `s3secretkey`.
 - b. Set the key name to `accessSecretKey`.
 - c. Get the value from your S3 configuration.
2. In the Administration section, modify the custom resource (CR) for the ManageWorkspace custom resource definition (CRD) by taking the following steps:
 - a. Select the ManageWorkspace custom resource definition (CRD).
 - b. Select the Instance tab, then select the custom resource (CR).
 - c. On the YAML tab, add or modify the `spec.settings.deployment` section, and ensure that the custom resource (CR) for your instance contains the `loggingS3destination` property and the following child properties and values that match your S3 configuration:
 - `bucketName`: The S3 bucket name of the log destination.
 - `endpointURL`: The S3 endpoint URL. URLs for S3 can vary, depending on the S3 service that you use, such as a public, private, or regional URL service. Choose the URL that matches your deployment.
 - `accessKey`: The S3 access key.
 - `secretKey`: The name of the secret that contains the S3 access credential that you configured in Step 1.

After you modify the CR for your instance, the values are propagated to the CRs for the administrative server and the server bundle pods. If any property or value is not specified, logs are not sent to S3 Cloud Object Storage.

The following code sample for the CR shows the required properties and some fictitious values:

```
deployment:
  loggingS3Destination:
    accessKey: AQDNWVKXRTTY84LJ4G6YR
    bucketName: s3-bucket
    endpointURL: https://s3.us-area.amazonaws.com
    secretKey:
      secretName: s3secretkey
```

Logs that result from the running the maxinst, updatedb, or integrity checker utilities are now redirected to your S3 storage location. Each modified log is compressed and has a name that contains the source location and the timestamp of when the administrative command started to run.

3. To upload server bundle logs from your log location on WebSphere Application Server Liberty, make the following API request: **POST** `https://host:port/maximo/api/service/logging?action=wsmethod:submitUploadLogRequest`. Provide the API key in the header of the request. The body is empty.

The API request creates an entry in the LOGREQUEST table of Maximo Manage for each server bundle. A continuously running cron task uploads the compressed log files to your S3 storage location when the table is updated. The name of each file contains the source location and the timestamp of when the command started to run.

You can query the LOGREQUEST table to troubleshoot any issues. Clean up old table entries by configuring an instance of the LOGREQUESTCLEANUP cron task to run each day.

- [S3 buckets](#)
Maximo Manage 8.5 supports nested and other buckets for file backups.

Streaming WebSphere Application Server Liberty logs

You can stream WebSphere Application Server Liberty logs for server bundles by constructing a URL that you can use in a browser or other tool that you use for REST API calls.

Before you begin

Before you can stream logs, your administrator must grant you the STREAMLOG signature option for the Logging application. An API key is also required.

About this task

When you enter the URL in a browser, the browser displays the content of the WebSphere Application Server Liberty messages.log file for the server bundle that you specified.

Procedure

1. To stream the contents of the messages.log file for WebSphere Application Server Liberty, enter a URL in the following format in a browser or other API tool that you use for REST API calls:

```
https://<URL to the server bundle for which you want to stream logs>/maximo/api/service/logging?
action=wsmethod:streamLog&apikey=<your API key>
```

For example,

```
https://mas.manage.ui.mydomain.com/maximo/api/service/logging?
action=wsmethod:streamLog&apikey=n0sjvsvm4m8495037r2baafag35r5qaoncps
```

2. Optional: To refresh the browser with the latest contents of the log, press Enter again.

S3 buckets

Maximo® Manage 8.5 supports nested and other buckets for file backups.

Maximo Manage supports two structures for backup and recovery folders:

- S3 bucket setup:

```
<S3bucketname>
  <S3bucketname>recovery
  <S3bucketname>backup
```

- Nested S3 bucket setup:

```
<S3bucketname>
  <S3bucketname>recovery
  <S3bucketname>backup
```

Adding trusted certificates

To enable secure communication with an external server, administrators can add trusted certificates for external sites into the truststore in WebSphere® Application Server Liberty. The list of aliases and certificates represents a complete chain of trust for the host. The certificates are necessary only if the host presents a certificate that is signed by a certificate authority that is not already trusted by Maximo® Application Suite.

Adding trusted certificates using API calls

To import trusted certificates, you can issue an API call to the maxinst server. This feature is useful if you do not have access to the IBM® Maximo Application Suite user interface.

About this task

You can use the following parameters for API calls:

Table 1. API call parameters

Parameter	Value
alias	The name to use for the imported certificate.
connect	The host and port in the format <i>hostname:port</i> .
servername	If the remote server where the certificate is located uses Server Name Indication (SNI), specify the name of the server.

Procedure

Select one of the following options for adding a trusted certificate using an API call:

- Provide a one-line string for the certificate in the body of the API.

Complete the following steps to convert the PEM-formatted certificate to a single string and add the certificate using an API call:

1. Download the certificate that you want to add.
2. Use the following command to convert the PEM-formatted string for the certificate to a single string:

```
awk 'NF {sub(/\r/, ""); printf "%s\n",$0;}' <single certificate pem file>
```

3. To add the single-string certificate, provide information for the API call that includes the alias parameter, as shown in the following example:

HTTP Method
POST

URL

```
https://maxinst.manage.myserver.com/toolsapi/toolservice/installexternalcert?alias=certainalias
```

Header

```
apikey=bfrudgf86mq874hm3hmo8859itfqsvr41rbpc8nq
```

Use the API key that is associated with the Manage user.

Request body

```
-----BEGIN CERTIFICATE-----\nMIIFljCCA36gAwIBAgINAgO8U1lrNmCY9QFQZjANBgkqhkiG9w0BAQsFADBMQsw\nnQYDVQQGEwJVUzEiMCAGAlUEChMZR29vZ2x1IFRydXN0IFN1cnZpY2VzIExmQzEU\nzM\nDAwMDQyWhcNMjcwOT.....\n.....\ntdufThcV4q508DIrGKZTqPwJN1\n1IXNDw9bg1kWRxYtnCQ6yICmJhSFm/Y3m6xv+cXDB1Hz4n/FsRC6UfTd\n-----END\nCERTIFICATE-----
```

- Create an API call that downloads the certificate from a server.
To download a certificate from a server, provide information, as shown in the following example:

HTTP Method

POST

URL

```
https://maxinst.manage.myserver.com/toolsapi/toolservice/installexternalcert?  
alias=certalias&connect=google.com:443
```

Header

```
apikey=bfrudgf86mq874hm3hmo8859itfqsvr41rbpc8nq
```

Use the API key that is associated with the ManageMaximo Health user.

Adding trusted certificates in the user interface

You can add certificates through the user interface when you configure Maximo ManageMaximo Health for deployment. The format of the certificate must be PEM.

Procedure

- Add certificates.
 1. Log in to IBM Maximo Application Suite as a system administrator.
 2. From Suite administration, select Workspaces from the side navigation menu and then select the workspace that you want to configure.
 3. On the Overview tab for the workspace, select the Manage tile.
 4. On the Manage panel, click Actions and select Update configuration.
 5. In the Imported certificates row on the Update Manage configuration window, click the Edit icon.
 6. In the Imported certifications section, click Add to add a certificate.
You might have to disable the System managed switch before you can add a certificate.
 7. Specify the certificate alias and copy and paste the contents of the certificate.
Each alias name must be unique within the workspace.
 8. Click Confirm to save your changes.
 9. Select one of the following options:
 - If you are configuring a new deployment, click Activate.
 - If you are updating a deployment, click Apply changes.
- Add certificates.
 1. In IBM Maximo Application Suite click Administration and then click Catalog.
 2. Select the Manage tile.
 3. On the application details page, click Actions and select Update configuration.
 4. In the Imported certificates row on the Update Manage configuration window, click the Edit icon.
 5. In the Imported certifications section, click Add to add a certificate.
You might have to disable the System managed switch before you can add a certificate.
 6. Specify the certificate alias and copy and paste the contents of the certificate.
Each alias name must be unique within the workspace.
 7. Click Confirm to save your changes.
 8. Select one of the following options:
 - If you are configuring a new deployment, click Activate.
 - If you are updating a deployment, click Apply changes.

Configuring databases

When your business needs change, you can create objects to extend the scope of your database before you create additional applications. As configuration changes are based on business rational, you must understand the structure of your database and the business requirements before you begin creating objects.

- [Database design](#)
You typically extend the scope of your system because you have a use case that you want to include in the system. During the design phase you define the use case, the business objects, and the relationships between the business objects. To configure objects in the database, you must understand the structure of the database and the implications of the changes that you make to existing objects, tables, indexes, and relationships.
- [Defining objects for applications](#)
To extend the scope of your system, you must create objects. Every application is created based on the underlying objects that support the required business functions. You must understand the construction of your database before you define additional objects.
- [Configuration of general ledger accounts](#)
Default general ledger (GL) accounts are created as part of the installation process but you can create additional GL account codes at a later date. You must

configure default GL account code formats for the system level before you can create a chart of accounts. Once configured, it is not recommended that you modify the GL account formats as changing the configuration can make the existing chart of accounts unusable.

- [Configuring the database](#)

When you change the database, for example by creating or deleting objects, attributes, or indexes, changes are stored in secondary tables. The changes do not take effect until you configure the database. The product restores the backup tables as part of configuration.

- [Configuring the system for regulatory compliance](#)

Electronic signature verification and electronic audit records provide an additional level of security control and auditing capability that are often needed for regulatory compliance.

- [Controlling changes to objects](#)

Depending on your users needs, you can add functions that will help users, for example creating lookups or creating system messages.

- [Search option configuration for performance optimization](#)

You want to prevent users from performing queries that retrieve hundreds of thousands of records. You should periodically review users saved queries, you could define default queries for your users, or educate them on how to create efficient queries

Database design

You typically extend the scope of your system because you have a use case that you want to include in the system. During the design phase you define the use case, the business objects, and the relationships between the business objects. To configure objects in the database, you must understand the structure of the database and the implications of the changes that you make to existing objects, tables, indexes, and relationships.

- [Relational database structure](#)

The database and the database structure are defined in the installation process. The structure of the database depends on whether the database is Oracle Database, IBM® Db2®, or Microsoft SQL Server.

Relational database structure

The database and the database structure are defined in the installation process. The structure of the database depends on whether the database is Oracle Database, IBM® Db2®, or Microsoft SQL Server.

A database that can be perceived as a set of tables and manipulated in accordance with the relational model of data. Each database includes:

- a set of system catalog tables that describe the logical and physical structure of the data
- a configuration file containing the parameter values allocated for the database
- a recovery log with ongoing transactions and archivable transactions

Table 1. Database hierarchy

Component	Description
<i>Data dictionary</i>	A repository of information about the application programs, databases, logical data models, and authorizations for an organization. When you change the data dictionary, the change process includes edit checks that can prevent the data dictionary from being corrupted. The only way to recover a data dictionary is to restore it from a backup.
<i>Container</i>	A data storage location, for example, a file, directory, or device that is used to define a database.
<i>Storage partition</i>	A logical unit of storage in a database such as a collection of containers. Database storage partitions are called <i>table spaces</i> in Db2 and Oracle, and called <i>file groups</i> in SQL Server.
<i>Business object</i>	A tangible entity within an application that users create, access, and manipulates while performing a use case. Business objects within a system are typically stateful, persistent, and long-lived. Business objects contain business data and model the business behavior.
<i>Database object</i>	An object that exists in an installation of a database system, such as an instance, a database, a database partition group, a buffer pool, a table, or an index. A database object holds data and has no behavior.
<i>Table</i>	A database object that holds a collection of data for a specific topic. Tables consist of rows and columns.
<i>Column</i>	The vertical component of a database table. A column has a name and a particular data type for example, character, decimal, or integer.
<i>Row</i>	The horizontal component of a table, consisting of a sequence of values, one for each column of the table.
<i>View</i>	A logical table that is based on data stored in an underlying set of tables. The data returned by a view is determined by a SELECT statement that is run on the underlying tables.
<i>Index</i>	A set of pointers that is logically ordered by the values of a key. Indexes provide quick access to data and can enforce uniqueness of the key values for the rows in the table.
<i>Relationship</i>	A link between one or more objects that is created by specifying a join statement.
<i>Join</i>	An SQL relational operation in which data can be retrieved from two tables, typically based on a join condition specifying join columns.

- [Data dictionary tables](#)

The structure of a relational database is stored in the data dictionary tables of the database.

- [Integrity checker](#)

The integrity checker is a database configuration utility that you can use to assess the health of the base layer data dictionary. The tool compares the data dictionary with the underlying physical database schema. If errors are detected, the tool produces error messages detailing how to resolve the issues.

- [Storage partitions](#)

A database storage partition is the location where a database object is stored on a disk. Database storage partitions are called *table spaces* in Db2 and Oracle, and called *file groups* in SQL Server.

- [Business objects](#)

A business object is an object that has a set of attributes and values, operations, and relationships to other business objects. Business objects contain business data and model the business behavior.

- [User-defined objects](#)

Objects can be created in two ways: you can create an object in the database or an object can be natively defined in the database. User-defined objects are

- always created in the Database Configuration application.
- [Configuration levels for objects](#)
Levels describe the scope of objects and must be applied to objects. Depending on the level that you assign to objects, you must create certain attributes. For users to access an object, an attribute value must exist at the level to which they have authority. The level that you assign to an object sometimes depends on the level of the record in the database.
- [Database relationships](#)
Database relationships are associations between tables that are created using join statements to retrieve data.
- [Business object attributes](#)
Attributes of business objects contain the data that is associated with a business object. A persistent attribute represents a database table column or a database view column. A nonpersistent attribute exists in memory only, because the data that is associated with the attribute is not stored in the database.
- [Attribute data types](#)
Each database record contains multiple attributes. Every attribute has an associated data type.
- [Database views](#)
A *database view* is a subset of a database and is based on a query that runs on one or more database tables. Database views are saved in the database as named queries and can be used to save frequently used, complex queries.
- [Indexes](#)
You can use indexes to optimize performance for fetching data. Indexes provide pointers to locations of frequently accessed data. You can create an index on the columns in an object that you frequently query.
- [Primary keys](#)
When you assign a primary key to an attribute, the key uniquely identifies the object that is associated with that attribute. The value in the primary column determines which attributes are used to create the primary key.

Data dictionary tables

The structure of a relational database is stored in the data dictionary tables of the database.

The following table describes the product data dictionary tables.

Table 1. Tables in the product data dictionary

Table name	Contents
MAXOBJECT	All objects. Links an object to its table or view.
MAXTABLE	All tables.
MAXVIEW	All views.
MAXATTRIBUTE	All attributes of an object. A table or view attribute depends on the attributes of the object.
MAXVIEWCOLUMN	All view columns.
MAXRELATIONSHIP	All relationships defined on objects.
MAXSEQUENCE	All sequences used in the system. SQL Server, Oracle, and Db2® use database sequence generators.
MAXSYSINDEXES	All indexes in the system. This table contains the index name, uniqueness and storage partition that is used in the MAXSYSKEYS table.
MAXSYSKEYS	The columns in an index.

Integrity checker

The integrity checker is a database configuration utility that you can use to assesses the health of the base layer data dictionary. The tool compares the data dictionary with the underlying physical database schema. If errors are detected, the tool produces error messages detailing how to resolve the issues.

You run the integrity checker in the source environment before and after you upgrade the database. Activities that might result in errors include:

- Running the upgrade process itself
- Running the set of patch scripts included in updating a database
- Configuring the database in the Database Configuration application
- Configuring the database in the Migration Manager application

Errors reported by the integrity checker might affect migration. You run the integrity checker in both the source and the target environments when you run the Migration Manager.

You must ensure that the errors are corrected either by using the integrity checker in repair mode or by applying changes directly to the underlying database.

In Maximo® Manage you can use APIs to run integrity checker. For more information, see [APIs for administrative utilities](#).

Alternatively, run integrity checker commands by using the remote shell in the terminal of the `maxinst` pod. You must have Red Hat® OpenShift® Container Platform access to run integrity checker in the remote shell.

Storage partitions

A database storage partition is the location where a database object is stored on a disk. Database storage partitions are called *table spaces* in Db2® and Oracle, and called *file groups* in SQL Server.

When a database is created, the database administrator configures the DBSTORAGEPARTITION domain in the Domains application to include a list of available table spaces where objects are stored. When you create an object as a table, you specify the storage partition from this list of available table spaces.

In IBM® DB2®, the database or system can manage table spaces:

- If the database manages table spaces, indexes can be different from the table.
- If the system manages table spaces, indexes must be the same as the table.

The database and the system cannot manage table spaces simultaneously; you must choose one or the other.

Business objects

A business object is an object that has a set of attributes and values, operations, and relationships to other business objects. Business objects contain business data and model the business behavior.

Unlike a business object, a database object does not model behavior. A database object is a self-contained software entity that consists of both data and functions to manipulate data. A business object might consist of one or more database objects.

Every business object has a fixed set of properties that identify the business object type. The properties also specify how the database can use the business object.

Information about a business object, which is referred to as the metadata, is stored in the database in database tables. Business objects include the following metadata:

- The definition of the business object, such as its name, the database entity, whether the object is persistent or nonpersistent, and the Java™ class name
- Attributes, such as the name, data type, size, and the field validation class name
- Associated relationships

Business objects can be either persistent or nonpersistent. Persistent business objects are associated with a database view or table and store attribute values in a database. Data in a nonpersistent business object is transient and is not stored in the database.

The metadata that is associated with business objects provides information about the data in database tables and is used to manage the database objects.

User-defined objects

Objects can be created in two ways: you can create an object in the database or an object can be natively defined in the database. User-defined objects are always created in the Database Configuration application.

Existing or imported objects are first natively defined in the backend of the database. They are later redefined in Maximo® in the Database Configuration application. When an object is imported into the database, the Imported check box is automatically selected on the Objects tab.

Configuration levels for objects

Levels describe the scope of objects and must be applied to objects. Depending on the level that you assign to objects, you must create certain attributes. For users to access an object, an attribute value must exist at the level to which they have authority. The level that you assign to an object sometimes depends on the level of the record in the database.

A system-level object is the only object that does not require an attribute value as it applies to all objects. If you specify a multiple-level for an object, multiple attributes must be created. For example, if you specify the SYSTEMORGSITE level, the system attribute, the organization attribute, and the site attribute must be created.

You do not need to specify the required values for attributes when you create an object, required values can be specified at a later date.

Security is applied to configuration levels.

For certain configuration levels, you can restrict the result set by appending a condition to the WHERE clause. For example, you can specify the site level as "siteid=...".

Table 1. Configuration levels for database objects

Level	Description	Object attributes	Example
SYSTEM	A system-level object. Security restrictions are applied at the application or object level in the specific system-level business object definitions.	System attribute	
SYSTEMORG	A system-level object that can also be assigned to an organization. If the organization ID is not specified, the object operates at the system level.	System attribute and organization attribute	orgid is null or orgid = ...
SYSTEMSITE	A system-level object that can also be assigned to a site. If the site ID is not specified, the object operates at the system level.	System attribute and site attribute	siteid is null or siteid = ...

Level	Description	Object attributes	Example
SYSTEMORGSITE	A system-level object that can also be assigned to an organization, or to an organization and a site. If the site ID is not specified, the object operates at either the system level or the organization level. The level depends on whether the organization ID is assigned. If the organization ID is not specified, the object operates at the system level.	System attribute, organization attribute, and site attribute	(siteid is null or siteid = ...) and (orgid is null or orgid = ...)
SYSTEMAPPFILTER	This object is treated as a system-level object but it can ask the profile for a list of sites and organizations in the context of an application so that the application can filter data. Filtering is required for site-level administration of users and groups. Used for Users and Groups.	System attribute and application filter attribute	
ORG	An organization-level object. The framework applies security for this type.	Organization attribute	orgid = ...
ORGSITE	An organization-level object that can also be assigned to a site. If the site ID is not specified, the object operates at the organization level.	Organization attribute and site attribute	(siteid is null or siteid = ...) and orgid = ...
ORGAPPFILTER	An organization-level object with application filtering. Used for contracts so that the contract applications can filter on the special object instead of filtering by using standard security.	Organization attribute and application filter attribute	
SITE	A site level object.	Site attribute	siteid = ...
SITEAPPFILTER	A site-level object with application filtering. Reserved for future objects.	Site attribute and application filter attribute	
ITEMSET	An item set-level object. The itemsetid attribute value must exist in the insert organization for users. The framework adds the required security restriction.	Item set attribute	
COMPANYSET	A company set-level object. The compnaysetid attribute value must exist in the insert organization for users. The framework adds the required security restriction.	Company set attribute	

Database relationships

Database relationships are associations between tables that are created using join statements to retrieve data.

The following table describes the database relationships.

Table 1. Database relationships

Type of relationship	Description
One-to-one	Both tables can have only one record on each side of the relationship. Each primary key value relates to none or only one record in the related table. Most one-to-one relationships are forced by business rules and do not flow naturally from the data. Without such a rule, you can typically combine both tables without breaking any normalization rules.
One-to-many	The primary key table contains only one record that relates to none, one, or many records in the related table.
Many-to-many	Each record in both tables can relate to none or any number of records in the other table. These relationships require a third table, called an associate or linking table, because relational systems cannot directly accommodate the relationship.

In the Database Configuration application, you can define Structured Query Language (SQL) statements for joins, and create relationships between parent and child objects. You can use a join to link data from multiple objects. The parent is the existing object and the child is the object that you are create.

Example

Parent = MAXUSER, Child =SITE, and Name = DEFSITE means that maxuser exists and you want to get the site for the default site for the user.

```
siteid = :defsite
```

This configuration means `site.siteid = maxuser.defsite`. When the SQL statement is run, the value of the parent attribute replaces anything preceded by a colon.

Business object attributes

Attributes of business objects contain the data that is associated with a business object. A persistent attribute represents a database table column or a database view column. A nonpersistent attribute exists in memory only, because the data that is associated with the attribute is not stored in the database.

A persistent business object can have persistent and nonpersistent attributes. Persistent attributes of a business object relate to columns of a database table or view. All attributes of a non-persistent business object are non-persistent.

The additional metadata that is associated with business object attributes is stored apart from the basic data type information. For example, attributes can include a domain, a custom class, a default value, and to specify whether the attribute is required.

Restrictions on attributes

Before you modify an attribute, you can verify whether it was created by the system or by someone at your site. Attributes created by the system have more restrictions on modifications than user-defined attributes. You cannot delete attributes created by the system.

In integration scenarios, data for a business object might be received from external business applications. Restricting changes to attributes prevents external data from overwriting the value of an attribute.

Some restrictions depend on whether text search is enabled for the object or on the data type. The rules governing modifications vary by attribute. For example, certain data types have a set value for the length, scale, dates, or integers. The Memo field is a regular ALN data type and it does not contain restricted values.

To manage restrictions on attributes, you can perform the following actions:

- View the current object attribute restrictions
- Restrict the attributes of an object
- Remove attribute restrictions from an object

Attribute data types

Each database record contains multiple attributes. Every attribute has an associated data type.

Table 1. Attribute data types

Data type	Data type name	Description
ALN	Alphanumeric characters, mixed case	Maximum length depends on the database: <ul style="list-style-type: none">• Oracle = 4000 characters• SQL Server = 8000 characters• DB2® = 32672 characters
AMOUNT	Decimal number, used for currency	
BIGINT	Big integer	
BLOB	Binary large object	Stores JPEG, movies, or PDF files in single records inside the database instead of in external files.
CLOB	Character large object	
CRYPTO	Encrypted binary	Encrypts data on the screen and in the database. Used for password hints.
CRYPTOX	Encrypted binary (one-way)	Encrypts data in the database, but leaves it readable on the screen. Used for passwords.
DATE	Date only	
DATETIME	Date and time	
DECIMAL	Decimal number	A number that includes an integer and a fraction that consists of a fixed number of digits called the scale.
DURATION	Duration in hours	Appears as 1:30 = 1.5 hours
FLOAT	Floating number	Numbers with fractional portions with variable precision.
GL	General ledger account	An ALN data type that is used for GL Accounts.
INTEGER	Integer number	
LONGALN	Long alphanumeric.	Used only for nonpersistent Long Description attributes. The corresponding native column in the database is defined as CLOB.
LOWER	Lowercase characters	
SMALLINT	Small integer	
TIME	Time only	
UPPER	Uppercase characters	
VARCHAR	Variable length character	
YORN	Yes or No, 1 or 0 in the database	

Database views

A *database view* is a subset of a database and is based on a query that runs on one or more database tables. Database views are saved in the database as named queries and can be used to save frequently used, complex queries.

There are two types of database views: dynamic views and static views. Dynamic views can contain data from one or two tables and automatically include all of the columns from the specified table or tables. Dynamic views are automatically updated when related objects or extended objects are created or changed. Static views can contain data from multiple tables and the required columns from these tables must be specified in the SELECT and WHERE clauses of the static view. Static views must be manually updated when related objects or extended objects are created or changed.

When you create a dynamic view with data from two tables, you must ensure that both tables have the same PRIMARYKEYCOLSEQ columns or contain unique indexes with the same column name in the same order.

Database views are populated depending on the object on which they are based. For example, if you add or remove an attribute from the WORKORDER object, the attribute is either added or removed from the dynamic view that is based on the object. When you change an attribute, not all changes are applied to the associated database view. For example, if you change the data type of an attribute, the change is applied to the database view. However, if you change or add a domain to the default value of the WORKORDER object, the change is not automatically applied to the database view. Instead, you must apply this change to the database view.

Indexes

You can use indexes to optimize performance for fetching data. Indexes provide pointers to locations of frequently accessed data. You can create an index on the columns in an object that you frequently query.

You cannot redefine existing indexes. You must delete indexes and re-create their definitions.

Primary keys

When you assign a primary key to an attribute, the key uniquely identifies the object that is associated with that attribute. The value in the primary column determines which attributes are used to create the primary key.

By default, a primary key is automatically created by taking the object name, adding an ID to the object name, and assigning a primary column value of 1. If you change the value, it must be sequential, unique, and greater than 0. The sequence determines the order in which the primary index is created. Each attribute can have only one primary key. The same attribute can be used in more than one primary key. When the object is saved, the primary key can no longer be modified.

A primary index is automatically created for the primary key and ensures that the primary key is unique. You can use the primary index to retrieve and access objects from the database. The unique index is a column, or an ordered collection of columns, for which each value identifies a unique row. The sequential values that are assigned in the primary columns determine the order in which the unique index is created. A unique index can contain NULL values.

Defining objects for applications

To extend the scope of your system, you must create objects. Every application is created based on the underlying objects that support the required business functions. You must understand the construction of your database before you define additional objects.

- [Creating objects](#)
An object is a self-contained software entity that consists of both data and functions to manipulate data. You can use an abbreviation of your organization as a prefix to any new or modified object or attribute name.
- [Adding views to databases](#)
A view can contain data from more than one object in the database. You can create object views in addition to views on existing system objects. If you work with custom applications, you can add object tables in the Database Configuration application.
- [Creating applications from imported database views](#)
You can use imported database views to create applications.
- [Specifying attributes for objects](#)
Attributes contain the data that is associated with objects. When you create an object, you must specify the attributes that are assigned to the object.
- [Enabling autonumbering for attributes](#)
You can configure autonumbering at the system, set, organization, or site level. You can enable autonumbering for attributes to apply starting numbers and prefixes to items such as assets or work orders. Autonumbering can facilitate the movement of items across the organization levels.
- [Adding tax types to database tables](#)
A tax type corresponds to a kind of tax, for example, to a city sales tax. You can specify up to 27 different tax types. The requirements of your financial system determine how many tax types you can specify.
- [Adding indexes](#)
You create an index to optimize performance when searching the table using the Find function and to establish uniqueness of table columns.
- [Adding primary keys to user-defined objects](#)
Primary keys can be added to user-defined objects to uniquely identify these objects in a database. A primary index is automatically created for the primary key and ensures that the primary key is unique.
- [Creating relationships between parent and child tables](#)
To retrieve data on objects, you must define the relationships between objects. You define SQL for joins to create relationships between parent and child objects.

Creating objects

An object is a self-contained software entity that consists of both data and functions to manipulate data. You can use an abbreviation of your organization as a prefix to any new or modified object or attribute name.

Procedure

1. In the Database Configuration application, click New Object.
2. Type a name in the Object field.
The Entity field shows the value that you typed in the Object field and becomes the name of the view on the database.
3. Specify a description for the object.
4. Optional: Specify object properties:

Option	Description
Main Object	To make the object a main object for Workflow, select this check box.

Option	Description
Persistent	If the object is persistent, three attributes are created: ID, description, and rowstamp (if selected). If the object is nonpersistent, nothing is added for attributes. You cannot configure the database without creating at least one attribute for the object.
Storage Partition	If applicable to your database, click Detail and select a storage partition for the object. The values are stored in the DBSTORAGEPARTITION domain.
User Defined	If an administrator created the object, the User Defined check box is selected. If the object is a regular product object, the User Defined check box is cleared.
Unique Column	The name of the attribute that is created as a unique identifier on a persistent object. This value is used in indexing. <ul style="list-style-type: none"> If the object is flagged as imported, then a unique column is not required. If you add a unique column, it must have a new column name and cannot exist in the native database.
Language Table	To enable this object for multiple languages, specify a value. The convention is L_ <i>tablename</i> .
Text Search Enabled	Select to enable text search on the object. You can use this function with text search on attributes.

5. Click Save Object.

What to do next

After you create an object, you must add attributes before you configure the database for your changes to take effect.

Adding views to databases

A view can contain data from more than one object in the database. You can create object views in addition to views on existing system objects. If you work with custom applications, you can add object tables in the Database Configuration application.

About this task

You can add an object table or view from any tab of the Database Configuration application.

Procedure

- On the toolbar, click New Object, and specify a value and a description for the object.
- Optional: Type over the value in the Entity field to change the name of the object on the native database.
- In the Service field, specify a value or use the default value of CUSTAPP.
- In the Level field, specify the scope of the object in the Multisite scheme.
- Optional: To create a view, select an object in the Extends Object field. The View check box is selected by default.
- Optional: Provide the following additional object details:

Option	Description
Main Object	To make the object a main object for Workflow, select this check box.
Persistent	If the object is persistent, the check box is selected and three attributes are created: ID, description, and rowstamp. If the object is non-persistent, the check box is clear. Nothing is added for attributes but you cannot configure the database without creating at least one attribute for the object.
User Defined	If the object is a regular product object, the User Defined check box is clear. If the object was created by an administrator the User Defined check box is selected.
Storage Partition	If applicable to your database, specify a storage partition for the object.
Unique Column	The name of the attribute that is created as a unique identifier on a persistent object. This value is used in indexing. <ul style="list-style-type: none"> If the object is flagged as imported, then a unique column is not required. If you add a unique column, it must have a new column name and cannot exist in the native database.
Text Search Enabled	To enable text search on the object, select the check box. You can use this function with text search on attributes. (This field appears only for existing objects.)

- Optional: In the View section, define the following details for a view:

Option	Description
View Where	The WHERE clause that is used for the view.
Join to Object	The secondary object that is used in the join for this view. If the view joins two tables, you can type the name for the second table in this field.
View Select	The SELECT clause that is used for the view when the Automatically Select check box is cleared. Use the format <code>SELECT TABLE1.COL1 AS A, TABLE2.COL2 AS B</code>
View From	The FROM clause that is used for the view when the Automatically Select check box is cleared.

- Optional: In the Audit table window, create an audit table and select the Audit Enabled check box to edit the filter field for the E-audit function.
- Save the object.

What to do next

After you add an object table or view, you must configure the database for your changes to take effect.

Creating applications from imported database views

You can use imported database views to create applications.

About this task

The unique ID of the main table column cannot be renamed. All other columns can be renamed.

Procedure

1. Create a view on the database.
2. In the Database Configuration application, create an object.
The object name must be the same name as the view created on the database.
3. In the Extends Object field, ensure that you specify the object name of the unique ID of the main table column.
4. Create an application from the database view.
5. If you renamed any fields in the database view, remove these fields from the Advanced Search dialog:
 - a. Go to Application Designer and open the new application.
 - b. Click Edit Dialogs and select More Search Fields.
 - c. Remove any fields that you renamed.

Specifying attributes for objects

Attributes contain the data that is associated with objects. When you create an object, you must specify the attributes that are assigned to the object.

- [Descriptions and long descriptions](#)
There is a limit to the amount of data that you can store in the description fields. Each database has its own specified limit. If you know that you need to store more data than is available in the description field, you can add a long description field to an attribute.
- [Adding attributes to objects](#)
You can add attributes to an object when you want to provide more information about that object. You add attributes to objects using the Database Configuration application.
- [Changing attributes](#)
You can change attributes when necessary. Depending on how the attribute is configured, you might not be able to modify all of the fields.
- [Creating restrictions on attributes](#)
You can create restrictions on attributes to prevent external data from overwriting the value for the chosen attribute.
- [Excluding user-defined attributes when duplicating objects](#)
There might be objects that you duplicate regularly but you do not want to include all user-defined attributes in the duplicated objects. For each object, you can specify the user-defined attributes that you do not want included when you duplicate objects. By excluding attributes, you can reduce the data maintenance work required to work with duplicated objects.

Descriptions and long descriptions

There is a limit to the amount of data that you can store in the description fields. Each database has its own specified limit. If you know that you need to store more data than is available in the description field, you can add a long description field to an attribute.

The description field object is associated with the VARCHAR (variable length character) column. This column can hold a maximum number of bytes it can hold. If you associate a long description field with an attribute, a long description is added to the VARCHAR column. Long descriptions are stored in the character large object (CLOB) column of the long description (LONGDESCRIPTION) table. If you include a long description field, you can store a smaller amount of data in the main table and a larger amount in the long description table.

The long description data can contain any alphanumeric data. This data appears in the Long Description field from the user interface.

Each long description must have a long description owner. When you select the Long Description Owner check box on the Attributes tab of the Database Configuration application, you become the owner of the long description. When the Long Description Owner check box is selected for an attribute for the first time, the HASLD (has long description) column is added to the main record.

An icon exists or can be added beside the description field on the UI. The appearance of the icon changes when long description data exists. HASLD indicates that a long description exists.

The default value for HASLD is 0. When data is entered in the long description, the value of HASLD changes to 1.

Adding attributes to objects

You can add attributes to an object when you want to provide more information about that object. You add attributes to objects using the Database Configuration application.

About this task

You can use an abbreviation of your organization as a prefix to any attribute name, for example, ACME_MEMOFIELD. This practice prevents accidentally choosing a database reserved word and prevents conflicts with new standard names in an upgrade. You cannot add an attribute that is named rowstamp, tenantid, maxsetupflag, or HASLD to an object.

Procedure

1. Go to the Database Configuration application (Go To Applications, > System Configuration, > Platform Configuration, > Database Configuration).
2. On the List tab, select the object to which you want to add an attribute.
3. On the Attributes tab, click New Row.
4. In the Attribute field, specify a value.
5. Specify values in the Title field and the Description field.
6. Optional: If you want to include a long description, which can contain more data than the Description field, select the Long Description Owner check box.
7. In the Type field, specify the data type of the attribute.
The Length and Scale fields show default values that are based on the type that you select.
8. Optional: Select the Required check box if you want the attribute to represent a required field on the screen.
If the attribute is a persistent attribute, it is also required on the database.
Requirement: If data exists in the table to which the attribute belongs, and you select the Required check box, you must specify a value in the Default Value field. Specifying a value in this field ensures that you cannot enter a null value for the required attribute. The default value that you specify is only validated against the associated domain for the attribute and the data type of the attribute.
9. Optional: If you want a group of attributes to share data type and length, specify the parent attribute in the Same as attribute field.
The child attribute copies the details of the parent attribute. If you change the details of any attribute in the group, the details of all attributes in the group change.
10. Optional: Provide more information about the attribute.
11. Save the object.

What to do next

You must configure the database for your changes to take effect.

After you add attributes, you can then add the attributes to the respective application in the Application Designer application to make the attributes accessible on the user interface.

Changing attributes

You can change attributes when necessary. Depending on how the attribute is configured, you might not be able to modify all of the fields.

Before you begin

Verify whether the attribute was created by the system or by someone at your site. If it was created by someone at your site, the User Defined check box is selected. You cannot delete attributes created by the system.

About this task

Attributes created by the system have more restrictions on modifications than user-defined attributes do. Some restrictions depend on whether text search is enabled for the object or on the data type.

For example, certain data types have a set value for the length, scale, dates, or integers. The Memo field is a regular ALN. You can make it anything you want.

The rules governing modifications are complex, and vary by attribute.

Procedure

1. Locate the attribute that you want to modify.
Tip: You can use Advanced Search to search for attributes.
2. Edit the Description, Type, Length, and Required fields according to your business needs.
Some fields are read only, depending on values in other areas.
3. Click Save Object.
The status of all affected objects display To Be Changed until you configure the database.

What to do next

You must configure the database for your changes to take effect.

Creating restrictions on attributes

You can create restrictions on attributes to prevent external data from overwriting the value for the chosen attribute.

Procedure

1. In the Database Configuration application, use the List tab to search for and to locate the object whose attributes you want to restrict.
2. Click the Object tab to make the selected object the current object in the application.
3. Select the Restrict Attributes action.
4. Navigate to the attribute that you want to restrict.
Tip: You can use the Filter fields to help you locate the attribute.
5. Select the Restricted check box.
6. Click OK.

What to do next

You must configure the database for your changes to take effect.

Excluding user-defined attributes when duplicating objects

There might be objects that you duplicate regularly but you do not want to include all user-defined attributes in the duplicated objects. For each object, you can specify the user-defined attributes that you do not want included when you duplicate objects. By excluding attributes, you can reduce the data maintenance work required to work with duplicated objects.

About this task

The list of attributes available for selection in the Skip Attributes window is populated by the user-defined attributes that are available for the selected object. If user-defined attributes do not exist in the object, no attributes are available for you to select. When you select user-defined attributes to be skipped, the attributes are not listed in future selection options.

If you specify that user-defined attributes be skipped for base objects, the skip values also apply to the object views.

Procedure

1. In the Database Configuration application, select an object that you want to duplicate.
2. Select the Skip Attributes action.
3. Specify the attributes that you do not want to be copied to new objects.
4. Optional: To specify conditions when attributes are skipped, specify a value in the Condition field.
5. Click OK and save the object.

What to do next

If you specify attributes to be skipped in the duplication process, you must configure the database for the changes to take effect.

Enabling autonumbering for attributes

You can configure autonumbering at the system, set, organization, or site level. You can enable autonumbering for attributes to apply starting numbers and prefixes to items such as assets or work orders. Autonumbering can facilitate the movement of items across the organization levels.

Before you begin

You can specify an autonumber only if the Can Autonumber check box is selected on the Attributes tab of the Database Configuration application. Whether this check box is selected depends on the data type of the attribute.

Procedure

1. In the Database Configuration application, select an object.
2. On the Attributes tab, select an attribute.
3. In the Advanced section, specify an autonumber. You can create an autonumber or use an existing autonumber.
4. In the Details section, specify `&AUTOKEY&` as the default value for the attribute and save the object.
5. If you created an autonumber in step 3, use the Autonumber Setup action in the Organizations application to specify the seed value and the prefix.
6. Save the object.

What to do next

You must configure the database for your changes to take effect.

Adding tax types to database tables

A tax type corresponds to a kind of tax, for example, to a city sales tax. You can specify up to 27 different tax types. The requirements of your financial system determine how many tax types you can specify.

Before you begin

Administration mode must be turned on before you can configure the database.

About this task

When you add tax types to the database, you specify the number of tax types, you configure the database, and then you update the database tables for your organizations. If you add more than five tax types, and configure and update the database tables, all of the tax types display in the Tax Options window of the Organizations application.

Procedure

1. In the Database Configuration application, select the Tax Types, >> Add/Modify Tax Types action.
2. In the Number of Tax Types field, specify the number of tax types that you want to use.
3. Click OK.
4. Select the Apply Configuration Changes action to configure the database.
5. In the Database Configuration window, provide the required information, then click OK.
6. Select the Tax Types, >> Update Tax Data action to update the database tables with the changes.

Adding indexes

You create an index to optimize performance when searching the table using the Find function and to establish uniqueness of table columns.

About this task

Indexes can be defined only for persistent tables.

Procedure

1. From the List tab, select the object to which you want to add an index, and click the Indexes tab.
2. In the Indexes table, click New Row.
3. In the Index field, specify a value.
4. Optional: To make each column in the index unique, select the Enforce Uniqueness check box.
5. For IBM® DB2® and SQL Server: Select the Clustered Index check box to create a clustered index.
You can have only one clustered index per table.
6. Specify a storage partition or accept the default value.
7. In the Columns table, click New Row to add a column to the index.
 - a. In the Column field, specify an attribute from the selected object.
 - b. Optional: In the Sequence field, specify the sequence for the column.
If you do not specify a value, then the order in which you add columns determines their sequence.
 - c. Optional: Select the Ascending check box to have the index searched in ascending order.
If this field is cleared, the index is searched in descending order.
8. Click Save Object.
The index status will display Add until you configure the database.

What to do next

You must configure the database for your changes to take effect.

Adding primary keys to user-defined objects

Primary keys can be added to user-defined objects to uniquely identify these objects in a database. A primary index is automatically created for the primary key and ensures that the primary key is unique.

Before you begin

You must be logged in as an administrator.

About this task

By default, the system assigns the unique ID attribute as the primary key by assigning a value of 1 to the Primary Column field of this attribute. You can clear this value, or enter your own value in the Primary Column.

Procedure

1. In the Database Configuration application, create an object or open the object to which you want to add a primary key.
2. On the Attributes tab, assign a value to one or more attributes in the Primary Column.
3. Save the object.

Creating relationships between parent and child tables

To retrieve data on objects, you must define the relationships between objects. You define SQL for joins to create relationships between parent and child objects.

Before you begin

Before you create a relationship, review the relationships defined in the database to determine if you can reuse an existing relationship. If the definition of a relationship does not match your needs, do not modify the relationship. Instead, create an additional relationship.

About this task

You define SQL for *JOINS*. A JOIN lets you link together data from multiple tables.

Procedure

1. Use the List tab to select the table for which you want to create a relationship, and then click the Relationships tab.
2. Click New Row.
3. In the Relationship field, specify a name.
4. Create a WHERE clause.
5. Select a Child Object.
6. Optional: Type comments in the Remarks field.
7. Click Save Object.

What to do next

If the relationship that you created is for a table or attribute, the changes will not take effect until you configure the database.

Configuration of general ledger accounts

Default general ledger (GL) accounts are created as part of the installation process but you can create additional GL account codes at a later date. You must configure default GL account code formats for the system level before you can create a chart of accounts. Once configured, it is not recommended that you modify the GL account formats as changing the configuration can make the existing chart of accounts unusable.

- [General ledger account codes](#)
Each general ledger account code consists of several components (segments). In the Database Configuration application, you define the default, system-level format of the account code. In the Chart of Accounts application, you specify the valid components to be used, as well as the organization-specific format of the account code.
- [General ledger account components](#)
Some general ledger account components are required while other components are optional.
- [Sequence of components in a general ledger account code](#)
Account components display in a sequential format, with the first component in the string representing the highest level.
- [Length of components in a general ledger account code](#)
Changing the length of the component values can result in invalid general ledger accounts. If you change the length, change the values to fit the new length.

General ledger account codes

Each general ledger account code consists of several components (segments). In the Database Configuration application, you define the default, system-level format of the account code. In the Chart of Accounts application, you specify the valid components to be used, as well as the organization-specific format of the account code.

For easy identification, use delimiters to separate components when they display. For example, use hyphens to separate components: 6100-400®-SAF. Delimiters are written to the database.

For any account code, you can:

- Define 20 or fewer components.
- Restrict the number of characters in a component field.
- Include a total of 254 or fewer characters/digits.

You can use any tab of the Database Configuration application to specify the general ledger account code format.

General ledger account components

Some general ledger account components are required while other components are optional.

Table 1. Required and optional components

Type of component	On-screen display
Required	Unknown values not specific to required components contain placeholder characters.
Optional	Any unknown optional components do not display. In the demo database, the fourth component is optional (most account codes consist of the first three components). <ul style="list-style-type: none">• It does not require any characters.• No accounts have been assigned to it in chart of accounts, so it does not appear as part of the general ledger account.

Your general ledger system has rules regarding whether an account is acceptable when partially defined.

- Fully defined (fully specified) accounts
 - Have no unknown values (placeholders) in required components
 - Example: 6100-350-SAF is fully defined
- Partially defined (partially specified) accounts
 - Contain placeholders in some required components
 - Example: 6100-???-SAF (the required activity component is not specified and therefore contains placeholder characters)

Sequence of components in a general ledger account code

Account components display in a sequential format, with the first component in the string representing the highest level.

Example

For example, the MAXDEMO database includes the following component sequence:

- Component 1 is for cost center
- Component 2 is for activity
- Component 3 is for resource
- Component 4 is for element

Since account components are concatenated, with the highest level at the beginning, account 6100-350-SAF is represented as:

Table 1. General Ledger account component sequence

Component 1	Component 2	Component 3	Component 4
6100	350	SAF	(not used)
Cost center	Activity	Resource	Element

Length of components in a general ledger account code

Changing the length of the component values can result in invalid general ledger accounts. If you change the length, change the values to fit the new length.

Example

In maxdemo the cost center component length is 4, the resource and activity component lengths are both 3, and the element component is 10. When you add in the three delimiters, the length of the GL is 23.

If you change the cost center component length to 3 and the activity component length to 4, the total length remains 23. No configuration is required. However, the general ledger component is now invalid. The cost center component length was shortened to 3 but has a four-digit value (in this example) of 6000.

Configuring the database

When you change the database, for example by creating or deleting objects, attributes, or indexes, changes are stored in secondary tables. The changes do not take effect until you configure the database. The product restores the backup tables as part of configuration.

- [Modes of configuring the database](#)
You can choose from these modes to configure the database: command-line mode, partial live configuration with administration mode turned on or a full live configuration. The mode that you choose depends on the type of change to the Manage schema you are making. It is recommended that you back up the database for all structural changes before you configure the database.
- [Configuring the database in administration mode](#)
You can configure the database in admin mode.

- [Database changes without administration mode](#)
Some object-level and attribute-level parameters can be updated without using administration mode.

Modes of configuring the database

You can choose from these modes to configure the database: command-line mode, partial live configuration with administration mode turned on or a full live configuration. The mode that you choose depends on the type of change to the Manage schema you are making. It is recommended that you back up the database for all structural changes before you configure the database.

The following table lists the advantages and disadvantages of each configuration mode:

Table 1. Configuration modes

Configuration modes	Advantages	Disadvantages
Command-line mode	Data is backed up for certain database changes if the affected table cannot be changed with data in it. It is easier to restore data from this configuration mode as there are no updates while the database is being configured.	Must shut down the application server therefore, users have no access to the applications during the configuration. Requires an information technology administration user who has control over the application server.
Partial live with administration mode turned on	Allows an administration user to perform tasks such as adding a column to a table without shutting down the application server. Users are logged out of the system. Only administrators with Can Log in During Admin Mode permissions can access Maximo®. This permission is in the Security Groups application within the Start Center application permissions. Data is backed up for certain database changes if the affected table cannot be changed with data in it.	Blocks users from the system applications. Suspends CRON tasks. Does not allow remote connectivity Disables event listeners. Requires the user to have Administrator login security authorizations, which you must assign in the Security Groups application.
Full live	Least impact on users as active transactions are not interrupted or lost. Does not require administration mode to be turned on. If changes performed during a live update are later determined to be incorrect, you can perform another live update to reverse the changes. Changes do not disrupt the live business object definitions. If you change the field validation class for an attribute and perform a live update to apply the changes, the business objects that are already instantiated are not revalidated.	Can be used only for non-structural changes to Maximo such as adding a domain to an attribute.

Table 2. Configuration modes

Configuration modes	Advantages	Disadvantages
Partial live with administration mode turned on	Allows an administration user to perform tasks such as adding a column to a table without shutting down the application server. Users are logged out of the system. Only administrators with Can Log in During Admin Mode permissions can access Maximo. This permission is in the Security Groups application within the Start Center application permissions. Data is backed up for certain database changes if the affected table cannot be changed with data in it.	Blocks users from the system applications. Suspends CRON tasks. Does not allow remote connectivity Disables event listeners. Requires the user to have Administrator login security authorizations, which you must assign in the Security Groups application.
Full live	Least impact on users as active transactions are not interrupted or lost. Does not require administration mode to be turned on. If changes performed during a live update are later determined to be incorrect, you can perform another live update to reverse the changes. Changes do not disrupt the live business object definitions. If you change the field validation class for an attribute and perform a live update to apply the changes, the business objects that are already instantiated are not revalidated.	Can be used only for non-structural changes to Maximo such as adding a domain to an attribute.

Configuring the database in administration mode

You can configure the database in admin mode.

Before you begin

You must have administration login security authorization. You obtain this authorization from the Security Groups application.
Before you can configure and turn on administration mode, you must set the mail.smtp.host property to ensure that you can receive scheduled reports.

About this task

When you save a record the changes are stored in temporary database configuration objects. Before you configure the database, you can close and reopen the Database Configuration application without losing any saved changes. A secondary table stores pending changes, which also appear in the Status field. You cannot query on Status.

In a clustered environment, when you turn admin mode on, all other cluster members are automatically stopped. Only the cluster member that has admin mode turned on is kept running. When you turn admin mode off, the other cluster members are restarted. Use the `mxe.adminmode.stopstartclusters` system property to enable or disable this feature. The default value for the `mxe.adminmode.stopstartclusters` system property is 1.

Procedure

1. In the Database Configuration application, select Manage Admin Mode from the action menu
2. In the Turn Admin Mode ON window, modify the values in the Number of Administrative Sessions Allowed field and the Number of Minutes for User Logout field.
The default value of each field is 5. If you modify these fields, click Update Properties for the parameters to take effect.
3. Click Turn Admin Mode ON.
4. In the Electronic Signature Authentication window, enter the appropriate value in the Reason for Change field.
5. Click OK.
A window opens that indicates that the Admin Mode is starting.
6. Click OK.
7. Throughout the configuration process, click Refresh Status to view the messages that the configuration process writes in the Status window.
If you decide to cancel the configuration, click Cancel Admin Mode.
8. Select the Apply Configuration Changes action to configure the database and restore backup tables. Wait until administration mode is turned on before performing this step.
9. To turn off Admin Mode, select the Admin Mode action, and then click Turn Admin Mode OFF.

Database changes without administration mode

Some object-level and attribute-level parameters can be updated without using administration mode.

Changes to the following object-level parameters are eligible for live updates:

Table 1. Object-level parameters that are eligible for live updates

Description	Source
Description	MaxObjectCfg.Description
Esig Filter	MaxObjectCfg.EsigFilter

Changes to the attribute-level parameters that are listed in the following table are eligible for live updates.

Table 2. Attribute-level parameters that are eligible for live updates

Header	Source	Additional rules to qualify for live update
Description	MaxAttributeCfg.Remarks	None
Title	MaxAttributeCfg.Title	None
Domain	MaxAttributeCfg.DomainID	None
Default Value	MaxAttributeCfg.DefaultValue	None
Search Type	MaxAttributeCfg.SearchType	For live update, you cannot change to or from Text Search (domainid = SEARCHTYPE , maxvalue = TEXT).
Esig Enabled	MaxAttributeCfg.EsigEnabled	None
Can Autonum	MaxAttributeCfg.CanAutonum	None
Autokey Name	MaxAttributeCfg.AutokeyName	None
Is Positive	MaxAttributeCfg.IsPositive	None
Field Validation Class	MaxAttributeCfg.Classname	For live update, the specified class must be accessible to the class loader.

If any of the Cfg tables for an object or any of its attributes have changes that are not listed in the preceding tables, that object and its attributes are not eligible for live updates.

Configuring the system for regulatory compliance

Electronic signature verification and electronic audit records provide an additional level of security control and auditing capability that are often needed for regulatory compliance.

- [Electronic signatures, audit records, and login tracking](#)
Electronic signature verification, electronic audit records, and login tracking features help you comply with audit and regulatory requirements.
- [Login tracking](#)
You can use login tracking to view login attempts.
- [Electronic audit records](#)
To track changes that users make to data, administrators can enable electronic audits.
- [Electronic signature verification](#)
Electronic signatures provide an extra layer of validation to confirm that a user who changes a record is the same user who is logged in to the application. In

addition to validation, the electronic signature feature enables administrators to audit changes and to determine who made a change and why the change was made.

Electronic signatures, audit records, and login tracking

Electronic signature verification, electronic audit records, and login tracking features help you comply with audit and regulatory requirements.

You can use the following features to comply with regulatory requirements:

Login tracking

Login tracking lets administrators view the number of login attempts and displays the current login status of the user.

Electronic signature verification

Electronic signature verification requires users to provide credentials and to give a reason for changes before they can change records. It ensures that the person who saves a record, changes a record, or accesses a specific action is the person who logged in.

Electronic audit records

Electronic audit records track changes to records, keep copies of the changes, and produce an audit trail. The electronic auditing function writes audit records to the database tables. The audit tables are configured for each business object that is enabled for auditing.

You define electronic signatures and audit records at the system level, so they apply to all organizations and sites.

You must enable login tracking to use electronic signatures.

Login tracking

You can use login tracking to view login attempts.

Login tracking tracks the number of login attempts for a user and gives the login status of a user.

Login tracking must be enabled if you use electronic signatures.

Login tracking is enabled by default. Run one of the following SQL statements on the database to enable or disable login tracking and then restart the server:

- Enable tracking with the following statement: `update MAXVARS set VARVALUE = '1' where VARNAME='LOGINTRACKING'`
- Disable tracking with the following statement: `update MAXVARS set VARVALUE = '0' where VARNAME='LOGINTRACKING'`

Electronic audit records

To track changes that users make to data, administrators can enable electronic audits.

After electronic audits are enabled, an audit record is created each time that a user adds, deletes, or modifies the value of an attribute in an application and saves the change. The audit record is written to the audit table that corresponds to the regular database object.

The audit record includes the following items:

- The username of the user who changed the data.
- A copy of the changed data for each attribute for which electronic audit enabled.
- The identifier that indicates whether the change was an insertion, update, or deletion.
- The current date and time of the transaction.
- The row stamp.
- The unique electronic audit transaction ID.
- The unique e-Sig transaction ID if electronic signature is enabled.
- The key values columns for the record, even if those columns are not electronic-audit enabled. For example, the work order number is recorded even when another attribute in the WORKORDER object triggers the electronic audit.
- [Enabling electronic audits](#)
Administrators can enable electronic audits, E-audit, on any database object for any number of attributes.
- [Database updates for electronic audit](#)
Some objects and attributes can be updated for electronic audits without using administration mode.

Enabling electronic audits

Administrators can enable electronic audits, E-audit, on any database object for any number of attributes.

About this task

Procedure

1. In the Database Configuration application, select the object that you want to audit.
2. In the Audit section on the Object tab, select the Audit Enabled check box.
3. Save the record.
4. From the More Actions menu, select Manage Admin Mode and refresh the database.

Results

An audit table is created for the object. For example, an A_ASSET audit table is created for the ASSET object.

What to do next

After you enable electronic audits for an object, you can select specific attributes and enable electronic audits for the attributes.

Database updates for electronic audit

Some objects and attributes can be updated for electronic audits without using administration mode.

An audit table is an object that the MAXTABLECFG.EAUDITBNAME column references.

Example

If the Person table is audited and the audit table is named A_Person, two rows exist in the MAXTABLECFG table, as shown in the following example:

Table 1. Electronic Audit Tables

Table name	Table name for electronic audit table
PERSON	A_PERSON
A_PERSON	(null)

For the base table, changes to the audit-related, object-level parameters in the following tables can be updated without using administration mode. For an audit table, if the object you add (that is, MAXOBJECTCFG.CHANGED = 1) and its base table can be changed without using administration mode, then the audit table is also eligible.

The following table lists the object-level parameters that can be changed without using administration mode:

Table 2. Object-level parameters that are eligible for live updates

Description	Table and object	Additional rules to qualify for live update
Electronic Audit Filter	MAXOBJECTCFG.EAUDIT FILTER	None
Electronic Audit Enabled	MAXOBJECTCFG.EAUDIT ENABLED	No additional rules. Field validation in the Database Configuration application ensures that when electronic auditing is enabled, there is a non-null value for EAUDITBNAME.
Electronic Audit Table Name	MAXTABLECFG.EAUDIT BNAME	If either of the following conditions is true, live updates for changes of EAUDITBNAME are supported: <ul style="list-style-type: none">• EAUDITBNAME is non-null and the object that is referenced by EAUDITBNAME is a new object (that is, MAXOBJECTCFG.CHANGED = 1).• EAUDITBNAME is being set to null (that is, EAUDITENABLED is being turned on).

The following table lists changes to the audit-related, attribute-level parameters on the base table that are eligible for live updates:

Table 3. Attribute-level parameters that are eligible for live update

Description	Attribute	Additional rules to qualify for live update
Electronic Audit Attribute Enabled	MAXATTRIBUTECFG.EAUDITENABLED	No additional rules. An attribute that is eligible for live update is turned on or off.

Electronic signature verification

Electronic signatures provide an extra layer of validation to confirm that a user who changes a record is the same user who is logged in to the application. In addition to validation, the electronic signature feature enables administrators to audit changes and to determine who made a change and why the change was made.

When an application or feature is configured to require an electronic signature, users can complete an action or change the application only if they supply the required password or key in the Electronic Signature Authentication window that opens. Users must also specify the reason for the change.

Users create an electronic signature key in the Set or Modify E-Signature Key dialog box that is available from their profile. Electronic signature keys must conform to the same rules as product passwords. Any key that is manually created or automatically generated from a reset action is validated using the rules for user passwords, such as password length or excluded words.

Requirements for passwords and electronic signature keys are configured in the Security Controls dialog box for a selected user.

Electronic signature records the user name and full user name of users who change database records or who perform actions in an application. The modification to the record such as change, insert, update, or delete, known as the identifier, is also recorded.

The full user name corresponds to the DISPLAYNAME attribute in the PERSON object.

All verification attempts are saved in the LOGINTRACKING object. The LOGINTRACKING object records the following items:

- User name or login ID
- Full user name, which is the person's display name
- Date and time of the attempt
- Whether the authentication was successful
- Application name where the electronic signature was invoked
- Reason for the change, as typed on the Electronic Signature Authentication window
- Unique transaction identifier
- Key values columns for the record
- [Configuring electronic signature verification](#)
To configure electronic signature verification, administrators must configure email messaging to notify users when their signature key is reset. Then the administrator can enable electronic signature requirements for specific objects and attributes.
- [Resetting the electronic signature key](#)
If users forget their electronic signature key or if the key is compromised, users can request a new electronic signature key from their administrator. Administrators can reset the key.

Configuring electronic signature verification

To configure electronic signature verification, administrators must configure email messaging to notify users when their signature key is reset. Then the administrator can enable electronic signature requirements for specific objects and attributes.

To implement electronic signature verification, complete the following configuration tasks:

1. Configure the `mx.esigresetemailfrom` system property that specifies an email address for communicating with users about signature key resets.
 2. Create the subject line and body text for email messages to users about signature key resets.
 3. Enable electronic signature verification for specific objects or attributes.
- [Configuring the email address property for signature key resets](#)
Administrators must configure the `mx.esigresetemailfrom` system property to specify an email address that sends a message to inform users when their electronic signature key is reset.
 - [Configuring email subject lines and body text](#)
In addition to specifying an email address for sending messages about electronic signature resets, administrators can also configure the subject line and body text of the email message that they send.
 - [Creating a drop-down list for the Reason for Change field](#)
When electronic signatures are required, users must enter a reason for changing a record. Administrators can configure the Reason For Change field to provide a list of options to choose from.
 - [Adding electronic signature requirements to objects and attributes](#)
After administrators configure email messages, they can enable electronic signature requirements for specific objects and attributes.

Configuring the email address property for signature key resets

Administrators must configure the `mx.esigresetemailfrom` system property to specify an email address that sends a message to inform users when their electronic signature key is reset.

About this task

If users forget their electronic signature key or if the key is compromised, users can request a new electronic signature key from their administrator.

Administrators can reset the electronic signature key in the Users application. Resetting the key triggers an email to the user to notify them that their key is reset and to provide them with a new key.

The key is randomly generated and has no expiration time limit.

Administrators specify the email address that sends the notification in the `mx.esigresetemailfrom` system property.

Procedure

1. In the Global Properties table in the System Properties application, select Filter to search for the `mx.esigresetemailfrom` property.
2. Expand the row for the property.
3. In the Global Value field, enter a valid email address.
4. In the Common Actions menu, click Save Property.
5. In the Global Properties table, select the check box for the `mx.esigresetemailfrom` property.
6. In the Common Actions menu, click Live Refresh.
7. In the Live Refresh window, verify that the current value for the property is the correct email address and click OK.

What to do next

After you configure the system property for the email address, in the Database Configuration application, you can specify the subject line and the body of the text that you want in your email. As a best practice, you can suggest to your users that they change the key after their initial login to make it more meaningful and easier to remember.

Configuring email subject lines and body text

In addition to specifying an email address for sending messages about electronic signature resets, administrators can also configure the subject line and body text of the email message that they send.

About this task

Two messages are added to the signature message group in the Database Configuration application for email messages:

- `esigresetbody`: Use this message to provide the text for the body of your email message.
- `esigresetsubj`: Use this message to provide a subject line for your email message.

Adding text for the body of the electronic signature email message

Procedure

1. In the Database Configuration application, from the More Actions menu, select Messages.
2. Click Filter.
3. In the Message Key column in Messages table, search for `esigresetbody` and expand the row.
4. In the Value field for the message, enter text for the body of the email message, as shown in the following example.

```
Enclosed is your new Maximo Esig key {0}. To log in and change your key, follow this link:  
http://{1}/maximo/ui.
```

Note: When entering text, ensure that you do not change or delete the variables or brackets. The electronic signature key will be supplied for variable `{0}`. The host name of your environment will be supplied for variable `{1}`.

5. Click OK.
6. From the More Actions menu, click Apply Configuration Changes.

Adding text for the subject of the electronic signature email message

Procedure

1. In the Database Configuration application, from the More Actions menu, select Messages.
2. Click Filter.
3. In the Message Key column in Messages table, search for `esigresetsubj` and expand the row.
4. In the Value field for the message, enter text for the subject line of the email message.
5. Click OK.
6. From the More Actions menu, click Apply Configuration Changes.

What to do next

After you complete the messages for the subject and body text, from the More Actions menu, select Manage Admin Mode and refresh the database.

Creating a drop-down list for the Reason for Change field

When electronic signatures are required, users must enter a reason for changing a record. Administrators can configure the Reason For Change field to provide a list of options to choose from.

About this task

By default, the Reason For Change field in the Electronic Signature Authentication window is a free-form text field where users can enter up to 50 characters to describe the reason for a change. Administrators can configure the field to require users to choose from a defined value list by adding values to the `CHANGEREASON` domain.

Note: You do not assign this value list to a database object and attribute. The connection to the database for this value list is already present.

Procedure

1. In the Domains application, open the `CHANGEREASON` domain.
2. Click Edit Detail.
3. In the ALN Domain window, click New Row.
4. In the Value field and Description field, specify values for the `CHANGEREASON` domain.
The following conditions apply to this value list:

- These values are not written to the database.
- The value in the Description field is what users see when they use the list.

For example, you want users to see a value list that contains only `Changed the record` and `Deleted the record`. In the Value field and Description field, enter the following information:

Value field	Description field
CHANGE	Changed the record
DELETE	Deleted the record

5. Click OK.

Adding electronic signature requirements to objects and attributes

After administrators configure email messages, they can enable electronic signature requirements for specific objects and attributes.

Before you begin

Before enabling electronic signature verification for specific objects and attributes, ensure that you have completed all configurations that are required for your implementation.

Note: The addition of electronic signature is supported only for Work Order Tracking, Purchase Order, and Purchase Requisition.

About this task

When you enable electronic signature verification for an object or attribute, users must create an electronic signature key on the Set or Modify E-Signature Key window in their user profile. Then, whenever they attempt to change any record that has an electronic signature requirement, users must enter the electronic signature key.

Procedure

1. In the Database Configuration application, select the object for which you want to require electronic signature verification.
2. On the Attributes tab, expand the row for the attribute for which you want to require an electronic signature.
3. In the Advanced section for the attribute, select the E-signature Enabled check box.
4. Save the record.
5. In the More Actions menu, click Manage eSig Actions.
6. In the Applications table in the Manage eSig Actions window, select the application for which you want electronic signature verification.
7. In the Options table for the application that you selected, select the E-signature Enabled check box for each action for which you want to require an electronic signature.
8. Click OK.

Resetting the electronic signature key

If users forget their electronic signature key or if the key is compromised, users can request a new electronic signature key from their administrator. Administrators can reset the key.

Before you begin

Before you reset a user's electronic signature key, ensure that you have completed all configurations that are required to designate the email address that sends the message and to configure the subject line and body text of the message.

About this task

Resetting the key sends an email to the user to notify them that their key is reset and to provide them with a new key. The key is randomly generated and has no expiration time limit. Users are not required to change the key after their first login. However, as a best practice, you can suggest to your users that they change the key after their initial login to make it more meaningful and easier to remember.

Procedure

1. In the Users application, locate the user whose key you want to reset.
 2. From the More Actions menu, select Reset Esig Key.
 3. In the confirmation window, click OK.
- An email is sent to the user with a new electronic signature key.

Controlling changes to objects

Depending on your users needs, you can add functions that will help users, for example creating lookups or creating system messages.

- [Defining lookup maps](#)
You define a lookup map to associate a source object and a source field with a target object and related fields. The product is delivered with pre-defined lookup maps, but you can define your own lookup maps for objects that you create.
- [Adding system messages](#)
You can add, change, and delete system messages that display when required to assist users as they use the application.
- [Query definitions](#)
Users typically have a well-defined set of columns that they want to query in each application. You can identify these columns by asking users or by examining reports of slow-running SELECT statements. Indexing these columns can improve system performance.

Defining lookup maps

You define a lookup map to associate a source object and a source field with a target object and related fields. The product is delivered with pre-defined lookup maps, but you can define your own lookup maps for objects that you create.

Procedure

1. On the Attributes tab, select the attribute for which you want to specify details.
2. Click Edit Lookup Map.
3. Click New Row.
4. Specify the following details for the target attribute:
 - In the Target Attribute field, select the attribute to which you want to return values.
 - In the Source Object field, specify the source from which values are returned.
 - In the Source Key field, specify the key of the source object from which you want to return values.
 - In the Sequence field, specify a numeric value to determine the attributes that are to be set before other attributes. A lower numeric value has priority over a higher numeric value.
5. Optional: Select the Allow Null check box if you want the target attribute to accept null values.
6. Click OK.

Adding system messages

You can add, change, and delete system messages that display when required to assist users as they use the application.

About this task

Single quotation marks (') do not appear in the displayed message. To include quotation marks in the displayed message, you must use double quotation marks (") when you write the text of the message.

Procedure

1. In the Database Configuration application, select the Messages action.
2. Click New Row and specify the message group to which you want the new message to belong.
3. In the Message Key field, type a unique string that you want to be associated with the message.
4. Specify the display method for the message.
5. In the Message ID field, specify the prefix and product to be associated with the message.
Customer-generated messages typically use the BMXZZ prefix. The complete identifier is generated when you click the prefix.
6. Select the Display ID check box to display the message identifier whenever the message is displayed.
7. In the Value field, enter the message text.
8. In the buttons, icons, and explanation and responses sections, specify additional details.
9. Click New Row to add more messages, or save your changes.

Query definitions

Users typically have a well-defined set of columns that they want to query in each application. You can identify these columns by asking users or by examining reports of slow-running SELECT statements. Indexing these columns can improve system performance.

Users can create and save their own queries and share queries with other users. Saved queries are stored in a table named QUERY. You must periodically review these saved queries for inefficient conditions and use of unindexed columns.

With SQL statements, you can create special-purpose queries for example, return all Preventive Maintenance work orders created since Monday of this week. When you create these queries, you can save users the effort of querying larger sets and sorting and scrolling through the sets.

You also can provide users with an efficient default query for frequently used applications so that they can see a preferred record set when they access the application. For example, in the Work Order Tracking application, you can specify a default query for supervisor Smith. With this default query in place, initially the user can see only work orders with **SMITH** in the Supervisor field.

Search option configuration for performance optimization

You want to prevent users from performing queries that retrieve hundreds of thousands of records. You should periodically review users saved queries, you could define default queries for your users, or educate them on how to create efficient queries

- [Text search function](#)
The text search function uses SQL to index, search, and analyze text and documents that are stored in system databases. You can search for information based on text, content metadata, or attributes.
- [Search type configuration](#)
By setting search types for database columns, you can improve the results that are returned by user queries. Setting the search type can also reduce the load on the database.

Text search function

The text search function uses SQL to index, search, and analyze text and documents that are stored in system databases. You can search for information based on text, content metadata, or attributes.

A default search method is associated with each attribute. If text search is enabled for an object, you can change the Search Type of an attribute from the Database Configuration application on the Attribute tab.

A text search is allowed only for fields of the ALN data type. A text search is designed to search long descriptions, or fields that are long data types.

A full text search is a language-specific text search. Parts of words, not words, are indexed. For example, if you search for *par*, results do not include *part*.

A text search is flagged on the object and on the attributes.

Search type configuration

By setting search types for database columns, you can improve the results that are returned by user queries. Setting the search type can also reduce the load on the database.

Tables with fewer than 2000 or 3000 records are typically scanned regardless of indexes. The input output (I/O) cost to read an entire table is less than the average I/O cost of the index lookup plus the table lookup. The SEARCHTYPE value does not affect database behavior when such scans are performed. Tables with relatively few rows have no noticeable degradation in performance.

The following search types are available for user queries.

Table 1. Search types for user queries

Search type	Description	Benefit	Entry required
Exact	Filters data based on the keywords that you specify. You specify an exact search type when you require accurate and targeted results. Exact searches use wild cards only if a user explicitly enters wildcard characters on the List tab or in the WHERE clause.	Key fields, such as Work Order and Purchase Order, and value list fields, such as Work Order Status, can benefit from the indexing that is used in exact searches.	=
Wildcard	The default search type is wildcard search. You can apply a wildcard search on description fields of tables that have a relatively small number of rows for example, 2000 or fewer rows. When a user enters a value in a field on the List tab, the wildcard search type condition looks like this: <code>column like '%value%'</code> In wildcard searching, the database engine cannot use indexes. Searching without indexes can result in slower search times, especially on tables with many rows.	Wildcard searching provides flexibility for the users.	%

Search type	Description	Benefit	Entry required
Full text	<p>You can specify a text search type on description fields of tables with large numbers of rows, for example, tens of thousands of rows. The text search engine takes time to refresh the indexes, so new records might not be found until the text search index refreshes itself.</p> <p>Stem search is also performed. For example, a search for service returns servicing and serviced.</p> <p>Most system tables have one or more ALN data type columns for descriptions, memos, or remarks. You can define text search types and a corresponding IBM® DB2® text search index, Oracle text index, or SQL Server full text catalog for columns that have excessive text.</p> <ul style="list-style-type: none"> On IBMDB2, you can update the text search index by using the UPDATE INDEX FOR TEXT command or the SYSPROC.SYSTS_UPDATE procedure. On Oracle, you can modify the maximo_ts_job_call procedure to change the schedule of the synchronization process to any interval. On SQL Server, you can set and modify the population schedule for the full text catalog. <p>Text indexing increases the load on the database because of the constant background processing to keep the indexes synchronized. However, text indexing produces efficient word searching of description fields.</p>	<p>Text searches produce faster search responses than wildcard searches. Fields that are text-search enabled have text search indexes and, therefore, result in a faster search response.</p> <p>If an object is enabled for text search, the full text searches on the attributes provided.</p>	Any combination of the words in the text search
None	The none search type is used for columns that cannot be searched. If you do not specify a search type, the value defaults to none or no search.	You use this search type to specify that a column should not be searched.	

You can use a combination of methods to refine searches.

Application Designer application

You can use the Application Designer application to customize an application by adding or removing columns from the List tab. You can then ensure that the columns to be queried are all indexed.

Application cloning feature

You can clone an application and then use the Application Designer application to create an alternate version with a restricted number of columns that can be queried.

Security groups feature

After you clone applications, you can use security groups to assign users to specific application clones. You can also use security groups to prohibit access to the More Search fields and WHERE clause advanced query options. When you prohibit access to those options, you limit users to query on the List tab of the application.

Migration Manager

Use Migration Manager to migrate configuration content from one product environment to another.

You typically migrate configuration content from a development environment to a test environment and then to a production environment.

- [Getting started with Migration Manager](#)

Migration Manager migrates configuration content from one product environment to another. You typically migrate configuration content from a development environment to a test environment and then to a production environment.

- [Planning for migration](#)

Before you migrate your configuration content, devote sufficient time to develop a migration plan.

- [Migrating your configuration content](#)

The migration process includes a series of preparatory and implementation steps that include setting up your migration collections and package definitions, and then creating, distributing, and deploying packages.

- [Migration troubleshooting](#)

You can identify and correct most errors by responding to the error messages that are displayed in the user interface and by reviewing the messages on the Messages tab of the Migration Manager application. For further troubleshooting, use the log files.

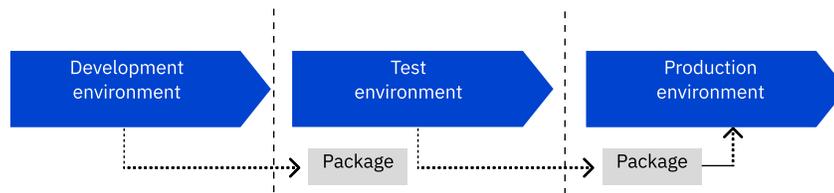
Getting started with Migration Manager

Migration Manager migrates configuration content from one product environment to another. You typically migrate configuration content from a development environment to a test environment and then to a production environment.

After you develop and configure your applications, you can migrate the configurations to a test environment. After testing the configurations, you can migrate them to a production environment. By using Migration Manager, you can migrate iterative configuration changes in a planned and controlled manner.

To migrate the configuration content, you organize it into *packages*. The packages go through a series of steps that make up the migration process. Some steps occur in the originating environment, called the source environment, and some steps occur in the destination environment, called the target environment.

Figure 1. Package movement



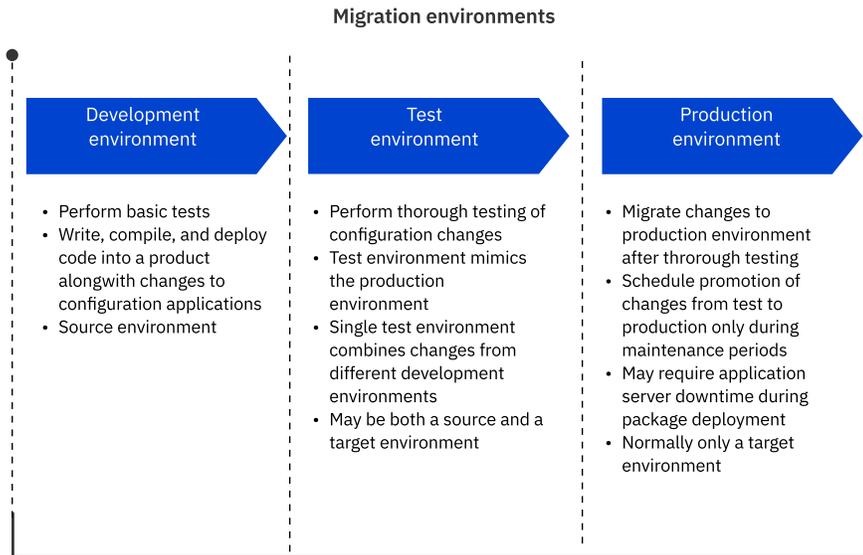
- [Migration environments](#)
You migrate configuration content from one environment to another.
- [Migration process](#)
The migration process involves several tasks in both the source and target environments.
- [Applications used in the migration process](#)
As you migrate configuration content, you use several applications to perform migration tasks.
- [What content you can migrate](#)
The configuration content that you can migrate comes from tables that are in the database or from files that are outside the database.
- [Package definitions and packages](#)
A package definition is a template that specifies the configuration content that goes into a package. A package is an instance of a package definition and contains the configuration content that is migrated.
- [Migration collections](#)
A migration collection is a group of configuration records that can be used to create package definitions. Migration collections simplify the creation of package definitions.

Migration environments

You migrate configuration content from one environment to another.

Development and testing typically occurs in a preproduction environment. You typically migrate configuration content between the following environments:

Figure 1. Migration environments



Development environment

After you identify the configuration changes that you want to make to your product, you can implement them in a development environment. In the development environment, you can perform basic tests to the changes. A development environment is useful if code must be written, compiled, and deployed into a product to accompany changes to configuration applications. In the migration process, in most situations, the development environment is only a source environment.

Test environment

You perform thorough testing of the configuration changes in the test environment. Complete end to end testing and check the logs. You can use a single test environment to mimic the production environment. For the most accurate testing, the test environment must contain all the business applications and configuration changes that you intend to use in the production environment. A single test environment is best suited to aggregating changes that you create in separate development environments. In the migration process, the test environment can be both a source and target environment.

Production environment

After thorough testing, when the software is ready for release, you are ready to migrate your changes to the production environment. When moving configuration content to production, schedule the promotion to occur during maintenance periods. The deployment of Migration Manager packages must be treated in the same manner as product installations and fix packs. In some situations, the deployment of packages might require your application server to remain unavailable to your users for some time. In the migration process, in most situations, the production environment is only a target environment.

When you migrate content, you perform the following steps:

1. Identify the configuration changes and implement them in your product in a development environment.
2. Do basic tests to the changes in the development environment.
3. Test the configuration changes in the test environment.
4. Migrate the changes from test to production environment after thorough testing. Schedule the migration to occur during maintenance periods.

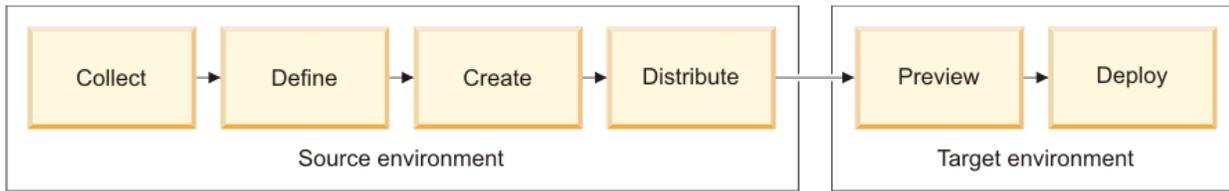
You identify source and target environments by using unique identifiers. The identifier is the combination of the database host name, the database identifier, and the database schema name.

You can set inbound restrictions in a target environment to prevent the distribution and deployment of packages to that environment from restricted sources.

Migration process

The migration process involves several tasks in both the source and target environments.

The process migrates configuration content from a source environment to a target environment. You perform the first set of steps in the source environment and the second set of steps in the target environment.



Steps in the source environment

Step	Description
Optional: Collect	Create migration collections to efficiently collect the configuration records that you want to migrate.
Define	You create, validate, approve, and activate the package definitions. The package definitions specify but do not contain the configuration data. You also define references for the target environments to which you intend to migrate content.
Create	You create packages from the package definitions. The packages contain the configuration data.
Distribute	You specify a target to which you want to distribute the package, and you distribute the package.

Steps in the target environment

Step	Description
Optional: Preview	If the package is in a file, you upload the file to the server. You preview the deployment to ensure that the package deploys without errors.
Deploy	Deploy the package. When the deployment completes, the configuration content is migrated and the migration process ends. You might need to do some post-deployment steps.

Applications used in the migration process

As you migrate configuration content, you use several applications to perform migration tasks.

You use the following applications in the migration process:

Application	Usage
Object Structures	Optional. You can use the Object Structures application to view, create, and modify an object structure. One or more related business objects comprise an object structure. A business object is an object-relational representation that corresponds to a database table of the product. The predefined object structures support many product configuration applications, and you can perform many migrations by using the provided structures.
Automation Scripts	Optional. You can create scripts for integration in the Automation Scripts application to apply custom logic during the processing of object structures when you perform migrations.
Migration Groups	Optional. You use the Migration Groups application to organize and group configuration content that you want to migrate. In many situations, you can work with the predefined (internal) migration groups instead of creating your own (user-defined) migration groups.
Migration Collections	You use the Migration Collections application to define migration collections. A migration collection is a group of configuration records that can be migrated to another environment. Migration collections simplify the creation of package definitions.
Migration Manager	You use the Migration Manager application to migrate your configuration content between product environments. You use this application in both your source and target environments. In a source environment, you define, create, and distribute the packages. In a target environment, you preview and deploy the packages.

What content you can migrate

The configuration content that you can migrate comes from tables that are in the database or from files that are outside the database.

Content that is in the underlying database is usually in tables. The data that is related to the configuration applications is aggregated into groups that can be migrated.

Content that is outside the database is typically in the form of files on the application server file system. When you extend or customize an application you might have files that the application depends on to run. Therefore, you might have to migrate the content that is outside the database together with the configuration content that is in the database. Content that is outside the database is referred to as a compiled source.

For example, suppose that you extend the Purchase Order application in a development environment by making the following changes:

- You add a table and columns to the database by using the Database Configuration application.
- You add a tab to the Purchase Order application by using the Application Designer application.
- You add a domain that contains look-up values by using the Domains application.
- You create a business workflow to automate the approval of the data that is managed by the new table.

The configuration content that you must migrate to your test and production environments includes the table, the tab, the domain and its look-up values, and the workflow. The configuration content includes database content and might include compiled sources.

- **Database configuration content**
Database configuration content is organized into migration objects and migration groups.
- **Compiled sources**
Compiled sources is a term for nondatabase content that is migrated. You can include compiled sources in a package definition, or you can upload compiled sources just before you create a package.

Database configuration content

Database configuration content is organized into migration objects and migration groups.

Business objects, migration objects, and migration groups have the following relationship:

- A business object is a representation of a product database table. Business objects are Java™ objects that help to manage the data in the tables.
- One or more related business objects make up a migration object. The set of business objects is used by an application to perform various tasks.
- One or more related migration objects are organized into a migration group.

Migration objects

A migration object is a group of one or more related business objects that represent database tables. One or more migration objects make up a migration group.

Your database might contain hundreds or thousands of business objects. Many of the business objects are related and are organized into object structures. An object structure therefore facilitates the migration of related data and is called a migration object.

Migration objects exist for many types of records, such as cron tasks, integration channels, security groups, and user interface presentations.

For example, the Workflow Process (DMWFPROCESS) migration object contains 16 business objects that enable the migration of workflow processes, nodes, and notification records that the Workflow Designer application manages.

You can use the predefined migration objects in the migration process or you can use the Object Structures application to create custom migration objects. You define migration objects in a development instance and then move them into test and production environments.

Migration groups

A migration group is a set of related migration objects. When you include a migration group in a package definition, all migration objects in the migration group are migrated. All other migration groups that the migration group depends on are also migrated.

Many applications provide complex features that must be represented by multiple migration objects. The migration groups organize the migration objects and their dependencies to simplify the migration process.

For example, a workflow process defines the process flow, the roles that act on the process, the actions that are run during the process flow, and the notifications (communication templates) that are generated as a result of the process flow. These roles, actions, and communication templates also have their own separate configuration applications. Depending on the nature of your configurations, the DMWFPROCESS migration object might depend on the DMACTION, DMROLE, and DMCOMMTEMPLATE migration objects. To organize these complex relationships, the Business Process Management (BPM) migration group is provided to order all of the migration objects that are used to migrate workflow and related data.

The ordering of the migration objects within a migration group is critical because of data dependencies. For example, the configuration data for a communication template (represented by the DMCOMMTEMPLATE) must be processed before the workflow process (DMWFPROCESS) that refers to the communication template. The migration group specifies an order to ensure that migration of the configuration content succeeds.

A migration group can be internal or user-defined. The predefined migration groups are internal. They are linked to other logically related migration groups by dependencies. A dependency ensures that all dependent configuration content is included in a migration. You cannot modify an internal migration group, but you can copy one and modify the copy.

User-defined migration groups are migration groups that you create, including copies of internal migration groups. When you create or modify migration groups, you must include all the necessary migration objects so that you maintain the referential integrity of the database.

Compiled sources

Compiled sources is a term for nondatabase content that is migrated. You can include compiled sources in a package definition, or you can upload compiled sources just before you create a package.

A compiled source is any file that is outside the product database, but is part of the enterprise archive (EAR) file. Compiled sources can be any type of file, such as class files, archive files, image files, property files, and other file types. Compiled sources can also be aggregations of files from the server file system that must be migrated with configuration content from the database. These files are placed into the EAR and deployed into the application server.

To migrate multiple compiled source files, you aggregate them into a single compressed file. To include many files in a package, such as a set of Java™ class files, you create a compressed file of the customizations that preserves the folder structure.

When a package is deployed to a target environment, you can download the compressed compiled source file, extract the contents into the build location, and build the EAR file. To migrate compiled sources, you must ensure that the target environment has a build environment in which you can run the scripts that rebuild the product EAR file.

Package definitions and packages

A package definition is a template that specifies the configuration content that goes into a package. A package is an instance of a package definition and contains the configuration content that is migrated.

Package definitions

A package definition specifies, but does not contain, configuration content. You use package definitions to create packages. By using the same package definition, you can create distinct packages that contain different sets of configuration content.

A package definition specifies the following information:

Header

The name of the package definition, the environment where it is created, and the type (Change, Snapshot, or Collection).

Set of migration groups

The configuration content that is contained in every package that is created from the package definition.

Compiled sources

Optional content from outside the database that is contained in every package that is created from the package definition.

Throughout the migration process, you must manage your package definitions. You must ensure that the correct types of package definitions are created. You must implement an approval process to ensure collaboration among all the migration participants. You must also ensure that package definition statuses are changed at the appropriate time.

If a package definition is incomplete or incorrect, steps of the migration process can fail. For example, if you define a package definition to migrate workflow definitions but do not include the associated communication templates, a package that is based on that package definition might fail to deploy in the target environment.

You can delete a package definition only if it is not activated, its status is not Locked, and no packages are based on it.

Packages

When a package is created, it is instantiated from a package definition and contains the following data:

Type of data	Description
Package manifest	Information about the content of the package, including the following details: <ul style="list-style-type: none">The migration objects that are included in the package.The number of records for each migration object.The readme information that was entered in the source environment by a deployment administrator.Version information about the source environment.Types of content that are in the package.
Package metadata	Information about the definition of the package.
Structural configuration content	Content that is stored in the underlying relational database schema as tables, views, columns, and indexes. For example, objects, attributes, and index definitions are structural content.
Nonstructural configuration content	Content that is typically stored as records in a table. For example, workflow process definitions are nonstructural content.
Compiled sources	Files that include source code customizations, libraries, configuration files, and report executable files. For example, Java™ class files are compiled sources.
History	Life cycle information about the package.

You can create, distribute, and deploy packages. The package is the item that you migrate from one environment to another.

- [Snapshot packages](#)
If you create a Snapshot package definition, its corresponding package contains the configuration content that exists at the moment the package is created.
- [Change packages](#)
A Change package contains configuration content that is captured over a defined period.
- [Collection packages](#)
A Collection package contains records that are based on the information in a migration collection.
- [Package definition status](#)
The status of a package definition determines the actions that you can apply to the package definition and its packages.
- [Package status](#)
The status of a package indicates that it is being created, deployed, or is in an interim state. You can use the status to track the steps of a package or to identify and resolve errors.
- [Deletion of package definitions](#)
When you delete a package definition, all the data that is related to the package definition is also deleted.
- [Deletion of packages](#)
If a package is no longer required or contains errors, you can delete it if it meets certain conditions.

Snapshot packages

If you create a Snapshot package definition, its corresponding package contains the configuration content that exists at the moment the package is created.

Use a Snapshot package definition when you want to migrate the following configuration content:

- Many changes at the same time
- Data that you cannot capture in Change packages because the data loading is performed by scripts
- The initial data load when you are setting up an environment
- Complex changes that require frequent revisions

Typically, you use a Snapshot package during the initial configuration of an environment.

By default, all records in a package definition are contained in a Snapshot package. However, you can filter the data to be included by defining SQL WHERE clauses on the migration objects that are in the package definition. For example, if you create two workflow processes, you can construct an SQL WHERE clause that ensures that only the records that are related to those two processes are included in the package. The criteria are applied to the root object of each object structure that is part of the package definition.

For Snapshot package definitions, you must specify a processing action. The default processing action, Replace, is used at deployment time to replace existing records in the target and to delete related records that are not in the Snapshot package. The AddChange processing action is used at deployment time only to add changed records to the target. Use the AddChange processing action only when configuration records have already been migrated to a target environment and changes have been made in the target environment that you do not want to lose when migrating further changes.

You can override the processing action in the Upload Compiled Sources window when you create a package.

An escalation for service requests is created in a development environment and migrated to a production environment by using a Snapshot package. The escalation has two escalation points. In the production environment, a third escalation point is added to support a business requirement. At the same time, in the development environment, minor changes are made to one of the previous escalation points.

The package that contains the changed escalation point is migrated again to the production environment by using the Replace processing action. In this situation, the production change to the escalation is lost because the escalation in the production environment is replaced by the updated development escalation.

Change packages

A Change package contains configuration content that is captured over a defined period.

You typically use a Change package if you must migrate a limited number of records that change after the initial configuration of an environment. The changes can include database inserts, updates, and deletions.

Use a Change package to migrate the following configuration content:

- Few or selective changes
- Changes that are made by specific users
- Changes that are made to a single application
- Deletions to records in tables

Change packages cannot contain business objects that have unique ID primary keys. You cannot migrate Change packages that contain business objects with unique ID primary keys. A unique ID column has the same name as the corresponding table, followed by the letters ID (for example, column DMMESSAGEID in the DMMESSAGE table). Values for unique ID columns are unique to a database. Migration of such data fails in a target environment because unique ID values might point to different records in the target and source databases. If a Change package definition contains business objects with unique ID primary keys, you cannot activate the package definition.

Insert changes might cause deployment errors if the record exists in the target. Before you migrate Change packages that contain database insert changes, ensure that the target environment does not contain the corresponding record. The record might exist from a previous migration or because it was created in the target environment. If the record exists, the Change package might fail to deploy. An error message indicates that the record exists and cannot be inserted.

Activation

The data in a Change package is based on the database changes that occur between the time that you activate the package definition and the time that you create the package or deactivate the package definition. After you activate a package definition, event listeners monitor the business objects in each object structure of the migration groups that are included in the package definition and start to capture the change information. When you deactivate a Change package definition, the event listeners stop capturing changes.

You use the menu actions in the Migration Manager application to activate and deactivate package definitions. You can activate a package definition only if its status is approved (Appr). An activated package definition cannot be modified.

Event tracking

After a Change package definition is activated, you can view and delete the records that are captured in the package in the View Event Tracking Records window. Typically, you delete Change records only in rare situations, such as if a change is made inadvertently or if a change is made only as a test.

When you use Change packages, you must occasionally reset event tracking to prevent system performance degradation. When you activate a Change package definition, the Migration Manager application captures and writes database changes to a change event tracking table in the database. Over time, the event tracking table might become large and slow down the tracking of changes, and you might need to reset event tracking. When you reset event tracking, the change

information is copied to a history table and removed from the change event tracking table. Do not reset event tracking immediately after you create a package from a package definition because you must first ensure that the deployment occurs without error.

If you migrate ticket templates by using Change packages, you must activate the package definition before any ticket templates are created or updated. After the Change package is deployed, you must reset the event tracking records for the package definition in the source environment.

Time considerations

The length of time that you capture events in a Change package is not restricted. However, Change packages are intended to capture a relatively small number of changes. If you use Change packages, take into account the following considerations:

- Change packages capture events only for the objects that are specified in the package definition. If an object is inadvertently omitted and a long time passes, all the changes to the object are lost.
- If a Change package contains many records captured over a long time, and if changes occur in the target environment simultaneously, the chances of deployment errors increase.
- If test changes are made while a Change package is active, the test changes are captured and are migrated to the target environment.

Administration mode

To make structural changes to the database using the Database Configuration application, administration mode must be turned on. When administration mode is on, event tracking stops. Do not make any other changes while administration mode is on. Wait until the database configuration is complete and administration mode is turned off.

Collection packages

A Collection package contains records that are based on the information in a migration collection.

You cannot create a package definition of type Collection in the Migration Manager application. Instead, you create Collection package definitions from the Migration Collections application after you have defined a migration collection.

Package definition status

The status of a package definition determines the actions that you can apply to the package definition and its packages.

You change the status of a package definition by using the Migration Manager application. The status might also change when you do some steps in the migration process. A package definition can have one of the following statuses:

Wappr (Waiting for approval)

Wappr is the default status when you create or duplicate a package definition. You can modify a package definition only when its status is Wappr. You can change this status to Appr only.

Appr (Approved)

You cannot modify a package definition whose status is Appr. You can toggle the status of a package definition between Appr and Locked. You can change this status to Locked or Wappr. You can activate a Change package definition only when its status is Appr.

Locked

The following restrictions apply to a package definition whose status is Locked:

- You cannot change the content of the package definition.
- You cannot create or distribute packages based on the package definition.
- You cannot create distributions from the package definition.
- For Change package definitions, you cannot reset tracking records.
- In a target environment, you cannot deploy a package that is based on a locked package definition.

You can toggle the status of a package definition between Locked and Appr. You can change this status to Appr only.

You can override the default status of Wappr for a package definition by setting the `mxe.dm.autoapprovepkgdef` property in the System Properties application. If you specify a value of 1 for the system property, the default status is Appr. Specify a value of 0 to use the default status.

Package status

The status of a package indicates that it is being created, deployed, or is in an interim state. You can use the status to track the steps of a package or to identify and resolve errors.

You do not set or change the status of a package. The status is created by the Migration Manager application during the creation or the deployment of a package. You can see the status and the history of status changes on the Package tab in the Migration Manager application.

In a source environment, a package can have one of the following statuses:

Status	Description
CREATE_NEW	The package is marked for creation, but compiled sources are not yet uploaded.

Status	Description
CREATE_INPROGRESS	The package is being created and compiled sources are uploaded.
CREATED	The package is created and can be deployed.
CREATE_ERROR	An error prevented the creation of the package.
CLOSED	The package is closed. Closing a package copies the file to an archive folder and deletes the staging table records. You cannot view or deploy a closed package. If your package is in the form of records in the staging table (distribution is type DATABASE), closing the package deletes the staging table records.

In a target environment, a package can have one of the following statuses:

Status	Description
DEPLOY_NEW	The package is marked for deployment and does not contain compiled sources.
DEPLOY_NEW_CMPSRC	The package is marked for deployment and contains compiled sources.
DEPLOY_INPROGRESS	The package is being deployed.
DEPLOYED	The package is deployed.
DEPLOY_ERROR	An error prevented the deployment of the package.
REDISTRIBUTE	The package is being redistributed.
REDISTRIBUTED	The package is redistributed.
REDISTRIBUTE_ERROR	An error prevented redistribution of the package.
CLOSED	The package is closed.

Deletion of package definitions

When you delete a package definition, all the data that is related to the package definition is also deleted.

You can delete a package definition at any time except when a corresponding package has a status of Create_Inprogress or Deploy_Inprogress.

When you delete a package definition, its related data is deleted. The related data includes the following items:

- The packages that have been created from the package definition.
- The targets and distributions that have been associated with the package definition.
- For a Change package definition, the changes that have been tracked.

You delete a package definition by selecting the Delete Package Definition action.

Deletion of packages

If a package is no longer required or contains errors, you can delete it if it meets certain conditions.

You can delete a package if any of the following conditions is true:

- In the source environment, the status of the package is CREATED, but you have not distributed the package to any target environment.
- In the source environment, the status of the package is CREATE_ERROR.
- In the target environment, the status of the package is DEPLOY_ERROR.

If the package type is FILE and you want to archive the file to refer to later, close the package instead of deleting it.

Migration collections

A migration collection is a group of configuration records that can be used to create package definitions. Migration collections simplify the creation of package definitions.

You can create migration collections to help you organize and create your package definitions, particularly if your product environment is shared by multiple developers.

You can configure migration collections to capture configuration events as they occur, similar to a Change package. Furthermore, you can configure applications so that users can add records to a migration collection from the application.

Each migration collection has an owner. The owner can add and remove configuration records from the migration collection or delete the migration collection. A migration collection is also either private or public. If a migration collection is public, other users with sufficient rights can also do these tasks.

The configuration records that are in a migration collection can be exported to an XML file, which can help you to track configurations externally. For example, you can export the configuration records and then add them to a version control system.

Planning for migration

Before you migrate your configuration content, devote sufficient time to develop a migration plan.

Planning a successful migration of configuration content requires you to do at least the following types of planning:

- Form a qualified migration team to do the migration steps and tasks.
- Identify the configuration changes and content that you must migrate.
- Identify the source and target environments for your migration.
- Devise a schedule for migrations.

You must also consider whether you must track the configuration content that you migrate in an external system, and how you handle the migration limitations that might apply to your content.

- **Migration participants and roles**
Planning and implementing the migration of configuration content involves several participants and roles.
- **Validation of database integrity**
Migration errors can be minimized by maintaining the integrity of the database in the source and target environments. Use the Integrity Checker utility to analyze the database.
- **Migration and database backups**
The Migration Manager application does not provide the capability to roll back a package that fails to deploy in a target environment. Before you migrate configuration content, you must back up your target database.
- **Migration scheduling**
Schedule migrations to take place during maintenance periods when users are not using the product.
- **Determining the configuration content to migrate**
As part of migration planning, you must determine whether the predefined migration objects and migration groups meet your needs. You can also compare source and target databases to determine what must be migrated.
- **Migration limitations**
Although most configuration content can be migrated in most environments, some configuration cannot be migrated. Extra steps are required in some circumstances.
- **Migration reports**
Several reports are provided to help you plan and manage the migration process.

Migration participants and roles

Planning and implementing the migration of configuration content involves several participants and roles.

The following roles are typical migration roles:

Role	Tasks
Database administrator	Database administrators monitor the integrity of the product databases, and back up and restore the databases.
Product administrator	The product administrators ensure that the product environment is available to the users. Product administrator might need to restart the application servers during the migration process.
Deployment manager	A deployment manager, also called a change manager, controls and coordinates the migration staff, ensures the timely execution of migration tasks, and resolves issues or conflicts. The deployment manager also ensures that all tasks are completed according to your change management plan.
Deployment specialist	Deployment specialists coordinate migration with the component developers and consultants. These specialists must identify and have access to both the development and test environments. They might also require access to production environments. They must be familiar with your IT policies so that they can manage the migration within your software maintenance periods. These specialists must be thoroughly familiar with the Migration Manager applications.
Component developer or consultant	Depending on the configuration changes in your organization, developers and consultants might be required to develop components such as workflows and escalations. Software developers might be required to write Java™ code.

Ensure that deployment specialists and administrators have sufficient user rights to deploy packages. For example, to deploy packages that contain inactive sites, the user must have rights to access inactive sites.

Validation of database integrity

Migration errors can be minimized by maintaining the integrity of the database in the source and target environments. Use the Integrity Checker utility to analyze the database.

Run the Integrity Checker on the databases that are in your source and target environments before and after you migrate configuration content. Examine and correct the warnings or errors in the report. The structure of the database and the data dictionary, which reflects the structure, must not show any discrepancies.

Run the Integrity Checker consistently in both source and target environments.

For more information about the Integrity Checker utility, see the *Upgrade Guide: IBM® Maximo® 6 to Version 7 Products* at [Maximo Upgrade Resources](#).

Migration and database backups

The Migration Manager application does not provide the capability to roll back a package that fails to deploy in a target environment. Before you migrate configuration content, you must back up your target database.

Before migrating changes from a source environment to a target environment, back up your target database. You can use the backup utility from your database vendor. If a migration fails, you can use your backup to restore the database.

Migration scheduling

Schedule migrations to take place during maintenance periods when users are not using the product.

You must plan and control migrations to production environments. Production environments might have users who need the production environment to be available at all times. Consider migrating your configuration content during a maintenance period. System downtime is not required for some migrations. However, using maintenance periods for migration ensures that you can handle any errors that occur and that you can restore the production system if necessary.

Determining the configuration content to migrate

As part of migration planning, you must determine whether the predefined migration objects and migration groups meet your needs. You can also compare source and target databases to determine what must be migrated.

The predefined migration objects and migration groups cover the migration of most typical configuration content. Review them to determine whether you must create migration objects and groups for your business requirements.

If you must customize the provided configuration content or create configuration content, you define the object structures in the Object Structures application. You can then add the object structures to migration groups in the Migration Groups application.

- **[Predefined migration objects and migration groups](#)**
Several migration objects and migration groups are included with the product to enable the migration of configuration content.
- **[Creating migration objects](#)**
You can create a migration object, or object structure, if no predefined object structure exists for one or more tables that you want to migrate. As an alternative to creating an object structure, you can add one or more objects to a predefined object structure.
- **[Migration object processing sequences](#)**
The order of the migration objects within a migration group determines the sequence in which the objects are processed. The order must be correct to ensure that the deployment of packages succeeds.
- **[Creating migration groups](#)**
You create a migration group to specify the configuration content that is to be migrated in a package. If you create your own object structures or reorganize the predefined object structures, you might need to create a migration group to contain those structures.
- **[Deletion of migration groups](#)**
You can delete a migration group if it meets certain conditions.
- **[Comparing source and target databases](#)**
For each package definition, you can identify the differences between a source database and a target database before you deploy the package. The results of a database comparison can help you determine the configuration content that must be migrated.
- **[Setting inbound restrictions](#)**
In a target environment, you can prevent the distribution and deployment of packages that come from restricted source environments. To accept packages that come only from an authorized source environment, set restrictions on all other environments.

Predefined migration objects and migration groups

Several migration objects and migration groups are included with the product to enable the migration of configuration content.

Each migration group contains one or more migration objects.

- **[Data Dictionary migration group](#)**
The Data Dictionary migration group manages objects, such as tables, attributes, relationships, and indexes.
- **[Document Library migration group](#)**
The Document Library migration group manages document library types and links to various product applications.
- **[Application migration group](#)**
The Application migration group manages the application user interface.
- **[Resources migration group](#)**
The Resources migration group is used to manage people and groups of people.
- **[Functional migration group](#)**
The Functional migration group is used to manage shifts, shift patterns, work periods, and calendars.
- **[Application Security migration group](#)**
The Application Security migration group is used to manage application security.
- **[Reporting migration group](#)**
The Reporting migration group is used to manage reports.
- **[System migration group](#)**
The System migration group performs various server-side tasks in the product. Object structures in this group are used, for example, to run cron tasks, create log file entries, and manage system properties.
- **[Integration migration group](#)**
The Integration migration group is used to manage integration interfaces, external systems, and other integration components.

- [Business Process Management migration group](#)
The Business Process Management migration group is used in the management of workflow processes, roles, communication templates, email listeners, actions, and escalations.
- [Migration migration group](#)
The Migration migration group is used to manage migration groups, dependencies, and migration packages.
- [Ticket Template Data migration group](#)
The Ticket Template Data migration group manages ticket templates.
- [Classification Data migration group](#)
The Classification data migration group manages classifications.
- [Interaction System Objects migration group](#)
The Interaction System Objects migration group is used to manage business objects that are related to web service interactions.
- [Interaction Artifacts migration group](#)
The Interaction Artifacts migration group is used to manage web service interactions.
- [Scripting System Objects migration group](#)
The Scripting System Objects migration group is used to manage automation scripts.
- [OSLC migration group](#)
The OSLC migration group is used to manage OSLC interactions, providers, and resource types.

Data Dictionary migration group

The Data Dictionary migration group manages objects, such as tables, attributes, relationships, and indexes.

DMCONDITION object structure

Managing application	Condition Expression Manager
Supported objects	Conditions
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	No

DMCURRENCY object structure

Managing application	Currency Codes
Supported objects	Currency codes
Outbound content processing	None
Inbound content processing	None
Carries long description	Yes, for the CURRENCY business object.
Carries records in multiple languages	No

DMDEFGLCONFIGURE object structure

Managing application	Database Configuration
Supported objects	General ledger (GL) definition configuration and components
Outbound content processing	None
Inbound content processing	During package deployment in a target environment, this object structure implements extra processing logic to ensure that GL components can be loaded without error.
Carries long description	No
Carries records in multiple languages	No

DMGLCONFIGURE object structure

Managing application	Database Configuration
Supported objects	General ledger (GL) configuration and components
Outbound content processing	None
Inbound content processing	During package deployment in a target environment, this object structure implements extra processing logic to ensure that GL components can be loaded without error.
Carries long description	No
Carries records in multiple languages	No

DMLANGUAGE object structure

Managing application	Not applicable
Supported objects	Languages
Outbound content processing	None
Inbound content processing	When a package is deployed, this object structure ensures that the enabled language is not disabled.
Carries long description	No
Carries records in multiple languages	No

DMMAXDOMAIN object structure

Managing application	Domains
Supported objects	Domains
Outbound content processing	During package creation in a source environment, this object structure skips internal domains that are not synonyms. This object structure does not extract the DBSTORAGEPARTITION domain, because this extraction must be managed separately in individual environments.
Inbound content processing	During package deployment in a target environment, this object structure implements extra logic to ensure that CROSSOVERDOMAIN records can be loaded without error.
Carries long description	No
Carries records in multiple languages	Yes, for the MAXDOMAIN, ALNDOMAIN, and SYNONYMDOMAIN business objects.

DMMAXINTOBJECT object structure

Managing application	Object Structures
Supported objects	Object structures
Outbound content processing	During package creation in a source environment, this object structure extracts only the structures that are configurable.
Inbound content processing	When a package is deployed, this object structure ensures that new objects that are associated with the object structure are loaded without error.
Carries long description	Yes, for the MAXINTOBJECT business object.
Carries records in multiple languages	No

DMMAXLOOKUPMAP object structure

Managing application	Database Configuration
Supported objects	Related keys
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	No

DMMAXMESSAGES object structure

Managing application	Database Configuration
Supported objects	Messages
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	Yes, for the MAXMESSAGES business object.

DMMAXOBJECTCFG object structure

Managing application	Database Configuration
Supported objects	Objects, attributes, indexes, views, tables, columns, autokeys, audit table settings
Outbound content processing	During package creation in a source environment, this object structure does not extract MXIN_INTER_TRANS and MXOUT_INTER_TRANS business objects. It also does not extract TEXTSEARCH indexes.
Inbound content processing	During package deployment in a target environment, this object structure checks whether the underlying target database is a Db2® database. If it is, the index that serves as a native primary key for the underlying database is not migrated.
Carries long description	No
Carries records in multiple languages	Yes, for the MAXOBJECTCFG and MAXATTRIBUTECFG business objects.

DMMAXRELATIONSHIP object structure

Managing application	Database Configuration
Supported objects	Relationships
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	None

DMMAXSEQUENCE object structure

Managing application	Database Configuration
Supported objects	Sequences
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	No

DMMAXSERVICE object structure

Managing application	Database Configuration
Supported objects	Services
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	Yes, for the MAXSERVICE business objects.
Additional information	A service is associated with a Java™ class. When you migrate this object structure, you must migrate the class file as a compiled source. Restart the application server to start new services.

DMMAXVARS object structure

Managing application	Multiple applications
Supported objects	Maxvars
Outbound content processing	None
Inbound content processing	When a package is deployed, this object structure skips new MAXVAR records.
Carries long description	No
Carries records in multiple languages	No

DMORGANIZATION object structure

Managing application	Organizations
Supported objects	Organizations and sites
Outbound content processing	None
Inbound content processing	During package deployment in a target environment, this object structure implements extra processing logic to ensure that address references for a site can be resolved. If you created an organization in the target, the new organization is inactive.
Carries long description	Yes, for the ORGANIZATION, ADDRESS, and SITE business objects.
Carries records in multiple languages	No

DMSETS object structure

Managing application	Sets
Supported objects	Sets
Outbound content processing	None
Inbound content processing	None
Carries long description	Yes, for the SETS business object.
Carries records in multiple languages	No

Document Library migration group

The Document Library migration group manages document library types and links to various product applications.

DMDOCTYPES object structure

Managing application	Multiple applications
Supported objects	Document library
Outbound content processing	None
Inbound content processing	During package deployment in a target environment, this object structure implements extra logic to ensure that DOCINFO records can be loaded without error.
Carries long description	Yes, for the DOCINFO business object.
Carries records in multiple languages	No

Application migration group

The Application migration group manages the application user interface.

DMKPIMAIN object structure

Managing application	KPI Manager
Supported objects	KPI (key performance indicator)
Outbound content processing	None
Inbound content processing	None
Carries long description	Yes, for the KPIMAIN business object.
Carries records in multiple languages	No

DMMAXAPPS object structure

Managing application	Application Designer
Supported objects	Applications
Outbound content processing	None
Inbound content processing	During package deployment in a target environment, this object structure implements extra logic to ensure that APPDOCTYPE records can be loaded without error.
Carries long description	Yes, for the SIGOPTION business object.
Carries records in multiple languages	Yes, for the MAXAPPS, MAXLABELS, and SIGOPTION business objects.
Additional information	If you insert or update an application presentation, you might need to restart the application server.

DMMAXLAUNCHENTRY object structure

Managing application	Launch in Context
Supported objects	Launch entries
Outbound content processing	None
Inbound content processing	None
Carries long description	Yes, for the MAXLAUNCHENTRY business object.
Carries records in multiple languages	No

DMMAXMENU object structure

Managing application	Application Designer
Supported objects	Menus
Outbound content processing	None
Inbound content processing	When a package is deployed, this object structure ensures that MAXMENU records are loaded without errors. The position column for the MAXMENU might be changed if the position is in use in the target environment.
Carries long description	No
Carries records in multiple languages	Yes, for the MAXMENU business object.

DMMAXMODULES object structure

Managing application	Not applicable
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Supported objects	Modules
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	Yes, for the MAXMODULES business object.

DMSCTEMPLATE object structure

Managing application	Start Center
Supported objects	Start center templates
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	No
Additional information	Only the start center templates are supported for migration. After you migrate a start center template, you can apply the template to an appropriate Start Center.

Resources migration group

The Resources migration group is used to manage people and groups of people.

DMPERSON object structure

Managing application	People
Supported objects	People
Outbound content processing	None
Inbound content processing	During package deployment in a target environment, this object structure implements extra logic to ensure that PERSON records are loaded without error.
Carries long description	Yes, for the PERSON business object.
Carries records in multiple languages	No

DMPERSONGROUP object structure

Managing application	Person Groups
Supported objects	Person groups
Outbound content processing	None
Inbound content processing	During package deployment in a target environment, this object structure implements extra logic to ensure that PERSONGROUPTEAM records are migrated without error.
Carries long description	Yes, for the PERSONGROUP business object.
Carries records in multiple languages	No

Functional migration group

The Functional migration group is used to manage shifts, shift patterns, work periods, and calendars.

DMCALENDAR object structure

Managing application	Calendars
Supported objects	Calendars
Outbound content processing	None
Inbound content processing	When a package is deployed, this object structure ensures that WORKPERIOD records are loaded without error.
Carries long description	Yes, for the CALENDAR business object.
Carries records in multiple languages	No

DMSHIFT object structure

Managing application	Calendars
Supported objects	Shifts

Outbound content processing	None
Inbound content processing	During package deployment in a target environment, this object structure implements extra logic to ensure that SHIFTPATTERNDAY records are loaded without error.
Carries long description	Yes, for the SHIFT business object.
Carries records in multiple languages	No

Application Security migration group

The Application Security migration group is used to manage application security.

DMCTRLGROUP object structure

Managing application	Application Designer
Supported objects	Control security
Outbound content processing	None
Inbound content processing	When a package is deployed, the object structure ensures that CTRLCONDITION records and CTRLCONDPROP records are loaded without errors.
Carries long description	No
Carries records in multiple languages	Yes, for the CTRLCONDPROP business object.

DMMAXGROUP object structure

Managing application	Security Groups
Supported objects	Security groups
Outbound content processing	When a package is created, this object structure adds the SCTEMPLATE information.
Inbound content processing	During package deployment in a target environment, this object structure implements extra logic. This logic ensures that security signature options records for change password and start center functions can be loaded securely.
Carries long description	Yes, for the MAXGROUP business object.
Carries records in multiple languages	No

DMMAXSERVSECURITY object structure

Managing application	Security Groups
Supported objects	Service security
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	No

DMMAXUSER object structure

Managing application	Users
Supported objects	Users
Outbound content processing	None
Inbound content processing	During package deployment in a target environment, if a new user must be created, a new password is generated for the user. An email message with the password is sent to the email address that is specified in the person record of the user. If no email address is specified, the user cannot receive the password and cannot log in.
Carries long description	No
Carries records in multiple languages	No
Additional information	In the Users and Security Groups applications, an administrator can control the generation of an email notification to a new user. The PWRESET communication template is used to create this notification. If you want the email notification to go to new users, ensure that the PERSON records for these users are migrated with appropriate email IDs. If you want to alter the content of the email notification, duplicate the PWRESET communication template and use the new communication template to send notifications.

DMSIGOPTFLAG object structure

Managing application	Application Designer
Supported objects	Signature options flags
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	No

DMSIGOPTION object structure

Managing application	Security Groups
Supported objects	Signature Options
Outbound content processing	None
Inbound content processing	When a package is deployed, this object structure ensures that SIGOPTION records are loaded without errors, and skips SIGOPTION records that are carried by MAXAPPS records.
Carries long description	Yes, for the SIGOPTION business object.
Carries records in multiple languages	Yes, for the SIGOPTION business object.

Reporting migration group

The Reporting migration group is used to manage reports.

DMKPIMAIN object structure

Managing application	KPI Manager
Supported objects	KPI (key performance indicator)
Outbound content processing	None
Inbound content processing	None
Carries long description	Yes, for the KPIMAIN business object.
Carries records in multiple languages	No

DMREPORT object structure

Managing application	Report Administration
Supported objects	Reports
Outbound content processing	None
Inbound content processing	During package deployment in a target environment, this object structure implements extra logic to ensure that REPORTAUTH and REPORTLOOKUP records are loaded without error.
Carries long description	No
Carries records in multiple languages	Yes, for the REPORT and REPORTLABEL business objects.

DMREPORTDESIGN object structure

Managing application	Report Administration
Supported objects	Report design
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	No

System migration group

The System migration group performs various server-side tasks in the product. Object structures in this group are used, for example, to run cron tasks, create log file entries, and manage system properties.

DMCRONTASKDEF object structure

Managing application	Cron Task Setup
Supported objects	Cron tasks
Outbound content processing	None
Inbound content processing	During package deployment in a target environment, any added cron task receives parameters from the CRONTASKINSTANCE business object in the target environment.
Carries long description	Yes, for the CRONTASKDEF and CRONTASKINSTANCE business objects.
Carries records in multiple languages	No

DMMAXLOGAPPENDER object structure

Managing application	Logging
Supported objects	Log appenders
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	No

DMMAXLOGGER object structure

Managing application	Logging
Supported objects	Loggers
Outbound content processing	None
Inbound content processing	When a package is deployed, this object structure ensures that child logger records are loaded without error.
Carries long description	No
Carries records in multiple languages	No

DMMAXPROP object structure

Managing application	System Properties
Supported objects	System properties
Outbound content processing	During package creation in a source environment, the only system properties that are extracted are those that are user-defined, that do not have file overrides configured, and that are common to all instances of the application server.
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	No

Integration migration group

The Integration migration group is used to manage integration interfaces, external systems, and other integration components.

DMMAXENDPOINT object structure

Managing application	End Points
Supported objects	Endpoints
Outbound content processing	None
Inbound content processing	None
Carries long description	Yes, for the MAXENDPOINT business object.
Carries records in multiple languages	No

DMMAXEXTSYSTEM object structure

Managing application	External Systems
Supported objects	External systems
Outbound content processing	None
Inbound content processing	When a package is deployed, this object structure ensures that MAXEXTOVER records are loaded without error.
Carries long description	Yes, for the MAXEXTSYSTEM business object.
Carries records in multiple languages	No

DMMAXIFACECONTROL object structure

Managing application	External Systems, Publish Channels, Enterprise Services
Supported objects	Interface controls
Outbound content processing	None
Inbound content processing	None
Carries long description	Yes, for the MAXIFACECONTROL business object.
Carries records in multiple languages	No

DMAXIFACEIN object structure

Managing application	Enterprise Services
Supported objects	Enterprise services
Outbound content processing	None
Inbound content processing	None
Carries long description	Yes, for the MAXIFACEIN and MAXIFACEPROC business objects.
Carries records in multiple languages	No

DMAXIFACEINVOKE object structure

Managing application	Invocation Channels
Supported objects	Invocation channels
Outbound content processing	None
Inbound content processing	None
Carries long description	Yes, for the MAXIFACEINVOKE business object.
Carries records in multiple languages	No

DMAXIFACEOUT object structure

Managing application	Publish Channels
Supported objects	Publish channels
Outbound content processing	None
Inbound content processing	None
Carries long description	Yes, for the MAXIFACEOUT and MAXIFACEPROC business objects.
Carries records in multiple languages	No

DMAXQUEUE object structure

Managing application	External Systems
Supported objects	Queues
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	No

DMWSREGISTRY object structure

Managing application	Web Service Library
Supported objects	Library of all the registered web services
Outbound content processing	None
Inbound content processing	All the web services are registered, the WSDL is generated, and the deployment descriptor is updated.
Carries long description	Yes
Carries records in multiple languages	No, except for the Description column.

Business Process Management migration group

The Business Process Management migration group is used in the management of workflow processes, roles, communication templates, email listeners, actions, and escalations.

DMACTION object structure

Managing application	Actions
Supported objects	Actions
Outbound content	None

processing	
Inbound content processing	During package deployment in a target environment, checks whether an action is linked to an escalation. If an action is linked to an escalation, the object structure does not delete the action and instead places a message in the product log file.
Carries long description	Yes, for the ACTION business object.
Carries records in multiple languages	No

DMACTIONGROUP object structure

Managing application	Actions
Supported objects	Action groups
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	No
Additional information	The Migration Manager application migrates actions before it migrates action groups.

DMCOMMTEMPLATE object structure

Managing application	Communication Templates
Supported objects	Communication templates
Outbound content processing	When a package is created, the class adds the SCTEMPLATE information to the package.
Inbound content processing	During package deployment in a target environment, this object structure implements extra logic to ensure that DOCLINKS records for a communication template can be loaded without error.
Carries long description	No
Carries records in multiple languages	No

DMESCALATION object structure

Managing application	Escalations
Supported objects	Escalations
Outbound content processing	None
Inbound content processing	When a package is created, this object structure ensures that escalation records for new communication templates are loaded without error.
Carries long description	Yes, for the ESCALATION business object.
Carries records in multiple languages	No
Additional information	An escalation can include a reference to an action group, which in turn can contain one or more actions. Therefore, migrate action groups and actions before escalations. Similarly, an escalation can include a reference to one or more communication templates. Therefore, migrate communication templates before actions.

DMINBOUNDCOMMCFG object structure

Managing application	Email listeners
Supported objects	Email listeners
Outbound content processing	None
Inbound content processing	During package deployment in a target environment, this object structure implements extra logic to ensure that email listener references to a workflow process are resolved correctly. Also ensures that email listener configuration records are loaded without error.
Carries long description	No
Carries records in multiple languages	No

DMROLE object structure

Managing application	Roles
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Supported objects	Roles
Outbound content processing	None
Inbound content processing	None
Carries long description	Yes, for the MAXROLE business object.
Carries records in multiple languages	No

DMWFPROCESS object structure

Managing application	Workflow Designer
Supported objects	Workflow process
Outbound content processing	None
Inbound content processing	During package deployment in a target environment, this object structure creates a revision of a workflow process whenever workflow data is imported. This object structure performs extra processing to ensure that other workflow-related records can be loaded without error. Before you import a workflow process, deploy into the target environment any subprocesses and communication templates that the workflow process depends on.
Carries long description	Yes, for the WFPROCESS, WFNODE, WFASSIGNMENT, and WFINTERACTION business objects.
Carries records in multiple languages	No

Migration migration group

The Migration migration group is used to manage migration groups, dependencies, and migration packages.

DMCFGGROUP object structure

Managing application	Migration Groups
Supported objects	Migration groups
Outbound content processing	None
Inbound content processing	During package deployment in a target environment, this object structure implements extra logic to ensure that migration group records with references to object structures can be loaded without error.
Carries long description	No
Carries records in multiple languages	No

DMDEPENDENCY object structure

Managing application	Migration Groups
Supported objects	Dependencies
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	No

DMMAPDEF object structure

Managing application	Migration Manager
Supported objects	Attributes selected for replacement
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	No

DMMAPRULES object structure

Managing application	Migration Manager
Supported objects	Replacement rules
Outbound content processing	None
Inbound content processing	During package deployment in a target environment, this object structure applies the attribute replacement rules.

Carries long description	No
Carries records in multiple languages	No

DMPACKAGE object structure

Managing application	Migration Manager
Supported objects	Packages
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	No
Additional information	All the object structures that comprise the Migration Manager and Migration Groups applications are nonconfigurable, to prevent errors when packages are processed. You cannot add business objects to the respective object structures. You cannot include or exclude attributes of individual business objects in the respective object structures.

DMPACKAGEDEF object structure

Managing application	Migration Manager
Supported objects	Package definitions
Outbound content processing	None
Inbound content processing	None
Carries long description	Yes, for the DMPACKAGEDEF business object.
Carries records in multiple languages	No

DMPKGDSTRGT object structure

Managing application	Migration Manager
Supported objects	Package targets
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	No

Ticket Template Data migration group

The Ticket Template Data migration group manages ticket templates.

DMTKTEMPLATE object structure

Managing application	Migration Manager
Supported objects	Ticket templates, ticket template specifications, ticket template activity records
Outbound content processing	During package creation in a source environment, this object structure sets the values for the HIERARCHYPATH and EXTERNALREFID attributes.
Inbound content processing	During package deployment in a target environment, this object structure finds the CLASSSTRUCTUREID value based on the HIERARCHYPATH attribute and sets the value. It also sets the TKTEMPLATESPEC, TKTEMPLACTIVITY, and TKTEMPLACTYSPEC objects so that the correct records are found for Change or Replace actions.
Carries long description	Yes
Carries records in multiple languages	No
Additional information	To enable the update of ticket templates, the object structure uses the EXTERNALREFID persistent attribute as an alternate key. Do not change this attribute. Also, do not remove the HIERARCHYPATH non-persistent attribute from the TKTEMPLATE, TKTEMPLACTIVITY, and TKTEMPLACTYSPEC objects, or deployment errors occur.

Ticket template dependencies

Ticket templates can have many dependencies. A ticket template record might depend on a person group, person, service group, service, company, classification, or organization. A ticket template activity record might depend on a job plan, organization, site, person, person group, company, or classification. A ticket template specification record or a ticket template activity specification record might depend on an asset attribute or unit of measure. None of this related data is part of the ticket template object structure. Therefore, the following related data must be migrated separately or created in the target environment before or after you migrate a ticket template:

Related data	Migration
Classifications, organizations, and sites	Migrate the related data separately or create it in the target environment.
Person groups and person records	Migrate the related data separately or create it in the target environment, and then link the related data to the migrated ticket template.
Asset attributes, companies, job plans, services and service groups, and units of measure	After the ticket template is migrated, create the related data in the target environment and then link the related data to the migrated ticket template.

Autokey values

If you do not want to use autokey values for the TEMPLATEID attribute, and want the users to always specify a value that is migrated, you must make the following customizations in the source and target environments:

- Remove the attribute restriction from the TEMPLATEID attribute and disable the autokey for the TKTEMPLATE object by using the Database Configuration application.
- Remove the alternate key that is defined on the TKTEMPLATE object of the DMTKTEMPLATE object structure by using the Object Structures application.

If you leave the autokey enabled, do not remove the restriction from the TEMPLATEID attribute. If you remove the restriction, but users do not override the generated autokey value, records could be updated in error.

Classification Data migration group

The Classification data migration group manages classifications.

DMCLASSIFICATION object structure

Managing application	Classifications
Supported objects	Classifications
Outbound content processing	None
Inbound content processing	During package deployment in a target environment, this object structure processes the class structure from the hierarchy path.
Carries long description	Only the CLASSSTRUCTURE long description
Carries records in multiple languages	No
Additional information	Do not remove the HIERARCHYPATH or DATATYPE non-persistent attributes, or deployment errors occur. Do not change the autokey attribute CLASSSTRUCTUREID, or records cannot be migrated.

Classification dependencies

Classifications can have many dependencies. A class structure record might depend on an organization or site. A classification Use With record might depend on a business object. A class specification might depend on a domain, unit of measure, organization, or site. A classification specification Use With record might depend on an organization, sire, or other business object. None of this related data is part of the classification object structure. Therefore, the following related data must be migrated separately or created in the target environment before or after you migrate a classification:

Related data	Migration
Organizations, sites, and domains	Migrate the related data separately or create it in the target environment.
Units of measure	Create the data in the target environment.
Other business object	Migrate the related data separately, or create it in the target environment and apply the configuration changes by using the configdb utility.

Interaction System Objects migration group

The Interaction System Objects migration group is used to manage business objects that are related to web service interactions.

DMMAXDOMAIN object structure

Managing	Domains
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application	
Supported objects	Domains
Outbound content processing	During package creation in a source environment, this object structure extracts only the domains that are not internal. This object structure does not extract the DBSTORAGEPARTITION domain, because this extraction must be managed separately in individual environments.
Inbound content processing	During package deployment in a target environment, this object structure implements extra logic to ensure that CROSSOVERDOMAIN records can be loaded without error.
Carries long description	No
Carries records in multiple languages	Yes, for the MAXDOMAIN, ALNDOMAIN, and SYNONYMDOMAIN business objects.

DMMAXINTOBJECT object structure

Managing application	Object Structures
Supported objects	Object structures
Outbound content processing	During package creation in a source environment, this object structure extracts only the structures that are configurable.
Inbound content processing	None
Carries long description	Yes, for the MAXINTOBJECT business object.
Carries records in multiple languages	No

DMMAXOBJECTCFG object structure

Managing application	Database Configuration
Supported objects	Objects, attributes, indexes, views, tables, columns, autokeys
Outbound content processing	During package creation in a source environment, this object structure does not extract business objects that are marked as INTERNAL. This object structure does not extract business objects that are audit tables.
Inbound content processing	During package deployment in a target environment, this object structure checks whether the underlying target database is a Db2® database. If it is, the index that serves as a native primary key for the underlying database is not migrated.
Carries long description	No
Carries records in multiple languages	Yes, for the MAXOBJECTCFG and MAXATTRIBUTECFG business objects.

DMMAXRELATIONSHIP object structure

Managing application	Database Configuration
Supported objects	Relationships
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	None

Interaction Artifacts migration group

The Interaction Artifacts migration group is used to manage web service interactions.

DMINTERACTION object structure

Managing application	Create Interaction, Interactions
Supported objects	All interactions with external applications.
Outbound content processing	During package creation in a source environment, this object structure exports the interactions.
Inbound content processing	During package deployment in a target environment, this object structure imports the interactions..
Carries long description	Yes
Carries records in multiple languages	No, except for the Description column.

DMMAXAPPS object structure

Managing application	Application Designer
Supported objects	Applications
Outbound content processing	None
Inbound content processing	During package deployment in a target environment, this object structure implements extra logic to ensure that DOCINFO records can be loaded without error.
Carries long description	Yes, for the SIGOPTION business object.

Carries records in multiple languages	Yes, for the MAXAPPS, MAXLABELS, and SIGOPTION business objects.
Additional information	If you insert or update an application presentation, you might need to restart the application server.

DMMAXENDPOINT object structure

Managing application	End Points
Supported objects	Endpoints
Outbound content processing	None
Inbound content processing	None
Carries long description	Yes, for the MAXENDPOINT business object.
Carries records in multiple languages	No

DMMAXGROUP object structure

Managing application	Security Groups
Supported objects	Security groups
Outbound content processing	None
Inbound content processing	During package deployment in a target environment, this object structure implements extra logic. This logic ensures that security signature options records for change password and start center functions can be loaded securely.
Carries long description	Yes, for the MAXGROUP business object.
Carries records in multiple languages	No

DMMAXIFACEINVOKE object structure

Managing application	Invocation Channels
Supported objects	Invocation channels
Outbound content processing	None
Inbound content processing	None
Carries long description	Yes, for the MAXIFACEINVOKE business object.
Carries records in multiple languages	No

DMMAXMENU object structure

Managing application	Application Designer
Supported objects	Menus
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	Yes, for the MAXMENU business object.

Scripting System Objects migration group

The Scripting System Objects migration group is used to manage automation scripts.

DMLAUNCHPOINT object structure

Managing application	Automation Scripts
Supported objects	Automation script launch points and launch point variables
Outbound content processing	None
Inbound content processing	During package deployment in a target environment, this object structure creates, updates, or deletes the script launch points and their variables.
Carries long description	No
Carries records in multiple languages	No

DMSCRIPT object structure

Managing application	Automation Scripts
Supported objects	Automation scripts and automation script variables
Outbound content processing	During package creation in a source environment, this object structure extract the scripts and the script variables that are

	defined in the application.
Inbound content processing	During package deployment in a target environment, this object structure creates, updates, or deletes the scripts and their variables.
Carries long description	No
Carries records in multiple languages	No

OSLC migration group

The OSLC migration group is used to manage OSLC interactions, providers, and resource types.

DMOSLCINTERACTION object structure

Managing application	OSLC Providers
Supported objects	OSLCINTERACTION, OSLCPREFILLMAP
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	No

DMOSLCPROVIDER object structure

Managing application	OSLC Providers
Supported objects	OSLCPROVIDER
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	No

DMOSLCRESTYPE object structure

Managing application	OSLC Providers
Supported objects	OSLCRESOURCETYPES
Outbound content processing	None
Inbound content processing	None
Carries long description	No
Carries records in multiple languages	No

Creating migration objects

You can create a migration object, or object structure, if no predefined object structure exists for one or more tables that you want to migrate. As an alternative to creating an object structure, you can add one or more objects to a predefined object structure.

About this task

You can include or exclude attributes of any business object that is part of a migration object. For example, it might be necessary to exclude attributes that are set by some configuration applications. Do not modify included or excluded attributes of business objects that are part of the included object structures that are used by the Migration Manager application. If you modify these attributes, the corresponding migration objects might not work correctly.

If you create your own object structures, you must test them by including them in a migration group and migrating the corresponding data. Sometimes, application business rules can prevent the processing of data that is migrated by using your own object structure. In this situation, you can author Java™-based object structure processing classes that can help control the migration.

Procedure

1. In the Object Structures application, on the toolbar, click New Object Structure
2. In the Object Structure field, specify a name.
The name must begin with an alphabetic character.
3. In the Consumed By field, specify MIGRATIONMGR.
4. Define the source objects for this object structure:
 - a. In the Source Objects table window, click New Row.
 - b. To add the primary (top-level) object to an object structure, specify a value in the Object field.
 - c. To add a child object to an object structure, specify values in the Object, Parent Object, Relationship, and Object Order fields.

- In a child object entry, the Relationship field can contain only a reference to a parent object or a reference to itself. If you establish a self-referencing relationship, the Self Reference check box is selected.
5. Click Save Object Structure.

Migration object processing sequences

The order of the migration objects within a migration group determines the sequence in which the objects are processed. The order must be correct to ensure that the deployment of packages succeeds.

Each migration object within a migration group must have a unique sequence number. Objects are processed in sequential order during the creation and deployment of the package. You can view the processing order of migration objects for all the predefined migration groups in the Migration Groups application.

If you use the predefined migration objects, the correct processing order is already established. If you create new migration groups, you must determine the order of the migration objects within the migration group.

You can use the Business Process Management migration group to migrate workflow processes. The migration group contains the following migration objects, which must be processed in the order shown:

1. DMACTION
2. DMACTIONGROUP
3. DMROLE
4. DMMCOMMTEMPLATE
5. DMESCALATION
6. DMWFPROCESS

This order must be followed because a workflow process might refer to one or more actions, roles, communication templates, or escalations. Similarly, an escalation might refer to one or more actions or communication templates, and a template might refer to a role.

Configuration content for a communication template (DMMCOMMTEMPLATE migration object) must be processed before the workflow process (DMWFPROCESS migration object) that refers to the communication template. Therefore, in the BPM migration group, the DMMCOMMTEMPLATE migration object has a processing order of 4 and the DMWFPROCESS migration object has a processing order of 6.

Creating migration groups

You create a migration group to specify the configuration content that is to be migrated in a package. If you create your own object structures or reorganize the predefined object structures, you might need to create a migration group to contain those structures.

About this task

Be sure to identify all the relationships between the business objects, including dependencies. If you omit required migration objects or dependencies, packages that use the migration group might fail to deploy.

Include all the necessary migration objects so that you maintain the referential integrity of the database to which you are migrating the configuration content. Assign the correct process order numbers, to ensure that the migration objects are processed in the correct order. Use the predefined migration groups as a reference when you are adding dependencies to your own migration groups.

Procedure

1. In the Migration Groups application, click New Migration Group.
2. In the Migration Group field, specify the name of the migration group.
3. Optional: To change the default process order, specify a new value in the Migration Group Order field.
4. Specify one or more migration objects to be added to the migration group:
 - a. In the Migration Objects table window, click New Row.
 - b. In the Migration Object field, specify the name of a migration object.
If you click Detail Menu and go to the Object Structures application to create a migration object, specify `MIGRATIONMGR` in the Consumed By field in that application.
 - c. Optional: To change the default process order, enter a new value in the Migration Object Order field.
5. Specify any dependent migration groups:
 - a. In the Dependency table window, click New Row.
 - b. In the Dependent Migration Group field, specify a migration group.
6. Save the migration group.

Deletion of migration groups

You can delete a migration group if it meets certain conditions.

You can delete a migration group if all the following conditions are true:

- The group is not an internal migration group.
- The group is not included in any active or inactive migration package.

- No other migration group depends on the migration group.

Comparing source and target databases

For each package definition, you can identify the differences between a source database and a target database before you deploy the package. The results of a database comparison can help you determine the configuration content that must be migrated.

The results of a database comparison can be added to a migration collection, which you can then use to create the packages that must be migrated.

Before you begin

Before you can run a database comparison, the package definition must exist in the source environment and the target must be defined in the Migration Manager application.

About this task

You can run a database comparison at different times to help determine what content must be migrated and tested. You can specify any type of package definition for the database comparison.

The results of the database comparison indicate whether the records match or whether the records are in only the source database or the target database.

Procedure

1. In the Migration Manager application, select a package definition.
2. On the Comparison tab, click Start Comparison Job.
3. Select a target database and click Start Job.
4. Click Refresh Job Status and review the status messages.
5. Optional: When the job finishes, add the results to a migration collection.

Setting inbound restrictions

In a target environment, you can prevent the distribution and deployment of packages that come from restricted source environments. To accept packages that come only from an authorized source environment, set restrictions on all other environments.

Before you begin

Obtain the host names, database names, and database schema names of the restricted source environments from a system administrator.

About this task

For a database distribution, the application checks the target for any restrictions before distribution. If a restriction is found, the database is not distributed to the target. For a file distribution, restrictions are checked when a package file is selected for deployment.

Procedure

1. In a target environment, start the Migration Manager application and click Select Action > Set Inbound Restrictions.
2. In the Set Inbound Restrictions window, click New Row.
3. In the Database Host field, specify the host name of the computer where the database is running. For example, if the fully qualified host name is xyz.usa.example.com, type xyz in the field.
4. In the Database Name field, specify the database instance or the database identifier on the server where the database is running.
For databases that use names longer than eight characters, such as Oracle databases, the first eight characters of the name must be unique so that inbound restrictions for different source environments are applied correctly.
5. In the Database Schema field, specify the database schema in the database instance on the computer where the database is running.
6. Click OK.

Migration limitations

Although most configuration content can be migrated in most environments, some configuration cannot be migrated. Extra steps are required in some circumstances.

Actions

To migrate a WFINITIAE action, which initiates a workflow process, the workflow process must be active. Therefore, two deployments are required. Migrate the workflow process and activate it in the target environment first, and then migrate the action.

Action groups

To migrate action groups that are created in the Actions application, you must also migrate all the actions that are in each action group. If you do not migrate the actions, the action groups cannot be used in the target environment.

Base language

A target environment must have the same base language as the source environment. If the target base language is different from the source base language, packages cannot be deployed.

Charts of accounts

Migration Manager does not migrate charts of accounts (GLs).

Classifications

The following limitations affect the migration of classifications:

- Data that is related to the CLASSIFICATION table is not migrated.
- You cannot migrate a classification hierarchy in which a parent classification was changed to alter the parent-child classification relationship.
- In Snapshot packages, regardless of the selected processing action, a database update is performed for classification records.
- You cannot migrate two or more different classifications that have the same hierarchy path.

Collection restrictions

Data restrictions for objects and attributes are migrated, but collection restrictions are only partially migrated. Data in the SECURITYRESTRICT table is migrated. Data in the COLLECTIONAUTH table is not migrated.

Conditions on security groups

In some situations you might need to create and deploy two separate Change packages. For example, consider the following scenario:

You have a security group that has a data restriction, and the data restriction references a condition. You create a package for application security and deploy the package to the target environment. You then remove the condition from the security group in the source environment, and delete the condition. You create a new package for application security and deploy the package to the target environment, but an error occurs.

The error occurs because during deployment, the Migration Manager attempts to delete the condition first.

To avoid this error, you must perform the migration in two steps. First, create a Change package that removes the condition from the security group, and deploy the package to the target environment. Then, create a second change package that deletes the condition, and deploy the second package to the target environment.

Crossover domains

To migrate a crossover domain to which an attribute has been added, you must create and deploy two packages. The first package to deploy must contain the attribute but not the domain. The second package to deploy must contain the domain.

Database configuration

In Oracle databases, setting up a system to run with a login user name that is different from the schema owner is a complex manual task and might cause migration errors. To avoid errors, ensure that the system properties `mxe.db.user` and `mxe.db.schemaowner` have the same value.

Also for Oracle databases, ensure that the semantics are set to CHAR in all source and target environments. Migrations between environments that have different semantics (CHAR and BYTE) might cause database errors.

Database indexes

For Db2® databases, indexes might not be migrated.

If a package is deployed and an index exists in the target environment, the index in the package is not deployed. If an index does not exist in the target environment, the index is created. If the index in the package is marked to be deleted, the index in the target with the same table and attribute combination is marked to be deleted.

Discarded configuration changes

A Change package can listen for database configuration events that occur in the Database Configuration application. Event information (inserts, updates, deletes) are persisted in the event tracking table. If a user discards all the database configuration changes by using the Discard Configuration Changes action, the events that are already captured remain in the tracking table. A migration user might not be aware that the events remain in the tracking table and might proceed to create, distribute, and deploy a package. During deployment, the Database Configuration application can determine that the data provided by the package does not contain changes and does not configure the database. The deployment of such a package does not harm the target environment, but the event tracking entries might be confusing to a user.

Electronic auditing

If you use the Database Configuration application to enable electronic auditing, the settings that control electronic auditing are migrated. If any electronic auditing tables are created, the tables are only useful for the specific environment. Therefore, any auditing tables and the data they contain are not migrated.

Exchange rates

You can migrate exchange rates only if the application servers in the source and target environments are configured to use the same time zone. If the time zones are different, a package might not deploy because of overlapping exchange rate validity periods. You cannot use exchange rates that have overlapping validity periods.

Integration tables

Changes to the Integration module interface tables, default queue tables MXIN_INTER_TRANS and MXOUT_INTER_TRANS, and any customized queue tables are not migrated. If you make any configuration changes in the source database to these tables, you must make the same changes in the target database.

Lookup maps

When you migrate lookup maps for new business objects, the migration of a single package that contains both the lookup map records and the business object records fail. The migration fails because the lookup map is processed first and depends upon the business object, which is not processed yet.

To work around this limitation, define two Change packages: one to capture the new business object and another to capture the lookup map. Migrate the business object Change package first.

MAXVARS table

The source and target environments must define the same MAXVARS. Migration Manager supports the update of existing MAXVARS only.

Organizations

After deployment of a package, a newly created organization in a target environment is inactive. It is inactive because a newly created organization cannot be activated without a clearing account (GL). The association of a GL account with an organization is a manual post-deployment step.

Person and site records

When a site is created, a default location of type HOLDING is generated. However, a location of type HOLDING cannot be associated with a person record. In order to associate a location with a new person record, you need to change the location type to another status, such as OPERATING.

If you try to migrate the site and person records in a single package, the location with type HOLDING causes a deployment error to occur. If this deployment error occurs, navigate to the Locations application and change the location type to OPERATING. Then return to Migration Manager and continue the deployment of the same package. Migration Manager now creates the person record and links it to the location record.

Restricted attributes

If an attribute is restricted by the Database Configuration application in a target environment, and an override of the restriction is not set up at the object structure level, the value of the attribute is not deployed.

Security settings

The following limitations apply to the migration of security settings:

- If you use LDAP, do not use the Migration Manager application to migrate user IDs. Use the LDAP server and tools to manage user IDs.
- When user IDs are migrated to a target environment, the passwords are reset and sent to the users in an email message. To receive the email message, the email server must be set up in the target environment. Additionally, the users must have configured email addresses in the target environment. The password sent in the email is a temporary password. The temporary password expires when the user logs in for the first time, at which time the user must reset the password. Use the mail.smtp.host system property in the System Properties application to set up the email server. The value for the property is the name of the host running the SMTP mail server.
- Password hint questions and answers are not migrated.
- Data in the MAXUSERSTATUS and LOGINTRACKING tables is not migrated.
- The product user data that is stored in the MAXUSER table is migrated. However, the corresponding native database user data that is stored in the data dictionary of the database is not migrated. If you want to maintain the product users as database users in the target environment, you must create the database users corresponding to the product users. You must also grant database access to these users. You can create the database users and grant them database access by selecting Database Access from the Select Action menu in the Users application.
- The following information in security groups is not migrated:
 - Labor authorizations
 - Limits and tolerances
 - Purchase general ledger
 - Status history
 - Storeroom authorizations
- User storerooms are not migrated. You must ensure that the storerooms are the same in the source and target environments.

Start centers

Only the start center templates can be migrated. After you migrate a start center template, you can apply the template to an appropriate start center.

System properties

When you use the DMMAXPROP migration object, only system properties that meet specific conditions are migrated.

To be migrated, a system property must meet the following conditions:

- The property is user-defined. Migration Manager does not migrate system-defined system properties.
- The property is not configured for a file override with a value in the maximo.properties file.
- The property value is a global property and does not have an instance-specific value. Instance-specific properties are system properties that are unique to a particular server.

When you configure the system-defined properties, always use the Systems Properties application within the target environment.

System XML files

Migration Manager does not support migration of user interface system XML files between product environments. System XML files include lookups.xml, menus.xml and library.xml. These XML files are not application-specific. They store common user interface components or resources. Use the Application Designer application to manage the export and import of these system XML files.

Ticket templates

The following limitations affect the migration of ticket templates:

- When you deploy a ticket template that references a job plan, the job plan must exist in the target and have a status of ACTIVE. If the status of the job plan is not ACTIVE, the deployment of the ticket template will fail.
- When you deploy a ticket template, a new autokey value is generated for the record by default. If this behavior is unsuitable, you must customize the DMTKTEMPLATE object structure.
- If you migrate ticket templates by using Change packages, you must activate the package definition before any ticket templates are created or updated. After the Change package is deployed, you must reset the event tracking records for the package definition in the source environment.
- To migrate ticket templates that have activities and activity specifications, a classification must be associated with the template.
- The status of ticket templates is preserved. For example, if a template is active in the source environment, the template is also active in the target environment after migration.

User and person records

If a person record is inactive and its related user record is also inactive, a deployment error occurs. The person record must be active for it to be added to a user record. To work around this limitation, migrate the person records, activate them in the target environment, and then migrate the user records.

Migration reports

Several reports are provided to help you plan and manage the migration process.

Before you can use the reports, they must be enabled. To enable reports, an administrator must import the reports into the database, create request pages for the reports, and authorize access to the reports.

Package Definition report

The Package Definition report shows the contents of a package definition. A change or deployment manager can use this report to review and approve a package definition.

If you generate the report before a package definition is approved, the report can be shared or sent by email to the appropriate manager. If you generate the report after a package definition is approved, the report shows any packages that were created in the source environment from the package definition.

Package Life Cycle report

The Package Life Cycle report shows the status changes of a package, the user who changed the status, and the date and time of each status change. You can use this report to audit packages.

In a source environment, this report also shows the targets to which a package was distributed. In a target environment, the report shows only the status changes of a package.

Migrating your configuration content

The migration process includes a series of preparatory and implementation steps that include setting up your migration collections and package definitions, and then creating, distributing, and deploying packages.

- [Setting up migration collections](#)
Use migration collections to simplify the creation of package definitions.
- [Setting up package definitions](#)
Package definitions must have a target to specify where the configuration content is migrated, and at least one or more configuration records to specify the content. Package definitions can also be set up to replace attributes at deployment time. Some package definitions can be created from migration collections.
- [Creating packages](#)
When you create a package, the actual configuration data is collected and added to the package and the package manifest is created. The package is in the form of records in a staging table.
- [Distributing packages](#)
After you create a package, you can distribute it to one or more target environments.
- [Deploying packages](#)
Deployment applies the configuration records that are in a package to a target environment.

Setting up migration collections

Use migration collections to simplify the creation of package definitions.

- [Exporting and importing configuration records to and from external systems](#)
To help plan and manage your migrations, you can export and import migration collections and store them in an external system, such as a version control system.
- [Creating migration collections](#)
The groups of configuration records that you migrate to another environment are migration collections. A migration collection can contain one or more configuration records of many types.
- [Capturing events in migration collections](#)
Instead of adding configurations one at a time to a migration collection, you can configure a migration collection to capture events as they occur, similar to a Change package.
- [Defining the related configuration records in migration collections](#)
You can enable and define the rules that determine the related configuration records that are added to migration collections by the validation process.
- [Validating migration collections](#)
A validation determines whether a migration collection is complete and whether it contains any orphan records or duplicate records that must be deleted. Validations run as background jobs, similar to cron tasks.
- [Enabling users to add records to migration collections](#)
You can configure some applications so that users can add records to a migration collection from the application, without using the Migration Collections application. An application that is configured in this way has a migration collections button in the menu bar.

Exporting and importing configuration records to and from external systems

To help plan and manage your migrations, you can export and import migration collections and store them in an external system, such as a version control system.

- [Exporting migration collection records](#)
You can export XML representations of the records in a migration collection to help you track or manage the configurations in external systems.
- [Downloading exported migration collection records](#)
You can download from the application server the XML representations of the records in a migration collection that were exported.
- [Importing migration collection records](#)
If configuration records were exported from the Migration Collections application, you can import the records into the database or a migration collection.

Exporting migration collection records

You can export XML representations of the records in a migration collection to help you track or manage the configurations in external systems.

For example, you can track configurations in an external version control system so that you can compare changes over time.

Before you begin

Exported configurations are saved to the `maximo/migration/collectionexport` folder on the application server. In a clustered environment, all application servers in the cluster must be able to access the folder. You can specify a different folder in the `mxe.dm.dmroot` system property.

About this task

Exported configurations are saved to a file whose name is `collection_objectstructure_datetime.xml`.

Procedure

1. In the Migration Collections application, select a migration collection.
2. Click Export Configuration on the row of a single record, or select multiple records and click Export Configurations.
3. If you exported a single record, specify the destination for the XML file and save the file.

What to do next

Store the exported records in your external system.

Downloading exported migration collection records

You can download from the application server the XML representations of the records in a migration collection that were exported.

Procedure

1. In the Migration Collections application, select a migration collection from which you have exported configuration records.
2. Select the configurations that were exported and click Download Exported Configurations
3. In the list of selected configurations, select a record that has exported files and then click Download File for the exported file.
4. Specify the destination for the XML file and save the file.
The name of the file is in the form *collection_objectstructure_datetime.xml*. A copy of the XML file with the same name is also saved to the *maximo/migration/collectionexport* folder on the application server.

Importing migration collection records

If configuration records were exported from the Migration Collections application, you can import the records into the database or a migration collection.

For example, you can export configuration content from a development environment, add the content to an external version control system, and then import the content into another development environment.

About this task

Only the primary business objects of each record in the XML file are added to a migration collection.

Procedure

1. In the Migration Collections application, select a migration collection.
2. Select the Import Configurations action.
3. Specify the name and location of the file that you want to import, specify whether you want to add the configuration records to a migration collection, and click OK.

Creating migration collections

The groups of configuration records that you migrate to another environment are migration collections. A migration collection can contain one or more configuration records of many types.

About this task

You can add a configuration record to a migration collection only if the record is supported by a migration object that can migrate the data that is contained in the record. Each configuration record in a migration collection is identified by its keys. Related configuration records can also be added to migration collections.

Procedure

1. In the Migration Collections application, click New Migration Collection.
2. On the Migration Collection tab, specify a name for the collection.
3. Optional: To enable other users to modify or delete the collection, select Is Public.
4. In the Configurations section, click New Row.
5. In the Application field, select the application from which you want to select configuration records and then click Go To Application.
6. In the List tab of the application that you selected, select a configuration record and then click Return With Value.
7. Add additional records to the migration collection.
8. Save the migration collection.

What to do next

After you create or modify a migration collection, validate it to ensure that it is complete.

Capturing events in migration collections

Instead of adding configurations one at a time to a migration collection, you can configure a migration collection to capture events as they occur, similar to a Change package.

About this task

You can capture add, update, and delete events, and you can restrict the events that are captured by role and by the type of event. You can add records manually while event tracking is enabled.

Procedure

1. In the Migration Collections application, select a migration collection and select the Configure Event Tracking action.
2. In the Configure Event Tracking window, click New Row.
3. Optional: Select a role.
4. Specify an application, or both an application and an object structure, and specify the types of events that you want to capture.
5. Add rows for each application or object structure, and click OK.

Results

The collection starts capturing the specified events immediately.

Defining the related configuration records in migration collections

You can enable and define the rules that determine the related configuration records that are added to migration collections by the validation process.

About this task

To ensure that the package definitions you create from your migration collections are complete, related configuration records are identified and can be added to the collections by the validation process. The system-defined rules are enabled by default but you can customize or disable them if necessary. The lookup rules identify data such as MAXVARS and system messages.

Procedure

1. In the Migration Collections application, select the Define Related Data and Lookup Rules action.
2. Optional: To disable any of the system defined related data rules, clear the Enabled check box.
3. To define a related data rule, click the Related Data Rules tab, click New Row, and specify the primary object and the related object.
4. To define a lookup rule, click the Lookup Rules tab, click New Row, and specify the primary object and an SQL WHERE clause.

Validating migration collections

A validation determines whether a migration collection is complete and whether it contains any orphan records or duplicate records that must be deleted. Validations run as background jobs, similar to cron tasks.

About this task

To ensure that a migration collection is complete and that any package definitions that are created from the collection are valid, validate the migration collection. The results of the validation include any orphan records or duplicate records, and any related configurations that you might need to add to the collection.

Orphan records are configurations that were deleted after the migration collection was created.

Duplicate records are configurations that were added to a migration collection, deleted and recreated in the originating application, and then added again to the migration collection. This sequence results in two records that refer to the same configuration.

You can inspect the related configurations to determine whether they can be deleted or need to be added to the collection.

Validations cannot be canceled and must run until they finish. You can perform other tasks during that time.

Procedure

1. In the Migration Collections application, select the migration collection that you want to validate.
2. Select the Validate Migration Collection action.
3. In the Validate Migration Collection window, click Start.
4. When the validation job finishes, view the orphan records, duplicate records, and related configurations on the Validation Results tab.
5. Inspect the orphan records and duplicate records and delete them if you do not want them in the collection.
6. Inspect the related configurations and either delete them or add them to the migration collection.
7. Save the migration collection.

Enabling users to add records to migration collections

You can configure some applications so that users can add records to a migration collection from the application, without using the Migration Collections application. An application that is configured in this way has a migration collections button in the menu bar.

About this task

Only applications that are enabled for migration by a migration object can be configured in this way.

Procedure

1. In the Migration Collections application, select the Add Migration Collections to Applications action.
2. In the list of applications, click Add Support and click OK.

Results

Users of the application can add configuration records to a migration collection by clicking the Add to Migration Collections button in the application menu bar. Users might need to log out and then log in before they can use the button.

Setting up package definitions

Package definitions must have a target to specify where the configuration content is migrated, and at least one or more configuration records to specify the content. Package definitions can also be set up to replace attributes at deployment time. Some package definitions can be created from migration collections.

- [Defining target environments and their distribution types](#)
For each source environment, you must define all the target environments to which you might distribute a package.
- [Creating package definitions](#)
Package definitions specify the configuration content that you want to migrate to another environment.
- [Attribute replacements](#)
The attributes of configuration records can be replaced as part of the migration process. Attribute replacement might be required when the data in configuration records in the target environment does not match the data in the source environment.
- [Selecting attributes to replace during deployment](#)
When you create a package definition, you can specify the attributes that must be replaced with appropriate values at deployment time. Attributes must be replaced, for example, when the data constraints in the target environment do not match the data constraints in the source environment.
- [Creating package definitions from a migration collection](#)
You can create package definitions based on the information in your migration collections.

Defining target environments and their distribution types

For each source environment, you must define all the target environments to which you might distribute a package.

About this task

You can define a target as a database or as a file.

When you distribute a package to a database target, the content of the package is placed into a staging table in the remote database. You can then deploy the package. Use a database target and distribution to migrate configuration content from a development environment to a test environment.

When you distribute a package to a file target, the content of the package is placed into a file in a folder on the application server in the source environment, and is then copied to the specified folder. Use a file target and distribution to migrate configuration content to a production environment where direct access to the production database is strictly controlled.

Procedure

1. In the Migration Manager application, select the Manage Targets action.
2. Define one or more targets:
 - a. In the Manage Targets window, click New Row.
 - b. In the Target Name field, specify a name for the target environment.
 - c. In the Type field, specify `DATABASE` or `FILE`.
 - d. In the Database URL or File Path field, specify a value:
 - For a Database target, specify the URL in standard JDBC format, for example, `jdbc:db2://localhost:50000/mxdb2`.
 - For a File target, specify the path to an existing folder that is on or accessible to the file system of the application server, for example, `C:\temp`.
 - e. For a Database target, specify a user name, password, and schema name.
3. Click OK.

What to do next

After you have created your targets, you can associate one or more of them with each package definition.

Creating package definitions

Package definitions specify the configuration content that you want to migrate to another environment.

About this task

Use this procedure only to define Snapshot and Change packages. To define Collection packages, you must use the Migration Collections application.

For Snapshot package definitions, you can filter the data by specifying an SQL WHERE clause so that a package contains a smaller set of configuration content. For example, to create a package that migrates only a specific workflow process, you can filter the workflow process migration object in the package definition to select only that one workflow process.

To include GL records, enter an SQL WHERE clause for the DMDEFGLCONFIGURE and DMGLCONFIGURE object structures.

- For the DMDEFGLCONFIGURE object structure, enter the SQL WHERE clause: `orgid is null order by glorder.`
- For the DMGLCONFIGURE object structure enter, the SQL WHERE clause: `orgid is not null order by orgid,glorder.`

Procedure

1. In the Migration Manager application, click New Package Definition.
2. Specify a name for the package definition.
3. In the Type field, specify `SNAPSHOT` or `CHANGE`.
4. For a Snapshot package definition, in the Processing Action field, specify `AddChange` or `Replace`.
5. Optional: To track only the changes in a Change package that are made by users that are in a specific role, specify the role in the Change Role field.
6. Add one or more migration groups to the package definition:
 - a. In the Migration Groups table window, click New Row.
 - b. Specify a migration group.
 - Any dependencies are shown in the Dependencies table window.
 - c. Optional: To filter the migration objects for a Snapshot package definition, click Set Where Clause and enter an SQL WHERE clause.
7. Optional: Add compiled sources to the package definition by adding rows to the Compiled Sources table window and specifying the file location.
8. On the Distribution tab, associate one or more of the defined target environments with the package definition.
9. Save the package definition.
10. When the package definition is ready to be used, change its status to `Appr`
11. Optional: To start capturing events in a Change package, activate the package definition.

Attribute replacements

The attributes of configuration records can be replaced as part of the migration process. Attribute replacement might be required when the data in configuration records in the target environment does not match the data in the source environment.

Attribute replacement can be used when the creator of the package definitions does not know the data constraints in the target environments to which packages might be deployed.

You select the attributes for replacement when you create a package definition in the source environment. The specified attributes to be replaced are stored in the metadata of a package. The replaced values are determined by the attribute replacement rules that you define in the target environment.

Selecting attributes to replace during deployment

When you create a package definition, you can specify the attributes that must be replaced with appropriate values at deployment time. Attributes must be replaced, for example, when the data constraints in the target environment do not match the data constraints in the source environment.

About this task

The attributes to be replaced are stored in the metadata of a package. The replacement values are determined by the replacement rules that are defined in the target environment.

Procedure

1. In the Migration Manager application in a source environment, select a package definition.
2. Select the Select Attributes for Replacement action.
3. For each object, select the attributes that must be replaced:
 - a. In the tree, select a migration object.
 - b. In the Attributes section, select Replacement Required for each attribute that you want to replace during deployment.
 - c. In the Remarks field, provide an explanation of why the replacement is required.

4. Click OK.

What to do next

Define the attribute replacement rules in the target environment.

Creating package definitions from a migration collection

You can create package definitions based on the information in your migration collections.

Before you begin

Validate a migration collection before you create package definitions from it.

About this task

Usually, a single package definition is created. However, depending on the ordering of the migration groups and object structures, in some cases two package definitions are created. If two are created, the first is used to migrate the object definitions without the domain references, and the second is used to migrate the table domains and the object configurations. The cases in which two package definitions are created are defined by the exceptions in the Define Package Definition Exceptions window.

Procedure

1. In the Migration Collections application, select a migration collection.
2. Select the Create Package Definition action.

Results

The package definition is shown on the Package Definitions tab.

Creating packages

When you create a package, the actual configuration data is collected and added to the package and the package manifest is created. The package is in the form of records in a staging table.

Before you begin

1. Create and approve the package definition.
2. Identify targets to which the package will be distributed.
3. For CHANGE package definitions, activate the package definition.

Procedure

1. In the Migration Manager application, select the package definition.
2. On the Package tab, click Create.
3. In the Upload Compiled Sources window, in the Read-Me Information field, type information about the package that you are creating. This information is to help the administrator to deploy the package in the target environment.
4. Optional: For a Snapshot package, specify a different processing action from what was specified when the package was defined.
5. If the Compiled Sources table window contains files, click Upload File next to each file.
The listed files were specified in the package definition.
6. Optional: Upload any compiled sources that were not specified in the package definition:
 - a. Click New Row.
 - b. In the File Name field, click Upload File.
 - c. In the Upload a File window, click Browse to specify a file to upload, and then click OK.
7. Click Continue, and then click OK after the package is created.

What to do next

After the package is created, you can distribute it.

Distributing packages

After you create a package, you can distribute it to one or more target environments.

Before you begin

Define the targets to which you will distribute the package.

You can prevent the distribution and deployment of packages that come from restricted sources by setting inbound restrictions in the target environment.

About this task

Packages are distributed one at a time. If you select multiple packages for distribution, the packages are distributed in sequence. If an error prevents the application from distributing a package to a target, the application can continue to distribute packages to other targets.

In a source environment, when you create a package, the Migration Manager application stores the data that makes up the package in the staging table. When you distribute the package, the staging table is accessed and the records extracted and copied into the physical package file. The staging table is also used in a target environment to start the deployment of a package. If you distribute a package as a file, the contents of the file are extracted and placed as records into the staging table. The deployment of the package applies the data in these records into the target database.

After you distribute a file type package to a target environment, a copy of the package is retained on the application server in the source environment. You can optionally download the copy to a client computer so that you can move it into source control or move it to other environments.

Procedure

1. In the Migration Manager application, select the package definition.
2. On the Package tab, select the package.
3. Click Distribute.
4. In the Distribute Package window, select the targets to which you want to distribute the package and click OK.
5. After the package is distributed, click OK.
A message indicates that the distribution was successful.
6. Optional: For a file type package, on the Package tab, click Download Package File next to the package that you want to download. Then, specify the location on the client computer to which you want to download the package and click Save.

What to do next

Preview and deploy the package in the target environment.

Deploying packages

Deployment applies the configuration records that are in a package to a target environment.

Important: Before you deploy a package, ensure that you have a backup of your database. Run the Integrity Checker utility to monitor the integrity of your database. Preview a deployment to identify potential data validation errors before you deploy the package.

The migration activities that precede deployment occur in a source environment, whereas you preview and deploy a package in a target environment. The deployment steps depend on the type of content in the package.

You can deploy only one package at a time. The time that it takes to deploy a package depends on the size of the package and the type of processing applied by the package.

- [Deployment overview](#)
A deployment is typically preceded by a deployment preview. The steps of the deployment depend on the type of configuration content in the package and on some aspects of the target environment.
- [Attribute replacement rules](#)
Attribute replacement rules are used to specify the conditions for replacing the values of fields in a configuration object at deployment time. The replacement rules apply to every package that is deployed in the target environment.
- [Uploading packages to a target environment](#)
If a package that you want to deploy is a file that was downloaded to a client computer, you must upload the package from the client computer to the target application server.
- [Deploying a package](#)
The deployment of a package applies the configuration records to the target environment. To analyze the effect of the changes without applying them, you can preview the deployment.
- [Downloading compiled sources](#)
If a package contains compiled sources, you can download them to a client computer or to a build environment to rebuild the EAR file before you deploy the EAR file to the application server.
- [Deployment data errors](#)
When a migration package is deployed, application data validations are applied to the configuration data that is imported from the package. If a data validation fails for data in the package, a deployment data error occurs and processing of the package stops.
- [Post-deployment activities](#)
After you deploy a package, you might need to activate some types of records, update database statistics, update user IDs, edit user queries, and deactivate administration mode.

Deployment overview

A deployment is typically preceded by a deployment preview. The steps of the deployment depend on the type of configuration content in the package and on some aspects of the target environment.

- **Deployment previews**
You can preview a deployment before you deploy a package to the target environment. By previewing a deployment, you identify potential data validation errors so that you can correct them in the source environment.
- **Deployment steps and package content**
The deployment steps depend on the type of content that is in a package. For some content, manual steps are required.
- **Deployment to an environment that has different products or versions**
If the target environment has products and version levels that differ from the source environment, the deployment might stop. You might be able to continue the deployment by excluding some products from the compatibility checks.
- **Deployment of a package to its source environment**
You can create a package that includes a set of configuration records for a defined environment and then deploy that package to the same environment.

Deployment previews

You can preview a deployment before you deploy a package to the target environment. By previewing a deployment, you identify potential data validation errors so that you can correct them in the source environment.

You preview a deployment by selecting the Preview check box and a rollback point in the Deploy Package window. You can then review the messages and potential errors, which are either displayed in the status window or saved to a preview log file. After you correct any errors, re-create the package and then preview the deployment again or deploy it.

You do not need to enable administration mode to preview a deployment. However, you cannot preview a deployment if structural changes are pending in the target environment or if a package has inbound restrictions.

Rollback points

When you preview a deployment, the preview data is stored temporarily in the target database tables so that the data validations can be run. The rollback point determines how long the preview data is stored in the tables.

For packages that have few dependencies, use a rollback point that stores the data in the target tables for a short time. For packages that have many dependencies, use a rollback point that stores the data in the target tables for a long time.

Rollback point	Description	When to use
Roll back every record	The data that is inserted or updated in the table is rolled back before the next record of the table is loaded. This rollback point stores the data in the target tables for the shortest time.	Use this rollback point when the content does not have dependencies. For example, use this rollback point for currency data.
Roll back every XML document	The data remains in the target tables until all the records of an XML document in a package are loaded. The data that is inserted or updated in the table is rolled back before the next XML document is processed.	Use this rollback point when one row of a table depends on another row of the same table, such as in a hierarchy of classifications.
Roll back every object structure	The data remains in the target tables until all the records of all the XML documents for an object structure are loaded. Depending on the volume of data, the data for a table might span multiple XML documents. The data that is inserted or updated in the table is rolled back before the next object structure is processed.	Use this rollback point for a set of domains where the domain content spans multiple XML documents.
Roll back every migration group	The data for all the object structures of a migration group type is stored in the target tables until the data for the entire migration group is loaded. The data that is inserted or updated in the table is rolled back before the next migration group type is processed. This rollback point stores the data in the target tables for the longest time.	Use this rollback point when the content has dependencies, such as for the data dictionary object structures. Do not use this rollback point for large packages.

Memory constraints

A deployment preview can use a large amount of memory in the application server. The amount that is used depends on the size of the package and the rollback point.

Before and during a deployment preview, Migration Manager checks the memory and stops the preview if a threshold is reached. The `mxe.dm.previewfreememorythreshold` system property defines the threshold as a percentage of the total available memory. Its default value is 20, which means that the preview stops, or cannot start, if less than 20% of the available memory is available.

Large packages, such as those that contain multiple migration groups and thousands of records, cannot be previewed. However, you can create several smaller packages by collecting subsets of the data in snapshot packages and by specifying SQL criteria. You can also reduce the number of migration groups in a package.

The preview log file indicates the available memory at each rollback point. Therefore, by rolling back at every record, you can study the preview log file to determine how much memory is used by a deployment preview.

Preview log files

The preview log file provides details on what occurs if the package is deployed. For example, the preview log file lists the processing of the XML documents that comprise the package and the data validations that check the configuration data in the XML documents. If data validation errors occur, the error messages are included in the preview log file. One validation error is captured for each record that is previewed, even if multiple errors occur for a record.

If you preview a deployment of a package again, the previous preview log file is deleted and a new log file is created. If you deploy a package that was previously previewed, the preview log file is deleted.

When a deployment preview completes, you can download the preview log file from the Package tab of the Migration Manager application.

The name of the preview log file matches the package name and has the suffix `_preview` and the extension `.log`.

Configuration commands and script log files

If the package includes structural changes that require the database to be configured, you can include the configuration commands in the preview log file and the script log file. However, the configuration changes do not occur.

The configuration commands are SQL-based Data Definition Language (DDL) statements. The commands are written to a script log file that is in the same folder as the preview log file. You can use the script log file to assess the structural changes, but you cannot run the script file on the target database.

The name of the script log file name matches the package name and has the suffix `_script` and the extension `.log`.

Deployment steps and package content

The deployment steps depend on the type of content that is in a package. For some content, manual steps are required.

The database content is classified as structural content or nonstructural content. Structural content is content that must be reflected in the database schema as tables, views, columns, keys, and indexes. Nonstructural content is all other database content, which is typically stored in records in a table.

The content that is outside the database consists of files that are on the application server file system, such as Java™ class files and properties files. These files are the compiled sources.

When you deploy a package, compiled sources must be downloaded first. Next, structural changes are processed. Finally, nonstructural changes are processed. However, the specific steps that must occur depend on the contents of the package. Deployment might involve manual steps, such as switching the system to administration mode to restrict user access, downloading compiled sources, deploying EAR files, and restarting the system. When manual steps are required, the deployment pauses and prompts you to do the steps.

The steps that occur depend on the following combinations of content that are in a package:

Type of content in the package	Steps required during deployment
Nonstructural content	No manual steps are required in the deployment of packages that contain only nonstructural content, such as workflow process definitions.
Structural content	If a package contains only structural content, such as object, attribute, or index definitions, the deployment pauses after data loading is complete. You must enable administration mode to apply the structural changes to the database.
Nonstructural and structural content	If a package contains both nonstructural and structural content, such as object, attribute, or index definitions and workflow process definitions, the deployment pauses after data loading is complete. You must enable administration mode to apply the structural changes to the database. After the structural changes are applied, the nonstructural content is loaded.
Compiled sources	If a package contains only compiled sources, such as custom Java packages and Java class files, the deployment pauses to enable the download of the compiled sources to a client computer. If the compiled sources include Java classes, you must rebuild the product EAR file and deploy the new EAR file. You then continue the deployment to confirm that the compiled sources have been deployed to the application server.
Compiled sources and nonstructural content	If a package contains compiled sources, such as custom Java packages and Java class files and workflow process definitions, the deployment pauses to enable the download of the compiled sources to a client computer. If the compiled sources include Java classes, you must rebuild the product EAR file and deploy the new EAR file. You then continue the deployment to confirm that the compiled sources have been deployed to the application server, and then nonstructural content is loaded.
Compiled sources, structural content, and nonstructural content	If a package contains compiled sources, such as custom Java packages and Java class files, structural content, such as object, attribute, or index definitions, and nonstructural content, such as workflow process definitions, the deployment pauses to enable the download of the compiled sources to a client computer. If the compiled sources include Java classes, you must rebuild the product EAR file and deploy the new EAR file. You then continue the deployment to confirm that the compiled sources have been deployed to the application server. The deployment pauses a second time after data loading is complete. You must enable administration mode to apply the structural changes to the database. After the structural changes are applied, the nonstructural content is loaded.

Deployment to an environment that has different products or versions

If the target environment has products and version levels that differ from the source environment, the deployment might stop. You might be able to continue the deployment by excluding some products from the compatibility checks.

When you deploy a package, Migration Manager checks for compatibility and shows the differences in the Version Compatibility window. You cannot deploy packages that are incompatible because the package content might cause errors or invalid product configurations. However, if the differences between the products and version levels are minor, you can exclude some products from the compatibility checks and continue the deployment.

The following product compatibility rules determine whether the deployment stops or can continue:

- If the version or release numbers do not match, the deployment stops.
- If the modification or fix pack numbers do not match, an information message is shown but the deployment can continue.
- If the interim fix numbers do not match, an information message is shown but the deployment can continue.
- If the target has products that are not in the source, an information message is shown but the deployment can continue.
- If the source has products that are not in the target, you must exclude the products from the compatibility checks to continue.

Products are numbered in the following format: `version.release.modification.fix_pack-interim_fix`. For example, `7.5.1.3-LX20110928` means version 7, release 5, modification 1, fix pack 3, interim fix LX20110928.

Deployment of a package to its source environment

You can create a package that includes a set of configuration records for a defined environment and then deploy that package to the same environment.

If you distribute the package as a compressed file, you can then deploy it to its source environment if either of the following conditions is met:

- The package definition has been deleted.
- All the packages that are based on the original package definition no longer exist in the source environment.

Attribute replacement rules

Attribute replacement rules are used to specify the conditions for replacing the values of fields in a configuration object at deployment time. The replacement rules apply to every package that is deployed in the target environment.

You select the attributes for replacement when you create a package definition in the source environment.

If the records and fields in a package meet the replacement rule conditions, the values are replaced when the package is deployed. For example, values of a configuration object can be replaced with a property value or MAXVAR value. The replacement rules affect every package that is deployed if the package contains migration objects that are referenced by the rules.

If you specify multiple conditions for a replacement rule, at least one condition must return a value of True for the replacement to occur.

If you specify multiple field evaluations for a condition, all the evaluations must return a value of True for the replacement to occur.

If a deployed package has attributes that are selected for replacement but there are no corresponding replacement rules, the deployment stops unless Skip prompts to create attribute rules is selected. You can then create the replacement rules.

- [Defining attribute replacement rules in a target environment](#)
Attribute replacement rules specify the conditions under which an attribute value is replaced at deployment time.

Defining attribute replacement rules in a target environment

Attribute replacement rules specify the conditions under which an attribute value is replaced at deployment time.

Procedure

1. In a target environment, open the Migration Manager application and select the Add/Modify Replacement Rules action.
2. In the Select Migration Object window, select a migration object in the tree and click Add/Modify Rules.
3. In the Replacement Rules section of the Add/Modify Replacement Rules window, click New Row.
4. Specify a name and sequence number for the rule.
5. To enable the rule for immediate use, select Enabled.
6. To apply the rule to database insertions, updates, or deletions, select the Apply on Primary Object check boxes.
7. On the Attributes tab, for each attribute, click New Row and define the attribute replacement rule:
 - a. Specify the field to replace.
 - b. To replace the value only when the value is null, select Replace When Null.
 - c. Select the type of replacement and specify the value. You can specify a property name, value, MAXVAR value, or field.
8. On the Conditions tab, for each condition, click New Row and define the condition:
 - a. To change the order in which the condition is applied, change the value in the Condition field.
 - b. In the Field Evaluation for Conditions section, click New Row
 - c. Specify an XML field.
 - d. In the Evaluation Type field, specify an operator.
 - e. Specify the value to evaluate. You can specify a value, MAXVAR value, or comparison field.
9. Click OK.

Uploading packages to a target environment

If a package that you want to deploy is a file that was downloaded to a client computer, you must upload the package from the client computer to the target application server.

Procedure

1. In the Migration Manager application, select the Upload Package action.
 2. Specify the name of the file and click OK.
- [Increasing the package size upload limit](#)
The default size limit for uploading a package to the application server is 20 MB. You can change the limit by editing the Migration Manager presentation XML file.

Increasing the package size upload limit

The default size limit for uploading a package to the application server is 20 MB. You can change the limit by editing the Migration Manager presentation XML file.

Before you begin

To edit the presentation XML file, you must be an administrator and you must know how to use the Application Designer application.

About this task

If you set a limit that is too high, the application server might run out of memory.

Procedure

1. Log in as an administrator and start the Application Designer application.
2. Export the dm.xml presentation XML file to a client workstation.
3. In a text or XML editor, find the section of the file that contains the following XML:

```
<dialog
id="home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_gp_migmgr_t_increase_package_size_limit_UPLOADPKG" label="Upload Package" beanclass="psdi.webclient.beans.dm.DMUploadBean">
<uploadfile
id="home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_gp_migmgr_t_increase_package_size_limit_UPLOADPKG_sec" label="Specify a File" oklabel="OK" cancellabel="Cancel" />
</dialog>
```

4. Add a maxfilesize parameter to the <uploadfile> tag and specify a package size upload limit. For example, the following maxfilesize parameter specifies a 50 MB limit:

```
<uploadfile
id="home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_gp_migmgr_t_increase_package_size_limit_UPLOADPKG_sec" label="Specify a File" oklabel="OK" cancellabel="Cancel" maxfilesize="50" />
```

5. Save the presentation XML file.
6. In the Application Designer application, import the edited dm.xml presentation XML file.

Deploying a package

The deployment of a package applies the configuration records to the target environment. To analyze the effect of the changes without applying them, you can preview the deployment.

Before you begin

Distribute the package to the environment where you will deploy it. If the package was downloaded to a client computer, upload it to the target application server.

Back up the target database.

Procedure

1. In the Migration Manager application, select the package definition that corresponds to the package that you want to deploy or preview.
2. Select the Deploy Package action.
3. Optional: To inspect and verify the contents of the package, click View Manifest.
4. Optional: Preview the deployment:
 - a. Select Preview.
 - b. Optional: To output SQL commands that correspond to structural changes in the package, select Include Database Configuration Commands.
 - c. Select a rollback point.
5. Confirm that you have a current backup of the database on the target environment.
6. If a package definition has attributes selected for replacement, but no attribute replacement rules are defined and you do not want to define the rules, select Skip prompts to create attribute rules.
7. Select a package and then click Deploy.
8. If the package contains compiled sources, download them to a client system.
If the compiled sources include Java™ class files, deploy the compiled sources:
 - a. Stop the application server.
 - b. Rebuild and deploy the EAR file.
 - c. Restart the application server.
 - d. In the Migration Manager application, on the Package tab, click Continue Deployment.
 - e. Confirm that the compiled sources are deployed to the application server.
9. If the package contains structural content, enable administration mode so that the structural changes are applied:
 - a. Select the Manage Admin Mode action, click Turn Admin Mode On, and click Close.
 - b. On the Package tab, click Continue Deployment.
10. Review the deployment messages in the status window and click OK.

11. Optional: If you previewed the deployment, download the preview log file to your client computer from the Package tab.

What to do next

- Before you deploy another package to the same environment, you must activate any organizations, sites, workflow processes, and communication templates that were migrated.
- If you enabled administration mode to apply structural changes, turn administration mode off.

Downloading compiled sources

If a package contains compiled sources, you can download them to a client computer or to a build environment to rebuild the EAR file before you deploy the EAR file to the application server.

Procedure

1. In the Migration Manager application, on the Package tab, click Download Compiled Sources next to the package.
2. In the Download Compiled Sources window, click Download File.
3. In the Save As window, select a folder on the client computer in which to save the compiled source file and click OK.
4. Select Downloaded and click Close.

Deployment data errors

When a migration package is deployed, application data validations are applied to the configuration data that is imported from the package. If a data validation fails for data in the package, a deployment data error occurs and processing of the package stops.

Depending on the type of error, you may be able to correct the data that caused an error and continue the deployment of a package. The deployment continues from the start of the configuration data file that caused the error.

Some deployment data errors are caused by data validation failure that results from loading data contained in the package XML. In these cases, the error is displayed on the Package tab of the Migration Manager application. The tab shows details about the error, including the configuration data that caused the error.

If multiple errors occur for the same package, the tab shows a history of all the errors. The history of the errors can be useful for audits. You can delete old deployment data error records, but you then lose the history of the errors for the package.

- [Correcting deployment data errors](#)
If a deployment of a package fails because of a data error, you can continue the deployment by correcting the error.

Correcting deployment data errors

If a deployment of a package fails because of a data error, you can continue the deployment by correcting the error.

Procedure

1. On the Packages tab of the Migration Manager application, select a package that has a status of DEPLOY_ERROR.
2. On the Deployment Data Errors tab, expand the record for the migration group that contains the error.
3. Review the details of the error message and the corresponding XML error data, and click Edit Error Data.
4. In the Error Data field of the Edit Error Data window, edit the XML data to correct the error, and click OK.
As you edit the data, you can refer to the original error data in the Original Error Data field.
5. In the Packages section, click Continue Deployment.

What to do next

If the deployment fails again, you can repeat the steps to correct the next error.

Post-deployment activities

After you deploy a package, you might need to activate some types of records, update database statistics, update user IDs, edit user queries, and deactivate administration mode.

Activating records

After you deploy a package that contains organizations, sites, workflow processes, or communication templates that were active in the source environment, you must activate them in the target environment before you deploy any other packages to the same environment.

Use the related application to activate the specific records. For example, use the Organizations application to activate organizations and sites.

Updating database statistics

After you deploy a package that applies table or index changes to a target environment with administration mode turned on, you must update the database statistics so that the query optimizer can determine the most efficient way to run SQL statements.

The update is required because when you use the Migration Manager application to change database objects, the statistics typically become incorrect. For example, when a migration adds an index, no statistics exist for the index. Therefore, statistics must be generated for the index to be used effectively. Similarly, when a migration modifies a table so that it is renamed and rebuilt, the indexes for the table are also rebuilt. Therefore, the statistics must be regenerated.

Use the Database Configuration application to update the statistics.

Updating user IDs

When you migrate product user IDs, the user data for associated database user IDs is not migrated. Therefore, if some users require their database user IDs, you must re-create the properties for those database user IDs in the target environment.

Editing user queries

When you migrate the Start Center template, the associated queries that are configured for each user are not migrated. After you migrate the Start Center template, you must open the template and edit the queries so that they correctly match the target environment.

Deactivating administration mode

If administration mode is enabled during package deployment, only users with administrative privileges can access the product. All escalations and cron tasks stop, except for Bulletin Board cron tasks.

When the deployment finishes, you must turn off administration mode. You perform this step so that the cron tasks and escalations restart and users without administrative privileges can access the product.

Migration troubleshooting

You can identify and correct most errors by responding to the error messages that are displayed in the user interface and by reviewing the messages on the Messages tab of the Migration Manager application. For further troubleshooting, use the log files.

Package creation and deployment tasks run in the background and have no corresponding user interface, except for a progress dialog. Therefore, errors, warnings, and informational messages for these tasks are displayed on the Messages tab of the Migration Manager application. The messages are deleted when the package definition or the package is deleted.

- [Migration logger](#)
The most detailed migration messages, including low-level errors, exceptions, and stack traces, are available in the log file.
- [Package creation errors](#)
In a source environment, if an error occurs when a package is created, the package has a status of CREATE_ERROR.
- [Package distribution errors](#)
If a distribution error occurs, you can review the error message, fix the problem, and try to distribute the package again.
- [Package deployment errors](#)
Deployment errors occur primarily when the configuration data in the package cannot be validated. If you cannot correct the errors that are displayed in the Deployment Data Errors tab, you can take further action.
- [Migration error messages](#)
You can take corrective actions in response to error messages that occur while you use the Migration Manager application.

Migration logger

The most detailed migration messages, including low-level errors, exceptions, and stack traces, are available in the log file.

You can configure the migration logger, which is named dm, in the Logging application. The sql and integration loggers provide further information to support migration.

Table 1. Migration logger and supporting loggers

Group / Area	Logger	Description	Log level
Migration	dm	Logs information about the migration manager.	Typically, loggers are activated and set at the ERROR level, which produces log statements only when errors are encountered. If you need more information to identify a migration error, change the level of the dm logger to INFO or DEBUG. If you must contact support about migration, send the dm logger with the level set to DEBUG.

Group / Area	Logger	Description	Log level
Integration	integration	Logs information about the integration framework configuration, creation, management, and runtime processing. Migration Manager uses the integration framework object structure.	To identify whether a migration error is caused by the integration framework object structure or XML processing, set the integration logger to DEBUG.
SQL	sql	Generates log statements of SQL statements run in the escalation server. The integration framework uses business objects, which typically work on the SQL database.	To identify whether a migration error is caused by executing a SQL operation, set the sql logger to INFO.

Package creation errors

In a source environment, if an error occurs when a package is created, the package has a status of CREATE_ERROR.

A package with a status of CREATE_ERROR cannot be migrated. You must delete the package, correct the cause of the error, and re-create the package.

You can sometimes correct package creation errors by reviewing the Messages tab and by analyzing the package manifest. To review more detailed information, open the log file.

Package distribution errors

If a distribution error occurs, you can review the error message, fix the problem, and try to distribute the package again.

If an error occurs when you distribute a package to a database, all the records of the package that were placed in the staging table in the target database are rolled back or deleted.

Although you can select multiple packages to be distributed, the application distributes only one package at a time in sequence. If an error prevents the application from distributing a package to a target, the application can continue to distribute packages to other targets.

Package deployment errors

Deployment errors occur primarily when the configuration data in the package cannot be validated. If you cannot correct the errors that are displayed in the Deployment Data Errors tab, you can take further action.

Error determination

During a deployment, the Migration Manager application creates progress messages that show the steps that succeeded. This information can help you to determine the cause of the error. The messages are stored in the product log file, if it is configured, and persist in the messages table.

To discover where an error is occurring, you can create package definitions with smaller sets of data. This step helps to determine which set of data deployed correctly and which set of data created an error.

Types of errors

An incomplete configuration might occur if the related configuration data is not in the package and if the data is not in the target environment. An incorrect configuration might occur if the configuration is created by using SQL scripts without validations.

If an error is caused by bad configuration data in a package, restore the target database from the database backup. Then, correct the configuration data in the source environment and re-create the package. For example, an incorrectly defined database index must be recreated in the source environment.

If an error occurs because the data in the target database must change, you can modify the data in the target database and redeploy the package. You do not have to re-create the package in the source environment. For example, if a workflow process revision is active and enabled in the target environment, the package that contains updates to this revision fails to deploy. You can deactivate and disable the workflow process in the target environment and deploy the package again.

If the application server stops running while a package is being deployed, the package remains in the DEPLOY_INPROGRESS status. You might be able to restart the deployment by clicking Continue Deployment. Depending on the stage of deployment, the structural integrity of the database might be compromised and a database restore operation might be necessary.

Integration framework errors

By default, a validation mechanism listens for data dictionary changes, identifies the changes to the integration framework integration components, and requests that the configurations be updated.

To ensure the deployment of packages that contain database updates that affect integration framework configurations, you can set the system property `mxe.int.validatepackage` to 1.

If this property is enabled, during a deployment the validation process identifies whether any business object changes affect the configuration of the components and which migration groups must be updated.

Migration error messages

You can take corrective actions in response to error messages that occur while you use the Migration Manager application.

The following list of messages is not comprehensive but it contains the messages that you are most likely to encounter.

Error code	Error message	Details in the Messages table	Explanation and response
BMXAA5198E	Could not create package <i>package_name</i>	Exception stack trace is written to the Message Details field	A package cannot be created. Check the associated stack trace to determine the cause of the error.
BMXAA5199E	Package distribution to target <i>target_name</i> failed	Exception stack trace is written to the Message Details field	A package cannot be distributed. The stack trace provides more details. Depending on the cause of the error, you can try to distribute the package again.
BMXAA5201E	Error checking distribution status in target environment for package <i>package_name</i>	Exception stack trace is written to the Message Details field	The database operations that determine the prior distribution status of the selected package failed. Check the associated stack trace to determine the cause of the error.
BMXAA5205E	Could not delete staging table records in target environment for incompletely distributed package <i>package_name</i>		A package is not completely distributed to a target environment database and the Migration Manager application attempts to clean up committed records from the target database staging table. Depending on the cause of the error, you might have to remove records manually.
BMXAA5206E	Could not read staging table records in source environment for package <i>package_name</i>		The Migration Manager application cannot extract the staging table records in the source environment of a package that is being distributed. Check the associated stack trace to determine the cause of the error.
BMXAA5207E	Could not write staging table records in target environment for package <i>package_name</i>		The Migration Manager application cannot insert records into the staging table on the target environment database. Check the associated stack trace to determine the cause of the error.
BMXAA5209E	Migration Manager root directory has not been configured using System Property <i>system_property</i> . The directory will default to <i>default_directory</i> .		No root folder has been configured for the mx.e.dm.dmroot system property. If no root folder is configured, the Migration Manager application file operations are performed on the home folder of the application server. Use the System Properties application to specify the appropriate value for the mx.e.dm.dmroot property.
BMXAA5212E	Error creating XML document in manifest for package <i>package_name</i>		The XML document that represents the manifest of a package cannot be generated. Check the associated stack trace to determine the cause of the error and try the action again.
BMXAA5214E	Could not create version header in manifest for package <i>package_name</i>		The application cannot retrieve and construct the version information of the package manifest that is being created or distributed. Check the associated stack trace to determine the cause of the error.
BMXAA5220E	Could not get database name in source environment		The name of the source database cannot be retrieved from the database to generate the source information for a package definition. Check the associated stack trace to determine the cause of the error. You might have to work with a database administrator to correct the error.
BMXAA5221E	Could not get database schema name in source environment		The schema name of the source database cannot be retrieved from the database to generate the source information for a package definition. Check the associated stack trace to determine the cause of the error. You might have to work with a database administrator to correct the error.
BMXAA5227E	Could not register event listeners for package <i>package_definition_name</i> and source <i>source_string</i>		The application cannot register the event listeners for the active change packages. The error is recorded in the log file if the logger is configured. The associated stack trace indicates the cause of the error.
BMXAA5228E	Could not register event listeners for all active Migration Manager change packages		The application cannot register the event listeners for the active change packages. The error might occur when the application server starts. The error is recorded in the log file if the logger is configured. The associated stack trace indicates the cause of the error.
BMXAA5234E	Error in tracking events for package definition <i>package_definition_name</i> and source <i>source_string</i>		The application cannot capture event information and write it to the event tracking table. The error is recorded in the log file if the logger is configured. The associated stack trace indicates the cause of the error.

Error code	Error message	Details in the Messages table	Explanation and response
BMXAA5244E	Cannot read manifest information from file <i>file_name</i>	Exception stack trace is written to the Message Details field	The manifest of a package cannot be read during deployment. The package file contents might be corrupted. You can test the file by copying it and extracting the manifest from the copy. If you cannot extract the manifest, re-create or redistribute the package. If the package file is not corrupted or if the manifest can be extracted, review the associated stack trace to identify the cause of the error.
BMXAA5252E	Error in checking entry in dmrestriction table		The application cannot check the restriction entries in the target database environment when distributing a package. The error is recorded in the log file if the logger is configured. The associated stack trace indicates the cause of the error.
BMXAA5257E	Package redistribution to target <i>target_name</i> failed	Exception stack trace is written to the Message Details field	The stack trace provides details of the error. Depending on the cause of the error, you can try the redistribution again.
BMXAA5290E	Could not locate or create the folder <i>folder_name</i>		The application cannot locate the processed folder under DMROOT or cannot create the folder. Check if you have write permissions in the parent folder and if there is enough disk space.
BMXAA5291E	Could not close package <i>package_name</i> to file <i>file_name</i>		The package file cannot be copied to the processed folder. Check if you have write permissions and if there is enough disk space
BMXAA5309E	Could not export package configuration records to the staging table for package <i>package_name</i>	Exception stack trace is written to the Message Details field	The package metadata records cannot be exported from the source database. Check the associated stack trace to determine the cause of the error.
BMXAA5310E	Could not export configuration records to the staging table for package <i>package_name</i>	Exception stack trace is written to the Message Details field	Configuration data records cannot be exported from the source database. Check the associated stack trace to determine the cause of the error.
BMXAA5311E	Could not export data dictionary configuration records to the staging table for package <i>package_name</i>	Exception stack trace is written to the Message Details field	The data dictionary records cannot be exported from the source database. Check the associated stack trace to determine the cause of the error.
BMXAA5313E	Could not connect to the target database specified by URL <i>database_URL</i>	Exception stack trace is written to the Message Details field	The target database is not running at the time of distribution. Check with the target environment database administrator for database availability and the required connection parameters and update the target definition.
BMXAA5314E	Could not create staging table records in the target database specified by URL <i>database_URL</i>	Exception stack trace is written to the Message Details field	Database operations to insert package records fail. Check the associated stack trace to determine the cause of the error. The cause of the error might be a database issue related to table spaces or permissions.
BMXAA5315E	Could not create consolidated package file <i>package_file_name</i> into the folder <i>target_folder_path</i>	Exception stack trace is written to the Message Details field	The application cannot write the file to the outbound folder under the DMROOT folder on the application server or cannot copy the file from the DMROOT folder to the user-specified target folder. Check the write permissions on the folder and check for enough disk space.
BMXAA5316E	Could not stage selected package file <i>package_name</i>	Exception stack trace is written to the Message Details field	The contents of the package file cannot be extracted and written to the staging table. Check the associated stack trace to determine the cause of the error. Alternatively, obtain a new package from the source and deploy the new package.
BMXAA5317E	Could not import package metadata records for package <i>package_name</i>	Exception stack trace is written to the Message Details field	Package metadata records cannot be imported into the target database. Check the associated stack trace to determine the cause of the error. Alternatively, obtain a new package from the source and deploy the new package.
BMXAA5318E	Could not import data dictionary records for package <i>package_name</i>	Exception stack trace is written to the Message Details field	Data dictionary records cannot be imported into the target database. Check the associated stack trace to determine the cause of the error. Alternatively, obtain a new package from the source and deploy the new package.
BMXAA5319E	Could not import configuration records for package <i>package_name</i>	Exception stack trace is written to the Message Details field	Package configuration records cannot be imported into the target database. Check the associated stack trace to determine the cause of the error.
BMXAA5320E	Could not apply data dictionary changes into database using Database Configuration for package <i>package_name</i> . Please check configdb log file for more detail.	Exception stack trace is written to the Message Details field	The target database cannot be configured after the data dictionary records are imported from the package. Do not try to redeploy the package. Instead, check with the administrator of the source environment to determine whether the same data dictionary changes were successfully applied in the source. If necessary, obtain a new package.
BMXAA5324E	Could not extract or write XML document to staging table record for migration object <i>migration_object_name</i> for package <i>package_name</i>		The application cannot create the XML document that represents the migration object record or cannot write the XML document to the staging table in the source environment. Check the associated stack trace to determine the cause of the error.

Error code	Error message	Details in the Messages table	Explanation and response
BMXAA5367E	Could not redistribute package metadata records for package <i>package_name</i>	Exception stack trace is written to the Message Details field	Metadata records that are regenerated for redistribution cannot be written to the staging table. Check the associated stack trace to determine the cause of the error.
BMXAA5648E	Could not distribute package <i>package_name</i> to target <i>target_name</i> . Source database is different than target database.		An attempt is made to distribute a package to a target database that is a different database management system than the source database. The Migration Manager application works only between databases of the same type. Distribute the package as a file instead.
BMXAA5651E	Target environment base language <i>language_name</i> is different from source base language <i>language_name</i> . You must change target base language to match that for source base language before you can deploy the package.		The application requires that packages are deployed in the base language. The target environment base language also must match the source environment. When a new package is available for deployment, check its manifest and determine the base language of the package. If the base language of the target environment, change it to match the source environment.
BMXAA6001E	Could not generate manifest for package <i>package_name</i> during redistribution	Exception stack trace is written to the Message Details field	The manifest of the package cannot be generated when a package is redistributed. Check the associated stack trace to determine the cause of the error.

Managing communication templates

You use communication templates to standardize frequently used email communications, which are also known as notifications. There are several ways you can use communication templates, such as with the workflow or escalation process. You can also create and send email communications from the ticket applications by using standardized information from communication templates.

- [Communications template overview](#)
You can create and manage communication templates that can be used to standardize frequently used e-mail communications (which are also known as notifications).
- [Working with communication templates](#)
You can create and manage communication templates that can be used to standardize frequently used e-mail communications also known as notifications.

Communications template overview

You can create and manage communication templates that can be used to standardize frequently used e-mail communications (which are also known as notifications).

- [Communication templates and escalations](#)
You can use escalations to monitor time-sensitive records and key performance indicators (KPIs). When you create escalation records, you can specify that email notifications are generated when a record reaches the defined escalation point.
- [Substitution variables for communication templates](#)
In the Communication Templates application, you use substitution variables in the Subject field and in the Message field. When you use substitution variables in a communication template that is used to create a notification, the substitution variables are replaced with the corresponding values in the record that generates the notification.
- [Predefined communication templates](#)
In the Communication Templates application, there are predefined communication templates that you can use to create notifications. You can use the predefined templates with the Workflow application, the Service Requests application, and the Incidents application. You can also use the predefined templates with the system database or with the demo database (MAXDEMO).
- [Recipients of communication templates](#)
In the Communication Templates application, you can add recipients to communication templates. You can choose from four types of recipients: roles, persons, person groups, and email addresses. You can add one or more recipients from each category, and you can add more than one type of recipient.
- [Attachments for communication templates](#)
In the Communication Templates application, you can attach many types of document files to communication templates. These document files include text files, images, spreadsheets, videos, web pages, and document folders. When you create a communication based on a template, the attachments are always sent with the communication.
- [Communication logs](#)
In the Communication Templates application, a communication log lists the inbound and outbound communications for a record, such as a ticket or work order. For outbound communications that are generated with the Create Communication action, the communication log entry contains the details from the email message and any attachments.

Communication templates and escalations

You can use escalations to monitor time-sensitive records and key performance indicators (KPIs). When you create escalation records, you can specify that email notifications are generated when a record reaches the defined escalation point.

You can create each notification in the Escalations application, or you can create communication templates for frequently generated notifications. Notifications are sent when records are found that meet the conditions that an escalation point defines.

In the Escalations application, you can create a template-based communication. A template-based communication uses all the features that are available in a communication template, including attachments. The default values for role or recipient, subject, and message are derived from the template. You cannot change these values in the Escalations application.

For example, a service desk agent does not complete assignments within the specified time span of six hours. The assignment is escalated to the supervisor and the supervisor receives an email communication.

- [Communication templates and the service desk](#)
You can use communication templates to create and send email messages from the service desk applications. These applications include the Service Requests application, the Incidents application, and the Problems application.
- [Communication templates and workflow](#)
You can design a workflow process to generate notifications about the progress of a specific record. Notifications can be made through email or through pager, providing that your paging system supports email.

Communication templates and the service desk

You can use communication templates to create and send email messages from the service desk applications. These applications include the Service Requests application, the Incidents application, and the Problems application.

When you create communication templates for the service desk applications, you ensure that communications with service desk customers contain standardized information.

Communication templates and workflow

You can design a workflow process to generate notifications about the progress of a specific record. Notifications can be made through email or through pager, providing that your paging system supports email.

When you design a workflow process that includes email notifications, you can create the notification, and apply a communication template and change or complete the notification.

For workflow processes, you create templates that use roles as a recipient. You can add one or more roles. You can add more than one category of recipient, such as persons, person groups, or email addresses. In the Workflow Designer application, you can create a template-based communication. A template-based communication uses all the features available in a communication template, including attachments. The default values for role or recipient, subject, and message are derived from the template. You cannot change these values in the Workflow Designer application.

You can create a template for purchase requisition approvals or rejections, which can be sent as the request flows through the workflow process. You create a workflow process for purchase requests. A user submits a request for a notebook. The request enters the workflow process and is approved by the immediate supervisor. After the purchase requisition is approved by finance, the status is set to approved and the user is notified of the approval.

Substitution variables for communication templates

In the Communication Templates application, you use substitution variables in the Subject field and in the Message field. When you use substitution variables in a communication template that is used to create a notification, the substitution variables are replaced with the corresponding values in the record that generates the notification.

When you use substitution variables in the Message field, you type the text in the Subject field or in the Message field. You then add a space and a colon before the substitution variable to format the output correctly. If more text or other variables follow, you must insert a space after any variables in the Subject field or the Message field.

You can also use dot notation with relationships in substitution variables. For example, `re11. re12. fieldname`.

Your Incident #:TICKETID was opened on :REPORTDATE . The person assigned to work on your issue is :OWNER . You will be contacted on or before :TARGETSTART .

Predefined communication templates

In the Communication Templates application, there are predefined communication templates that you can use to create notifications. You can use the predefined templates with the Workflow application, the Service Requests application, and the Incidents application. You can also use the predefined templates with the system database or with the demo database (MAXDEMO).

Templates for the system database

You can customize templates for the system database for your business needs. Because there is an associated escalation or workflow process that refers to these templates, you cannot delete them.

Templates for the demo database

You can change or delete templates for the demo database (MAXDEMO). You can use the demo database communication templates in your test environment to gain experience adding and managing templates.

The email Listeners application uses default templates for error notifications. If an error is encountered while staging inbound records, an error notification is sent to the email administrator. The type of error determines the error notification that is sent to the email administrator.

Recipients of communication templates

In the Communication Templates application, you can add recipients to communication templates. You can choose from four types of recipients: roles, persons, person groups, and email addresses. You can add one or more recipients from each category, and you can add more than one type of recipient.

If you are creating a communication template for use with a workflow process or escalation process, you must add at least one recipient. If you are creating a template for use with the Ticket application or the Work Order application, you do not have to add a recipient. If you do not add a recipient, users who apply the template to a record are notified that an email is not sent, because there are no recipients.

Attachments for communication templates

In the Communication Templates application, you can attach many types of document files to communication templates. These document files include text files, images, spreadsheets, videos, web pages, and document folders. When you create a communication based on a template, the attachments are always sent with the communication.

Communication logs

In the Communication Templates application, a communication log lists the inbound and outbound communications for a record, such as a ticket or work order. For outbound communications that are generated with the Create Communication action, the communication log entry contains the details from the email message and any attachments.

Working with communication templates

You can create and manage communication templates that can be used to standardize frequently used e-mail communications also known as notifications.

- [Creating communication templates](#)
You can create communication templates to standardize frequently used email communications. You can also use communication templates to create email notifications to use with the automated workflow and escalation processes.
- [Attaching documents to communication templates](#)
You can send additional information in an email communication using a communication template. You can attach document folders, files, and web pages to email communications.
- [Copying communication templates](#)
You can create a template that is based on an existing template.
- [Changing communication templates](#)
Once you create a communication template, you can change it to reflect any changes in your business needs.
- [Deleting communication templates](#)
You can delete a communication template that is no longer being used.
- [Changing the status of communication templates](#)
You can manage the use of communication templates by changing the status to either active or inactive. An active status indicates that the template is ready for approval or use. An inactive status indicates that you no longer want to use the template.

Creating communication templates

You can create communication templates to standardize frequently used email communications. You can also use communication templates to create email notifications to use with the automated workflow and escalation processes.

Procedure

1. In the Communication Templates application, click New Communication Template.
A new communication template opens with an inactive status.
2. Optional: If the Template field is blank, provide a name or identifier.
3. In the Applies To field, specify a value.
4. In the Accessible From field, specify from where users can access the template:

Option	Description
ALL	For the template to be available: <ul style="list-style-type: none">• From the Create Communication action in other applications• For use with workflow and escalation processes

Option	Description
APPS	For the template to be available from the Create Communication action in other applications, except for the Escalations application and the Workflow application
ESCALATION	For the template to be available only with the escalation function
WORKFLOW	For the template to be available only with the workflow function

5. Optional: Create an entry in the communication log and attach files to the communication template.
6. Complete the following details for the communication template:
 - a. Specify the email address from which the communication template is sent.
 - b. Optional: If the recipient must reply to an email address other than the address of the sender, provide an email address in the Reply to field.
 - c. In the Subject field and Message field, specify substitution variables.
 - d. Optional: Add a recipient on the Recipients tab. If you are creating a communication template for a workflow or escalation process, you must add at least one recipient.
 - e. Optional: If you are creating a communication template for a workflow process and you want the last memo to display first in the list of memos, type `:wfaassignment.lastmemo` as part of the description for the template.
 - f. Optional: If you are creating a communication template for a workflow process and you need memos to be available immediately, type `:wfaassignment.currentmemo` as part of the description for the template.
7. Save your changes.

- [Adding email addresses as communication template recipients](#)

When you create a communication template, you can use email addresses as a recipient. You can add one or more email addresses, and you can add more than one category of recipient such as persons, person groups, or roles.

- [Adding person groups as communication template recipients](#)

When you create a communication template, you can use person groups as a recipient. You can add one or more person groups. You can also add more than one category of recipient such as email addresses, persons, or roles.

- [Adding persons as communication template recipients](#)

When you create a communication template, you can use persons as a recipient. You can add one or more persons. You can also add more than one category of recipient such as person groups, email addresses, or roles.

- [Adding roles as communication template recipients](#)

When you create a communication template, you can use roles as a recipient. You can add one or more roles. You can also add more than one category of recipient such as persons, person groups, or email addresses.

Adding email addresses as communication template recipients

When you create a communication template, you can use email addresses as a recipient. You can add one or more email addresses, and you can add more than one category of recipient such as persons, person groups, or roles.

Procedure

1. In the Communication Templates application, open or create a communication template.
2. Click the Recipient tab.
3. Click Show Table to expand the email table window.
4. Click New Row to add a recipient.
5. Select whether the recipient receives the communication directly, is copied, or is blind copied.
6. Save your changes.

Adding person groups as communication template recipients

When you create a communication template, you can use person groups as a recipient. You can add one or more person groups. You can also add more than one category of recipient such as email addresses, persons, or roles.

About this task

The email communication is sent to the first available person according to the calendar and shift. If no one is available, the email communication is sent to the default person in the person group.

Procedure

1. In the Communication Templates application, open or create a communication template.
2. On the Recipient tab, click Show Table to expand the Person table window.
3. Click Select Groups to add multiple recipients. In the Select Person Groups window, choose the groups that you want to add and click OK. For each person in the person group, you can select any of the following options:
 - To - the person receives the email communication directly.
 - cc - the person is copied on the email communication.
 - bcc - the person is blind copied on the email communication.
4. Optional: If you do not want the communication sent to every person in the group, clear the Broadcast check box.
5. Save your changes.

Adding persons as communication template recipients

When you create a communication template, you can use persons as a recipient. You can add one or more persons. You can also add more than one category of recipient such as person groups, email addresses, or roles.

Procedure

1. In the Communication Templates application, open or create a communication template.
2. Click the Recipient tab.
3. Click Show Table to expand the Person table window.
4. Select one of the following options:

Option	Description
New Row	To add a single recipient, in the Person field, specify a value.
Select People	To add multiple recipients, in the Select People window, select the people that you want to add and click OK.

5. Select whether the recipient receives the communication directly, is copied, or is blind copied.
6. Save your changes.

What to do next

On the Communication Template tab, you can view the recipient that you added.

Adding roles as communication template recipients

When you create a communication template, you can use roles as a recipient. You can add one or more roles. You can also add more than one category of recipient such as persons, person groups, or email addresses.

Procedure

1. In the Communication Templates application, open or create a communication template.
2. Click the Recipient tab.
3. Click Show Table to expand the Role table window.
4. Choose one of the following options:

Option	Description
New Row	To add a single recipient. In the Role field, specify a role.
Select Roles	To add multiple recipients. In the Select Roles window, select the roles that you want to add and click OK.

5. Choose whether the recipient receives the communication directly, is copied, or is blind copied.
6. Save your changes.

What to do next

On the Communication Template tab, you can view the roles that you added.

Attaching documents to communication templates

You can send additional information in an email communication using a communication template. You can attach document folders, files, and web pages to email communications.

- [Attaching document folders to communication templates](#)
To send additional information with a communication template, you can attach document folders. When you create a communication based on a template, the document folders are always sent with the communication.
- [Attaching files to communication templates](#)
To send additional information with a communication template, you can attach many types of files, including text files, images, spreadsheets, and videos. When you create a communication based on a template that has attachments, the attachments are always sent with the communication.
- [Attaching web pages to communication templates](#)
To send additional information with a communication template, you can attach web pages. When you create a communication based on this template, the attachments are always sent with the communication.
- [Linking records to communication templates](#)
You can insert a hyperlink to a record within the body of your communication template message that includes the application name and record ID.

Attaching document folders to communication templates

To send additional information with a communication template, you can attach document folders. When you create a communication based on a template, the document folders are always sent with the communication.

About this task

The business object to which the template applies determines which document folders you can view in the Folders table window. These folders are defined in the originating application. For example, if you create a communication template for incidents, the system lists any document folders that have been defined in the Incidents application. The system also links any folders linked in the database to the Incidents application.

Procedure

1. In the Communication Templates application, open or create a communication template.
2. Click the Attachment Folders tab.
3. Select the Send with Communication check box for the document folders that you want to attach to the template.
4. Save your changes.

Attaching files to communication templates

To send additional information with a communication template, you can attach many types of files, including text files, images, spreadsheets, and videos. When you create a communication based on a template that has attachments, the attachments are always sent with the communication.

Procedure

1. In the Communication Templates application, open or create a communication template.
2. On the Communication Template tab, click Attachments and select whether to attach files or attach files from the library.
3. Save your changes.

Attaching web pages to communication templates

To send additional information with a communication template, you can attach web pages. When you create a communication based on this template, the attachments are always sent with the communication.

Procedure

1. In the Communication Templates application, open or create a communication template.
2. On the Communication Template tab, click Attachments.
3. To attach a Web page, select Add New Attachments, > Add New Web Page.
4. Save your changes.

Linking records to communication templates

You can insert a hyperlink to a record within the body of your communication template message that includes the application name and record ID.

Procedure

Insert the following link into the body of your message:

```
http://:HOSTNAME/maximo/ui/maximo.jsp?event=loadapp&value=:APP&uniqueid=:OWNERID
```

where *HOSTNAME* is the name or IP address of the MXServer

where *OWNERID* is the name of the owner

Results

When a notification is generated, the application name and record ID appear in the message as a hyperlink that leads directly to the record.

To access the record, the email recipient must be a registered user with a security permission in the specified application.

Copying communication templates

You can create a template that is based on an existing template.

About this task

When you copy a communication template, the copy has the same information as the existing template, except for a new template ID and an inactive status.

Procedure

1. In the Communication Templates application, display the template that you want to copy.
2. Select the Duplicate Template action.
3. Optional: If the Template field is blank, specify a value.
4. Save your changes.

Changing communication templates

Once you create a communication template, you can change it to reflect any changes in your business needs.

Before you begin

You do not need to deactivate the template before you change it.

Procedure

1. In the Communication Template application, open the template that you want to change.
2. Change the information in the appropriate fields.
3. Save your changes.

Deleting communication templates

You can delete a communication template that is no longer being used.

Before you begin

You can delete a communication template only if it is not referenced by a workflow process or escalation process.

Procedure

1. In the Communication Templates application, open the template that you want to delete.
2. Select the Delete Template action.
3. Click Yes.

Changing the status of communication templates

You can manage the use of communication templates by changing the status to either active or inactive. An active status indicates that the template is ready for approval or use. An inactive status indicates that you no longer want to use the template.

Before you begin

If the template is used for an active escalation or workflow process, you cannot change the status of a template to inactive. Only templates that you set to active can be applied by other users to a ticket record.

About this task

The default status of a template is inactive.

Procedure

1. In the Communication Templates application, open a communication template.
2. Click Change Status.
3. In the Status field, select a status.
You can view the date and time of the status change in the Status Date field.
4. Click OK.

Managing escalations

You use escalations to ensure that critical tasks, such as those defined in service level agreements, are completed on time. You can also use escalations for events that notify you before contracts expire, or to change the status or owner of a record. You can use escalations with any application.

- [Escalations overview](#)
An escalation is a mechanism for monitoring time-sensitive records. Escalations can take actions or send notifications when a record reaches a defined escalation point. Your workflow administrator can specify that a task assignment has a time limit. If the assignment is not completed within the specified time limit, an escalation can be triggered for the record.
- [Working with escalations](#)
You use escalations to automatically monitor the critical processes in your enterprise. You can also use escalations for events, such as contract expiration, a change in the status of a records, or a change in the ownership of a record.

Escalations overview

An escalation is a mechanism for monitoring time-sensitive records. Escalations can take actions or send notifications when a record reaches a defined escalation point. Your workflow administrator can specify that a task assignment has a time limit. If the assignment is not completed within the specified time limit, an escalation can be triggered for the record.

- [Escalation engine](#)
The product contains an escalation engine that runs the escalations. Escalations help you ensure that critical tasks, such as those defined in service level agreements, are completed on time.
- [Predefined escalations](#)
To help simplify escalation management, the Escalation application has two categories of predefined escalations: those escalations for the Maximo® database and those escalations for the demonstration (Maxdemo) database.
- [Escalations and service level agreements](#)
Escalations help businesses comply with service level agreement commitments by proactively avoiding service level agreement violations.
- [Communication templates and notifications](#)
An escalation can initiate notifications when records are not acted upon in a timely manner. You can ensure that notifications are uniform in structure by basing them on communication templates. Notifications are sent out in the form of emails through your email service.
- [Escalation record fields](#)
An escalation is a mechanism to monitor records that can be acted upon or to send notifications when a record reaches a defined escalation point. In the Escalations application, you can create an escalation for any business object. Because all applications are associated with business objects, you can create escalations for any application.
- [Deletion rules for escalations](#)
In the Escalations application, you can manage escalations by deleting them.

Escalation engine

The product contains an escalation engine that runs the escalations. Escalations help you ensure that critical tasks, such as those defined in service level agreements, are completed on time.

The escalation engine performs the following tasks:

- Drives the escalation process
- Uses the cron task function
- Tests all active escalation definitions at a set schedule
- Retrieves escalation definitions from the database and constructs appropriate SQL statements
- Runs SQL statements against target objects for the escalation
- Retrieves records, and performs actions and notifications associated with the escalation definitions
- [Escalation logs](#)
You can monitor the execution of escalations by the escalation engine. To do so, you can configure logging and examine the log files for log statements related to the escalation engine.
- [Structured Query Language Expression Builder](#)
Use the Structured Query Language (SQL) Expression Builder to easily specify conditions to which an escalation applies. You also can build SQL expressions manually.
- [Escalation points](#)
In an escalation, you define the conditions to be met for an associated record, such as a work order, an asset, or a purchase order. When the conditions are met, the escalation is triggered. An escalation point represents the condition that must be met. You can use one or more of escalation points to define an escalation.

Escalation logs

You can monitor the execution of escalations by the escalation engine. To do so, you can configure logging and examine the log files for log statements related to the escalation engine.

To enable escalation engine logging, you use the Logging application. For each of the loggers set the wanted log level. If the logger does not exist, create your own logger. Verify that the loggers are all active. Associate an appender with a logger to ensure that log statements send to a product log file. When you save your changes, run the Apply Settings action in the Logging application for the settings to take effect immediately.

The following table lists the escalation loggers, a description of the logger, and the log level to set each logger to.

Logger	Description	Log level
crontask	Root logger that generates log statements for all cron tasks	DEBUG
ESCALATION	Child logger that inherits from cron task root logger and generates log statements specifically for the escalation engine	DEBUG
sql	Root logger that generates log statements of SQL statements run in the application server	INFO
COMMTEMPLATE	Child logger that inherits from service root logger and generates log statements specifically for communication templates and notifications events	INFO
mail	Root logger that generates log statements for communication with the mail server when sending notifications.	DEBUG

Structured Query Language Expression Builder

Use the Structured Query Language (SQL) Expression Builder to easily specify conditions to which an escalation applies. You also can build SQL expressions manually.

The SQL Expression Builder is a tool for building SQL expressions. This tool requires a basic understanding of SQL structure and syntax. The SQL statement evaluates to a true or to a false result at run time.

The SQL Expression Builder includes the following functions:

- Common SQL conditions
- Operators
- Mathematical functions
- Calendar lookup
- Classification lookup
- Keywords

The SQL Expression Builder also contains a relationship tree. This relationship tree allows you to drill down through the fields and related tables for the specified object or application and select a value.

Escalation points

In an escalation, you define the conditions to be met for an associated record, such as a work order, an asset, or a purchase order. When the conditions are met, the escalation is triggered. An escalation point represents the condition that must be met. You can use one or more of escalation points to define an escalation.

Activating an escalation does not trigger an escalation process. An escalation is triggered only when the escalation engine finds records that meet the criteria defined by the escalation points.

You can create the following categories of escalation points:

Elapsed time since a past event

Compares the current date and time to the specified field that represents an event in the past. You can select from a list of DATETIME fields on the record. For example, a Start Date on a workflow assignment, an Actual Start date on a work order, or a Status Date on a record that includes status.

Time until a future event

Compares the current date and time to the specified field that represents an event in the future. For example, a Renewal Date on a contract, a Due Date on an invoice, or a Target Finish date on a work order.

Condition

Condition without a time measurement. If you want to trigger the actions and notifications of an escalation based on a condition that does not have a time measurement, you can specify the condition in the Escalation Point Condition field. You also can use the Condition field to specify that the escalation point is applied only to the subset of records specified by the condition.

- [Actions associated with escalation points](#)

When records meet the conditions in an escalation point, an action can be triggered. An action is an event, such as a changing status. Escalation points are the components of an escalation that represent a monitored condition or threshold, such as measuring elapsed time. To activate an escalation, you must associate at least one action with an escalation point.

Actions associated with escalation points

When records meet the conditions in an escalation point, an action can be triggered. An action is an event, such as a changing status. Escalation points are the components of an escalation that represent a monitored condition or threshold, such as measuring elapsed time. To activate an escalation, you must associate at least one action with an escalation point.

Action types define categories of actions. You can use a predefined action type, such as set owner, status change, and create ticket, or you can create an action type.

Action groups are predefined sets of actions that are grouped in a specific sequence. Escalation points are associated with actions through the action group. If you associate a predefined action, an action group is created for that action, and the predefined action becomes a member of that action group. Only the action group with the escalation point is associated, not the action itself.

When you add multiple actions, you can assign a preexisting action a sequence number. The values for the description and the action type are defaulted based on the object and action that you chose.

Action groups can be created automatically when you add actions in the Escalations application, or you can add action groups in the Actions application. In the Actions application, you create actions and specify that an action is used with an escalation.

Predefined escalations

To help simplify escalation management, the Escalation application has two categories of predefined escalations: those escalations for the Maximo® database and those escalations for the demonstration (Maxdemo) database.

To use the predefined escalations, you must activate them.

Predefined escalations for the database

You can change predefined escalations for the database to suit your business needs. You must not delete these predefined escalations because they are required for the escalations functionality to work.

The following table describes the predefined escalations for the database.

Table 1. Predefined escalations for the database

Escalation name	Application	Description
INVDUE	Invoice application	Changes the invoice status to the target invoice status when the due date is reached on invoices that were generated from a payment schedule
MSTRCTREFF	Master Contracts application	Changes the status of a contract to approved when the contract start date is reached
LEACTREFF	Lease Contracts application	Lease contract start date has been reached and the status should be changed to approved.
LABCTREFF	Labor Contracts application	Labor contract start date has been reached and the status should be changed to approved.
PURCTREFF	Purchasing Contracts application	Purchase contract start date has been reached and the status should be changed to approved.
REPORTLONG	Report Administration application	The report is taking longer than the specified amount of time to complete.
WARCTREFF	Warranty Contracts application	Warranty contract start date has been reached and the status should be changed to approved.

Predefined escalations for Maxdemo database

The following table describes examples of the predefined escalations for the Maxdemo database.

Table 2. Examples of the predefined escalations for the Maxdemo database

Escalation name	Application	Description
Warranty expiring	<ul style="list-style-type: none"> Master Contracts application Lease Contracts application Warranty Contracts application Purchasing Contracts application Labor Contracts application 	Notifies the current owner of the warranty 90 days, 60 days, and 30 days before the expiration of the warranty of the asset
Contract renewal	<ul style="list-style-type: none"> Master Contracts application Lease Contracts application Warranty Contracts application Purchasing Contracts application Labor Contracts application 	Notifies the buyer of the contract 90 days, 60 days, and 30 days before the contract renewal date
SLA review date	<ul style="list-style-type: none"> Service Level Agreements application 	Notifies the service level agreement (SLA) administrator 30 days, 60 days, and 90 days before the SLA review date for all active SLA
Autoclose resolved tickets	<ul style="list-style-type: none"> Service Requests application Incidents application Problems application 	Automatically closes all non-historical tickets (all classes) that have been in a resolved status for more than 10 days

Escalations and service level agreements

Escalations help businesses comply with service level agreement commitments by proactively avoiding service level agreement violations.

- Each service level agreement has a one-to-one relationship with an escalation.
- Each commitment in a service level agreement maps to an escalation point in the corresponding escalation.
- After defining a service level agreement, you can define the corresponding escalation, and the service level agreement application populates escalation points (you can modify them).
- The service level agreement application contains an Escalation tab, providing a view into the corresponding escalation.

Communication templates and notifications

An escalation can initiate notifications when records are not acted upon in a timely manner. You can ensure that notifications are uniform in structure by basing them on communication templates. Notifications are sent out in the form of emails through your email service.

A notification includes a template ID, the role or recipient name, the subject of the notification, and the message. If you have information that is sent out repeatedly, you can create a communication template for it and attach it as a notification on an escalation.

You can create two types of notifications in the Escalations application:

- A free-form notification that uses only a few features of a communication template
- A template-based notification that can use all the features of a communication template, including attached documents

If you create a free-form notification the system generates a template ID for it. However, the system does not save the notification for reuse in the Communication Templates application. If you select an existing communication template, the system defaults the values in the Role/Recipient, Subject, and Message fields from the communication template you chose. You cannot change these read-only values from within the Escalations application.

Escalation record fields

An escalation is a mechanism to monitor records that can be acted upon or to send notifications when a record reaches a defined escalation point. In the Escalations application, you can create an escalation for any business object. Because all applications are associated with business objects, you can create escalations for any application.

An escalation record consists of the following fields

Object (Applies To field)

You create escalation records for a specific business object. The escalation engine retrieves records, from the business object, that meet the escalation point criteria.

SQL statement — (Condition field)

An escalation record can apply to all application records, or to a specific set of records. You can create an SQL statement that specifies records to which the escalation is applied. The conditions can apply to one or more tables associated with the object.

Organization and Site

Escalations are stored at the system level. You can create escalations for use with a specific organization or site.

Schedule

A schedule that defines how often the system checks for records that meet the criteria for the escalation. The polling interval can be seconds, minutes, hours, days, weeks, or months. You also can specify whether the interval is calendar or date based.

Calendar Organization

The organization that is associated with the escalation calendar.

Calendar

The calendar that specifies the days and times for which the escalation is valid.

Shift

The shift that specifies the days and times for which the escalation is valid.

Escalation Point

Date-and time-based, or other condition criteria for when the actions or notifications specified on the escalation record are triggered. An escalation record can have one or more escalation points.

Actions

Any actions that must be taken when a record reaches the conditions of an escalation point. You define actions separately for each escalation point. You can associate multiple actions for each escalation point. You use the Actions application to define actions.

Notifications

Any notifications that the system must generate when a record reaches the conditions of an escalation point. You define notifications separately for each escalation point.

Deletion rules for escalations

In the Escalations application, you can manage escalations by deleting them.

The following rules apply when you delete escalations:

- When you delete an escalation, the actions and notifications are not deleted. Instead, the associations between the escalation points and the actions and notifications are removed. You delete actions in the Actions application and notifications in the Communication Templates application.
- In the Escalations application, you cannot delete escalations that are associated with service level agreements (SLA).
- If a service level agreement that is associated with an escalation is deleted, then the escalation is also deleted.

Working with escalations

You use escalations to automatically monitor the critical processes in your enterprise. You can also use escalations for events, such as contract expiration, a change in the status of a records, or a change in the ownership of a record.

- **Creating escalations**
You create an escalation to monitor time-sensitive records that could require action. You can create an escalation for any business object and for any application. You can create escalations at the organization or site level.
- **Validating escalations**
You must validate an escalation record before you can activate it. Validation checks the Structured Query Language (SQL) statements to ensure that the SQL is valid and that the escalation engine can run it.
- **Activating escalations**
You can activate an escalation record that has at least one escalation point and one action or notification defined for each escalation point. The product polls for records meeting the criteria set by the escalation. If a match is found, the appropriate action is triggered.
- **Modifying escalations**
You can change existing escalations.
- **Deactivating escalations**
You deactivate an escalation record to modify the record or to delete it.

Creating escalations

You create an escalation to monitor time-sensitive records that could require action. You can create an escalation for any business object and for any application. You can create escalations at the organization or site level.

Before you begin

Before you can activate and use an escalation record, you must define at least one escalation point and at least one action or notification for the escalation point. An *escalation point* defines the threshold at which an escalation is triggered. An *action* is the event that is triggered when an escalation point is reached.

Procedure

1. On the toolbar, click New Escalation. If the Escalation field is empty, specify a value.
 2. In the Description field, type a description.
 3. In the Applies To field, specify the object to which to apply the escalation.
 4. Optional: Specify values in the Organization and Site fields. If you specify a value for either organization or site, you restrict the use of the escalation to either that organization or site. If you specify values for both organization and site, the escalation can be used only at that site.
 5. Optional: Type an expression in the Condition field to indicate to which records the escalation applies. For example, if you want to escalate only task assignments that have a value specified in the Time Limit field, include the following text in your SQL statement: **TIMELIMIT is not null**. You can type the SQL condition manually. You can also use the Expression Builder to create the SQL statement.
 6. In the Schedule field, click the Set Schedule icon to set how frequently to poll the database for records.
 7. Optional: In the Calendar Organization, Calendar, and Shift fields, specify values to limit when the escalation is run.
 8. Click Save Escalation.
- **Defining escalation points**
You can define one or more escalation points for an escalation. For each escalation point, you can specify one or more actions or notifications.

Defining escalation points

You can define one or more escalation points for an escalation. For each escalation point, you can specify one or more actions or notifications.

Procedure

1. In the Escalations application, create, or display an escalation record.
2. In the Escalation Points table window, click New Row.
3. In the Row Details window, specify the condition that triggers the escalation point by selecting one of the following options:
 - If you are creating a time-based escalation point, specify values in the Elapsed Time Attribute field, in the Elapsed Time Interval field, and in the Interval Unit of Measure field. Type a positive number in the Elapsed Time Interval field to indicate a time period in the past. Type a negative number to indicate a time in the future.
 - If you are creating a condition-based escalation point, type an SQL statement in the Escalation Point Condition field to specify the condition that triggers the escalation. You can specify a value manually or click the SQL Expression Builder icon.

4. If you want the actions and notifications of the escalation point triggered more than once, select the Repeat check box.
5. Click Save Escalation.

What to do next

Now you define an action to take for each escalation point that you created.

- **Defining actions for escalation points**
You define at least one action or notification for each escalation point on an escalation record. You define actions separately for each escalation point. You use the Actions application to create action records.
- **Defining notifications for escalation points**
You must define at least one action or notification for each escalation point on an escalation record. You can use a communication template to create a notification. You can also type the subject, message, and recipients manually. You define notifications separately for each escalation point.

Defining actions for escalation points

You define at least one action or notification for each escalation point on an escalation record. You define actions separately for each escalation point. You use the Actions application to create action records.

About this task

To define actions for an escalation point, complete the following steps:

Procedure

1. In the Escalations application, create or display an escalation record.
2. In the Escalation Points table window, select the escalation point for which you want to define actions.
3. Click the Actions sub tab.
4. In the Actions window, click New Row.
5. In the Action field, specify a value.
6. Optional: Modify the Sequence field to indicate the order in which the action is performed.
7. Click Save Escalation.

What to do next

You must validate the escalation before activating it.

Defining notifications for escalation points

You must define at least one action or notification for each escalation point on an escalation record. You can use a communication template to create a notification. You can also type the subject, message, and recipients manually. You define notifications separately for each escalation point.

Procedure

1. In the Escalations application, create, or display an escalation record.
2. In the Escalation Points table window, select the escalation point for which you want to define notifications.
3. On the Notifications sub tab, click New Row.
4. Perform one of the following steps:
 - In the Template field, specify a value.
 - Type entries in the Role/Recipient field, in the Subject field, and in the Message field.
5. Click Save Escalation.

Validating escalations

You must validate an escalation record before you can activate it. Validation checks the Structured Query Language (SQL) statements to ensure that the SQL is valid and that the escalation engine can run it.

About this task

The validation process checks for syntax errors and ensures that escalation conditions have been defined in the table for the specified object. The product does not validate actions or notifications.

If an error is discovered in one or more SQL statements, the errors are written to the Validation Results section of the escalation record.

Procedure

1. In the Escalations application, display the record that you want to validate.
2. Select the Validate action.
3. If the validation fails, click the Maximize button to expand the Validation Results section and to view the error log. The SQL error might be in the Condition field or in the Escalation Point Condition fields. Correct the SQL statements and validate the record again.
4. Click Save Escalation.

What to do next

Activate the escalation.

Activating escalations

You can activate an escalation record that has at least one escalation point and one action or notification defined for each escalation point. The product polls for records meeting the criteria set by the escalation. If a match is found, the appropriate action is triggered.

Before you begin

An escalation record must be validated before it can be activated.

About this task

The product checks for records that meet the frequency criteria defined in the Schedule field of the escalation record. If records are found that match, and any of those records meet the conditions defined by the escalation points, then the escalation mechanism triggers the appropriate actions, notifications, or both.

Activating an escalation does not trigger an escalation process. The escalation process triggers only when the escalation engine finds records meeting the criteria defined by the escalation points.

When you activate an escalation, all fields on the record become read-only. You cannot edit an escalation record while it is active.

Procedure

1. In the Escalations application, display the record that you want to activate.
2. Select the Activate/Deactivate Escalation action. The product selects the Active check box in the record heading and creates an instance of the ESCALATION cron task.
3. Click Save Escalation.

Modifying escalations

You can change existing escalations.

Before you begin

All fields on an activated escalation are read-only. You must deactivate the escalation before you can edit it.

About this task

You can modify the following elements of a deactivated escalation:

- You can delete one or more escalation points.
To activate an escalation, it must have at least one escalation point. When you delete an escalation point, the links to the associated actions and notifications. are deleted.
- You can delete one or more actions or notifications associated with an escalation point.
To activate an escalation, it must have at least one action or notification defined for each escalation point.

Procedure

1. From the Escalations application, display the escalation that you want to edit.
2. If you have not deactivated the escalation, select the Activate/Deactivate Escalation action.
3. On the Escalations tab, edit the information as needed. If a field has a Detail Menu, click it and select an option to retrieve a different value.
4. Click Save Escalation.
5. If you are ready to active the escalation, select Activate/Deactivate Escalation.

Deactivating escalations

You deactivate an escalation record to modify the record or to delete it.

Procedure

1. In the Escalations application, display the record that you want to deactivate.
2. Select the Activate/Deactivate Escalation action.
3. Click Save Escalation.

What to do next

After you deactivate an escalation, you can perform the following actions:

- You can delete one or more escalation points. When you delete an escalation point, the links to the associated actions and notifications are deleted.
- You can delete one or more actions or notifications associated with an escalation point. To activate an escalation, it must have at least one action or notification defined for each escalation point.

Enabling email updates for objects and workflow assignments

With email interaction, users without access to a desktop user interface can change objects and workflow assignments. A worker assigned to an object or workflow assignment receives an email that describes the object or workflow assignment. The email recipient replies to the email to change the status of the object, accept or reject the workflow assignment, or update the attributes of the record.

- [Email interaction overview](#)
You use email interaction to send work order and purchasing information to remote users who do not have access to the desktop. The email recipient can change the status of an object or update a workflow assignment. The email recipient changes the status of an object or updates a workflow assignment by specifying a value in an email from a portable device.
- [Examples of email interaction](#)
You use email interaction to send work order and purchasing information to remote users who do not have access to the desktop. The email recipient can change the status of an object or update a workflow assignment. The email recipient changes the status of an object or updates a workflow assignment by specifying a value in an email from a portable device.
- [Configuring updates by using email interaction](#)
You configure email interaction to ensure that users who do not have access to a desktop computer can change the status of objects or workflow assignments.

Email interaction overview

You use email interaction to send work order and purchasing information to remote users who do not have access to the desktop. The email recipient can change the status of an object or update a workflow assignment. The email recipient changes the status of an object or updates a workflow assignment by specifying a value in an email from a portable device.

Email interaction supports two configurations. Email recipients can reply to an email to change the status of an object or to complete a workflow assignment. For example, an off-site technician can update the status of an assigned work order from Approved to In Progress. For both configurations, email interaction has two email format types. In the simple format, the email recipient can change the status of an object or accept or reject a workflow assignment. In the advanced format, the email recipient can modify attributes that are associated with an object status change or workflow assignment. For example, the user can change the start date, completion date, priority level, or description.

- [Simple and advanced email formats](#)
Email interaction can process email notifications in both simple and advanced formats. The email format determines whether the user can change the attributes of the target object in the body of the email. You choose either the simple or advanced format in the People application.

Simple and advanced email formats

Email interaction can process email notifications in both simple and advanced formats. The email format determines whether the user can change the attributes of the target object in the body of the email. You choose either the simple or advanced format in the People application.

Simple format

In simple format, the email recipient can update to a record only. The first email that is sent to the user contains a list of values that is associated with record update options. The value in the first line of the reply email corresponds to the value that is associated with the update to the record.

For example, in an object status change configuration, the status options for a work order might be 1 = Approved, 2 = In progress and 3 = Complete. If the work order is approved, the value 1 is listed in the first line of the reply email.

Advanced format

In advanced format, the email recipient can update a record and change the attributes of the target object that is specified in the configuration. The attributes can also be changed with or without changing the status of the record in the object status change configuration.

For example, in a workflow assignment the start date and completion date of a workflow task changes. The new start date is 10/01/12 and the new completion date is 12/30/12. The email recipient updates the record by changing the attributes of start date to 10/01/12, and completion date to 12/30/12 in the body of the email.

- [Email variables in email interaction](#)

You use existing communication templates for email interaction. If you choose to create your own communication templates, you must specify variables. All the communication templates except for confirmation and error notification must contain the variables.

Email variables in email interaction

You use existing communication templates for email interaction. If you choose to create your own communication templates, you must specify variables. All the communication templates except for confirmation and error notification must contain the variables.

The Subject field of the communication templates must contain the `@MAILKEY@` variable. The following table shows the variables that you must include in the body of the communication templates for email interaction. You can also include some optional variables to instruct users how to reply to an email or to list the tasks in a work order.

Variable	Purpose	Optional or required	Email format
<i>SELECTIONLIST</i>	Adds a list of number prompts or name-value pairs	Required	Simple and advanced
<i>OBJID</i>	Adds the ID of the object	Required	Simple
<i>GUIDANCE</i>	Adds instructions for how to reply	Optional	Simple and advanced
<i>TASKLIST</i>	Adds the list of tasks on a work order	Optional	Simple and advanced

Examples of email interaction

You use email interaction to send work order and purchasing information to remote users who do not have access to the desktop. The email recipient can change the status of an object or update a workflow assignment. The email recipient changes the status of an object or updates a workflow assignment by specifying a value in an email from a portable device.

Email interaction supports two configurations. Email recipients can reply to an email to change the status of an object or to complete a workflow assignment. For example, an off-site technician can update the status of an assigned work order from Approved to In Progress. For both configurations, email interaction has two email format types. In the simple format, the email recipient can change the status of an object or accept or reject a workflow assignment. In the advanced format, the email recipient can modify attributes that are associated with an object status change or workflow assignment. For example, the user can change the start date, completion date, priority level, or description.

- [Example: Enabling email updates to purchase orders](#)

A system administrator wants to enable an assessor, who works in the field and does not have access to a desktop, to update the status of a purchase order.

- [Example: Enabling email updates to workflow assignments](#)

A system administrator wants to ensure that a supervisor, who does not have access to a desktop, can approve or reject workflow assignments. The system administrator also wants the supervisor to be able to change the start date and completion date of the workflow assignment.

Example: Enabling email updates to purchase orders

A system administrator wants to enable an assessor, who works in the field and does not have access to a desktop, to update the status of a purchase order.

Before you begin

To configure email interaction, you must have an email client, SMTP mail server, a user ID, and a password for email authentication. Because you are only updating purchase orders, you must set the Email format field of the People application to simple. Existing communication templates and escalations are provided for email interaction. For example, you can use the template for the email that notifies the assessor that the purchase order is complete.

About this task

A system administrator works in the head office of a large public insurance company. Some of the company's employees travel long distances, from the company headquarters to remote sites around the country. Maria, an assessor, who travels to remote sites to assess the progress of purchase orders, does not have access to a desktop. Maria does have email access from a mobile device. Email interaction setup allows Maria to communicate back, to the system administrator, the status of the purchase order. The customer service department can then pass information about the job to the customer.

Procedure

1. In the Systems Properties application, specify the address of the mail server as `mail.smtp.host` your user ID as `mxe.smtp.password`, and password as `mxe.smtp.password` for email authentication.

2. In the E-mail Listener application, enter your E-mail Address, E-mail Password, and Mail server. The protocol is a standard pop3 account.
 - a. In the Select Security Settings window, create a row and specify the SR object.
 - b. In the Select Security Settings window, select the PURCHASEORDER object that is associated with the status update.
 - c. Activate the email listener and MFMAILCLEAN cron task.
3. To find existing templates, in the Communications Template application, search for MFMAIL in the Template field.
 - a. The MFMAILSENDWO template is an existing template, for the first email that is sent to Maria when the purchase order is approved.
 - b. In the MFMAILRESCOMPWO, MFMAILRESNOSTWO, MFMAILRESWO, MFMAILSMPREJ templates, specify the address of the email listener in the Send from field.
 - c. Do not specify a recipient in the communication templates. The role is specified in the Send to field in the configuration.
4. In the Escalations application, open the MFMAILSENDWOM escalation.
 - a. For object status change configurations, you must include status as one criteria of the condition query. The status in the escalation, must be the same status that is specified in the first email.
 - b. Specify the custom class for object status change as `com.ibm.tivoli.maximo.mfmail.MfMailSTSendAction`.
5. In the Email Interaction Setup application, choose status for the configuration type and complete the fields.
 - a. In the Task Completion Notification Template field of the object status change configurations window, specify MFMAILRESCOMPWO in the row where you assign the selection value.
 - b. In the Status Change Response Template field of the Selection Values window, specify MFMAILRESWO in the row where you assign the selection value for accepting the status update.
 - c. In the Status Change Response Template field of the Selection Values window, specify MFMAILRESNOSTWO in the row where you assign the selection value for reminding Maria to change the status of the purchase order.
 - d. In the Status Change Response Template field of the Selection Values window, specify MFMAILSMPREJ in the row where you assign the selection value for rejecting the status update.
 - e. Validate and activate the configuration.

Results

When a purchase order is approved, Maria receives an email with a request to update the status of the purchase order. When Maria arrives at the remote site, the purchase order is already started. Maria sends a reply email that updates the status of the purchase order to, in progress. Maria then receives another email that requests the status of the purchase order to be updated. When the purchase request is complete, Maria sends back a reply email that updates the status of the purchase order to 'complete'. Maria receives a final email to confirm that the status of the purchase order is complete.

Example: Enabling email updates to workflow assignments

A system administrator wants to ensure that a supervisor, who does not have access to a desktop, can approve or reject workflow assignments. The system administrator also wants the supervisor to be able to change the start date and completion date of the workflow assignment.

Before you begin

Configuring email interaction requires an SMTP mail server with an administrator account for authentication. To allow a supervisor to change the attributes of the workflow assignment, in the record for the user in the People application, in the Email Format field must be set to Advanced. The default value for the field is advanced, so in this example, the system administrator does not change this field. Existing communication templates are provided for email interaction. For example, a template for the email that notifies the supervisor that the workflow assignment was approved is provided.

About this task

In a large textiles company, every work order in a workflow must be approved by Marco, the head supervisor. The company has a large factory floor and Marco is often on the floor without access to a desktop. The system administrator wants to configure email interaction so that when a work order is created, Marco receives an email on the portable device that he carries. The system administrator wants Marco to be able to reply to the email to approve or reject the work order. Also, due to a busy schedule, Marco must frequently delay the start date of work orders. The system administrator wants Marco to be able to edit the email to change the start date and completion date of the workflow assignment.

Procedure

1. In the Systems Properties application, specify the address of the mail server as `mail.smtp.host`, your user ID as `mxe.smtp.password`, and the password as `mxe.smtp.password` for email authentication.
2. To find existing templates, in the Communications Templates application, search for MFMAIL in the Template field.
 - a. In the MFMAILSENDWFA1, MFMAILRESCOMPWF, and MFMAILRESREJWF1 templates, in the Send from field, specify the address of the E-mail Listener.
 - b. Do not specify a recipient in the communication templates. The role is specified in the Send to field in the configuration.
3. In the E-mail Listener application, enter `MFMAILRCV` for the workflow process.
 - a. In the Select Security Settings window, create a row and specify the SR object.
 - b. In the Select Security Settings window, create a row and specify the target object that is associated with the email notification.
 - c. Activate the email listener and MFMAILCLEAN cron task.
4. In the Workflow Designer application, open the task node properties and in the Communication template field, specify `MFMAILSENDWFA1`. The MFMAILSENDWFA1 template is an existing template for the first email that is sent to Marco when a work order is created.
5. In the Escalations application, open and modify the MFMAILSENDWFM escalation. This escalation has an escalation point and an action that starts email interaction.
 - a. Modify the SQL query in the escalation to specify the workflow process that sends the first email.
 - b. Specify the custom class as `com.ibm.tivoli.maximo.mfmail.MfMailWFSEnder`.
6. In the Email Interaction Setup application, specify `Workflow` for the configuration type and complete the fields.
 - a. In the Workflow Assignment configurations window, in the Task Completion Notification Template field, specify `MFMAILRESCOMPWF`.

- b. In the Selection Values window, in the Workflow Change Response Template field, specify MFMAILRESCOMPWF in the row where you assign the selection value for accepting the work order.
- c. In the Workflow Change Response Template field, specify MFMAILRESREJWF1 in the row where you assign the selection value for rejecting the work order.
- d. Select the Validate and activate action.

Results

When a work order is created in a workflow, Marco receives an email with a request to approve or reject the work order. Marco can reply to the email to change the start date and completion date. Marco receives a second email with a request to approve or reject the work order. Marco replies to approve the work order and receives one final email that confirms that the choice was processed.

Configuring updates by using email interaction

You configure email interaction to ensure that users who do not have access to a desktop computer can change the status of objects or workflow assignments.

Before you begin

The configuration tasks require a mail server, a user ID, and password for email authentication. Set up an email client or use an existing client to communicate with the specified mail server.

Procedure

1. In the People application, in the Email format field, select the email format for email interaction.
2. In the Systems Properties application, specify the mail server and the user ID and password for email authentication.
3. In the Communications Template application, create communication templates for email interaction.
 - Search for MFMAIL in the Template field to find existing templates.
 - a. In each template that you identified for email interaction, in the Send from field, specify the address of the email listener.
 - Do not specify a recipient in the communication templates. The role is specified in the Send from in the Email Interaction Setup application.
4. In the Email Listener application, in the Workflow Process field, enter MFMAILRCV.
 - a. In the Select Security Settings window, create a row and specify the SR object.
 - b. In the Select Security Settings window, create a row and specify the target object that is associated with the email notification.
 - c. Activate the email listener and the MFMAILCLEAN cron task.
5. Optional: If you are using email interaction for a workflow assignment, open the Workflow Designer application. Open the Task node properties window and in the Communication template field, specify the communication template for the first email that is sent to the user.
6. In the Escalations application, create an escalation for email interaction.
 - Search for MFMAIL in the Escalation field to find existing escalations.
 - a. Optional: For object status change configurations, specify **status** as one of the criteria for the condition query.
 - b. Modify the SQL query in the escalation to specify the status or workflow process that sends the first email.
 - c. Specify a custom class depending on the type of configuration:

Option	Description
Object status change	com.ibm.tivoli.maximo.mfmail.MfMailSTSendAction
Workflow assignment	com.ibm.tivoli.maximo.mfmail.MfMailWFSEnder

7. In the Email Interaction Setup application, complete the fields to identify the type of configuration, specify the communication templates, and assign number prompts.
8. Select the validate and activate action.

Managing cron tasks

Cron tasks are behind-the-scene jobs that run automatically and on a fixed schedule. Predefined cron tasks support scheduling activities such as generating preventive maintenance work orders and reordering inventory items on schedules. Predefined cron tasks are provided, and you can also create your own cron tasks.

- [Cron task setup overview](#)
You can reschedule cron tasks and change parameter values without stopping and restarting the server. You can create cron tasks and cron task instances, remove cron tasks or cron task instances, and change cron task parameters.
- [Working with cron tasks](#)
Cron tasks are behind-the-scene jobs that run automatically and on a fixed schedule. You can create or change cron tasks.

Cron task setup overview

You can reschedule cron tasks and change parameter values without stopping and restarting the server. You can create cron tasks and cron task instances, remove cron tasks or cron task instances, and change cron task parameters.

- [Preexisting cron tasks](#)
There are cron tasks that are supplied by the product and are set up to run scheduled jobs on the system server. Cron tasks are behind-the-scene jobs that

- run automatically and on a fixed schedule.
- [Access levels for cron tasks](#)
Access levels determine what users can do when they are using the Cron Task Setup application.
- [Cron task parameters](#)
The cron task class file lists parameters. Parameter tables store parameter values for cron task instances.
- [Instances of cron tasks](#)
An instance is a copy of a cron task that you can change to meet your business needs. You can create multiple instances for each cron task.
- [Owner and Issuer for cron task instance](#)
You might want to set different owner and issuer for different cron task instances. For example, some user wants to have issuer as <varname>saml</varname> and owner as <varname>scim</varname> and others want to have issuer as <varname>saml</varname> and owner as <varname>local </varname> to be able to manage users in <keyword conref="..../shared/conrefs.dita#conrefs/prodname_imas_short"/>.

Preexisting cron tasks

There are cron tasks that are supplied by the product and are set up to run scheduled jobs on the system server. Cron tasks are behind-the-scene jobs that run automatically and on a fixed schedule.

The following table describes the cron tasks that are supplied by the product. All these cron tasks are set to full access level, except for ESCALATIONS and LSNRCRON (READONLY).

Table 1. Cron tasks that are supplied by the product

Cron task	Description
ReorderCronTask	The reorder cron task determines the rules or parameters for scheduled reordering, direct issue, and inventory items.
PMWoGenCronTask	The preventive maintenance work order generation cron task runs and generates scheduled work orders for planned maintenance.
KPICronTask	This cron task generates key performance indicators.
ESCALATION	The escalation cron task processes escalations to ensure that critical tasks are completed on time.
LSNRCRON	The e-mail listener cron task runs continuously on the application server, and processes inbound e-mail messages through a staging table.
JMSQSEQCONSUMER	This cron task is used by the integration framework to poll the queue.
IFACETABLECONSUMER	This cron task is used by the integration framework to poll the interface tables.
SwSuiteCronTask	This cron task determines whether the software titles in the Deployed Asset application are present.
ReconciliationCronTask	This cron task runs reconciliation tasks that consist of link and comparison rules. These rules are used to determine how assets are performing relative to the discovered data in the Deployed Asset application. Outputs from this task include a RECONLINK table. This table links assets to their counterpart assets and a reconciliation results table that lists the differences between compared assets and deployed assets.
MeasurePointWorkOrderCronTask	This cron task generates work orders when meter readings or measurements reach a condition that is defined in the Condition Monitoring application.
FLATFILECONS	This cron task processes inbound flat files.
XMLFILECON	This cron task processes inbound XML files.
BBCron	This cron task periodically updates the count for the number of bulletin board messages.

Access levels for cron tasks

Access levels determine what users can do when they are using the Cron Task Setup application.

You can set the access level to one of these options:

- FULL enables users to change or delete the cron task definitions and instances.
- MODIFYONLY enables users only to change the cron task.
- READONLY enables users only to view the cron task.

Cron task parameters

The cron task class file lists parameters. Parameter tables store parameter values for cron task instances.

When you create a cron task instance, the parameter names are retrieved from the cron task class file. For each parameter, a row is added to the parameter table for this instance. When instances are initialized and associated parameters are changed, the instances dynamically obtain the changes from the database.

Example

Table 1. Example of CRONTASKPARAMETER table with data for the ReorderCron cron task

CRONTASKNAME	INSTANCENAME	PARAMETER	VALUE
ReorderCronTask	NA	directisse	

CRONTASKNAME	INSTANCENAME	PARAMETER	VALUE
ReorderCronTask	NA	emailto	
ReorderCronTask	NA	ignoreorderpoint	0
ReorderCronTask	NA	leadtime	0
ReorderCronTask	NA	logfile	
ReorderCronTask	NA	storeroom	Nashua
ReorderCronTask	NA	useagreement	1
ReorderCronTask	NA	directisue	
ReorderCronTask	NA	emailto	
ReorderCronTask	NA	ignoreorderpoint	0
ReorderCronTask	NA	leadtime	0
ReorderCronTask	NA	logfile	
ReorderCronTask	NA	storeroom	Central, Bedford
ReorderCronTask	NA	useagreement	1

Instances of cron tasks

An instance is a copy of a cron task that you can change to meet your business needs. You can create multiple instances for each cron task.

You can change the attributes or parameters of a cron task instance. Using this method, the same cron task can perform different functions.

Each instance has an entry in the CRONTASKINSTANCE table. The instance includes the following attributes:

- Set schedule string (defines the schedule for this instance)
- Description
- Flag indicating whether the instance is active
- Datetime field indicating the date and time that the load or reload of the cron task is requested (not displayed to users)
- Run as user ID

If you have a cron task that performs backups, you can create instances to perform backups at different frequencies, such as daily, weekly, or monthly.

Owner and Issuer for cron task instance

You might want to set different owner and issuer for different cron task instances. For example, some user wants to have issuer as `<varname>saml</varname>` and owner as `<varname>scim</varname>` and others want to have issuer as `<varname>saml</varname>` and owner as `<varname>local </varname>` to be able to manage users in `<keyword conref="../shared/conrefs.dita#conrefs/prodname_imas_short"/>`.

Symptoms

During upgrade to Manage, all Maximo® users are synchronized to Maximo Application Suite. You can specify the authentication method, which was used before the upgrade. To specify the authentication method, you must configure MXE_OLDAUTHINTICATION in Manage custom resource. A valid list of values is *local*, which is default, *saml*, and *ldap*. Based on this setting, two user properties are set in Maximo Application Suite:

- Authentication method, which is set to MXE_OLDAUTHINTICATION.
- Owner, which is set to *local* for type *local* and *scim* for values *ldap* and *saml*. If Owner is set to *scim*, the user cannot be changed in Maximo Application Suite because it controls an external repository.

Causes

One setting controls two properties. You might want users to be managed in Maximo Application Suite even if the authentication method is set to *saml* or *ldap*. Also, you might have internal and external users even if all authentication is done in *saml*. In this case, you want to maintain some users in Maximo Application Suite and other users to be external and managed by *ldap*.

Resolving the problem

You can configure Owner and Issuer (authentication type) during user synchronization from Manage to Maximo Application Suite.

To do this, two new cron task parameters are added to the user synchronization MASUSERSYNC cron task:

- Owner
- Issuer

By default, the Owner and Issuer are set to *null* so that the default logic remains the same. It is relayed to MXE_OLDAUTHINTICATION to set authentication method and owner in Maximo Application Suite.

If you want to fix users, which were already sent to Maximo Application Suite, you can fix these users after the initial synchronization. You must reset the MASISSUER column in the MAXUSER table to *null*, setting Owner and Issuer as cron task parameters and starting MASUSERSYNC cron task.

If you create users that use Maximo Integration Framework in Manage and want to synchronize it to Maximo Application Suite, then you can set cron task parameters in the way you want and synchronize new users.

For example, if you want to have the authentication method as *saml* but the user to be managed in Maximo Application Suite, you can set:

Issuer - *saml*

Owner - *local*

Working with cron tasks

Cron tasks are behind-the-scene jobs that run automatically and on a fixed schedule. You can create or change cron tasks.

- [Creating cron task definitions](#)
A cron task definition consists of a name, class name, access level, and description. You can create cron task definitions to meet the specific needs of your organization.
- [Deleting cron task definitions](#)
Cron tasks have a definition that includes name, class name, access level, and description. In the Cron Task Setup application, you can delete cron task definitions that you are no longer using.
- [Working with instances of cron tasks](#)
You can create multiple instances for each cron task. You can also reload instances of cron tasks, and you can delete instances of cron tasks.
- [Disabling cron tasks for a server bundle](#)
Active cron tasks run on all servers in a sequence. In you have multiple server bundles, you can disable a cron task instance on one or more of the bundles to reduce the workload on the bundles.
- [Viewing hidden cron tasks](#)
READONLY cron tasks are hidden. If necessary, you can view these hidden cron tasks.

Creating cron task definitions

A cron task definition consists of a name, class name, access level, and description. You can create cron task definitions to meet the specific needs of your organization.

Before you begin

Create a class file for your custom cron task and package the class file into an Enterprise Application Archive (EAR) file. Then, deploy the EAR file in the application server.

Procedure

1. In the Cron Task Setup application, click New Cron Task Definition.
2. Provide a name for the cron task.
3. In the Class field, enter the name of the cron task class file.
The name is case-sensitive.
4. Specify a value to indicate the level of access that a user has to the cron task.
5. Save the cron task definition.

Deleting cron task definitions

Cron tasks have a definition that includes name, class name, access level, and description. In the Cron Task Setup application, you can delete cron task definitions that you are no longer using.

About this task

The deletion of cron task definitions is based on these rules:

- Cron task definitions with instances or with access levels of READONLY or MODIFYONLY cannot be deleted.
- Cron task definitions must be inactive to be deleted.

Procedure

1. Display the cron task definition that you are deleting.
2. Ensure that the cron task definition has no instances.
3. Select the Delete Cron Task action.

Working with instances of cron tasks

You can create multiple instances for each cron task. You can also reload instances of cron tasks, and you can delete instances of cron tasks.

- **[Creating cron task instances](#)**
Before you can run custom cron tasks, you must create a cron task instance. You can create numerous instances for a single cron task, which allows you to fine-tune these tasks to your business needs.
- **[Copying cron task instances](#)**
After you create a cron task instance, you can copy it and change it. When you copy a cron task instance, the active status, schedule, run as user ID, and parameter values are also copied.
- **[Changing cron task instances](#)**
You can change the attributes or parameter values for a cron task instance to suit your specific needs. You can change the attributes or parameter values without restarting the application server.
- **[Reloading cron task instances](#)**
You use the Cron Task Setup application to reload instances of cron tasks.
- **[Deleting cron task instances](#)**
In the Cron Task Setup application, you can delete cron task instances that you are no longer using. An instance is a copy of a cron task that you can change to suit your business needs.

Creating cron task instances

Before you can run custom cron tasks, you must create a cron task instance. You can create numerous instances for a single cron task, which allows you to fine-tune these tasks to your business needs.

Before you begin

You must have FULL access to the cron task you are creating an instance for. You cannot add new instances to cron task definitions that you have READONLY access or MODIFYONLY access to.

About this task

When you create an instance, the cron task automatically imports a group of associated parameters from the cron task definition. You cannot add new parameters, but you can set parameter values and schedules for each instance.

Procedure

1. In the Cron Task Setup application, select the cron task definition for which you want to create an instance.
2. On the Cron Task tab, click New Row.
3. Specify a name and a schedule for the cron task instance.
The date is shown as a string in the Schedule field. Do not change the string in the Schedule field. Click Set Schedule to change the schedule.
4. Specify a user with the necessary privileges. The user must have access for the actions that the cron task performs.
5. Optional: Select the Active check box.
6. Save your changes.
7. Select the Reload Request action.
8. Select the instance, and click OK.

Copying cron task instances

After you create a cron task instance, you can copy it and change it. When you copy a cron task instance, the active status, schedule, run as user ID, and parameter values are also copied.

Procedure

1. In the Cron Task Setup application, select the relevant cron task instance.
2. Click Duplicate.
3. Provide a name for the cron task instance.
4. Optional: Change additional information.
5. Save your changes.

Changing cron task instances

You can change the attributes or parameter values for a cron task instance to suit your specific needs. You can change the attributes or parameter values without restarting the application server.

Before you begin

Before you change a cron task instance, the instance must have an access level of FULL or MODIFYONLY.

Procedure

1. In the Cron Task Setup application, select the cron task with the instance that you want to change.
2. Click View Details for the instance that you want to change.
3. Change applicable information.
4. Save your changes.
5. Determine if the changes that you made require a reload.
6. Optional: If a reload is required, select the Reload Request action.

Example

You change the schedule on which a cron task runs, suspend a task by making it inactive, or change the run as user ID.

Reloading cron task instances

You use the Cron Task Setup application to reload instances of cron tasks.

Procedure

1. You must reload an instance only in certain situations. These are the possible situations under which you might need to reload an instance.

Option	Description
Reload Request Not Required	<ul style="list-style-type: none">• When switching cron task from Active to Inactive.• Generally, do not submit a reload request after changing parameter values.
Reload Request Required	<ul style="list-style-type: none">• When you change any other attributes on the crontask instance, such as schedule and runasuser.• If the parameter value is cached when crontask instance starts or reloads. Check the parameter field to see if this instance occurs.

2. If a reload is required, select the Reload Request action.
3. In the Reload Request window, select the instances that you want to reload.
4. Click OK.

Deleting cron task instances

In the Cron Task Setup application, you can delete cron task instances that you are no longer using. An instance is a copy of a cron task that you can change to suit your business needs.

About this task

The deletion of cron task instances is based on these rules:

- Cron task instances with access levels of READONLY or MODIFYONLY cannot be deleted.
- Cron task instances must be inactive to be deleted.

Procedure

1. Display the instance that you want to delete.
2. Clear the Active check box to make the instance inactive.
3. Click Mark Row for Delete.

Disabling cron tasks for a server bundle

Active cron tasks run on all servers in a sequence. In you have multiple server bundles, you can disable a cron task instance on one or more of the bundles to reduce the workload on the bundles.

About this task

You can prohibit all or a selected set of instances from running by modifying the bundleLevelProperties property when you deploy the application. You can use a combination of system properties to run a cron task on a server bundle, and exclude a particular instance of that cron task.

For example, the ReorderCronTask and the PMWoGenCronTask are process-intensive. To reduce the workload on a server bundle, you can disable these two cron tasks on that bundle.

If the mxe.crontask.dorun property is left empty, all cron tasks run except for those specified on the mxe.crontask.donotrun property.

If the same cron task is specified on both the mxe.crontask.dorun property and on the mxe.crontask.donotrun property, the mxe.crontask.donotrun property takes priority, and the cron task will not run.

Procedure

1. In the Server bundles section of the deployment panel, select View in the Additional properties column.
2. In the Bundle level properties section of the Additional server bundle properties window, click Add property.
3. Specify the appropriate property name, for example `mxe.crontask.donotrun`.
4. Specify a value for the bundle-level property in the format `crontaskname . instancename`, where *crontaskname* is the name of the cron task and *instancename* is the name of the cron task instance.
For example, if you want to disable a cron task instance on a server bundle, specify `mxe.crontask.donotrun` for the property name and specify a property value such as `ReorderCronTask.ReorderCronTask01`.
5. To implement your changes, redeploy the server bundle.

Viewing hidden cron tasks

READONLY cron tasks are hidden. If necessary, you can view these hidden cron tasks.

Procedure

1. In the Cron Task Setup application, delete FULL from the Access field.
2. Press Enter to view the hidden cron tasks.

Managing domains

To help ensure consistent and valid data input, some fields in the product are associated with domains. Domains enable users to select appropriate values. Administrators can add values to existing domains or add domains.

- [Domains overview](#)
You can add domains or modify existing ones to ensure consistent and valid data input. Domains can standardize data and reduce input errors.
- [Working with domains](#)
You use domains to select or enter valid values for certain fields. The defined values are specified by domains. Many domains are used in the product's applications.
- [Applications associated with domains](#)
After you create a domain, you need to apply the domain to an attribute. You use the Classifications, the Database Configuration, and the Application Designer applications to apply and to modify domains.

Domains overview

You can add domains or modify existing ones to ensure consistent and valid data input. Domains can standardize data and reduce input errors.

Domains are used throughout the product. They validate entered field values, provide lookup lists from which users can select field values, and can copy data sets or values to fields. Table domains allow you to choose values from another table in the product. Crossover domains allow data from a source table to be copied into the application that you are working in.

If invalid data is entered into a field, an error message is displayed. For crossover and table domains, by using the Database Configuration application, you can customize messages to provide more assistance about selecting valid values.

You can add ALN, Numeric, Numeric Range, Table, and Crossover domains. You can add synonym values to Synonym domains. After adding or modifying domains, additional tasks are typically required. For example, you associate a new domain with an extra attribute in the Database Configuration application and apply the configuration changes. Then, in Application Designer, you can add a control for the attribute and associate it with a lookup list.

If you add a pick list to an attribute in the Classifications application, the changes do not need to be configured further.

- [Types of domains](#)
There are several types of domains that are used in the product. Domains define the values that are allowed in fields. They can be available in lookup list dialog boxes that are also referred to as *Select Value* lists. Domains also define the values that can be typed directly in a field. Domains helps ensure that valid and consistent data is entered and reported on. Domains are used throughout the product.
- [Domains and organizations or sites](#)
Applying domains to the organization or site level (by typing appropriate values in the organization field and site field) might create unintentional access restrictions. Leaving these fields blank is the default, and stores domains at the system level.

Types of domains

There are several types of domains that are used in the product. Domains define the values that are allowed in fields. They can be available in lookup list dialog boxes that are also referred to as *Select Value* lists. Domains also define the values that can be typed directly in a field. Domains helps ensure that valid and consistent data is entered and reported on. Domains are used throughout the product.

You can add or edit all types of domains except synonym domains, which can only be edited. You can work with the following types of domains:

ALN

A static list of alphanumeric values.

Numeric

A static list of numeric values.

Numeric range

A list of numeric values that you define by specifying a range.

Synonym

These are special, reserved domains that list internal values used by the product's business logic. You cannot add or delete synonym domains or internal values but you can add synonym values that are presented to the user.

Table

A list of values that are chosen from another table. The data in the other table can change frequently.

Crossover

A special table domain in which the values from another table are copied (or crossed over) and brought into the application where the user is working.

Internal domains

Some domains are used by the business logic of the product. These domains are called *internal* domains. You can modify only the description of the internal domain and internal domain values.

- [ALN domains](#)
Alphanumeric, or ALN, domains are simple lists of values that use one of the alphanumeric data types: ALN, UPPER, and LOWER. They are typically used for static lists of values that rarely change.
- [Numeric domains](#)
Numeric domains are static lists of numeric values that rarely change.
- [Numeric range domains](#)
A numeric range domain is a domain that uses any of the numeric data types, but does not contain individual values. Instead, they specify valid ranges of values.
- [Crossover domains](#)
Crossover domains are similar to table domains because they validate a field value against another table in the product. However, crossover domains allow data from the other table to be copied into fields in the current application. For example, you can return the serial number of an asset from the ASSET table to a field in the Item Master application.
- [Synonym domains](#)
Synonym domains are special domains that are reserved by the system. Their internal values are used by the business logic of the product. You cannot add internal values to synonym domains, but you can add synonyms to an internal value and display the synonym to the user.
- [TABLE domains](#)
TABLE domains are dynamic sets of values based on the values in a column of a table. This means that they allow fields in one application to be validated against other fields in the product.
- [Foreign keys and TABLE domains](#)
Using domains, you can create a foreign key from a system level for site-level or for organization-level objects.

ALN domains

Alphanumeric, or ALN, domains are simple lists of values that use one of the alphanumeric data types: ALN, UPPER, and LOWER. They are typically used for static lists of values that rarely change.

ALN domains can only be edited in the Domains application.

Example

Your company requires that calendar information is consistent because the data is used in reports and audits. You create a list of valid values for days of the week or months of the year.

Numeric domains

Numeric domains are static lists of numeric values that rarely change.

A length and scale are always specified for these domains and should match the attribute you link them to. They can only be edited in the Domains application.

Examples of numeric domain lists include amounts in currency, decimal values, durations in hours, integer values, small integer values, and floating values.

Numeric range domains

A numeric range domain is a domain that uses any of the numeric data types, but does not contain individual values. Instead, they specify valid ranges of values.

You can specify the following kinds of ranges:

Discrete

A range with a defined interval between values, for example, a range from 0 to 10, with valid values 0, 2, 4, 6, 8, and 10. The interval in this example is 2.

Continuous

A range within which any value that satisfies the data type is valid. For example, in a range of 1 to 6 with a decimal data type and scale of 2, values such as 1, 1.03, 2.14, 3, 4.73, 5.2, and 6 are all valid. The interval in this example is null (no value in the Interval field).

A length and scale are always specified for these domains and should match the attribute you link them to.

You cannot create lookups for numeric range domains. Add meaningful help in the attribute's Description field to help users choose valid values. Also, consider the types of values a user or automated process normally enter into a field with their type of domain. An invalid value results in an error message.

Numeric ranges with more than one segment

You might use multiple segments in your numeric range domain for various reasons. Here are two examples:

- You want to define a measurement range for meter readings that is more precise at low measurements than at high measurements. You define three segments:
Segment 1: minimum 0, maximum 0.8, interval 0.2, resulting valid values, 0, 0.2, 0.4, 0.6, 0.8
Segment 2: minimum 1, maximum 9, interval 1, resulting valid values 1, 2, 3, 4, 5, 6, 7, 8, 9
Segment 3: minimum 10, maximum 30, interval 5, resulting valid values 10, 15, 20, 25, 30

A user or automated process would always enter one of those values.

- You want values inserted into a field only if the reported values are beyond the accepted normal range. For example, meter readings could be above or below the accepted tolerances. You can define two segments:
Segment 1: minimum 0, maximum 9.9, interval null. Any reading between 0 and 9.9 could be entered.
Segment 2: minimum 20.1, maximum null, interval null. Any reading of 20.1 or higher could be entered.

Meter readings from 10 and 20 would not be recorded.

Crossover domains

Crossover domains are similar to table domains because they validate a field value against another table in the product. However, crossover domains allow data from the other table to be copied into fields in the current application. For example, you can return the serial number of an asset from the ASSET table to a field in the Item Master application.

When you create a crossover domain, you can specify one or more conditions that must be met before values are returned from a source object. You can define conditions for the source object and the destination object, and if the conditions are met, values are returned to the destination field. You use the Conditional Expression Manager to define conditions for crossover domains.

To learn more about data structures and relationships, you can view information in the Object Structures application.

Be aware of the level at which data is used. For example, an asset is added at the site level, so it is possible that identical asset identifiers are used in more than one site. If you add a clause to select an assetnum, you also specify a site identifier.

Order of fields and conditions on crossover domains

If you define conditions on crossover domains in custom applications, carefully consider the order that users scan through the fields. When you define a condition, the condition is evaluated at the moment the value for the attribute is set. If a condition relates to another field with a value that has not been set, values are not returned as expected. For example, this situation might occur due to the order of the layout of the application interface.

Example: Serial number crossover

You want to add a serial number (the destination) to a work order. You want the serial number to cross over from the serial number of the related asset, the source, when the work type is emergency maintenance, the condition. Select the work type before you select the asset number for the crossover to occur as expected.

Synonym domains

Synonym domains are special domains that are reserved by the system. Their internal values are used by the business logic of the product. You cannot add internal values to synonym domains, but you can add synonyms to an internal value and display the synonym to the user.

Synonym domains are common and are often found on status and type fields. An example of a synonym domain is work order status. The internal values of the domain include APPR (Approved), CAN (Canceled), CLOSE (Closed), COMP (Completed), WAPPR (Waiting on Approval), and others. You can add synonyms of the internal values that fit your business needs.

Example: Synonym values for WAPPR (Waiting on Approval)

Your company requires two people to approve a work order with costs over \$300.00. You add synonym values for the internal WAPPR value to indicate the next role to approve the work, such as WAPPRMAN and WAPPRVP. The work manager puts the work order in WAPPRMAN status and the approving manager puts the work order in WAPPRVP status. The vice president has final approval and puts the work order into APPR status.

TABLE domains

TABLE domains are dynamic sets of values based on the values in a column of a table. This means that they allow fields in one application to be validated against other fields in the product.

The domain specifies the object that you want to validate against. It also specifies a Validation WHERE clause that defines the 1:1 relationship to a record in the child table object.

To learn more about data structures and relationships, you can view information in the Object Structures application.

Be aware of the level at which data is used. For example, an asset is added at the site level, so it is possible that identical asset identifiers are used in more than one site. For that reason, when you add the clause to select the assetnum, you also specify a site identifier.

Example

You can use a TABLE domain to present a valid list of records from the PERSON table to be typed in the OWNER field on a service request.

Foreign keys and TABLE domains

Using domains, you can create a foreign key from a system level for site-level or for organization-level objects.

Example

If you want to add a new attribute for assets on the TKTEMPLATE object, perform the following steps:

1. Create a TABLE domain.
2. Add the assetnum attribute to the TKTEMPLATE.
3. Add a relationship to the asset table.
4. Add the attribute siteid to TKTEMPLATE.

Domains and organizations or sites

Applying domains to the organization or site level (by typing appropriate values in the organization field and site field) might create unintentional access restrictions. Leaving these fields blank is the default, and stores domains at the system level.

Example one

When you specify an organization or site for domain values, note where the domain is being used.

In the Labor application, you use the SKILLLEVEL domain on the CRAFTSKILL object. You specify both the organization and site values for domain values. When you access the Labor application and lookup the skill level, you do not see your values. This issue occurs because you specified a site, and the object that is using the domain is at the organization level. To fix this problem, remove the site from the domain value.

Example two

You might want to leave the organization field and site field empty for all values (users in all organizations and sites can access them). If you specify an organization or site for one value, you must specify an organization or site for all values (users in the specified organizations or sites can access them).

Otherwise, complicated outcomes can result. For example, you can set an organization with the following domain values:

Table 1. Sample domain setup with specific organizations

Value	Organization
GREEN	A
BLUE	B
RED	(No organization specified)

With this domain configuration, you get the following results:

- Records in Organization A can access GREEN only.
- Records in Organization B can access BLUE only.
- Records in other organizations (other than Organization A and Organization B) can access RED only.

Working with domains

You use domains to select or enter valid values for certain fields. The defined values are specified by domains. Many domains are used in the product's applications.

In some cases, you can specify error messages that users see when an invalid value is entered.

Work with the application in your nonproduction environment, and then import the changes to your production environment.

If you add or modify a domain, existing records are not validated or changed unless a user edits the value in a field. Your users are helped to enter valid values by the information that you specify in the Attribute Description field.

A new domain can be linked to an attribute in the Database Configuration application. Domains can also be specified on classification attributes to provide pick lists for users. Domains that are added to classification attributes do not require further configuration.

When a field is linked to a domain, you can show a lookup indicator on the field. Configure that control to specify a lookup list in Application Designer. The lookup definition and format are defined in the Lookups.xml file. In Lookups.xml, you can add lookups to select the displayed columns, and can add sorting and filtering as you require. You can export the Lookups.xml file from Application Designer, modify it, and import and test the changes.

Work with these applications in your nonproduction environment, and import the changed files to your production environment.

- [Adding alphanumeric domains](#)
You add an alphanumeric (ALN) domain when you want to add a domain that uses one of the alphanumeric data types.
- [Adding numeric domains](#)
You add a numeric domain when you want to add a domain that uses one of the numeric data types.
- [Adding numeric range domains](#)
You add a numeric range domain when you want to add a domain that uses one of the numeric data types. However, you specify a range rather than specific values.
- [Adding table domains](#)
You add a table domain when you want to draw a single, dynamic value directly from a column in the database. This process creates a dynamic value list because the values it draws from the database might change. For example, you want to associate a lookup list with an extra field that the product provides.
- [Adding crossover domains](#)
You add a crossover domain when you want to return a value from a field in one application to a field in another application.
- [Associating domain values with conditions](#)
You can associate ALN, synonym, and numeric domain values with a condition to limit the number of values available to users for conditions such as status, priority, and asset. This association ensures that only users determined by you can set certain statuses, change the priority of work orders, and so on.
- [Creating synonyms of internal values](#)
You can create synonyms of internal values so that you can present different values to users based on your business needs.
- [Deleting synonyms of internal domain values](#)
You can delete a synonym of an internal value when it is no longer useful.
- [Deleting domains](#)
You can delete most domains when they are no longer useful.

Adding alphanumeric domains

You add an alphanumeric (ALN) domain when you want to add a domain that uses one of the alphanumeric data types.

About this task

Work with the application in your nonproduction environment, and then import the changes to your production environment.

Because you can use a domain with multiple fields, the length you specify must be less than or equal to the length of the shortest field with which you intend to use the domain. For example, if you want to use the domain with three fields of lengths 8, 10, and 12, specify a length of 8 or less. If you specify a length greater than the field the domain is used in, you cannot assign the domain to the attribute in the Database Configuration application. Alternatively, you can specify a greater length in the Domains application and use the Database Configuration application to change the length of the field that uses the domain.

Procedure

1. Open the Domains application.
2. At the bottom of the Domains table window, click Add New Domain and select Add New ALN Domain.
3. In the Domain field, specify a name for the domain.
4. In the Description field, type a short description for the domain.
5. In the Data Type field, specify a data type for the domain.
6. In the Length field, specify a length that is equal to or less than the length of the field that uses the domain.
For example, if you are adding a domain for a field in the Assets application that has a length of 12, then specify a length of 12.
7. Click New Row.
8. Fill the Value and Description fields.
9. Optional: Apply a domain value to a specific organization or site by entering the relevant values in the Organization and Site fields.
Domains are applied at the system level by default.
You can leave the Organization and/or Site fields empty for all values so that users in all organizations and sites can access them. Or you could specify an organization and/or site for all values so that only the users in the specified organizations and/or sites can access them. Otherwise, complicated outcomes can result.

For example, if you enter a value RED with no organization specified, a value GREEN with Organization A specified, and a value BLUE with Organization B specified, then records in Organization A has access to GREEN only. Records that are in Organization B has access to BLUE only. Records that are in other organizations has access to RED only. When you specify an organization and/or site for one value, records in that organization and/or site no longer have access to values that have no organization or site specified.

- Optional: Click New Row again to add more values.
- Click OK.

What to do next

After you add a domain, you might still have several tasks to perform, depending on the domain and how you want to display it. In the Classifications application, you can associate an ALN domain with an attribute in the Attributes table window. No further configuration is needed.

If you use a domain in any other context, adding a domain requires additional tasks:

- Associate the new domain with an attribute in the Database Configuration application.
- Configure the database in the Database Configuration application.
- Use the Application Designer application to modify the user presentation as needed. For example, if you add an ALN domain to a field, you must add a Select Value control. New crossover domains might require new fields in the destination application.

Adding numeric domains

You add a numeric domain when you want to add a domain that uses one of the numeric data types.

About this task

Because you can use a domain with multiple fields, the length that you specify here must be less than or equal to the length of the shortest field with which you use the domain. For example, if you want to use the domain with three fields of lengths 8, 10, and 12, specify a length of 8 or less for the domain. If you specify a length greater than the field the domain is used in, you are not able to assign the domain to the attribute in the Database Configuration application. Alternatively, you can specify a greater length in the Domains application. You can use the Database Configuration application later to change the length of the field that uses the domain.

Procedure

- In the Domains application, in the Domains table window, add a domain and select Add New NUMERIC Domain.
- Specify a name, description and data type.
- Depending on the data type the Length field might or might not be editable. If editable, specify a length that is equal to or less than the length of the field that uses the domain.
For example, if you are adding a domain for a field in the Assets application that has a length of 12, then specify a length of 12.
- For Decimal data type only, in the Scale field, specify a scale value if different from the default, 2.
- Insert a row for a new range segment, and add a segment name, range minimum and maximum values, and interval for that segment.
- Optional: Apply a domain value to a specific organization or site by specifying values in the Organization and Site fields.
If no organization or site is specified, the domain is available to all users.
For example, if you enter a value 100 with no organization specified, a value 300 with Organization A specified, and a value 500 with Organization B specified, then records in Organization A have access to 300 only. Records that are in Organization B have access to 500 only. Records that are in other organizations have access to 100 only. Once you specify an organization and/or site for one value, records in that organization and/or site no longer has access to values that have no organization/site specified.
- Optional: Insert rows for more segments.
- Save your changes.

What to do next

After you add a domain, you might still have several tasks to perform, depending on the domain and how you want to display it. In the Classifications application, you can associate a domain with an attribute in the Attributes table window, and no further configuration is needed.

If you use a domain in any other context, adding a domain requires additional tasks.

- Associate the new domain with an attribute and apply changes in the Database Configuration application.
- Configure the database in the Database Configuration application.
- Use the Application Designer application to modify the user interface as needed. For example, if you add an ALN domain for a field, you must add the Select Value control. New crossover domains might require new fields in the destination application.

Adding numeric range domains

You add a numeric range domain when you want to add a domain that uses one of the numeric data types. However, you specify a range rather than specific values.

About this task

Because you can use a domain with multiple fields, the length that you specify here must be less than or equal to the length of the shortest field you use the domain with. For example, if you want to use the domain with three fields of lengths 8, 10, and 12, specify a length of 8 or less for the domain. If you specify a length greater than the field the domain is used in, you cannot assign the domain to the attribute in the Database Configuration application. Alternatively, you can specify a greater length in the Domains application. You can use the Database Configuration application later to change the length of the field that uses the domain.

Procedure

1. In the Domains table window of the Domains application, add a domain and select Add New NUMERIC RANGE Domain.
2. Specify a name and description for the domain.
3. Specify a data type for the domain.
4. Depending on the data type, the Length field might or might not be editable. If the field is editable, specify a length that is equal to or less than the length of the field that uses the domain.
For example, if you are adding a domain for a field in the Assets application that has a length of 12, then specify a length of 12.
5. For DECIMAL data type only, in the Scale field, specify a scale value if different from the default, 2.
6. Click New Row and fill the following fields.
Each row defines a range.

Field	Description
Range Segment	Specify an identifying number for the segment. For example, 1 if the range has just one segment, or 1, 2, or 3 if the domain has three segments. For a range with regular intervals or a simple continuous range, you need only one segment.
Range Minimum	Specify the lowest value in the range, for example, 10 in the range 10 - 50. You can leave either the Range Minimum field or the Range Maximum field empty (null value), but not both.
Range Maximum	Specify the highest value in the range, for example, 50 in the range 10 - 50. You can leave either the Range Minimum field or the Range Maximum empty (null value), but not both.
Interval	For a range with discrete values, specify the value of the interval that separates the values you want to appear in the list. For example, the interval is 10 in the range 10 - 50 if you want the values 10, 20, 30, 40, and 50 to be valid. For a continuous range of values between the minimum and maximum values, leave this field null (empty). Continuous is relative to the data type. For example, if the data type is INTEGER and the range is 1 - 5, then only 1, 2, 3, 4, and 5 are valid values.

7. Optional: Apply a domain value to a specific organization or site by specifying values in the Organization and Site fields.
Domains are applied at the system level by default.
You might want to leave the Organization and/or Site fields empty for all range segments so that users in all organizations and sites can access them. Or you might specify an organization and/or site for all range segments so that only users in the specified organizations and/or sites can access them.
8. Optional: Click New Row again to add ranges for more segments.
9. Save your changes.

What to do next

After you add a domain, you might have several tasks to perform, depending on the domain and how you want to display it.

- Associate the new domain with an attribute in the Database Configuration application.
- Configure the database in the Database Configuration application.
- Use the Application Designer application to modify the user interface as needed. For example, if you add an ALN domain for a field, you must add the select value button. New crossover domains might require new fields in the destination application.

Adding table domains

You add a table domain when you want to draw a single, dynamic value directly from a column in the database. This process creates a dynamic value list because the values it draws from the database might change. For example, you want to associate a lookup list with an extra field that the product provides.

About this task

Table domains differ from crossover domains in that crossover domains are used for copying multiple dynamic values from a table.

Procedure

1. In the Domains application, in the Domains table window, add a domain and select Add New TABLE Domain.
2. Specify a unique identifier and a description for the domain.
3. Insert a row and complete the following fields.
You can learn more about the data structures and relationships in the product in the Object structures application.

Field	Description
Object	Specify the name of the object that contains the attribute from which you want to create a domain. For example, to obtain values from the ASSET object, specify ASSET.
List Where Clause	The filter that specifies additional criteria that limits the values returned to the lookup list. For example, to select asset records that begin with the numbers 114, type: <code>assetnum like '114%'</code> Note: Your entry is not validated now for syntax or any other errors. Be sure that you specified a valid WHERE clause. If you make errors, errors do not become apparent until you configure the database.

Field	Description
Validation Where Clause	<p>The 1:1 relationship to a value in the child object, which is specified in the Object field. In the WHERE clause, specify the child attribute first. Then specify the source attribute, prefixed with a colon.</p> <p>Be aware of the level at which data is used. For example, an asset is added at the site level, so it is possible that identical asset identifiers are used in more than one site. The clause to select the assetnum should also specify a site identifier.</p> <p>For example, if you want a field named Z (attribute Z) to contain values from the assetnum field in the Assets application for the Concord site, type: <code>assetnum = :z and siteid =:Concord</code>.</p>

4. Optional: Specify a group value and a key value to select an error message to display when domain validation fails. You define values for error messages in the Database Configuration application.
 - a. In the Error Message Group field, specify the group value of the error message.
 - b. In the Error Message Key field, specify the key value of the error message.
5. Optional: Apply a domain value to a specific organization and site by specifying values in the Organization and Site fields. Domains are applied at the system level by default. You can allow users in all organizations and sites to access the values by leaving the Organization and Site fields empty.
6. Optional: Add more rows.
7. Save your changes.

What to do next

After you add a domain, you might still have several tasks to perform, depending on the domain and how you want to display it.

In the Classifications application, you can associate a domain with an attribute in the Attributes table window. Specify the table attribute and lookup name. No further configuration is needed.

If you use a domain in any other context, adding a domain requires any of the following tasks:

- Associate the new domain with an attribute in the Database Configuration application.
- Configure the database in the Database Configuration application.
- Modify the presentations as needed with the Application Designer application. For example, if you add an ALN domain for a field, you must add a Select Value control. New crossover domains might require new fields in the destination application.

Adding crossover domains

You add a crossover domain when you want to return a value from a field in one application to a field in another application.

About this task

Ensure that the SQL statements that you use in this procedure are valid. The application does not validate SQL statements.

Procedure

1. Open the Domains application.
2. In the Domains table window, add a domain and select Add New CROSSOVER Domain.
3. Specify a name and description for the domain.
4. In the Crossover Domain table window, insert a row and define details for the crossover domain:

Field	Description
Object	Select the name of the object that contains the attribute that you want to create a domain from. For example, to obtain values from the ASSET object, select ASSET.
Validation Where Clause	<p>The 1:1 relationship to a value in the child object, which is specified in the Object field. In the WHERE clause, specify the child attribute first. Then specify the source attribute, prefixed with a colon.</p> <p>Be aware of the level at which data is used. For example, an asset is added at the site level, so it is possible that identical asset identifiers are used in more than one site. The clause to select the assetnum should also specify a site identifier.</p> <p>For example, if you want a field named Z (attribute Z) to contain values from the assetnum field in the Assets application for the Concord site, type: <code>assetnum = :z and siteid =:Concord</code>.</p>
List Where Clause	<p>The filter that specifies additional criteria that limits the values returned to the lookup list.</p> <p>For example, to select asset records that begin with the numbers 114, type: <code>assetnum like '114%'</code></p>

5. Optional: Specify a group value and a key value to select an error message to display when domain validation fails. You define values for error messages in the Database Configuration application.
6. Optional: To apply a domain to a specific organization or site, specify values in the Organization and Site fields. To allow access to users in all organizations and sites, clear all values from these fields.
7. Select fields for the crossover domain:
 - a. In the Crossover Fields table window, add a row.
 - b. In the Source Field list, select an attribute of the object that you specified in the Object field. This attribute represents the field from which you want to return values.
 - c. In the Destination Field text box, specify the field to which you want values to be returned.
 - d. Optional: Select the Accept NULL Value checkbox to copy the value from the source field when the value of the target attribute is empty. This function overwrites the previous value.
 - e. Optional: Select the No Overwrite checkbox to copy the value of the source attribute when it is null.
8. Optional: Specify conditions for the source object or the destination object, or both:

- a. In the Condition on Source field, select a condition or use the Conditional Expression Manager to build the condition for the source object of the crossover.
If a condition is specified, the source object must meet the condition before the crossover occurs.
 - b. In the Condition on Destination field, select a condition or use the Conditional Expression Manager to build the condition for the destination object of the crossover.
If a condition is specified, the destination object must meet the condition before the crossover occurs.
 - c. In the Sequence field, type a numeric value to specify the order that the crossover occurs when multiple crossovers are defined.
Crossovers with lower values occur before crossovers with higher values.
9. Save your changes.

What to do next

After you add a domain, you might still have several tasks to perform, depending on the domain and how you want to display it. In the Classifications application, you can associate a domain with an attribute in the Attributes table window, and no further configuration is needed.

If you use a domain in any other context, adding a domain requires additional tasks.

- In the Database Configuration application, associate the new domain with an attribute and configure the database. After you onboard a tenant, the tenant can change the domains that you provide or create their own domains. These domains are tenant-specific and are not available to other tenants.
- In the Database Configuration application, associate the new domain with an attribute and configure the database.
- In the Application Designer application, modify the user interface as needed. For example, if you add an ALN domain for a field, you must add a Select Value control. New crossover domains might require new fields in the destination application.

Associating domain values with conditions

You can associate ALN, synonym, and numeric domain values with a condition to limit the number of values available to users for conditions such as status, priority, and asset. This association ensures that only users determined by you can set certain statuses, change the priority of work orders, and so on.

Before you begin

Before you associate a domain value with a condition, you must set up the domain values for the ALN, synonym, and numeric domains. You must then define a condition for when particular domain values appear in a domain. You can create conditions in the condition library of the Conditional Expression Manager application.

About this task

If you modify the condition for a domain value after the value was selected for a field, the existing values are not revalidated. When you associate a condition with a domain value, you can specify an object name. Conditional values are not supported in the List or Search tab.

Procedure

1. Open the Domains application and select the Edit Detail icon for the domain that contains the values that you want to associate with a condition.
Depending on the domain type that is selected, an ALN, numeric, synonym, table, or crossover window opens from where you can add or change conditions.
2. Select View/ Modify Conditions and add or change the conditions as necessary. If you are adding a condition, you must associate the condition with an object.
3. Optional: If you want to add the same conditions for multiple domain values, select Set Conditions and select a condition from the condition library.
You can apply the same condition to all of the selected values.
4. Optional: If you want domain values to be used by multiple objects, specify the objects in the Object Name field.
5. Save the record.

Creating synonyms of internal values

You can create synonyms of internal values so that you can present different values to users based on your business needs.

About this task

Procedure

1. In the Domains application, select the synonym domain for which you want to add a synonym value, such as WOSTATUS.
2. Click Edit Detail to open the Synonym Domain table window.
The Internal Value field is used by the product and must be unique. The value and its description are what users see.
3. Optional: Specify an organization or organization and site for which an existing domain value is valid. For more information about the effect of changing this data, refer to the important note that follows.
4. Add new values for an internal domain by inserting a row and entering values in the fields:

Field	Description
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Field	Description
Internal Value	Specify the existing internal value for which you want a synonym. For example, in the WOSTATUS domain, if you want to create a synonym for WAPPR called WAIT, you would specify the WAPPR internal value.
Value	Specify the synonym value that you want a user to see. For example, WAIT.
Description	Type a description of the synonym to differentiate it from the existing value.

5. Optional: Select the Default checkbox to make the new synonym value the default.

Each internal value can have only one default synonym value.

For example, the status of WAPPR (Waiting for Approval) is added when you create a work order. You add a synonym value, WAIT. If you want the system to insert WAIT instead of WAPPR, then make WAIT the default.

6. Optional: Apply a domain value to a specific organization or site by specifying values in the Organization and Site fields.

Domains are applied at the system level by default.

Leave the Organization and Site fields empty if you want users in all organizations and sites to access them. Or specify organization and site for all values so that only users in the specified organizations and sites can access them.

If you create a synonym value and specify a site or organization, and then click OK, duplicate rows are inserted for the other values. The duplicate rows have the site or organization you specified for the new value that you created. For example, the MRTYPE domain has three values: RECURRING, STANDARD, and TRANSFER (each with an internal value of the same name). If you create a synonym value, REGULAR, with the internal value of STANDARD and specify Organization B, the synonym values RECURRING and TRANSFER are added with Organization B specified.

Important: After you implement the system and inserted records, you generally must not add a synonym value with a site or organization specified. This action can invalidate existing data. If you must add a synonym value and specify a site or organization, you must also add synonym values for all the existing values. For example, if you added a synonym value for STANDARD with an organization or site specified, you must also add synonym values for RECURRING and TRANSFER (if they are used on records) with the same organization or site specified.

7. Optional: Add more synonym values.

8. Save your changes.

Deleting synonyms of internal domain values

You can delete a synonym of an internal value when it is no longer useful.

About this task

In synonym domains, you can delete synonym values, with the following conditions:

- You can delete only non-default synonym values.
- If you delete one synonym value for which you have specified an organization or site, you must delete all other values for which you have specified that organization or site.
- Do not delete synonym values if you have records referencing them.

Procedure

1. In the Domains table window of the Domains application, select the domain with the synonym value that you want to delete and click Edit Detail.
2. In the SYNONYM Domain table window, mark one or more rows for deletion.
3. Save your changes.

Deleting domains

You can delete most domains when they are no longer useful.

About this task

You cannot delete a synonym domain. You can delete other types of domains, but not if the domain is assigned to an attribute. To delete the domain, you must first disassociate the attribute.

Deleting a domain does not affect values that have already been inserted on records. For example, if a user inserts a value in a field using a domain select value list, that value remains on the record. The value remains on the record even if the domain is later disassociated from the attribute and deleted.

Procedure

1. In the Domains application in the Domains table window, select the domain that you want to delete and click the Mark Row for Delete icon.
2. In the warning message, click Yes.
3. Save your changes.

Applications associated with domains

After you create a domain, you need to apply the domain to an attribute. You use the Classifications, the Database Configuration, and the Application Designer applications to apply and to modify domains.

The table that follows lists the applications that are used to apply or to modify domains.

Table 1. Applications used to apply or to modify domains

Application	Description	Example
Classifications	Associate a domain with an attribute in the Attributes table window.	In the Domains application, add an ALN domain with three values. In Classifications, add a classification for assets. Specify an attribute to classify assets with and associate the new domain with the attribute. The next time that the new classification is applied to an asset, the three classification values are available for selection from that attribute.
Database Configuration	Associate a domain with an attribute. Most domains also have a default value, which you would specify in Database Configuration. If the attribute is required, a default value for the domain is also required.	An amount field might be bound to a NUMERIC domain or a status field might be bound to a SYNONYM domain. When you configure the database, the system does not validate the value you insert as the default field value. For example, you can have an Organization called EAGLENA, where the only acceptable domain value is CREW4. You can make the crewid attribute required in the Preventive Maintenance application, give it the default value of CREW2, and configure the database without error. The error, such as CREW2 is not a valid value, appears only when you return to the Preventive Maintenance application to insert a record.
Application Designer	Modify the user interface as needed.	Add one of the extra attributes to an application presentation. Associate the extra attribute with a domain. If you added an ALN domain for a field, you add a select value control by using the application designer application. New CROSSOVER domains might require new fields in the destination application.

Linear assets management

A linear asset is an asset that is defined and maintained using a linear referencing method. Roads, pipelines, and railroad tracks are examples of linear assets. Using measurements along the linear asset, you can locate maintenance activities, identify where characteristics change, and plan monitoring and metering.

Linear assets enhance your ability to maintain large and complex systems, such as:

- Roads and railways that carry transportation assets
- Water, waste water lines, and streets that connect facilities
- Gas and electric lines that support production assets
- Fiber optic trunk lines that connect IT and communications assets

A linear asset can contain additional assets, including a combination of linear and point assets. For example, you can create a linear asset for a road that has additional linear assets for segments of the road. You can manage each segment separately. You can specify physical features for linear assets, such as mile posts and guard rails on a road. You can classify linear assets so that you can search for and report on data. You can specify relationships between linear assets, such as road intersections. You can apply relationship hierarchies and relationships. The Features application is available to help you manage the physical objects that are associated with linear assets.

Linear asset components are available in the following applications. Some components are visible only when you are working with a linear asset.

- Assets
- Relationships
- Work Orders
- Preventive Maintenance
- Service Requests
- Condition Monitoring
- Routes

The product also contains features that enable you to develop and conduct asset inspections. Data from inspection and maintenance activities can be reported and analyzed to look for trends that have an impact on asset cost and availability.

- **Linear components**
Linear asset components include components that are enabled for use after security authorization. Other components are visible only if you are working with a linear asset.
- **Configuring security**
The product provides components that are enabled for use after security authorization. Other components are visible only if you are working with a linear asset.
- **Configuring a linear reference**
Before you configure a linear reference, you must create the units of measure and any conversion measures that the linear reference uses. Then create a linear referencing method that specifies how to locate work on a linear asset. You cannot create a linear asset until at least one linear referencing method is available to apply to it.
- **Configuring a linear asset segment**
A linear asset segment (or span) can contain one or more assets that includes at least one linear asset and a combination of other linear and point assets. The segment can also contain asset attributes, features, classifications, relationships, and work items.
- **Organizing work on a linear asset**
You can organize work by working on segments of a linear asset. You can plan your work by creating a route and preventive maintenance of one or more linear segments, and conduct work on those same linear segments. You can track the progress against your linear assets in the Work Progress table.

- [Importing linear assets from an external system](#)
You can import linear assets from an external application through the integration framework.
- [Reference information for linear asset controls](#)
Use this reference information as a checklist of linear asset controls and to clarify the terminology that is used when working with linear assets.

Linear components

Linear asset components include components that are enabled for use after security authorization. Other components are visible only if you are working with a linear asset.

- [Linear referencing](#)
Linear referencing enables you to locate points and spans along linear assets. There can be many linear referencing methods, such as absolute, relative, percent, addressing, time, and stationing.
- [Features application](#)
A feature is a physical object, such as a guard rail or a mile marker, that you associate with one or more linear assets. Features are not tracked with unique identifiers. You apply costs associated with a feature to the linear asset that has a unique identifier.
- [Relationships and linear assets](#)
The product supports two types of relationships: hierarchical relationships and user-defined relationships. A user-defined relationship uses basic terms, such as intersects, or contains to describe the dependency or connectivity between assets.
- [Linear asset classifications](#)
When you classify a nonlinear asset, the attribute applies to the entire asset. When you classify a linear asset, you can enter different values for the same attribute and identify the start and end measures where the values for that attribute change.
- [Linear segment details](#)
You use the Linear Segment Details section to locate a linear segment or point on a linear asset. The Linear Segment Details section, which displays on tabs in several applications, appears only if you are working with a linear asset.

Linear referencing

Linear referencing enables you to locate points and spans along linear assets. There can be many linear referencing methods, such as absolute, relative, percent, addressing, time, and stationing.

This topic describes an absolute linear referencing method but the product also supports reference points that are created using features but store absolute measure even when reference points are used. This type of referencing allows workers in the field to use relative linear referencing such as mile posts, while also ensuring accurate maintenance history is recorded against the asset.

Use linear referencing to locate point assets, relationships to locations or other assets (linear and nonlinear), features, attributes, and assigned work.

Linear referencing uses distance measures from known points along X, Y, and Z axes.

- X axis. A distance along the center line of the linear asset. This distance, the measure, is the distance from the beginning of the linear asset. You can also use an X offset to reference the distance from a known reference point along a linear asset, such as the distance from an intersection or a mile post.
- Y axis. A distance to the right or left side of the linear asset. This distance is the Y offset. You measure it from reference values that you define, such as the center line or right pavement edge.
- Z axis. A distance above or below the linear asset. This distance is the Z offset. You measure it from reference values that you define, such as the road surface.

To work with your linear assets, define one or more linear reference methods (LRMs) that fit your business practices. To define an LRM, specify units of measure and reference points for each of the axes. For example, you might define an LRM that uses miles for the measure, X axis, and feet for all the offset measurements.

Examples of linear referencing uses

The following examples illustrate how various enterprises use LRMs. The examples provide a general description, not specific units of measure for all axes.

- For roadways:
 - Kilometers
Measures are in kilometers from the start of the linear asset. This method is also known as distance measuring instrument (DMI), absolute LRM, or the document-oriented method.
 - Miles
Measures are in miles from the start of the linear asset. This method is also known as distance measuring instrument (DMI), absolute LRM, or the document-oriented method.
 - Milepost
Measures are from previously defined mile posts. This method is also known as a relative LRM or a sign-oriented method. Some roadways that do not have mile posts use roadside landmarks.
 - Station-Offset
An engineering method that establishes stations every 100 feet or every 200 feet and that adds an offset to identify the exact location.
- For railways:
 - Milepost

Measures are from previously defined mile posts. Railway mileposts, unlike road mileposts, rarely exist at the labeled mileage. Mile Post 2 might be 5420 feet beyond Mile Post 1, and so on.

Chain Marker

A chain unit, used in land measurement before 1960, exists as a means to identify linear locations. Originally 66 feet, it is also used today to identify a distance of 100 feet.

- For pipelines:

Stationing

An engineering method that establishes stations every 100 feet or 200 feet and adds an offset to identify the exact location.

Absolute Stationing

Station and offset values are converted to absolute measures. This method is also known as calculated measure. For example, if a pipeline segment starts at 10 + 100 (station 10 with an offset of 100), the calculated measure (with stations every 100 feet) is 1100.

Features application

A feature is a physical object, such as a guard rail or a mile marker, that you associate with one or more linear assets. Features are not tracked with unique identifiers. You apply costs associated with a feature to the linear asset that has a unique identifier.

A road is a linear asset. The features of a road include guard rails, mile posts, signs, traffic lights, pavement, culverts, intersections, and so on. Features that are associated with assets are unique, based on their start and end measures, and can also have labels. Typically a label is used only when that label can be reference in the field. For example guardrails typically don't have labels, but mile posts, such as MP 27, have labels. In some cases, such as railways, the same label can exist more than once for a single linear asset, for example if a segment of track was acquired from another organization. This arrangement is acceptable, and the two labeled features are identified using both their labels as well as their start and end measures.

You use the Features application to create, to modify, and to delete the features used with linear assets. Use the Assets application to associate features with linear assets, and to specify a classification for the feature. You cannot delete a feature after it has been associated with a linear asset.

Relationships and linear assets

The product supports two types of relationships: hierarchical relationships and user-defined relationships. A user-defined relationship uses basic terms, such as intersects, or contains to describe the dependency or connectivity between assets.

With a hierarchical relationship, a location can be the parent of other locations or of assets, and an asset can be the parents of other assets. With user-defined relationships, you can create relationships that establish a contextual link between related assets. User-defined relationships reflect the associations between assets and locations in networks, where objects contain, connect to, or are dependent on other objects. User-defined relationships can be used in conjunction with hierarchical relationships.

You can configure user-defined relationships to establish the contextual relationships between the components of a linear asset. If a railroad worker must perform some work on a railroad track at mile point 47, you can use relationships to see what else is located on this span of track that may impact the work.

You define and work with relationships in these ways:

- In the Relationships application, you create the formal definitions and accompanying rules for relationships.
- In the Relationships tab of the Assets application, you associate relationships with assets. The tab lists only user-defined relationships and does not list any hierarchical relationships.

If you use a GIS application that provides geographical context or a schematic viewer that provides operational context, user-defined relationships may be unnecessary for your business processes. User-defined relationships are provided for business that are not using such applications, or that want the additional value in defining operational context within the product.

You can configure user-defined relationships for use in conjunction with traditional hierarchies, because assets still have financial or organizational context. A linear asset must reside within a single location to use it with a traditional hierarchy. If you have a linear asset that spans multiple work sites, you can either segment that asset and place each segment in a different site, or you can place the asset in a single site, and use the Repair Facility functionality to allow teams from other sites to work on the linear asset. The cost of the work is still charged to the asset, but the work history shows that the work was conducted in another site.

Linear asset classifications

When you classify a nonlinear asset, the attribute applies to the entire asset. When you classify a linear asset, you can enter different values for the same attribute and identify the start and end measures where the values for that attribute change.

For example, the material for a 100 foot pipe can be PVC from measure 0 to 50, and IRON from 50 to 100.

Ensure that you specify the Linear Type attribute as Linear to make it visible for a linear asset. This option exists to allow the same classification to be applied to linear and nonlinear assets.

If you want to ensure that you have a single value for an attribute for the entire span of the linear asset, identify it as Continuous. Running the Gaps and Overlap report identifies any continuous attributes or features that have overlapping values, or any spans that are without a value. An example of a continuous attribute is a speed limit for a road, since the entire road has a speed limit, yet only a single speed limit for any span.

Linear segment details

You use the Linear Segment Details section to locate a linear segment or point on a linear asset. The Linear Segment Details section, which displays on tabs in several applications, appears only if you are working with a linear asset.

For example, if you specify a linear asset in the Asset field on a preventive maintenance record, the PM tab displays a Linear Segment Details section. If you enter a point asset, the PM tab does not display this section. The Linear Segment Details section includes fields for both the start point and the end point. If you locate a point, such as a stop sign, the start and the end points are the same.

The following terms are associated with linear segments:

Measure

The absolute distance from the start of a linear asset. You can specify a measure manually. The measure is calculated for you if you enter a reference point and a reference point offset. In the example, using Mile Post 27 and an offset of -528, the calculated measure is 26.9 miles (528 feet = .1 mile).

Offset

A measure from a previously defined reference point. The possible kinds of offsets are the following:

Reference Point Offset

The distance before or after the reference point. Specify an offset value if the segment start or end is before or after the reference point. The value can be negative (before) or positive (after). For example, if the start of the segment is 528 feet before Mile Post 27, type -528.

You cannot specify an offset that, when combined with the reference point, yields a measure that is outside the boundaries of the linear asset. For example, if reference point Mile Post 1 is at 1.0 miles on a linear asset that begins at 0.0 miles, you cannot enter an offset of -2 miles.

Y-Offset

A distance perpendicular to the direction of the linear asset. For example, a speed limit sign is located 10 feet from the right edge of the road. "Right" is positive and "left" is negative. Therefore, the Y offset is 10.

Z-Offset

A distance above a linear asset or below a linear asset. For example, an exit sign is located 18 feet above the surface of the road, and a culvert is 4 feet below the surface of the road. The Z offset for the sign is 18, and the Z Offset for the culvert is -4.

Reference point

A feature instance that you can use as a starting point or as an ending point for a linear segment. A reference point is a means of communicating a work location. For example, it can be more useful to workers to say that roadside plowing on Route 96 begins at the intersection of Routes 96 and 75, and ends at Exit 34. It would be less useful to say the work begins at Mile 27.85 and ends at Mile 33.8.

The use of reference points varies according to department practices and to individual variation among linear assets. Some roads might have accurate and persistent mile post markers and workers use the absolute measure in conjunction with the referencing method. For example, a worker can use MP 27.32 to reference a pot hole. In this case, the worker is actually saying mile 27.32, but because the mile posts are all accurate, he uses a combination of the mile post and an absolute measure. Other roads might have few markers or no accurate markers, and users must rely on reference points. This issues is common in the rail industry, where mile posts and chain markers are no longer at their original measures and is sometimes referred to as short or long miles or kilometers. Use labels that maintenance workers in the field can easily identify.

Click Select Value to select the reference point.

Y Reference

The point from which the Y Offset is measured.

The system administrator creates the set of Y Reference values by creating a domain in the Domains application. For roads, some common examples include midline, outer pavement edge, and inner pavement edge. For example, a stop sign is located not just 20 feet from a road, but 20 feet from the midline of a road.

Z Reference

The point from which the Z Offset is measured.

The system administrator creates the set of Z Reference values by creating a domain in the Domains application. For roads, some common examples include road surface and road bed. For example, an exit sign is located 18 feet above the road surface, or a culvert is 12 feet below the road bed.

Configuring security

The product provides components that are enabled for use after security authorization. Other components are visible only if you are working with a linear asset.

License-based component

The license-based component does not become available until you grant access to it in the Security Groups application. The Add/Modify Linear Referencing Methods action in the Select Action menu of the Assets application, is an example of this type of component. You must configure a linear referencing method before you can start creating linear assets. Therefore, configuring security access to this component is the first task that you must perform after installation.

Conditional components

After a user defines an asset as linear, conditional controls become visible. These components are visible only when the user is working with an asset that is defined as a linear asset. For example, when a user creates a work order on a linear asset, the following linear components are visible in the Work Order Tracking application:

- Feature field
- Feature Label field

- Linear Segment Details section

If the user creates a work order on an asset that is not linear, these components are not visible.

These conditional components are configured with signature option security. Each of these conditional components has a signature option that determines when to show or hide it, based on whether a linear asset is in use or not. The signature option is linked to a condition that looks for the linear indicator on the asset. If the indicator is set to TRUE, then the component is displayed. These signature options are linked to the MAXEVERYONE security group, or the group that is configured to act as the MAXEVERYONE group for your organization.

- **Enabling application components**

You must manually enable the Add/Modify Linear Referencing Methods menu option in the Security Groups application. You can also enable several other license-based components at the same time.

Enabling application components

You must manually enable the Add/Modify Linear Referencing Methods menu option in the Security Groups application. You can also enable several other license-based components at the same time.

Procedure

1. In the Security Groups application, specify EVERYONE in the Group field and then click the Applications tab.
2. Select the Assets application.
3. In the Options for Assets table, select the Grant Access check box for the Add/Modify Linear Referencing Method option.
4. Ensure that the check boxes to grant access to the Add/Modify Conversions and the Add/Modify Units of Measure options are also selected.
These menu options must be enabled because you must configure units of measure and conversion factors to use in your linear referencing methods.
5. Filter for the following options and grant access to them also:
 - Filter by Linear Assets
 - Relationships tab
 - View Relationship History
6. Click Grant Listed Options for this Application to commit the changes that you configured.

What to do next

Use the same procedures to grant access to the Filter for Linear Assets option in the following applications:

- Work Order Tracking
- Service Requests
- Quick Reporting
- Preventive Maintenance

Configuring a linear reference

Before you configure a linear reference, you must create the units of measure and any conversion measures that the linear reference uses. Then create a linear referencing method that specifies how to locate work on a linear asset. You cannot create a linear asset until at least one linear referencing method is available to apply to it.

- **Creating units of measure**

You create a unit of measure to measure assets, such as miles in a road or items in a box. You can associate a unit of measure with a conversion factor that converts one unit of measure to another, such as converting miles to kilometers.

- **Configuring conversion factors**

If you intend to use related units of measure, configure the conversion factor to apply to them. The conversion factor to use, for example, between a kilometer and a meter is 1000 (one thousand).

- **Creating a linear referencing method**

You must create at least one linear referencing method before you can start working with linear assets. A linear referencing method (LRM) determines the position of a linear asset, based on a start point, a measure, and a direction.

Creating units of measure

You create a unit of measure to measure assets, such as miles in a road or items in a box. You can associate a unit of measure with a conversion factor that converts one unit of measure to another, such as converting miles to kilometers.

Procedure

1. In the Assets application, click Unit of Measure and Conversion > Add/Modify Units of Measure in the Select Action menu.
You can create units of measure and conversion factors in many applications.
2. Click New Row.
3. In the Unit of Measure field, specify an identifier for the unit of measure.
4. Optional: Enter values in the following fields:

- Abbreviation
- Description

The abbreviation value along with an asset classification is used to create descriptions for assets, locations, and items.

5. Click OK.

Results

The unit of measure is now available for use in many applications. You can delete a unit of measure only when it is not used in a conversion, on a specification template, or on a meter record.

Configuring conversion factors

If you intend to use related units of measure, configure the conversion factor to apply to them. The conversion factor to use, for example, between a kilometer and a meter is 1000 (one thousand).

Before you begin

You must configure the relevant units of measure before you can configure a conversion factor to apply to them.

Procedure

1. In the Assets application, click Unit of Measure and Conversion > Add/Modify Conversions in the Select Action menu.
You can create units of measure and conversion factors in many applications.
2. Click New Row.
3. Specify values in the From Unit of Measure and To Unit of Measure fields.
If you enter a unit of measure that has not been configured, an error is indicated.
4. In the Conversion Factor field, specify an appropriate value.
The conversion factor from meter to centimeter, for example, is .001 but the conversion factor from centimeter to meter is 100.
5. Click OK.

Creating a linear referencing method

You must create at least one linear referencing method before you can start working with linear assets. A linear referencing method (LRM) determines the position of a linear asset, based on a start point, a measure, and a direction.

About this task

To configure a linear referencing method, you specify units of measure for the length of the linear asset and for three offset measures. You can define multiple linear referencing methods, but you can apply only one of them to an individual linear asset. You cannot modify a linear referencing method after you add it to an asset.

Procedure

1. From the Select Action menu in the Assets application, select Add/Modify Linear Referencing Methods.
2. Click New Row.
3. Enter values in the following fields:

Option	Description
LRM	Identifies the linear referencing method.
Unit of Measure	The unit of measure used to measure the length of the linear asset, for example miles or kilometers. The unit of measure must exist in the database.
Base Unit of Measure	By default, this field uses the value in the Unit of Measure field, but you can specify a different value.
Offset Unit of Measure	The unit of measure for the start and end reference points of the linear asset. The unit of measure for a linear asset can be miles, for example, but you can use feet to measure distances from a reference point, such as 300 feet from Mile Post 12.

4. Optional: You can also specify values in the following fields:

Option	Description
Y-Offset Unit of Measure	The perpendicular distance from the linear asset, for example, a speed limit sign located 10 feet from the right edge of a road.
Z-Offset Unit of Measure	The distance above or below a linear asset for example, an exit sign located 18 feet above the surface of the road, or a culvert located four feet below the surface of the road.
Y Reference	The point from which the Y offset is measured, for example, a stop sign is located not just 20 feet from a road, but 20 feet from the midline of a road.
Z Reference	The point from which the Z offset is measured, for example, an exit sign is located 18 feet above the road surface, or a culvert is 12 feet below the road bed.

5. Click OK.

Configuring a linear asset segment

A linear asset segment (or span) can contain one or more assets that includes at least one linear asset and a combination of other linear and point assets. The segment can also contain asset attributes, features, classifications, relationships, and work items.

- [Creating linear assets](#)
A linear asset, also known as a continuous asset, is an asset that you maintain in segments, such as a road, a pipeline, or a railroad track. You make measurements along the linear asset to specify work, monitoring, metering, placement of signs, and so on.
- [Classifying a linear asset](#)
You classify a linear asset in much the same way that you classify a nonlinear asset. The key difference is that the values for linear asset attributes can change over the span of a linear asset.
- [Creating features](#)
A feature is a physical object, such as a guard rail or a mile marker, that you associate with one or more linear assets. Features are not tracked with unique identifiers. When you associate a feature with a specific asset, you can then apply a label to it that can be used as a reference point.
- [Associating features with linear assets](#)
You use the Assets application to associate features with linear assets. For example, for roads, you can associate mile posts, guard rails, pavement types, speed limit signs, and other objects and properties. You can associate a feature with a linear asset multiple times. Each association is a feature instance.
- [Example of reference points that are outside the span of a linear asset feature](#)
Reference points such as mileposts are used to define other features, attributes, relationships, and work order spans. When the start and end points of an asset feature do not correspond to reference points, you can select reference points outside the span of the asset feature. Default values are used for the offset to ensure that the measurement is within the boundaries of the reference points.
- [Creating relationships](#)
You can configure user-defined relationships to establish the context of the relationship between linear assets. You create relationships to define rules to determine how configuration items relate to each other. These rules affect how you deploy and manage configuration items and how you search for configuration items.
- [Retrieving related assets](#)
You can use advanced search features to retrieve assets that are related to a selected asset.
- [Creating a route based on relationships](#)
You can create a route based on user-defined relationships.
- [Linear segment label and balloon tip formatting](#)
Special tags, attributes, and properties can be used to format the text that is used in the label and balloon tip for linear segments.
- [Locating Linear features on the map from the Linear Visual table](#)
You can locate a Linear feature for an asset on the map from the Linear Visual table.
- [Deleting Linear segments on maps](#)
You can delete linear record information directly from a map.
- [Managing data by using the Linear Visual Control grid on the map](#)
You can use the Linear Visual Control map tool to manage Linear features while you view the map.
- [Configuring the appearance of Linear object symbols in the Linear Visual Control display](#)
Configure how Linear objects appear in the Linear Visual Control to quickly identify traits for the object. For example, you can color-code work orders for a segment by status, or the speed limit for a street.
- [Configuring the appearance of Linear object symbols in maps](#)
Customize how linear features appear in the map to quickly identify traits for the feature. For example, you can color-code multiple segments to group them in a collection.

Creating linear assets

A linear asset, also known as a continuous asset, is an asset that you maintain in segments, such as a road, a pipeline, or a railroad track. You make measurements along the linear asset to specify work, monitoring, metering, placement of signs, and so on.

Before you begin

Before you create a linear asset, you must define the linear referencing method (LRM) to apply to it and configure the units of measure for working with the LRM, such as kilometers, meters, miles, or feet.

Procedure

1. In the Assets application, click New Asset, and specify a value. If you use auto numbering for assets, the Asset field displays a number. For linear assets, you might want to use a different naming convention. Change the value to match the convention. It is unlikely that you will move a linear asset from one site to another site, but a move can occur for accounting reasons. To move a linear asset from one site to another, the asset number must be unique at the organization level. If you want to move an asset from one organization to another organization, the asset number must be unique at the system level. If an asset has the same number as an asset at the site or organization to which you want to move the selected asset, provide another number for the asset being moved. The move history is maintained regardless of asset number changes.
2. In the Asset Description field, type a description.
3. Select the Linear check box.
4. In the Details section, specify values as needed. Some fields are not used with linear assets, for example, Rotating Item. There are exceptions based on industry requirements and business practices. Note the following fields regarding their possible use with linear assets:
 - a. Parent. Defines a physical relationship that is hierarchical, for example, intersects with, merges with, and parallels. You can also use this field to identify an organizational or a financial relationship. A parent relationship does not use start and end measures. A parent linear asset is the parent of the entire child linear asset.

- b. Location. Identifies the physical location of a point asset. Linear assets are geographically dispersed and the concept of location might not be useful. However, some facilities contain linear assets within a physical structure that you can identify by location.
- 5. In the Linear Referencing Details section, type values as needed. Note the following considerations for specific fields:
 - a. Direction. Select a direction if relevant to the linear asset. This value is informational only and is not used in calculations.
 - b. LRM. Click Select Value and select the linear referencing method you want to use with this asset.
 - c. Start Measure and End Measure. The start measure can be any value. It does not have to be zero. For example, you might create multiple linear assets for multiple sections of an interstate highway, but use continuous mileage across the sections. The first section might start at zero, the second section might start at 48, and so on. Adjust the end measure to account for whatever value is specified for the start measure. For example, if a linear asset is 50 miles long and the start measure is 20, the end measure is 70. You can adjust the start and end measures at a later time. Shorten the length only if the segment you want to remove has no feature instances or attributes associated with it. In the Description fields, provide short explanations for why you specified those measures.
- 6. In the Purchase Information section, in the Costs section, in the Downtime section, and in the Modified section, specify values as needed.
- 7. Click Save Asset.

Classifying a linear asset

You classify a linear asset in much the same way that you classify a nonlinear asset. The key difference is that the values for linear asset attributes can change over the span of a linear asset.

Before you begin

Map out a classification hierarchy. For example, if you are classifying roads, you can have a Roads classification that has attributes that apply to all roads. You can then configure child classifications for road classes whose attributes are specific to each child class. Creating a classification hierarchy can ensure that only those attributes that are important to each asset class are applied. Use domains, which are predefined lists of values, to enhance the quality of data by restricting options and removing the possibility of data entry errors. With table domains, you can access data directly from a table column, making domain values dynamic.

Procedure

1. In the Assets application, select the asset that you want to classify.
2. In the Specifications tab, select the Detail menu for the Classification field and either:
 - Select Classify if the classification you want to use already exists.
 - Select Go To Classifications, to create a classification and then return with the value.
3. Click New Row to create an attribute and add values, including start and end measures.
4. Repeat the previous step to create all of the attributes required to properly classify the asset.

When you classify a road, for example, you can add a different County attribute for each county that is traversed by the road, and a different Area attribute for urban and rural sections of the road.
5. Click Save Asset.

Example

This example classifies a road. You create a classification called Road and select this classification. Create an attribute called Alias because most roads are known by other names by maintenance teams and external agencies. The road is called the Memorial Highway from mile 10 to 20, so specify this as the value for attribute Alias, and enter 10 as the start measure and 20 as the end measure. The road is known as the Northeast Corridor from mile 15 to 40, so click New Row, specify Alias as the attribute, and repeat the process, entering Northeast Corridor as the value and 15 and 40 as the start and end measures respectively. These entries overlap which is acceptable. If the attribute is defined as Continuous (in the Classifications application), the overlap is identified when you run the Gaps and Overlap report.

Creating features

A feature is a physical object, such as a guard rail or a mile marker, that you associate with one or more linear assets. Features are not tracked with unique identifiers. When you associate a feature with a specific asset, you can then apply a label to it that can be used as a reference point.

About this task

You create features in the Features application and you associate features with linear assets in the Assets application.

Procedure

1. From the Feature tab of the Assets application, click New Feature.
2. In the Feature field, type a name for the feature.
3. In the Feature Description field, type a description.
4. In the Details section, specify a type in the Type field.
 - a. Specify LINEAR if the feature has length and you want to associate the length with measurements on the linear asset. For example, you associate a guard rail with beginning measurement points and ending measurement points on a roadway, such as miles 7.6 to 7.8.
 - b. Specify POINT if you want to associate the feature with a single measurement point on a linear asset. For example, you associate a speed limit sign with a single measurement point on a roadway. Even if a feature has length, if you only associate the feature with a single point on a linear asset, then specify the type POINT. For example, the feature power line has length, but it crosses a road at a single point.

5. If the type is linear, check the Continuous box to specify whether the feature is continuous with the linear asset. Select the check box if the feature runs the entire length of the linear asset. The feature can be a single instance that runs the entire length, or it can be multiple instances that run through the entire length. Clear the check box if the feature runs for only part of the length of the linear asset. Run the Gap and Overlap Report to identify gaps in continuous features.
6. Select the Shared check box if you want the feature to be shared among multiple linear assets for which you have created a relationship. For example, two related linear assets share a segment. You associate the feature with one of the assets and it displays on the record for the other asset. Clear the check box if you want to associate the feature manually each time, even if multiple linear assets share a segment.
7. Select the Is Reference Point check box if you want to use the feature as a start or end point for a linear segment. For example, you specify a mile post to be a reference point because you want to use it to locate other features. If you clear the check box, you cannot use the feature as a reference point. Use the Relationships application to create relationships between linear assets.
8. Select the Specifications tab and specify information in the following fields as needed:
 - a. In the Classification field, type a value, or click Detail Menu to select an option and to retrieve a value. The attributes for that classification are inserted in the Specifications window.
 - b. If a class description for the classification exists, the Class Description field is automatically filled in. Use the Classifications application to create classifications and to define attributes for them.
9. To add attributes for the feature, click New Row in the Specifications tab.
 - a. In the Attribute field, specify a value.
 - b. Optional: Type values in other fields, as needed. Some fields are read-only, depending on the values in the other fields.
10. Click Save Feature .

Associating features with linear assets

You use the Assets application to associate features with linear assets. For example, for roads, you can associate mile posts, guard rails, pavement types, speed limit signs, and other objects and properties. You can associate a feature with a linear asset multiple times. Each association is a feature instance.

Procedure

1. From the Assets application, display the record of the linear asset with which you want to associate a feature.
2. Click the Features tab, and in the Features window, click New Row.
3. In the Feature field, specify a feature.
4. In the Label field, type a label if the feature name and measures are not sufficient to identify the feature instance. Use labels in the following situations:
 - a. When multiple instances of an asset feature reside at the same measures. The labels allow you to differentiate between the asset features.
 - b. When you plan to use the feature as a starting point or as an ending reference point to locate work. Reference points must be identifiable by maintenance workers in the field. For example, a label can be the text on a sign, or a label can be a point of interest, such as a named hilltop. A label can also be a relationship with another asset or with a location, such as an intersection or a rest area.
 - c. When you want to do work on a feature. The feature must be identifiable in the field, which requires some form of visible label. If the feature has been classified, the Classification field displays the classification. The Class Description field displays the class description.
5. Select the Share With Related Assets check box if you want the feature to be visible on related linear assets when the relationship span includes the location of this feature instance. For example, a mile post might be located between two linear assets. You want the feature to appear on both linear asset records. Use the Relationships application to define the relationships between linear assets. This option is useful for parallel linear assets that share the same measures. For example, multiple parallel tracks on a railway.
6. Select the Is Reference Point check box if you want to use this feature instance as a reference point, such as a work location. For example, a mile post is typically used as a reference point. Some features, however, are not suitable as reference points. You can use pavement as a feature that spans the length of a road, but you would not specify it as a reference point.
7. In the Linear Segment Details section, specify measures and specify offsets to identify the location of the feature instance.
8. The Attributes window displays the attributes associated with the classification for this feature. You can add values and measures to these attributes. To add additional attributes, click New Row.
9. Click Save Asset.

Example of reference points that are outside the span of a linear asset feature

Reference points such as mileposts are used to define other features, attributes, relationships, and work order spans. When the start and end points of an asset feature do not correspond to reference points, you can select reference points outside the span of the asset feature. Default values are used for the offset to ensure that the measurement is within the boundaries of the reference points.

Example

You create a linear asset such as a 100 mile train track. You add mileposts to the track at mile intervals to act as reference points. You label the mileposts MP 1 to MP 100. You create a guardrail as an asset feature. The guardrail starts at MP 10 with an offset of 250 feet, and ends at MP 10 with an offset of 500 feet. You create a guardrail classification with an attribute of MATERIAL because at a point along the guardrail the material changes from wood to aluminum. You can use MP 10 as a reference point, even though it is outside the span of the guardrail. If MP 10 is selected for the start or end measure of the MATERIAL attribute value, the offset defaults to 250. The default ensures that the calculated absolute measure is brought within the span of the guardrail asset feature. You can override the offset with the correct value. For example, the Wood value might start from MP 10 offset 250 and end at MP 10 offset 375. The Aluminum value would then start at MP 10 offset 375 and end at MP 10 offset 500.

Creating relationships

You can configure user-defined relationships to establish the context of the relationship between linear assets. You create relationships to define rules to determine how configuration items relate to each other. These rules affect how you deploy and manage configuration items and how you search for configuration items.

Procedure

1. In the Relationships application, click New Relationship.
2. Optional: Specify a classification.
You create the classification in the Classifications application.
3. In the Use with field, select ASSET.
4. Optional: Select the Is Reference Point check box if you intend to use this relationship as a reference point on a linear asset.
5. Optional: You can create one or more rules to apply to the relationship in the Asset Relationship Rules section.
6. Save the new relationship.

Retrieving related assets

You can use advanced search features to retrieve assets that are related to a selected asset.

Procedure

1. In the List tab of the Assets application, select the Filter by Linear Assets option in the Advanced Search menu.
2. Specify the asset that you want to search and specify start and end measures or the start and end reference points.

Results

The search retrieves the following assets:

- All assets whose relationship start measures are within the entered span
- All assets whose relationship end measures are within the entered span
- All assets whose relationship covers the entire span entered

Creating a route based on relationships

You can create a route based on user-defined relationships.

Procedure

1. In the Routes application, click New Route.
2. Click Path Selector.
3. Specify the asset that is at the start of the route and click Refresh.
4. Check the respective rows to select one or more assets to use as route stops, and click Select.
5. Click Select and Return if you want to select assets and return them to the route.
6. Click Close.

Linear segment label and balloon tip formatting

Special tags, attributes, and properties can be used to format the text that is used in the label and balloon tip for linear segments.

You can use special character tagging for Asset and Feature specifications that have multiple attributes. Only attributes that have values appear in the label or balloon tip. Use the `#{ [-- and --] }` tags to bracket a series of attributes. The following example shows a list of attributes in a text format.

```
#{ [--  
  ${assetattrid}: ${numvalue} ${measureunitid}  
  ${assetattrid}: ${numvalue}  
  -- ] }
```

The following example shows a list of attributes in an HTML format.

```
<div>#{ [--</div>  
  <div>${assetattrid}: ${numvalue}  
    ${measureunitid}</div>  
  <div>${assetattrid}: ${numvalue}</div>  
  <div>-- ]</div>
```

If one or more of the attributes that are listed in the first line do not have values that are assigned to them, then the second line is checked. This process continues until a line is found where all attributes that are listed have values that are assigned to them. The text that is generated from those attributes is used for the label or balloon tip. If no suitable lines are found, then no information that appears between the tags is used.

The `parentAssetIsSource` and `parentAssetIsTarget` attributes can be used with the Relationship layer to determine whether the main asset is either the source or the target to the related asset, for example:

```
#{ [--  
  ${parentAssetIsSource}#{attributeTitle|targetassetnum} ${targetassetnum}  
  ${parentAssetIsTarget}#{attributeTitle|sourceassetnum} ${sourceassetnum}  
  --]}
```

Based on that assessment, contextual information can be included in the label or balloon tip. The attributeTitle property can retrieve the given title of an attribute, for example:

```
#{attributeTitle|STARTMEASURE}: ${startmeasure}
```

This property can be useful to retrieve the globalized version of the title of the attribute.

- [Configuring balloon tips and label messages for Linear Visual Control segments](#)
You can configure the text that is displayed in the label and balloon tip for a linear segment to provide context and historical information for the segment.
- [Customizing the default label and balloon tip information for new organizations](#)
You can add information directly in the product database to customize the default label and balloon tip information for linear objects.

Configuring balloon tips and label messages for Linear Visual Control segments

You can configure the text that is displayed in the label and balloon tip for a linear segment to provide context and historical information for the segment.

Procedure

1. In the Organizations application, select an organization and select an organization action, for example, Asset Options.
2. In the Linear Visual Control Message Configuration table, select a Linear Layer object type.
3. In the Label field, use the field selection tool to specify attributes that you want to display in the object label.
4. In the Balloon Tip Message template field, Use the field selection tool to specify attributes that you want to display in the object balloon tip message.
5. Click OK to save your changes.

Customizing the default label and balloon tip information for new organizations

You can add information directly in the product database to customize the default label and balloon tip information for linear objects.

Procedure

1. Log in to the database server by using a user ID that has permission to modify Maximo® Asset Management database tables.
2. In the LVCMSGINFODFLT table, add the following columns:
 - INFOATTRIBUTETEMPLATE
 - LABEL
3. To customize a balloon tip for a layer name, create a CLOB object in the INFOATTRIBUTETEMPLATE column. Each object must be defined by using HTML tags. At a minimum, you must use division tags for each line, for example:

```
<div><b>${workorder.description}</b></div>  
<div>#{attributeTitle|recordclass}: ${recordclass}</div>  
<div>#{attributeTitle|workorder.status}: ${workorder.status}</div>  
<div>#{attributeTitle|workorder.statusdate}: ${workorder.statusdate}</div>  
<div>#{attributeTitle|STARTMEASURE}: ${startmeasure}</div>  
<div>#{attributeTitle|ENDMEASURE}: ${endmeasure}</div>
```

4. To customize a label for a layer name, create a CLOB object in the LABEL column. Each object must be defined as text, for example:

```
${workorder.description}
```

Locating Linear features on the map from the Linear Visual table

You can locate a Linear feature for an asset on the map from the Linear Visual table.

Before you begin

The location function for Linear features in the product is available when you also have deployed Maximo® Spatial Asset Management, and you have selected Spatial as the map provider for the asset record.

Procedure

1. Open the Assets application and select a Linear asset.
2. Select any tab that includes Linear segment details, Specifications, Features, Relationships and Work, and then locate the Linear Visual table. The location function is not accessible from the Linear Visual table located on the Map tab.
3. Right-click a feature in the table and select Open map. A new window displays the map at the location of the feature you selected, which is highlighted.

What to do next

You can also locate a Linear feature from the map tab of an application by opening Linear Visual Control tool on the map toolbar and selecting a feature from the list. Alternatively, you can open the Linear Visual Control tool on the map, select a linear feature on the map, and the feature will be highlighted in the Linear Visual Control tool.

The appearance of the feature highlight can be changed from the Map Symbology tab of the Map Manager application. Configure attributes of the `lvcTargetMapLayer` object to modify the color, thickness, and style of Linear feature highlights.

Deleting Linear segments on maps

You can delete linear record information directly from a map.

Procedure

1. Open a map that includes linear layers with features.
2. Open the Identify tool and select a linear feature on the map.
3. Use the navigation arrows in the Identify tool results window to locate the linear segment that you want to delete.
4. Click the Delete linear segment button.
If this option is not available, you cannot delete this type of information directly from the map.
5. Confirm that you want to delete the current linear segment.

Results

The linear segment is removed from the linear feature. The linear layer and the Identify tool results window are refreshed. Information about the deleted segment is removed from any relevant tables shown for specifications, features, relationships, work orders, and tickets.

Managing data by using the Linear Visual Control grid on the map

You can use the Linear Visual Control map tool to manage Linear features while you view the map.

Procedure

1. Open a record that includes Linear data that is linked to a GIS feature.
2. Select the Map tab to open the map for the record.
3. From the map toolbar, select the Linear Visual Control tool to display the Linear Visual Control grid.
The grid displays information for the current record. You can move and size the grid as required.
4. Select a linear feature in the Linear Visual Control grid to highlight it in the map.
5. Open the Identify tool and select the highlighted linear feature to view its details.
6. Select the Features list from the feature details window.
7. Select an object from the features list to highlight it on both the map and the Linear Visual Control grid.

Configuring the appearance of Linear object symbols in the Linear Visual Control display

Configure how Linear objects appear in the Linear Visual Control to quickly identify traits for the object. For example, you can color-code work orders for a segment by status, or the speed limit for a street.

About this task

You use JSON to configure the appearance of Linear objects that are defined for specifications, features, relationships, and work, including work orders and tickets.

Procedure

1. Open the Organizations application.
2. Select an organization, and then select Asset Options from the list of More Actions.
3. In the Linear Visual Control Symbolism section, click Configure.
4. Locate an object you want to modify and use the JSON editor to update one or more attributes.
For example, you can update the `cssClass` attribute to display the object in a different color. The help option provides object configuration assistance by defining objects and attributes that can be used in the JSON editor.
5. Click Update to validate and save your changes.
Updates are saved to the `MAPSYMBOLGYCONFIG` column of the `MapManager` table in the database. You can restore the default symbol appearance by clicking Restore.
6. Open a Linear record to verify that the Linear objects shown in the Linear Visual Control display have updated.

Configuring the appearance of Linear object symbols in maps

Customize how linear features appear in the map to quickly identify traits for the feature. For example, you can color-code multiple segments to group them in a collection.

About this task

You configure the appearance of features in a map by using a JSON editor. The JSON editor can be used either in code view mode or a hierarchical tree view mode. Use the code view mode to create and modify JSON information through a code editor with code formatting assistance. In the tree view, you can browse the object hierarchy, search, rearrange existing object elements by dragging them, or create new objects and attributes.

Procedure

1. Open a Map Manager record and then select the Map Symbology tab.
2. Use the JSON editor to configure the appearance of linear objects that appear in the **linearSymbologies** section.
The help option provides object configuration assistance by defining objects and attributes that can be used in the JSON editor.
3. Click Update to validate and save your changes.
Updates are saved to the MAPSYMBOLGYCONFIG column of the MapManager table in the database. You can restore the default symbol appearance by clicking Restore .
4. Open a Maximo® record that includes linear data and then select the Map tab to verify that your changes were applied.

Organizing work on a linear asset

You can organize work by working on segments of a linear asset. You can plan your work by creating a route and preventive maintenance of one or more linear segments, and conduct work on those same linear segments. You can track the progress against your linear assets in the Work Progress table.

1. [Creating start and end features](#)
Not all work zones can be identified using absolute measures. Most maintenance workers identify work zones using start and end reference points. Reference points are simply features that have been identified as reference points.
2. [Creating a work order with multiple assets](#)
Linear assets are typically part of a linear network or infrastructure. You can attach multiple assets to a single work order.
3. [Searching for work orders using linear measures](#)
You can search for work orders based on linear measures.
4. [Creating a work order on an asset feature](#)
After you apply a feature to an asset, you can create a work order on that feature. The work can apply to all features of a particular type that are associated with an asset or the work can apply to a specific instance of feature that has a label.
5. [Tracking the progress of work on a linear asset](#)
You can track the progress of work on both linear and nonlinear assets.

Creating start and end features

Not all work zones can be identified using absolute measures. Most maintenance workers identify work zones using start and end reference points. Reference points are simply features that have been identified as reference points.

Procedure

1. In the Features application, create a feature.
2. Select the Is Reference Point check box.
3. Save the feature.

What to do next

If you are working on city streets, you can also create reference points automatically by identifying a relationship as a reference point. When you apply that relationship, then both linear assets in the relationship will have a feature created that can be used subsequently to define work zones.

Next topic: [Creating a work order with multiple assets](#)

Creating a work order with multiple assets

Linear assets are typically part of a linear network or infrastructure. You can attach multiple assets to a single work order.

About this task

If railway tracks require grinding, the work order can often include one track, a crossover track, and a parallel track. Signal inspections often include multiple assets as well. When you add multiple assets to a work order, all cost of work is applied to the asset, location or G/L account at the header of the work order. If you to distribute the costs to each asset, place them on separate child or task work orders.

Procedure

1. You can apply multiple assets to a work order in the multiple asset table.
2. You can apply multiple assets from a route that has Entries in the Work Order's Multi Asset, Location and CI Table selected.

Previous topic: [Creating start and end features](#)

Next topic: [Searching for work orders using linear measures](#)

Searching for work orders using linear measures

You can search for work orders based on linear measures.

Procedure

1. In the List tab of the Work Orders application, select the Filter by Linear Assets option in the Advanced Search menu.
2. Specify the linear asset that you want to search along, including either the start and end measures or the start and end reference points.

Results

The following work orders will be retrieved:

- All work orders whose start measures are within the entered span
- All work orders whose end measures are within the entered span
- All work orders whose span covers the entire span entered

Previous topic: [Creating a work order with multiple assets](#)

Next topic: [Creating a work order on an asset feature](#)

Creating a work order on an asset feature

After you apply a feature to an asset, you can create a work order on that feature. The work can apply to all features of a particular type that are associated with an asset or the work can apply to a specific instance of feature that has a label.

About this task

The cost of any work done is applied to the asset with which the feature has been associated.

Procedure

1. In the Work Orders application, add the linear asset to the work order.
The window refreshes to include the Feature and Feature Label fields.
2. Specify a value in either the Feature or the Feature Label field.
The start and end measures for the specified feature are used to populate the start and end measures for the work order.

Previous topic: [Searching for work orders using linear measures](#)

Next topic: [Tracking the progress of work on a linear asset](#)

Tracking the progress of work on a linear asset

You can track the progress of work on both linear and nonlinear assets.

Procedure

1. When you add a single linear asset to a work order, in the Progress table you can specify segments that identify where work has been completed.
Progress can exceed the planned span, and the work order status is not based on the spans entered.
2. If multiple linear assets are specified for a work order in the Multiple Assets, Locations and CIs table, in the Progress table you can enter segments that identify where work has been completed on any of the assets.
3. Optional: Where multiple assets are specified for a work order, you can select the Progress check box for an asset in the Multiple Assets, Locations and CIs table window.

Previous topic: [Creating a work order on an asset feature](#)

Importing linear assets from an external system

You can import linear assets from an external application through the integration framework.

- [Import of linear assets from an external application](#)
You can automate the import of linear assets from an external system and map this data to the data formats and structures used by the product.
- [Performing the import](#)
To perform the import, you must create an object structure for the data, create the import files, run the import, and perform some additional configurations.

Import of linear assets from an external application

You can automate the import of linear assets from an external system and map this data to the data formats and structures used by the product.

You can use the integration framework to import of linear asset data from an external system. You provide flat files containing the data to import, such as text files containing commas-separated values. The integration framework processes this data and maps it to object structures (or interface objects) that organize the data for use by the product.

The integration framework includes some predefined object structures, including the MXAsset object structure. The integration framework does not include object structures for Features, AssetFeatures, Relationships, and AssetRelationships objects. You must configure additional object structures for these objects in the Object Structures application.

The objects in an object structure are arranged in a hierarchy. For example, in the MXAsset object structure, the parent object is Asset and it includes child objects such as AssetMeter and AssetSpec. If you import using the XML format, the hierarchy is retained. If you use a flat file structure, the hierarchy is also flattened, putting data such as asset header, specification and status all in one file. To simplify the data, create a separate flat file for each object, and import the files in a sequence that insures that data from parent objects is imported before data from dependent child objects.

After creating the flat files to import, you configure a cron task to run the imports. The same validation is used for data import as applies when a user manually enters data in an application. The import process also validates that the data in the flat files conforms to the xml defined for the integration object structures.

The integration framework also provides an option of importing or exporting directly from the product applications.

Performing the import

To perform the import, you must create an object structure for the data, create the import files, run the import, and perform some additional configurations.

- [Configuring the asset object structure](#)
The integration framework includes a predefined object structure for assets, MXASSET. You can add the ASSETFEATURE object to this object structure, and set it to support the import of data in flat file structures.
- [Creating import files](#)
Create a separate spreadsheet for each object that you are importing.
- [Running the import](#)
You can configure a cron task to import linear asset data from an external system. Before running the import, you can preview some of the data and check that the integration is working.
- [Configuring features and relationships for import](#)
The integration framework does not include predefined integration components for the FEATURES object or the RELATIONSHIPS object. You must create object structures for these objects and configure enterprise services to use them before you can import data to them.

Configuring the asset object structure

The integration framework includes a predefined object structure for assets, MXASSET. You can add the ASSETFEATURE object to this object structure, and set it to support the import of data in flat file structures.

Procedure

1. Filter for MXASSET in the Object Structures application.
2. Check the Support Flat Structure checkbox in the header information for the object structure
3. Click New Row in the Source Objectssection.
4. Specify the following values:
 - a. ASSETFEATURE in the Object field
 - b. ASSET in the Parent Object field
 - c. ASSETFEATURES in the Relationships field
5. Click the Add Modify Alias option in the Select Action menu to check if any attributes are duplicated in the object structure.
If duplicates are identified, provide an alias, for example by adding a prefix before the attribute name.

Creating import files

Create a separate spreadsheet for each object that you are importing.

About this task

If you create a separate spreadsheet for each source object it is easier to import data from a flat file and organize it within an object hierarchy. You must structure the data in the spreadsheet in the format required by the integration framework. The example in this procedure uses the EXTSYS1 external system, a predefined component provided with the integration framework. You can configure a different external system in the External Systems application.

Procedure

1. Specify the header information in the first row. This information is required, must be in the first row, and must be in the format *<External system>*,*<Enterprise service>*,*<Action>*,*<Language>*
To import new records into the Asset object structure, the first row header information is EXTSYS1, MXASSETInterface,Add,EN.
All of the values are required except the action value. Include the Add action only when you are importing new records so that a new record is automatically created. When you are updating existing records, do not include the Add action in the header information.
2. Specify column headings in the second row that match the aliases specified for the object structure.
Open MXASSET in the Object Structure application and use the Add Modify Alias action if you want to check the aliases to enter in the spreadsheet.
3. Specify data to import in the third row and all subsequent rows.
4. Save the spreadsheet.
5. Import the data to a CSV file.
6. Open the CSV file in a text editor to correct any formatting errors that occurred when you converted the data to a CSV file:
 - a. If there are quote marks surrounding the content of the first row, delete the quote marks.
 - b. If there are additional commas between values in the first or second row, delete them.
Each value must be separated by just one comma.
 - c. Check for unintended spaces between the column headers in the second row and remove any that you find.

What to do next

Create additional spreadsheets for the other objects in the MXASSET object structure.

Running the import

You can configure a cron task to import linear asset data from an external system. Before running the import, you can preview some of the data and check that the integration is working.

Procedure

1. Filter for the JMSQSEQCONSUMER cron task in the Cron Task Setup application.
2. Select the Active checkbox for the SEQQIN cron task instance, to enable the cron task.
3. Filter for EXTSYS1 in the External Systems application.
Substitute another name if you configured a different external system for the import.
4. Select the Enabled check box to enable communication during the import.
5. Select the MXASSETInterface record in the Enterprise Services tab and deselect the Continuous Queue checkbox.
6. To preview the import, click Data Import and specify the following values:
 - a. Select the Flat File option.
 - b. Select the Import Preview check box to review the process without importing data.
If errors are encountered, you can review error messages in the Message Reprocessing application and fix the input file before you import any data.
 - c. Specify , (comma symbol) in the Delimiter field.
 - d. Click Browse to navigate to the CSV file to import.
 - e. Click OK.
7. When the import preview is successful, click Data Import again.
8. Deselect the Import Preview check box but use the same values for all other fields.
9. Click OK to enable the import as soon as the cron task runs.
The default setting is for the cron task to run every 30 minutes but you can change this setting.
10. Repeat these steps to import flat files of data to other objects in the MXASSET object structure and for the objects in the MXFEATURES and MXRELATIONSHIPS object structures.

Configuring features and relationships for import

The integration framework does not include predefined integration components for the FEATURES object or the RELATIONSHIPS object. You must create object structures for these objects and configure enterprise services to use them before you can import data to them.

- [Creating an object structure](#)
You must create two object structures to enable integration, one for the FEATURES object and another for the RELATIONSHIPS object.
- [Creating an enterprise service](#)
Create an enterprise service for each new object structure and use it to manage integration activities with external systems.

Creating an object structure

You must create two object structures to enable integration, one for the FEATURES object and another for the RELATIONSHIPS object.

About this task

The procedures for creating the two object structures are the same, but ther

Procedure

1. Click the New Object Structure icon in the Object Structures application.
2. Specify a name for the object structure, either MXFEATURE or MXRELATIONSHIP.
3. Specify INTEGRATION in the Consumed by field.
4. Check the Support Flat Structure check box to enable processing of data provided in flat files.
5. Click New Row in the Source Details section and specify the name of the object, either FEATURE or RELATIONSHIP.
The object structures are now configured but you must perform two additional steps to add the FEATURESPECS object to the MXFEATURES object structure.
6. Optional: In the MXFEATURES object structure only, click New Row in the Source Details section and specify the following values:
 - a. Specify FEATURESPECS as the object.
 - b. Specify FEATURES as the parent object.
 - c. Specify FeatureSpecClass in the Relationship field.
 - d. Specify 2 in the Object Order field. to indicate that this object is the second to be processed during integration.
Object structures can contain many child objects. The number in this field determines the order in which child objects are processed during integration.
7. Save the object structure.
8. Optional: In the MXFEATURES object structure only, click Add/Modify Alias in the Select Action menu.
 - a. Select FEATURESPEC.
 - b. Add FS_ as a prefix to FEATURESID, to create an alias of FS_FEATURESID
 - c. Add FS_ as a prefix to CLASSSTRUCTUREID to create an alias of FS_CLASSTRUCTUREID

What to do next

Configure enterprise services to manage integration transactions between the new object structures and the external system.

Creating an enterprise service

Create an enterprise service for each new object structure and use it to manage integration activities with external systems.

About this task

After you create enterprise services for the MXFEATURES and MXRELATIONSHIPS object structures, you can import features and relationships data for your linear assets.

Procedure

1. Click New Enterprise Service in the Enterprise Services application.
2. Specify MXFEATUREInt in the Enterprise Service field.
3. Specify MXFEATURE in the Object field.
4. Save the enterprise service.
5. Repeat these steps to create an enterprise service for the MXRELATIONSHIPS object structure. Substitute MXRELATIONSHIPInt and MXRELATIONSHIPS as the values in the Enterprise Service and Object fields.

What to do next

You can now use the new enterprise services to run an import that adds features and relationships data to the linear assets you imported earlier.

Reference information for linear asset controls

Use this reference information as a checklist of linear asset controls and to clarify the terminology that is used when working with linear assets.

- [Conditional components](#)
The product provides some components that are enabled for use after security authorization. Other components are visible only if you are working with a linear asset.
- [Visual control tools](#)
Use the tools available in the visual control space to manage how you view linear asset grid data.

- [Linear asset terminology](#)
A linear asset is an asset whose length plays a critical role in its maintenance.

Conditional components

The product provides some components that are enabled for use after security authorization. Other components are visible only if you are working with a linear asset.

- [Linear components in the Assets application](#)
The product includes a number of linear management components in the Assets application. Some must be enabled by using the Security Groups application, and some are visible only when a linear asset is selected.
- [Linear components in the Classifications application](#)
The product includes several linear management components that are visible in the Classifications application.
- [Linear components in the Condition Monitoring application](#)
The product includes a linear management component in the Condition Monitoring application. It is visible only when a linear asset is selected.
- [Linear components in the Features application](#)
The product provides a Features application that enables you to work with physical objects that are associated with linear assets. You can view feature history if you have the correct security authorization and you are working with a linear asset.
- [Linear components in the Preventive Maintenance application](#)
The product includes a number of linear management components in the Preventive Maintenance application. Some components must be enabled using the Security Groups application, and some are visible only when a linear asset is selected.
- [Linear components in the Quick Reporting application](#)
The product includes a number of linear management components in the Quick Reporting application. Some components must be enabled using the Security Groups application, and some are visible only when a linear asset is selected.
- [Linear components in the Routes application](#)
.The Routes application contains linear asset components that are visible only when a linear asset is selected.
- [Linear components in the Work Order Tracking application](#)
The product includes a number of linear management components in this application. Some components must be enabled using the Security Groups application, and some are visible only when a linear asset is selected.
- [Linear components in the Create Service Request application](#)
This application includes several linear management components that are visible only when a linear asset is selected.
- [Linear components in the View Service Request application](#)
The application provides components that are enabled for use after security authorization. Other components are visible only if you are working with a linear asset.
- [Linear components in the Service Requests application](#)
The application provides components that are enabled for use after security authorization. Other components are visible only if you are working with a linear asset.
- [Nonlinear components used by the product](#)
The product uses some components that are not linear components and are used by other applications. These components must be enabled in the Security Groups application.

Linear components in the Assets application

The product includes a number of linear management components in the Assets application. Some must be enabled by using the Security Groups application, and some are visible only when a linear asset is selected.

Table 1. Linear components in the Assets application

Tab or window	Control type	Control name		Security enabled	Linear asset selected
List tab	Field	Linear			
List tab, Advanced Search	More Search Fields menu option	Linear			
List tab, Advanced Search	Filter by Linear Asset menu option	Filter by Linear Asset		X	
All tabs	Select Action menu option	Add/Modify Linear Referencing Methods		X	
All tabs	Select Action menu option	View Feature History		X	X
Meters tab	Field	From			X
Meters tab	Field	To			X
Meters tab	Section	Linear Segment Details			X
Enter Meter Reading, Select Action menu option	Enter Meter Reading window, Section	Linear Segment Details			X
Manage Meter Reading History, Select Action menu option	Manage Meter Reading History window, Section	Linear Segment Details			X
Features tab	Tab	All fields			
Specifications	Field	From			X
Specifications	Field	To			X
Specifications	Section	Linear Segment Details			X

The Relationships tab in the Assets application can be used with linear assets. The Relationships tab must be enabled in the Security Groups application.

Linear components in the Classifications application

The product includes several linear management components that are visible in the Classifications application.

Table 1. Linear components in the Classifications application

Tab or window	Control type	Control name		Security enabled	Linear asset selected
Main tab	Select Value menu	Use with Object, Features option			
Main tab	Field	Linear Type			
Main tab	Field	Continuous			

Linear components in the Condition Monitoring application

The product includes a linear management component in the Condition Monitoring application. It is visible only when a linear asset is selected.

Table 1. Linear components in the Condition Monitoring application

Tab or window	Control type	Control name		Security enabled	Linear asset selected
Main tab, Measurements table	Section	Linear Segment Details			X

Linear components in the Features application

The product provides a Features application that enables you to work with physical objects that are associated with linear assets. You can view feature history if you have the correct security authorization and you are working with a linear asset.

Table 1. Linear components in the Features application

Tab or window	Control type	Control name		Security enabled	Linear asset selected
Features tab in the Assets application	Application	Features			
	Select Action menu option	View Feature History		X	X

Linear components in the Preventive Maintenance application

The product includes a number of linear management components in the Preventive Maintenance application. Some components must be enabled using the Security Groups application, and some are visible only when a linear asset is selected.

Table 1. Linear components in the Preventive Maintenance application

Tab or window	Control type	Control name		Security enabled	Linear asset selected
List tab, Advanced Search	Menu option	Filter by Linear Asset		X	
Main	Section	Linear Segment Details			X
Main	Field	Feature			X
Main	Field	Feature Label			X

Linear components in the Quick Reporting application

The product includes a number of linear management components in the Quick Reporting application. Some components must be enabled using the Security Groups application, and some are visible only when a linear asset is selected.

Table 1. Linear components in the Quick Reporting application

Tab or window	Control type	Control name		Security enabled	Linear asset selected
List tab, Advanced Search	Menu option	Filter by Linear Asset		X	
Main	Section	Linear Segment Details			X
Main	Field	Feature			X
Main	Field	Feature Label			X
Main	Section	Progress Table			X

If a linear asset exists anywhere on the work order, the Progress table is visible.

Linear components in the Routes application

The Routes application contains linear asset components that are visible only when a linear asset is selected.

Table 1. Linear components in the Routes application

Tab or window	Control type	Control name		Security enabled	Linear asset selected
Main	Button	Path Selector			X
Main	Section	Route-Stops table, Linear Segment Details			X

Linear components in the Work Order Tracking application

The product includes a number of linear management components in this application. Some components must be enabled using the Security Groups application, and some are visible only when a linear asset is selected.

Table 1. Linear components in the Work Order Tracking application

Tab or window	Control type	Control name		Security enabled	Linear asset selected
List tab, Advanced Search	Menu option	Filter by Linear Asset		X	
Main tab, Header Asset	Section	Linear Segment Details			X
Main tab, Header Asset	Field	Feature			X
Main tab, Header Asset	Field	Feature Label			X
Main tab, MultiAssetLocCI table	Section	Linear Segment Details			X
Main tab, MultiAssetLocCI table	Field	Feature			X
Main tab, MultiAssetLocCI table	Field	Feature Label			X
Main tab	Table	Progress table			X

If a linear asset exists anywhere on the work order, the Progress table is visible.

Linear components in the Create Service Request application

This application includes several linear management components that are visible only when a linear asset is selected.

Table 1. Linear components in the Create Service Request application

Tab or window	Control type	Control name		Security enabled	Linear asset selected
Main	Section	Linear Segment Details			X
Main	Field	Feature			X
Main	Field	Feature Label			X

Linear components in the View Service Request application

The application provides components that are enabled for use after security authorization. Other components are visible only if you are working with a linear asset.

Table 1. Linear components in the View Service Request application

Tab or window	Control type	Control name		Security enabled	Linear asset selected
Search for Service Request window	Button	Linear Asset Search			
Service Request details window	Field	Feature			X
Service Request details window	Field	Feature Label			X
Service Request details window	Section	Linear Segment Details			X

Linear components in the Service Requests application

The application provides components that are enabled for use after security authorization. Other components are visible only if you are working with a linear asset.

Table 1. Linear components in the Service Requests application

Tab or window	Control type	Control name		Security enabled	Linear asset selected
Main	Section	Linear Segment Details			X
Main	Field	Feature			X
Main	Field	Feature Label			X

Nonlinear components used by the product

The product uses some components that are not linear components and are used by other applications. These components must be enabled in the Security Groups application.

Table 1. Nonlinear components used by the product

Component	Description
Relationships tab in the Assets application	This tab must be enabled for the Assets application in the Security Groups application. Includes all fields in the main tab, and the View Asset Relationship History option in the Select Action menu. The component is not conditional and can be used for linear and nonlinear assets.
View Asset Relationship History	This option must be enabled for the Assets application in the Security Groups application. When enabled, the option is available in the Select Action menu, and opens the View Asset Relationship History window.
View Asset Specification History	This option must be enabled for the Assets application in the Security Groups application. When enabled, the option is available in the Select Action menu, and opens the View Asset Specification History window.
Add/Modify Units of Measure option in the Select Action menu, Assets application	This option must be enabled for the Assets application in the Security Groups application. You must configure units of measure to use when you create a linear referencing method. The component is not conditional and can be used for linear and nonlinear assets and several other applications.
Add/Modify Conversion Factors option in the Select Action menu, Assets application	This option must be enabled for the Assets application in the Security Groups application. You configure conversion factors to apply to units of measure to use when you create a linear referencing method. The component is not conditional and can be used for linear and nonlinear assets and several other applications.

Visual control tools

Use the tools available in the visual control space to manage how you view linear asset grid data.

Table 1. Linear visual control tools

Tool	Description
Print	Print the current visual control view. To print graphic elements, ensure that your browser is configured to print background graphics.
Expand all rows	Expand all rows that are displayed on the tree grid.
Collapse all rows	Collapse all rows that are displayed on the tree grid.
Zoom in	Zoom in to view more detail for an element. You can also right-click an element to access the zoom feature.
Zoom out	Zoom out to view hierarchical detail for an element. You can also right-click an element to access the zoom feature.
Zoom to fit	Fit all elements into a single screen view.
Debug tool	Open the debug tool to view debug information for the visual control.

Linear asset terminology

A linear asset is an asset whose length plays a critical role in its maintenance.

Purpose

The following terms are associated with linear assets:

Attribute

A property of a linear asset or of a feature. For example, speed limit is an attribute of a highway (a linear asset) with multiple possible values (40 miles per hour, 50 miles per hour, and so on). A guardrail (a feature) comes in different types. You can specify "Type" to be an attribute of a guardrail, and specify a value for each type of guardrail.

You can apply an attribute to an entire linear asset or to part of a linear asset. For example, a 50 miles per hour speed limit might apply to all or to part of Route 96.

Dynamic segmentation

The ability to analyze a linear asset multiple ways without affecting its underlying geometry. For example, you define a road as a linear asset. The road starts at mile zero and ends at mile 60. You assign a speed limit of 55 miles per hour to miles 0 - 20, and a speed limit of 65 miles per hour to miles 20 - 60. At the same time, the number of lanes might be three lanes from miles 0 - 40, and four lanes from miles 40 - 60.

Do not split a linear asset into multiple assets to accommodate changing properties. Define the properties in the context of one linear asset. Segment the linear asset virtually to analyze it and to work with it.

Feature

A physical object that you associate with a linear asset, but which itself is not an asset. Use features, such as, mile posts, to locate where work takes place. Create feature records using the Assets > Features application.

You can associate one or more feature instances with a linear asset. Apply costs associated with a feature instance against the linear asset where the feature instance occurs. For example, you create a feature called Mile Post, and you create a feature instance labeled MP 27 on Route 95. If you repair MP 27, the cost for the repair is charged to Route 95.

The use of features varies based upon your business model. If you want to track costs against an object, create an asset record for the object instead of creating a feature record.

You can also create features by using the relationships that you define in the IT Infrastructure > Relationships application. For example, a municipality uses intersections to locate work. By relating two streets and by specifying that the relationship is a reference point, a feature instance is created each time the relationship is applied to those linear assets.

Feature instance

A feature that you have associated with a linear asset. For example, you create a feature called Mile Post. When you associate Mile Post with a linear asset in a location, it is a feature instance.

Linear referencing

Define the location of a point along a linear asset. Linear referencing uses distance measures from known points along the X, Y, and Z axes. The X axis is the length of the linear asset. The Y axis is the distance to the right or to the left of the linear asset. The Z axis is the distance above the linear asset or below the linear asset.

Linear referencing method

A method of determining a position by using a known starting point, a measure, a direction, and offset values. To define a linear referencing method, specify units of measure for the length of the linear asset, and for three offset measures (see offset). You can define multiple linear referencing methods.

Linear segment

A span of a linear asset defined by a starting measure and by an ending measure. The span can be the entire length of the linear asset or it can be any continuous part of it. The starting measure and ending measure for the linear segment must be within the starting measure and ending measure of the linear asset. A linear segment cannot overlap two linear assets.

Measure

The absolute distance from the start of a linear asset. You can specify a measure manually. The measure is calculated for you if you enter a reference point and a reference point offset.

Offset

A measure from a previously defined reference point. The three kinds of offsets are as follows:

Reference Point Offset

A distance along the length of the asset measured from a previously defined reference point. For example, a speed sign is 0.2 miles from Mile Post 10.

Y-Offset

A distance perpendicular to the direction of the linear asset. For example, a speed limit sign is located 10 feet from the right edge of the road. Right is positive and left is negative. Therefore, the Y offset is 10.

Z-Offset

A distance above a linear asset or below a linear asset. For example, an exit sign is located 18 feet above the surface of the road, and a culvert is 4 feet below the surface of the road. The Z offset for the sign is 18, and the Z Offset for the culvert is -4.

Point asset

An asset whose length does not play a critical role in its maintenance. For example, a pump, a railway switch, or a camera. With a point asset, you do not assign work to a particular length of the asset, but rather to the entire asset or to its parts.

Reference point

A feature instance that you can use as a starting point or as an ending point for a linear segment. A reference point is a means of communicating a work location. For example, it can be more useful to workers to say that roadside plowing on Route 96 begins at the intersection of Routes 96 and 75, and ends at Exit 34, rather than to say that the work begins at mile 27.85 and ends at mile 33.8.

The use of reference points varies according to department practices and to individual variation among linear assets. Some roads might have accurate and persistent mile post markers and workers can rely on them to locate work. Other roads might have few markers or no accurate markers, and users can rely on reference points.

Relationship

A defined interdependency between two linear assets: a linear and a point asset, or a linear asset and a location. Define relationships using the IT Infrastructure > Relationships application. Relationships can be physical. For example, intersects with or is parallel to. Relationships can also be abstract. For example, belongs to or is owned by.

Planning and scheduling work

You can plan and schedule upcoming work in a graphical view.

You can manage upcoming work and assignments by creating schedules. By using the graphical view, maps, and calendars, you can see the work and resource requirements that are in the schedule. For unplanned work, you can respond to requirements by graphically assigning work to the appropriate labors and crews based on their availability. You can create street-level routes for work lists to visually manage work progress on maps that show work, crews and labor based on their Maximo® service addresses.

The following applications are used to plan and schedule upcoming work.

Table 1. Scheduling applications

Application	Description
Graphical Scheduling	Maintenance planners and schedulers can manage and schedule upcoming work.
Graphical Scheduling - Large Projects	Maintenance planners and schedulers can manage and schedule upcoming work in large projects.
Scheduling dashboard	Maintenance planners and schedulers can see upcoming work, fix scheduling issues, and view resource utilization all from one convenient location.
Graphical Assignment	Supervisors and dispatchers can assign the work records to resources.

Application	Description
Graphical Assignment - Repair Facility	Repair facility planners can assign the work records to repair facilities.
Graphical Work Week	Schedule and assign work while you manage resources over a short period of time.
Graphical Resource View	Manage resource hours over one week or one month at a time.
Graphical Crew Management	Supervisors and dispatchers can assemble crews to complete the work assignments.
<ul style="list-style-type: none"> Graphical Appointment Book Appointment Book Manager 	Customer service representatives can schedule appointments with customers to complete the work.
Scheduler Data Manager	Validate a schedule or work list's data before scheduling or assigning work, while ensuring that data best practices are followed.
Scheduling Alternate Resources	Define alternate availability for resources in your schedules.
Configure Tooltips	Modify tooltip text for work records and resources in the graphical view.
<ul style="list-style-type: none"> Configure Weather Forecast Configure Weather Alerts 	If you have a subscription to Weather.com®, you can display weather data in Maximo Manage. Supervisors and dispatchers can configure notifications that are sent to technicians and customers to warn them about weather conditions that might affect work.

If your labor and crew resources have mobile devices that can access Maximo Mobile, they can remotely complete their daily tasks, such as preparing resources, and reviewing and updating work orders.

- [Scheduling roles](#)
Each role in your organization uses specific applications to manage the scheduling process.
- [Scheduling terms](#)
This section describes common terminology used when scheduling work in Maximo Manage.
- [Best practices: Data preparation for scheduling](#)
Many factors affect the ease and effectiveness of scheduling. By preparing your data ahead of time, you can ensure that your work can be scheduled effectively.
- [Performance considerations for scheduling work](#)
You can improve performance when scheduling work by limiting the query size of your schedules and adjusting other settings.
- [Graphical view](#)
The graphical view helps you to schedule and assign work more efficiently. When you view your projects in the graphical view, the information is divided by category.
- [Managing schedules](#)
You can create and maintain schedules that are based on work record, asset, or location hierarchies. The queries you use determine which hierarchy the work records in your schedule reflect.
- [Managing assignments](#)
You can assign work to labor, crews, or repair facilities based on their skills and availability.
- [Managing short term work](#)
You can manage work in one week increments by using the Graphical Work Week application.
- [Managing resources](#)
You can manage your resources in the Graphical Resource View application in order to see all resource availability and assignments in a single view.
- [Managing crews graphically](#)
You can manage the labor and assets that are assigned to positions in crews visually by using the Graphical Crew Management application.
- [Validating data](#)
You can validate the data in your schedules and work lists in the Scheduler Data Manager application.
- [Managing appointment books](#)
You can create and manage appointment books for customer service representatives to use when they schedule customer appointments.
- [Managing weather](#)
You can configure and enable weather forecasts and alerts to notify users about weather events that might affect work.
- [Optimizing schedules](#)
You use IBM® Maximo® Optimizer to automate efficient decisions for long-range planning, scheduling, and dispatching of resources for asset maintenance while balancing competing objectives and constraints.

Scheduling roles

Each role in your organization uses specific applications to manage the scheduling process.

The following table describes how roles correspond with the applications.

Table 1. Scheduler roles

Role	Description	Applications used
Planner	<ul style="list-style-type: none"> Model work steps in job plans and routes. Define PM frequencies. Forecast long term work and costs. Use historical data to adjust the plan. 	Graphical Scheduling
Scheduler	<ul style="list-style-type: none"> Create rolling work schedules. Resource level and capacity plan. Define schedule windows. Define dependencies and the critical path. Monitor schedule compliance. 	Graphical Scheduling
Supervisor or dispatcher	<ul style="list-style-type: none"> Assign work to people or crews. Monitor and assign emergency work. Manage crew resources. Monitor dispatched people and crews. 	<ul style="list-style-type: none"> Graphical Assignment Graphical Crew Management
Repair facility planner	<ul style="list-style-type: none"> Assign mobile assets to a facility. Manage repair facility capacity. 	Graphical Assignment – Repair Facility
Customer service representative	Book appointments that are based on customer preference, technician availability, work zone, and weather.	Graphical Appointment Book

Scheduling terms

This section describes common terminology used when scheduling work in Maximo® Manage.

- [Rolling schedules](#)
You can set your schedules to refresh automatically at predefined intervals.
- [Date calculation and display](#)
The graphical view shows work dates based on a work record's scheduled start and scheduled finished dates, if they are available. If no dates that are defined for the work, the segments are shown based on other criteria.
- [Date constraints in schedules](#)
When you set date constraints on work records, the constraints appear in the Gantt view.

Rolling schedules

You can set your schedules to refresh automatically at predefined intervals.

You use the Rolling Schedule check box to designate a scheduling project as a rolling schedule. You set the interval at which you want the schedule to refresh in the Rolling Schedule window, available from the Actions menu. For example, you want to refresh the work records in the schedule every day at 7:00 AM.

The values in the Rolling Frequency and Duration in Days fields generate the project start and end dates. The start and end dates determine which dates are shown in the graphical view, and an additional 14 days before and after the schedule dates are included as a buffer. You can configure the buffer to be more or less than 14 days.

Rolling is best used for a moving time frame, in which most work is expected to occur within the start and end range of the schedule. For example, a 4-week rolling schedule gets refreshed on Monday to show forward planning. Scheduling and rescheduling are done in the 4-week planning range. Resource counts and the visible date range are restricted to the schedule's width (plus or minus 14 days), although all work can be seen if needed. Scrolling backward in the graphical view is limited.

Date calculation and display

The graphical view shows work dates based on a work record's scheduled start and scheduled finished dates, if they are available. If no dates that are defined for the work, the segments are shown based on other criteria.

Start and end dates and project offset dates

The Start Date and End Date fields control the work period calendar that shows in the graphical view. If a value is defined in the Rolling Offset in Days field in the Roll Schedule window, it is added to either side of the date range in the graphical view. You cannot move work segments outside the graphical view date range as calculated by these fields.

Initial scheduling

The following rules are used to calculate dates for work records in schedules:

1. If both schedule dates exist (scheduled start and scheduled finish), they are used.

2. If one schedule date exists (scheduled start or scheduled finish), the other date is calculated by adding (to schedstart) or subtracting (from schedfinish) the duration.
3. If target dates exist (targetstartdate and/or targcompdate), they are used.
4. If no dates exist, the records are scheduled by their duration, beginning at the current system date.

Parent-child relationships

If a child work order or task has no dates that can be used, it uses its parent's dates if they exist. If a child work order or a task has dates that can be used, they override the parent's dates. The parent's dates are a summary of the start of the earliest child or task through the end of the latest finish date of any of the children.

Completed, closed, and canceled work

Completed records are shown in the schedule as gray read-only bars, using their actual start and actual finish dates.

Closed and canceled work orders are not included in the schedule, even if the work order query on the schedule's main tab includes them.

Precedence constraints

Precedence constraints determine the order of scheduling by establishing dependencies between work orders or tasks. Precedence constraints can be inserted, edited, and deleted directly in the graphical view.

Precedence constraints can be finish-to-start, finish-to-finish, start-to-start, or start-to-finish. They can have lead time (overlaps or head starts) or lag time (gaps or delays).

The constraints can come from a job plan or from work orders that were linked to their predecessors beforehand. Inserting or changing a link does not immediately change the schedule dates. They are processed as part of critical path method (CPM) scheduling when it is run.

Only links between work orders at the same level under the same parent or between tasks of the same work order, are allowed. To graphically manage links between your work orders, you can organize them into a work package under a parent work order in Work Order Tracking. Your work query can fetch that one work order, and all children and tasks automatically become part of the schedule.

To graphically manage links between your work orders, you can organize them into a work package under a parent work order in Work Order Tracking. Your work query can fetch that one work order, and all children and tasks automatically become part of the schedule.

CPM

In graphical scheduling applications, CPM is a process that determines the schedule dates for the work records. CPM uses durations, precedence constraints, and working time to schedule work. It does not consider resource availability.

1. The schedule begins at the overall schedule start date (or today). Records without predecessors are scheduled. If the Preserve Schedule Start Dates check box is selected, the dates are unchanged from the last saved session. If the Preserve Schedule Start Dates check box is cleared, the start dates move to the schedule start (or today).
2. If a record has a start date, CPM considers its interruptible state. If a record is interruptible, its duration is scheduled to occur only during working time according to the schedule's calendar and shift. An interruptible work record can result in the record splitting around a non-work period. It can also result in a record's start date moving forward to the next working period, if its original date fell in a non-work period. If the work is not interruptible, the record is scheduled as soon as possible, regardless of calendar and shift.
3. Successor records are evaluated. The precedence type and lead or lag time is applied to the predecessor's start or finish date to derive the successor's start or finish date. Duration is added (to the start) or subtracted (from the finish) to calculate the other date. The record's successors are then scheduled, and so on, until there are no successors. The total span of that work is rolled up to its parent record. Parent schedule dates are always calculated from the children and are not editable in the graphical view.

Date constraints in schedules

When you set date constraints on work records, the constraints appear in the Gantt view.

Work date constraints are set in work management applications, for example, Work Order Tracking, Activities and Tasks, Changes, and Releases. The values in the Start No Earlier Than and Finish No Later Than fields on the work records are the date constraints.

After you create a schedule and save the data, you can view the work in the Gantt view. When you click a work record in the Gantt view, date constraints on the work record appear as red lines. The thin red line indicates the Start No Earlier Than date, and the thick red line indicates the Finish No Later Than date. If no date constraints are defined for a task, the task shows the date constraints of its parent work record.

In the Graphical Assignment - Repair Facility application, date constraints on the availability of the repair location show as well. The constraints appear as blue lines, the thin blue line indicating the start of the repair location schedule window, and the thick blue line indicating the end of the window.

You can adjust the dates in the Gantt view by dragging and dropping the work records, or by extending their duration. When you adjust the work dates, the Gantt view indicates whether the dates that you provided conflict with date constraints placed on the work or repair location. If you move the work to a date that conflicts with a constraint, the color of the work record changes to red. You can readjust the schedule dates to fall within the defined constraints, or you can override them and save the schedule.

Best practices: Data preparation for scheduling

Many factors affect the ease and effectiveness of scheduling. By preparing your data ahead of time, you can ensure that your work can be scheduled effectively.

Calendar and shift information

Set up your calendar with shift and shift break information. Include all shifts that you want to schedule work for. Ensure that your calendar extends far enough into the future. For example, if you want to plan your work out for the next six months, ensure that your calendar information extends out for six months.

Craft, crew, and labor information

Set up your crafts and crew types so that they can be specified on job plans and work plan labor. Set up labor and crews with their appropriate shifts and ensure that they are available for assignments.

Work orders and tasks

Divide your work orders and other work records into smaller tasks so that each task can be scheduled and divided between resources as needed. Plan your resources at the level that they are managed. For example, if you assign entire work orders, the resource requirement must be at the work order level. If you assign individual tasks within a work order, the resource requirement must be at task level. If you require resources at the task level, you must include tasks in the schedule to see them in the Gantt view.

Use the Interruptible check box to schedule work only during work time. If a task or work order is not interruptible, it is scheduled in a single block that might include non-work time.

Job plan information

Review your job plans to ensure that they require the appropriate craft and crew types. Also, carefully review job plan durations.

Durations affect scheduling and cost calculations. Ideally, all durations for craft requirement should be for the entire length of the job plan. For example, a 2 hour job plan for fire hydrant maintenance would require 2 hours for a plumber and 2 hours for a mechanic. Job plan and work order durations are synchronized in the Gantt view.

Service addresses

Create service addresses for assets and locations. When you enter an asset or location as a service address, XY coordinates are calculated for each asset and location. You can then view work graphically on the Dispatch tab in the Gantt view of the Graphical Assignment application.

Performance considerations for scheduling work

You can improve performance when scheduling work by limiting the query size of your schedules and adjusting other settings.

The following suggestions can improve performance:

- Break schedules up into smaller queries. Work on smaller data groups within a larger schedule. Only the information that changed is saved. For example, assume that you are working on a group of 20 work orders in the middle of a schedule that contains 300 work orders. Click Perform Critical Path Method on Selected Rows instead of Perform Critical Path Method on All Rows when adjusting the dates and links for the work. There are fewer changes to save and commit.
- Create the schedule at a work order level if the tasks are descriptive in nature and do not affect schedule scope. Clear the Include Tasks in Schedule check box in the Work Order Tracking application to bring only the work order into the schedule. If you want to see resources used by that work order, plan them at the work order level rather than at the task level.
- Limit the number of records that can be retrieved by a saved query at a time. Limiting the number of records can prevent users from inadvertently creating queries that retrieve too many records into the Gantt view (the default is 1000). To limit the record count, in the System Properties application, open the mxe.skd.populatecount record. In the Global Value field, enter the number of records that you want to allow Scheduler to retrieve at a time. From the Select Action menu, choose Live Refresh to activate the new setting.
- When modifying multiple work records at the same time in the graphical view (by using right-click options), limit the number of records you select at one time. Changes to large groups of work records affect performance.
- Specify when the commit operation is run in the background by configuring asynchronous processing. You can limit the number of records that can be committed at a time before the commit transaction is sent to a background, or asynchronous, process. You can then continue to work on other schedules. The schedule that is being committed remains in a read-only state until the commit is complete. To limit the record count, in the System Properties application, open the mxe.skd.changeount record. In the Global Value field, enter the number of records that you want to allow Scheduler to commit while running in real time (the default is 500). From the Actions menu, choose Live Refresh to activate the new setting.
- In Graphical Scheduling projects, clearing the Enable Related Attributes? check box can significantly reduce time when rendering the graphical view. Including attributes from related tables affects performance.

Graphical view

The graphical view helps you to schedule and assign work more efficiently. When you view your projects in the graphical view, the information is divided by category.

Interface layout

In the Graphical Scheduling applications, the graphical view is divided into four sections:

Activity table

The Activity table lists all work records in a table view.

Activity chart

The Activity chart shows the work to be performed on a timeline.

Resource table

The Resource table lists the resources that are needed for the work, in a table view.

Resource chart

The Resource chart shows the resources that are needed for the work on a timeline.

You can resize the panes in the graphical view. For example, you can limit the size of the Activity table so that your Activity chart is maximized. Changes that you make to the panes are saved with the schedule.

Colors in the graphical view

Colors in the graphical view are defined by system properties in the System Properties application. For more information on colors in the graphical view, see the [Maximo® Manage Scheduling Community](#). You will need to join the community in order to view content. This process can take several minutes.

- [Graphical view navigation](#)
The graphical view navigation tools help you to schedule and assign work more efficiently. You can use zoom features, resource planning charts, and toolbar buttons to focus on specific aspects of the work while you create your schedule.
- [Graphical view tips](#)
You can use several shortcuts in the graphical view to make scheduling and assigning work easier.
- [Graphical view customization](#)
You can modify the default values of system properties to determine what information appears in the graphical view. The properties are located in the System Properties application.

Graphical view navigation

The graphical view navigation tools help you to schedule and assign work more efficiently. You can use zoom features, resource planning charts, and toolbar buttons to focus on specific aspects of the work while you create your schedule.

- [Record movement in the graphical view](#)
You can move records individually or in groups in the graphical view. You can modify start dates, finish dates, and durations by dragging the task bars with your mouse.
- [Sorting columns in the graphical view](#)
You can sort columns in the graphical view to focus on specific data.
- [Filtering data in the graphical view](#)
To search for specific data, you can filter the data in the graphical view.
- [Zoom options in the graphical view](#)
When scheduling and assigning work, you can adjust the zoom level of the graphical view to focus on work that is scheduled during a specific time, and view tasks and job plans in detail.
- [Refreshing data in the graphical view](#)
When you refresh the information in your schedule, you update the schedule with changes that were made to the work records in the applications where the work records originated.
- [Uncommitted work](#)
Uncommitted work is work that was modified in the graphical view without being saved to the originating work record applications.

Record movement in the graphical view

You can move records individually or in groups in the graphical view. You can modify start dates, finish dates, and durations by dragging the task bars with your mouse.

You can move records in the graphical view in two ways:

- You can drag work to a new date in the Activity chart.
- You can right-click on the work record and move it to predefined intervals.

When you move and drag a summary bar, all children move accordingly.

You can only move and resize work requirements and assignments that appear in the assignment node.

Dragging work in the graphical view

Each task bar (at the lowest level of the hierarchy) has three edit points:

- The edges of the bar represent the scheduled start and finish dates of the work. You can click and drag the edges to change the start date, end date, and duration.
- Click the middle of the bar to drag the record to a new start and finish date while preserving duration.

You can stretch the ends of the task bar to the preferred start and end dates, modifying the duration of the work record. If you move the start or end date of a work record outside of any date constraints that exist for that record, a red line appears, indicating where the date constraint falls. The work record turns red, indicating it

is in violation of its date constraints. You can move the work back to comply with the date constraints, or override them. You can drag the work record from the middle of the task bar to reschedule dates without changing duration.

Dragging multiple records

You can select multiple work records at the same time and reschedule them as a group. You can multiselect task bars in the graphical view in the following ways:

- Click outside of the tasks, then group them with a border.
- Use Ctrl-click to select individual tasks of a noncontiguous group.

The task bars that you select have edit markers visible on both ends of the bar. The task row in the Activity table is highlighted. When multiple rows are selected, only the start and finish dates can be moved, preserving duration. Dragging any of the selected rows moves them all proportionally. Moving a group of tasks or child records moves the parent record with them. Parents always span their children and tasks.

Moving records using right-click options

You can move work in the graphical view by right-clicking on the work record in the Activity table or chart. The following options are available from the right-click menu:

- Move to Next Hour: Moves the work record one hour ahead.
- Move to Today: Moves the work record to the current date.
- Move to Next Day: Moves the work record one day ahead.
- Move to Day: Opens a calendar from which you can choose the date that you want to move the record to, keeping the time in tact.
- Set Work to Day: Opens a calendar from which you can choose the date and time that you want to move the record to.

You can select multiple records at the same time and use the right-click options to move their dates.

Moving PM records

In the Graphical Scheduling application, you can modify the dates for PM forecasts in the same way. If the Forecast Dates Locked? check box is selected, the PM segment is gray and cannot be moved. If the Reforecast Subsequent Dates? check box is selected, the PM segments are blue and can be moved. After you change the date, the segment turns red and the entire forecast row becomes read-only pending reforecast. To reforecast the PM, click PM Reforecast All in the toolbar.

PM segments cannot be moved past the next PM segment. If the PM is meter-based, only the first segment can be modified.

Sorting columns in the graphical view

You can sort columns in the graphical view to focus on specific data.

Procedure

1. In the table portion of the graphical view, click the arrow in the header of the column that you want to sort by. You can sort in ascending or descending order.
2. Add an additional sort column by pressing Shift while clicking the arrow for the second column that you want to sort by.
You can sort by up to three columns by using this method. To change the number of columns you can sort by, modify the `skd.max.sort.columns` system property in the System Properties application.

Filtering data in the graphical view

To search for specific data, you can filter the data in the graphical view.

Procedure

1. In the graphical view, click the Filter icon .
A search box opens for each column heading.
 2. Type the text that you want to search for in the search box.
 3. Click the X next to the search box to choose the operator that you want to use in the filter.
For example, you can filter for values that are equal to, less than, or end with your search text.
After you specify filter criteria, the graphical view contains only the data that you filtered for. Any text that is contained anywhere in a hierarchy affects search results.
For example, if you search for AIR in the description, work records that do not contain AIR in their description appear if they have tasks that contain AIR in the description.
 4. To view the entire schedule again, click the Clear Filter and Show All Activities icon .
 5. Optional: You can also search for records in the Quick Filter field, or limit the records by hierarchy level by clicking the hierarchy levels at the beginning of the Description column.
- **Quick filter**
You can use the Quick Filter field to locate records in your schedule or work list.

Quick filter

You can use the Quick Filter field to locate records in your schedule or work list.

Type text in the Quick Filter field and press Enter. Work rows that contain the text that you specified in any column are shown. Parent records are included if tasks meet the search criteria. Tasks are always shown in the context of their parent.

You can use the following advanced techniques to further filter data:

Table 1. Quick filter searches

Search type	Example of returned records	Example of search terms
And search	Approved work records for asset 14300	APPR 14300
Exact phrase search (use quotes)	Work records for reciprocating pumps	"reciprocating pump"
Or search	Work records for pumps or for location BR410	Pump OR BR410
Exclusion search (use minus sign)	All work records that are not related to asset 14300	-14300
Search within a specific column	Work records that have Kelly Hose Maintenance in the Description column	Description=Kelly Hose Maintenance
Greater than (>), less than (<)	Tasks that have task numbers that are higher than 50	Task > 50
And search with mathematical search (&&)	Tasks that have task numbers that are less than 80 and that have a priority that is greater than 6	Task < 80 && Priority > 6

Zoom options in the graphical view

When scheduling and assigning work, you can adjust the zoom level of the graphical view to focus on work that is scheduled during a specific time, and view tasks and job plans in detail.

The following zoom options are available in the graphical view:

- Zoom In : Expands the calendar scale so that you can see more detailed information.
- Zoom Out : Contracts the calendar scale so that you can see a larger time frame.
- Zoom to Week : Sets the calendar scale to show one week.
- Go to Day : Opens a calendar so that you can select a single date for the calendar to show.

You can also focus in on specific time frames by placing your cursor on the calendar bar, and clicking a starting point. The cursor switches to a double-ended arrow. Click an end point, and then double-click the highlighted area to zoom in on it.

- Double-click a month to see a four week view.
- Double-click a week to get a seven day view.
- Double-click a day to get the view in hours.

Changes you make to the calendar scale are saved with the schedule.

Refreshing data in the graphical view

When you refresh the information in your schedule, you update the schedule with changes that were made to the work records in the applications where the work records originated.

Refreshing data for work records

When you update work records in the work management applications, you can refresh your schedule data to include the updates. The following business rules apply:

- Any new work records that you add in the work management applications that fit your query criteria appear in your schedule. Corresponding tasks and resources also appear.
- If you change the Scheduled Start or Scheduled End dates in the work management application where the record originated, the dates are updated in the schedule, providing that the segments were not edited in the schedule. If changes were made in the schedule but not committed back to the work management application, no updates are made to the schedule.
- If you change the precedence relationships between tasks in the work management application, the precedence constraints are updated in your schedule, providing that no changes were made to the constraints in the Graphical Scheduling application. If changes were made in the application but not committed back to the work management application, no updates are made.
- If you change the status or priority of a work record in the work management application, the schedule is updated. If a work record changes to a status of CANCELLED or CLOSED, it is deleted if the Preserve Existing Records on Refresh check box is cleared.

Refreshing data for preventive maintenance forecasts

For preventive maintenance (PM) forecasts, changes made in the Preventive Maintenance application to the forecasted PMs are brought into the schedule, and the forecasts are updated accordingly. The following business rules apply:

- If edits were made to a PM forecast in the scheduling application, and no edits were made in the PM application, the data in the schedule is not refreshed.
- If edits were made in the scheduling application, and new forecast dates appear on the PM record, the new forecast dates are added to the schedule, but the dates that you modified in the scheduling application are not changed.
- If a forecast is deleted in the PM application, it is deleted from the schedule upon refresh.
- When a PM is deleted or its status changed to INACTIVE in the PM application, it is removed from the schedule upon refresh.
- If a forecast was deleted and regenerated in the PM application, all forecast dates are updated and overwritten in the schedule.

Uncommitted work

Uncommitted work is work that was modified in the graphical view without being saved to the originating work record applications.

When you change work records in the graphical view, their appearance in the Activity table changes. Uncommitted work is indicated with an asterisk, and is italicized in blue.

You can commit work (at the PM or work order level) by using the Commit Selected Work action, or you can commit all changes at once by using the Commit All button. The edits can be changes that you made in the Gantt view, or changes that came from a child work record. (The graphical view always recalculates the duration of the parent work record to span the duration of its children.) You cannot commit a task without its parent work record. However, when you commit a work order, its tasks are also committed.

If you want to erase all uncommitted changes, you can refresh the graphical view. The uncommitted changes are overwritten by data from the work records in the database.

In the Graphical Scheduling application, the following changes are considered uncommitted work.

- Start Date
- End Date
- Duration
- Precedence constraints

In the Graphical Assignments applications, the following changes are considered uncommitted work.

- Work that was assigned, unassigned, or reassigned, split, or deleted
- Start Date
- End Date
- Duration

Graphical view tips

You can use several shortcuts in the graphical view to make scheduling and assigning work easier.

Work record hover information

You can press ALT-click while hovering over a work record to get a full description of the work.

Selecting all work records under a parent

You can select all work records under a parent work record in the graphical view. Press Shift-Click on the check box next to the parent record to highlight the entire work hierarchy.

Right-click options

You can right-click on most areas of the graphical view to see a list of actions that you can perform on the selected records. The right-click options include the following:

- From the activity table, right-click on the work record number to modify the work record. For example, you can change the status of the record or create a job plan for it.
- From the activity table or chart, right-click on the work description to highlight the work in the Gantt view. You can expand the work hierarchy, or move the work to another hour or day.
- From the resource table, right-click to see where a labor or resource is already assigned, see their craft and skill level, or change their availability.
- From the resource table, you can split work into multiple segments, or create or delete an assignment.

Zoom in on selected work

You can show work segments in the graphical view by double-clicking the work in the activity table.

Resource Filter

You can use the resource filter to show only the labor and crew resources that are required for the selected work records.

Resizing the chart

You can resize the windows of the graphical view by dragging the arrow at the bottom corner.

Lock scrolling while assigning work

Using keyboard keys, you can restrict where you can drag assignments in the graphical view. Click Shift while dragging to move tasks up and down on the graphical view, locking the time. Click Alt while dragging to move tasks left to right, locking the labor, craft, or crew assignment.

Graphical view customization

You can modify the default values of system properties to determine what information appears in the graphical view. The properties are located in the System Properties application.

Changing property values

You can change a display property by modifying its value in the System Properties application. You can search the System Properties application for properties that are related to the graphical view by using the following prefixes:

- skd
- map
- lbs

Displaying shift colors

You can enable shifts to display in certain colors in the System properties application. Use the `skd.shift.enable.colors` system property to display shifts by color in the graphical view. Choose the colors in which the shifts display in the `skd.shift.colors` property.

Modifying drag increment settings

In the Graphical Scheduling and Graphical Assignment applications, when you drag a work record in the graphical view, it moves in 15 minute increments. You can change the increment by modifying the `skd.gantt.view.snap_to_interval_mins` property in the System Properties application. If you want to plan and schedule in more precise detail, make the setting smaller.

Modifying column sorting settings

In the repair facilities and Asset/Location Graphical Scheduling applications, you can sort up to three columns of data in the graphical view . You can change the number of columns you can sort by modifying the `skd.max.sort.columns` property in the System Properties application.

Modifying the work action menu order

System administrators can change the order in which the right-click menu for work record actions display by updating the Maximo® database. Using any database tool, update the MENUORDER column in the SKDACTION table. You must restart the Maximo server for changes to take effect.

Modifying resource availability display options

You can choose to consider person/crew modified availability when calculating hourly totals by modifying the `mxe.skd.resourceavail` property in the System Properties application.

You can remove modified availability from the sum of the Hours-based view and the Resource & Availability tab calculations. In the System Properties application, change the value of the `mxe.skd.resourcesummedview` property to 0. The default value is 1, which shows the modified availability.

Modifying work record display options

The `mxe.skd.availabilitydaterange` property determines the length of time that asset availability displays for in the Other Resources window. By default, it is set to display for 7 days past the end of the work order start date. It can be modified in the System Properties application.

You can choose to mark work records without dates as modified once they are scheduled in the Graphical Scheduling application by modifying the `mxe.skd.setactivitymodified` property in the System Properties application.

Modifying notification options

You can turn off notifications from the emergency work crontask if no emergent work is found by modifying the `mxe.skd.setsendemailfornoemwo` property in the System Properties application.

Modifying performance options

You can set the number of changed rows that initiate a background commit to the database by modifying the `mxe.skd.changecount` property in the System Properties application.

You can limit the number of work list records that tables can populate at once by modifying the `mxe.skd.populatecount` property in the System Properties application.

Modifying colors

You can modify the default color settings in the graphical view by using the System Properties application. Search the System Properties application for properties that are related to the graphical view by using the following prefixes:

- `skd`
- `map`
- `lbs`

For more information on colors in the graphical view, see the [Maximo Asset Management Scheduler Community](#). You will need to join the community in order to view content. This process can take several minutes.

Modifying colors for resource availability

Modifications to resource availability display in the graphical view in different colors, depending on the reason. You can modify the default color settings, or add additional reason codes.

Modify existing reason codes using the following system properties:

Table 1. Modified availability display colors

System property	Reason code	Default color code
<code>skd.modavail.color.EXTRATIME</code>	Extra time	<code>#b0ecde</code>
<code>skd.modavail.color.MEET</code>	Meeting	<code>#79e5b2</code>
<code>skd.modavail.color.PERS</code>	Personal time	<code>#eae8c6</code>
<code>skd.modavail.color.SICK</code>	Sick time	<code>#311151</code>
<code>skd.modavail.color.TRAIN</code>	Training	<code>#dfc78e</code>
<code>skd.modavail.color.VAC</code>	Vacation time	<code>#8c769f</code>

You can also add additional reason codes to account for different types of modified availability in the Domains application. Search for the `RSNCODE` domain and additional codes as necessary.

Defining colors for synonym statuses

If your organization uses synonyms for work record statuses, you can define specific color settings for the synonyms in the System Properties application. Add a new system property in the System Properties application using the syntax: `skd.syn.<OBJECTNAME>.<STATUS>.background` and enter a hexadecimal color code in the Global Value field.

For example, you have a synonym for approved work orders called `APPR_S1`.

1. In the System Properties application, enter a new system property called: `skd.syn.workorder.APPR_S1.background`.
2. In the Global Value field, enter the hexadecimal color code for the color you want the work orders to be in the graphical view.
3. From the Actions menu, click Live Refresh.

Defining critical path indicators

When CPM is run on a schedule, the critical path is highlighted. The critical path indicate the records that have no float, meaning if their dates slip, the entire project slips. You can configure the color of the highlight in the `skd.criticalpath.color` system property in the System Properties application. To enable warning messages that alert users to changes in the critical path, enable the `skd.cp.impactwarning.enabled` system property.

- [Defining shift colors](#)
You can enable resource shift calendars to appear in the resource view to assist you in scheduling work when resources are available.
- [Configure Tooltips application](#)
You can modify tooltip text for work records and resources in the graphical view.
- [Configuring default settings in the graphical view](#)
You can specify the work and resources that appear in the data table of the Gantt view. The settings specified in the Configure Gantt Properties: Default Settings window apply to all schedules or work lists.

Defining shift colors

You can enable resource shift calendars to appear in the resource view to assist you in scheduling work when resources are available.

Procedure

1. In the System Properties application, search for the `skd.shift.enable.colors` property. Change the Current Value to 1 to enable the property. Save the record.
2. Define the colors that you want the shifts to display in the `skd.shift.colors` property. Save the record.

Return to the Graphical Scheduling application to see your changes. The maintenance and operation shifts are shown in the top portion of the graphical view. The shifts are shown in the resource section.

Configure Tooltips application

You can modify tooltip text for work records and resources in the graphical view.

Tooltips are shown when you hover over work or resource bars in the graphical view. The following tooltip types can be configured:

Table 1. Configurable tooltips

Application	Tooltip type
Graphical Scheduling	<ul style="list-style-type: none">• Work record• PM• Resource
Graphical Scheduling - Large Projects	<ul style="list-style-type: none">• Work record• Resource
Graphical Assignment	<ul style="list-style-type: none">• Work record or assignment• Resource
Graphical Assignment - Repair Facility	Work record or assignment

- [Configuring tooltips](#)

You can modify the text that is shown when you hover over a work or resource record in the graphical view. This text is called a tooltip.

Configuring tooltips

You can modify the text that is shown when you hover over a work or resource record in the graphical view. This text is called a tooltip.

About this task

The Configure Tooltips application contains the default values for tooltips that are shown in the graphical view. You can modify the default values to change the text.

Procedure

1. In the Configure Tooltips application, search for the tooltip template that you want to modify. You can enter the first few letters in the Template Name search field or press Enter to display all values. Open the tooltip template for the tooltip that you want to modify.
2. Edit the HTML. Click Tooltip Preview to see your changes.
You can reset the tooltip text to the default value by clicking Reset to Default.
3. Save the record.

Configuring default settings in the graphical view

You can specify the work and resources that appear in the data table of the Gantt view. The settings specified in the Configure Gantt Properties: Default Settings window apply to all schedules or work lists.

Only data that you specify in the Configure Gantt Properties: Default Settings window can be shown in the Gantt view.

You define the data that appears in the graphical view on the following tabs:

Table 1. Tabs that can contain graphical view data

Tab	Description
Work Properties	Specify the work that shows in schedules. Select data from the Activity, Change, Release, or Work Order applications.
Resource Properties	Specify the resource data that shows in schedules. Select data from the Crafts application.

You can specify a business object and attribute, such as a database table and column, to associate with each property that you enter. You can specify the order in which data appears in the data table in the Display Order field. You can set certain data to appear on all schedules by selecting Always Visible.

Managing schedules

You can create and maintain schedules that are based on work record, asset, or location hierarchies. The queries you use determine which hierarchy the work records in your schedule reflect.

- [Schedules overview](#)

Schedules allow maintenance planners to optimize the resources used to complete work. You can create multiple scenarios of schedules, run optimization

- templates on them, and choose the preferred version to save to the work records.
- [Graphical Scheduling application](#)
You use the Graphical Scheduling application to manage and schedule work and resources at your organization. The schedules you create are based on work record, asset, or location hierarchy. You can view the schedules in the graphical view to manage them visually.
- [Graphical Scheduling - Large Projects application](#)
You use the Graphical Scheduling - Large Projects application to manage schedules that are too large for the Graphical Scheduling application.
- [Scheduling dashboard](#)
On the Scheduling dashboard, you can see all your schedules at a glance and view upcoming work.

Schedules overview

Schedules allow maintenance planners to optimize the resources used to complete work. You can create multiple scenarios of schedules, run optimization templates on them, and choose the preferred version to save to the work records.

- [Graphical view for schedules](#)
When you view your schedule in the graphical view, the information is divided by work record type.
- [Resource planning in schedules](#)
You can use the graphical view to help you schedule work based on resource requirements and their availability. You can prioritize and adjust your schedule by balancing the resource load.
- [Status of schedules](#)
The status of a schedule indicates whether the record is in draft form, is approved for use, or is closed.
- [Schedule duplication](#)
You can duplicate a schedule to take an existing schedule and add additional work and resources to it while you maintain a copy of the original.
- [Time zones in the graphical view](#)
Time zones display in the graphical view differently for work and PM forecasts.
- [CPM in schedules](#)
Schedules use the standard critical path method (CPM) algorithm to assign schedule dates to each work record. Critical path method logic adjusts scheduling dates by factoring in precedence relationships, calendar information, specified start dates, and other factors.
- [Percent complete display and calculations](#)
In the Graphical Scheduling application, you can display percent complete for work orders and tasks, and then calculate the percent complete for the parent work records and the schedule, helping your planner to keep projects on track.
- [Schedule compliance calculation](#)
A maintenance planner needs to track metrics to ensure that maintenance projects in the department are on track.
- [Scheduling work in the graphical view](#)
After you create a project schedule, you use the graphical view to visually manage and schedule work and resources in your organization. The graphical view shows you the available resources for work, and allows you to make schedule changes.

Graphical view for schedules

When you view your schedule in the graphical view, the information is divided by work record type.

Schedule information for work and PM forecasts is shown separately:

- Work schedules are shown in the Activity and Resource tables.
- PM forecasts appear in the lower portion of the tables, in the PM section. The PMs and jobplans within the PM forecasts are segmented bars. If there is no job plan associated with a PM, the graphical view gives a default duration of one hour. The bars can be moved to new dates, but the durations of the job plans cannot be changed. When you edit a forecast or a job plan that is associated with a forecast, the edited segment becomes a striped bar.

Work records whose status is CANCELLED or CLOSED are not included in the graphical view.

Resource planning in schedules

You can use the graphical view to help you schedule work based on resource requirements and their availability. You can prioritize and adjust your schedule by balancing the resource load.

In the graphical view, resources are displayed in the two lower panes: the Resource table and the Resource chart. You can resize the panes to customize your view.

Resource hours and availability

Craft and crew type resources that are required for the work are shown in the resource view. The resource hours that are listed in blue represent the number of craft hours that the work requires for a shift. The hours in yellow are the total craft hours that are available for the shift.

In the resource view, resource load and availability is displayed by craft. Alt-click on the yellow or blue bar to display resource information for that craft. It shows available hours, number of labor records working, and total number of hours assigned. When you make changes to the scheduled work above in the graphical view, the resource buckets are automatically updated as well. You can choose which day the resources display from by changing the value in the Start Week Day field on the schedule tab. By default, it starts on Sunday. You can also choose whether you want to see your resource load and availability displayed by shift, or in daily, weekly, or monthly segments in the Resource Load and Availability Display Mode field.

You can filter the graphical view to show the specific craft and crew type requirements and availability required for specific work records. In the Activity table.

Select the work record you want to see the craft requirements for. Click the Filter resources based on the selected work orders  button. The resources required for the work are shown in the Resource chart.

You can filter the graphical view to show the work that requires specific craft resources. In the Resource table, select the craft or crew type record that you want to see the work records for. Click the Filter work orders based on the selected resources  button. The work records that require the selected craft or crew type are shown in the Activity table.

To clear the filters, click  again.

Availability of other resources

Asset, locations, items, and tools that are required for work are available in the Other Resource Availability window. Right-click a work record in the activity chart and select Other Resources Availability to see the availability of resources that are required for the work.

Asset and location availability are displayed based on their operating and maintenance schedules, and the appropriate asset or location calendar. The schedules appear as follows:

- An orange bar shows the calendar for the site of the asset or location.
- A green bar shows the maintenance schedule for the asset or location. It is the best time to schedule work.
- A red bar shows the operational schedule for the asset or location, when it is unavailable for maintenance.

Item and tool availability are shown in the following way:

- A green bar indicates that the item or tool is available during the scheduled work time.
- An orange bar indicates one of the following circumstances:
 - If the work record is in WAPPR status, indicates that the item or tool is partially available, and can be reserved.
 - If the work record is not in WAPPR status, indicates that a soft reservation was made for this tool or item.
- A red bar indicates that the item or tool is unavailable during the scheduled work time.

Unlike labor and crew availability, tool and item availability show only for the task that is selected in the Activity table. You cannot view item and tool availability for multiple tasks at the same time.

Alternate availability

You can define alternate availability for resources in your schedules in the Scheduling Alternate Resources application.

- [Scheduling Alternate Resources application](#)
You can define alternate availability for resources in your schedules.
- [Asset and location availability](#)
A maintenance planner must consider many factors when scheduling work. These factors include the availability of specialized labor and crews, the availability of the asset or location itself, and the nature of the maintenance work.

Scheduling Alternate Resources application

You can define alternate availability for resources in your schedules.

You can override resource availability for the entire duration of the project, or for specific dates in the project.

For example, a project schedule is eight weeks long. During that period, 20 mechanics are available for the first four weeks. During the next two weeks, 15 mechanics are available. For the final two weeks, 18 mechanics are available. You can define the craft availability for each time period in the application. You can also define alternate availability for crew types and tools.

- [Defining alternate resource availability](#)
You can modify the availability of craft, crew type, and tool resources for specific dates in a schedule, or for the entire duration.

Defining alternate resource availability

You can modify the availability of craft, crew type, and tool resources for specific dates in a schedule, or for the entire duration.

Procedure

1. In the Scheduling Alternate Resources application, click the Detail menu to select a schedule.
2. Click Modify. The Modify Alternate Availability table lists the craft, crew type, and tool resources that are used in the schedule that you selected. Each shift has its own resource entry.
3. In the row for the correct resource and shift combination, modify the quantity of the available resource. Enter a start and end date for the modification.
4. To enter a second row for the same resource and shift, click Add New Alternate Availability . In the new row, enter the new start and end dates.
You can have as many entries per resource and shift combination as necessary.
5. When you are finished making modifications, save the record.

Example

For example, a schedule ABC is 8 weeks long. During that period, 20 mechanics are available for the first four weeks. During the next two weeks, 15 mechanics are available. For the final two weeks, 18 mechanics are available. All mechanic work takes place in the day shift.

In the Scheduling Alternate Resources application, open the record for schedule ABC. In the Modify Alternate Availability table, find the row for mechanics in the day shift. Enter 20 in the Quantity field, and the start and end dates for the first four weeks of the schedule. Click Add New Alternate Availability. In the new row, enter 15 in the Quantity field, and the start and end dates for those two weeks. Click Add New Alternate Availability again. In the new row, enter 18 in the Quantity field and the start and end dates. Save the record.

Asset and location availability

A maintenance planner must consider many factors when scheduling work. These factors include the availability of specialized labor and crews, the availability of the asset or location itself, and the nature of the maintenance work.

Maintenance schedule

The maintenance schedule is the time during the day when your maintenance crew can work on an asset or location. Certain assets and locations require specialized labor or crews to perform maintenance on them. A crew might be available in a location only on certain days, or at certain times. The crew's schedule is defined in the maintenance schedule windows, so that this information is available to the maintenance planner. A maintenance schedule is not required for regular assets and locations that do not require a specialized crew or skill.

In the Define Maintenance Schedule dialog box, you define the asset or location maintenance schedule. In the Manage Maintenance Schedule dialog box, you can add, delete, or modify entries for specific assets or locations.

Operational schedule

The operational schedule for an asset or location is the time during the day when the asset or location is in use, and is unavailable for maintenance. This information can be entered in the Operational Schedule dialogs or can be imported from the Maximo® integration framework.

In the Define Operational Schedule dialog box, you define the operational schedule for the asset or location. In the Manage Operational Schedule dialog box, you can add, delete, or modify entries for specific assets or locations.

For example, an X-ray device requires a specialized maintenance crew, including a technician and a radiation inspector, for annual maintenance. The specialized maintenance crew is at the location on Tuesdays, from 7 a.m. to 10 a.m. The operating schedule for the X-ray device is 9 a.m. to 5 p.m., daily. The maintenance can be performed on Tuesday between 7 a.m. and 9 a.m.

Status of schedules

The status of a schedule indicates whether the record is in draft form, is approved for use, or is closed.

The following statuses are used for schedules.

Draft

The draft status is the default status for new schedules. A draft schedule is being developed or reviewed. In draft status, you can define the schedule details, like calendar information, the start date for work, and the queries that define the work and required resources. You can also modify the schedule details, the queries, and the work in the Gantt view.

Approved

When a schedule is in approved status, the schedule details and the work queries are read-only. You can modify the resource queries, and you can modify the work records in the Gantt view. You can create multiple scenarios for an approved schedule, if your schedule allows it (by using the Scenario Allowed check box).

Closed

A schedule can be closed when all the work is complete, or when it is no longer used. A closed schedule does not show in the list view. It can be accessed only from the Advanced Search window. It can be changed back to approved status if necessary.

If more scenarios exist for the schedule, it cannot be changed to draft status.

Schedule duplication

You can duplicate a schedule to take an existing schedule and add additional work and resources to it while you maintain a copy of the original.

You can duplicate schedules in two ways. Both options are available from the Action menu:

Duplicate Schedule Definition

Duplicates just the schedule information, including the query that was used, calendar information, and other data that you entered on the Schedule tab.

Duplicate Schedule

Duplicates the entire schedule record, including data on the Schedule tab, and changes you made in the Gantt view.

Time zones in the graphical view

Time zones display in the graphical view differently for work and PM forecasts.

Time zones for work records

Work records are shown in the local time zone of the user. When you create a schedule, select the calendar and shift information for where the work will be performed (which might differ from the database date and time). The craft requirements for those work orders also are shown in the local time zone of the user. Craft availability is shown based on the calendar and the shift specified in the schedule. For example, if the shift is from 7:00 AM to 3:00 PM, the availability is shown for that duration.

Your Maximo® database is set to Eastern Standard Time (EST). A work order is scheduled to start today at noon (12:00 PM), EST. If the locale settings of the user are in Pacific Standard Time (3 hours earlier than EST), the Gantt view shows the work starting at 9:00 AM. However, the work order start time at the database level (on EST) is still noon. Therefore, select the shift information based on the locale of the user, not the database.

Time zones for PM forecasts

PM segments are shown with a start time of 12:00 AM, regardless of the time zone of the user. If the user moves a segment to another time, the segment returns to 12:00 AM when the schedule is saved. If the segment was moved to a different date, the new date saves with 12:00 AM as the start time.

CPM in schedules

Schedules use the standard critical path method (CPM) algorithm to assign schedule dates to each work record. Critical path method logic adjusts scheduling dates by factoring in precedence relationships, calendar information, specified start dates, and other factors.

When precedence constraints exist between work orders or tasks, you want the schedule dates to honor those relationships. Critical path method logic schedules the work to ensure that work is performed in the correct order. Critical path method logic follows certain rules to set optimal schedule dates for the work records in a schedule. The logic is based upon durations, precedence constraints, and working time, and not on resource availability.

You can apply critical path method logic in the Scheduler application by clicking the critical path method toolbar buttons in the graphical view.

How critical path methodology adjusts schedule dates

All work that has no dependencies is scheduled to start on the earliest scheduled start date. If the Preserved Scheduled Start Dates check box is selected for a schedule, the logic does not change the start date of tasks that are not dependent on others. However, independent tasks that are interruptible are moved to the earliest working time.

Interruptible work is scheduled only during work hours, as defined by the calendar in the schedule. Uninterruptible work is scheduled at the first available time. If no calendar information is associated with the schedule, all work is treated as interruptible.

Critical path method logic evaluates precedence relationships. For example, in a Finish-to-start relationship between Task 1 and Task 2, the start date for Task 2 is moved to the end date of Task 1.

Lead and lag time are added to the schedule dates as needed. For example, in the Finish-to-start relationship in the previous example, if Task 2 has a lead time of three hours, Task 2 is scheduled three hours after Task 1 finishes.

When critical path method logic adjusts the work dates, a Start-to-finish relationship can move work to a date that is earlier than the current date. To avoid the conflict, enter a value in the Start Date field on the schedule. The logic does not schedule any work earlier than the specified start date. This date is also used in cases when the work records have no target or schedule dates.

When CPM is run on a schedule, the critical path is highlighted. The critical path indicates the records that have no float, meaning if their dates slip, the entire project slips. You can configure the color of the highlighting (`skd.criticalpath.color`) and enable warning messages (`skd.cp.impactwarning.enabled`) for CPM in the System Properties application.

Critical path method logic does not affect preventive maintenance forecasts in the schedule.

Identifying the critical path

After running CPM, the critical path is highlighted in the graphical view. A backward pass calculates the late dates and float to determine the critical path, allowing users to focus on the important tasks that drive the schedule finish date. You can filter to show only the critical path by clicking Filter by Critical Path .

Percent complete display and calculations

In the Graphical Scheduling application, you can display percent complete for work orders and tasks, and then calculate the percent complete for the parent work records and the schedule, helping your planner to keep projects on track.

The percent complete for work can be determined in three ways.

Physical percent complete

The physical percent complete is manually entered, and is an estimation by the user.

Actual percent complete

The actual percent complete is calculated by dividing actual hours that were entered on the work record by planned hours (total actual hours / total planned hours).

- The value can exceed 100%.
- The value is time-based by labor transactions (duration of work completed / total duration)
- The value is updated when labor hours are reported in work record applications.

Task percent complete

The task percent complete can be calculated either on an average of completed tasks or on work time completed.

- For the average, it is calculated by dividing the number of the completed work segments by the total number of segments in the work (tasks completed / total # of tasks).
- For time-based calculations, it divides the number of work hours completed / number of total work hours required for the segment.

Percent calculation system property

The `skd.percentcomplete.rollup` system property determines how the calculation methods are rolled into the Graphical Scheduling application. By default, the property is set to 0, making the calculations time-based (based on reported hours). You can change the value to 1 to make the calculations based on averages.

For example, a schedule with task percent complete calculation has three tasks complete out of six total tasks. However, the span of the schedule is 19 hours, and the three task complete span 1 hour each. A value of 0 (time-based) in the `skd.percentcomplete.rollup` system property makes the Task Percent Complete 15% (3 hours / 19 hours). A value of 1 (average-based) in the `skd.percentcomplete.rollup` system property makes the Task Percent Complete 50% (3 tasks / 6 tasks).

- [Displaying percent complete in the graphical view](#)
You can view the percentage of a schedule that is complete in the Graphical Scheduling application.

Displaying percent complete in the graphical view

You can view the percentage of a schedule that is complete in the Graphical Scheduling application.

Procedure

1. In the Graphical Scheduling application, open the schedule that you want to display and calculate the percent complete for.
2. On the Schedule tab, select a value in the Percent Complete Calculation Method field.
For example, select Actual to calculate actual percent complete.
The graphical view now shows percent complete at the task level.
3. From the Actions menu, select Calculate % Complete.
The values in the Percent and Last Calculated fields for parent work records and the schedule are updated.
4. In the graphical view, click Display menu to choose visible columns . Select the Percent Complete column for the method that you chose. For example, select the Actual Hours Percent Complete column. Click OK to close the menu.
The percent complete column appears in the graphical view. If you chose Physical Percent Complete, you can update the value directly in the graphical view.

Results

The work records in the graphical view show percentage complete in the segments that represent them. For example, a work record that is 50% complete appears half green. If you entered a Physical Percent Complete and chose another calculation method as well, the calculated percentage appears. You can click the Show/Hide Actuals icon to display both values.

Schedule compliance calculation

A maintenance planner needs to track metrics to ensure that maintenance projects in the department are on track.

The planner might evaluate any of the following items:

- The cost of work over a specific time period
- Whether work is being completed on time
- The accuracy of the planning process
- [Viewing costs associated with scheduled work](#)
A maintenance planner needs to see the cost of work over a period to ensure that the department is not over budget. For example, the monthly maintenance cost for a certain location must not exceed \$10,000.
- [Forecast costs for preventive maintenance](#)
When budgeting for long-term work, you need to review upcoming work and its associated costs. You can use the Forecast Cost tab to see upcoming

preventive maintenance forecasts and the costs that are associated with each one.

- **[Evaluating project performance](#)**

A maintenance planner wants to evaluate overall project performance, comparing target and actual dates against the current maintenance schedule. The planner reviews the current scheduling project, and wants to anticipate problems that might be caused if date slippages occur.

- **[Evaluating maintenance planning](#)**

A maintenance manager wants to evaluate the accuracy of project planning in the maintenance department by using the schedule compliance factor. The manager wants to compare projected and actual hours for planned work on a schedule.

- **[Evaluating resource load and availability](#)**

For a certain day, a maintenance planner wants to see the number of hours of planned work that each craft has, compared to the number of resource hours that are available.

- **[Calculating schedule compliance with a cron task](#)**

You can set up a cron task to calculate schedule compliance automatically, at predefined intervals.

Viewing costs associated with scheduled work

A maintenance planner needs to see the cost of work over a period to ensure that the department is not over budget. For example, the monthly maintenance cost for a certain location must not exceed \$10,000.

Procedure

1. In the Graphical Scheduling application, open the record that you want to view costs for.
2. On the Cost and Usage tab, enter the date that you want the cost calculation to begin on.
3. In the Start Week Day field, select the day of the week that should be considered starting day for work cost calculations. Weekly work costs will calculate from this day forward.
4. Click Calculate Cost.
5. In the Work Cost table on the Week, Month, or Year tab, open the time period that you want to view costs for.
The totals are broken down into three categories.

Committed estimated total

The total cost of the work scheduled during the time period and committed to the database. The committed cost is saved in the work record applications.

Saved estimated total

The total cost of the work scheduled during the time period that was saved to the schedule. The saved cost is not saved to the work record applications.

Actual total

The total cost of the scheduled work incurred during the time period.

Forecast costs for preventive maintenance

When budgeting for long-term work, you need to review upcoming work and its associated costs. You can use the Forecast Cost tab to see upcoming preventive maintenance forecasts and the costs that are associated with each one.

You can calculate the projected costs for upcoming work by using the Forecast Cost tab. When you generate a forecast, forecasted work is displayed on the Forecast tab. On the Forecast Cost tab, you can click Calculate Cost to see the cost that is associated with each projected work order. All forecasted work is listed with the labor, material, tool, and service costs for each projected forecast. You can see a combined total for all the projected work to ensure that you budget for the work.

On the following subtabs, you can view the detailed costs for each category in the projected cost:

- On the Labor subtab, you can review craft, skill, and labor rate information to see how the labor costs were calculated.
- On the Material subtab, you can review item quantities and associated costs.
- On the Tool subtab, you can review tool rates and quantities for each tool that the work requires.
- On the Service subtab, you can review details for any service costs that are associated with the work.

Evaluating project performance

A maintenance planner wants to evaluate overall project performance, comparing target and actual dates against the current maintenance schedule. The planner reviews the current scheduling project, and wants to anticipate problems that might be caused if date slippages occur.

About this task

A maintenance planner reviews the current scheduling project, and wants to anticipate problems that might be caused if date slippages occur. The planner wants to take steps to correct possible problems before they occur.

Procedure

1. In the graphical view of the Graphical Scheduling application, select the row in the activity table that you want to view details for.
2. Click the Show / Hide Compliance toolbar button.
In the activity chart, the graphical view shows an orange segment that represents the target time span for the work. The graphical view shows a light green bar representing actuals.
3. From the activity table, right-click on the work record and navigate to the application that the work record originated in.
For example, for a work order, select Go To Work Order Tracking.
4. View the details of the work record, including the owner, priority, supervisor, and actual labor hours.
5. Return to the Graphical Scheduling application. In the activity table, right-click on the work record and take the following actions.
 - Select Owner: Select an owner for the work record that you can follow up with later.
 - Initiate Workflow: Set a workflow process in motion to notify management of the delay.
 - Create Communication: Send an email to the labor or crew resource responsible for their work, or to their manager, alerting them to the problem.

Evaluating maintenance planning

A maintenance manager wants to evaluate the accuracy of project planning in the maintenance department by using the schedule compliance factor. The manager wants to compare projected and actual hours for planned work on a schedule.

Procedure

1. In the Graphical Scheduling application, open the schedule that you want to evaluate.
2. On the Compliance tab, enter the start and end dates for the time period that you want to evaluate. Click Start Compliance.
3. In the Schedule Compliance Factor table window, select the time period that you want to review.
The table shows the planned hours for the time period.
4. Click Finish Compliance.
5. Save the record.

Results

The compliance details show in the Schedule Compliance Factor table. The Plan Work Records column lists the number of work records you planned to completed during the selected time period. The Actual Work records column list the number of work records you completed during the time period. The number of break-in and break-out work records are also listed. Break-in work is work that was not in the original schedule, but was later added. Break-out work is work that was included in the original schedule, but was later removed.

The Dashboard tab displays compliance information for each compliance period.

Evaluating resource load and availability

For a certain day, a maintenance planner wants to see the number of hours of planned work that each craft has, compared to the number of resource hours that are available.

Procedure

1. In the Graphical Scheduling application, open the schedule that you want to evaluate.
2. On the Resource Load and Availability tab, enter the start day for your work week.
3. Click Calculate Labor Hours.
4. In the Labor Hours table window, select the time period that you want to review.

Results

The resource hours details for each craft show in the Labor Hours table. The Planned Duration Hours column lists the planned duration of the work that is contained in the schedule. For example, all work must be completed in 3 hours. The Planned Labor Hours column lists the number of labor hours that are required to complete the work. For example, the planned duration of an electrical job is 3 hours, but the work takes 6 hours to complete, you allocate two electricians. The Available Labor Hours column lists the total number of craft hours that you have available for the selected time period.

Calculating schedule compliance with a cron task

You can set up a cron task to calculate schedule compliance automatically, at predefined intervals.

About this task

The *schedule compliance factor* measures adherence to the maintenance schedule, measuring the effectiveness of the work scheduling process. You can measure compliance on a weekly, monthly, or any user-defined basis. The schedule compliance factor is a percentage. It is derived by dividing the actual hours spent on work planned at the beginning of the time period, by the total planned work hours. For example, if the week starts on Monday, the compliance factor reflects work that is scheduled for that week as of Monday morning. The schedule compliance factor does not factor in unplanned work that was scheduled and performed during the time period.

Procedure

1. In the Graphical Scheduling application, open the schedule that you want to evaluate.
2. Click the Compliance tab. Enter the length of time for which you want the schedule compliance calculated in the duration fields.
3. Select the Cron Active check box to activate the cron task.
4. Define the frequency with which you want the schedule compliance calculation to run in the Schedule Frequency field.
5. Save the record.

Example

For example, you want to calculate the schedule compliance factor every week, from Monday to Friday. Enter the start date in the Schedule Compliance Start field. Enter 5 in the Duration field, and select Days in the Duration Units field. In the Schedule Frequency field, select every 1 week, on Monday at 8:00 AM. Click OK.

Scheduling work in the graphical view

After you create a project schedule, you use the graphical view to visually manage and schedule work and resources in your organization. The graphical view shows you the available resources for work, and allows you to make schedule changes.

Before you begin

You can customize your schedule display settings in the graphical view in the Configure Gantt Properties: Default Settings window. You can also adjust display properties on the Activity and Resource chart.

About this task

The following restrictions apply when scheduling work in the graphical view:

- Canceled, completed, or closed tasks are read-only in the graphical view. The dates for the task cannot be changed and the task cannot be moved in the schedule.
- You cannot set or manage date constraints from the graphical view. Date constraints originate from, and are managed in, the work record. You can, however, manage task-precedence constraints in the graphical view. For example, a task has a date constraint, and you move the task scheduled dates beyond that date in the graphical view. The color of the task changes to red, indicating it is in violation of the date constraint. You can schedule the work to occur at any time, but the date constraint remains in place in work management applications.
- Forecasts cannot be deleted in the graphical view.

Procedure

1. To modify the scheduled dates for a work record, select the work record in the Activity chart of the graphical view.
2. Review the information in the resource table to determine when to schedule the work.
3. Click the center of the work segment that represents the work, and drag it to the new date.
If you move the start or end date of a work record outside of any date constraints that exist for that record, a dashed line appears, indicating where the date constraint falls. The work record turns red, indicating it is in violation of its date constraints. You can move the work, or override the date constraints.
4. Save the schedule. To save your changes to the work management applications, such as Work Order Tracking or Activities and Tasks, commit the changes.

- [Creating schedules](#)

Creating a schedule in the Graphical Scheduling application helps you to see upcoming work based on work record, asset, or location hierarchy, and optimize the resources that are needed for the work. The schedule is prioritized and logically structured by work record. By default, schedules can be updated or deleted only by the user who created them. Use the Manage Commit Access action to control who can commit the schedule back to the database.

- [Sample queries](#)

You must use the proper query to populate your schedule or work list with relevant data.

- [Scheduling work based on resource availability](#)

When you are scheduling upcoming work, you must ensure that you schedule it when craft, asset, location, item, and tool resources are available.

- [Managing precedence constraints in the Graphical Scheduling application](#)

You can manage precedence constraints in the graphical view to ensure that tasks are completed in a designated order.

- [Interruptible and uninterruptible tasks](#)

Interruptible and uninterruptible work records are scheduled differently in the graphical view.

- [Committing schedule and work list data](#)

When you commit your schedule or work list, you update the work management records in the applications where they originated.

- [Scenarios](#)

You can create multiple scenarios for a schedule or work list to compare how different parameters and constraints change work completion dates. Creating multiple scenarios allows you to keep multiple working copies of a schedule without publishing the data to the work records.

Creating schedules

Creating a schedule in the Graphical Scheduling application helps you to see upcoming work based on work record, asset, or location hierarchy, and optimize the resources that are needed for the work. The schedule is prioritized and logically structured by work record. By default, schedules can be updated or deleted only by the user who created them. Use the Manage Commit Access action to control who can commit the schedule back to the database.

Procedure

1. In the Graphical Scheduling application, click New Schedule .
2. In the Schedule field, specify a name for the schedule, and then use the Description field to briefly describe the schedule.
3. In the Type field, specify the schedule type that you want to create. Choose Asset, Location, or Work.
4. In the Calendar field, specify the shift calendar for when the work is to be performed.
5. In the Shift field, specify the work shift when the work is to be scheduled.
If you do not enter calendar or shift information, the schedule assumes that resources are unavailable.
6. If you want your project to automatically refresh at predefined intervals, select the Rolling Schedule check box. You set up the rolling schedule by selecting Roll Schedule from the Actions menu. For example, you want to refresh the work records in the schedule every day at 7:00 AM.
7. Enter start and end dates for the schedule.
The Start Date and End Date control the work period calendar that shows in the graphical view. If Project Start Offset Days and Project End Offset Days exist, they are added to either side of the date range in the graphical view. You cannot move work segments outside the graphical view date range as calculated by these four fields.
8. Use the Restrict Work to Dates? check box to further filter your work query to include only work with a start or finish date between the schedule start and finish dates. This means that any work records without schedule dates is not included in the graphical view at all.
9. In the queries section, select the asset or location records that you want to schedule for. You can choose from existing queries, create a new one, or select certain assets or locations. Choose from the following options:

Option	Description
Select assets or locations	Click New Row. In the details section that appears, select the Detail menu for the Assets or Locations field. Select the assets or locations that you want to include in the schedule.
Retrieve a saved query	Click Copy Query to produce a list of queries to choose from. Select the query that you want to use.
Create a query	Click New Row. In the details section that appears, complete the required fields to specify the details for the query.

Click the Detail menu for the Data Objects field. In the Select Objects window, select the database tables that you want your query to pull data from. You can select multiple tables.

10. You can choose either work orders or PMs that you want to exclude from your schedule by adding a Work Query Restriction.
11. In the Restrict Resource Availability section, you can restrict which labor and crew resources are available in the schedule. For example, you may have 30 electricians, but you only want to include the ones in a particular work location in the schedule. You can choose from existing craft, labor, crew, or crew type queries, or create a new one.
12. Click the More Information subtab. In the Additional Resources section, find any resources that you want to include in the schedule that are not required by the work or PMs in the schedule. You can choose from existing craft, labor, crew, or crew type queries, or create a new one. Choose from the following options:

Option	Description
Retrieve a saved resource query	Click Copy Query to produce a list of resource queries to choose from.
Create a resource query	Click New Row. In the details section that appears, complete the required fields to specify the details for the resource query.

13. Click Save Schedule.

Sample queries

You must use the proper query to populate your schedule or work list with relevant data.

Work queries for a schedule or work list

The following queries are examples of common queries you might use to populate a schedule or work list. These queries are to be used as templates for your actual production queries, which should be tested thoroughly before deployment. Your database syntax might vary.

You can also create queries using the relevant application's list page, in the Advanced Search window. You can do a query by example on the field combinations of interest. Once executed, you can see and modify the SQL statement in the Where Clause window, available from the dropdown menu in the Advanced Search window.

All work orders scheduled for a two week period

```
((woclass = 'WORKORDER' or woclass = 'ACTIVITY') and schedstart <= '2010-04-16 09:08:24.000' and historyflag = 0 and siteid = 'BEDFORD' and istask = 0 and schedstart >= '2010-04-05 09:08:04.000')
```

All work orders that a specific user owns, and are approved or in progress

```
owner = (select personid from person where personid = (select personid from maxuser where userid = 'WILSON')) and status in ('APPR','INPRG') note that the attribute owner could just as easily be supervisor or lead, or any field that resolves to a person id.
```

All work orders that are scheduled for this week

```
((woclass = 'WORKORDER' or woclass = 'ACTIVITY') and historyflag = 0 and siteid = 'BEDFORD' and istask = 0 and schedstart >= sysdate and schedstart <= (sysdate + 7))
```

All work orders targeted to be complete that are not (backlog)

((woclass = 'WORKORDER' or woclass = 'ACTIVITY') and historyflag = 0 and siteid = 'BEDFORD' and istask = 0 and targcompdate <= sysdate and status != 'COMP')

All in progress work for a group of assets with a similar prefix, found anywhere on a work order (as the primary asset or an entry in the Multiple Asset, Locations, and CIs table window)

((woclass = 'WORKORDER' or woclass = 'ACTIVITY') and status = 'INPRG' and historyflag = 0 and siteid = 'BEDFORD' and istask = 0) and (exists (select 1 from maximo.multiassetloci where ((assetnum like 'A80%')) and (recordkey=workorder.wonum and recordclass=workorder.woclass and worksiteid=workorder.siteid)))

Scheduling work based on resource availability

When you are scheduling upcoming work, you must ensure that you schedule it when craft, asset, location, item, and tool resources are available.

About this task

A maintenance planner is creating a schedule for the next three months. The maintenance planner wants to ensure that the dates meet start and end date requirements, and that it is scheduled when all resources that are required to complete the work are available.

Procedure

1. In the Graphical Scheduling application, open the appropriate schedule.
2. In the Activity table of the graphical view, drag the work segment to the timeframe that you want to schedule it for.
The resource chart shows craft or crew type requirements for the work, and their availability on that day.
3. Check for the availability of other resources. Right-click on the work record in the Activity chart and choose Other Resources Availability. The Other Resources Availability window opens.
The window shows the assets, locations, items, and tools that are required for the work, along with their availability. An orange segment indicates time when the resource is not available for maintenance. Green segments indicate the maintenance schedule associated with an asset or location. The asset and location are available to be worked on during this period.
4. Ensure craft and crew type availability during the newly scheduled work time. On the Resource Load and Availability tab below the work list, confirm that the craft and crew resources that are needed for the work are available on the scheduled work date.
5. Make schedule adjustments as necessary.
6. Save the schedule.

Managing precedence constraints in the Graphical Scheduling application

You can manage precedence constraints in the graphical view to ensure that tasks are completed in a designated order.

About this task

A *precedence constraint* is a relationship between two work records that indicates when one task begins or ends in relation to another. You can define precedence relationships between any tasks that are siblings under the same parent work record. Some precedence relationships are defined in the work management application where the work record originated. You can edit constraints or add new ones in the Gantt view. You cannot add constraints to preventive maintenance forecasts.

Procedure

1. To insert a precedence constraint, press Ctrl-click on the work records that you want to link, then click Create constraints for selected work . All of the selected work records are now linked by constraints. The constraints are start-to-finish, in order. If a constraint does not violate any finish-to-start work requirements, the line connecting the records is blue. If a constraint violates finish-to-start work requirements, the line connecting the records is red.
 2. To modify or delete the constraint, right-click on the line for the constraint that you inserted. Select Edit Constraint or Delete Constraint.
 3. Click Save Schedule .
 4. To save your changes to the work records in the work management applications, click Commit Changes  from the Actions menu.
- **Predecessor relationships**
Predecessor relationships indicate when successor work records and tasks can begin to ensure that tasks are completed in a designated order.

Predecessor relationships

Predecessor relationships indicate when successor work records and tasks can begin to ensure that tasks are completed in a designated order.

You can define the following relationships:

Table 1. Descriptions of predecessor relationships

Relationship	Description
Finish-to-finish	When the status of a predecessor changes to COMP (Complete), its successor changes to INPRG (In Progress). You can change the status of the successor. However, you can only change the status of the successor to COMP if the status of the predecessor is COMP or beyond.
Finish-to-start	When the status of a predecessor changes to COMP (Complete), its successor changes to INPRG (In Progress). The status of the successor cannot be changed to INPRG until the status of the predecessor is COMP.
Start-to-finish	When the status of a predecessor status changes to INPRG (In Progress), the status of its successor changes to INPRG. You can change the status of the successor. However, you can only change the status of the successor to COMP (Complete), if the status of the predecessor is INPRG or beyond.
Start-to-start	When the status of a predecessor status changes to INPRG (In Progress), the status of its successor changes to INPRG. The status of the successor cannot be changed to INPRG until the status of the predecessor is INPRG.

Your work record statuses might be different, depending on the values that you defined in the Organizations application.

For example, Work Order 1 (WO1) has a Finish-to-start relationship with Work Order 2 (WO2). WO1 contains three tasks, the duration of which total 12 hours. WO2 cannot start until all tasks for WO1 are complete (12 hours). The status of WO2 changes to INPRG when all three tasks for WO1 are complete, making WO1 complete.

Lead and Lag time do not affect status changes that occur through flow control.

Interruptible and uninterruptible tasks

Interruptible and uninterruptible work records are scheduled differently in the graphical view.

If no calendar or shift information is defined on the schedule, there is no distinction between interruptible and uninterruptible work in the graphical view.

Interruptible work

Interruptible work can be performed during work hours only. When interruptible work appears for the first time in the graphical view, it is scheduled for the first available work time in the calendar. The duration of the work is added to the start date and time to arrive at the work end date and time. If any portion of the work occurs during nonwork time, the unfinished portion is moved forward to the next work time. The nonwork portion of the work is shaded differently in the graphical view, indicating that no work is being performed.

The duration for an interruptible task is not always the difference between the start date and time and end date and time. The duration is the sum of the work hours between the start and end date and time. For example, a task starts on 06/01/2010, at 7:00 AM and ends on 06/02/2010, at 9:00 AM. Work time is between 7:00 AM and 3:00 PM. The duration is 10 hours (eight hours of work time on June 1, and two hours on June 2).

Uninterruptible work

Uninterruptible work can be performed at any time, regardless of work hours. The work is completed without interruption. When uninterruptible work appears for the first time in the graphical view, it is scheduled for the first available time on the schedule. The work continues, uninterrupted, until finished. The duration of the work is always the difference between the start date and time, and end date and time.

Committing schedule and work list data

When you commit your schedule or work list, you update the work management records in the applications where they originated.

Committing data from work records

When you commit a schedule or work list that contains work records, changes that were made in the schedule are saved to the appropriate work management application. The following business rule applies:

- If the work order was canceled or closed in the work management application, it is not updated by the schedule or work list.

Committing data from PM forecasts

When you commit a schedule that contains PM forecasts, changes that were made in the schedule are saved to the Preventive Maintenance application. The following business rules apply:

- If a forecast, or any portion of a forecast, was deleted from the Preventive Maintenance application, changes made in the schedule are not saved.
- If a work order was generated from the Preventive Maintenance application, and a forecast date was dropped, and then added, some forecasted dates for the PM will not match the data in the schedule. Changes that were made in the schedule to the forecasts that still exist in both places are updated in the Preventive Maintenance application. Changes that were made in the schedule to forecast dates that no longer exist are not saved to the PM. To add the new PM forecast date from the Preventive Maintenance application into the schedule, refresh your data.
- If a forecast was deleted and regenerated in the Preventive Maintenance application, no changes from the schedule are saved to the PM.

Scenarios

You can create multiple scenarios for a schedule or work list to compare how different parameters and constraints change work completion dates. Creating multiple scenarios allows you to keep multiple working copies of a schedule without publishing the data to the work records.

You can create scenarios in the following applications:

- Graphical Scheduling
- Graphical Assignment

A schedule or work list includes information such as calendar information, the start date for work, and the queries that define the work and required resources. Every schedule has one main scenario, which is a reflection of the work record data at the time that the schedule was created or last refreshed.

You can create multiple scenarios to compare how changes in resources, priority, and date constraints change the work order dates. For example, you can create a scenario to see how additional resources affect the schedule dates. You can create another scenario that focuses on getting higher priority work completed first, and a third that strictly enforces the start no later than and finish no earlier than dates. You can create a scenario from the Action menu.

The active scenario is shown on the List View. You view other scenarios from the Action menu. When you publish a scenario, it becomes the new active schedule record.

- [Comparing scenarios](#)
You can compare multiple scenarios of a schedule or work list to determine which version best fits your needs.
- [Published schedules](#)
When you publish a schedule, you commit the schedule data to the work records in the database.
- [Snapshots](#)
A snapshot is a read-only view of a schedule and its graphical view, which represents the schedule data when the snapshot was taken. You can compare snapshots to other snapshots and to scenarios.

Comparing scenarios

You can compare multiple scenarios of a schedule or work list to determine which version best fits your needs.

About this task

You can compare any two scenarios of the same schedule or work list in the Compare Scenarios tab. You can compare the work dates and the labor load for each scenario. Two graphical charts show when work is scheduled, or you can switch views to compare resource loads. Differences between the two scenarios are highlighted, including work records that are scheduled for different dates, or that appear in only one scenario. You can also compare the current schedule with a baseline, or snapshot, of the original schedule. When you compare a scenario to your baseline, you can see break-in and break-out work. Break-in work is work that was not in the original schedule, but was later added. Break-out work is work that was included in the original schedule, but was later removed.

Procedure

1. In the graphical view, view a scenario (or snapshot) that you want to compare.
2. Select Compare Scenarios from the Action menu, or click the Compare Scenarios tab. The Select Scenarios window opens, listing all scenarios and snapshots for the schedule. The current scenario is automatically selected. Choose another scenario from the list to compare it to.
3. Click Compare. The scenario window displays the Gantt view of both scenarios, with work dates. Break-ins, break-outs, and differences in work dates are highlighted. You cannot move or modify any dates in the graphical view when you compare scenarios.
4. Click the Next Change button to move the focus to the next difference in schedules, or click the Display Differences Only button to filter the view to show only differences.
5. Click the Compare Cost tab. Click Calculate Cost to update the costs for both scenarios. Select a tab to display the weekly, monthly, or yearly costs for each scenario.
6. Click the Compare Costs Chart tab. From the charts menu, choose the comparison chart that you want to view. For example, click Saved Estimated Total (Weekly) to view the comparison chart for total costs for the week that the work is scheduled for.
7. Open the graphical view. Click the scenario name to return to the graphical view of the original record.

Published schedules

When you publish a schedule, you commit the schedule data to the work records in the database.

When you publish a scenario, it becomes the main schedule record, and commits the changes that you made in the graphical view to the work records in the database. A snapshot of the graphical view is created, and can be viewed later by using the Manage Snapshots and Scenarios window.

You can publish a schedule by selecting Publish from the Actions menu.

You cannot publish a schedule that is in draft status.

Snapshots

A snapshot is a read-only view of a schedule and its graphical view, which represents the schedule data when the snapshot was taken. You can compare snapshots to other snapshots and to scenarios.

Snapshots are available in the Graphical Scheduling application.

You create a snapshot by selecting Create Snapshot from the Actions menu.

A snapshot is also created when a scenario is published.

You can view and delete snapshots in the Manage Snapshots and Scenarios window, available from the Actions menu.

Graphical Scheduling application

You use the Graphical Scheduling application to manage and schedule work and resources at your organization. The schedules you create are based on work record, asset, or location hierarchy. You can view the schedules in the graphical view to manage them visually.

You can identify possible scheduling conflicts that might arise from multiple concurrent work orders that need the same resources. You can move work records in bulk. For example, you can reschedule all unfinished work from the previous week to the next week. You can also match resources to requirements so that you can address exceptions rather than manually schedule all assignments.

After you create a work schedule, you can view the schedule in a graphical view. At a glance, you can see all the work in the schedule, and the resource requirements for that work. You can reschedule work so that resources are not overloaded or underutilized, and compare various work schedules by creating different scenarios. You can change the schedule with the drag-and-drop capability of the graphical view, and save the changes to the Maximo® database.

The Graphical Scheduling application manages constraints to ensure that your work is scheduled properly. For example, you can use task-precedence constraints to specify that some work (such as painting a wall) cannot be started until other work (sanding the wall) is complete. Similarly, you can use the date constraint feature to ensure that tasks that are scheduled to start on a certain date do not supersede tasks that are scheduled to start on an earlier date. Critical path methodology (CPM) can be used to track these dependencies while you make schedule changes, and recalculate the schedule accordingly.

Graphical Scheduling - Large Projects application

You use the Graphical Scheduling - Large Projects application to manage schedules that are too large for the Graphical Scheduling application.

The application is similar to the Graphical Scheduling application, with the following enhancements in the graphical view to facilitate large project performance (schedules containing 10,000 or more records):

- Work records are loaded in pages, 50 records at a time. The pages are created on the server rather than fetching and updating all work records in the project at once. The status at the bottom of the graphical view indicates the total number of records, the number of pages, and the start and end dates of the schedule.
- Child work records are collapsed by default. They can be opened as needed.
- Work records that have dependencies that are not on the same data page have an icon that indicates a dependency. If the work has an incoming dependency (for example, start to finish), the icon is on the left of the work record. If the work record has an outgoing dependency (for example, finish to start), the icon is on the right. You can ALT+click on the icon for the details of the constraint.
- The resource section of the graphical view is collapsed by default. If you open the resource section, resource information displays that is specific to the zoom level of the graphical view. A refresh button becomes available when changes are made to the work. You can refresh as needed by clicking the icon. The resource view also refreshes every time that it is opened.
- Changes made in the graphical view are automatically saved back to the work records.
- Critical Path Methodology (CPM) functionality and optimization run on the entire project, and display for the current page of records.
- The filter, sorting, and search functions query the entire project. Quick sort is not available.
- PM forecasting is not supported.

Scheduling dashboard

On the Scheduling dashboard, you can see all your schedules at a glance and view upcoming work.

Key performance indicators show important information, including scheduling problems and resource utilization. You can update work records, view resource allocation, fix scheduling problems, and run optimization from one convenient location. You can publish your changes when your adjustments are complete.

You choose which schedules appear on your dashboard in the Graphical Scheduling application.

- [Adding schedules to the Scheduling dashboard](#)
In order for schedules to appear on the Scheduling dashboard, they must be prepared for the dashboard in the Graphical Scheduling application. You can choose which schedules appear on the dashboard by creating a schedule scenario and preparing it for the dashboard.
- [Viewing resource utilization on the Scheduling dashboard](#)
You can see the percentage of your resources that are being used in each schedule on your dashboard.
- [Viewing resource leveling on the Scheduling dashboard](#)
You can view resource allocation and planned work by craft on the Scheduling dashboard.
- [Fixing scheduling issues on the Scheduling dashboard](#)
When optimization runs, sometimes work records cannot be scheduled because they do not meet the scheduling criteria that are defined in the optimization settings. You can update these work records on the dashboard to better align with the scheduling rules that you defined, or you can change the scheduling optimization rules.
- [Monitoring optimization progress on the Scheduling dashboard](#)
You can view optimization progress and results for your schedules on the Scheduling dashboard.
- [Removing schedules from the Scheduling dashboard](#)
You can remove schedules from the Scheduling dashboard by changing their settings in the Graphical Scheduling application.

Adding schedules to the Scheduling dashboard

In order for schedules to appear on the Scheduling dashboard, they must be prepared for the dashboard in the Graphical Scheduling application. You can choose which schedules appear on the dashboard by creating a schedule scenario and preparing it for the dashboard.

About this task



Procedure

1. On the Scheduling dashboard, click Prepare Schedules.
The Graphical Scheduling application opens.
2. In Graphical Scheduling, open the schedule that you want to include on the Scheduling dashboard.
3. Create a scenario for the schedule, if one does not exist. From the Actions menu, select Create Scenario and choose which kind of scenario you want to create.
If you want to use an existing scenario instead, open the scenario in Graphical Scheduling.
4. From the Actions menu, select Prepare for Dashboard.
5. In the Prepare Schedule for Dashboard window, select the scenario that you want to appear on the dashboard. If you want to apply a template, click Select Template and choose a template from the list.
6. Click OK.
The schedule scenario now appears on the Scheduling dashboard.
7. To add more schedules to the dashboard, in the My schedules table, click Add schedules.
The Graphical Scheduling application opens, where you can prepare more schedules for the dashboard.

Viewing resource utilization on the Scheduling dashboard

You can see the percentage of your resources that are being used in each schedule on your dashboard.

About this task

The Resource utilization KPI on the header shows the utilization rate for all crafts that are included in the schedule. The resources table shows utilization by craft.

Procedure

1. On the Scheduling dashboard, click the name of the schedule that you want to view.
2. In the Resources table, click the cell for the date and craft resource that you want to view resource utilization details for.
The scheduled hours, available hours, and utilization percentage are displayed. To view resource leveling data for that date and craft, click Resource leveling.
3. Click a different cell to view resource utilization for that date and craft.

Viewing resource leveling on the Scheduling dashboard

You can view resource allocation and planned work by craft on the Scheduling dashboard.

Procedure

1. On the Scheduling dashboard, click the name of the schedule that you want to view.
2. Click the Resource leveling tab.
3. From the craft menu, select the craft that you want to view resource levels for.
4. In the date selection field, choose the date from which you want assigned work to show. Work is shown on the Resource leveling tab for two weeks, beginning on the date that you choose.

Fixing scheduling issues on the Scheduling dashboard

When optimization runs, sometimes work records cannot be scheduled because they do not meet the scheduling criteria that are defined in the optimization settings. You can update these work records on the dashboard to better align with the scheduling rules that you defined, or you can change the scheduling optimization rules.

About this task

You can view scheduling issues from the main dashboard, or from within individual schedules.

Procedure

1. On the Scheduling dashboard, open the schedule that you want to view.
2. On the Scheduling issues tile, click the number.
The Issues tab opens. Use the table filter to group issues by category.
3. For each row in the Results table, expand the error message to determine why the work record was not scheduled. Update the values to fix the scheduling issue. Repeat for each row in the Results table.
4. From the Actions menu, select Optimize schedule.
5. In the Optimize schedule window, update scheduling rules as needed. Click Optimize schedule.
The optimization runs, and schedules the work records that had scheduling issues.
6. When you are satisfied with the schedule, publish it to the Work Order Tracking application. From the Actions menu, select Publish schedule.

Monitoring optimization progress on the Scheduling dashboard

You can view optimization progress and results for your schedules on the Scheduling dashboard.

Procedure

1. After fixing scheduling issues or refreshing your schedule, from the Actions menu, select Optimize schedule to run optimization.
The Optimize Schedule page opens. On the Optimize Schedule page, you can see optimization progress, including the solutions, the solve status, and any alerts or warnings that were encountered. You can watch the progress or click Run in background to return to the Scheduling dashboard.
2. When optimization is complete, click Go to schedule to return to the Issues tab for the schedule, where you can fix any unresolved issues. You can also view the latest optimization report at any time by clicking the Last ran link in the schedule header, or from the Optimization status column on the Scheduling dashboard.

Removing schedules from the Scheduling dashboard

You can remove schedules from the Scheduling dashboard by changing their settings in the Graphical Scheduling application.

Procedure

1. In the Graphical Scheduling application, open the scenario for the schedule that you want to remove from the Scheduling dashboard.
2. In the Scheduling Dashboard Ready field, turn off the toggle switch.
3. Save the schedule.
The schedule is removed from the Scheduling dashboard.

Managing assignments

You can assign work to labor, crews, or repair facilities based on their skills and availability.

- [Assignments overview](#)
You use assignments to assign work to labor, crews, or repair facilities based on their skills and availability.
- [Graphical Assignment application](#)
You assign work to labor and crews at your facility based on their skills and availability. In the Graphical Assignment application, you view upcoming work and assign the work graphically to the appropriate labor or crew resource, and respond to dynamic work situations.

- [Graphical Assignments - Repair Facility application](#)

In the Graphical Assignments - Repair Facility application, you can assign work directly to your facilities based on their availability. For example, you can assign work directly to an aircraft hangar.

Assignments overview

You use assignments to assign work to labor, crews, or repair facilities based on their skills and availability.

- [Assigning work](#)

You use the Assignment view to assign upcoming work to labor and crews based on their availability.

- [Splitting work between people and shifts](#)

You can split work into multiple assignments to complete the work as efficiently as possible. For example, if a job takes more time than anticipated, you can continue it into a second shift with another labor or crew resource.

- [Rescheduling assignments](#)

In reviewing the weekly schedule for the organization, a maintenance planner sees that some work must be reassigned because of upcoming emergency work. The maintenance planner wants to leave a particular labor or crew resource available for the upcoming work.

- [Assigning emergency work](#)

You can check for emergency work in your organization and assign the work as it comes in. You can assign the work to available resources automatically or manually.

- [Exporting assignment calendars](#)

In the Graphical Assignment and Graphical Work Week applications, you can export the assignment calendars for resources to keep a separate record of them. You can download the resource calendars or send them in an email.

- [Resource availability for assignments](#)

You use the Assignment view in the Graphical Assignment and Graphical Assignment - Repair Facility applications to assign work to available resources.

Assigning work

You use the Assignment view to assign upcoming work to labor and crews based on their availability.

About this task

Assignments typically originate from a job plan, but can be added to work records at any time. Job plans specify the crafts and crew types that are required to do the work.

The Assignment View tab displays labor and crew availability as it is defined in the Calendars application, where you can define calendar, shift, and break information. Non-work time appears in the assignment view as a shaded area on the resource table. The assignment view also shows the modified availability of the resources, including overtime, sick, and vacation time.

If you have filters applied for the work segments in the work view, you can carry the filter results into the assignment view by clicking Enable Filtering from the

Work View .

Procedure

1. On the Assignment View tab, select the orange bar representing the work record that you want to assign. You can shift-click to select multiple records. Resources that match the requirements of the work exactly (both craft and skill) are shaded dark blue. Resources that partially match the requirements (craft only) are shaded light blue. A multiple skills icon indicates that the labor or crew possesses multiple skills. You can right-click on the resource and select View Craft/Skill to see all of its associated skills. You can assign work by using one of the following methods:
 - Drag the work record to the resource that you want to assign it to in the resource chart.
 - Right-click on the bar representing the work that you want to assign. Select Available Labor. In the Available Labor window, select the labor or crew resource that you want to assign the work to. Click OK.
 - Right-click on the resource that you want to assign the work to. Select Assign Available Labor/Crew. The work is assigned to the selected resource based on their availability. It is split to accommodate shifts, etc.
 - To assign only top or bottom level work records to a resource, you can use the CTRL and ALT keys while drawing a border around the work you want to assign.
 - Press the CTRL key and draw a border around the work to select only the top level work records in the hierarchy. Right-click on a work segment for any selected work order and select Available Labor/Crew. Choose the labor or crew resource you want to assign the work to.
 - Press the ALT key and draw a border around the work to select only the bottom level work records in the hierarchy. Right-click on a work segment for any selected task and select Available Labor/Crew. Choose the labor or crew resource you want to assign the tasks to.Using keyboard keys, you can restrict where you can drag assignments. Click Shift while dragging to move tasks up and down on the Gantt view, locking the time. Click Alt while dragging to move tasks left to right, locking the labor, craft, or crew assignment. When work is properly assigned, the bar that represents the assigned work is green. If you selected a resource that does not match the work requirements, the bar is red. If you have double-booked a resource, the bar is yellow. Alt-click on the bar to get work details, including an explanation of any assignment violations.
 - a. If an appointment is required (in the work record application), an icon indicates that an appointment has not been made. Right-click on the assignment and choose Lock to set the appointment. Appointments that are locked cannot be rescheduled due to optimization or manual edits. To change the scheduled time manually, right-click on it and choose Unlock.
2. Save the work list.

Splitting work between people and shifts

You can split work into multiple assignments to complete the work as efficiently as possible. For example, if a job takes more time than anticipated, you can continue it into a second shift with another labor or crew resource.

Procedure

1. In the resource chart of the Assignment view, right-click on the work record that you want to split.
2. Split the work by either segment or shift. For example, if the work duration spans more than one work shift, you can split the work by shift. If you want to break the work up into smaller segments that can be assigned simultaneously, split the work into two or three segments.
3. Assign each segment of the work.
 - Drag the work to the appropriate labor or crew resource.
 - Right-click on the bar representing the work that you want to assign. Select Available Labor. In the Available Labor window, select the labor or crew resource that you want to assign the work to. Click OK.
4. Save the record.

To merge the assignments in the future, right-click on any segment of the assignment and select Merge Split Assignments.

Rescheduling assignments

In reviewing the weekly schedule for the organization, a maintenance planner sees that some work must be reassigned because of upcoming emergency work. The maintenance planner wants to leave a particular labor or crew resource available for the upcoming work.

Procedure

1. In the Graphical Assignments application, click the Assignment View tab. In the resource table, locate the labor or crew entry to make available for emergency work.
2. Drag the assignments that you want to reassign to another labor or crew resource. You can also reassign all the work assigned to a resource to a different day by selecting multiple records (Ctrl-click) and dragging them to a different day.
3. Save the record.

Assigning emergency work

You can check for emergency work in your organization and assign the work as it comes in. You can assign the work to available resources automatically or manually.

Procedure

1. In the Graphical Assignment application, from the Action menu, choose Define Emergency Work.
2. Enter a SQL WHERE clause to query for incoming work that qualifies as emergency work. Select Assign Automatically to assign the work to available resources automatically. Clear the Assign Automatically check box to choose from a list of available labor resources and assign the work yourself.
3. Select the frequency with which you want the query to run.
4. Click Submit to run the query immediately. Click Save to run it at the scheduled time.

Results

You can preview emergency work that matches your query in the Emergency Work Orders table window. You can see any assignments that were made.

If you chose not to automatically assign work, the Emergency Work Resource Availability window opens. From the list, select the resource that you want to assign the work to. For queries set to run in the future, email notifications are sent. You can also see a list of new emergency work by clicking View Available Resources for Emergency Work Orders on the Scheduler toolbar.

Whenever emergency work is added to a work list, travel time is recalculated by your map service provider.

Exporting assignment calendars

In the Graphical Assignment and Graphical Work Week applications, you can export the assignment calendars for resources to keep a separate record of them. You can download the resource calendars or send them in an email.

Before you begin

To send an assignment calendar in an email, you need to specify an email address on the person or crew record of the resource.

About this task

The calendar is exported into an .ICS file. You can export assignments for a single resource or a group of resources, and send them to your team to import into their external calendar applications.

Procedure

1. In the Graphical Assignment or Graphical Work Week application, open the work list that contains the assignments that you want to export.
2. In the Resource chart, right-click on the labor or crew record whose calendar you want to export.
3. Select Export to Calendar.
4. In the Export to Calendar window, in the Start Date field, enter the date that you want the exported calendar to start on.
5. In the Number of Days field, specify the length of the exported calendar, in days.
6. In the Method field, choose how you want to export the calendar, either by file download or email.
7. Click OK.

The calendar information is exported by using the delivery method that you selected.

Resource availability for assignments

You use the Assignment view in the Graphical Assignment and Graphical Assignment - Repair Facility applications to assign work to available resources.

Labor and crew availability

In the Graphical Assignment application, labor and crew resources that meet your query criteria are shown on the Assignment View tab. The tab shows their availability, as well as their craft and skill level.

Labor and crew availability are shown as follows:

- A white section on the calendar represents the working shift of the labor or crew resource. It also indicates any planned overtime.
- A light gray section on the calendar indicates that the labor or crew is not working during the shift.
- A dark gray section on the calendar indicates that the resource is assigned to other work that is not included in this work list.
- A light blue section on the calendar indicates that the labor or crew is unavailable for work during their regular shift due to modified availability, like sick or vacation time.

Repair facility availability

In the Graphical Assignment - Repair Facility application, facilities that meet your query criteria are shown on the Assignment View tab.

Repair facility availability is shown as follows:

- A white section on the calendar indicates available time.
- A light gray section on the calendar indicates unavailable time.
- A dark gray section on the calendar indicates that the facility is being used for other work that is not included in this work list.

Work assignments

Work assignments display in the Assignment view as follows:

- An orange bar indicates that the work requirement that is unassigned.
- A green bar indicates that the work is assigned to a labor or crew resource.
- A red bar indicates the labor or crew resource that you assigned the work to does not meet the craft and skill requirements of the work.

Graphical Assignment application

You assign work to labor and crews at your facility based on their skills and availability. In the Graphical Assignment application, you view upcoming work and assign the work graphically to the appropriate labor or crew resource, and respond to dynamic work situations.

On the Work List tab, you can create a list of scheduled work orders and the available labor and crews, and apply a street level route.

The graphical view consists of two tabs. On the Assignment View tab, you can review unassigned work and the resources that are available to do the work. You see the daily availability of your crews and technicians, including shifts and breaks, and exceptions such as sick leave and vacation time. You can access resource details, such as skill, rate, and certifications. You can also see current assignments and balance the workload. You can reassign work, or split work between resources or across shifts. In the Work View tab, you can see work details, such as assets and priority. You can also modify work details, such as status, work priority, and target start and end dates.

In the Dispatch view, you can see work and work routes in maps and calendars. These tools also provide a graphical view of the requirements, availability, and work assignments of labor and crews. You can use these tools to view detailed information about labor and crews to monitor their work progress more precisely in the short term, such as during a work shift.

In the Dispatch view, you can do the following tasks to respond more effectively to dynamic work situations:

- Sequence and assign work to labor and crews based on the priority, status, and locations of work orders
- Determine travel time between work orders

- Locate labor and crews using their mobile devices or global positioning system (GPS)

All assignment information can be saved to the associated work records.

- **Creating work lists**
You can create a list of upcoming work that needs to be assigned, and assign it to labor and crews based on their skills and availability. Work lists can be updated or deleted only by the user who created them. Use the Manage Commit Access action to control who can commit the work list back to the database.
- **Dispatching work to crews and labor**
You dispatch work to assign resources, such as labor resources or assets, to work orders. After you configure queries to define street-level routes, you dispatch labors and crews to unplanned work, such as when a labor is sick or for emergency work orders.

Creating work lists

You can create a list of upcoming work that needs to be assigned, and assign it to labor and crews based on their skills and availability. Work lists can be updated or deleted only by the user who created them. Use the Manage Commit Access action to control who can commit the work list back to the database.

Before you begin

You can set up shift patterns in the Calendars application to reflect rotating shifts. You can then pull the shift pattern into the work list to reflect the rotation.

Procedure

1. In the Graphical Assignments application, in the Work List tab, create a new work list.
2. Enter a name for the work list and specify calendar and shift information for when the work is to be performed.
3. If you want your project to automatically refresh at predefined intervals, select the Rolling Project? check box and define the frequency in the Roll Date Schedule field. For example, you want to refresh the work records in the schedule every day at 7:00 AM.
4. Enter start and end dates for the work list.
The Start Date and End Date control the work period calendar that shows in the graphical view. Enter a value in the Rolling Offset in Days field if you want to add days to both sides of the date range in the graphical view. You cannot move work segments outside the graphical view date range as calculated by these four fields.
5. You can filter the work query to include only work with a start or finish date between the schedule start and finish dates. This means that any work records without schedule dates is not included in the graphical view at all. To include only work within the schedule dates, select the Restrict Work to Dates? check box.
6. Create a work query based on the work records that you want to include in your work list.
7. In the Restrict Resource Availability section, you can restrict which labor and crew resources are available in the graphical view. For example, you may have 30 electricians, but you only want to include the ones in a particular work location in the schedule. You can choose from existing craft, labor, crew, or crew type queries, or create a new one. If you do not enter anything in this section, all resources for the calendar and shifts that you selected will be included.
8. Apply the street-level route, if applicable, and save the work list.

Dispatching work to crews and labor

You dispatch work to assign resources, such as labor resources or assets, to work orders. After you configure queries to define street-level routes, you dispatch labors and crews to unplanned work, such as when a labor is sick or for emergency work orders.

About this task

Work is planned several weeks ahead of time in the Graphical Scheduling application. Work is planned by coordinating new and unassigned work orders with the available resources, which can be individual labor resources or crews and their tools. Any shift breaks for crews are entered in the Calendar application.

Dispatching is required closer to the time of the scheduled work, when the dispatcher must manage unplanned scheduling issues. For example, an electrician is not available today due to illness. All of the work that is assigned to the electrician needs to be reassigned to another labor resource for the work to be completed today. Or an emergency work order needs to be completed within the next two hours.

The dispatcher needs to find a labor resource to replace the sick labor resource, create a route for the new labor resource, and then delete the street-level route of the sick labor resource. Then, the emergency work order must be located on a map to find a nearby crew or labor resource to do the unplanned work. The street-level route for the crew needs to be redrawn to include the emergency work order.

- **Preparing to dispatch labor and crews**
Before you dispatch labor or crews, you must create a list of scheduled work orders and apply a street-level route before dispatching labor and crew resources.
- **Responding to labor and crew unavailability**
You must be able to reassign work from absent labor and crew resources to other labor and crews so that work is completed on schedule. You must also update the street-level routes provided to the replacement labor and crews.
- **Responding to emergency work**
A dispatcher assigns labor and crews to emergency work. After the work order is created, the dispatcher views the location of the emergency work on a map and finds nearby labor or crews to it. Then street-level route is updated to include the emergency work.
- **Geolocation of labor and crews**
Geolocation uses various types of signals to approximate the location of a user. You can enable the geolocation of labor and crews so that you can view maps to monitor their work and route progress.

- [Street level route cron task](#)

The street level route cron task is scheduled to run daily on the system server. Cron tasks are behind-the-scene jobs that run automatically and on a fixed schedule.

- [Work zones](#)

You can divide a geographic area into smaller work zones and reduce travel time between work orders. Work is then assigned to resources based on the work zones that they are associated with.

Preparing to dispatch labor and crews

Before you dispatch labor or crews, you must create a list of scheduled work orders and apply a street-level route before dispatching labor and crew resources.

Procedure

1. In the Graphical Assignment application, on the Work List tab, complete the fields to create a work list.
2. Define a work query in the SQL Expression Builder to retrieve the relevant work and labor or crew records. For example, create the following query to find all open work orders that are scheduled for the next week:

Option	Description
Db2®	<code>((woclass = 'WORKORDER' or woclass = 'ACTIVITY') and historyflag = 0 and schedstart >= CURRENT_TIMESTAMP and schedstart <= (CURRENT_TIMESTAMP + 7 DAYS) and (status != 'COMP'))</code>
Microsoft SQL Server	<code>((woclass = 'WORKORDER' or woclass = 'ACTIVITY') and historyflag = 0 and schedstart >= GetDate() and schedstart <= GetDate()+7 and (status != 'COMP'))</code>
Oracle Database	<code>((woclass = 'WORKORDER' or woclass = 'ACTIVITY') and historyflag = 0 and schedstart >= sysdate and schedstart <= sysdate+7 and (status != 'COMP'))</code>

3. Filter by resources, such as labor and crews.
4. Apply the street-level route.

Responding to labor and crew unavailability

You must be able to reassign work from absent labor and crew resources to other labor and crews so that work is completed on schedule. You must also update the street-level routes provided to the replacement labor and crews.

Procedure

1. In the Graphical Assignment application, on the Dispatch View tab, view the work orders of the absent labor or crew resource on a map and on a calendar.
2. Click each work order on the map to view the work order details. Check which labor or crews can complete the work orders based on their location and skills.
3. Reassign the work to the most suitable labor or crews resource.
 - If a single labor or crew resource cannot complete all the work orders, then you must divide the work between several labor and crew resources. Assign each work order to the most suitable labor or crew resource.
 - If you can find one replacement to reassign all the work for that labor resource, you must create a street level route. Select the Apply Street Level Routes action, and specify the date of the work, the start and end location, and the labor or crews record.

The map is refreshed to include the street-level route for the replacement labor or crew resources.
4. Delete the street-level route for the absent labor or crew resource. From the Action menu, select Delete Street Level Routes, and specify the date of the absence, the labor record, and the start and end location for the work.

Responding to emergency work

A dispatcher assigns labor and crews to emergency work. After the work order is created, the dispatcher views the location of the emergency work on a map and finds nearby labor or crews to it. Then street-level route is updated to include the emergency work.

Before you begin

The emergency work order is created in the Work Order Tracking application.

Procedure

1. In the Graphical Assignment application, on the map on the Dispatching tab, select the icons to view the unassigned work orders and nearby labor and crews.
2. In the calendar, ensure that a nearby labor and crew resource has the availability and required skills for the work order.
3. On the map, select the work order and assign it to the labor or crew resource. The street-level route for the crew is updated.

Geolocation of labor and crews

Geolocation uses various types of signals to approximate the location of a user. You can enable the geolocation of labor and crews so that you can view maps to monitor their work and route progress.

The following table describes the map geolocation symbols that might be associated with the labor and crews.

Table 1. Geolocation symbols

Symbol	Description
	Indicates that the location data was refreshed was less than an hour ago. You can change the interval time between date refreshes in the <code>mxe.lbs.lastupdate.tolerance</code> system property.
	Indicates that the location data was refreshed was over an hour ago.
	Indicates that the location of the labor or crews is estimated to be outside of the defined radius. You can change the radius in the <code>mxe.lbs.maximumAccuracy</code> system property.
	Indicates the accuracy of the geolocation of the labor and crews. The smaller the radius, the more accurate the geolocation. If the accuracy is less than 2000 meters, then the image is not displayed.

Street level route cron task

The street level route cron task is scheduled to run daily on the system server. Cron tasks are behind-the-scenes jobs that run automatically and on a fixed schedule.

The SLROUTECLEANUP cron task deletes street level routes that were scheduled for dates two or more days in the past. For example, on the 11th November, 2012 all street level routes from the 9th November, 2012 or before, are deleted. The SLROUTECLEANUP cron task runs every day at 12 am.

Work zones

You can divide a geographic area into smaller work zones and reduce travel time between work orders. Work is then assigned to resources based on the work zones that they are associated with.

You create a work zone in the Work Zone application. You choose a work zone type for the work zone, for example, WATER, to indicate the utility category for that zone. You can then assign specific labor resources, crews, assets, and locations to that work zone, ensuring that all work that must be completed in that area is assigned appropriately. A specific geographic location can be in multiple work zones. Depending on the type of work that is required, different resources are assigned the work.

For example, a city block might be in electrical work zone A, but in water zone 3, and sewer zone SEW1. Electrical crew EL1 might respond to electrical outages, while water crew W46 responds to water maintenance needs.

You can assign crews and labor to specific work zones, so that they are assigned work that occurs in that zone. You can assign a crew or labor record can be assigned to multiple work zones, but each record has only one default work zone.

Graphical Assignments - Repair Facility application

In the Graphical Assignments - Repair Facility application, you can assign work directly to your facilities based on their availability. For example, you can assign work directly to an aircraft hangar.

In the Assignment view, you review a list of all the facilities within a location. You can review when they are available for work and plan accordingly.

On the Work List tab, you can create a list of scheduled work orders and the available labor and crews for your repair facility.

The graphical view consists of two tabs. On the Assignment View tab, you can review unassigned work and the facilities available to do the work. You can review current assignments in your repair facilities and balance the workload. On the Work View tab, you can review work details, such as assets and priority. You can also modify work details, such as status, work priority, and target start and end dates.

All assignment information can be saved to the associated work records.

- [Repair facilities](#)
A repair facility is a facility where assets are brought for maintenance. You can assign work to resources that are associated with the repair facility, or to the repair facility itself.
- [Creating work lists](#)
You can create a list of upcoming work that needs to be assigned, and assign it to repair facilities based on their availability. Work lists can be updated or deleted only by the user who created them. Use the Manage Commit Access action to control who can commit the work list back to the database.
- [Assigning work to repair facilities](#)
You use the Assignment view to assign upcoming work to repair facilities based on their availability.
- [Asset availability in repair facilities](#)
You can view the availability of assets, items, and tools that are required for work in the Work View tab.

Repair facilities

A repair facility is a facility where assets are brought for maintenance. You can assign work to resources that are associated with the repair facility, or to the repair facility itself.

A repair facility can take many forms, including automotive bays, aircraft hangars, and workshops. Planning for these facilities is done for short time periods when work emerges or becomes due simultaneously. For example, you might schedule work for a repair facility for two weeks in advance.

Creating work lists

You can create a list of upcoming work that needs to be assigned, and assign it to repair facilities based on their availability. Work lists can be updated or deleted only by the user who created them. Use the Manage Commit Access action to control who can commit the work list back to the database.

Procedure

1. In the Graphical Assignment - Repair Facility application, on the Work List tab, create a new work list.
2. Enter a name for the work list and specify calendar and shift information for when the work is to be performed.
3. Specify a repair facility.
4. Create a query based on the work records that you want to include in your work list. Resources that are required to complete the work are included in the Assignment view.
Facilities that match your repair facility are listed.

Assigning work to repair facilities

You use the Assignment view to assign upcoming work to repair facilities based on their availability.

About this task

The Assignment view displays the availability of your repair facilities. Unavailable time appears in the Gantt view as a shaded area on the resource table.

Procedure

1. On the Assignment View tab, select the work record that you want to assign. An orange bar represents unassigned work. You can assign work by using one of the following methods:
 - Drag the work record to the resource that you want to assign it to in the resource chart.
 - Right-click on the bar representing the work that you want to assign. Select Available Location. In the Available Location window, select the labor or crew resource that you want to assign the work to. Click OK.When work is properly assigned, the bar that represents the assigned work is green. If you selected a resource that does not match the work requirements, the bar is red.
If an appointment is required (in the work record application), an icon indicates that an appointment has not been made. Right-click on the assignment and choose Lock to set the appointment. Appointments that are locked cannot be rescheduled due to optimization or manual edits. To change the scheduled time manually, right-click on it and choose Unlock.
2. Save the work list.

Asset availability in repair facilities

You can view the availability of assets, items, and tools that are required for work in the Work View tab.

Assets, items, and tools that are required for work are available in the Other Resource Availability window. Right-click on a work record in the Work View tab to see the availability of resources required for the work.

Asset availability is displayed based on operating and maintenance schedules, and the appropriate asset calendar. The availability displays as follows:

- An orange bar shows the calendar for the site of the asset.
- A green bar shows the maintenance schedule for the asset. It is the best time to schedule work.
- A red bar shows the operational schedule for the asset, when it is unavailable for maintenance.

Item and tool availability are shown in the following way:

- A green bar indicates that the item or tool is available during the scheduled work time.
- An orange bar indicates one of the following:
 - If the work record is in WAPPR status, it indicates that the item or tool is partially available, and can be reserved.
 - If the work record is not in WAPPR status, it indicates that a soft reservation has been made for this tool or item.
- A red bar indicates that the item or tool is unavailable during the scheduled work time.

Tool and item availability show only for the task selected in the work view. You cannot view item and tool availability for multiple tasks at the same time.

Other resource availability appears for the date or the work record, plus 7 days in the future. You can change the calendar view to span different days using right-click options.

- [Checking asset availability in repair facilities](#)

A maintenance planner needs to reschedule assignments based on changes in asset availability.

Checking asset availability in repair facilities

A maintenance planner needs to reschedule assignments based on changes in asset availability.

About this task

In reviewing the schedule for the organization, a maintenance planner notices that an asset that is scheduled to be worked on is not available for maintenance. The operating schedule for the asset was modified, and now conflicts with the scheduled work.

Procedure

1. In the Work View tab of the Graphical Assignments application, locate the correct date in the resource chart.
2. In the Activity table on the left of the chart, select the appropriate work record. Right-click and select Other Resources Availability . The asset availability displays.

What to do next

You can also check item and tool availability in the Other Resources Availability window.

Managing short term work

You can manage work in one week increments by using the Graphical Work Week application.

- [Graphical Work Week application](#)
You use the Graphical Work Week application to schedule and assign work while you manage resources over a short period of time.

Graphical Work Week application

You use the Graphical Work Week application to schedule and assign work while you manage resources over a short period of time.

In the Graphical Work Week application, you can schedule and assign work to resources. The graphical view displays scheduled work time and shift hours in one week increments. You can scroll forward and backward one week at a time between the start and end dates that you define on the Work tab.

All assignments and work records without assignments are included in the graphical view, without a hierarchy structure. For work records without assignments, you can create assignment records and assign them to resources.

- [Creating work lists in the Graphical Work Week application](#)
You can create a list of upcoming work that needs to be assigned, and assign it to labor and crews based on their skills and availability.
- [Modifying availability in the Graphical Work Week application](#)
You can modify the availability of resources in the graphical view of the Graphical Work Week application.
- [Balancing resource loads and assigning work](#)
In the Graphical Work Week application, you can reschedule and assign work to balance your resources and workload.

Creating work lists in the Graphical Work Week application

You can create a list of upcoming work that needs to be assigned, and assign it to labor and crews based on their skills and availability.

Before you begin

You can set up shift patterns in the Calendars application to reflect rotating shifts. You can then include the shift pattern into the work list to reflect the rotation. For more information, see [Shift patterns for calendars](#).

Procedure

1. In the Graphical Work Week application, on the Work List tab, create a new work list.
2. Enter a name for the work list and specify calendar and shift information for when the work is to be performed.
3. If you want your work list to automatically refresh at predefined intervals, select the Rolling schedule check box. You set up the rolling schedule by selecting Roll Schedule from the Actions menu. For example, you want to refresh the work records in the schedule every day at 7:00 AM.
4. Enter start and end dates for the work list.
The start and end dates control the work period calendar that is shown in the graphical view. Including an extra week beyond your current scheduling plans allows for room to move work out a week in the graphical view.

- If you want to add days to both sides of the date range in the graphical view, you can enter value in the Rolling Offset in Days field in the Roll Schedule window. You cannot move work segments outside the graphical view date range as calculated by these fields.
- Create a work query that is based on the work records that you want to include in your work list. If you want to include all work that is scheduled between the start and end dates of your work list, you can leave this field blank.

Any work records without scheduled dates are not included in the graphical view.

 - To include work without scheduled dates, select the Include Work Orders Without Dates check box. Scheduled start dates are automatically created in the Work Order Tracking application for these records.
 - To include work only within the schedule dates, clear the Include Work Orders Without Dates check box.
 - In the Restrict Resource Availability section, restrict which labor and crew resources are available in the graphical view. For example, you might have 30 electricians, but you want to include only the ones in a particular work location in the schedule. You can choose from existing craft, labor, crew, or crew type queries or create a new one. If you do not enter anything, all resources for the calendar and shifts that you selected are included.
 - Optional: Use the actions that are available in the More Actions menu to create a work list that is based on an existing work list or schedule in the Graphical Assignment or Graphical Scheduling application.

Modifying availability in the Graphical Work Week application

You can modify the availability of resources in the graphical view of the Graphical Work Week application.

About this task

The reason codes that are displayed in the graphical view of the Graphical Work Week application are defined in the Domains application. You can add new reason codes as necessary in the RSNCODE domain.

The colors that are used in the graphical view are defined by system properties. For more information, see [Graphical view customization](#).

Procedure

- In the Resource chart of the graphical view, select the reason for modifying availability from the Reason Code menu in the toolbar.
- From the Availability Type menu, select the length of time that you want to modify availability for. For example, you can modify availability for a full day, a partial day, or a full week.

If you select Partial, enter values in the Start Time and End Date fields in the Modify Availability window.
- To modify the availability of a single resource, double-click the date cell that corresponds with the resource and the date that you want to modify availability for.

To modify the availability of multiple resources, select the check boxes at the beginning of each resource row that you want to apply the modified availability to. In one of the selected rows, double-click the date cell that you want to modify availability on.

The modified availability is show in the graphical view, and the changes are saved back to the person or crew record. If a resource has multiple modifications for the same day, an indicator appears in the corner of the date cell. To see details about the modifications, right-click on the resource in the resource table and select Modify Person Availability. In the Modify Person Availability window, scroll to the Modify Work Dates table.

Balancing resource loads and assigning work

In the Graphical Work Week application, you can reschedule and assign work to balance your resources and workload.

About this task

In this example, you created a work list in the Graphical Work Week application that includes all scheduled work and resources for the day shift for this week (Work List XYZ). In the graphical view, you can see that you have too much work scheduled for Monday that requires first class electricians. Your total workload for Monday shows 56 hours of electrical work that requires first-class electricians. However, your total labor hours for electricians on Monday is 40 hours (five labor resources at 8 hours each). You need to move some of the work to next week, and then assign all the work to available resources.

Procedure

- In the Graphical Work Week application, open the graphical view for work list XYZ.
- Scroll to the Resource chart at the bottom of the page.

You notice that the Electrician-First Class entry for Monday is displayed in red, which indicates that more work is scheduled than you have resources to complete it. The text in red reads 56:00/40.00, which indicates that you are over scheduled by 16 hours (56 hours are scheduled out of 40 available hours).
- In the Resource chart, select the row for Electrician-First Class. Click the Filter Work Orders Based on the Selected Resources button.

The Activity table filters the work records to show the electrical work.
- Select the check boxes for multiple work records to reschedule. You can also draw a border around the work in the Activity chart, or use Shift-click to select multiple records.
- Right-click on the segments and select Set to Day. Choose a date next week to schedule the work.

To be able to schedule the work next week, those dates must be included in the schedule on the Work tab.

If the work records have date constraints (Start No Earlier Than or Finish No Later Than dates), the constraints appear in the Activity chart, on either side of the work segment .
- Scroll down to the Resource chart and check your load balance.
- Repeat steps 3-6 until all load balances appear blue.

What to do next

Assign work to resources.

1. In the Activity chart of the graphical view, select the work segment that you want to assign.
2. In the Resource chart, double-click the date cell for the labor or crew resource that you want to assign the work to.

If all of the selected work (or work that has a long duration) cannot fit into a single shift, it is automatically split between days for that resource.

Assignment records are automatically saved to the database. If the `mxe.skd.syncwdates` property is set to 1, work order changes are also saved back to the work records. The schedule start and end dates are updated to match the new assignments.

Managing resources

You can manage your resources in the Graphical Resource View application in order to see all resource availability and assignments in a single view.

- [Graphical Resource View application](#)
You use the Graphical Resource View application to manage resource hours over a period of time. You can choose to see one week or one month at a time.
-

Graphical Resource View application

You use the Graphical Resource View application to manage resource hours over a period of time. You can choose to see one week or one month at a time.

In the graphical view, you can see scheduled work time per shift, as well as modified availability in a single view. You can see total resource hours by craft, and you can also access assignment records.

You can enter new availability modifications, and see modified availability totals by resource. You can also see rotating shift patterns, which are defined in the Calendars application.

- [Creating resource lists](#)
You can create a resource list to see the availability of all required resources in a particular week.
 - [Modifying availability in the Graphical Resources View application](#)
You can modify the availability of resources in the graphical view of the Graphical Resources View application.
-

Creating resource lists

You can create a resource list to see the availability of all required resources in a particular week.

Before you begin

You can set up shift patterns in the Calendars application to reflect rotating shifts. You can then include the shift pattern into the resource list to reflect the rotation. For more information, see [Shift patterns for calendars](#).

Procedure

1. In the Graphical Resource View application, on the Resource List tab, create a new resource list.
 2. Enter a name for the resource list and specify calendar and shift information for when the work is to be performed. A maximum of five shifts is allowed.
 3. Select the Show Labor in Resource Chart Check box to include labor records in your resource list. Select the Show Crews in Resource Chart? check box to include crews.
 4. Optional: In the Restrict Resource Availability section, restrict which labor and crew resources are available in the graphical view. For example, you might have 30 electricians, but you want to include only the ones in a particular work location in the schedule. You can choose from existing craft, labor, crew, or crew type queries, or create a new one. If you do not enter anything, then all resources for the calendar and shifts that you selected are included.
-

Modifying availability in the Graphical Resources View application

You can modify the availability of resources in the graphical view of the Graphical Resources View application.

About this task

The reason codes that are displayed in the graphical view of the Graphical Resources View application are defined in the Domains application. You can add new reason codes as necessary in the RSNCODE domain.

The colors that are used in the graphical view are defined by system properties. For more information, see [Graphical view customization](#).

Procedure

1. In the toolbar of the graphical view, select the reason for modifying availability from the Reason Code menu.
2. From the Availability Type menu, select the length of time that you want to modify availability for. For example, you can modify availability for a full day, a partial day, or a full week.
If you select Partial, enter values in the Start Time and End Date fields in the Modify Availability window.
3. To modify the availability of a single resource, double-click the date cell that corresponds with the resource and the date that you want to modify availability for.
To modify the availability of multiple resources, select the check boxes at the beginning of each resource row that you want to apply the modified availability to. In one of the selected rows, double-click the date cell that you want to modify availability on.
The modified availability is show in the graphical view, and the changes are saved back to the person or crew record. If a resource has multiple modifications that are scheduled for the same day, an indicator appears in the corner of the date cell. To see details about the modifications, right-click on the resource in the resource table and select Modify Person Availability. In the Modify Person Availability window, scroll to the Modify Work Dates table.

Managing crews graphically

You can manage the labor and assets that are assigned to positions in crews visually by using the Graphical Crew Management application.

You can view crews and their details, including assigned labor and assets. You can also see whether all qualifications and requirements for the crew are met. You can modify crew assignments as necessary, and update the labor, asset, and crew records in the background.

- [Resources in the Graphical Crew Management application](#)
You assign labor and assets to crews in the Graphical Crew Management application.
- [Creating crew lists](#)
You create a list of crews so that you can view the resources that are assigned to crews. You can then make daily adjustments as necessary. Crew lists can be updated or deleted only by the user who created them.
- [Adjusting crew assignments](#)
As a dispatcher, you often must adjust the daily assignments of your crews based on changes in the availability of your resources. For example, if a driver is sick, you must assign a new driver to that crew for that day. You can perform this daily shuffle by using the Assignments tab of the Graphical Crew Management application.

Resources in the Graphical Crew Management application

You assign labor and assets to crews in the Graphical Crew Management application.

The Gantt view consists of two tabs. On the Crew View tab, you can see crew requirements, status, craft/skill information of resources, and whether the crews have been properly configured.

On the Assignments tab, you can view resources available for crew assignment and make the assignments. You see the daily availability of your crews and technicians, including shifts and breaks, and exceptions such as sick leave and vacation time. You can access resource details, such as skill, rate, and certifications. You can also see current assignments.

Labor and assets that match the query that you ran are shown in the Assignments tab.

Labor availability

Labor availability is shown as follows:

- A white section on the calendar indicates that the labor resource is available during the shift.
- A light gray section on the calendar indicates that the labor resource is unavailable for work during the shift.
- A dark gray section on the calendar indicates an existing work order or crew assignment that is not included in the schedule.
- A light blue section on the calendar indicates that the labor resource is unavailable due to modified availability, like sick or vacation time.

Asset assignments

A light blue section on the calendar indicates an existing work order or crew assignment for an asset.

Crew assignments

The crew assignments display in the Assignments tab as follows:

- A green bar indicates that the crew requirements are met.
- An orange bar indicates that the crew has outstanding requirements.
- A yellow bar indicates that the crew's assigned labor and assets do not meet all requirements or qualifications for the crew. If the labor or asset record is yellow in the resource chart, a requirement was not met. For example, your work requires a first class mechanic, and you assigned a second class mechanic. If the crew record in the resource chart is yellow, a crew qualification was not met. For example, the crew is required to have one member with CPR training and no one assigned to the crew does. You can right-click on the crew resource and select Crew Assignment Status to determine the problem.

Creating crew lists

You create a list of crews so that you can view the resources that are assigned to crews. You can then make daily adjustments as necessary. Crew lists can be updated or deleted only by the user who created them.

Procedure

1. In the Graphical Crew Management application, in the Crew List tab, create a new crew list.
2. Enter a name for the crew list and specify calendar and shift information for when the crew is needed. The labor and crew resources that work during those shifts are shown in the Gantt view.
3. Enter the start date that you want to assign crew requirements on. If you do not enter a date, the graphical view shows today's date.
4. In the queries table windows, create queries to define the crew and resource information that you want to see. The available labor and asset resources that match the crew requirements show in the resource table in the graphical view.
5. Save the crew list.

Results

On the Assignments tab, you can see the list of resources by type (labor/craft and tool type/asset). You can assign labor resources and assets to crews in the Crew View tab or in the Crews application. Changes that are made in both places appear when you refresh the graphical view.

On the Crew View tab, crews that have all crew requirements met are green. Crews that have outstanding assignments are orange. Crews with assigned labor and assets that do not meet all requirements or qualifications for the crew are yellow. For example, your work requires a first class mechanic, and you assigned a second class mechanic. If the crew record in the crew requirements chart is yellow, a crew qualification was not met. For example, the crew is required to have one member with CPR training and no one assigned to the crew does. You can right-click on the crew in the crew requirements table and select Crew Assignment Status to determine the problem.

Adjusting crew assignments

As a dispatcher, you often must adjust the daily assignments of your crews based on changes in the availability of your resources. For example, if a driver is sick, you must assign a new driver to that crew for that day. You can perform this daily shuffle by using the Assignments tab of the Graphical Crew Management application.

About this task

On the Assignments tab, you can assign labor and assets to crews for any single day.

Procedure

1. In the Graphical Crew Management application, on the Crew List tab, display the crew list whose assignments you want to adjust. Enter the start date that you want to assign crew requirements on. If you do not enter a date, the graphical view shows today's date.
2. On the Crew View tab, review the status of the crew list for the start date specified in step 1. An orange crew bar signifies an open requirement.
3. Expand the crew to find out which position or positions have open requirements, for example, CREW1/LEADER/ELECTRICIAN. Check the skill level.
4. On the Assignments tab, open the corresponding list of resources, for example, ELECTRICIAN. Select the requirement in the header row and drag it to a resource that is available and has a matching skill level, or right-click on the requirement and choose Create Assignment.
 - When the requirement is assigned, you can split the assignment into two segments and assign each segment to a different resource. Right-click on the requirement in the Resource chart and choose Split Work.
5. Crews with assigned labor and assets that do not meet all requirements or qualifications for the crew are yellow. Reassign requirements as necessary. Drag the requirement to the appropriate resource. When all requirements are met and qualifications are satisfied, the bar is green.
 - To reassign resources for multiple days, right-click on the crew name in the Crew Requirements table and select Adjust Crew Assignments.
6. Save the crew list.

Validating data

You can validate the data in your schedules and work lists in the Scheduler Data Manager application.

- **Scheduler Data Manager application**

By using the Scheduler Data Manager application to validate a schedule or work list's data before scheduling or assigning work, you can ensure that data best practices are followed.

Scheduler Data Manager application

By using the Scheduler Data Manager application to validate a schedule or work list's data before scheduling or assigning work, you can ensure that data best practices are followed.

You can access the application from the Administration application menu, or from within the following applications:

- Graphical Scheduling
- Graphical Scheduling - Large Projects
- Graphical Assignment

- Graphical Work Week

Sometimes, data that is valid in an IBM® Maximo® Asset Management environment might not be conducive to scheduling. For example, the following work records might cause scheduling issues:

- Work records that have no planned labor.
- Work records that have a schedule window, like a Start No Earlier Than or Finish No Later Than date, that is in the past or outside the schedule calendar.
- Work records that have planned labor requirements that do not match your schedule. For example, the work requires three electricians, but your schedule only has access to two.

By validating the data in a schedule, you ensure that the included work records have better scheduling results. When a violation is found you can take corrective action in the Schedule Data Manager application to update the work record and correct the error.

Only work records can be validated by the Schedule Data Manager application. Preventive maintenance records are not evaluated.

- [Validating schedule data](#)
You can validate the work record data contained in your schedule to adhere to best practices for scheduling. Validation can be run on work, dependencies, and required resources for all work records included in the schedule.
- [Troubleshooting data validations](#)
The Scheduler Data Manager application validates the data that you include in your schedules and work lists. When errors are found in the data that is included, you can make corrections or exclusions as needed.

Validating schedule data

You can validate the work record data contained in your schedule to adhere to best practices for scheduling. Validation can be run on work, dependencies, and required resources for all work records included in the schedule.

About this task

You can access the Scheduler Data Manager application directly in the following applications:

- Graphical Scheduling
- Graphical Scheduling - Large Projects
- Graphical Assignment
- Graphical Work Week

You can navigate to the Scheduler Data Manager application by clicking the detail menu for the schedule or work list name, or by navigating to it through the Go To menu. If you access the application through the Go To menu, use the List tab to select the schedule or work list to validate.

Procedure

1. In the Scheduler Data Manager application, select the schedule or work list whose data you want to run validation on. The Schedule tab displays read-only information that is copied from the Maximo® Asset Manager Scheduler applications. The one exception is the Duration Threshold field, which you can edit on the Schedule tab.
2. On the Work tab, select the check boxes for the validations that you want the process to check. You can select any combination of options.
3. Click Validate Work. A notification window displays the status of the validation progress. Click OK to close the window.
You can monitor the progress of validation jobs by selecting Show Validation Jobs from the More Actions menu.
When validation is complete, all work rows that are contained in the schedule are displayed in the work record table. Key data about the work, including duration, priority, and restraint dates is included.
4. Review any errors or warnings that the validation process found for each work record. You can select the Show Errors/Warnings Only check box to narrow your results. You can also filter for specific errors and warnings in the Filter By Error/Warning field. To correct violations, you can update work data directly in the table, or by clicking the icons next to the error or warning. Changes that you make are saved in the work records. You must refresh the schedules in order to see the changes.
5. Repeat steps 2 through 4 on the additional tabs to validate the following:

Tab	Validations
Calendar	Calendar information
Queries	Work and resource queries
Dependencies	Work record dependencies
Resources	Required resources
Assignments	Assignment data

The tabs that are visible in the Scheduler Data Manager application depend on which application you are validating data from.

Troubleshooting data validations

The Scheduler Data Manager application validates the data that you include in your schedules and work lists. When errors are found in the data that is included, you can make corrections or exclusions as needed.

You use the Scheduler Data Manager application to test your data for scheduling and assignment best practices. You can check your data before you view it in the graphical view, or at any time to catch and change any potential problems. The application looks at the key data components of the schedule or work list, specifically the following items:

- Calendar
- Queries
- Work
- Dependencies
- Assignments
- Resources

Table 1. Example: Key indicators (partial list)

Tab	Parameters
Calendar	<ul style="list-style-type: none"> • Does the calendar cover the entire schedule? • Are there work periods for the shifts defined? • Are the shift patterns sequential and named?
Queries	<ul style="list-style-type: none"> • Does the SQL clause affect performance? • Does the clause retrieve a reasonably sized data set?
Work	<ul style="list-style-type: none"> • Do the work orders have defined durations? • Does non-interruptible work exceed the shift length? • Do work orders have work plans? • Is work prioritized? • Do work plans have resource quantities that exceed availability?
Dependencies	<ul style="list-style-type: none"> • Are the precedence relationships between work records and tasks non-circular? • Are they affected by work status or actual dates?
Resources	<ul style="list-style-type: none"> • Are crafts, crews, and rotating tools available in a sufficient quantity to be able to schedule work at a specific point in the schedule?

For each category, click Validate, review the data rows in the table, and review any errors or warnings. In many cases you can fix the issue in the table, which updates the associated records and improves your schedule.

For larger or rolling schedules, consider running validation through a scheduled a cron task, so you can review the results regularly.

- [Calendar validations](#)
You can validate the calendar that your schedules and work lists use and troubleshoot the results.
- [Query validations](#)
You can validate the queries that your schedules and work lists use and troubleshoot the results.
- [Work validations](#)
You can validate the work that your schedules and work lists include and troubleshoot the results.
- [Dependency validations](#)
You can validate the work dependencies that your schedules and work lists use and troubleshoot the results.
- [Assignment validations](#)
You can validate the assignments in your work lists and troubleshoot the results.
- [Resource validations](#)
You can validate the resources that your schedules and work lists use and troubleshoot the results.

Calendar validations

You can validate the calendar that your schedules and work lists use and troubleshoot the results.

Table 1. Calendar/shift validations

Field	Validation	Level	Warning/Error	Solution
Schedule	Too many shifts can affect performance in the graphical view.	Schedule	W – nn shifts are selected. Performance can be affected when the number of shifts for a schedule is greater than four.	Go to the schedule or work list application and edit the shifts.
Work Periods	All shifts require work periods that span the schedule start and end dates.	Shift	E – Shifts must be applied for the entire span of the schedule.	Go to the Calendars application and select Define/Apply Shifts.
Work Periods	Shifts must be applied on the calendar.	Shift	E – Work periods do not exist for the shift.	Go to the Calendars application and select Define/Apply Shifts.
Shift Pattern	The shift is too short or too long, or pattern days overlap.	Shift	W - Shifts cannot be less than 2 hours or greater than 13 hours for labor and crews.	Go to the Calendars application and redefine the shift pattern.
Schedule	The end date of the schedule is before or the same as the end date of the calendar.	Schedule	E – The calendar start and end dates do not align with the schedule start and end dates.	Go to the Calendars application and update the calendar start and end dates.
Shift Pattern	Check the shift pattern definition for overlapping times. For example, day one is from 11 PM to 7 AM and day two is 6 a.m. to 2 PM.	Shift	E – Pattern day 1 and day 2 times overlap.	Go to the Calendars application and select Define/Apply Non-Working Time.

Field	Validation	Level	Warning/Error	Solution
Shift Pattern	Pattern day name	Shift	W – Pattern day name was not provided. “W” will be displayed in the graphical resource view for all working days.	Go to the Calendars application and select Define/Apply Nonworking Time.

Query validations

You can validate the queries that your schedules and work lists use and troubleshoot the results.

Validations can be run on the following query types:

- Work
- Asset
- Location
- Resources
- Additional resources

Table 1. Query validations

Field	Validation	Object/Type	Warning/Error	Solution
SQL Best Practices	Dates in query (schedule dates/target dates)	WORKORDER/WOACTIVITY	W – Consider using restrict work to dates.	Return to the schedule and modify the query.
SQL Best Practices	%xxx%	All	W – %xxx% contains queries that might cause performance issues.	Return to the schedule and modify the query.
SQL Best Practices	Is task	WORKORDER/WOACTIVITY	W – Istask is added by Maximo® Asset Manager Scheduler. If it is included in the query, it can affect performance.	Return to the schedule and modify the query.
SQL Best Practices	History	WORKORDER/WOACTIVITY	W – History is added by Maximo Asset Manager Scheduler. If it is included in the query, it can affect performance.	Return to the schedule and modify the query.
Records	Number of work records if using the Graphical Scheduling application and count is greater than 3000 records and less than 5000 records.	WORKORDER/WOACTIVITY	W – Consider using the Graphical Scheduling-Large Projects application for schedules of this size.	In the Graphical Scheduling-Large Projects application, choose the Create Schedule from Graphical Scheduling application action.
Records	Number of work records if using the Graphical Scheduling application and count is greater than 5000 records.	WORKORDER/WOACTIVITY	E – Use the Graphical Scheduling-Large Projects application for a record count of <i>nnn</i> .	In the Graphical Scheduling-Large Projects application, choose the Create Schedule from Graphical Scheduling application action.
Records	Number of work records if using the Graphical Assignment or Graphical Work Week application and count is greater than 500 records.	WORKORDER/WOACTIVITY WORKORDER/ASSIGNMENTS	W – Consider breaking the work list into multiple work lists in order to match work and resources.	Make changes in the Graphical Assignments or Graphical Work Week application.

Work validations

You can validate the work that your schedules and work lists include and troubleshoot the results.

Table 1. Work validations

Validation	Warning/Error	Solution
A task or work order with no children has 0 duration.	W – 0 duration for planned work.	Modify the value in Duration field.
Interruptible work has a specified shift that is not included in the schedule.	W – The interruptible shift selected is not included in this schedule.	Modify the value in the Interruptible field by using the Select Value icon.
The Start No Earlier Than date plus the duration is greater than or equal to the schedule end date.	E – This work cannot be successfully scheduled with the current Start No Earlier Than date.	Modify the Start No Earlier Than date.
The Finish No Later Than date minus the duration is less than or equal to the schedule start date.	E – This work cannot be successfully scheduled with the current Finish No Later Than date.	Modify the Finish No Later Than date.
The location assignment dates do not fall within the schedule dates.	E – Location assignment exists outside of schedule dates.	In the Work Order Tracking application, open the parent work record and change the assignment.
The location assignment is shorter than the parent work order duration.	E – Location assignment is not long enough to complete all work in this work package.	In the Work Order Tracking application, open the parent work record and change the assignment.

Validation	Warning/Error	Solution
Bottom level work records and operations do not have planned resources (craft, crew type, tool)	W – There are no required resources to determine schedule dates.	In the Work Order Tracking application, adjust the planned labor.
Craft: A single work record or operation has a planned craft quantity greater than the available craft quantity on any shift	E – Work cannot be scheduled without enough resources in a single shift.	In the Work Order Tracking application, adjust the planned labor or the resources.
Crew Types: A single work record or operation has a planned crew type quantity greater than the available crew type quantity on any shift.	E – Work cannot be scheduled without enough resources in a single shift.	In the Work Order Tracking application, adjust the planned labor or the resources.
Rotating Tools: A single work record or operation has a planned tool quantity greater than the available tool quantity.	E – Work cannot be scheduled without enough resources.	In the Work Order Tracking application, adjust the planned labor or the resources.
Planned labor exists on the parent work order when planned labor also exists at the task level.	W – Labor can be planned at the task or work record level, but not both.	In the Work Order Tracking application, adjust the planned labor or the resources.
Duration is negative or over the threshold of 24*100 (quantity*duration).	E – Duration is negative or unreasonably high.	Modify the value in Duration field.
Task is missing a parent work record.	E – Tasks must have a parent work record.	In the Activities and Tasks application, add a parent work record.
Work record does not have a priority.	W – Work records must have a priority.	Modify the value in Priority field.

Dependency validations

You can validate the work dependencies that your schedules and work lists use and troubleshoot the results.

Table 1. Dependency validations

Validation	Error	Solution
Circular dependency.	E – You cannot have a circular dependency.	Modify the dates in the Edit Constraints window.
Actual dates break the dependency.	E – Actual dates break the dependency.	Modify the dates in the Edit Constraints window, or modify the actuals in the Work Order Tracking application.
Dependency Lead/Lag incorrect – lag time is longer than the threshold 24*100 (quantity*duration).	E – Dependency lead/lag time is too long.	Modify the dates in the Edit Constraints window.
Dependency missing target.	E – The dependency target is missing.	Delete the constraint.
Dependency missing origin.	E – The dependency origin is missing.	Delete the constraint.

Assignment validations

You can validate the assignments in your work lists and troubleshoot the results.

The tabs that are visible in the Scheduler Data Manager application depend on which application you are validating data from. The Assignments tab is only available when validating work lists from the Graphical Assignment and Graphical Work Week applications.

Table 1. Assignment validations

Field	Validation	Warning/Error	Solution
Hours	Assignment hours are longer than the work record hours.	W – Assignment hours are longer than the work order or task duration.	In the Work Order Tracking application, modify the assignment hours.
Schedule Date	The schedule date of the assignment is different from the work record.	W – Work record schedule date does not include the assignment start or end date.	In the Work Order Tracking application, modify the assignment hours or start date.
Craft/Crew Type	Required craft and skill level or crew type is not available on shifts in the work list.	E – Cannot assign craft %xxx% for shifts in work list.	In the Work Order Tracking application, modify the craft, skill level, or crew type.
Work Zone	A work zone exists on the assignment when no labor or crews with that value exist.	E – Cannot assign for work zone %xxx%.	Modify the work zone in the Work Order Tracking, Labor, or Crews applications.
Crew Work Group	A required work plan does not match the assignment.	W - Work Plan required %xxx% craft or crew, but was signed to %yyy% craft or crew.	Modify the labor using the Available Labor icon.
Crew Work Group	A crew work group appears on the assignment when no labor or crews with that value exist.	E – Cannot assign for crew work group %xxx%.	Modify the crew work group.

Resource validations

You can validate the resources that your schedules and work lists use and troubleshoot the results.

The tabs that are visible in the Scheduler Data Manager application depend on which application you are validating data from. The Resources tab is only available when validating schedules from the Graphical Scheduling applications.

Table 1. Resource validations

Validation	Error	Solution
Craft: The total number of planned craft hours exceeds all available craft in all shifts.	E – All work cannot be scheduled with the limited number of resources.	Modify the craft hours in the Scheduling Alternate Resources application.
Crew types: The total number of planned crew type hours exceeds all available crew type in all shifts.	E – All work cannot be scheduled with the limited number of resources.	Modify the crew type hours in the Scheduling Alternate Resources application.
Rotating tools: The total number of planned tool hours exceeds all available rotating assets.	E – All work cannot be scheduled with the limited number of resources.	Modify the tool hours in the Scheduling Alternate Resources application.

Managing appointment books

You can create and manage appointment books for customer service representatives to use when they schedule customer appointments.

- [Appointment Book Manager application](#)
In the Appointment Book Manager application, you can create and update appointment books for customer service representatives to use when they schedule customer appointments.
- [Graphical Appointment Book application](#)
You use the Graphical Appointment Book application to schedule appointments in appointment windows that you defined in the Appointment Book Manager application.

Appointment Book Manager application

In the Appointment Book Manager application, you can create and update appointment books for customer service representatives to use when they schedule customer appointments.

An *appointment book* is a calendar view of the daily time slots in which an appointment for on-premise work can be done.

You set up appointment windows in which the work can be completed based on calendar and shift information, and determine how many appointment slots are available within each range. Appointments can then be made in the Graphical Appointment Book application by customer service representatives at your organization.

- [Creating appointment books](#)
You can create an appointment book for customer service representatives to use when scheduling appointments with customers.
- [Viewing appointments in an appointment book](#)
You can view available and scheduled appointments in the View tab of the Appointment Book Manager application.
- [Modifying available appointments in an appointment book](#)
You can modify how many appointments are available in an appointment book.
- [Managing access to appointment books](#)
You can grant users and groups access to specific appointment books in the Appointment Book Manager application.

Creating appointment books

You can create an appointment book for customer service representatives to use when scheduling appointments with customers.

About this task

An *appointment book* is a calendar view of the daily time slots in which an appointment for on-premises work can be done.

Procedure

1. In the Appointment Book Manager application, create a new record.
2. Enter a name for the appointment book, and a Start Date and End Date. Representatives can schedule appointments within the defined date range.
3. Enter values in the Calendar, Shift fields for the appointment book.
4. In the Start Day field, select the day of the week that you want the appointment book to start on. Then, enter a value in the Days in Pattern field. For example, enter Sunday in the Start Day field and 7 in the Days in Pattern field for a typical 7 day weekly shift.
5. Enter a work zone for the appointment book, if appropriate.
6. If you want to allow users to request a specific person to complete the work when they create an appointment, select the Allow Labor Assignment check box.
7. In the Work Order Dates and Work Order Status fields, specify the criteria that you want work orders that are created in the Graphical Appointment Book application to have.
8. In the Job Plans table window, select the job plans that you want to associate with the appointment book. The job plans that you specify are copied to the work records created when an appointment is made in the Graphical Appointment Book application. You can modify the value in the Number of Appointments field as necessary.
9. In the Appointment Windows table window, click New Row to create an appointment window.
You can create multiple appointment windows for an appointment book. For example, you can create one appointment window for the morning and one for the afternoon.
10. Enter a name for the appointment window.
11. Specify values in the Start Time and End Time fields. The start and end times for the window must occur within the defined shift for the appointment book.

12. In the Appointments field, define the number of appointments that are available in the appointment window.
13. Modify the values in the Effective Start Date and Effective End Date fields as needed. If the Effective End Date field is blank, the appointment window is in effect indefinitely.
14. In the Pattern Exceptions table window, enter any exceptions for appointment availability within the appointment windows. For example, if two technicians are attending training on a specific day, you can modify the number of appointments that are available on that day.
15. Save the record.

Viewing appointments in an appointment book

You can view available and scheduled appointments in the View tab of the Appointment Book Manager application.

About this task

After you set up an appointment book, you can use the View tab to see all appointments that are associated with the appointment book.

Procedure

1. In the Appointment Book Manager application, open the appointment book record that you want to view.
2. On the View tab, the Graphical View subtab shows an overview of all appointments, and how many in each appointment window are scheduled.
3. Click the Appointments Available subtab to see appointment information in a list view.
4. Click the Appointments Made subtab to view appointments that were scheduled by a customer service representative in the Graphical Appointment Book application.

Modifying available appointments in an appointment book

You can modify how many appointments are available in an appointment book.

About this task

You can change the number of available appointments within an appointment window as long as those appointments are not already booked.

Procedure

1. On the Graphical View subtab of the Appointment Book Manager application, right-click on the green segment representing the day and appointment window that you want to modify.
2. Select Modify Available Appointments. In the Modify Appointment Book Availability window, enter the new number of appointments for that day/window. Click OK. The number of total available appointments for that segment is updated.
You can also modify the number of available appointments by selecting Modify Appointment Book Availability in the Actions menu.

Managing access to appointment books

You can grant users and groups access to specific appointment books in the Appointment Book Manager application.

Procedure

1. In the Appointment Book Manager application, open the appointment book record that you want to grant access to.
2. Select Manage Appointment Book Access from the Actions menu.
3. In the Manage Appointment Book Access window, click the Select Person and Select Group buttons to select the person or group records that you want to enable to access the appointment book.
4. Click OK.

Graphical Appointment Book application

You use the Graphical Appointment Book application to schedule appointments in appointment windows that you defined in the Appointment Book Manager application.

An *appointment book* is a calendar view of the daily time slots in which an appointment for on-premise work can be done.

In the Appointment Book Manager application, you set up appointment windows in which the work can be completed based on calendar and shift information. You also determine how many appointment slots are available within each range.

In the Graphical Appointment Book application, customer service representatives can make appointments for customers within pre-defined appointment windows. They can schedule additional work records for affected locations at the same time.

- [Scheduling appointments](#)
Customer service representatives can make appointments for customers within pre-defined appointment windows.
- [Rescheduling appointments](#)
You can reschedule appointments that were previously made in the Graphical Appointment Book application.
- [Canceling appointments](#)
You can cancel appointments that were previously made in the Graphical Appointment Book application.
- [Enabling communication templates for appointments](#)
Communication templates are available for you to use when scheduling and rescheduling appointments in the Graphical Appointment Book application.

Scheduling appointments

Customer service representatives can make appointments for customers within pre-defined appointment windows.

Before you begin

You create appointment books in the Appointment Book Manager application. An *appointment book* is a calendar view of the daily time slots in which an appointment for on-premise work can be done. You set up appointment windows in which the work can be completed based on calendar and shift information, and determine how many appointment slots are available within each range. Appointments can then be made in the Graphical Appointment Book application by customer service representatives at your organization.

Procedure

1. In the Graphical Appointment Book application, enter the location or service address where you want to schedule the appointment.
2. In the Appointment Book field, select the appointment book that you want to use when you make the appointment.
3. In the Job Plan field, select the job plans that you want completed during the appointment. Only job plans associated with the appointment book are available to be selected.
4. Click Find.
In the graphical appointment view, available appointment windows are shown.
5. Right-click on the green segment that represents the appointment window when you want to schedule the appointment. Select Make Appointment.
In the Create Work Order with Appointment Window window, enter any additional information and click OK.

If additional work records are outstanding for the selected location, you can schedule appointments for them as well.

6. In the Other Work for Location table window, select the work record that you want to make an appointment for.
7. Right-click on the green segment that represents the appointment window when you want to schedule the appointment. Select Make Appointment for Selected Work Order.

Rescheduling appointments

You can reschedule appointments that were previously made in the Graphical Appointment Book application.

Procedure

1. In the Graphical Appointment Book application, search for the appointment that you want to reschedule. Enter values in the Location, Appointment Book, and Job Plan fields to locate the appointment.
2. Click Find.
3. In the Existing Appointments table window, select the appointment that you want to reschedule.
4. In the graphical appointment view, right-click on the green segment that represents the appointment window when you want to schedule the appointment. Select Reschedule Selected Appointment.

Canceling appointments

You can cancel appointments that were previously made in the Graphical Appointment Book application.

Procedure

1. In the Graphical Appointment Book application, search for the appointment that you want to cancel. Enter values in the Location, Appointment Book, and Job Plan fields to locate the appointment.
2. Click Find.
3. In the Existing Appointments table window, select the appointment that you want to cancel.
4. Click Cancel Appointment.

Enabling communication templates for appointments

Communication templates are available for you to use when scheduling and rescheduling appointments in the Graphical Appointment Book application.

About this task

Email and SMS notifications can be sent to customers to inform them of upcoming appointments and relevant updates. The notifications must be enabled in the Communication Templates and Escalations applications.

Procedure

1. In the Communication Templates application, search for "appointment" in the Description field of the List tab.
The following results are returned:
 - APPTTECHST
 - APPTNEW
 - APPTRESCHED
 - APPTCANCEL
2. For each communication template that you want to enable, change the status to ACTIVE.
3. Save the records.
4. In the Escalations application, search for "appointment" in the Description field of the List tab and then open the APPTTECHST record.
5. From the Actions menu, select Activate/Deactivate Escalations.
6. Save the record.

Managing weather

You can configure and enable weather forecasts and alerts to notify users about weather events that might affect work.

- [Configure Weather Forecast application](#)
You use the Configure Weather Forecast application to enable and configure weather forecast panels in applications.
- [Configuring Weather Alerts application](#)
You can configure and enable weather alerts so that work records in the graphical and map views are highlighted when they are at risk because of weather events.

Configure Weather Forecast application

You use the Configure Weather Forecast application to enable and configure weather forecast panels in applications.

Weather information can be configured for the following applications:

- Graphical Appointment Book
- Graphical Assignment
- Graphical Scheduling
- Graphical Scheduling - Large Projects
- [Enabling weather panels in applications](#)
You can enable weather information for certain applications in the Configure Weather Forecast application.
- [Configuring weather panels](#)
You can configure the front and back panels of your weather panel in the Configure Weather Forecast application.

Enabling weather panels in applications

You can enable weather information for certain applications in the Configure Weather Forecast application.

About this task

Weather information can be configured for the following applications:

- Graphical Appointment Book
- Graphical Assignment
- Graphical Scheduling
- Graphical Scheduling - Large Projects

You can enable up to four weather properties for each view: Current®, Hourly, and Daily.

Procedure

1. In the Configure Weather Forecast application, select the application that you want to enable weather data for.
2. On the main tab, select the Enable Weather check box.

3. For the Graphical Assignment and Graphical Scheduling application, select the Enable Back Panel check box if you want an additional weather panel to show.
4. On the Current, hourly, and Daily subtabs, select the weather property that you want to enable on the panels. For example, select Heat Index. Select the Enable in Front Panel or Enable in Back Panel check boxes to determine where to show that weather property.
5. Enter the display order in the Attribute Order in Panel field. For example, enter 1 for the weather property that you want to display first.
6. Optional: Enter a display style in the Style Name field.
You can choose from predefined weather styles to apply to the weather attribute. The predefined styles are defined in the cascading stylesheet (.css). For example, large, align_start, align_end, center, etc.
7. Optional: Select the Suppress Label check box to hide the weather attribute label in the panel. For example, 25°C rather than Temperature: 25°C.
8. Enable other weather properties as needed.
9. Save the record.

Configuring weather panels

You can configure the front and back panels of your weather panel in the Configure Weather Forecast application.

You can select up to four weather properties to appear on each weather panel. Pick the minimum amount necessary to maximize display space.

The following table describes display options that you can configure:

Table 1. Weather panel configuration

Display option	Description
View Order	Specifies the order in which weather properties appear. A view order of '0' indicates that there is no specific ordering. When properties have the same view order, they are ordered by the field label.
Suppress Label	Indicates whether to hide the weather attribute label in the panel. For example, 25°C rather than Temperature: 25°C . This option applies only to the front weather panel.
Style Name	<p>Style name properties are defined in the cascading stylesheet. The following list contains valid style name properties:</p> <ul style="list-style-type: none"> • center • right • left • small • medium • large • space-top • space-bottom <p>You can use multiple Style Name properties per item. This option applies only to the front weather panel.</p> <p>Some styles apply only if the weather label is suppressed. For example, center, left, right apply only if no weather label is present.</p>

- [Weather data customization](#)
You can modify the default values of system properties to determine how your weather data appears. The properties are located in the System Properties application.

Weather data customization

You can modify the default values of system properties to determine how your weather data appears. The properties are located in the System Properties application.

Changing property values

You can change the weather panel width and height, the number of panels to show, and the unit of measure to display weather data in. You change a display property by modifying its value in the System Properties application. Search the System Properties application for properties that are related to the weather data by using the following prefix:

- skd.weather
- mxe.weather

Configuring Weather Alerts application

You can configure and enable weather alerts so that work records in the graphical and map views are highlighted when they are at risk because of weather events.

Weather alerts are configured in the Configuring Weather Alerts application (when a subscription is purchased) and enabled with a cron task. When enabled, an icon appears on work records that might be affected by the specified weather conditions. A work tooltip explains the peril.

Example

When a peril or alert is received from The Weather Company®, a cron task looks for work that is scheduled or assigned in the affected area during that timeframe.

In the Graphical Scheduling application and the work view of the Graphical Assignment application, work records that can be impacted by the alert are flagged with an icon. The work order tooltip shows the alerts, allowing the planner to decide whether the job needs to be rescheduled.

In the Graphical Assignment application, the dispatching map displays current weather alerts and all affected assignments show within the radius of the alert map marker. The dispatcher can reschedule the work and notify the crews.

A technician in the field is notified by SMS or email to seek shelter because of bad weather in the area.

In the Graphical Appointment Book application, customer locations are checked to see if there are any alerts for that area. If there are, an icon displays in the calendar with a tooltip that describes the peril. The customer service representative can reschedule the work if needed.

- [Configuring weather alerts](#)

You configure weather alerts based on weather conditions and zones affected in the Configure Weather Alerts application.

Configuring weather alerts

You configure weather alerts based on weather conditions and zones affected in the Configure Weather Alerts application.

Procedure

1. In the Configure Weather Alerts tool, open the Service Configuration page.
2. Add weather perils to your organization in the Weather Perils table. You can add up to 22 weather perils. (The perils can be downloaded and sent to create your weather subscription).
3. Click Alert Endpoint.
4. Create endpoints for the weather alerts. Enter the URL, user name, and password for each endpoint.
5. Register the endpoints with the weather service by clicking Register All. Save your changes.
6. On the Weather Zone page, enter the Service Address or the longitude and latitude of the center of each weather zone, and specify the radius of the zone.
7. Register each weather zone with the weather service by clicking the Register icon. Save your changes.

What to do next

For the weather alerts to appear in Maximo® Asset Management Scheduler applications, you must enable the POPULATEWOWEATHERALERT cron task.

Note:

If you are using Weblogic and are not using application server security (for instance, you are using LDAP in Maximo), you need to bypass Weblogic basic authentication, which can be done with the following configuration change:

To set the enforce-valid-basic-auth-credentials flag, perform the following steps:

1. Add the <enforce-valid-basic-auth-credentials> element to config.xml within the <security-configuration> element as follows:

```
<enforce-valid-basic-auth-credentials>>false</enforce-valid-basic-auth-credentials>
</security-configuration>
```

2. Start or restart all of the servers in the domain.

- [Enabling weather alerts by using cron tasks](#)

In order for weather alerts to be displayed for affected work records in graphical and map views, you must enable the weather alert cron tasks.

Enabling weather alerts by using cron tasks

In order for weather alerts to be displayed for affected work records in graphical and map views, you must enable the weather alert cron tasks.

Procedure

1. In the Cron Task Setup application, search for the POPULATEWOWEATHERALERT cron task.
2. In the Cron Task Instances table, select the Active check box.
3. Save the record.

What to do next

To clear expired alerts on work records, open the REMOVEWOWEATHERALERT cron task and set the cron task to Active. When the cron task runs, expired weather alerts are removed.

Optimizing schedules

You use IBM® Maximo® Optimizer to automate efficient decisions for long-range planning, scheduling, and dispatching of resources for asset maintenance while balancing competing objectives and constraints.

Maximo® Optimizer is purchased separately through one of the following plans:

Maximo® Optimizer plan

The Maximo® Optimizer plan with no restrictions on the deployment of virtual processor cores (VPCs), parallel execution of jobs, or number of custom models.

Maximo® Optimizer Limited plan

The Maximo® Optimizer Limited plan limits the deployment to two VPCs and a serialized execution of jobs for only one model. The model is a default model or a customized version of the default model that is provided by IBM.

For more information on deploying and activating Maximo Optimizer, see [Deploying IBM Maximo Optimizer](#).

- [IBM® Maximo® Optimizer optimization models](#)
You can run optimization models to schedule or assign work within a scenario. When you run an optimization model, the work is scheduled and assigned based on the criteria that you specify. Each model provides results that are tailored to a specific business need.
- [Optimization templates](#)
A template is a default set of values that can be used across multiple schedules to optimize work that is based on your objectives. You create a template to define which work details are most important to you during scheduling.
- [Running optimization](#)
Using optimization templates, you can run optimization on your schedule scenarios and work lists to enhance scheduling results.
- [Monitoring optimization processes](#)
You can monitor the progress of completed, scheduled, or ongoing optimization processes by using options from the Actions menu.
- [Example of comparing optimization scenarios](#)
You can create multiple scenarios to perform an analysis of how resource allocation affects schedule dates. You can create the scenarios manually, or you can use predefined resource leveling options to automate the scheduling of work.

IBM® Maximo® Optimizer optimization models

You can run optimization models to schedule or assign work within a scenario. When you run an optimization model, the work is scheduled and assigned based on the criteria that you specify. Each model provides results that are tailored to a specific business need.

Some models provide information for long term planning, while others focus on short term planning and assigning work. You can run multiple optimization models and compare the results by creating multiple scenarios.

Table 1. Optimization model options

Planning type	Applications	Optimization scenarios
Long term planning	<ul style="list-style-type: none">• Graphical Scheduling• Graphical Scheduling - Large Projects	<ul style="list-style-type: none">• Resource leveling• Capacity planning• Maintenance scheduling optimization
Short term assignment	<ul style="list-style-type: none">• Graphical Assignment	<ul style="list-style-type: none">• Labor and crew assignment• Spatial scheduling

Resource leveling optimization

You can optimize your schedule to balance your resource use, balancing your work demands with the resource pool that is available. Resource leveling optimization ensures that you are not under-utilizing labor resources, or over-allocating work to a specific craft.

Resource leveling ensures that you are not over-scheduling the amount of work that you can get accomplished. When you level resources, you can also meet other objectives, such as minimizing task interruption or labor costs. For example, you can match a work record's required skill level, rather than assigning it to a resource with a higher skill level.

Capacity planning optimization

You can optimize your schedule to ensure that you can complete as much work as possible in the allotted time period.

In planning work, you can identify whether additional labor resources are necessary to complete work in a specific timeframe. For example, 100 work orders must be completed this week. Capacity planning optimization ensures that you are using all available labor resources to accomplish your goal. When you set the optimization parameters, you can set other criteria that must be met. For example, you can ensure that work is scheduled only when the asset is available for maintenance.

Labor and crew assignment optimization

You can optimize your schedule to automatically assign people and crews to work based on their availability and required skills.

Assigning work can be time consuming for supervisors and planners. Factors to consider include resource availability and the skill level that the work requires. You can set the labor and crew optimization model to accommodate these factors, which are based on your preferences. For example, you can set the optimization model to respect appointments that were made, or use the same labor or crew resource throughout a job.

You can then review the assignments, adjust them as needed, and publish them.

Spatial scheduling optimization

You can optimize your schedule to automatically assign work to people and crews based on their geographic location.

When you use spatial scheduling optimization to assign work, work is assigned based on the locations and work zones of labor and crew resources. Crew types are evaluated and assigned appropriate work, and efficient routes are created. You can then review the assignments in the Gantt view and adjust them as needed, or view them spatially on the Dispatch View tab. You can publish the assignments when ready.

Optimization templates

A template is a default set of values that can be used across multiple schedules to optimize work that is based on your objectives. You create a template to define which work details are most important to you during scheduling.

Optimization templates contain the parameter values that you want the optimization model to take into account when it schedules work. The parameter values include objectives, constraints, and variables. For example, you can define one template whose primary objective is to minimize cost and another whose objective is to schedule high-priority work first.

When you work with a schedule, you can select which optimization template to use. Templates exist for the following optimization use cases:

- Resource leveling
- Capacity planning
- Labor and crew assignments
- Spatial dispatching
- Maintenance scheduling optimization

Running optimization

Using optimization templates, you can run optimization on your schedule scenarios and work lists to enhance scheduling results.

About this task

If you have a multilanguage environment, optimization results (messages, conflicts, and alerts) are returned in the language of the current user. For example, if a user in a Japanese environment runs optimization, the results are returned in Japanese. A user in an Italian environment who viewed the results would also see them in Japanese.

Procedure

1. In the scheduling or assignment application, display the scenario or work list that you want to run optimization for.
2. Optional: Review or create a new template.
 - a. From the More Actions menu, select the optimization template that you want to run.
 - b. In the template window, select an existing template or click New Template to create a new one.
 - c. Review the parameters on the Template Main Parameters and Additional Parameters tabs. Include or exclude parameters that you want the optimization to consider by using the check boxes.
 - d. Click OK to save your template and return to the schedule.
3. From the Common Actions menu, select Run Optimization.
4. Define the parameters for the optimization on the Variables tab and other tabs.
5. Choose when you want the optimization to run.
 - a. To run optimization immediately, click Run
 - b. To set up optimization to run by using a cron task, click Set Cron Tasks. In the Optimization Parameters for Cron Tasks window, define when you want to the cron task to run. You can set it up to run at specific date and time, to run at a specific recurring interval, or both. Click Save to save your settings, then click Run.
6. In the graphical view, review the results, and adjust the schedule or work list manually as necessary.

What to do next

You can monitor optimization processes and their progress by using the following optimization options in the More Actions menu:

- View Optimization Processes
- View Scheduled Optimization Processes
- View Optimization Progress

For scheduling optimization, the View Optimization Progress window displays key performance indicator (KPI) information. Depending on the KPI value, you can terminate the optimization process by clicking Terminate.

Monitoring optimization processes

You can monitor the progress of completed, scheduled, or ongoing optimization processes by using options from the Actions menu.

To see optimization processes that are currently running, select View Optimization Processes from the Actions menu. You can see the status of each process, and how long it took to complete. You can also see an optimization summary, a conflict report for failed optimizations, and a list of records that were not optimized or

assigned. These records appear in the Gantt view in red at the end of the scheduled dates. (You can set a system property to move these to the beginning of the schedule instead.)

To view optimization processes that are scheduled to run but not running currently, select View Scheduled Optimization Processes.

To see a log of current optimization processes, select View Optimization Progress.

For scheduling optimization, the View Optimization Progress window displays key performance indicator (KPI) information. You can terminate the optimization process by clicking Terminate.

Example of comparing optimization scenarios

You can create multiple scenarios to perform an analysis of how resource allocation affects schedule dates. You can create the scenarios manually, or you can use predefined resource leveling options to automate the scheduling of work.

About this task

In this example, you have many work orders that must be completed with limited resources. You have an existing schedule that contains both current maintenance and emergent work and work from a substantial backlog. You must assign the work in order of priority to the resources that are available. You want to see whether allocating 100% of your resources to the schedule affects the dates significantly over allocating 75%.

Procedure

1. With the schedule open, from the Actions menu, create a resource leveling scenario. Select OK and Move to open the new scenario.
2. From the Actions menu, click Run Optimization.
3. In the Resource Leveling Optimization window, select Immediate.
4. On the Variables tab, in the Percentage Availability field, enter 100. Click Submit.
5. In the Gantt view, review the results, and adjust the schedule manually as necessary.
6. Run the resource leveling scenario again by repeating steps 1-5. Use 75 in the Percentage Availability field.
7. Compare the scenarios.
8. Publish the scenario that best fits your needs.

Managing calibration assets and standards

You can manage your calibration assets and the standards that are used to calibrate them.

You can ensure regulatory compliance with FDA (21 CFR part 11 for support of electronic signatures and electronic audits), calibration of instruments, tools and measurement equipment and standards. Compliance Assistance Documentation provides support for asset-related CAPA processes, and support in validation projects.

You can manage the calibration of instruments that measure process variables such as temperature, pressure, and flow. You can maintain a historical record of calibration measurements for instruments and measurement and test equipment. You can also track historical records of the calibration instrument or the standard that is used to calibrate an instrument or measurement and test equipment.

You can create data sheet templates to document your instrument specification and apply the templates to multiple instruments. You can select or define tolerance levels and input-range limits for each data sheet and associate the data sheet with job plans and work orders. You can then use the data sheets in work orders to gather calibration as-found and as-left data to record and analyze the performance of the instrument.

By creating performance maintenance intervals, you can automatically create calibration work orders to ensure that the calibration of assets is completed on time. Calibration job plans define the procedures that you use to calibrate an instrument. You can use revision control to update the information of a job plan or a data sheet and maintain records of the previous revisions.

To comply with industry regulations, your calibration history is recorded to ensure that your calibration assets are fully traceable. You can identify which standard or measurement and test equipment was used to calibrate an asset. You can apply reverse traceability to identify all assets that were calibrated with a specific standard.

- [Documenting instrument specifications by using data sheets](#)
You document your instrument specifications using the data sheet template. These specifications are typically defined by the manufacturer of the instrument.
- [Defining calibration procedures, assets, tools, and locations](#)
You can create asset records to define your instruments, measurement and test equipment (M&TE), and standards. You can also manage your instruments as locations and M&TE as tools.
- [Configuring calibration features](#)
You must complete configuration tasks in order to use calibration features.
- [Recording calibration data in work orders](#)
You document your calibration data results using calibration work orders.

Documenting instrument specifications by using data sheets

You document your instrument specifications using the data sheet template. These specifications are typically defined by the manufacturer of the instrument.

- [Data sheet templates](#)
Data sheets are templates that define the calibration process for one or more asset functions. You use the Data Sheet Template application to create data sheets for calibration assets.
- [Data sheets](#)
Data sheets provide technicians with the information that they need to perform a calibration. A data sheet is a template that defines the specifications of an asset for the calibration process.
- [Non-linear instruments in data sheets](#)
Non-linear instruments are analog instruments that have their tolerance limits calculated based on the desired output value and not the nominal input value.
- [Tolerance limits on data sheets](#)
Tolerance is an acceptable value or value range for a specified output value. You define the tolerance limits for accuracy of a calibration point on a data sheet.
- [Creating data sheets](#)
A data sheet is a template that defines the specifications of an asset for the calibration process. Data sheets give a technician the information necessary to calibrate an analog or discrete asset function.
- [Associating work assets with data sheets](#)
When you associate an asset with a data sheet, you are attaching a template with predefined calibration points for the work asset.
- [Duplicating the asset function of a data sheet](#)
When you create multiple data sheets with similar information, you can duplicate the asset function information to save time.
- [Calibration calculations](#)
During the calibration of an asset, calculations are used to determine whether the asset passes or fails the calibration. These calculations are based on the values that you specify on the data sheet.
- [Data sheet templates](#)
Data sheets are templates that define the calibration process for one or more asset functions. You use the Data Sheet Template application to create data sheets for calibration assets.
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Data sheets

Data sheets provide technicians with the information that they need to perform a calibration. A data sheet is a template that defines the specifications of an asset for the calibration process.

A data sheet defines the asset function specifications and the calibration point of an asset. The data sheet also defines the functional checks and dynamics checks of an asset, if required.

Data sheets are associated with assets and are copied to calibration work orders for the asset. On the work order data sheet, the technician enters calibration As Found and As Left data. This data is used to analyze asset performance and calibration frequency.

The data sheet also records uncertainty measurement data for instruments and measuring and test equipment (M&TE). This uncertainty data is calculated and imported from an external source into the Data Sheet Template application and the Work Order Tracking application.

- [Asset functions](#)
The asset function specifies the calibration data for the function of an asset. You can specify calibration data about one or more asset functions.
- [Calibration points](#)
A calibration point is the test information that is used to calibrate an asset. The amount of calibration points that are required for a calibration process is determined by business requirements.
- [Dynamic checks](#)
A dynamic check is additional data about the instrument being calibrated.
- [Functional checks](#)
A functional check is an additional check point that is required to calibrate an instrument.
- [Uncertainty measurement for calibration](#)
The results from the calibration of an asset can vary when the asset is measured multiple times. In calibration, the uncertainty measurement helps determine the reliability of the asset by comparing the recorded value to its real value.
- [Asset functions](#)
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The results from the calibration of an asset can vary when the asset is measured multiple times. In calibration, the uncertainty measurement helps determine the reliability of the asset by comparing the recorded value to its real value.

Asset functions

The asset function specifies the calibration data for the function of an asset. You can specify calibration data about one or more asset functions.

Calibration data includes the input and output values of an asset, the tolerance limits of an asset, and the uncertainty measurement data of an asset. The combination of these values is calculated to determine whether the calibration of an instrument passes or fails performance tests.

You can configure a data sheet for the following types of devices:

Analog device

An *analog device* is an instrument that provides continuous results, such as a pressure gauge.

Discrete device

A *discrete device* is an instrument that has only two settings. For example, a discrete device can be a switch that is either on or off or a valve that is either open or closed.

- [Asset function parameters](#)
The asset function specifies the calibration data for an asset. There are two types of asset functions: an analog asset function and a discrete asset function.
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Asset function parameters

The following table lists the parameters that are enabled for analog asset functions and asset discrete functions.

Parameter	Analog	Discrete
Technician Can Insert Points	✓	✓
No Adjustment Limit	✓	✓
Input Minimum Field Resolution	✓	✓
Limits clipped at calibration ranges:	✓	
Input Limits Clipped		
Output Limits Clipped		
Input range limits:	✓	
Input Range From		
To		
Input Units	✓	✓
Range on nominal limits and criteria:	✓	
Range Limit From		
To		
As		
Output Minimum Field Resolution	✓	
Output range limits:	✓	
Output Range From		
To		
Output Units	✓	
Square Root of Input	✓	
Process Units	✓	✓
Scaling Factor	✓	✓

Parameter	Analog	Discrete
Single tolerance range and criteria: Single From To As	✓	✓
Summed tolerance range and criteria: Summed EU %Span %URV %Reading Applied As	✓	
Uncertainty tolerance range and criteria: Guardband From To As	✓	✓
Status when Exceeded	✓	✓

Calibration points

A calibration point is the test information that is used to calibrate an asset. The amount of calibration points that are required for a calibration process is determined by business requirements.

A calibration point defines the nominal input value and the desired output value for an analog asset function.

A calibration point defines the set point and set point action for a discrete asset function.

Dynamic checks

A dynamic check is additional data about the instrument being calibrated.

A dynamic check point does not affect the calibration of an instrument, but is relevant to the calibration of an instrument. For example, a dynamic check can record the reading of gear settings or controller tuning of an instrument.

Functional checks

A functional check is an additional check point that is required to calibrate an instrument.

The options for a functional check are either pass or fail. For example, a functional check can record a temperature setting that contributes to either a pass or fail.

Uncertainty measurement for calibration

The results from the calibration of an asset can vary when the asset is measured multiple times. In calibration, the uncertainty measurement helps determine the reliability of the asset by comparing the recorded value to its real value.

Any measurement is subject to imperfections. Some of these imperfections are caused by random effects, such as short-term fluctuations in temperature, humidity, and air-pressure, or variability in the performance of the measurer. Repeated measurements show variation because of these random effects.

Other imperfections are caused by systematic effects. These systematic effects can be the offset of a measuring instrument or a change in its characteristics between calibrations. Other systematic effects can be personal bias in reading an analog scale or the uncertainty of the value of a standard.

The uncertainty measurement data for calibration is calculated externally to Maximo® Calibration. Information about calibration assets is exported from Maximo Calibration to the external system, where the information is calculated to determine the correct uncertainty data. The information is then imported into the calibration data sheet tables and the data sheet work order tables. When a data sheet is attached to a work order, the uncertainty measurement data is imported from the Data Sheet Template application.

You use the Manage integration framework to link Maximo Calibration to the external system. Before you configure Maximo Calibration for uncertainty data, you must complete the basic configuration tasks to set up your environment. See the information about basic configuration in the *IBM Maximo Asset Management Integration Guide*.

Non-linear instruments in data sheets

Non-linear instruments are analog instruments that have their tolerance limits calculated based on the desired output value and not the nominal input value.

To indicate that an instrument is non-linear, select the Non-linear check box. If calibration points are already entered, they must be cleared before you can select non-linear.

When an instrument is selected as non-linear, the Engineering Unit (EU) is the only tolerance that is used. Also, the desired output value of the calibration point must be within the output range of the asset function.

Tolerance limits on data sheets

Tolerance is an acceptable value or value range for a specified output value. You define the tolerance limits for accuracy of a calibration point on a data sheet.

You can specify up to four tolerance levels on a data sheet. Tolerance 1 is the tightest (or narrowest) tolerance and Tolerance 4 is the widest. Typically, the manufacturer of the asset establishes the tolerance limits.

Example of using tolerance limits

Tolerance 1 is the output limit range that does not require adjustment for the asset. An asset passes calibration if the actual output value for the asset is within the limit range of Tolerance 1. No additional action is required.

The asset requires adjustment if the actual output value exceeds the limit range of Tolerance 1 but is within the limit range of Tolerance 2. The asset owner is also notified.

Tolerance limits are validated as tightest to widest by using the following criteria:

- Tolerance 1 lower limits > Tolerance 2 lower limits > Tolerance 3 lower limits > Tolerance 4 lower limits
- Tolerance 1 upper limits < Tolerance 2 upper limits < Tolerance 3 upper limits < Tolerance 4 upper limits

Tolerance limits are also validated by using the following criteria:

- The lower tolerance limit value, the From field, must be less than or equal to zero.
- The upper tolerance limit value, the To field, must be greater than or equal to zero.

When a technician enters As-found and As-left values on the work order data sheet, these values are validated to ensure that they are within the specified range.

Creating data sheets

A data sheet is a template that defines the specifications of an asset for the calibration process. Data sheets give a technician the information necessary to calibrate an analog or discrete asset function.

About this task

When you create a data sheet, the status default value is draft.

If you enter a value for an asset function using the comma as the thousand separator, the value becomes a decimal number. For example, if you enter 1,000 and your minimum field resolution is 3, then the value converts to 1.000 (one). If you enter 1000 and your minimum field resolution is 3, then the value converts to 1000.000 (one thousand).

Procedure

1. In the Data Sheet Template application, click New Data Sheet and specify a data sheet name.
2. Create an asset function and specify the type of asset function.
3. Specify whether the asset function is a calibration point, a functional check point, or a dynamic check point.
4. Optional: To allow a field technician to add calibration point rows to a work order data sheet while performing a calibration, select the Technician Insert Points check box.
5. Specify the asset function information.
6. Specify either the calibration point information, the functional check point information, or the dynamic check point information of the asset function.
This checkpoint information is according to the business rules for your company.
7. Save the data sheet.

What to do next

Change the status of the data sheet to approved to add it to a work asset. You can then associate the data sheet to a job plan or to a work order.

- [Revising the version of a data sheet](#)

Changes that are made to data sheets are saved by using revision control. Revision control maintains a historical record to troubleshoot calibration issues with assets when data sheet values have changed.

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Revising the version of a data sheet

Changes that are made to data sheets are saved by using revision control. Revision control maintains a historical record to troubleshoot calibration issues with assets when data sheet values have changed.

About this task

You can revise data sheets that are in approved status only. Data sheet revision numbers increment by 1. You can view the revision history of a data sheet from the Select Action menu. Work orders that the data sheet is attached to are not automatically updated.

When the status of the revised data sheet is set to approved, the status of the previous data sheet is set to Revised. The revised data sheet cannot be edited or reopened.

Job plans that are associated with the data sheet are automatically updated to the revised version.

Procedure

1. In the Data Sheet Template application, select the data sheet that you want to revise.
2. From the Select Action menu, select Revise Data Sheet.
3. Enter a revision description and click OK.
The status of the data sheet is set to Pending Revision.
4. Update the data sheet for this revision and save the changes.

What to do next

You can change the status of the revised data sheet to either Waiting on Approval or Approved.

Associating work assets with data sheets

When you associate an asset with a data sheet, you are attaching a template with predefined calibration points for the work asset.

About this task

You can link one or more assets to a data sheet. You can use the current data sheet for multiple assets that have identical calibration data sheet requirements.

Procedure

1. In the Data Sheet Template application, select the data sheet you want to associate with a work asset.
2. On the Work Assets tab, insert a row.
3. Specify either a location, an asset, or an item.
If you select a location as the work asset, the Asset field is automatically populated.
4. Save the data sheet.

Duplicating the asset function of a data sheet

When you create multiple data sheets with similar information, you can duplicate the asset function information to save time.

About this task

You can duplicate the asset function information of a data sheet that is in draft status and pending revision status only.

Procedure

1. In the Data Sheet Template application, select the asset function of the data sheet that you want to duplicate.
2. Click Duplicate Row.
3. Specify the asset function number and description.
4. Update any fields as required.
5. Save the record.

Calibration calculations

During the calibration of an asset, calculations are used to determine whether the asset passes or fails the calibration. These calculations are based on the values that you specify on the data sheet.

The results of these calculations depend on the type of asset that is being calibrated. The results also depend on whether the tolerance levels are based on the input or the output information of the asset. Your desired output is the result that you want for your asset. The desired output is based on the direction of the values and whether the value is increasing or decreasing.

These calculations are processed on the Data Sheet tab in the Data Sheet application and the Work Order application.

- [Symbols used in calibration formulas](#)
The calibration formulas use specific symbols. These symbols define the algorithms that are used in the calibration calculations.
- [Tolerance criteria for calibration calculations](#)
The tolerance criteria in a data sheet determines which algorithm is used to calculate the lower and upper output limits for each tolerance level. Each tolerance criterion represents a specific calculation formula to calculate tolerance limits.
- [Single tolerance for calibration calculations](#)
You can use a single tolerance criterion for each tolerance level. The single tolerance calculates the desired output.
- [Summed tolerance for calibration calculations](#)
You can use summed tolerance criteria for each tolerance level. Summed tolerance is the total of single tolerance expressions.
- [Square root tolerance for calibration calculations](#)
The square root calculation is used to perform the input limits and output tolerance calculations for differential pressure producing flow meters.
- [Reverse flow calculation for calibration calculations](#)
The reverse flow calculation is used to perform the input limits and output tolerance calculations for linear assets, for example flow indicators in reverse flow.
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Symbols used in calibration formulas

The calibration formulas use specific symbols. These symbols define the algorithms that are used in the calibration calculations.

List of the symbols used in calibration formulas

i	Input value: nominal or actual.
i_{lower}	Input range, lower limit.
i_{upper}	Input range, upper limit.
i_a	Actual input value (as found input).
i_{calc}	Calculated input value (input as calculated from the as found output).
o_{lower}	Output range lower limit.
o_{upper}	Output range upper limit.
o_a	Actual output value (as found output).
o_{calc}	Calculated output value (output as calculated from the input).

- Δi Input range span.
- Δo Output range span.
- r_{lower} Range limit From value (lower limit).
- r_{upper} Range limit To value (Upper limit).
- Tolerance Tolerance value entered, for example, +/- 2.5, +2.5 or -2.5.

Tolerance criteria for calibration calculations

The tolerance criteria in a data sheet determines which algorithm is used to calculate the lower and upper output limits for each tolerance level. Each tolerance criterion represents a specific calculation formula to calculate tolerance limits.

Table 1. Criteria definitions and calculations

Criterion	Criteria definition	Tolerance calculation based on input	Tolerance calculation based on output
Engineering Units (EU)	Tolerances that are based on input are expressed in input units. The tolerance levels are always expressed in output units; therefore, a conversion must occur. The conversion is $\left(\frac{\Delta o}{\Delta i}\right)$ If the tolerance is based on output, then no conversion is required.	$Tolerance * \left(\frac{\Delta o}{\Delta i}\right)$	Tolerance
%Span	The values for the %Span criterion are calculated from the calibrated input span of the asset. The values are then converted to output units and are added to or subtracted from the desired output value to determine the range limits. The span is the algebraic difference of the input upper and lower range values divided by 100. If the tolerance is based on output, then no conversion is required.	$Tolerance * \left(\frac{\Delta i}{100}\right) * \left(\frac{\Delta o}{\Delta i}\right)$	$Tolerance * \left(\frac{\Delta o}{100}\right)$
%URV	The %URV criterion is the upper range value divided by 100. If the upper input range value is used, the value must be converted to output units before the tolerance is calculated. The converted tolerance is then added to or subtracted from the desired output value to determine the range limits. If the tolerance is based on output, then no conversion is required.	$Tolerance * \left(\frac{r_{Upper}}{100}\right) * \left(\frac{\Delta o}{\Delta i}\right)$	$Tolerance * \left(\frac{O_{Upper}}{100}\right)$
%Reading	The values for the %Reading criterion are calculated from the nominal input value applied to the asset. The values are then divided by 100, converted to output units, and added to or subtracted from the desired output value to determine the range limits. These values are not constant, but vary with nominal input. If the tolerance is based on output, then no conversion is required.	$Tolerance * \left(\frac{i}{100}\right) * \left(\frac{\Delta o}{\Delta i}\right)$	$Tolerance * \left(\frac{o}{100}\right)$

Single tolerance for calibration calculations

You can use a single tolerance criterion for each tolerance level. The single tolerance calculates the desired output.

You use one of two calculations to calculate the desired output. The calculation that is used depends on the direction of the input and the output. The desired output is calculated and then applied to the formulas to calculate tolerance limits.

Table 1. Single tolerance calculations

Description	Input and output	Calculation
Same direction increasing	If Input From to Input To < 0 and Output From to Output To <= 0	Desired output $= (i - i_{Lower}) * \left(\frac{\Delta o}{\Delta i}\right) + o_{Lower}$
Same direction decreasing	If Input From to Input To > 0 and Output From to Output To >= 0	Desired output $= (i - i_{Lower}) * \left(\frac{\Delta o}{\Delta i}\right) + o_{Lower}$
Opposite direction increasing/decreasing	If Input From to Input To < 0 and Output From to Output To >= 0	Desired output $= O_{Upper} - (i - i_{Lower}) * \left(\frac{\Delta o}{\Delta i}\right)$

Description	Input and output	Calculation
Opposite direction decreasing/increasing	If Input From to Input To > 0 and Output From to Output To <= 0	Desired output $= O_{Upper} - (i - i_{Lower}) * \left(\frac{\Delta o}{\Delta i}\right)$

Summed tolerance for calibration calculations

You can use summed tolerance criteria for each tolerance level. Summed tolerance is the total of single tolerance expressions.

The calculation converts the individual terms to corresponding output units and then adds all the output units together.

Summed Tolerance = Desired Output + EU + %Span + %URV + %Reading

The following figure shows the formula based on input (where T = tolerance):

Figure 1. Summed tolerance formula based on input

$$= (i - i_{Lower}) * \left(\frac{\Delta o}{\Delta i}\right) + O_{Lower} + \left[T * \left(\frac{\Delta o}{\Delta i}\right)\right] + \left[T * \left(\frac{\Delta i}{100}\right) * \left(\frac{\Delta o}{\Delta i}\right)\right] + \left[T * \left(\frac{i_{Upper}}{100}\right) * \left(\frac{\Delta o}{\Delta i}\right)\right] + \left[T * \left(\frac{i}{100}\right) * \left(\frac{\Delta o}{\Delta i}\right)\right]$$

The following figure shows the formula based on output (where T = tolerance):

Figure 2. Summed tolerance formula based on output

$$= (i - i_{Lower}) * \left(\frac{\Delta o}{\Delta i}\right) + O_{Lower} + [T] * \left[T * \left(\frac{\Delta o}{100}\right)\right] + \left[T * \left(\frac{O_{Upper}}{100}\right)\right] + \left[T * \left(\frac{o}{100}\right)\right]$$

Square root tolerance for calibration calculations

The square root calculation is used to perform the input limits and output tolerance calculations for differential pressure producing flow meters.

Square root calculations

You select the Square Root of Input check box to use this calculation.

The formula for calculating the desired output is included in the square root equations.

The following figure shows the desired output calculation:

Figure 1. Desired output calculation

$$\sqrt{\left(\frac{i}{i_{Upper}}\right)} * \Delta o + O_{Lower}$$

Table 1 shows the positive square root equation and negative square root equation for each criterion.

Table 1. Single square root equations for input

Criterion	Description	Positive square root equations	Negative square root equations
EU	When the Square Root of Input check box is selected, the positive square root equation is used for the engineering unit criterion. The negative square root equation is used if the input + tolerance is a negative number.	$\sqrt{\left(\frac{i + Tolerance}{i_{Upper}}\right)} * \Delta o + O_{Lower}$	$O_{Lower} - \sqrt{\left(\frac{i + Tolerance}{i_{Upper}}\right)} * \Delta o$
%Span	When the Square Root of Input check box is selected, the positive square root equation is used for the %Span criterion. The negative square root equation is used if the input + tolerance is a negative number.	$\sqrt{\left(\frac{i + Tolerance(\frac{\Delta i}{100})}{i_{Upper}}\right)} * \Delta o + O_{Lower}$	$O_{Lower} - \sqrt{\left(\frac{i + Tolerance(\frac{\Delta i}{100})}{i_{Upper}}\right)} * \Delta o$
%URV	When the Square Root of Input check box is selected, the positive square root equation is used for the %URV criterion. The negative square root equation is used if the input + tolerance is a negative number.	$\sqrt{\left(\frac{i + Tolerance(\frac{i_{Upper}}{100})}{i_{Upper}}\right)} * \Delta o + O_{Lower}$	$O_{Lower} - \sqrt{\left(\frac{i + Tolerance(\frac{i_{Upper}}{100})}{i_{Upper}}\right)} * \Delta o$
%Reading	When the Square Root of Input check box is selected, the positive square equation is used for the %Reading criterion. The negative square root equation is used if the input + tolerance is a negative number.	$\sqrt{\left(\frac{i + Tolerance(\frac{i}{100})}{i_{Upper}}\right)} * \Delta o + O_{Lower}$	$O_{Lower} - \sqrt{\left(\frac{i + Tolerance(\frac{i}{100})}{i_{Upper}}\right)} * \Delta o$

Table 2 shows the positive square root equation and negative square root equation for a summed square root.

Table 2. Summed square root equations for input

Description	Summed square root equation
Positive square root equations	$\sqrt{\left(\frac{i + Tolerance + Tolerance(\frac{\Delta i}{100}) + Tolerance(\frac{i_{Upper}}{100}) + Tolerance(\frac{i}{100})}{i_{Upper}}\right)} * \Delta o + O_{Lower}$

Description	Summed square root equation
Negative square root equations	$O_{Lower} - \sqrt{\left(\frac{i + Tolerance + Tolerance\left(\frac{\Delta i}{100}\right) + Tolerance\left(\frac{i_{Upper}}{100}\right) + Tolerance\left(\frac{i}{100}\right)}{i_{Upper}} \right)^2 * \Delta o}$

Reverse flow calculation for calibration calculations

The reverse flow calculation is used to perform the input limits and output tolerance calculations for linear assets, for example flow indicators in reverse flow.

You select the Reverse Flow check box to use this calculation.

The formula for calculating desired output is included in the following equations.

The following figure shows the desired output calculation:

Figure 1. Desired output calculation

$$\left(\left(\frac{i - i_{Lower}}{\Delta i} \right)^2 * \Delta o \right) + O_{Lower}$$

Table 1. Single squared equation for reverse flow

Criterion	Description	Squared equations
EU	When the Reverse Flow check box is selected, the squared equation is used for the engineering unit criterion.	$\left(\left(\frac{i - i_{Lower} + Tolerance}{\Delta i} \right)^2 * \Delta o \right) + O_{Lower}$
%Span	When the Reverse Flow check box is selected, the squared equation is used for the %Span criterion.	$\left(\left(\frac{(i - i_{Lower}) + Tolerance\left(\frac{\Delta i}{100}\right)}{\Delta i} \right)^2 * \Delta o \right) + O_{Lower}$
%URV	When the Reverse Flow check box is selected, the squared equation is used for the %URV criterion.	$\left(\left(\frac{(i - i_{Lower}) + Tolerance\left(\frac{i_{Upper}}{100}\right)}{\Delta i} \right)^2 * \Delta o \right) + O_{Lower}$
%Reading	When the Reverse Flow check box is selected, the squared equation is used for the %Reading criterion.	$\left(\left(\frac{(i - i_{Lower}) + Tolerance\left(\frac{i}{100}\right)}{\Delta i} \right)^2 * \Delta o \right) + O_{Lower}$

Figure 2. Summed squared equations. This equation calculates the reverse flow for summed squared criteria.

$$\left(\frac{(i - i_{Lower}) + Tolerance + \left(Tolerance\left(\frac{\Delta i}{100}\right) + Tolerance\left(\frac{i_{Upper}}{100}\right) + Tolerance\left(\frac{i}{100}\right) \right)}{\Delta i} \right)^2 * \Delta o + O_{Lower}$$

Defining calibration procedures, assets, tools, and locations

You can create asset records to define your instruments, measurement and test equipment (M&TE), and standards. You can also manage your instruments as locations and M&TE as tools.

- [Calibration procedures](#)
You create calibration job plans to define calibration procedures. You can also apply revision control to a job plan and associate data sheets to a job plan.
- [Calibration assets](#)
Calibration assets include *instruments*, which are the devices that do the work, and *measuring and test equipment* (M&TE), which are the devices that measure and test the instruments.
- [Tools used for calibration](#)
When you create a tool for calibration, you configure the tool as a rotating item to track the tool as an asset and create work orders.
- [Loop locations](#)
A loop is a set of instruments that are grouped and calibrated together. The input and output of the entire group determines whether the calibration is successful.

Calibration procedures

You create calibration job plans to define calibration procedures. You can also apply revision control to a job plan and associate data sheets to a job plan.

- **Calibration job plans**
You create calibration job plans to define the procedures that calibrate instruments and measuring and test equipment (M&TE). You can also revise these job plans and maintain a historical record of the changes that were made.
- **Revising calibration job plans**
You create calibration job plans so that you can apply revision control to a job plan. When you revise calibration job plans, a record of the changes that are made is saved.
- **Associating data sheets to a work asset on a job plan**
You can associate one or more data sheets with a work asset of a calibration job plan. Information from the data sheets is used to analyze data and evaluate asset performance.

Calibration job plans

You create calibration job plans to define the procedures that calibrate instruments and measuring and test equipment (M&TE). You can also revise these job plans and maintain a historical record of the changes that were made.

Job plans contain tasks and information about estimated labor, labor hours, materials, services, and tools that are required for the work. To ensure a safe working environment, you can add work assets and associate safety plans that can be used when work is performed. You can associate one or more data sheets with a work asset of a calibration job plan.

You can specify which organizations and sites can use the information that is on the job plan and its tasks. If you do not specify this information, the job plan can be used in any site of any organization.

You can apply job plans to preventive maintenance records, routes, and work orders. After a job plan becomes a work plan on a work order, you can change the work plan without affecting the job plan. You also can create a job plan from a work plan that you use frequently.

Revision control allows you to revise a calibration job plan. You can track and compare job plans and view the history of the changes made to each job plan.

Revising calibration job plans

You create calibration job plans so that you can apply revision control to a job plan. When you revise calibration job plans, a record of the changes that are made is saved.

About this task

You can revise job plans that are in active status only. When you revise a job plan, the current job plan is duplicated with the same name. The revision number increments by 1. Work orders with an existing job plan attached are not updated with the revised version.

You can enable revision control in the Organizations application.

Procedure

1. On the Job Plans application, select the job plan that you want to revise.
2. From the Select Action menu, select Revise Job Plan.
3. Enter a description for the revised job plan in the Revision Description field and click OK.
The revised job plan has a status of pending revision. The original job plan remains in active status.
4. Update the revised job plan.
5. After all changes are completed, change the revised job plan to active status.
The original job plan automatically changes to revised status and it can no longer be changed.
6. Save the revised job plan.

What to do next

You can view all changes that have been made to the job plan, including who was responsible and when the changes were made.

Associating data sheets to a work asset on a job plan

You can associate one or more data sheets with a work asset of a calibration job plan. Information from the data sheets is used to analyze data and evaluate asset performance.

About this task

When a job plan is attached to a work order and has the same primary asset as the work order, then the data sheet is also attached to the work order.

Job plans are not updated when data sheets are revised. Only approved data sheets are attached to a Work Order.

Procedure

1. In the Job Plan application, select the job plan to attach the data sheet to.
2. On the Work Assets tab, insert a new row in the Data Sheets table window and specify a data sheet.
3. Save the job plan.

Calibration assets

Calibration assets include *instruments*, which are the devices that do the work, and *measuring and test equipment (M&TE)*, which are the devices that measure and test the instruments.

Measuring and test equipment is also referred to as standards by technicians who perform calibrations. Instruments are periodically calibrated with measuring and test equipment to certify that they perform within specified limits. Measuring and test equipment is also periodically calibrated to certify that it performs within its specified limits.

You can identify whether an asset is measuring and test equipment and assign an owner and status for that asset. You can then identify which measuring and test equipment was used to calibrate an instrument. You can also identify all instruments that were calibrated with a specific measuring and test equipment .

You can define whether the asset is calibrated internally or by a vendor and define the operating range and accuracy measurements of the asset.

Use the Assets application to define and uniquely identify calibration assets. You can also determine the next calibration due date of an instrument and associate assets with loop calibrations.

- [Rotating and nonrotating measuring and test equipment](#)
Measuring and test equipment (M&TE) can be either rotating or nonrotating. Rotating measuring and test equipment is an asset that can move in and out of storerooms. Nonrotating measuring and test equipment remains in one location throughout its lifecycle.
- [Creating an asset record for measuring and test equipment](#)
Measuring and test equipment (M&TE) test the performance of instruments. When you create an asset record, you can indicate that the asset is M&TE.

Rotating and nonrotating measuring and test equipment

Measuring and test equipment (M&TE) can be either rotating or nonrotating. Rotating measuring and test equipment is an asset that can move in and out of storerooms. Nonrotating measuring and test equipment remains in one location throughout its lifecycle.

Rotating measuring and test equipment has both a unique asset number and an inventory tool number.

You can use the tool number to track measuring and test equipment as a group, as it moves in and out of inventory and other types of locations. You can use the asset number to track individual instances of the measuring and test equipment as they move between locations and between sites.

A nonrotating piece of measuring and test equipment has a unique asset number, but does not have a tool number because you do not track nonrotating assets in inventory.

Example of a rotating measuring and test equipment

A company has four identical gauges (same make, same model), therefore all four gauges have the same tool number. Each gauge also has its own unique asset number. so you can track the use, the repair, and the location of each individual gauge. Before you can create a record for a rotating piece of measuring and test equipment, you must create the rotating tool record in the Tools application.

Creating an asset record for measuring and test equipment

Measuring and test equipment (M&TE) test the performance of instruments. When you create an asset record, you can indicate that the asset is M&TE.

Procedure

1. In the Assets application, click New Asset.
2. Enter a unique asset number.
3. Enter the description and status of the asset.
4. If the asset is a rotating asset, specify a value in the Rotating Item field.
5. If this asset has a parent, specify a value in the Parent field.
If the parent asset is associated with a location, the location identifier is copied to the Location field.
6. Select the Is M&TE check box to indicate that the asset is M&TE.
7. Specify the M&TE classification.
8. Specify whether the calibration of the M&TE is completed internally or externally:
 - Select the Internal Calibration check box to indicate that you calibrate the M&TE internally.
 - If the tool is calibrated externally, specify the calibration vendor.

9. Save the asset record.

Tools used for calibration

When you create a tool for calibration, you configure the tool as a rotating item to track the tool as an asset and create work orders.

You can assign qualifications to the calibration tool to ensure that technicians are trained and qualified to use the tool when they complete a work order.

You can define calibration measuring and test equipment (M&TE) as a tool and identify if the tool is calibrated internally or externally.

To uniquely identify a tool, you can also record the following attributes:

- Commodity group and commodity code
- Meter and meter group
- Issue unit
- Lot type
- Material safety data sheet (MSDS)
- Whether to inspect the tool on receipt, which means that you require the tool to be examined during the receiving process before it is accepted
- Whether the tool is outside, which means that it is owned by an outside supplier
- Whether the tool is calibrated internally

- [Creating a tool record](#)

A tool record defines a tool and allows you to associate information with the tool. Tools are used to perform work, such as building, maintenance, and repairs.

Creating a tool record

A tool record defines a tool and allows you to associate information with the tool. Tools are used to perform work, such as building, maintenance, and repairs.

Procedure

1. In the Tools application, click New Tool.
2. Specify a tool and lot type.
3. If the tool is part of measurement and test equipment, select the Is M&TE check box.
4. Specify whether the calibration of the M&TE is completed internally or externally:

Option	Description
If the tool is calibrated in internally	Select the Internal Calibration check box.
If the tool is calibrated externally	Specify the calibration vendor.

5. Save the record.

- [Adding alternate tools to a tool record](#)

Alternate tools can be used to perform the same work if a shortage of a particular tool occurs.

- [Associating data sheets to a tool record](#)

You can associate one or more data sheets to a tool record. Information from the data sheets is used to analyze data and evaluate performance.

Adding alternate tools to a tool record

Alternate tools can be used to perform the same work if a shortage of a particular tool occurs.

About this task

If you want two tools to be alternates for each other, you must assign each as an alternate for the other. Measuring and test equipment (M&TE) tools can only be alternate tools to other M&TE.

Procedure

1. In the Tools application, open an existing tool record.
2. On the Tool tab, insert a row and specify the alternate tool.
3. Save your changes.
4. If this tool is the alternate for the tool that you specified in step 2, repeat these steps for the other tool.

Associating data sheets to a tool record

You can associate one or more data sheets to a tool record. Information from the data sheets is used to analyze data and evaluate performance.

Procedure

1. In the Tools application, select the tool to attach the data sheet to.
2. From the Select Action menu, select Attach Data Sheet and insert a row.
3. Specify the data sheet plan number.
4. Click Done to return to the current record.

Loop locations

A loop is a set of instruments that are grouped and calibrated together. The input and output of the entire group determines whether the calibration is successful.

You identify a location as part of a loop in the Locations application by selecting the Loop Calibration check box on the Locations tab. You associate assets with the loop in the Assets application using the Location field for each asset.

You associate data sheets with locations in the Work Order Tracking application.

When assets are added in the Assets application, they are listed on the Assets tab in the Locations application. You use the Locations application to view the history of a loop calibration.

If a data sheet, which is part of a loop calibration, is marked as required, then all data on that data sheet is required. This data includes all asset functions for calibration points, function checks, or dynamic checks.

- [Adding a location to a loop calibration](#)
A loop calibration is a set of instruments that are grouped and calibrated together. The input and output results of the entire group determines the pass or fail status of the calibration.

Adding a location to a loop calibration

A loop calibration is a set of instruments that are grouped and calibrated together. The input and output results of the entire group determines the pass or fail status of the calibration.

Procedure

1. In the Locations application, select the location that you want to add to a loop calibration.
2. Select the Loop Calibration check box.
3. Save the location.

What to do next

You can associate assets with the loop in the Assets application.

- [Attaching data sheets to a location record](#)
You can associate one or more data sheets to a location record. Information from the data sheets is used to analyze data and evaluate performance.

Attaching data sheets to a location record

You can associate one or more data sheets to a location record. Information from the data sheets is used to analyze data and evaluate performance.

Procedure

1. In the Location application, select the location to attach the data sheet to.
2. From the Select Action menu, select Attach Data Sheet and insert a row.
3. Specify the data sheet.
4. Click OK to return to the current record.

Configuring calibration features

You must complete configuration tasks in order to use calibration features.

- [Configuring options for organizations](#)
You can configure specific calibration options and define edit rules for your organizations.
- [Configuring calibration features for uncertainty data](#)
You configure Maximo Manage to link to an external system that calculates uncertainty measurement data.

Configuring options for organizations

You can configure specific calibration options and define edit rules for your organizations.

- [Configuring calibration options for organizations](#)
You can configure calibration options for an organization, such as displaying warning messages or controlling the number of times a user can extend a PM record.
- [Configuring edit rules for calibration work orders](#)
You can configure each work order status to define when a data sheet on a work order can be edited. The edit rules apply to all calibration work orders for the selected organization.

Configuring calibration options for organizations

You can configure calibration options for an organization, such as displaying warning messages or controlling the number of times a user can extend a PM record.

About this task

These calibration options apply to the Work Order Tracking application and the Preventive Maintenance application.

Procedure

1. In the Organizations application, select the organization.
2. From the Select Action menu, select Calibration Options, > Work Order - Other Organization Options.
3. Specify the options to configure your organization.
4. Click OK to apply the changes.

Configuring edit rules for calibration work orders

You can configure each work order status to define when a data sheet on a work order can be edited. The edit rules apply to all calibration work orders for the selected organization.

About this task

You can specify the edit rules for editing As Found and As Left values, adding new data sheets, and editing calibration points.

Procedure

1. In the Organizations application, select the organization.
2. From the Select Action menu, select Calibration Options, > Work Order - Edit Rules.
3. In the Edit Rules window, choose the status for each value to indicate that the property can be changed.
4. Click OK to apply the changes.

Configuring calibration features for uncertainty data

You configure Maximo Manage to link to an external system that calculates uncertainty measurement data.

1. [Creating the data sheet template object structure](#)
An object structure is the common data layer that the integration framework uses for data processing. You create an object structure for the data sheet template to configure Maximo Manage for uncertainty data. You specify source objects in the object structure.
2. [Creating the work order data sheet object structure](#)
An object structure is the common data layer that the integration framework uses for data processing. You create an object structure for the work order data sheet to configure Maximo Manage for uncertainty data. You specify source objects in the object structure.
3. [Creating publish channels for the object structures](#)
A publish channel is the link for sending data to the external system. You create one publish channel for the data sheet template object structure and another publish channel for the work order data sheet object structure.
4. [Creating enterprise services for the object structures](#)
An enterprise service is the link for importing data from the external system. You create one enterprise service for the data sheet template object structure and another enterprise service for the work order data sheet object structure.
5. [Configuring the external system](#)
The external system calculates the uncertainty data that is required for the calibration process. You configure the external system to link to Maximo Manage.

Creating the data sheet template object structure

An object structure is the common data layer that the integration framework uses for data processing. You create an object structure for the data sheet template to configure Maximo Manage for uncertainty data. You specify source objects in the object structure.

Procedure

1. In the Object Structure application, create an object structure and specify a name.
2. In the Consumed By field, select Integration.
3. Specify the source objects for the data sheet template.
4. Save the object structure.

What to do next

Create the work order data sheet object structure.

- [Source object information: Data sheet template object structure](#)
You define the data sheet template source objects in the data sheet template object structure.

Next topic: [Creating the work order data sheet object structure](#)

Source object information: Data sheet template object structure

You define the data sheet template source objects in the data sheet template object structure.

Specify the following source object information in the data sheet template object structure.

Source object name	Parent Object field	Relationship field	Alternate Key field	Include Persistent fields
PLUSDSPLAN			PLUSDSPLAN_NDX2	<ul style="list-style-type: none"> • CONFIDLEVEL • DSPLANNUM • GBMETHOD • GUARDBAND • KFACTOR • REVISIONNUM • SYSTEMID • SYSTEMIDDESC • UNCERTFREQ • UNCERTUNITS
PLUSCDSINSTR	PLUSDSPLAN	PLUSCDINSTR	PLUSCDSINSTR_NDX2	<ul style="list-style-type: none"> • ASSETFUNCTION • CONFIDLEVEL • DSPLANNUM • GBFROM1 • GBTO1 • GBSUMDIRECTION1 • GBFROM2 • GBTO2 • GBSUMDIRECTION2 • GBFROM3 • GBTO3 • GBSUMDIRECTION3 • GBFROM4 • GBTO4 • GBSUMDIRECTION4 • GBMETHOD • GUARDBAND • INSTRSEQ • KFACTOR • REVISIONNUM • UNCERTFREQ • UNCERTUNITS
PLUSCDSPPOINT	PLUSCDSINSTR	PLUSCDSINSTRPOINTS	PLUSCDSPPOINT_NDX2	<ul style="list-style-type: none"> • DSPLANNUM • INSTRSEQ • POINT • REVISIONNUM

Creating the work order data sheet object structure

An object structure is the common data layer that the integration framework uses for data processing. You create an object structure for the work order data sheet to configure Maximo Manage for uncertainty data. You specify source objects in the object structure.

About this task

You specify source object information in the object structure.

Procedure

1. In the Object Structure application, create an object structure and specify a name.
2. In the Consumed By field, select Integration.
3. Specify the source objects for the work order data sheet.
4. Save the object structure.

What to do next

After you create the two object structures, you configure a publish channel for each object structure.

- **Source object information: Work order data sheet object structure**
You define the work order data sheet source objects in the work order data sheet object structure.

Previous topic: [Creating the data sheet template object structure](#)

Next topic: [Creating publish channels for the object structures](#)

Source object information: Work order data sheet object structure

You define the work order data sheet source objects in the work order data sheet object structure.

Specify the following source object information in the work order data sheet object structure.

Source object name	Parent Object field	Relationship field	Alternate Key field	Include Persistent fields
PLUSCWODS			PLUSCWODS_NDX5	<ul style="list-style-type: none">• CONFIDLEVEL• DSPLANNUM• GBMETHOD• GUARDBAND• KFACTOR• REVISIONNUM• SITEID• SYSTEMIDDESC• SYSTEMID• TUR• UNCERTFREQ• UNCERTUNITS• WONUM• WODSNUM
PLUSCWODSINSTR	PLUSCWODS	PLUSCWODSINSTR	PLUSCWODSINSTR_NDX5	<ul style="list-style-type: none">• CALIBFUNCTION• CALIBFUNCTIONTIME• COMSTDUNCERT• DSPLANNUM• GBFROM1• GBTO1• GBSUMDIRECTION1• GBFROM2• GBTO2• GBSUMDIRECTION2• GBFROM3• GBTO3• GBSUMDIRECTION3• GBFROM4• GBTO4• GBSUMDIRECTION4• GBMETHOD• GUARDBA• INSTRSEQ• KFACTOR• REVISIONNUM• SITEID• TUR• UNCERTFREQ• UNCERTUNITS• WODSNUM• WONUM

Source object name	Parent Object field	Relationship field	Alternate Key field	Include Persistent fields
PLUSCWODSPOINT	PLUSCWODSINSTR	PLUSCWODSINSTRPOINTS	PLUSCWODSPOINT_NDX5	<ul style="list-style-type: none"> • DSPLANNUM • EXPECTDRIFT • EXPECTDRIFTEU • INPUTUNCERT • INPUTUNCERTEU • INSTRSEQ • POINT • REVISIONNUM • SITEID • UNCERTVALUE • UNCERTVALUEEU • WODSNUM • WONUM

Creating publish channels for the object structures

A publish channel is the link for sending data to the external system. You create one publish channel for the data sheet template object structure and another publish channel for the work order data sheet object structure.

Procedure

1. In the Publish Channel application, create a publish channel record.
2. Specify a publish channel name.
3. Specify the object structure.
4. Optional: To automatically generate XML files for all events, from the Select Action menu, select Enable Event Listener.

What to do next

Create an enterprise service for both object structures.

Previous topic: [Creating the work order data sheet object structure](#)

Next topic: [Creating enterprise services for the object structures](#)

Creating enterprise services for the object structures

An enterprise service is the link for importing data from the external system. You create one enterprise service for the data sheet template object structure and another enterprise service for the work order data sheet object structure.

Procedure

1. In the Enterprise Services application, create an enterprise service record.
2. Specify an enterprise service name.
3. Specify the object structure.

What to do next

Configure the external system for the uncertainty calculation system.

Previous topic: [Creating publish channels for the object structures](#)

Next topic: [Configuring the external system](#)

Configuring the external system

The external system calculates the uncertainty data that is required for the calibration process. You configure the external system to link to Maximo Manage.

Procedure

1. In the External System application, create the external system record and specify the external system name.
2. Select the End Point as MXXMLFILE.
3. To enable the external system, select the Enabled check box.
4. Specify the queues for the external system.
5. Specify the publish channels that you created.
6. Specify the enterprise services that you created.

What to do next

Now, you can import and export the xml file information.

Previous topic: [Creating enterprise services for the object structures](#)

Recording calibration data in work orders

You document your calibration data results using calibration work orders.

- [Work order tracking in calibration](#)
When you create a work order, you initiate the maintenance process and create a historical record of work that is being performed.
 - [Associating data sheets to a work order](#)
When you create a work order to calibrate an instrument, you can associate the data sheet necessary to perform the calibration process to the work order.
 - [Checking the status of a tool](#)
Tools that are used to calibrate an instrument must be in active status. You can view the status of a tool before it is added to a work order to ensure that it is in active status.
 - [Entering calibration results on a work order data sheet](#)
When you calibrate an asset, you enter the results of the As Found and As Left values on the data sheet of a work order. These values determine the calibration status of the asset.
 - [Extending due dates of calibration PM records](#)
You extend the date of a preventive maintenance (PM) record to override the typical next due date for generating PM work orders. You can extend the due date of a PM for a calibration asset a specified number of times.
-

Work order tracking in calibration

When you create a work order, you initiate the maintenance process and create a historical record of work that is being performed.

You use the Work Order Tracking application to create and manage calibration work orders.

When you create a calibration work order, you specify the work order with one of the following work types:

- CAL
- PMCAL
- CMCAL
- EMCAL

You use data sheets that are associated with a work order to calibrate an asset. A data sheet contains the specifications of an asset that is required for the calibration of the asset.

The data sheet also records uncertainty measurement data for instruments and measurement and test equipment. When a data sheet is attached to a work order, the uncertainty measurement data is imported from the Data Sheet Template application. Alternatively, uncertainty measurement data can be entered or imported directly into the work order data sheet.

On calibration work orders, you can view the calibration history of an asset and check the status of a tool associated with a work order. You can also record the result of a spot check for a tool associated with a work order and review data sheets that are attached to work orders.

Work order data sheets

You use the work order data sheet to enter data that is gathered during the calibration of an asset. Calibration assets are instruments and measuring and test equipment (M&TE).

Data sheets are created in the Data Sheet Template application and associated with assets. When a work order is created for a work asset with one or more associated data sheets, the data sheets are copied to the work order. You can also associate data sheets with job plans or attach them directly to a work order.

Only approved data sheets can be processed on work orders. During the calibration of an asset, you can enter the results of the as-found and as-left data. This data is used to analyze asset performance and calibration frequency.

As-found and as-left data

As Found and *As Left* are standard industry terms. The *As-found* and *As-left* data determines the calibration status of the asset.

When an asset is calibrated, the *As-found* data is recorded. *As-found* data is the calibration results before the asset is adjusted. In Maximo® Calibration, the *As-found* values are calculated to ensure that they are within the established range that is specified on the data sheet. If the values are outside the limit range, the asset is adjusted and the *As-left* results are recorded. *As-left* data is the calibration results after the asset is adjusted.

You must complete all *As-found* and *As-left* values before you can close a work order.

Associating data sheets to a work order

When you create a work order to calibrate an instrument, you can associate the data sheet necessary to perform the calibration process to the work order.

Before you begin

The data sheet that you want to associate to a work order must have a status of approved.

Procedure

1. In the Work Order Tracking application, select the calibration work order.
2. On the Data Sheet tab, click New Row in the Associated Data Sheets table window.
3. Specify the data sheet and save the work order.

- [Viewing the calibration history of data sheets](#)

You can view a list of completed data sheets of an asset that is associated with a work order. Calibration information about the asset is displayed.

Viewing the calibration history of data sheets

You can view a list of completed data sheets of an asset that is associated with a work order. Calibration information about the asset is displayed.

About this task

You can also view a list of data sheets for a specific date range.

Procedure

1. In the Work Order Tracking application, select the work order.
2. From the Select Action menu, select View Calibration History.
Data sheet information, including asset calibrations, location calibrations, and loop calibrations, is displayed.

Checking the status of a tool

Tools that are used to calibrate an instrument must be in active status. You can view the status of a tool before it is added to a work order to ensure that it is in active status.

Procedure

1. In the Work Order Tracking application, select the work order record for which you want to check a tool.
2. From the Select Action menu, select Check Tool Status.
3. Specify the tool and click Refresh.

The status information of the tool is displayed.

- [Recording tool spot check results](#)

Before you assign a tool to a work order, you can verify that the tool is operating within its correct range. You record the results of the verification using the Tool Spot Check action.

Recording tool spot check results

Before you assign a tool to a work order, you can verify that the tool is operating within its correct range. You record the results of the verification using the Tool Spot Check action.

Procedure

1. In the Work Order Tracking application, select the work order record that contains the associated tool that you want to check.
2. From the Select Action menu, select Tool Spot Check and click New Row.
3. Specify the tool information.
4. Specify the results of the spot check in the Status field.
5. Specify the check type and enter comments.
6. Click OK to save the tool spot check results.

Entering calibration results on a work order data sheet

When you calibrate an asset, you enter the results of the As Found and As Left values on the data sheet of a work order. These values determine the calibration status of the asset.

Procedure

1. In the Work Order Tracking application, select the work order.
2. Select the Data Sheet tab.
3. Specify the As Found results for the calibration point.
4. Optional: If the results are outside the specified limit range, adjust the asset.
5. Specify the As Left results for the calibration point.
6. Save the work order.

- [Adding a calibration point to a work order data sheet](#)

Calibration points are typically defined when you create a data sheet in the Data Sheet Template application. However, you can add calibration points to a data sheet on a work order if you need to check additional points for that asset.

Adding a calibration point to a work order data sheet

Calibration points are typically defined when you create a data sheet in the Data Sheet Template application. However, you can add calibration points to a data sheet on a work order if you need to check additional points for that asset.

Before you begin

You can add a calibration point only if the Technician Insert Points check box is selected on the data sheet in the Data Sheet Template application.

Procedure

1. In the Work Order Tracking application, select the calibration work order.
2. On the Data Sheet tab and in the Calibration Points table window, insert a row.
3. Enter a numeric value for the calibration point.
4. Specify either the discrete or analog asset function information.
5. Save the calibration point.

Extending due dates of calibration PM records

You extend the date of a preventive maintenance (PM) record to override the typical next due date for generating PM work orders. You can extend the due date of a PM for a calibration asset a specified number of times.

About this task

The number of times that you can extend the due date is configured in the Organizations application. The default number of times is 1. The due date of a calibration PM must be controlled so that the calibration schedule of an asset is completed on time.

If the allocated number of times to extend the due date is exceeded, you can override the extended date. Only users with security permissions can override the extended date.

When a calibration due date is extended on a preventive maintenance (PM) record, you can view this change on the associated master PM.

Procedure

1. In the Preventive Maintenance application, select the PM record.
2. On the Frequency tab, ensure the Estimated Next Due Date field contains a date.
3. In the Extended Date field, specify a value and enter a reason for extending the date.
The date must be later than the Estimated Next Due Date.
4. Optional: To adjust this date after the work order for the PM is generated, select the Adjust Next Due Date check box.
5. Save your changes.

- [Overriding extended dates of calibration PM records](#)

Users with security access can override the number of times that the due date of a preventive maintenance (PM) plan can be extended.

- [Viewing PM extended dates](#)

When a calibration due date is extended on a preventive maintenance (PM) record, you can view this change on the associated master PM.

Overriding extended dates of calibration PM records

Users with security access can override the number of times that the due date of a preventive maintenance (PM) plan can be extended.

About this task

The number of times that you can extend the due date of a PM plan for a calibration asset is configured in the Organizations application.

Procedure

1. In the Preventive Maintenance application, select the PM record for which you want to extend the date.
2. From the Select Action menu, select Override Extend Date.
3. Specify a new date and click OK.

Viewing PM extended dates

When a calibration due date is extended on a preventive maintenance (PM) record, you can view this change on the associated master PM.

Procedure

1. In the Master Preventive Maintenance application, select the master PM record.
2. From the Select Action menu, select View PM Extend Dates.
3. Click OK to close the window.

Administering and configuring attached documents

As an administrator, you can maintain attached documents for your applications in persistent storage or in cloud object storage.

- [Configuring attached documents](#)
Configuration for attached documents includes preparing a storage repository, specifying storage parameters when you deploy Maximo® Manage, and configuring the application after deployment.
- [Administering attached document libraries](#)
Administrators use the Attachment Library/Folders action in applications to create a document library and to organize documents into folders. Files and folders that you add are stored in the storage repository that you create for Maximo Manage.

Configuring attached documents

Configuration for attached documents includes preparing a storage repository, specifying storage parameters when you deploy Maximo® Manage, and configuring the application after deployment.

- [Preparing storage repositories](#)
Before you can store and view attached documents, you must determine a storage option and complete the configuration requirements for that option. Both persistent storage and cloud storage options are available.
- [Adding persistent storage parameters to deployments](#)
When you deploy Maximo Manage, you configure a persistent claim to the storage volume that was created to store attachments.
- [Configuring system properties for persistent storage](#)
To implement attached document features for persistent storage in Maximo Manage, administrators specify system properties to define parameters, such as a default file path, maximum file size, attachment security, and other relevant properties.
- [Configuring system properties for S3](#)
To implement attached document features for Simple Storage Service (S3) cloud object storage in Maximo Manage, administrators specify system properties to define parameters, such as the storage bucket, access key, and other relevant properties.
- [Converting file-based storage to S3 storage](#)
Maximo Manage provides you with a tool to convert file-based attachments to S3 attachments.

Preparing storage repositories

Before you can store and view attached documents, you must determine a storage option and complete the configuration requirements for that option. Both persistent storage and cloud storage options are available.

Preparing persistent storage repositories

If you want to use a Network File System (NFS) to provide storage for attached documents, you must provision a persistent storage volume for Maximo Manage using the Kubernetes persistent volume (PV) framework.

Setting up the storage is outside of the scope of the Maximo Manage deployment and must be completed before you deploy the application. Then, when you deploy the application, you can configure a persistent claim to the amount of storage that you need for attached documents.

While the detailed steps for preparing storage depend on your organization's specific implementation, the following guidelines provide a high-level summary of the tasks to complete when you set up NFS storage:

- Deploy an NFS server and ensure that the server is enabled and started.
- Export an NFS file share and ensure that it is accessible. In the file share, specify the directory to use for attached documents, the IP address for a method to access the directory, and the authorizations for accessing the folder. Ensure that everyone has read and write access to the directory. When you deploy Maximo Manage, you specify the mount path for the directory when you create the persistent volume claim for the storage. You also specify the directory when you configure system properties for attached documents in Maximo Manage.
- In Kubernetes, within Red Hat® OpenShift®, set up an NFS provisioner and class. Note the class name because you specify the class name for your persistent volume claim when you deploy Maximo Manage.
- Create a persistent volume storage resource. Note the volume name because you specify the volume name for your persistent volume claim when you deploy Maximo Manage.

For more information about setting up persistent storage, see [Understanding persistent storage](#) in Red Hat OpenShift documentation.

Preparing S3 storage

If you want to use Simple Storage Service (S3) cloud object storage for storing attachments, you must first create a bucket for storing the attachments.

Note the access key, secret key, S3 endpoint URI, and name of the storage bucket. You specify those values when you configure the following system properties:

- mxe.cosaccesskey
- mxe.cossecretkey
- mxe.cosendpointuri
- mxe.cosbucketname

Adding persistent storage parameters to deployments

When you deploy Maximo® Manage, you configure a persistent claim to the storage volume that was created to store attachments.

Before you begin

Ensure that you prepared a persistent storage volume and can provide the volume name, class name, mount path, and size for your persistent volume claim.

Procedure

1. Log in to Maximo Application Suite as a system administrator.
2. From the catalog, on the Applications tab, select the Manage tile.
3. On the application details page, click Actions and select Update configuration.
4. In the Persistent volume claims (PVCs) row on the Update Manage configuration window, click the Edit icon.
5. In the Persistent volume claims (PVCs) section of the configuration window, click Add PVC.
You might have to click System managed to view configuration options.
6. Add the following details for your persistent volume claim.

Option	Description
PVC name	User-defined name of the persistent volume claim for storage.
Volume name	Name of the volume that was provisioned for attached document storage.
Size	Amount of storage that is required for this persistent claim.
Mount path	Mount path for the volume within the Maximo Manage pod.
Storage class name	Storage class that describes and classifies the storage.

7. After you complete all configurations, select one of the following options:
 - If you are configuring a new deployment, click Activate.
 - If you are updating a deployment, click Apply changes.

Configuring system properties for persistent storage

To implement attached document features for persistent storage in Maximo® Manage, administrators specify system properties to define parameters, such as a default file path, maximum file size, attachment security, and other relevant properties.

About this task

This task describes how to configure the system properties that are needed to set up attachments if you provisioned storage for attachments by using the Kubernetes persistent volume (PV) framework. The topic describes the basic properties that you must configure after you deploy Maximo Manage. However, you might need to specify other properties for your implementation. For more information, see *Attached document properties*.

Before you begin

You must have authorization to edit system properties for attached documents.

Procedure

1. In the System Properties application, in the Property Name field, filter for attached document property or properties that you want to configure.
2. Configure the system properties for attached documents as shown in the following table.

Table 1. Required system properties for attached documents

Property	Description	Value
mxe.doclink.doc types.defpath	The default file directory to use for folders in the attached documents library. Specifies the default path for the directory that you set up for attached documents on your persistent storage volume. Your documents are stored in this directory. This value must be configured before you can attach documents and requires a live refresh.	Specify the path to the directory that you set up in your persistent storage volume. For example, /d01/doclinks
mxe.doclink.doc types.topLevelP aths	Specifies the top-level attachments directory that stores all document folders in your persistent storage volume. The Default File Path value that is entered in the Manage All Documents Folder window must be a subdirectory of this value. This value cannot be null. When you complete the system property configurations, restart the server bundle pod to implement the changes.	The default location is the top-level directory on the persistent storage volume. For example, \doclinks.
mxe.doclink.pat h01	The HTTP Server path to link documents that are attached to records. The server name in the path must be a fully qualified server name. This property requires a live refresh.	/d01/doclinks=https://hostname//maximo/os lc/doclinks For example: /d01/doclinks=https://host//maximo/oslc/do clinks
mxe.doclink.sec uredAttachment	The value that you specify for this property determines whether the application displays the file path of attached documents. Setting this property to <code>true</code> prevents the application from displaying the file path of attached documents. The application displays only the content root and the file name. Setting the property to <code>true</code> makes all attached document requests go through the Maximo Manage server instead of an HTTP web server and provides an extra layer of security to the stored documents.	The default value for this property is false. For Maximo Manage deployments on Red Hat® OpenShift®, set this property to <code>true</code> .
mxe.report.Atta chDoc.validateU RL	Determines whether the URL of the attached document needs to be validated before the document is printed.	The default value for this property is 1. For Maximo Manage, set this property to 0.

3. Restart the server bundle pod.
If you have multiple server bundles, restart all of them.

Configuring system properties for S3

To implement attached document features for Simple Storage Service (S3) cloud object storage in Maximo® Manage, administrators specify system properties to define parameters, such as the storage bucket, access key, and other relevant properties.

About this task

You can configure the system properties after you deploy Maximo Manage.

Before you begin

You must have authorization to edit system properties for attached documents.

Procedure

1. In the System Properties application, select the property that you want to edit. You can locate document properties for S3 attachments by specifying the following filters in the Property Name field:
 - mxe.cos
 - mxe.doclink
 - mxe.attachmentstorage
2. Configure the system properties for attached documents as needed.
For more information about the system properties for S3 storage, see *Attachment properties for S3 storage*.
3. Restart the server bundle pod.
If you have multiple server bundles, restart all of them.

Converting file-based storage to S3 storage

Maximo® Manage provides you with a tool to convert file-based attachments to S3 attachments.

About this task

When you deploy Maximo Manage, you can find a new shell script that is named file2s3.sh in \tools\maximo folder.

Procedure

Run the shell script file2s3.sh by using the following parameters:

Table 1. Listing of shell script parameters

Parameter name	Description	Example
-bBucketName	Bucket name	-bqabucket
-xAccessKey	Access key	-x6xg5v1EacUtyMLXgzXbg
-sSecretKey	Secret key	- xiaAKhsSYKM51u39yyIH05l4jYzgCf5NH HJUUltm5
-rEndpoint	End point or URL of the S3 provider	-rs3.us.cloud-object- storage.appdomain.cloud
-wwhere cause for filtering docinfo table	A where clause for filtering docinfo table. The document information table stores links to all the documents.	-w"(document='TESTDOC')"

Note: The maxinst or admin pod must be able to access the folder locations of the attachments for the tool to work.

```
For example, ./files2s3.sh -bqabucket -x6xg5v1EacUtyMLXgzXbg  
-siaAKhsSYKM51u39yyIH05l4jYzgCf5NHJUUltm5 -rs3.us.cloud-object-storage.appdomain.cloud  
-w"(DOCUMENT='TESTDOC')"
```

Administering attached document libraries

Administrators use the Attachment Library/Folders action in applications to create a document library and to organize documents into folders. Files and folders that you add are stored in the storage repository that you create for Maximo® Manage.

You can maintain the library, create folders as needed, and specify which folders are available for each application. The system includes default folders, including folders for attachments, diagrams, images, and websites. You can also create more folders or organize the folders into functional categories. Other folders might include permits, part sheets, photographs, procedures, and drawings.

To open an attachment, users must have the appropriate application for that document type that is installed on their computer. For example, you must have Microsoft Word installed to view a Word document.

- [Adding document folders](#)
Administrators can add folders to attached document libraries from within Maximo Manage applications.
- [Associating document folders with applications](#)
Administrators can associate document folders with Maximo Manage applications. By default, folders for attachments, images, and diagrams are associated with applications that have the attached documents action.
- [Adding file attachments to the library](#)
You can add a file attachment to your documents library.
- [Adding URLs to the library](#)
You can add a URL to your document library.
- [Modifying existing documents](#)
You can modify the information for documents that are stored in the document library.
- [Attaching documents to records](#)
You can attach relevant information to your records in the form of a file or a URL address. Documents can include text files, spreadsheets, and diagrams.

Adding document folders

Administrators can add folders to attached document libraries from within Maximo® Manage applications.

Before you begin

You must have administrative permissions to add folders.

About this task

Several default folders are provided with the Maximo Manage application, including folders for attachments, diagrams, images, and websites. When you are setting up your attachment library, ensure that you specify the appropriate file path to the storage repository for the default folders and for any other folders that you add.

Procedure

1. Open any Maximo Manage application that has the attached documents actions.
2. Select Attachment Library/Folders and then select the Manage Folders action.

3. Click Add a New Document Folder.
4. Specify the information for the new folder.
Ensure that you specify the file path to the directory that you set up for attached documents on your persistent storage volume.
5. Click OK.

Associating document folders with applications

Administrators can associate document folders with Maximo® Manage applications. By default, folders for attachments, images, and diagrams are associated with applications that have the attached documents action.

Before you begin

You must have administrator privileges to associate document folders with an application.

Procedure

1. Open a Maximo Manage application that has the attached documents actions.
2. Select Attachment Library/Folders, then select the Associate Folders action.
3. Click New Row.
4. In the Document Folder field, enter a value. The Document Folder Description field and the Application field contain default values, which you can change.
5. Click OK to save your changes.

Adding file attachments to the library

You can add a file attachment to your documents library.

Procedure

1. Open an application that has the attached documents actions.
2. Select the Attachment Library/Folders action, then select the Manage Library action.
3. Click Add a Document to the Library, then select Add New File.
4. Complete all necessary fields, and click OK.

Adding URLs to the library

You can add a URL to your document library.

Procedure

1. Open an application that has the attached documents actions.
2. Select the Attachment Library/Folders action, then select Manage Library.
3. Click Add a Document to the Library, then select Add New Web Page.
4. Complete all necessary fields, and click OK.

Modifying existing documents

You can modify the information for documents that are stored in the document library.

About this task

If you click View Details for a document, you can modify only the Document Description field and the URL/File Name field, and select the Print with Work Pack check box.

Procedure

1. Open an application that has the attached documents actions.
2. Select Attachment Library/Folders, then select the Manage Library action.
3. In the Manage Library window, expand the row for the document that you want to modify.
4. Modify editable fields that you want to change.
Fields with a white background are editable and fields with a gray background are read-only.
5. Click OK.

Attaching documents to records

You can attach relevant information to your records in the form of a file or a URL address. Documents can include text files, spreadsheets, and diagrams.

About this task

You can attach documents to records and to tasks on a record. You can upload a file attachment from your computer, or you can attach a file from your attached documents library.

Procedure

1. In an application that has the attached documents actions, click Attachments.
2. Select one of the following actions to attach documents:

Option	Description
To add an attachment from the library.	<ol style="list-style-type: none">a. Select Add from Library.b. Select one or more files in the library and click OK.
To add an attachment.	<ol style="list-style-type: none">a. Select Add New Attachments.b. Select Add New File or Add New Web Page.c. In either the Create a File Attachment window or the Create a URL Attachment window, specify the folder to add the attachment to.d. Enter the details for the file or URL attachment.e. If you want to add this file to the library, you can select the Add document to the document library for others to use checkbox.f. Click OK.

Restriction: Center for Internet Security (CIS) policies might prevent the upload of some HTML files as attachments. In such cases, convert the file to a PDF format, or contact your administrator about adjusting the CIS policies.

Enabling edit mode

You can enable edit mode for records, such as work orders and tickets, that are used frequently by multiple users. Edit mode reduces errors that occur when two users edit a record in the same application at the same time.

Edit mode does not eliminate all error occurrences when two users are editing a record. For example, errors can still occur when two users edit the same record in two different applications.

- **Edit mode for records that are used frequently by multiple users**
Examples of applications in which multiple users might concurrently access records include the Work Order Tracking application, the Problems application, the Incidents application, the Changes application, and the Activities and Tasks application.
- **Configuring edit mode**
You enable edit mode on an application-by-application basis. Edit mode is not enabled for any applications when the product is installed.
- **Releasing records from edit mode**
If records remain in edit mode erroneously, you can release the records in the Record Release application. You can filter the records to locate the records that you want to release.

Edit mode for records that are used frequently by multiple users

Examples of applications in which multiple users might concurrently access records include the Work Order Tracking application, the Problems application, the Incidents application, the Changes application, and the Activities and Tasks application.

When edit mode is enabled for an application but a record is not in edit mode, actions that update the underlying record are not available to the user. When the user places the record in edit mode, the actions become visible. An action that has a prerequisite of SAVE in Application Designer indicates that it might update the underlying record.

When a user selects records on an application's List tab and selects an action, the action does not run on records that are currently being edited by other users if the action causes an error. If the action will not cause an error, then the action takes place on the records in edit mode. For example, a user places a record in edit mode in the Item Master application. Another user selects that record on the application's List tab and selects the Add to Item Storeroom action while the first user is making changes on the Item tab. The action is allowed on the record as it does not cause an error for the first user.

The following actions release a record from edit mode:

- Starting another application by using the Go To menu.
- Returning to the List tab of the application.
- Paging through records by using the Next and Previous links.
- Logging out.

If a user closes the browser without logging out, the record remains in edit mode until session times out. Starting a child application does not take the record out of edit mode, nor does saving the record.

Configuring edit mode

You enable edit mode on an application-by-application basis. Edit mode is not enabled for any applications when the product is installed.

About this task

You enable edit mode for an application by using the Edit Mode Enabled? check box in Application Designer.

If you decide at a later point that edit mode is not needed for an application, you can clear the Edit Mode Enabled? check box. Disable edit mode outside of normal business hours. Users who are currently editing records in the application when you disable edit mode continue to have edit mode access until they log out and log back in.

Procedure

1. In Application Designer, open an application that you want to configure for edit mode.
2. Select the Edit Mode Enabled? check box.
3. Save the application.
4. Log out and log back in.

Results

Users who are members of security groups that have save permissions can open records in the application in edit mode after they log out and log back in.

Releasing records from edit mode

If records remain in edit mode erroneously, you can release the records in the Record Release application. You can filter the records to locate the records that you want to release.

Procedure

1. In the Record Release application, select the records that you want to release from edit mode.
2. Click Release Edit Mode.

Log management

You can create and manage log files that contain informational, warning, or error messages about various application activities. You also can view log data about for the Maximo® Manage server bundles and for processes that are handled by the administrative server.

- [Log output locations](#)
In Maximo Manage, output logs from administrative server processes or from the server bundles are directed to standard output (STDOUT) in Red Hat® OpenShift®. They also can be sent or redirected to a Simple Storage Service (S3) Cloud Object Storage location that you provision.
- [Sending log output to S3 Cloud Object Storage](#)
You can send server bundle logs for Maximo Manage to Simple Storage Service (S3) Cloud Object Storage. You also can redirect logs from the administrative server to S3 Cloud Object Storage.
- [Managing log files](#)
You create log files to save the informational, warning, or error messages about the system. You can also manage the logging process and the format of the log files across your organization.
- [Working with log files](#)
There are several tasks relating to managing your log files from applications, such as specifying log file formats and locations, and associating loggers with appenders.
- [Viewing Maximo Manage Logs](#)
View the IBM® Maximo Manage logs for Server, Maxinst and Update database, User sync, Workspace operator, and Build logs from the Red Hat OpenShift console.

Log output locations

In Maximo® Manage, output logs from administrative server processes or from the server bundles are directed to standard output (STDOUT) in Red Hat® OpenShift®. They also can be sent or redirected to a Simple Storage Service (S3) Cloud Object Storage location that you provision.

To view log files, select Workloads...>Pods in the console menu. Open the pod for your project and select the Logs tab to view logs. Or, view or process the output with various tools, such as an aggregation of logs in a Red Hat OpenShift cluster-level logging stack, or kubectl, the Kubernetes command-line tool.

You also can send server bundle logs for Maximo Manage to Simple Storage Service (S3) Cloud Object Storage that you provision. You can redirect logs from the administrative server to S3 Cloud Object Storage.

For more information about logging to S3 Cloud Object Storage, see the related task.

Sending log output to S3 Cloud Object Storage

You can send server bundle logs for Maximo® Manage to Simple Storage Service (S3) Cloud Object Storage. You also can redirect logs from the administrative server to S3 Cloud Object Storage.

Before you begin

You must provision an S3 Cloud Object Storage location and note its S3 bucket name, endpoint URL, S3 access key properties, and the value of the S3 secret. If you intend to send server bundle logs to S3, you must have or obtain an API key in the Administrative Work Center.

About this task

The Maximo Manage application is deployed in one or more workloads, which are called server bundles. Server bundles include the ui, all, mea, reports, and cron types. Server bundle logs can be uploaded from your log location on WebSphere® Application Server Liberty to your S3 location.

The administrative server handles commands for the updatedb, maxinst, and the integrity checker utilities. Administrative server logs can be redirected to your S3 location.

Procedure

1. In your Red Hat® OpenShift® Container Platform deployment, go to Workloads > Secrets and add a key and value secret for your S3 configuration.
 - a. For the secret name, specify `s3secretkey`.
 - b. Set the key name to `accessSecretKey`.
 - c. Get the value from your S3 configuration.
2. In the Administration section, modify the custom resource (CR) for the ManageWorkspace custom resource definition (CRD) by taking the following steps:
 - a. Select the ManageWorkspace custom resource definition (CRD).
 - b. Select the Instance tab, then select the custom resource (CR).
 - c. On the YAML tab, add or modify the `spec.settings.deployment` section, and ensure that the custom resource (CR) for your instance contains the `loggingS3destination` property and the following child properties and values that match your S3 configuration:
 - `bucketName`: The S3 bucket name of the log destination.
 - `endpointURL`: The S3 endpoint URL. URLs for S3 can vary, depending on the S3 service that you use, such as a public, private, or regional URL service. Choose the URL that matches your deployment.
 - `accessKey`: The S3 access key.
 - `secretKey`: The name of the secret that contains the S3 access credential that you configured in Step 1.

After you modify the CR for your instance, the values are propagated to the CRs for the administrative server and the server bundle pods. If any property or value is not specified, logs are not sent to S3 Cloud Object Storage.

The following code sample for the CR shows the required properties and some fictitious values:

```
deployment:
  loggingS3Destination:
    accessKey: AQDNAWKXRTTY84LJ4G6YR
    bucketName: s3-bucket
    endpointURL: https://s3.us-area.amazonaws.com
    secretKey:
      secretName: s3secretkey
```

Logs that result from the running the maxinst, updatedb, or integrity checker utilities are now redirected to your S3 storage location. Each modified log is compressed and has a name that contains the source location and the timestamp of when the administrative command started to run.

3. To upload server bundle logs from your log location on WebSphere Application Server Liberty, make the following API request: **POST** `https://host:port/maximo/api/service/logging?action=wsmethod:submitUploadLogRequest`. Provide the API key in the header of the request. The body is empty.

The API request creates an entry in the LOGREQUEST table of Maximo Manage for each server bundle. A continuously running cron task uploads the compressed log files to your S3 storage location when the table is updated. The name of each file contains the source location and the timestamp of when the command started to run.

You can query the LOGREQUEST table to troubleshoot any issues. Clean up old table entries by configuring an instance of the LOGREQUESTCLEANUP cron task to run each day.

- [S3 buckets](#)
Maximo Manage 8.5 supports nested and other buckets for file backups.

Streaming WebSphere Application Server Liberty logs

You can stream WebSphere Application Server Liberty logs for server bundles by constructing a URL that you can use in a browser or other tool that you use for REST API calls.

Before you begin

Before you can stream logs, your administrator must grant you the STREAMLOG signature option for the Logging application. An API key is also required.

About this task

When you enter the URL in a browser, the browser displays the content of the WebSphere Application Server Liberty messages.log file for the server bundle that you specified.

Procedure

1. To stream the contents of the messages.log file for WebSphere Application Server Liberty, enter a URL in the following format in a browser or other API tool that you use for REST API calls:

```
https://<URL to the server bundle for which you want to stream logs>/maximo/api/service/logging?  
action=wsmethod:streamLog&apikey=<your API key>
```

For example,

```
https://mas.manage.ui.mydomain.com/maximo/api/service/logging?  
action=wsmethod:streamLog&apikey=n0sjvsvm4m8495037r2baafag35r5qaoncps
```

2. Optional: To refresh the browser with the latest contents of the log, press Enter again.

Managing log files

You create log files to save the informational, warning, or error messages about the system. You can also manage the logging process and the format of the log files across your organization.

- [Logging application components](#)
The Logging application has the loggers, appenders, and layouts components that you configure.
- [Application of logger settings](#)
Log settings in the Logging application define the type of information that is logged. Before you can activate logging for applications or runtime components, you must apply log settings in the Logging application.

Logging application components

The Logging application has the loggers, appenders, and layouts components that you configure.

Loggers

Loggers prepare log statements to be written to console or log file.

Loggers are named entities or keys, such as log4j.logger.maximo.sql. Loggers also form a hierarchy. A logger is defined as an ancestor of another logger. This relationship is true only when the name of the logger is followed by a dot or is a prefix of the descendant logger name. If there are no ancestors between a logger and the descendant logger, a logger becomes the parent of a child logger. For example, log4j.logger.maximo.sql is the parent of log4j.logger.maximo.sql.WORKORDER.

Log levels indicate the type of event that the system logs. You can assign the following levels to Loggers: DEBUG, INFO, WARN, ERROR, and FATAL.

Appenders

Appenders specify the output definitions for loggers. For example, a rolling appender writes log statements to a specified file. Once a size limit for the file is reached, that file is renamed and a new file is created.

Appenders can exist for consoles or files. You can associate one or more loggers with a given appender. Alternatively, you can associate a single logger with multiple appenders.

The product provides the following types of appenders. You cannot delete any of the provided appenders.

Table 1. Appender types

Type	Description
Console appender	Writes log statements to the application server console.
Rolling appender	Writes log statements to the file specified in the File Name field. Once the file size limit is reached (5 MB by default), the current file is renamed and a new file is created. For example, if the current file is named maximo.log, then the renamed file is maximo.log.1.
Daily Rolling appender	Writes log statements to the file specified in the File Name field. The file is renamed and a new file is created at a specified rate. This rate depends on the Date Pattern attribute. For example, if you have configured the Date Pattern of your Daily Rolling Appender to yyyy-MM-dd , when the current file is named maximo_scheduled.log, the renamed file is maximo_scheduled.log.2007-06-18.

Layouts

A layout specifies the output format of the log statement and is always associated with an appender.

For example, a Conversion Pattern such as: `%d{dd MMM yyyy HH:mm:ss:SSS} [%-2p] %m%n`, results in the following log statement: `2007-05-07 14:07:41,508 [main] INFO MyApp - Entering application;`

Application of logger settings

Log settings in the Logging application define the type of information that is logged. Before you can activate logging for applications or runtime components, you must apply log settings in the Logging application.

If you create a logger or change the log settings, select the Apply Settings action.

Perform this action if you change the settings in the Log Level field or in the Active check box. You also perform this action if you add loggers.

Working with log files

There are several tasks relating to managing your log files from applications, such as specifying log file formats and locations, and associating loggers with appenders.

- [Specifying local log file locations](#)
You can specify a folder for storing your log files from activities such as escalations and integrations.
- [Managing appenders](#)
You can create, change, or delete appenders in the Logging application.
- [Automation scripts loggers](#)
All logging that is related to scripts is done by the autoscript logger. The log level is set, by default, to ERROR. Only errors that are encountered during script execution, are output to the system console or to the product log file.
- [Log control of individual scripts](#)
To help you identify errors in automation scripts, you can add child script loggers to the root logger for automation scripts. Then, you associate the new script logger with the script that you want to monitor and specify a log level that is more granular than the log level for root logger for automation scripts.
- [Cron task loggers](#)
When cron tasks fail to run successfully, the root logger cron task can be set to different levels to obtain more detailed logs. If a particular cron task fails to run successfully, additional loggers can be set up to isolate the cause of the failure.
- [Adding a rolling logger for the PMWoGen cron task](#)
You can limit the size and number of log files that are saved for the PMWoGen cron task. You add a cron task logger that rolls over to a new log file when the current log reaches a specified size. Older versions are deleted after a specified number of instances. The log level can be less granular than the level that is specified for the parent cron task logger.
- [Escalation loggers](#)
If an escalation fails to run, the failure can be caused by the escalation engine, the email notifications, or actions triggered by the escalation. You can troubleshoot the cause of the failure by setting the correct log level.
- [Integration framework loggers](#)
The integration framework has four root loggers: integration, REST, interaction, and Open Services Lifecycle Collaboration (OSLC). To receive the maximum amount of information set the root loggers to DEBUG.
- [Enabling the EventTracker filter](#)
To enable the EventTracker filter, uncomment the filter definition and filter mapping in the web.xml file, which is located in `Tpae root\applications\maximo\maximouiweb\webmodule\WEB-INF\` directory.
- [Configuring custom log messages to help resolve bugs](#)
To identify the section of a log file that contains statements or messages that are relevant to product use, problem creation, or a debugging activity, you can configure custom log messages. You specify start and end messages that are included in the log file. You can review the statements or messages that are shown in between the custom log start and end messages in the log file to help you trace a scenario or resolve an issue.
- [Enabling thread logs](#)
In the System Configuration application, you can enable thread logs to track actions made by specified users in Maximo Manage, such as in the user interface.
- [Scenario: Interpreting log file statements to resolve errors](#)
Marco, a system administrator, wants to isolate and resolve an error that occurs when someone tries to save a work order. Marco can troubleshoot the problem by setting the Word Order Tracking root logger to DEBUG and the SQL root logger to INFO.

Specifying local log file locations

You can specify a folder for storing your log files from activities such as escalations and integrations.

Before you begin

You must ensure that the user account used to run the application server has both read and write permissions on the log file destination folder.

Procedure

1. In the Logging application, select the Set Logging Root Folder action.
2. In the Set Logging Root Folder window, specify a location in the Root Logging Folder field.

Managing appenders

You can create, change, or delete appenders in the Logging application.

Procedure

1. Select the Manage Appenders action.
2. In the Manage Appenders window, you can create, modify, or delete an appender.

Automation scripts loggers

All logging that is related to scripts is done by the autoscript logger. The log level is set, by default, to ERROR. Only errors that are encountered during script execution, are output to the system console or to the product log file.

Individual script log levels can be used to redirect output statements in the script code to the system console or to the product log file. To ensure that output statements are redirected, set the log level of the individual script to the same log level of the autoscript logger. For example, if the autoscript logger is set to INFO, then the individual script log level must also be set to INFO.

The log level can be changed so that more script execution information is written to the product log file. Some of the statements are from the scripting component while others can be the script code-specific output statements. Each individual script can be configured at different log levels.

Example

A system administrator enters a purchase price value. A field validation script that is associated with the Purchase Price field of the Asset application runs business rules that compute the replacement cost. The system administrator encounters an error that indicates that the script failed to run line number 17 of the script. If required, he can place the output statements in the script code to isolate the specific section of code that is failing. He can set up detailed DEBUG logging to determine the type of variable, either input or output, that was received into or calculated in the script.

Log control of individual scripts

To help you identify errors in automation scripts, you can add child script loggers to the root logger for automation scripts. Then, you associate the new script logger with the script that you want to monitor and specify a log level that is more granular than the log level for root logger for automation scripts.

In the Logging application, you can create a child logger of the autoscript logger and associate the child logger with a script that you want to monitor. In the Key field, append the name of the script in uppercase text to the root autoscript name. Then, for example, you can set the log level to Debug on the child logger and keep the level of the parent log set to Error.

This action can help you to find and troubleshoot script errors more easily.

Example

You add a script that is named ASSETCHG1 to send a notification whenever an asset identifier is changed.

You want to be sure that the action and notification complete successfully, so in the Logging application, you add a child logger to the log4j.logger.maximo.script Autoscript logger. In the Key field, you specify the logger name as log4j.logger.maximo.script.ASSETCHG1. You set the log level for this script to Debug, make the script active, and apply the settings. The parent Autoscript logger is set to Error.

You test changing an asset identifier and when the notification does not occur, you review the debug log for the ASSETCHG1 script. You find and correct an error in the script.

Cron task loggers

When cron tasks fail to run successfully, the root logger cron task can be set to different levels to obtain more detailed logs. If a particular cron task fails to run successfully, additional loggers can be set up to isolate the cause of the failure.

The following table lists the application area, the cron task, a description of the cron task, and the log levels to set each logger to. The list details the key cron tasks and not contain all of the cron tasks.

Table 1. Cron task loggers. Cron task logger details

Group / Area	Cron task	Description	Loggers and log level
Escalation	ESCALATION	Runs active escalation definitions and starts actions and notifications	To isolate execution errors with escalations, set the child logger of cron task root logger to DEBUG level.
Email listener	LSNRCRON	Runs periodically to process incoming emails and create or update Service Requests	To isolate execution errors with the email listener, set the child logger of cron task, EmailListnerCron to DEBUG level.

Group / Area	Cron task	Description	Loggers and log level
Integration	FLATFILECONSUMER	Automates the processing and loading of data contained in flat files	To isolate execution errors with the integration framework, set the integration root logger to DEBUG level. This logger supports log statements produced from all of the integration framework cron tasks.
Integration	IFACETABLECONSUMER	Automates the processing and loading of data contained in interface tables	To isolate execution errors with the integration framework, set the integration root logger to DEBUG level. This logger supports log statements produced from all of the integration framework cron tasks.
Integration	JMSQSEQCONSUMER	Automates the processing of messages from the JMS sequential queue in the integration framework	To isolate execution errors with the integration framework, set the integration root logger to DEBUG level. This logger supports log statements produced from all of the integration framework cron tasks.
Integration	XMLFILECONSUMER	Automates the processing and loading of data contained in XML formatted files	To isolate execution errors with the integration framework, set the integration root logger to DEBUG level. This logger supports log statements produced from all of the integration framework cron tasks.
Reporting	REPORTLOCKRELEASE	Determines whether locked report jobs continue, or are canceled and resubmitted to the reporting queue	To isolate execution errors with reporting, set the child logger REPORTLOCKRELEASE for the cron task root logger to DEBUG.
Reporting	REPORTOUTPUTCLEANUP	Automates the clean-up of previously output report entries that are stored	To isolate execution errors with reporting, set the child logger REPORTOUTPUTCLEANUP for the cron task root logger to DEBUG.
Reporting	REPORTSCHEDULE	Automates the removal of report usage entries that are created each time a report is run	To isolate execution errors with reporting, set the child logger REPORTSCHEDULE for the cron task root logger to DEBUG.
KPI	KPICronTask	Refreshes KPI values periodically	To isolate execution errors with KPI, set the child logger KPICronTask for the cron task root logger to INFO.
User group/synchronization	LDAPSYNC	Automates the synchronization of users and groups maintained in an LDAP directory	To isolate execution errors with security, set the child logger LDAPSYNC for the cron task root logger to DEBUG.
User group/synchronization	VMMSYNC	Automates the synchronization of users and groups maintained in an LDAP directory	To isolate execution errors with security, set the child logger VMMSYNC for the cron task root logger to DEBUG.
Inventory	ReorderCronTask	Runs the reorder process for direct issue items	To isolate execution errors with inventory, set the child logger, INVENTOR for the application root logger to DEBUG.

Adding a rolling logger for the PMWoGen cron task

You can limit the size and number of log files that are saved for the PMWoGen cron task. You add a cron task logger that rolls over to a new log file when the current log reaches a specified size. Older versions are deleted after a specified number of instances. The log level can be less granular than the level that is specified for the parent cron task logger.

About this task

The PMWoGen cron task can be enabled to automatically generate work orders from preventive maintenance records. Logging activity can be extensive, depending on the number of sites and assets that you maintain.

Procedure

1. In the Logging application, select the Manage Appenders action and add an appender that is named PMWoGen.
2. Specify the class file name as `psdi.util.logging.MXFileAppender`.
3. Specify the log file name as `pmwogencronlog.log`.
4. Specify the maximum file size for the most current log and the number of most recent files to retain. Save your changes.
5. In the Root Loggers section, filter for the cron task logger and insert a child logger. Name the child logger `PMWoGenCronTask`.
6. In the Key field, specify `log4j.logger.maximo.crontask.PMWoGenCronTask`.
7. Set the log level to INFO.
8. Specify the PMWoGen appender and save your changes. Apply the settings.

Results

Logging for the PMWoGen cron task is directed to the new logger. The log file rolls over based on the information that you specified for the appender.

Escalation loggers

If an escalation fails to run, the failure can be caused by the escalation engine, the email notifications, or actions triggered by the escalation. You can troubleshoot the cause of the failure by setting the correct log level.

The following table lists the escalation loggers, a description of the logger, and the log level to set each logger to.

Logger	Description	Log level
crontask	Root logger that generates log statements for all cron tasks	DEBUG

Logger	Description	Log level
ESCALATION	Child logger that inherits from cron task root logger and generates log statements specifically for the escalation engine	DEBUG
sql	Root logger that generates log statements of SQL statements run in the application server	INFO
COMMTEMPLATE	Child logger that inherits from service root logger and generates log statements specifically for communication templates and notifications events	INFO
mail	Root logger that generates log statements for communication with the mail server when sending notifications.	DEBUG

Integration framework loggers

The integration framework has four root loggers: integration, REST, interaction, and Open Services Lifecycle Collaboration (OSLC). To receive the maximum amount of information set the root loggers to DEBUG.

The following table lists the loggers, a description of the log level, and log levels to set the logger to.

Table 1. Integration framework loggers. Integration framework logger details

Logger	Description	Log level
Integration	Logs information about the integration framework configuration, creation, management, and runtime processing.	DEBUG
REST	Logs information about the REST API components. REST API starts the integration with business objects. The REST API call from a client, runs the client request against the appropriate business object and returns a response.	DEBUG
Interaction	Logs information about both the design process, when a web service interaction is created, and the execution process, where a web service interaction is run. Designated users run web service interactions to receive data interactively from external systems."	DEBUG
OSLC	Logs information about both the design process, when an OSLC interaction is created, and the execution process, where an OSLC interaction is run.	DEBUG

Enabling the EventTracker filter

To enable the EventTracker filter, uncomment the filter definition and filter mapping in the web.xml file, which is located in *Tpae root*\applications\maximo\maximouiweb\webmodule\WEB-INF\ directory.

About this task

If your web.xml file does not contain the commented code, you can enable the EventTracker filter by adding the code, without the comments. Add the filter definition between the last filter definition and the first filter mapping in your web.xml file. Then, add the filter mapping so that it is the last entry in the filter mappings.

Procedure

1. Open the web.xml file from the *Tpae root*\applications\maximo\maximouiweb\ webmodule\WEB-INF\ directory.
2. Remove the comment from the following code for the filter:

```
<!-- Uncomment these lines to enable the EventTracking filter
  <filter>
    <filter-name>EventTrackingFilter</filter-name>
    <filter-class>psdi.webclient.system.filter.EventTrackingFilter</filter-class>
  </filter>
-->
```

3. Remove the comment from the following code for the filter mapping:

```
<!--! Uncomment these lines to enable the EventTracking filter
<filter-mapping>
  <filter-name>EventTrackingFilter</filter-name>
  <url-pattern>/ui/*</url-pattern>
</filter-mapping>
<filter-mapping>
  <filter-name>>EventTrackingFilter</filter-name>
  <url-pattern>/webclient/login/logout.jsp</url-pattern>
</filter-mapping>
-->
```

4. Save and rebuild the Tivoli®'s process automation engine enterprise archive (EAR) file.
5. Redeploy the EAR file.

What to do next

In the Logging application, a new row in the Root Loggers table lists the EventTracker filter as eventtracking with the key value log4j.logger.maximo.webclient.eventtracking. By default, the logging level is set to INFO, which logs all events. If the logging level is set to ERROR, change the logging level to INFO and select the Apply Settings action.

- [Logging events for specific applications or users](#)
You can add rows to the Logger table in the Logging application to enable the EventTracker filter to log the events of specific applications, specific users, or specific users in specific applications.
- [Enabling logging for application server security synchronization](#)
To troubleshoot application server security synchronization issues, enable logging for the VMMSYNC and LDAPSYNC cron tasks.
- [Stopping the logging of events](#)
You can stop logging events in the Logging application, which eliminates the need to edit the web.xml file and restart the application server.
- [Correlation of related events in logs](#)
Log correlation is the process of analyzing a set of related events. The analysis is based on rules that are used to interpret the event data. When log correlation is enabled, you can use the correlation ID to identify the UI request, cron task action, MXSCRIPT object, or REST call that produced a log entry.

Logging events for specific applications or users

You can add rows to the Logger table in the Logging application to enable the EventTracker filter to log the events of specific applications, specific users, or specific users in specific applications.

Procedure

1. In the Logging application, in the Root Logging table, set the logging level for log4j.logger.maximo.webclient.eventtracking to ERROR.
2. In the Logging table, add a new row.
3. Set the Logger field to one of the following:

Option	Description
To log a specific application	Specify the application ID, for example, wotrack.
To log a specific user	Specify the user ID, for example, wilson.
To log a specific application for a specific user	Specify the application ID.user ID, for example, wotrack.wilson.

The Key field is automatically populated based on the value in the Logger field.

4. Select the Apply Settings action.

Enabling logging for application server security synchronization

To troubleshoot application server security synchronization issues, enable logging for the VMMSYNC and LDAPSYNC cron tasks.

About this task

You must enable VMMSYNC and LDAPSYNC for both cron task sync and SQL logging. You can set logging levels for the entire cron task or just for specific instances. To set logging levels for specific instances, set the logging property *instancename* to DEBUG.

Procedure

1. In the Logging application, set the following logging properties to DEBUG:
 - log4j.logger.maximo.crontask.VMMSYNC
 - log4j.logger.maximo.crontask.LDAPSYNC
 - log4j.logger.maximo.sql.crontask.LDAPSYNC
 - log4j.logger.maximo.sql.crontask.VMMSYNC
2. To enable DEBUG SQL logging for business objects, set the log4j.logger.maximo.sql.servicename.objectname logging property to DEBUG.
For example:

```
log4j.logger.maximo.sql.SIGNATURE.MAXUSER=DEBUG
log4j.logger.maximo.sql.SIGNATURE.MAXGROUP=DEBUG
log4j.logger.maximo.sql.PERSON.PERSON=DEBUG
log4j.logger.maximo.sql.PERSON.EMAIL=DEBUG
log4j.logger.maximo.sql.PERSON.PHONE=DEBUG
```

3. Select the Apply Settings action.

Stopping the logging of events

You can stop logging events in the Logging application, which eliminates the need to edit the web.xml file and restart the application server.

Procedure

1. In the Logging application, in the Root Logging table, set the logging level for log4j.logger.maximo.webclient.eventtracking to ERROR.
2. Select the Apply Settings action.

Correlation of related events in logs

Log correlation is the process of analyzing a set of related events. The analysis is based on rules that are used to interpret the event data. When log correlation is enabled, you can use the correlation ID to identify the UI request, cron task action, MXSCRIPT object, or REST call that produced a log entry.

Correlation ID

When log correlation is enabled, identify the user interface (UI) request, cron task action, MXSCRIPT, or REST call that produced a log entry by using the correlation ID. All log entries for a single UI request or cron task action have the same correlation ID. The unique correlation ID applies to any group of log entries such as SQL logs or application logs.

The correlation ID is in the format of `[CID-TYPE-NUMBER]`. The type can be CRON, UI, MXSCRIPT, or REST. The number ensures uniqueness. The server name is also included when log correlation is enabled. For log entries that are not yet correlated, the correlation ID field in the log is empty. The server name field is empty for logs that are generated before the server name is available.

To enable log correlation, in the System Properties application, add the `mxe.logging.CorrelationEnabled` property.

To enable UI request correlation, in the System Properties application, add the `mxe.webclient.logging.CorrelationEnabled` property.

Example

The following example shows the correlation log for the UI requests that are associated with an SQL statement that is being debugged:

Interpret the log file

```
06 Jun 2012 16:12:38:360 [INFO] [MXServer] [CID-UI-993] Correlation started.
06 Jun 2012 16:12:38:534 [INFO] [MXServer] [CID-UI-993] BMXAA6719I - USER = (WILSON) SPID =
(137) app (WOTRACK) object (WORKORDER) : select * from workorder where (woclass in (select
value from synonymdomain where domainid = 'WOCLASS' and maxvalue in ('WORKORDER', 'WOACTIVITY'))
and historyflag = 0 and istask = 0 and siteid = 'BEDFORD')
06 Jun 2012 16:12:38:546 [INFO] [MXServer] [CID-UI-993] BMXAA6719I - USER = (WILSON) SPID =
(149) app (WOTRACK) object (WORKORDER) : select * from workorder where (workorderid = 202)
06 Jun 2012 16:12:38:582 [INFO] [MXServer] [CID-UI-993] BMXAA6719I - USER = (WILSON) SPID =
(27) app (WOTRACK) object (WORKORDER) : select * from workorder where (workorderid = 202)
06 Jun 2012 16:12:38:717 [INFO] [MXServer] [CID-UI-993] BMXAA6719I - USER = (WILSON) SPID =
(20) app (WOTRACK) object (WORKORDER) : select count(*) from workorder where
(woclass in (select value from synonymdomain where domainid = 'WOCLASS
' and maxvalue in ('WORKORDER', 'WOACTIVITY')) and historyflag = 0 and istask = 0 and siteid
= 'BEDFORD')
06 Jun 2012 16:12:38:998 [INFO] [MXServer] [CID-UI-993] Correlated data: BEGIN UIsessionId:3
Event:loadapp AppName:autoscript UserId:wilson UIClientIP:127:0:0:1 ElapsedTime:638 ms END

06 Jun 2012 16:12:44:589 [INFO] [MXServer] [CID-UI-994] Correlation started.
06 Jun 2012 16:12:44:597 [INFO] [MXServer] [CID-UIASYNC-995] Correlation started.
06 Jun 2012 16:12:44:634 [INFO] [MXServer] [CID-UIASYNC-995] BMXAA6719I - USER = (WILSON)
SPID = (149) app (WOTRACK) object (WORKORDER) : select * from workorder where ((woclass in
(select value from synonymdomain where domainid = 'WOCLASS' and maxvalue in ('WORKORDER',
'WOACTIVITY')) and historyflag = 0 and istask = 0 and siteid = 'BEDFORD')) and ((status like
'%WAPPR%'))
06 Jun 2012 16:12:44:641 [INFO] [MXServer] [CID-UIASYNC-995] Correlated data:
BEGIN UIsessionId:3 AppName:wotrack UserId:wilson UIClientIP:127:0:0:1 ElapsedTime:44 ms END
```

- The first log statement in the fragment displays a field `[CID-UI-993]` that is the component that is correlated in this example.
- CID is the correlation ID, followed by the component that is being correlated, and the numeric value that is applied to all the correlated statements output for the particular correlation.
- The `[CID-UI-993]` field groups a set of correlated log statements that are started by a UI request.
- A correlated set of log statements is marked by the Correlation started and Correlation data statements. The first set of correlated log statements begins with `[CID-UI-993]correlation started` and ends with `[CID-UI-993]Correlated data:BEGIN` the specific component information `END`.
- The second set of correlate log statements indicate that the next set of correlated log statements is being output.
- When a UI request is correlated, sql commands that run in response to user interaction are placed in the same group of correlated log statements as the UI request.
- In the second correlated statement for correlation `[CID-UI-993]`, the sql command is associated with the WORKORDER table.
- If multiple sql statements run in response to the UI request the statements are output to the same group of correlated log statements.
- The final log statement for correlation `[CID-UI-993]` begins with `Correlation data` and provides information about the user session that started the output of correlated log statement.
- The additional information includes:
 1. The UI session Identifier 3.
 2. The UI event `loadapp`.
 3. The application that started the UI event `autoscript`.
 4. The user that started the event `wilson`.
 5. The IP address from where the UI request was received `UIClientIP`.
- In the final log statement for correlation `[CID-UI-993]`, the `ElapsedTime` information specifies the time that is spent by the application server to process the UI request.

Configuring custom log messages to help resolve bugs

To identify the section of a log file that contains statements or messages that are relevant to product use, problem creation, or a debugging activity, you can configure custom log messages. You specify start and end messages that are included in the log file. You can review the statements or messages that are shown in between the custom log start and end messages in the log file to help you trace a scenario or resolve an issue.

Before you begin

If you want to change any details of the custom messages that display in a log file, such as the prefix or message text, open the Database Configuration application. Select the Messages action. Filter for the `begincustomlog` or `endcustomlog` message, modify the message, and save the record.

About this task

Log files that are tagged with start and end messages can help product support organizations to more easily trace application actions and isolate potential issues.

Procedure

1. In the Logging application click Configure Custom Log Messages on the toolbar.
2. In the Configure Custom Log Messages window, specify any comments that you want included in the start and end sections of the log file.
3. Take note of the error message numbers for the start and end messages so that you can search for them in the log file later.
4. To inject the Start message into the log file to trace a scenario, click Start Writing to the Log File.
5. Perform the actions.
6. To inject the End message to stop writing to the log file, click Stop Writing to the Log File.
The log information that is captured between the start message and the end message can be reviewed.
7. Navigate to the location where the log file is saved.
8. Open the log file in a text editor and search for the start and end messages.
9. Review the statements and messages that are shown between the two messages to trace the scenario or resolve the issue.

Enabling thread logs

In the System Configuration application, you can enable thread logs to track actions made by specified users in Maximo® Manage, such as in the user interface.

Procedure

1. In the Logging application, select the Configure Custom Logging action. On the Thread Logger tab, create a row in the Thread Loggers section.
2. Select a context value so that actions that are performed in that area of Maximo Manage are tracked in the thread log. For example, you can select `UI` to track actions that are performed in the user interface.
3. Specify the name of the user whose actions are logged and select the Is Enabled? check box.
4. In the Thread Logger Details section, specify the type of log for the type of actions that are logged, such as SQL actions.
5. In the Thread Logger Details section, specify the level to indicate how much information is retrieved by the logger. The following table explains each of the levels:

Level	Description
INFO	Retrieves general information about completed actions.
DEBUG	Retrieves detailed information about completed actions. This level is the default level.

Scenario: Interpreting log file statements to resolve errors

Marco, a system administrator, wants to isolate and resolve an error that occurs when someone tries to save a work order. Marco can troubleshoot the problem by setting the Work Order Tracking root logger to DEBUG and the SQL root logger to INFO.

Replicating the error

In the Work Order Tracking application, Marco creates a work order and associates multiple tasks with the work order. Each task is arranged in sequence. When Marco tries to save the work order, the error `BMXAA5395E Task 20 is causing a loop condition by connecting back to task 10` is shown. The work order cannot be saved. If Marco enables the Work Order Tracking application logger and the SQL logger, he can view detailed information to determine the cause of the error.

Enabling loggers

In the Logging application, Marco searches for the `WOTRACK` root logger and sets the log level to DEBUG. Then, Marco searches for the SQL root logger and the `WORKORDER` child logger, and sets the log level for both loggers to INFO. Marco associates an appender with each logger.

Creating the log file statements

Marco attempts to save the work order again, but encounters the same error. Because Marco enabled the loggers, a detailed log file statement is produced. The cause of the error can be isolated by interpreting the log file statement.

Interpreting the log file statement

The log file statement shows a path that lists a sequence of successor tasks.

```
21 May 2012 11:37:03:927 [DEBUG] [MXServer] [] Task Successors
```

Task 40 is represented in the log file with the identifier T1088.

```
21 May 2012 11:37:03:929 [DEBUG] [MXServer] [] Task -> T1088 Successors -> []
```

Task 30 is represented in the log file with the identifier T1087.

```
21 May 2012 11:37:03:929 [DEBUG] [MXServer] [] Task -> T1087 Successors -> []
```

Task 20 is represented in the log file with the identifier T1086.

```
21 May 2012 11:37:03:930 [DEBUG] [MXServer] [] Task -> T1086 Successors -> [T1085, T1088]
```

Task 10 is represented in the log file with the identifier T1085.

```
21 May 2012 11:37:03:930 [DEBUG] [MXServer] [] Task -> T1085 Successors -> [T1086, T1087]
```

Task 50, represented in the log file statement with the identifier T1089, has successors Tasks 10 (T1085), 20 (T1086) and 30 (T1087).

```
21 May 2012 11:37:03:931 [DEBUG] [MXServer] [] Task -> T1089 Successors -> [T1085, T1086, T1087]
```

Each path for a sequence of tasks in the Work Order Tracking application is validated. Each path is called a branch. For each branch, the application determines whether any of the tasks in the branch points back to itself somewhere in the branch. This condition is called a loop.

After the list of tasks is created, each branch is validated starting at Task 50 (T1089).

```
21 May 2012 11:37:03:931 [DEBUG] [MXServer] [] Beginning from a new starting point [T1089]
```

```
21 May 2012 11:37:03:931 [DEBUG] [MXServer] [] Start validating branch:T1089
```

```
- - -
```

```
21 May 2012 11:37:03:932 [DEBUG] [MXServer] [] T1089
```

Tasks 10 (T1085), 20 (T1086), and 30 (T1087) are all checked for loops.

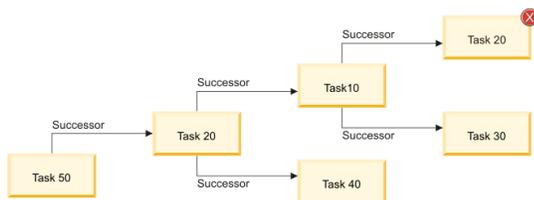
```
21 May 2012 11:37:03:932 [DEBUG] [MXServer] [] T1085
```

```
21 May 2012 11:37:03:932 [DEBUG] [MXServer] [] T1086
```

Debug statements are output for successors Task 10 (T1085) and Task 20 (T1086). Task 30 (T1087) does not have a corresponding debug statement, which indicates that the error was encountered when Task 20 (T1086) was being validating.

```
21 May 2012 11:37:03:932 [DEBUG] [MXServer] [] Task 20 is causing a loop condition by connecting back to task:10.
```

The following diagram shows the validation process for the branch that is associated with Task 50. The error message indicates that the loop is created by Task 20. Task 20 is invalid because it is listed as a successor to Task 10 twice in the path definition.



A successor = comes after a task

Viewing Maximo Manage Logs

View the IBM® Maximo® Manage logs for Server, Maxinst and Update database, User sync, Workspace operator, and Build logs from the Red Hat® OpenShift® console.

Procedure

1. Go to your Red Hat OpenShift console.
2. Go to Workload_> Pods menu.
3. Select log type.
 - Maximo Manage Server logs.
Server logs are written to the standard output.

- Select your Maximo Manage project.
 - Check your Liberty server pods.
 - Select the server pod to view log.
 - cron
 - mea
 - report
 - ui
 - all
 - Click Liberty server pod.
 - Select the Logs tab to view the log for the selected server.
- You can also configure IBM Maximo Application Suite (MAS) supported log configuration by Red Hat OpenShift. For example, Elasticsearch, Fluentd, and Kibana dashboard (EFK) can be configured for logging. The logs automatically flow to the EFK stack.

Aggregated Maximo Manage logs can be retrieved from the EFK stack.

<https://docs.openshift.com/container-platform/4.6/logging/cluster-logging-deploying.html>

You can also push the logs to any S3 compatible object storage by following these steps.

- Set up S3 credentials.
 - Create the following four environment variables in your Maximo Manage deployment:
 - LOG_BUCKETNAME
 - LOG_S3ACCESSKEY
 - LOG_S3ENDPOINTURL
 For example, <https://s3.us.cloud.object.storage.appdomain.cloud>
 - LOG_S3SECRETKEY
 - Create a log request (POST) by using any HTTP Rest Client. For example, the Postman tool.

Request URL: <http://manageserver:7001/maximo/oslc/service/logging?action=wsmethd:submitUploadRequest>

 - Replace the Maximo Manage server in the URL to your Maximo Manage server host or IP address.
 - A record is created in the Maximo Manage table (LOGREQUEST)
 - Use the S3 browser to view the logs by using your S3 credentials.
 - Each Maximo Manage server handles the latest log request. It compresses the log files in the liberty log directory and uploads it in Cloud Object Storage.
 - The logs can be downloaded from the Liberty server. It is saved in the directory that is set for the system property "server.output.dir".
 - For example, "/opt/was/libert/wip/usr/servers/default/
 - A record is created in the Maximo Manage table (LOGREQUESTDET)
 - The Maximo Manage table records will be removed by crontask (LOGREQUESTCLEANUP) after the logs are posted to the object storage. The crontask needs to be activated manually. It runs one time every day.
- **Maxinst and update database logs**

The maxinst and update database logs can be retrieved from the maxinst pod.

 - Select the maxinst pod for your project.
 - Go to the Terminal tab and `cd /opt/IBM/SMP/maximo/tools/log/` to view logs.

You can also view the log from the Logs tab.
 - **User sync logs**

The User sync logs can be accessed from the user sync pod.

 - Click the user sync pod and select Logs tab.
 - **Maximo Manage Workspace operator logs**

The Maximo Manage Workspace operator log can be accessed from the Maximo Manage workspace pod.

 - In the Maximo Manage Workspace pod, select Logs tab.
 - **Build logs**

The Build log can be accessed from the Maximo Manage build pods.

 - In the Maximo Manage build pod, select Logs tab.

What to do next

You can install OpenShift Logging by deploying the OpenShift Elasticsearch and Red Hat OpenShift Logging Operators. For more information, see [Installing OpenShift Logging](#).

Managing bulletin boards

You use bulletin boards to post messages about critical problems and incidents, and to broadcast information throughout an organization. You can also view communication logs from service desk agents and their users, and communications that are generated by workflow processes and escalations.

- [Bulletin board overview](#)

You can create messages about critical problems and incidents that you can broadcast throughout an organization. Recipients can view bulletin board messages from the navigation bar of an application or from the Start Center.

- [Working with bulletin boards](#)
Using the Bulletin Board application, you can create bulletin board messages, specify the audience for the messages, and perform other tasks.

Bulletin board overview

You can create messages about critical problems and incidents that you can broadcast throughout an organization. Recipients can view bulletin board messages from the navigation bar of an application or from the Start Center.

- [Communication logs for bulletin board messages](#)
You can view a communication log for bulletin board message in the Bulletin Board application. Communication logs are available in several applications.

Communication logs for bulletin board messages

You can view a communication log for bulletin board message in the Bulletin Board application. Communication logs are available in several applications.

The log contains communications about outbound messages that were sent between service desk users and agents. You also view communications that were generated by escalations and workflows if the related communication template specifies that these messages are stored in logs.

Working with bulletin boards

Using the Bulletin Board application, you can create bulletin board messages, specify the audience for the messages, and perform other tasks.

- [Viewing bulletin board messages](#)
You can use the bulletin board to create, view, and post messages related to critical problems and incidents, and to broadcast company-wide information. Creating and posting messages on the bulletin board minimizes the creation and duplication of tickets.
- [Creating bulletin board messages](#)
You can create messages to communicate to users about critical problems and incidents, and to broadcast information throughout the organization.
- [Specifying audiences for bulletin board messages](#)
You can specify the audience that can view a bulletin board message. You can limit the audience by organization, by site, or by person group. If you do not specify an audience, any user can view the message.
- [Changing the status of bulletin board messages](#)
You can change the status of a bulletin board message to control the content of what is posted to the bulletin board. The status of a bulletin board message can be draft, approved, or rejected.
- [Copying bulletin board messages](#)
You can copy an existing bulletin board message. Once you copy a message, you can use the same information that is in the original message. You can also change the values in the message that you copied and save it as a new message.
- [Viewing communication logs for bulletin board messages](#)
You can view outbound bulletin board messages and any attachments that were sent between users and service desk agents.
- [Viewing the history of bulletin board messages](#)
Each time you change the status of a bulletin board message, the change is stored in a history transaction. You can view this read-only status history of a bulletin board message.
- [Deleting expired bulletin board messages](#)
By default, expired bulletin board messages are not deleted. If you do not need to keep expired messages, you can change your settings so when expired the messages are deleted.

Viewing bulletin board messages

You can use the bulletin board to create, view, and post messages related to critical problems and incidents, and to broadcast company-wide information. Creating and posting messages on the bulletin board minimizes the creation and duplication of tickets.

Before you begin

You must be granted access to the Bulletin Board application before you can create and post messages.

About this task

Messages can be routed to all users, or just selected organizations, sites, or person groups. You can view only those bulletin board messages for which you have been selected as an audience. If the composer of the message has not selected a specific audience, any user who logs in to the system can view the message. Located in the Navigation bar of all applications, the icon named Bulletins indicates whether you have unread bulletin board messages. The icon uses a numeric value to indicate the number of bulletin board messages that you can view. The icon also changes from red to green when a new message is posted.

Procedure

1. In the Navigation bar, the Bulletin Board area displays all the bulletin board messages. When you change the value in the Viewed field, you change which messages you see. By default, the value in the Viewed field is N, and the Bulletin Board area displays unread messages. To view either previously viewed

messages or all messages:

- Enter Y in the Viewed field to see previously viewed Bulletin Board messages.
 - Leave the Viewed field blank to see all messages (both previously viewed and unread bulletin board messages). The messages display, with the most recent message appearing at the top of the list. Each message displays the date and time when the message was posted to the Bulletin Board.
2. In the Bulletin Board window, click a message to display the details of the message.
 3. Click the message again to collapse the detailed view of the message.
 4. Click OK.

Creating bulletin board messages

You can create messages to communicate to users about critical problems and incidents, and to broadcast information throughout the organization.

Procedure

1. In the Bulletin Board application, click New Message.
2. Type an identifier, a subject for the message, a posting date, and an expiration date.
3. Type a message of up to 4,000 characters.
4. Optional: Limit the message to an audience by organization, by site, or by person group.
5. Save your changes.
6. In the Select Action menu, click Change Status and change the status of the message to approved.

Specifying audiences for bulletin board messages

You can specify the audience that can view a bulletin board message. You can limit the audience by organization, by site, or by person group. If you do not specify an audience, any user can view the message.

Procedure

1. In the Bulletin Board application, open the message for which you want to specify an audience.
2. Click a tab to specify an audience by organization, by site, or by person group.
3. On the tab, select one or more organizations, sites, or person groups and save your changes.

Changing the status of bulletin board messages

You can change the status of a bulletin board message to control the content of what is posted to the bulletin board. The status of a bulletin board message can be draft, approved, or rejected.

Procedure

1. In the Bulletin Board application, open the message for which you want to change the status.
2. Select the Change Status action.
3. In the Change Status window, select a status and click OK to save your changes.

Example

For example, you can create a bulletin board message with a status of draft, and then route the message to a supervisor. The supervisor reviews the message, and changes the status to approved. The message is then posted to the bulletin board.

Copying bulletin board messages

You can copy an existing bulletin board message. Once you copy a message, you can use the same information that is in the original message. You can also change the values in the message that you copied and save it as a new message.

Procedure

1. In the Bulletin Board application, open the message that you want to copy.
2. Select the Duplicate Message action.
3. Optional: In the new message, change the subject, the message, and the posting and expiration dates.
4. Save your changes.

Viewing communication logs for bulletin board messages

You can view outbound bulletin board messages and any attachments that were sent between users and service desk agents.

Procedure

1. In the Bulletin Board application, open the message for which you want to view the communication log.
2. Click the Communication Log tab. By default, you can view the messages in reverse chronological order according to the Date field.
3. Click View Details to view the details of a message.
The information in the communication log is read-only.

Viewing the history of bulletin board messages

Each time you change the status of a bulletin board message, the change is stored in a history transaction. You can view this read-only status history of a bulletin board message.

Procedure

1. In the Bulletin Board application, display the message whose status history you want to view.
2. Select the View History action.
3. View the status information and click OK.

Deleting expired bulletin board messages

By default, expired bulletin board messages are not deleted. If you do not need to keep expired messages, you can change your settings so when expired the messages are deleted.

About this task

To activate this setting, you must change the `mxe.crontask.deleteBB` system property and add parameters for the ESCBLTNEXP escalation.

Procedure

1. In the System Properties application, open the `mxe.crontask.deleteBB` system property.
2. Specify the global property value as 1, save the property, and refresh the session.
3. In the Escalations application, open the ESCBLTNEXP escalation.
4. Select the Activate/Deactivate Escalation action.
5. Specify values in the Elapsed Time Interval field and in the Interval Unit of Measure field for the EXPIREDATE elapsed time attribute.
6. In the Actions section, add the DELEXPMSG action.
7. Save the escalation.
8. Activate the escalation.

Working with sets

You use sets to create item sets and company sets that are shared across multiple organizations.

About this task

The following relationships apply to sets and organizations:

- You must create at least one item set and one company set before you can create any organization.
- You can create as many item sets and company sets as your business practices require.
- You must associate each organization with only one company set.
- You must associate each organization with only one item set.

You cannot delete an item or company set if the set is not empty or if the set is associated with an organization.

- [Creating item sets or company sets](#)
You create an item or company set to enable the sharing of item master and company master information between organizations.

Creating item sets or company sets

You create an item or company set to enable the sharing of item master and company master information between organizations.

Before you begin

In the Sets application, you view organizations that are associated with sets. Before you can view the organization, you must use the Organizations application to assign the set to at least one organization.

About this task

You can create an unlimited number of sets. Multiple organizations can use the same item set or company set.

Procedure

1. In the Sets application, click New Row.
2. Provide the name of the set. The name must be unique for all sets; an item set and a company set cannot have the same name.
3. Optional: Provide a description of the set.
4. Specify a value for the type.
5. Optional: If you specified COMPANY as the value for type, select the Automatically Add Companies to Company Master check box to automatically create a company master record. A company master record is then created whenever a user adds a company in the Companies application. If you do not select this check box, users must add companies in the Company Master application.
6. In the Default Item Status field, specify the status that you want new item master, service item, and tool records to have.
7. Click Save Sets.
After you save the record, the only fields that you can edit are the Sets Description field and, for a company set, the Automatically Add Companies to Company Master check box.

What to do next

After you create a set, you use the Organizations application to assign the set to an organization.

- [Changing item or company sets](#)
After you create an item or company set, you can change settings to suit your business needs.

Changing item or company sets

After you create an item or company set, you can change settings to suit your business needs.

Procedure

1. In the Sets application, click View Details for the set that you want to change.
2. Change one or more of the following settings:
 - Change the description.
 - For a company set, change the Automatically Add Companies to Company Master check box.
3. Save your changes.

Managing organizations

You can set up the organizations and sites that you use. You can set defaults for various options that are related to applications or groups of applications, such as Work Order Tracking, Inventory, Purchasing, Preventative Maintenance, Assets, and so on.

About this task

The following relationships apply to sets and organizations:

- You must create at least one item set and one company set before you can create an organization.
- You can create as many item sets and company sets as your business practices require.
- You must associate each organization with only one company set.
- You must associate each organization with only one item set.
- [Organizations overview](#)
You can set up multiple organizations and sites for your company. The divisions are determined by the types of operations that are performed at different locations, and what data can be shared among them. Different organizations and sites keep parts of their operations separate, while sharing others.
- [Working with organizations](#)
You can set up the organizations and sites that you use. You can set defaults for various options that are related to applications or groups of applications, such as Work Order Tracking, Inventory, Purchasing, Preventative Maintenance, Assets, and so on.

Organizations overview

You can set up multiple organizations and sites for your company. The divisions are determined by the types of operations that are performed at different locations, and what data can be shared among them. Different organizations and sites keep parts of their operations separate, while sharing others.

- **[Application levels and data storage](#)**
Application data is stored at different levels. The separation of data allows you to reuse as much data as possible across organizations and sites without breaching best practices in security and authorization.
- **[Sites and organizations](#)**
A site is a division within an organization that maintains certain data independently from other sites. When you create an organization, you create at least one site.
- **[Item sets](#)**
Item sets let multiple organizations within a company view and choose from a common set of items stocked in the storeroom. An organization can be associated with only one item set. However, multiple organizations can use the same item set.
- **[Autonumbering](#)**
When you set up autonumbering and a user creates a record, the record IDs or other specified fields increment by one.
- **[ABC breakpoints and organizations](#)**
ABC analysis helps you quickly identify which inventory items represent the greatest monetary investment for your company in terms of dollar value and rate of turnover. This analysis ensures that crucial inventory does not fall below minimum levels, and helps keep current balance figures for an item reconciled with the actual count.
- **[Enablement of repair facilities](#)**
To create work orders in a site that is different from the site of the asset on the work order, enable the repair facilities feature.
- **[Customization options for applications](#)**
There are many options and settings that you can customize for your applications in the Organizations application. They include work order options, inventory, purchasing, asset, and preventive maintenance (PM) options. You can access the options from the Select Action menu or the More Actions section of the side navigation menu.

Application levels and data storage

Application data is stored at different levels. The separation of data allows you to reuse as much data as possible across organizations and sites without breaching best practices in security and authorization.

The following are the four application levels:

Table 1. Application levels

Application levels	Description
System level	The data is available to all organizations and sites.
Set level	This level is a special category by which multiple organizations can share items and vendor company data. The system stores this data by default at the organization level.
Organization level	The data is available to only the specified organization and all sites within the organization.
Site level	The data is available to only the specified site.

The following examples illustrate how the level at which application data is stored affects how you use the system:

- The application level determines the level at which record IDs must be unique.
For example, Work Order Tracking is a site-level application; two different sites can both use the same work order number to identify two different work orders. Chart of Accounts is an organization-level application; two different organizations can use the same general ledger account number to specify different general ledger accounts.
- The application level affects some aspects of security.
For example, if a security group has access to one site for an organization-level application, then members of that group can access all of the application records for that organization.
- The application level affects some user default settings.
For example, if a site is used as a filter to display records, but the application is at the organization level, then a user can access all records for the organization that owns that site.

Sites and organizations

A site is a division within an organization that maintains certain data independently from other sites. When you create an organization, you create at least one site.

When you create a site, the values that you specify are used as defaults for that site. You can change the values as needed. You cannot delete a site and you cannot delete an organization after you add a site.

You can use sites to administer security, and to give users different rights at different sites.

Sites that belong to the same organization must use the same currency. They must also share the same options for work orders, assets, labor, and other types of data.

- **[Activation and deactivation of organizations and sites](#)**
The ability to activate and deactivate organizations and sites is dependent on the enterprise hierarchy. When you create an organization, you create at least one site. When you deactivate an organization, all sites within that organization become inactive. This ensures that the structure of your company is not compromised.

Activation and deactivation of organizations and sites

The ability to activate and deactivate organizations and sites is dependent on the enterprise hierarchy. When you create an organization, you create at least one site. When you deactivate an organization, all sites within that organization become inactive. This ensures that the structure of your company is not compromised.

When you deactivate an organization or site, users can no longer create records for that organization or site. A deactivated organization or site and all its information is not deleted. Records that reference a deactivated organization or site are not affected.

If a site and its organization are both deactivated and you activate the organization, the site is not automatically activated.

You can activate and deactivate an organization or a site on the Organization tab of the Organizations application.

Item sets

Item sets let multiple organizations within a company view and choose from a common set of items stocked in the storeroom. An organization can be associated with only one item set. However, multiple organizations can use the same item set.

You identify an item set with a unique name or number, and each item that belongs to the item set has a unique item number.

When you create an organization, you associate an item set to it. When you create an item, by default the item is placed into the item set associated with the organization for your default insert site.

Autonumbering

When you set up autonumbering and a user creates a record, the record IDs or other specified fields increment by one.

Many applications, such as Work Order Tracking, Purchase Requisition, Purchase Orders, and Invoices have autonumbering set up for their key fields such as record ID. You can change the default starting sequence. You can also add a prefix to an existing numbering sequence or add autonumbering to other fields. For applications that do not have autonumbering, you can set up autonumbering for the record ID field or other fields.

Applications store data at one of these levels: system, set, organization, and site. You use different actions to set up autonumbering for applications at each level. For a multisite implementation, you can have different autonumbering sequences for different organizations and sites. For example, Work Order Tracking is a site-level application. You can set up different autonumbering sequences for each site.

You specify the numbering scheme for autonumbering in the Organizations application. To implement the numbering scheme in the organization that you are autonumbering, use the Database Configuration application.

System-level autonumbering

You can specify autonumber seeds and prefixes for applications at the system level.

For example, Incidents is a system-level application. Incident IDs are unique at the system level. If you implement autonumbering for incident records with a seed of 1000, each new incident record increments by one. This increment occurs regardless of where the incident record is entered. If incident 1000 is inserted at site 1 in organization A, and the next incident record is inserted at site 3 in organization B, then the incident number at site 3 will be 1001.

Organization-level autonumbering

If you want all organizations to be part of the same numbering sequence, you can use the Organizations application to implement autonumber seeds and prefixes for organization-level applications.

For example, Calendars is an organization-level application. Calendar IDs are unique at the organization level. If you specify autonumbering for calendars in organization A with a seed of 1000, then each new calendar record increases by one in the organization, regardless of which site generates the calendar. If calendar 1000 is inserted at site 1, and the next calendar record is inserted at site 2, the calendar number at site 2 is 1001.

Site-level autonumbering

If you want all sites in the organization to be part of the same numbering sequence, you use the Organizations application to implement autonumber seeds and prefixes for site-level applications.

For example, Preventive Maintenance is a site-level application and preventive maintenance IDs are unique at the site level. However, you can implement an organization-level sequence. You can choose to have the autonumbering work in the following ways:

- All sites are part of the same sequence. You set the autonumbering for preventive maintenance records and the autonumbering works the same as with an organization-level application. If preventive maintenance 1000 is inserted at site 1, and the next preventive maintenance record is inserted at site 2, the preventive maintenance number at site 2 is 1001.
- You have three sites and you want one to have independent preventive maintenance autonumbering. You want sites 1 and 2 to be on the same autonumber sequence, but you want site 3 to be independent. You set preventive maintenance autonumbering to 1000. You then specify an independent autonumber sequence for site 3.
- You want all sites to have independent preventive maintenance autonumbering. You specify autonumbering for all sites, or you specify autonumbering for all sites except one. The exception is defined by whatever you specify in the Organization Level window.

Set-level autonumbering

In the Organizations application, you can specify autonumber seeds and prefixes for applications at the set level.

For example, Item Master is a set-level application, and item master IDs are unique at the set level. You implement autonumbering for item master records with a seed of 1000. Each new item master record increments by one, regardless of where the item master record is added. If item master 1000 is inserted at site 1 in organization A, and the next item master record is inserted at site 3 in organization B, then the item master number at site 3 is 1001.

ABC breakpoints and organizations

ABC analysis helps you quickly identify which inventory items represent the greatest monetary investment for your company in terms of dollar value and rate of turnover. This analysis ensures that crucial inventory does not fall below minimum levels, and helps keep current balance figures for an item reconciled with the actual count.

The ABC type value for an item is determined by running the Inventory ABC Analysis report. You can run this report from the Inventory application or module. This report multiplies the current year-to-date issued quantity by the last cost of the item. The report sorts the items in descending order of the calculated dollar value.

The types values for A, B, or C are set based on the percentages that you specify in the Organizations application. You can set an ABC type to indicate no category, and that type is excluded from the ABC analysis.

For example, you can use these parameters:

- Type A break point 30% (enter .30)
- Type B break point 30% (enter .30)
- Type C break point 40% (enter .40)

Using these values, the top 30% of items by cost is type A, the next 30% of items is type B, and the last 40% is type C.

The Inventory ABC Analysis report also changes the cycle count for the item, based on the ABC type and the cycle count. If the ABC type is set to N, the cycle count is not changed.

You set the cycle count to the number of days for each ABC type. For example, type A cycle counts can be 30 days, type B cycle counts 60 days, and type C cycle counts 90 days.

You can run the Inventory Cycle Count report to show each item that is due for a cycle count in the next month, together with its ABC type.

Enablement of repair facilities

To create work orders in a site that is different from the site of the asset on the work order, enable the repair facilities feature.

Enablement of repair facilities is useful for transportation assets and other moveable assets. Moveable assets are often serviced on the road, at a repair facility that does not belong to the home site of the asset.

Enablement of the feature means that a repair facility, a special type of location, can take ownership of work orders from multiple sites that are in the same organization. User security can then be configured to give permissions to view work orders in multiple sites if the work orders are owned by the repair facility. When you enable the feature, fields that are related to repair facilities are made visible in the Work Order Tracking application and other affected applications.

The Enable Repair Facilities check box is on the Other Organization Options window in the Organizations application.

If you enable the repair facilities feature, the Bypass Site Mismatch Warning Message check box on the Other Organization Options window becomes read/write. Select the check box to prevent the display of a warning message when a work order is created in a site that is different from the site of the asset on the work order.

Customization options for applications

There are many options and settings that you can customize for your applications in the Organizations application. They include work order options, inventory, purchasing, asset, and preventive maintenance (PM) options. You can access the options from the Select Action menu or the More Actions section of the side navigation menu.

Table 1. Customization options

Options	Description
Work orders	Defines and changes work types and work order types for classes of work orders.
Edit rules	Specifies the work order properties that can be changed for a given work order status. For example, you specify that an asset and a location can be edited when it is approved.
Actual start date for work orders	Specifies whether the actual start date is the date when the work order status is changed to initiate or changed to complete.
Default problem start time	Specifies whether the downtime starts when someone reports the problem or when the problem occurs. The default date and time are shown in the Start field in the Downtime Report window.
Site options	Specifies how to increment task numbering such as the starting number for the first task and the increment value for each task. Task numbering is used on the Plans tab in the Work Order Tracking application
Inventory defaults	Specifies default settings for inventory such as ABC breakpoints, cost and currency variances, and negative current and available balances.

Options	Description
Inventory reorders	Specifies whether an approved or unapproved purchase requisition or purchase order is created when a reorder request is generated. You can also specify the maximum number of reorder lines on a purchase order or purchase requisition.
Inventory costs	Specifies the default issue cost that applies when an item is issued from a selected site.
Transfer options	Specify whether a shipment record is required to transfer items.
Purchasing defaults	Specify default settings for the purchasing life cycle such as whether a PR must be approved before it is converted to a PO or contract. You can also specify if costs can be added to or modified for line items.
Purchase order labor	Specify whether a purchase order is required to approve internal labor.
Tax options	Specify the default tax general ledger accounts and tax codes to calculate the amount of tax that is due on a purchase requisition, request for quotation, purchase order, or invoice at the organization level. You can also specify the order in which tax codes are used.
Contract options	Specify contract options such as contract types, and the terms and properties that are associated with contract types.
Invoice options	Specify default settings for invoices such as whether to validate the financial period when you save an invoice. You can also copy the invoice date specified by the vendor to the General Ledger (G/L) posting date.
Asset options	Specify whether to record asset history when the status of a work order changes to complete or to closed.
Drilldown options	Specify how a drilldown opens for locations and assets. Specify that the drilldown top level starts at the top-level location or asset.
Preventive maintenance (PM) options	Specify general preventive maintenance (PM) options such as whether the priority entered on job plans is used to sequence PMs. You can also specify whether the frequency criteria on a PM is used to generate work orders. You can also provide the lead time in days between when an automatically generated work order is created and when the preventive maintenance is scheduled.
Safety plan options	Specify whether data for hazards is available with the work assets data in the Safety Plans application.
Labor options	Specify default settings for labor transactions such as the approval process for internal and external labor. You can also specify whether craft and labor can be different or must match when you report actuals.
Global ticket solutions options	Specify whether solutions for global tickets are automatically applied to related global tickets.
Service level agreement options	Specify how you want to match service level agreements (SLAs) to records for example, one or multiple SLAs. You can also specify the target dates to apply to a record.
Workflow options	Specify workflow processes for work orders, purchase requisitions, and purchase orders.
System settings	Specify general system settings such as the default start and end dates, and the format of names. You can also specify the character that represents the unspecified general ledger components in an account code.

- [Taxes for organizations](#)
You can specify default tax general ledger accounts and tax codes to calculate the amount of tax that is due on a purchase requisition, request for quotation, purchase order, or invoice. You can also specify the order in which tax codes are used in calculations.
- [Drilldown options](#)
Drill-down options specify how a Drilldown window opens. The drill-down options apply to applications in which both the Location field and the Asset field on a record are blank. The options also apply to the Open Drilldown action in the Assets application.

Taxes for organizations

You can specify default tax general ledger accounts and tax codes to calculate the amount of tax that is due on a purchase requisition, request for quotation, purchase order, or invoice. You can also specify the order in which tax codes are used in calculations.

A tax type can be, for example, a federal, state, or city sales tax. Another tax type might be a special tax for handling hazardous material.

A tax code represents a particular tax rate, such as MA for the Massachusetts sales tax of 5%. Therefore, one tax type might include tax codes for all state or provincial sales taxes.

The requirements of your financial system determine how you specify the tax types, and also how many tax types you use. In the Tax Options window of the Organizations application, the default number of tax types that you can view is five. If your financial requirements dictate additional tax types, you can use the Database Configuration application to specify up to 27 different tax types. Each tax type can have any number of tax codes.

If your financial system uses one, you can specify a general ledger account for paid and unpaid taxes.

Taxes paid

Taxes paid to vendors

Unpaid taxes

Taxes not yet paid to the government

Adding taxes to the cost of an item increases the stocked item average cost for that item. To avoid this increase, you can add the tax to issue on receipt items only. For items issued directly to a work order, general ledger account, location, or asset, the tax is only added to the cost of the individual item.

Drilldown options

Drill-down options specify how a Drilldown window opens. The drill-down options apply to applications in which both the Location field and the Asset field on a record are blank. The options also apply to the Open Drilldown action in the Assets application.

The standard drill-down function includes two options:

Top Level Starts at Top Level Location (Start at Top Location in Primary System)

The Drilldown window opens to the Location tab, and begins with the top-level location of the primary system. This option is useful for organizations with many asset records that use location hierarchies to organize these records.

Top Level Starts at Top Level Asset (Show All Assets without Parent)

The Drilldown window opens to the Asset tab. This option is useful when asset records are organized into a hierarchy with a few top-level asset records. If the organization has many top-level asset records, selecting this option might slow or hinder performance when you display the records.

If you enable the extended drill-down view that displays both assets and locations in a single hierarchy, the Drilldown window does not display tabs. For related information, see [Extended drill-down view for assets displays top-level system location when an asset is blank](#).

Working with organizations

You can set up the organizations and sites that you use. You can set defaults for various options that are related to applications or groups of applications, such as Work Order Tracking, Inventory, Purchasing, Preventative Maintenance, Assets, and so on.

- [Creating organizations](#)
In the Organizations application, you create the organizations to use with the system. Each organization can have multiple sites.
- [Clearing material reservations for work orders](#)
To customize organization properties specific for your business needs, you can specify when to clear the material reservation for a work order.
- [Specifying options for work orders and ticket owners](#)
In the Organizations application, you can determine the behavior of the Select Owner action in the Work Order Tracking application and in several service desk applications. You can specify whether there is a value in the Date field in these applications, and if the list of persons is filtered according to availability.
- [Setting purchasing options](#)
You can customize purchasing options for your specific business needs.
- [Specifying autonumbering for applications](#)
You can specify autonumber seeds and prefixes for applications at the system, organization, site, and set levels so that all sets in an organization use the same numbering sequence.
- [Displaying user messages](#)
You can specify when users are prompted by user interface (UI) messages to provide them with information.

Creating organizations

In the Organizations application, you create the organizations to use with the system. Each organization can have multiple sites.

Before you begin

You must create at least one organization and one site. Before you create the first organization, use the Currency Codes application to create at least one currency code. You cannot change the base currency after you save the record. Use the Sets application to create at least one item set and one company set. Use the Chart of Accounts application to create a general ledger account. Multiple organizations can use the same item set or company set.

About this task

Multiple organizations and sites can use the same database, while certain business procedures and information remain specific to the individual organizations and sites. After you save an organization record, you cannot edit the item or company set. After you add a site to the organization and save the record, you cannot edit base currency 1.

Procedure

1. In the Organizations application, click New Organization.
 2. Type a name for the organization.
 3. Specify base currency code 1 for your base currency.
 4. Optional: Specify base currency 2.
 5. Specify the item set and the company set that you want to associate with this organization.
 6. In the Default Item Status field, select the status that you want new item master, service item, and tool records to have.
 7. Click Save Organization.
- [Activating organizations](#)
When you create an organization, it is inactive by default. To allow users to interact with an organization, you must activate it.
 - [Deleting organizations](#)
As your business needs change, you can delete the organizations that you created.

Activating organizations

When you create an organization, it is inactive by default. To allow users to interact with an organization, you must activate it.

Before you begin

To activate an organization, you must first create the account in the Chart of Accounts application. This process includes creating general ledger component values and general ledger codes, and activating general ledger components.

About this task

You can activate any sites that are inactive.

Procedure

1. In the Organizations application, select the organization that you want to activate.
2. On the Organization tab, in the Clearing Account field, specify the account code that you created in the Chart of Accounts application.
3. Select the Active check box.

Deleting organizations

As your business needs change, you can delete the organizations that you created.

About this task

You can delete an organization only if it has no sites associated with it.

Procedure

1. On the List tab in the Organizations application, select the relevant organization.
2. Select the Delete Organization action.
3. Save your changes.

Clearing material reservations for work orders

To customize organization properties specific for your business needs, you can specify when to clear the material reservation for a work order.

Procedure

1. In the Organizations application, select an organization.
2. Select the Work Order Options > Other Organization Options action.
3. In the Other Organization Options window, specify whether to clear the material reservation when the work order status changes to either Complete or to Closed.
4. Click OK.

Specifying options for work orders and ticket owners

In the Organizations application, you can determine the behavior of the Select Owner action in the Work Order Tracking application and in several service desk applications. You can specify whether there is a value in the Date field in these applications, and if the list of persons is filtered according to availability.

Procedure

1. In the Organizations application, select the organization for which you want to specify ownership options.
2. Select the Ownership Assignment Options action.
3. In the Ownership Assignment Options window, select a site.
4. Select one of the following options.

Option	Description
Do not check Person Availability	In the Work Order Tracking application and relevant service desk applications, the Date field is blank and the list of persons is not filtered by availability.
Check Person Availability	In the Work Order Tracking application and relevant service desk applications, the Date field is populated. The list of persons is filtered by availability at that date, according to calendars.

5. Click OK.

Setting purchasing options

You can customize purchasing options for your specific business needs.

- [Associating properties with contracts for organizations](#)
You can associate properties with a contract.
- [Associating terms and conditions with contracts for organizations](#)
You can associate terms and conditions with a contract.
- [Specifying options for invoices](#)
You can specify the invoice date as the start of the financial period. The invoice date and the general ledger posting date are matched, because the general ledger posting date is replaced with the invoice date. You can also specify that financial period validation is performed each time an invoice is saved.

Associating properties with contracts for organizations

You can associate properties with a contract.

Procedure

1. In the Organizations application, select the relevant organization.
2. On the Organization tab, select the Purchasing Options > Contract Options action.
3. In the Contract Options window, select the contract type.
4. Click Associate Properties.
5. In the Associate Properties window, select a property to associate with the contract type.
6. Optional: Specify a default value for the property and specify whether the property can be edited.
7. Click OK.

Associating terms and conditions with contracts for organizations

You can associate terms and conditions with a contract.

Before you begin

The terms and conditions that you associate are derived from values in the Terms and Conditions application.

Procedure

1. In the Organizations application, select the relevant organization.
2. On the Organization tab, select the Purchasing Options > Contract Options action.
3. In the Contract Options window, select the contract type.
4. Click Associate Terms.
5. In the Associate Terms and Conditions window, click New Row.
6. In the Terms field, specify a value.
7. Click OK.

Specifying options for invoices

You can specify the invoice date as the start of the financial period. The invoice date and the general ledger posting date are matched, because the general ledger posting date is replaced with the invoice date. You can also specify that financial period validation is performed each time an invoice is saved.

About this task

If the value specified in the Invoice Date field is not a valid financial period, the value in the G/L Posting Date field is updated to the start date of the next open financial period.
For consignment invoices, you can specify the maximum number of lines that can be included on the invoice for the vendor that is replenishing the consignment items. When the default maximum number of lines specified is reached, a consignment invoice is automatically created.

Procedure

1. In the Organizations application, select the organization for which you want to set invoice options.
2. From the Select Action menu, select Purchasing Options > Invoice Options.
3. In the Invoice Options window, specify whether you want the G/L Posting Date field to be updated with the date in the Invoice Date field.
4. Specify whether you want the financial period validated each time an invoice is saved. Clear this option if you want the financial period validated when the invoice is approved.
5. For consignment types of invoices, specify the maximum number of lines that can be included on the invoice for a specific vendor. The default maximum number of lines is 40.
6. Click OK.

Specifying autonumbering for applications

You can specify autonumber seeds and prefixes for applications at the system, organization, site, and set levels so that all sets in an organization use the same numbering sequence.

About this task

To create an autonumber or to attach an autonumber to a field, use the Database Configuration application.

Procedure

1. In the Organizations application, select the organization for which you want to set up autonumbering.
 2. Select the System Level, Set Level, Organization Level, or Site Level action.
 3. Specify the values for the appropriate level:
 - For the system level, set level, and organization level, specify or change values for the seed.
 - For the site level, specify or change values for the autonumber name and seed.
 4. Optional: To have the autonumber preceded by a standard value, specify a value for prefix.
For example, **IN** (for incident) can precede the autonumber.
 5. Click OK.
- [Specifying autonumbering for special order items](#)
Special order items are not kept in stock in the inventory, therefore, they do not have inventory item numbers. You must order these items by description.

Specifying autonumbering for special order items

Special order items are not kept in stock in the inventory, therefore, they do not have inventory item numbers. You must order these items by description.

Procedure

1. In the Organizations application, select the organization for which you want to specify autonumbering.
2. Select the Purchasing Options > PO Options action.
3. In the PO Options window, select Allow the Generation of Special Order Items.
4. Click OK and save your changes.

Displaying user messages

You can specify when users are prompted by user interface (UI) messages to provide them with information.

About this task

For assets that are down, if downtime was already reported, the message does not appear. Duplicate problem messages are displayed by default for assets and locations.

Procedure

1. In the Organizations application, select the relevant organization.
2. Select the Work Order Options > Other Organization Options action.
3. Specify the details you want to display to users:
 - To display asset status information after a user completes or closes a work order, and when the asset status is still down, select the Display Downtime Report Prompt upon WO Completion for Asset in a 'Down' Status check box.
 - To display a warranty message when a user enters an asset under warranty on a work order, select the Display Warranty Status check box.
 - To display a duplicate problem message when a duplicate problem is reported on an asset or on a location, select the On Asset or On Location check boxes.
4. Click OK.

Managing calendars

You can create and change calendars for organizations and for sites. You can create calendars to define working times as well as shifts. A calendar can also specify non-working time, such as weekends, holidays, and shutdowns.

- [Calendars overview](#)
Calendars are shared entities that define the framework for shifts, holidays, and so on, for organizations. A calendar can also specify non-working time, such as weekends, holidays, and shutdowns.

- [Working with calendars](#)

You can create multiple calendars for an organization to manage shifts, working time, and non-working time.

Calendars overview

Calendars are shared entities that define the framework for shifts, holidays, and so on, for organizations. A calendar can also specify non-working time, such as weekends, holidays, and shutdowns.

- [Shift patterns for calendars](#)
A shift defines working time that is not specific to a date. You choose the working days, then you designate the start time and end time for work.
- [Exceptions to the standard calendar](#)
Information for individuals, such as vacation days, sick leave, personal time, and overtime, is not stored on the main calendar record.

Shift patterns for calendars

A shift defines working time that is not specific to a date. You choose the working days, then you designate the start time and end time for work.

Once a shift is defined, you can apply it to a calendar. You can then apply the calendar to person, location, asset, and other records to specify working time.

Most shift patterns use a seven day pattern. Most patterns start with Sunday, or are multiples of seven, such as 14 days or 21 days, with a Monday start day. In some companies, there are unique circumstances for which a five day or other pattern might be used. You can create shift definitions that do not reflect the typical working time at your company, but would be useful for special work situations.

You use the Define Pattern action to create shift patterns. The number of days in the pattern specifies the block of days that repeat. If you use a number that is not a multiple of 7, the pattern does not repeat on the same days of the week. For example, with a 15-day pattern of 10 days on and 5 days off, the second instance of the shift starts on a different day than the first.

Example 1: Creating a shift

You can create a shift called first, which has the following properties:

- Working days are Monday through Friday.
- Work starts at 7:00 a.m. and ends at 3:00 p.m.
- Work hours for the day total 8.

Example 2: Creating a rotating shift

You can create a 21-day rotating shift, called shift A. The shift details are as follows:

- Working days are Monday through Friday.
- Work hours for the day total 8.
- During week 1, work starts at 7:00 a.m. and ends at 3:00 p.m. The description is Day, and the Pattern Day value is D.
- During week 2, work starts at 3:00 p.m and ends at 11:00 p.m. The description is Evening, and the Pattern Day value is E.
- During week 3, work starts at 11:00 p.m. and ends at 7:00 a.m. The description is Night, and the Pattern Day value is N.

Exceptions to the standard calendar

Information for individuals, such as vacation days, sick leave, personal time, and overtime, is not stored on the main calendar record.

You can use the following applications and icons to enter exceptions to the standard calendar:

People

Modify Person Availability

Assignment Manager

Modify Availability

The system combines the standard calendar assignments and the exceptions to determine the availability of a person for a given day, shift, and so on.

Working with calendars

You can create multiple calendars for an organization to manage shifts, working time, and non-working time.

- [Creating calendars](#)
You can create calendars to define working time with a start date and an end date, as well as shifts. A calendar can also specify non-working time, such as weekends, holidays, and shutdowns.
- [Specifying shifts in calendars](#)
To customize shifts for your business needs, you can define shifts and apply them to calendars.
- [Applying shifts to calendars](#)
In the Calendars application, you can specify the range of dates over which you want to apply shifts. You can apply the shifts to the entire period defined for the calendar or for a shorter period.

- [Specifying shift patterns in calendars](#)
To customize shift patterns for your business needs, you can specify the hours in a shift for each day in a pattern.
- [Specifying shift breaks in calendars](#)
To customize shifts for your business needs, you can specify shift breaks.
- [Copying calendars](#)
The easiest way to create a calendar that is like an existing one is to copy the existing one and change the copy as needed.
- [Deleting calendars](#)
If you are no longer using a calendar, you can delete it.
- [Establishing work periods](#)
You can create work periods for a given date and then customize the work period to suit your business needs. You can also modify work periods, and specify non-working time for work periods.

Creating calendars

You can create calendars to define working time with a start date and an end date, as well as shifts. A calendar can also specify non-working time, such as weekends, holidays, and shutdowns.

Before you begin

Your default insert site must be in the organization for which you want to create the calendar. To check and change your default insert site, use the Profile > Default Information link in the toolbar.

About this task

The calendars that you create are for the organization of your default insert site.

Procedure

1. In the Calendars application, click New Calendar.
2. Type a name for the calendar.
3. Optional: Type a description for the calendar.
4. Specify the dates on which you want the calendar to start and end.
5. Save your changes.

What to do next

You created a calendar without shifts, work periods, holidays, or other details. Use the Define/Apply Shifts action to add shifts and the Define/Apply Non-Working Time action to add holidays and other non-working time. Use the People application to change person availability and the Assignment Manager application to change availability. In the calendar header, you can change the calendar description, start date, and end date.

Specifying shifts in calendars

To customize shifts for your business needs, you can define shifts and apply them to calendars.

Procedure

1. In the Calendars application, select the calendar for which you want to define a new shift.
2. Select the Define/Apply Shifts action.
3. In the Define/Apply Shifts window, click New Row.
4. Type a name for the shift.
5. Optional: Type a description for the shift.
6. Specify the day on which you want the pattern to begin.
7. Type the number of days in the pattern.
For example, the typical weekly patterns are seven days long, but you might need a 10-day, 14-day, or other pattern.
8. Optional: Define a pattern and apply the shifts to the calendar.
9. Click OK.
The Define/Apply Shifts window opens with the details in the Shift Pattern table window.

Applying shifts to calendars

In the Calendars application, you can specify the range of dates over which you want to apply shifts. You can apply the shifts to the entire period defined for the calendar or for a shorter period.

Procedure

1. In the Calendars application, select the calendar for which you want to apply a shift.
2. Select the Define/Apply Shifts action.
3. In the Define/Apply Shifts window, click Apply Shift(s).
4. In the Apply Shifts with Range window, select one of the following ranges.

Option	Description
Entire Calendar	The start date and end dates reflect the dates specified for the calendar, but are read-only.
Selected Dates	The start date and end dates defined for the calendar are inserted. Change these dates, if necessary.

5. Click OK.

Specifying shift patterns in calendars

To customize shift patterns for your business needs, you can specify the hours in a shift for each day in a pattern.

Before you begin

After you create a shift, you can specify a shift pattern.

Procedure

1. In the Calendars application, select the calendar for which you want to apply a shift.
2. Select the Define/Apply Shifts action.
3. In the Define/Apply Shifts window, click Define Pattern.
4. For the first work day in the pattern, specify the time the work period on that day starts and ends.
When you move the cursor to the Work Hours field, the work hours are calculated as the interval between the two times.
5. Optional: Specify a different value for work hours.
6. Specify the start time and end time for the remaining work days. To copy the values from one day to the other days, click Fill Out Work Days Data.
7. Click OK.

Specifying shift breaks in calendars

To customize shifts for your business needs, you can specify shift breaks.

Before you begin

After you create a shift, specify a shift pattern. Then, set up shift breaks to reflect the actual availability of your labor and crews for each shift.

Procedure

1. In the Calendars application, select the calendar for which you want to apply a shift.
2. From the Actions menu, select Define/Apply Shifts.
3. In the Define/Apply Shifts window, ensure that shifts and shift patterns are defined for the calendar.
4. In the Shift table, select the shift that you want to define shift breaks for.
5. In the Shift Pattern table, select the shift pattern that you want to define shift breaks for.
6. In the Shift Breaks table, click New Row.
7. In the Break field, click Select Value and choose the kind of shift break that you want to create.
8. Specify the start time and end time for shift break.
9. From the Actions menu, select one of the following options.

Option	Description
Apply Breaks	Applies the shift break to all patterns in the shift. Labor and crew availability is not modified.
Clear Breaks	Clears all shift breaks from all patterns in the shift. Labor and crew availability is updated to reflect the changes.
Apply Work Breaks	Modifies the availability of all labor and crews that are assigned to the shift. Labor/crews appear unavailable during the specified shift break for every instance of the defined calendar/shift/pattern day.
Clear Work Breaks	Updates the availability of all labor and crews that are assigned to the shift. The shift breaks remain in place in the Calendar application, but modified availability records are cleared for all labor and crews assigned to the shift.

10. Click OK to close the Define/Apply Shifts window.

Copying calendars

The easiest way to create a calendar that is like an existing one is to copy the existing one and change the copy as needed.

Procedure

1. In the Calendars application, select the calendar that you want to copy.
2. Select the Duplicate Calendar action.

3. Type a name for the new calendar.
4. Optional: Type a description for the calendar. The default is the description on the calendar that you copied.
5. Save your changes.
When you save the new calendar, all shift and non-working time information is copied from the old calendar.

Deleting calendars

If you are no longer using a calendar, you can delete it.

About this task

You cannot delete a calendar if it is used on any of the following types of records:

- Asset
- Asset status
- Personal calendar
- Service level agreement
- Preventive maintenance
- Job plan
- Location
- Work order

Procedure

1. In the Calendars application, select the calendar that you want to delete. You can select only one calendar at a time for deletion.
2. Select the Delete Calendar action.
3. Click Yes.

Establishing work periods

You can create work periods for a given date and then customize the work period to suit your business needs. You can also modify work periods, and specify non-working time for work periods.

- [Creating work periods](#)
A work period represents a single shift applied to a specific date. You can create work periods for a given date and then customize the work period to suit your business needs.
- [Changing work periods](#)
A work period represents a single shift applied to a specific date. To customize work periods for your business needs, you can change work periods for a given date.
- [Specifying non-working time for work periods](#)
You can define non-working time, such as holidays and shut downs, or any other non-working time that you want to apply to a work period.

Creating work periods

A work period represents a single shift applied to a specific date. You can create work periods for a given date and then customize the work period to suit your business needs.

Procedure

1. In the Calendars application, select the calendar for which you want to create work periods.
2. Click the Work Periods tab.
All work periods for the entire calendar display, including all dates with defined work hours or defined non-working time.
3. Click New Row.
4. Specify values for work date, shift, start time, end time, and work hours.
5. Optional: Add a note.
6. Save your changes.

Changing work periods

A work period represents a single shift applied to a specific date. To customize work periods for your business needs, you can change work periods for a given date.

About this task

You cannot change a non-working time period. However, you can delete it.

You also can change work periods from the Calendar tab. On the date for which you want to change working time, click the hours value and make the necessary changes.

Procedure

1. In the Calendars application, select the calendar that you want to change.
2. Click the Work Periods tab.
All work periods for the entire calendar are displayed, including all dates with defined work hours or defined non-working time.
3. Find the row with the work period that you want to change.
4. Change the start time, end time, work hours, and notes.
5. Save your changes.

Example

If you have a corporate calendar, and you want to change the work period for a single shift for a single date because the company is closing early, you change the shift for that date.

Specifying non-working time for work periods

You can define non-working time, such as holidays and shut downs, or any other non-working time that you want to apply to a work period.

Procedure

1. In the Calendars application, select the calendar for which you want to define non-working time.
2. Select the Define/Apply Non-Working Time action.
3. In the Define/Apply Non-Working Time window, click New Row.
4. Optional: Type a description for the non-working time.
5. Specify a start date and end date. For non-working time that occurs on one day, the start date and the end date are the same.
6. Specify a value for type.
7. Click Apply.
8. Click OK.

Managing classifications

You can use classifications to simplify the task of managing and of retrieving historical data from other applications. You can use classifications to align with external standards, such as vendor standards and industry standards. You can also use classifications to define the escalation path for incidents.

- [Classifications overview](#)
Classifications identify and characterize similar objects. A building, a notebook computer, and a centrifugal pump are types of classifications. A classification can also describe an event, such as a broken window or a hard disk failure. You use the Classifications application to create classifications and to establish classification hierarchies.
- [Working with classifications](#)
You can create classifications, and specify details about the attributes of classifications. You can search classification structures and attributes that have associated values when you use any record type that can be classified. You can also define associations between actual configuration item (CI) classifications and authorized CI classifications.

Classifications overview

Classifications identify and characterize similar objects. A building, a notebook computer, and a centrifugal pump are types of classifications. A classification can also describe an event, such as a broken window or a hard disk failure. You use the Classifications application to create classifications and to establish classification hierarchies.

- [Classification paths and hierarchies](#)
You can develop a classification structure by joining two or more classifications into a hierarchy. In a classification hierarchy, the next level up is called the parent, and the next level down is called the child. Each child (which is also a classification) can become a parent and can have its own child levels. This pattern can continue indefinitely. The structure from the top-level parent to the child is called the classification path.
- [Generate Description option](#)
On the Classifications tab of the Classifications application, the Generate Description option and the Use Classification option provide varying results. The results depend on the option that you select.
- [Associations of records with classifications](#)
You can associate types of records, such as assets, items, or solutions, with specific classifications. You modify the Use With settings in the Classifications application to associate records with classifications.
- [Classification searches](#)
You can search classification structures and attributes that have associated values. You can search for values in records that you created for items, locations, configuration items, work orders, tickets, and so on.
- [Actual and authorized configuration item classifications](#)
You can define associations between actual configuration item (CI) classifications and authorized CI classifications.

- **Attributes of classifications**
You use attributes to define the characteristics of classifications. For example, for a classification of pump, you can have an attribute of horse power. For a classification path of PROBLEM\COMPUTER, you can have an attribute of memory size.
- **Classifications planning**
You create classifications to retrieve information later. Before you create a classification, determine the information that you want to retrieve. You can base your classification structure on how you group objects in your enterprise. You can also use classifications to define the escalation path for incidents.

Classification paths and hierarchies

You can develop a classification structure by joining two or more classifications into a hierarchy. In a classification hierarchy, the next level up is called the parent, and the next level down is called the child. Each child (which is also a classification) can become a parent and can have its own child levels. This pattern can continue indefinitely. The structure from the top-level parent to the child is called the classification path.

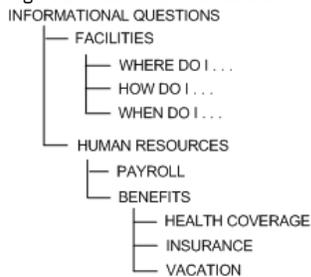
You can also use a numbering system in which a number describes the position of the classification in the classification structure. The number of digits describes the level in the hierarchy. Numbering systems are suitable only if they are not subject to change, because the identifier of the classification (PUMP, 30612456, ROTARY) cannot be changed. The identifier can be deleted only if it is not used in a classification hierarchy.

Example of a request for information

Someone calls the service desk to get information about the facilities. The service desk uses classifications to categorize the ticket as an informational request. The ticket is associated with the classification path INFORMATIONAL QUESTIONS \ FACILITIES \ WHERE DO I...

10 minutes later, the service desk receives a call about health coverage. The service desk can use the same classification structure to categorize both incidents. The following figure shows a classification structure that uses the example of a request for information.

Figure 1. Classification structure - example of a request for information



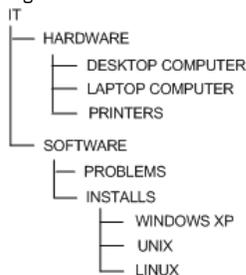
Example of a request for software installation

Someone contacts the service desk and requests a Microsoft Windows XP installation. A service request and change ticket are created. The ticket is associated with the classification path IT \ SOFTWARE \ INSTALLS \ WINDOWS XP Professional.

10 minutes later, the service desk receives a printer-related call. The service desk can use the same classification structure to classify the printer incident ticket as was used to categorize the earlier request.

The following figure shows a classification structure that uses the example of a request for software installation.

Figure 2. Classification structure - example of a request for software installation



Generate Description option

On the Classifications tab of the Classifications application, the Generate Description option and the Use Classification option provide varying results. The results depend on the option that you select.

The following table describes the results of using these options.

Option	Result
--------	--------

Option	Result
Select Generate Description only	The description that is provided in the Description field for the record, such as an asset record, that uses the classification is overwritten. The description is replaced with the attribute values that are entered in the Specifications tab of the record. Included in the description are the units of measure that are specified in the Attributes window of the Classifications tab. You can view generated descriptions in the application with which the record is associated, such as the Assets application.
Select both Generate Description and Use Classification	The description in the application with which the record is associated is overwritten with the identifier for the classification. The description is also overwritten with the values that are entered in the Specifications tab, and the units of measure that are specified in the Attributes window of the Classifications tab.

Associations of records with classifications

You can associate types of records, such as assets, items, or solutions, with specific classifications. You modify the Use With settings in the Classifications application to associate records with classifications.

The Select Value windows that display the classification can also be associated by the Use With settings.

You can tailor the attributes of a classification for each object that you want to use with it. You use the Attributes window to associate the attributes of classifications with specific objects.

Classification searches

You can search classification structures and attributes that have associated values. You can search for values in records that you created for items, locations, configuration items, work orders, tickets, and so on.

Example of a classification search

Your company created classifications for the following fields:

- Name
- Affected by (name)
- Asset
- Location
- Service Groups
- Service

When you create a service request record, you enter values in the Name field, and in the Asset field. You also enter values in the Location field, the Service Groups field, and the Service field. You can use the navigation tree in the Classification Search window to view the values that are associated with the classification structures and their attributes.

The classification hierarchy that is shown varies depending on the application or the field from which you access the window. The navigation tree shows classifications that can be used with a specific type of record.

Actual and authorized configuration item classifications

You can define associations between actual configuration item (CI) classifications and authorized CI classifications.

- [Actual configuration items](#)
An actual configuration item is an item that is loaded into the Actual Configuration Items application from the discovery engine using the IBM® Tivoli® Integration Composer. You can load configuration items into the database from a discovery engine or an asset management database. First load your configuration item data into the discovery engine using the bulk loader interface.
- [Authorized configuration items](#)
An authorized configuration item is an item that conforms to rules and relationships that you define in the Configuration Items application. These configuration items are items that you want to maintain under configuration management and change control.
- [Actual configuration item classifications and authorized configuration item classifications](#)
You use the Classifications application to define associations between actual configuration item (CI) classifications and authorized CI classifications. You can create an authorized CI from an actual CI record when you define these associations. You can include the number of attributes that you need for configuration management and change control.

Actual configuration items

An actual configuration item is an item that is loaded into the Actual Configuration Items application from the discovery engine using the IBM® Tivoli® Integration Composer. You can load configuration items into the database from a discovery engine or an asset management database. First load your configuration item data into the discovery engine using the bulk loader interface.

- [Actual configuration item details](#)

For configuration items that are based on actual configuration items, you can use the Configuration Items application to view detailed information that is in the Actual Configuration Items application.

Authorized configuration items

An authorized configuration item is an item that conforms to rules and relationships that you define in the Configuration Items application. These configuration items are items that you want to maintain under configuration management and change control.

When you create an authorized configuration item, it can be linked to an actual configuration item record. You can also create an authorized configuration item that is independent of any actual configuration item record, because not all configuration items need to work with the discovery engine. You can create a link between the authorized configuration item and the actual configuration item in the Configuration Items and Actual Configuration Items applications.

Actual configuration item classifications and authorized configuration item classifications

You use the Classifications application to define associations between actual configuration item (CI) classifications and authorized CI classifications. You can create an authorized CI from an actual CI record when you define these associations. You can include the number of attributes that you need for configuration management and change control.

You create an authorized classification hierarchy that maps to an actual classification hierarchy. You typically create partial mappings between the two classifications, rather than a complete mirror image. When creating an authorized CI from an actual CI you can create authorized configuration items. These items are created for the child classifications that have a containment relationship with the actual CI.

You use the discovery tool to discover actual configuration items in your environment. The number of actual configuration items that are discovered by the discovery tool is likely to be greater than the number of authorized configuration items for which you want to create records or to use. By mapping one hierarchy to another, you can limit the number of actual configuration items that you link to authorized configuration items. For example, an actual configuration item hierarchy has five levels. You can create authorized configuration item records for the top three levels of actual configuration items.

Attributes of classifications

You use attributes to define the characteristics of classifications. For example, for a classification of pump, you can have an attribute of horse power. For a classification path of PROBLEM\COMPUTER, you can have an attribute of memory size.

You can further define attributes by domain. A classification attribute can be tied to an ALN domain, to a numeric domain, or to a table domain. You can validate an attribute against the values in a particular database column by using a table domain.

You define domains using the Domains application.

- [Groupings of attributes](#)

You can group attributes into sections so that you can use the same attribute multiple times.

- [Apply Down Hierarchy option](#)

When you add an attribute to a classification, you can use the Apply Down Hierarchy option. When you check this box, the attribute that is assigned to that classification is added to the classifications that are below it in the hierarchy.

Groupings of attributes

You can group attributes into sections so that you can use the same attribute multiple times.

Example of an attribute grouping

For example, you define a pipe in the system as an asset. The pipe has the following characteristics:

- It is 80 feet (~25 m) long.
- It contains 10 sections of equivalent length.
- It has an interior diameter that narrows at one end of the pipe.

Because of the taper, the walls of the pipe must be thicker at the narrow end to withstand the higher pressure. Each section has a different average interior diameter and wall thickness. Therefore, the attribute is the interior diameter.

Related concepts

- [Apply Down Hierarchy option](#)

Apply Down Hierarchy option

When you add an attribute to a classification, you can use the Apply Down Hierarchy option. When you check this box, the attribute that is assigned to that classification is added to the classifications that are below it in the hierarchy.

The Inherited From field indicates that the attribute is associated with a classification that is higher up in the hierarchy. The Inherited From field displays the classification where an attribute originated.

Related concepts

- [Groupings of attributes](#)

Classifications planning

You create classifications to retrieve information later. Before you create a classification, determine the information that you want to retrieve. You can base your classification structure on how you group objects in your enterprise. You can also use classifications to define the escalation path for incidents.

- **Types of records to be classified**
You can use the Classifications application to store information about different types of records. You can classify application records and search for the records that you classified.
- **Categories of items for reporting**
You can organize your classification structures into categories or groups of items for reporting. You can create unlimited classification levels.
- **Industry codes**
You can apply industry codes when you create classifications. You can get a list of the codes that you frequently use in your enterprise, and apply them to your classifications.

Types of records to be classified

You can use the Classifications application to store information about different types of records. You can classify application records and search for the records that you classified.

You can classify the following types of records:

- Assets
- Items
- Locations
- Solutions
- Tickets (service requests, incidents, and problems)
- Work orders (activities, changes, and releases)

Categories of items for reporting

You can organize your classification structures into categories or groups of items for reporting. You can create unlimited classification levels.

You can organize information into top-level categories, such as the following categories:

- Information Technology assets
- Production assets
- Facility assets
- Fleet assets

You can work from the top-level categories into the more detailed levels. For example, fleet assets can contain 18-wheel trucks, and sales fleet cars.

Another example is to categorize the service desk call for a software installation differently than the service desk call for information. This type of categorization helps to determine how many customers complained about a software installation as opposed to how many calls were about health coverage.

Industry codes

You can apply industry codes when you create classifications. You can get a list of the codes that you frequently use in your enterprise, and apply them to your classifications.

Example of using an industry code

If your company does vehicle or code maintenance, you can use the vehicle maintenance industry standard codes. In the United States, most mechanics know that an oil change is code 42-3-2. You can use the same code when you create a classification for an oil change, or use the code that applies in your country.

Working with classifications

You can create classifications, and specify details about the attributes of classifications. You can search classification structures and attributes that have associated values when you use any record type that can be classified. You can also define associations between actual configuration item (CI) classifications and authorized CI classifications.

- **[Creating classifications](#)**
You classify information to categorize it logically, so that the information is easier to find. You can classify different types of records, such as location records, asset records, item records, and work order records.
- **[Associating attributes with records](#)**
You can specify detailed information about the attributes of a classification. You can enter attribute details about each record that you want to use with a classification.
- **[Modifying classifications](#)**
You can change classifications by modifying the information for the classification. You can also modify a classification by adding a classification to an existing classification to create a hierarchy for the top-level classification.
- **[Searching for classifications from application records](#)**
You can search classification structures and attributes with associated values when you use any record type that can be classified. Record types include assets, items, locations, configuration items, work orders, and tickets.
- **[Defining associations between actual and authorized configuration item classifications](#)**
You can define associations between actual configuration item (CI) classifications and authorized CI classifications. When you map associations, you create an authorized CI record from an actual CI record.
- **[Adding units of measure](#)**
You can specify or change the units of measure that you use when ordering and issuing items. Any units of measure that you add become available in the product for use with all items.
- **[Configuring the signature option to enable classification images](#)**
Signature options, which are defined in the Security Groups application, are used control access to functions in applications. By using signature options, you can grant access to specific groups of users. In the Classifications application, you can select images that represent asset classifications that are used.

Creating classifications

You classify information to categorize it logically, so that the information is easier to find. You can classify different types of records, such as location records, asset records, item records, and work order records.

About this task

To make a classification available for every organization and site, leave the Site and Organization fields blank.

Procedure

1. From the application toolbar of the Classifications application, click New Classification.
2. In the Classification field, specify a classification.
3. Specify the information for the new classification.
4. Optional: To specify the records that you want to use with the classification, click New Row in the Use With table and add one or more records.
5. To add child classifications, click New Row in the Children table.
6. Optional: To add attributes, insert rows and complete the fields in the Attributes table. For most of the fields, click Select Value to select from existing values. Alternatively, you can create values, as with the Classification field.
7. Click Save Classification.

Associating attributes with records

You can specify detailed information about the attributes of a classification. You can enter attribute details about each record that you want to use with a classification.

Procedure

1. From the Classifications application, click the Classifications tab.
2. In the Attributes section, click the Use with Object Detail icon on the row for the attribute whose details you want to enter.
3. In the Use With Object Detail window, specify details for the attribute.

Field or column name	Description
Use With Object	The record for which you enabled the classification.

Field or column name	Description
Sequence	The order in which you want the attribute to appear in the list of attributes on the Specifications tab of the related application. For example, the attribute capacity is one of three attributes of a classification that you enabled for the ASSET and WORKORDER records. In the Assets application, the attribute capacity can appear first in the list of attributes. In the Work Order Tracking application, the attribute capacity can appear third.
Mandatory	Makes the attribute a required field in the related application. For example, you can make it a required field in the Assets application, but not in the Work Order Tracking application.
Used in Description Generation	The description of the attribute appears in the description of the classification in the related application.
Used in Specifications	The attribute appears on the Specifications tab of the related application.

4. Optional: Specify a default value for the attribute:
 - a. In the row for the attribute, click View Details for the Use With Object name column.
 - b. In the Details area, specify a default value based on the data type of the attribute.
5. Click OK.

Modifying classifications

You can change classifications by modifying the information for the classification. You can also modify a classification by adding a classification to an existing classification to create a hierarchy for the top-level classification.

Procedure

1. From the Classifications application, click the Classifications tab.
2. Select the Add/Modify Properties > Classifications action.
3. To add a classification to an existing classification, perform the following steps:
 - a. Click New Row.
 - b. Type a unique classification name.
 - c. Type a description, an organization, and a site for the classification.
 - d. Repeat this process for each classification that you want to add.
4. To modify a classification:
 - a. Select the classification that you want to modify.
 - b. Modify the information for the classification.
5. Click OK.

- **Modifying attributes**

You use attributes to define the characteristics of classifications. You can modify the properties of attributes. You can then associate the attributes with classifications.

- **Adding attributes**

You can add attributes. You can then associate the attributes with classifications. You can use attributes with many record types, such as asset records, location records, and item records.

Modifying attributes

You use attributes to define the characteristics of classifications. You can modify the properties of attributes. You can then associate the attributes with classifications.

Procedure

1. From the Classifications application, click the Classifications tab.
2. On the Classifications tab, select the Add/Modify Properties > Attributes action.
3. From the Attributes area of the Classifications tab, find the attribute that you want to modify.
4. Edit the appropriate fields.
5. Repeat this process for each attribute that you want to modify, and click OK.

Adding attributes

You can add attributes. You can then associate the attributes with classifications. You can use attributes with many record types, such as asset records, location records, and item records.

Procedure

1. From the Classifications application, click the Classifications tab.
2. Select the Add/Modify Properties > Attributes action.

3. Add a row in the Attributes area, and specify the information for the new attribute.
4. Repeat this process for each attribute that you want to add, and click OK.

Searching for classifications from application records

You can search classification structures and attributes with associated values when you use any record type that can be classified. Record types include assets, items, locations, configuration items, work orders, and tickets.

Procedure

1. From the application associated with the type of record, click the Detail Menu button and choose Classification.
2. Select a classification category in the Classification Search tree, and drill down to find the record.
3. Select a record identifier in the window to return a value to the field.

Defining associations between actual and authorized configuration item classifications

You can define associations between actual configuration item (CI) classifications and authorized CI classifications. When you map associations, you create an authorized CI record from an actual CI record.

Before you begin

The classification must be at the top level of the hierarchy. You define the top level for a classification when you create the classification.

Additionally, in the Use With window, the applications must include configuration items.

About this task

For each actual CI classification hierarchy that you use to import actual configuration items, you can create one or more authorized classification hierarchies.

For each of the authorized CI hierarchies, you use the Manage CI Hierarchies window to map the links between authorized and actual classifications. Mapping includes the parent-child classification levels. At each level of the classification, you can also specify the relationships between source classifications and target classifications.

Procedure

1. From the List tab of the Classifications application, select the CI classification hierarchy that you want to manage.
2. Select the Manage CI Hierarchies action.
3. In the Actual CI Classification field in the Manage CI Hierarchies window, click Detail Menu and select Classify to select an actual classification.
4. In the Children window, select a row.
5. In the Actual CI Classification field, specify the actual CI classification that you want to associate with the authorized child classification.
6. Click Detail Menu and select Classify to select a classification.
7. In the Relationships window, specify the relationships that you want to define for the selected child classification. To add a relationship, perform the following steps:
 - a. Click New Row.
 - b. Specify the source and target classifications, the relationship, and other information.
 - c. Click Select Relation Rules to select from a list of relationship rules.
8. Optional: Repeat steps 4, 5, and 6 to map actual classifications to other child authorized classifications.
9. Click OK.

Results

After you map the classifications, you use them in the Actual Configuration Items application to create configuration items from actual configuration items. When you define mappings between authorized and actual configuration items, you can create many configuration item records at the same time. You link entire or partial hierarchies instead of individual configuration items. You create records for the child classifications and for the top-level classification.

Adding units of measure

You can specify or change the units of measure that you use when ordering and issuing items. Any units of measure that you add become available in the product for use with all items.

About this task

If the units of measure do not match when you receive or transfer an item into a storeroom, the product looks for a conversion ratio to determine the stocking balance. You associate the order and issue units to an item when you add the item to a storeroom. You can access the Add/Modify Units of Measure window from more than one application.

Procedure

1. From your application, display a record.
2. Select the Unit of Measure and Conversion > Add/Modify Units of Measure action.
3. Click New Row.
4. Specify a unit of measure.
5. Type an abbreviation for this unit of measure. If configured to do so, the product uses the abbreviations along with the classification of an asset to create descriptions for assets, locations, and items.
6. Type a description for this unit of measure.
7. Click New Row to specify additional units of measure.
8. Click OK.

Configuring the signature option to enable classification images

Signature options, which are defined in the Security Groups application, are used control access to functions in applications. By using signature options, you can grant access to specific groups of users. In the Classifications application, you can select images that represent asset classifications that are used.

Procedure

1. In the List tab of the Security Groups application, you select the group to be granted access to the relationship functions. For example, MAXEVERYONE for all Maximo® users.
2. In the Applications tab, on the Description column, click Classifications.
3. Scroll down to the third panel, listing Classifications application functions, select the Grant Access check box on the Add/Modify Image line, and Save.

Managing charts of accounts

You use the Chart of Accounts application to set up default general ledger accounts and resource codes for standard accounting functions.

- [Chart of accounts overview](#)
You can set up default general ledger accounts and resource codes for standard accounting functions. You create accounts and resource codes to correspond with accounts that you use in your external accounting system. You can also set up financial periods, and specify general validation options.
- [Working with chart of accounts](#)
You can set up default general ledger accounts and resource codes for standard accounting functions.

Chart of accounts overview

You can set up default general ledger accounts and resource codes for standard accounting functions. You create accounts and resource codes to correspond with accounts that you use in your external accounting system. You can also set up financial periods, and specify general validation options.

- [General ledger account codes](#)
You define values for the different components, and link together the component values to create general ledger account codes. You use the general ledger accounts for specific financial tracking purposes. You can also specify dates for general ledger accounts to be active or to expire.
- [Organizational default accounts for general ledgers](#)
In the Chart of Accounts application, you use organizational default accounts as holding accounts for financial considerations.
- [Merge of general ledger accounts](#)
When a general ledger account field is not uniquely specified, the general ledger components are merged. Generating work orders and other kinds of transactions requires choosing among component values. The product invokes a set of rules on how to handle them.
- [Resource codes for general ledgers](#)
A resource code typically consists of one component of the account code.
- [Inactive component values](#)
In the Chart of Accounts application, you can deactivate component values. Inactive components are not available to general ledger accounts that you add to records. General ledger accounts that use an inactive component become inactive also. You can also set component values to expire by a specific date, which renders them inactive.

General ledger account codes

You define values for the different components, and link together the component values to create general ledger account codes. You use the general ledger accounts for specific financial tracking purposes. You can also specify dates for general ledger accounts to be active or to expire.

A general ledger account code consists of several components (or segments), that are separated by delimiters, such as 6000-200-350. A component that has not been assigned a value is represented by placeholder characters, such as 6000-???-350.

You define the format of the account code in the following ways:

- You can define the number, length, and data type of components, whether the components are required, and any delimiter, in the Database Configuration application. The account structures defined in Database Configuration are the default, system-level structures.
- You can define the format of the account code to be specific to an organization. You can define the number, length, and data type of components, whether the components are required, and any delimiter, using the Chart of Accounts application.
- You can specify a default placeholder character in the Database Configuration application. You can specify an organization-specific placeholder character in the Organizations application.

You can specify the validation rules for the following component combinations for the general ledger account codes that users can use:

- A combination of existing components
- Only component combinations that are specified as general ledger accounts

You also can download account codes from your accounting system. A generic financial application programming interface and several product-specific application programming interfaces are provided. These application programming interfaces let the system interface with financial software, such as Oracle® and SAP®.

Organizational default accounts for general ledgers

In the Chart of Accounts application, you use organizational default accounts as holding accounts for financial considerations.

There are three organizational default accounts:

- Global rotating suspense account - You use rotating suspense accounts to hold the accumulated cost of repairs for rotating equipment.
- Global ticket account - You use the global ticket account when a ticket for a service request is created and no other account is available.
- Tool control account - You use the tool control account when a transaction involves a tool and no other account is available.

In the Chart of Accounts application, you use the Organization Default Accounts action to define default accounts.

Merge of general ledger accounts

When a general ledger account field is not uniquely specified, the general ledger components are merged. Generating work orders and other kinds of transactions requires choosing among component values. The product invokes a set of rules on how to handle them.

General ledger accounts are merged component by component. Defined components always supersede an undefined component. For example, if the first component of one account code is 6000 and the first component of the other account code is a placeholder (????), the merged first component is 6000.

When general ledger account codes merge, the result can be an unspecified account code. In this case, to complete the merge, complete one of the following actions:

- To use the merged account code, an authorized user must establish the account code in the Chart of Accounts application. The account code must be established before you can proceed with the transaction.
- If you do not use the merged account code, then ensure that the transaction is valid.

Resource codes for general ledgers

A resource code typically consists of one component of the account code.

There are three kinds of resource codes:

- Labor resource codes - General ledger account code components that track whether labor used in a transaction is internal labor or external labor.
- Tool resource codes - General ledger account code components that track whether a tool used in a transaction belongs to the enterprise (internal) or an external vendor.
- Inventory resource codes - General ledger account code components to attach to inventory items that are used in transactions.

Inactive component values

In the Chart of Accounts application, you can deactivate component values. Inactive components are not available to general ledger accounts that you add to records. General ledger accounts that use an inactive component become inactive also. You can also set component values to expire by a specific date, which renders them inactive.

When you deactivate a general ledger component value, no change is made to the general ledger accounts on existing records that use that value.

Example

A work order uses a cost center component with a value of 6250. You deactivate this cost center. The value is not available to use in new general ledger accounts. All general ledger accounts that use the cost center also become inactive. The existing work order still uses cost center 6250.

Working with chart of accounts

You can set up default general ledger accounts and resource codes for standard accounting functions.

- [Working with general ledger accounts](#)
You can change the configuration of general ledger account structures to be specific to your organization. You can create component codes and resource codes to correspond with accounts that you use in your external accounting system. You can also set up financial periods, and specify general validation options.
- [Creating general ledger component values](#)
You define valid component values for general ledger account codes. You use these values when you select a general ledger account code.
- [Changing general ledger account structures](#)
You can change the default component values for general ledger accounts to be specific to organizations within your enterprise. You might want organizations to have distinct general ledger account structures. For example, the lengths of the components might vary, and the components might be of different data types, depending on how the components are being used.
- [Updating databases for general ledger accounts](#)
After you change a default general ledger account or resource code, you can update the database for one organization at a time.
- [Setting up accounts](#)
You can set up organizational default accounts as holding accounts for financial considerations. You can also specify default general ledger accounts to be associated with company-related accounts, as well as external labor control accounts to be associated with general ledger accounts.
- [Specifying financial periods for general ledgers](#)
You can segment accounting periods by specifying the start date and close date of a financial period.
- [Specifying resource codes for general ledgers](#)
You can specify default values for different types of labor resources, tool resources, and inventory items. These codes are then used to determine accounting charges.
- [Specifying validation options](#)
You use validation options to specify how general ledger accounts are validated. General ledger accounts are validated when they are used in general ledger account fields.

Working with general ledger accounts

You can change the configuration of general ledger account structures to be specific to your organization. You can create component codes and resource codes to correspond with accounts that you use in your external accounting system. You can also set up financial periods, and specify general validation options.

- [Creating general ledger account codes](#)
You can use general ledger account codes to enable financial reporting. You specify the component values for general ledger accounts. You can also specify a date range for an account to be active. For example, you can specify that a general ledger account for a specific craft is active from 02/25/2010 through 02/25/2011, and expires on 02/26/2011.

Creating general ledger account codes

You can use general ledger account codes to enable financial reporting. You specify the component values for general ledger accounts. You can also specify a date range for an account to be active. For example, you can specify that a general ledger account for a specific craft is active from 02/25/2010 through 02/25/2011, and expires on 02/26/2011.

About this task

If the date set in the Expiration Date field is in the future, the general ledger account remains active until the specified date is reached. If no expiration date is specified, the general ledger account does not expire.

Procedure

1. In the Chart of Accounts application, select the organization for which you want to create a general ledger account code.
2. Click New Row.
3. Specify the component values for the general ledger account value.
4. Click OK.
5. Optional: Change the long description.
If you change the descriptions for component values, the general ledger account description is not updated. Update the general ledger account description manually.
6. Optional: Specify the appropriate type code.
7. The default for the Active Date field is the date that the general ledger account is created. To activate the account at a different date, specify a future date.
The general ledger account remains inactive until the date specified is reached. The read-only Active check box shows as cleared to indicate that the account is not active.
8. If you want the general ledger account to expire by a specific date, specify a date in the Expiration Date field.
9. Save your changes.

Results

After you save your changes, you cannot edit the GL Account field.

- [Changing general ledger account codes](#)
After you create a general ledger account, you can change specific information. You might want to activate an account code or set the expiration date on an account code.
- [Deleting general ledger account codes](#)
As your business needs change, you can delete a general ledger account code at any time.

Changing general ledger account codes

After you create a general ledger account, you can change specific information. You might want to activate an account code or set the expiration date on an account code.

About this task

If the date set in the Expiration Date field is in the future, the general ledger account remains active until that date is reached. If no expiration date is specified, the general ledger account never expires.

Procedure

1. In the Chart of Accounts application, select the organization for which you want to change the general ledger account code.
2. Click View Details for the code that you want to change.
3. Optional: Change the information in the GL Account Description field, the Type field, the Active Date field, and the Expiration Date field.
4. Save your changes.

Deleting general ledger account codes

As your business needs change, you can delete a general ledger account code at any time.

About this task

When you delete a general ledger account code, you cannot use the account code on new records. However, existing database records that used the deleted account code are not changed. Therefore, a deleted general ledger account code can still exist in previously created work orders, purchase orders, and so on.

Deleting general account codes can cause problems with the general accounting system that you integrate with the system.

Procedure

1. In the Chart of Accounts application, select the organization for which you want to delete a general ledger account code.
2. Click Mark Row for Delete.
3. Save your changes.

Creating general ledger component values

You define valid component values for general ledger account codes. You use these values when you select a general ledger account code.

Procedure

1. In the Chart of Accounts application, select the organization for which you want to create a general ledger component value.
 2. Select the GL Component Maintenance action.
 3. In the GL Component Maintenance window, select the component for which you want to create values.
 4. Click New Row.
 5. In the GL Component Value field, specify the value for the component.
The value that you specify must be in the format that was specified in the Database Configuration application. The value in Database Configuration is the default, system-level format.
 6. Type a description of the component value.
 7. Optional: To deactivate the component value, clear the Active check box.
 8. Click OK.
- [Changing component values in general ledger accounts](#)
To adapt to business changes, you can change the description of a general ledger component value. You can also activate and deactivate components that are used in general ledger accounts.
 - [Deleting general ledger component values](#)
To customize general ledger information for your business needs, you can delete a component value that is used in general ledger account codes.

Changing component values in general ledger accounts

To adapt to business changes, you can change the description of a general ledger component value. You can also activate and deactivate components that are used in general ledger accounts.

About this task

If you change the status of a component value to inactive, all general ledger accounts that use that component inherit that status. The Expiration Date field for the associated general ledger account on the main Chart of Accounts window is set to the current date and time. The Expiration Date field is set to the current date and time only if the field was previously set to a future date, or if the field was left blank. If the field was set to a date in the past, that value is restored. When you reactivate an account component, you reactivate the general ledger accounts that use the component. Additionally, the Active Date field on the main Chart of Accounts window is set to the current date and time if the Active Date previously specified was in the future. If the Active Date field was set to a date in the past, that value is restored.

The Expiration Date field displays the expiration date that was previously specified if the date set is in the future. If the expiration date previously specified is in the past, that value is restored. If an expiration date was not specified, the Expiration Date field is left blank.

Procedure

1. In the Chart of Accounts application, select the organization for which you want to change a component value.
2. Select the GL Component Maintenance action.
3. In the GL Component Maintenance window, click View Details for the component value that you want to change.
4. To change the component value, perform one of the following actions:
 - Change the description.
 - Change the active status of the component value in the Active check box. If you activate a component value that was previously deactivated, the Activate GL Accounts window displays. Click the Activate Accounts check box for the component that you are reactivating, then click OK.
 - Change additional information.
5. Click OK.

Deleting general ledger component values

To customize general ledger information for your business needs, you can delete a component value that is used in general ledger account codes.

Procedure

1. In the Chart of Accounts application, select the organization for which you want to delete a general ledger component value.
2. Select the GL Component Maintenance action.
3. In the GL Component Maintenance window, click Mark Row for Delete for the component value that you want to delete.
4. Click OK.

Example

After you delete a general ledger component value, general ledger account codes in existing database records that use that value are not changed. For example, a work order uses a cost center value of 6500. If you delete 6500, the work order keeps this number as the cost center.

Changing general ledger account structures

You can change the default component values for general ledger accounts to be specific to organizations within your enterprise. You might want organizations to have distinct general ledger account structures. For example, the lengths of the components might vary, and the components might be of different data types, depending on how the components are being used.

About this task

The first time the Add/Modify Account Structure window displays, the default configuration defined for the general ledger account displays. You use the Database Configuration application to define the default configuration at the system level. The changes made to organization-specific account structures do not affect the configuration specified at the system level.

You can define one account structure specific to each organization. When the account structure is defined, you can modify the attributes. The modified account structure does not affect existing data.

Procedure

1. In the Chart of Accounts application, select the organization for which you want to modify the general ledger account structure.
2. Select the Add/Modify Account Structure action.
3. In the Add/Modify Account Structure window, select the component for which you want to modify values.
4. In the Component field, specify the name of the component.

5. In the Length field, specify the length of the field. The length of the field cannot exceed the length defined at the system level.
6. In the Type field, specify the data type for the component. If the type defined at the system level is numeric, the type set at the organization level cannot be alphanumeric. If the type set at the system level is alphanumeric, the type set at the organization level can be numeric.
7. Optional: Click the Required check box if you want the component to be mandatory. If the value set at the system level is 1, the Required check box is read-only. If the value set at the system level is 0, this check box is modifiable for the organization.
8. Optional: Modify the Screen Delimiter to specify a different separator character between components.
9. Click OK.

Example

For example, you can create account structures for different organizations in separate geographic regions, as follows:

- Organization A is in Europe. Organization A has the account structure **xxx-xx-xxx** with component one and component two being required. Component two is of the alphanumeric type.
- Organization B is in North America. Organization B has the account structure **xxx-xxx-xx** with components one, two, and three being required. Component two is of the integer data type.

Updating databases for general ledger accounts

After you change a default general ledger account or resource code, you can update the database for one organization at a time.

Before you begin

When you update the database, ensure that no one is using the system. Historical records are not updated.

Procedure

1. In the Chart of Accounts application, select the organization whose database you want to update.
2. Select the Update Database action.
3. In the Update Database window, select one of the following updates:

Option	Description
Overwrite Blank Accounts Only	Use this option to overwrite blank GL Account fields
Overwrite Accounts With Old Defaults	Use this option to overwrite accounts that have not been updated since being inserted.
Overwrite All Accounts	Use this option to overwrite all relevant GL Account fields, including blank fields, with updated data.

4. Click OK.

Setting up accounts

You can set up organizational default accounts as holding accounts for financial considerations. You can also specify default general ledger accounts to be associated with company-related accounts, as well as external labor control accounts to be associated with general ledger accounts.

- [Setting up organization default accounts](#)
You use organizational default accounts as holding accounts for financial considerations.
- [Specifying company-related accounts for general ledgers](#)
For types of companies that use payment, you can specify default general ledger accounts for company-related accounts.
- [Specifying external labor control accounts for general ledgers](#)
You use external labor control accounts to set up default account codes for work performed by outside vendors.

Setting up organization default accounts

You use organizational default accounts as holding accounts for financial considerations.

About this task

You can set up the following global general ledger accounts:

Global Rotating Suspense Account

You use rotating suspense accounts to hold the accumulated cost of repairs for rotating equipment.

Global Ticket Account

You use the default account when a ticket for a service request is created and no other account is available.

Tool Control Account

You use the default account when a transaction involves a tool and no other account is available.

Procedure

1. Open the Chart of Accounts application.
2. In the Organizations table window, select the organization for which you want to define the accounts.
3. Select the Organization Default Accounts action.
4. In the Global Rotating Suspense Account field, click Select Value and choose an account.
5. In the Global Ticket Account field, click Select Value and choose an account.
6. In the Tool Control Account field, click Select Value and choose an account.
7. Click OK.

Specifying company-related accounts for general ledgers

For types of companies that use payment, you can specify default general ledger accounts for company-related accounts.

About this task

The accounts include accounts received but not invoiced, account payable suspense, and accounts payable control account. The accounts are based on company types that are specified in the Companies application.

Procedure

1. In the Chart of Accounts application, select the organization for which you want to specify company-related accounts.
2. Select the Company Related Accounts action.
3. In the Company Related Accounts window, click New Row.
You can add a new row only if there is an enterprise type that has not yet been associated with general ledger accounts.
4. Specify a type, received but not invoiced account information, accounts payable suspense account information, and accounts payable control account information.
5. Click OK.

Specifying external labor control accounts for general ledgers

You use external labor control accounts to set up default account codes for work performed by outside vendors.

Procedure

1. In the Chart of Accounts applications, select the organization for which you want to specify an external labor control account.
2. Select the External Labor Control Accounts action.
3. In the External Labor Control Accounts window, click New Row. You can add a new row only if there is a vendor that has not yet been associated with a general ledger account.
4. Specify values for the vendor and control account.
5. Click OK.

Specifying financial periods for general ledgers

You can segment accounting periods by specifying the start date and close date of a financial period.

Before you begin

You must define at least one financial period.

About this task

The transactions must occur during an open, valid financial period. The requirements of the accounting system that you use determines the format of the financial period.

Procedure

1. In the Chart of Accounts application, select the organization for which you want to define a financial period.
2. Select the Financial Periods action.
3. In the Financial Periods window, click New Row.
4. Enter the name or number for the period.
5. Specify start and end dates for the financial period:
If there is no financial period, the current date and time displays in the From field. If financial periods exist, the From field displays the date and time shown in the To field of the most recent period.
6. Optional: Specify a close date.
After this date, you cannot charge additional transactions to the accounting period.

Results

To prevent gaps and overlaps in time between contiguous periods, if you change the date of an existing period, the surrounding dates are reset. If you use financial periods, then a financial period stamp is added to all transactions when they are generated.

What to do next

You use the Actual Close Date field to close the financial period.

- [Closing financial periods](#)
You can close a specific financial period to ensure that no more transactions are entered in that period.

Closing financial periods

You can close a specific financial period to ensure that no more transactions are entered in that period.

Procedure

1. In the Chart of Accounts application, select the organization for which you want to close a financial period.
2. Select the Financial Periods action.
3. In the Financial Periods window, specify the actual close date for the financial period that you want to close.
Your name is displayed in the Closed By field.

Results

After you close a financial period, financial transactions for that period are no longer accepted.

Specifying resource codes for general ledgers

You can specify default values for different types of labor resources, tool resources, and inventory items. These codes are then used to determine accounting charges.

Procedure

1. In the Chart of Accounts application, select the organization for which you want to define resource codes.
2. Select the Resource Codes action.
3. In the Resource Codes window, complete the information specific to the type of resource code that you are defining:

Option	Description
Labor resource codes	In the Internal field and External field, specify the labor resource code components.
Tool resource codes	In the Internal field and External field, specify the tool resource code components.
Inventory resource codes	<ol style="list-style-type: none">a. Click New Row.b. Specify values for the commodity group.c. Optional: Specify a value for the inventory resource code component.

4. Click OK.

Specifying validation options

You use validation options to specify how general ledger accounts are validated. General ledger accounts are validated when they are used in general ledger account fields.

Before you begin

You specify the system-level, default format of general ledger account codes using the GL Account Configuration window in the Database Configuration application. You specify organization-specific general ledger account codes using the Add/Modify Account Structure option in the Chart of Accounts application.

Procedure

1. Open the Chart of Accounts application.
2. In the Organizations table window, select the organization for which you want to specify validation rules.
3. Select the Validation Options action.
4. Select or clear the appropriate check boxes in the following list:

Option	Description
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Option	Description
Deactivate GL Validations	If you deactivate general ledger validations, the entries in general ledger account fields are validated against values in the Chart of Accounts application. If you reactivate this setting, general ledger fields are not validated. You can enter values in general ledger fields, but cannot specify additional settings.
Validate GL Component Combinations	If you validate general ledger component combinations, only valid general ledger account entries are accepted. If you do not use this option, any combination of valid component values is accepted.
Validate Financial Periods	If you validate financial periods, checks are performed to ensure that a transaction occurs within an open, valid financial period. If you do not use this option, validations are not performed against defined financial periods.
Require Valid GL Account for All Transactions	If you require valid general ledger accounts for all transactions, transactions without a valid general ledger account are not allowed. Without this selection, valid general ledger debit and credit accounts must be present on all transactions.

5. Click OK.

Working with cost management

You use the Cost Management application to track the financial resources required to complete the project. You can also link work orders from a project in the Cost Management application to the Work Order Tracking application.

- [Creating cost management projects](#)

When you create a project in the Cost Management application you can assign work orders to that project in the Work Order Tracking application. You can then generate project cost information to track the financial resources required to complete the project.

Creating cost management projects

When you create a project in the Cost Management application you can assign work orders to that project in the Work Order Tracking application. You can then generate project cost information to track the financial resources required to complete the project.

About this task

After you assign the work order to a project or task, the project name appears in other applications in read-only format. To change the project or task to which the work order belongs, use the Work Order Tracking application.

Procedure

1. On the toolbar, click New Project and specify a project name.
2. Type a description for the project. By default, the application selects the Is Chargeable check box. This option allows you to charge costs to the project. If necessary, clear the Is Chargeable check box.
3. Specify a type for the project.
4. In the Parent Project field, assign the project to a parent project.
5. Optional: Type the Budget and Budget Line information.
6. In the Value field, specify the amount of money allocated for the project.
7. Specify the status of the project, the start date, and the end data for the project. By default, the system assigns an APPR status to the project.
8. In the Tasks table window, click New Row to add tasks to the project.
9. Click Save Project.

Managing currency codes

You can define and manage currencies that you can use in purchase orders, purchase requisitions, invoices, and so on.

- [Creating currency codes](#)

You create currency codes to define and manage currencies. A currency code record consists of a currency code, its description, and a setting specifying availability. All organizations can use currency codes.

Creating currency codes

You create currency codes to define and manage currencies. A currency code record consists of a currency code, its description, and a setting specifying availability. All organizations can use currency codes.

About this task

You cannot use a currency that is not active.

Procedure

1. In the Currency Codes application, click New Row.
2. In the Currency field, provide a code value to represent the currency.
For example, you use CND for the Canadian dollar.
3. Optional: Provide a description.
4. Optional: Deactivate the currency.
5. Click Save Currency.

- [Changing currency codes](#)

You change a currency code record to change the currency code description or to make the currency active or inactive.

Changing currency codes

You change a currency code record to change the currency code description or to make the currency active or inactive.

Procedure

1. In the Currency Codes application, find the currency code record that you want to change.
2. Activate or deactivate the currency.
3. Save your changes.

Setting system properties

You can set system properties that various components use to control how applications and other aspects of the product work.

A system property is a key-value pair that is used at the system level.

- [Global properties](#)

A global property applies to the entire system. The property applies to all the server instances that use a common database, including a clustered environment.

- [Options for system properties](#)

Every property defined in the System Properties application has options that you can manage.

- [Values for system properties](#)

You can modify the default values for system properties to tailor IBM® Maximo® Manage to your needs.

- [System properties that contain password information](#)

Several system properties contain password information. Therefore, if you change a password, you must update the associated property value.

- [Fetch stop limit memory errors](#)

A Java™ virtual memory heap out-of-memory error is caused by an operation that fetches and constructs too many objects into one Maximo business object (MBO) set. This type of error can disconnect all users from the server. You can use the `mxe.db.fetch` system properties to configure the fetch limit, which can help prevent out-of-memory errors.

Global properties

A global property applies to the entire system. The property applies to all the server instances that use a common database, including a clustered environment.

Global properties always have the following options selected by default, but you can clear the options:

- Online Changes Allowed - By default, you can change most properties by using the System Properties application.
- Live Refresh - By default, most properties allow a live refresh where a new value applied to a system property takes effect immediately.

Options for system properties

Every property defined in the System Properties application has options that you can manage.

Table 1. System property option

Property options	Description
File override	Specifies whether the property and its value are loaded from a file rather than from the database.
Online changes allowed	Specifies whether the System Properties application is used to change the value for the property. For example, the global property <code>mxe.db.driver</code> does not allow online changes.
Live refresh	Specifies whether the property value can take effect immediately after saving the value.
Encrypted	Specifies whether the property is stored in an encrypted manner in the underlying product database. The value is encrypted by using the standard encryption functions for the product. For example, the global property <code>mxe.int.uddipassword</code> is encrypted.

Property options	Description
Security level	Specifies the level of access to this property by various product components. Public The property and its value can be accessed through unauthenticated client sessions. Secure The property and its value can be accessed through authenticated client sessions. Private The property and its value can be accessed only with the business object framework of the system.
User defined	Specifies whether the property is created by a user or if the property is provided with the product.
Nulls allowed	Specifies whether the property can have null values. You can change this characteristic only for user-defined properties.
Data type	Specifies the type of value that can be provided for the property. The value can be an integer, alphanumeric, or a yes or no (YORN). For example, the global property <code>mxe.allowLocalObjectsmxe.int.uddipassword</code> is associated with the YORN data type. If you specify a value other than 1 or 0, an error message is displayed that indicates the value is invalid.
Domain	Specifies a domain that provides a list of values to which the property can be set. For example, the <code>mxe.db.transaction_isolation</code> global property is associated with the TRANSISO domain. Therefore, the values for the property must match a corresponding domain value.
Masked	Specifies whether the global and default values are hidden on the user interface.

Values for system properties

You can modify the default values for system properties to tailor IBM® Maximo® Manage to your needs.

You can specify values for system properties in the System Properties application.

You can also add custom properties for individual server bundles. Custom properties are useful when you want to handle processes for one bundle in one way and for another bundle in another way. For example, you might want the email address for the administrator of your reports server bundle to be different from the email address of the administrator for your user interface server bundle. You can specify server bundle properties when you deploy Manage.

If you add a new server bundle property, ensure that you also add the property to the System Properties application before you specify the property during deployment.

Restoring default values

In the System Properties application, you can restore the default values for system properties.

When you restore the system default values, the values are restored for the property names that you select. In effect, all user-defined values are removed and default values are restored.

To restore the system default values, click Restore Maximo Defaults.

System properties that contain password information

Several system properties contain password information. Therefore, if you change a password, you must update the associated property value.

When you change a password, you must update the values of the following system properties:

- `mxe.adminPasswd`
- `mxe.adminusercredential`
- `mxe.b2b.password`
- `mxe.int.uddipassword`
- `mxe.report.bo.rptServerLogonPass`
- `mxe.system.regpassword`

For example, if you change the administrative password, you must update the `mxe.adminPasswd` property.

Fetch stop limit memory errors

A Java™ virtual memory heap out-of-memory error is caused by an operation that fetches and constructs too many objects into one Maximo® business object (MBO) set. This type of error can disconnect all users from the server. You can use the `mxe.db.fetch` system properties to configure the fetch limit, which can help prevent out-of-memory errors.

You use the fetch stop limit properties to set an upper limit on the number of objects that are fetched from the database and constructed on the server into a single set. You can set different limits for different types of objects. When the upper limit is reached, an exception is thrown so that the process is stopped. You can then either reduce the number of objects by using filters or change the operation to prevent the database from fetching too many objects.

The fetch stop limit is enabled by default with a limit of 5000 for all objects. If the fetch stop limit is reached and the exception is thrown during a user interface operation, the error message is typically shown to the user. Depending on how the outer logic is implemented, this message might be wrapped by another message or not shown. However, the error is always logged on the server.

Scenarios where fetch stop limit errors occur

Large fetch counts that cause errors typically occur in two scenarios:

- When you apply an action to a large result set. The result set is retrieved without sufficient filtering. This error can occur when you mistakenly start a list page action or when a legitimate operation loads too many objects.
- Where an operation embedded in a user action retrieves a large set of objects and the data cannot be filtered.

Actions to take when fetch limit stop errors occur

Analyze the data and identify the operation that causes the error. You can try to correct the error by filtering the data or by splitting the target of the action into smaller batches. If the error cannot be corrected, the administrator must adjust the system in one or more of the following ways:

- Increase the fetch limit for the particular object if it is safe to use a higher limit. If you do not want other user operations to be capped by this high number, you can call the `MboSet.setLogLargFetchResultDisabled(true)` method on the MBO set.
- Correct the data to avoid processing such a large data set.
- Use discardable MBO sets to prevent all the objects from being fetched into memory.
- Move the operation into a cron task and schedule the cron task to run at a low-demand time or on another server.
- Modify the process so that it fetches fewer objects.

Automating routine tasks with automation scripts

You use automation scripts to implement object rules, attribute validations, workflow or escalation actions, and workflow and security condition logic for applications. Automation scripts can reduce the time that you spend on automating tasks because you do not need to recompile files or restart the server.

- **Automation scripts**
Automation scripts are small, targeted pieces of code that can extend the product. An automation script consists of a launch point, variables with corresponding binding values, and the source code. You use wizards to create the components of an automation script. You create scripts and launch points or you create a launch point and associate the launch point with an existing script.
- **Creating automation scripts**
You create automation scripts to automate routine application tasks. You can use the supplied wizards to create scripts and launch points with associated variables and bindings. You can also use the wizards to associate launch points with existing scripts.
- **Example: Automating assigning service requests to service groups**
The development team at a manufacturing facility is asked to implement a business rule into the production system. When a pipeline leaks in the facility an operator creates a service request to report the leak. The pipeline volume determines the service group that is assigned to the service request. The development team creates a script that assigns the service request to the appropriate service group. If the volume of the pipeline is greater than a specified limit, the team must also ensure that a work log is created.
- **Example: Automating communication by using a custom role**
The development team at a large maintenance organization must design a process that notifies people when quantities of certain parts are running low. Unexpected disruptions to the supply chain, for example due to adverse weather or industrial disputes, can affect the availability of parts for scheduled maintenance activities. With advance warning of shortages, work supervisors can reschedule non-essential work that requires these parts, conserving supplies and minimizing the effect on schedules.
- **Launch points**
A launch point is a complete script configuration. The configuration consists of the target application or context, the variables that are passed between the application and the script, and the body of the script.
- **Examples of Maximo Business Rules (MBR) scripts**
Several examples are provided to illustrate how to use Maximo® Business Rules (MBR) language in several common scripting scenarios.
- **Variables in automation scripts**
Variables determine how information is passed into or received from a script. You can configure the variables for the script in the wizards instead of declaring variables within the source code. By using variables, you reduce the complexity of the source code and make it easier to reuse the source code for different purposes.
- **Gathering user input by using choice messages in automation scripts**
A choice message gathers user input, which can then be used in the automation script. You can use choice messages in automation scripts to create an interactive user experience. For example, a message can say that a record does not exist and ask if the record should be created.
- **Reusable library scripts in automation scripts**
A library script is a reusable piece of programming logic that automation scripts can invoke from within the body of their code. Creating library scripts can save time and effort. Library scripts are stored in the database in the AUTOSCRIP table.
- **Scheduling automation scripts to run as part of cron tasks**
Cron tasks are jobs that run automatically on a fixed schedule on the application server. For example, the ESCALATION cron task processes escalations to ensure that critical tasks are processed on time. You can use several predefined cron tasks and you can also define new cron tasks. For new cron tasks, you must provide a Java™ class implementation that contains the business logic that is executed on a schedule.
- **Adding scripts that run as asynchronous jobs**
You can add scripts that can run as asynchronous jobs in the product. Use the asynchronous job framework to submit jobs that need to be run one time asynchronously, such as when you want to run something quickly in the background.
- **Automation scripts for integration**
You can use automation scripts to customize the processing transactions of integration messages by implementing object structure, publish channel, enterprise service, and invocation channel integration components.
- **Debugging with automation scripts**
You debug a script to remove any issues before you customize applications. Print statements can be placed in a script to capture the logs that are specific to

- a script. Log statements in the scripting framework are automatically sent to the autoscript logger.
- [Testing automation scripts](#)
It is possible to test automation scripts after you create them.
- [Error messages for users](#)
You can display error messages to users from inside a script. For example, you can display an error message for users to see in the Assets application when an asset number does not follow the rules for naming assets.
- [Creating scripts to manage attachments](#)
Maximo Manage can read or write attachments from any store that is registered with Maximo Application Suite.

Automation scripts

Automation scripts are small, targeted pieces of code that can extend the product. An automation script consists of a launch point, variables with corresponding binding values, and the source code. You use wizards to create the components of an automation script. You create scripts and launch points or you create a launch point and associate the launch point with an existing script.

You can also create library scripts, which are reusable pieces of programming language that automation scripts can invoke from the body their code. Library scripts must be hosted on the same system.

Prerequisite skills

To extend the product business logic or automate tasks, you must have knowledge in the following areas:

- Scripting language syntax and operations
- Product configurations such as workflow processes, escalations, and actions
- Application data models and relationships

Experience with the Maximo® business object (MBO) API is an advantage although not a prerequisite.

Components of automation scripts

Launch points

A launch point defines the execution context for a script, for example when a business object is updated or a value is entered into a field. Five types of launch point are supported and the Automation Scripts application provides a separate wizard application for creating each type of launch point.

Variables and binding values

You can specify the variables that determine how information is passed into or received from a script in the wizard applications. Variables are not mandatory, but when you use variables it simplifies the amount of code to be written and is easier to reuse the code.

Source code

You can write source code in an external application and import it into the Automation Scripts application. Alternatively, you can enter code directly into the Source Code field in the wizard applications. The source code must be written in the languages that are supported by the following script engines:

- Nashorn JS
- Jython, version 2.7.2

Creating automation scripts

You create automation scripts to automate routine application tasks. You can use the supplied wizards to create scripts and launch points with associated variables and bindings. You can also use the wizards to associate launch points with existing scripts.

About this task

To automate tasks, you must have knowledge of the following areas :

- Scripting language syntax and operations
- Product configurations such as workflow processes, escalations, and actions
- Application data models and relationships

Experience with Maximo® business object (MBO) API is an advantage although not a prerequisite.

You use the same menu items for creating scripts and launch points as you do for creating a launch point to associate with an existing script. For example, you use the Create > Script with Object launch point action to create a script and an object launch point, or to associate an object launch point with an existing script.

In some automations, you must use the documented MBO APIs to automate a routine task. For example, when you automate a task that involves creating a record, you must use the documented MBO APIs for the record creation part of the automation.

Procedure

1. In the Automation Scripts application, select the type of launch point that you want to create.
2. Select whether to add a script or specify an existing script. If you add a script, you can code it in a source code field or you can import a script.
3. Create the launch point if you are using one, and then associate variables and bindings with the launch point.
4. Click Create to save the launch point, variables, and script code.

Example: Automating assigning service requests to service groups

The development team at a manufacturing facility is asked to implement a business rule into the production system. When a pipeline leaks in the facility an operator creates a service request to report the leak. The pipeline volume determines the service group that is assigned to the service request. The development team creates a script that assigns the service request to the appropriate service group. If the volume of the pipeline is greater than a specified limit, the team must also ensure that a work log is created.

About this task

The development team uses automation scripts to implement the business rule. In this procedure, steps 1 - 3 result in the script correctly assigning the service request to the service group. Step 4 involves creating a work log and so, requires Java™ or Maximo® Business Object (MBO) API invocations to be called.

Procedure

1. Create an action launch point and script.
2. Create an escalation.
3. Test the configuration.
4. Create the work log by using MBO APIs.

- **Example: Result of automating the assignment of service requests**

In a service request that is created to report a pipeline leak, an operator specifies the appropriate classification for the pipeline based on attributes such as diameter and length. When a business rule is implemented using automation scripts, if the volume of the pipeline is less than 1000 cubic feet, the service request is assigned to service group A. If the volume is greater than 1000 cubic feet, the service request is assigned to service group B and a work log entry is created.

- **Example: Assigning the service group to the service request**

You create a script to implement the business rule. You create an action launch point and associate the launch point with a script that identifies and correctly assigns the service group to the service request.

- **Example: Work log creation by using MBO APIs**

The scripting framework does not have any functions to create a work log. You must use the documented MBO APIs to create the work log.

Example: Result of automating the assignment of service requests

In a service request that is created to report a pipeline leak, an operator specifies the appropriate classification for the pipeline based on attributes such as diameter and length. When a business rule is implemented using automation scripts, if the volume of the pipeline is less than 1000 cubic feet, the service request is assigned to service group A. If the volume is greater than 1000 cubic feet, the service request is assigned to service group B and a work log entry is created.

The rule is implemented in an automation script. Upon implementation, an escalation definition created by the development team enables the script and its associated launch point.

By defining an escalation, the team ensures that service requests are automatically examined by the script. New service requests that meet the pipeline leakage criteria are automatically assigned to the appropriate service group.

When the development team create the automation script, the business rule is implemented with the following components:

- The escalation runs automatically and periodically in the application server.
- When the escalation finds service request records that match the criteria, an action starts.
- The action launch point is the entry point into the business rule implementation. The action starts the launch point.
- The script implements the business rule to identify and assign the correct service group. If required, a work log is generated.

The script code has two parts:

- The first part is written in the Jython scripting language and identifies the service group.
- The second part uses MBO API invocations to create a work log record and to set values. You can express business rules in the flow control constructs of the scripting language. However, certain tasks require Java™ or MBO API invocations to be called. Specifically, the creation of a new record from within the script requires the use of the Java MBO add() method.

Example: Assigning the service group to the service request

You create a script to implement the business rule. You create an action launch point and associate the launch point with a script that identifies and correctly assigns the service group to the service request.

- **Example: Creating the action launch point and script**

You use a wizard to create an action launch point with service request as the object. You can paste script code directly into the wizard.

- **Example: Creating the escalation**

You create an escalation that checks all new service requests for a classification of 'PIPE_LEAK'. When the escalation finds a service request with this classification, it calls an action. The result of the action is that a business rule is implemented. The service request is assigned to the correct service group and if required, a work log is created.

- **Example: Testing the configuration**

You test the solution to ensure that all new service requests that meet the criteria are assigned to the correct service group. You can therefore test that the business rule is being correctly implemented.

- [Example: Actions performed by the example script](#)
When the escalation runs the action, the action starts the script. The script determines which group the service request is assigned to.

Example: Creating the action launch point and script

You use a wizard to create an action launch point with service request as the object. You can paste script code directly into the wizard.

Procedure

1. In the automation scripts application, select the `Create_>Script` with Action Launch Point action.
2. Specify a launch point name and description.
 - a. Specify the object as SR.
 - b. Specify a name for the action.
For consistency, use the same name that you used for the launch point.
3. Enter a script name.
For consistency, use the same name that you used for the launch point.
 - a. Specify the script language as Jython.
 - b. Enter the variable names and binding values in Table 1.
 - c. For the `v_servicegroup` variable, select the Suppress Access Control check box.

Table 1. Variables, types, and bindings specified in the action launch point

Variable Name	Type	Binding
<code>v_srclassif</code>	IN	<code>CLASSSTRUCTURE.CLASSIFICATIONID</code>
<code>v_sratrdiameter</code>	IN	<code>TICKETSPECCLASS [ASSETATTRID='DIAMETER'] . NUMVALUE</code>
<code>v_sratrlen</code>	IN	<code>TICKETSPECCLASS [ASSETATTRID='LENGTH'] . NUMVALUE</code>
<code>v_servicegroup</code>	OUT	<code>COMMODITYGROUP</code>

4. In step 3 of the wizard, enter the following script code:

```
#Check if the SR is classified as a pipe leakage
if v_srclassif=='PIPE_LEAK':
    #Now calculate total volume of the pipe-formula is:3.14 * length * (diameter / 24) ^ 2
    volume = 3.14 * v_sratrlen * (v_sratrdiameter / 24)**2
    if volume < 1000:
        #If volume is less than 1000 cubic feet, just assign SR to GROUP A
        v_servicegroup = 'GROUP A'
    else:
        #If vol is greater than 1000 cubic ft, assign SR to GROUP B and create worklog
        v_servicegroup = 'GROUP B'
        # Now add the MBO API code to create a new record in the work log for the SR
        worklogset = mbo.getMboSet ('WORKLOG')
        worklog = worklogset.add()
        worklog.setValue('clientviewable',1)
        worklog.setValue('logtype','WORK')
        worklog.setValue('description','System initiated processing-work assigned to GROUP B')
```

5. To save the launch point, variables, and script code, click Create.

Example: Creating the escalation

You create an escalation that checks all new service requests for a classification of 'PIPE_LEAK'. When the escalation finds a service request with this classification, it calls an action. The result of the action is that a business rule is implemented. The service request is assigned to the correct service group and if required, a work log is created.

Procedure

1. In the Escalations application, create an escalation.
2. Specify a name for the escalation.
For consistency, use the same name you used for the launch point that you created in the previous task.
3. Specify SR as the business object the escalation applies to.
4. Specify the condition as `reportedpriority=1 and status='QUEUED' and commoditygroup is null`.
5. Specify the schedule as 1 minute.
6. Create the escalation point.
7. In the Actions window, select the action you associated with the action launch point in the previous task.
8. Save the escalation.

Example: Testing the configuration

You test the solution to ensure that all new service requests that meet the criteria are assigned to the correct service group. You can therefore test that the business rule is being correctly implemented.

Procedure

1. In the Classifications application, create a classification named PIPE_LEAK.
 - a. Add an attribute called diameter with a numeric data type and specify inches as the unit of measure.
 - b. Add an attribute called length with a numeric data type and specify feet as the unit of measure.
 - c. In the Use with window, specify service requests.
2. In the Service Groups application, create two service groups named Group A and Group B.
3. In the Service Requests application, create a service request and specify the reported priority as 1 and the status as QUEUED.
 - a. In the Classify window, specify PIPE_LEAK as the classification.
 - b. Specify values for length and diameter. For example, length=720 feet and diameter=31 inches.
4. Activate the escalation that you created in the previous task.

Results

When the active escalation executes, the service request is assigned to the appropriate service group. By creating PIPE_LEAK service requests for pipes of different diameters and lengths, you can check that the correct service group is assigned. If the computed volume is greater than the specified limit, the work log is also generated against the service request.

Example: Actions performed by the example script

When the escalation runs the action, the action starts the script. The script determines which group the service request is assigned to.

The following script is used to automate the assignment of service requests to service groups:

```
#Check if the SR is classified as a pipe leakage
if v_srclassif=='PIPE_LEAK':
    #Now calculate total volume of the pipe-formula is:3.14 * length * (diameter / 24) ^ 2
    volume = 3.14 * v_srattrlen * (v_srattrdiameter / 24)**2
    if volume < 1000:
        #If volume is less than 1000 cubic feet, just assign SR to GROUP A
        v_servicegroup = 'GROUP A'
    else:
        #If vol is greater than 1000 cubic ft, assign SR to GROUP B and create worklog
        v_servicegroup = 'GROUP B'
        # Now add the MBO API code to create a new record in the work log for the SR
        worklogset = mbo.getMboSet ('WORKLOG')
        worklog = worklogset.add()
        worklog.setValue('clientviewable',1)
        worklog.setValue('logtype','WORK')
        worklog.setValue('description','System initiated processing-work assigned to GROUP B')
```

When the escalation runs, the script executes the following logic:

1. Checks if the service request has a classification of 'PIPE_LEAK'. Continues execution if a match is found.
2. Calculates the pipeline volume by using a formula and stores the result in a local variable.
3. If the volume is less than 1000 cubic feet, assigns the service request to 'GROUP A'.
4. If the volume is greater than 1000 cubic feet, assigns the service request to 'GROUP B'. Creates a work log to indicate that service request processing started.

The script indicates when the documented MBO APIs must be used. For calculations, you can define input variables to provide the data the script needs. The formula for calculating the pipeline volume is available on many public websites. In this example, the input variables `v_srclassif`, `v_srattrdiameter`, and `v_srattrlen` are used in the script. The input variables are based on the bindings in the SR, TICKETSPECCLASS, and CLASSSTRUCTURE business objects.

Table 1. Variables that are used in the example script

Variable	Binding	How binding is resolved
<code>v_srclassif</code>	<code>CLASSSTRUCTURE.CLASSIFICATIONID</code>	The scripting framework traverses the CLASSSTRUCTURE relationship from the SR object to the CLASSSTRUCTURE object and retrieves the CLASSIFICATIONID value which is a string.
<code>srattrdiameter</code>	<code>TICKETSPECCLASS[ASSETATTRID='DIAMETER'].NUMVALUE</code>	The scripting framework traverses the TICKETSPECCLASS relationship from the SR object to the TICKETSPECCLASS object and retrieves the value of the diameter attribute. To retrieve one attribute, the binding specifies a filter in square brackets [ASSETATTRID='DIAMETER'].
<code>v_srattrlen</code>	<code>TICKETSPECCLASS[ASSETATTRID='LENGTH'].NUMVALUE</code>	The scripting framework retrieves a single value for the length attribute from the binding and filter.

When the volume of the pipe is calculated, the script checks if the value is greater or less than 1000 cubic feet. Based on the result of the *if* and *else* condition in the script, the output variable `v_servicegroup` is set to service group A or service group B. The script retrieves the value from the `v_servicegroup` variable and enters the value into the service request.

Example: Work log creation by using MBO APIs

The scripting framework does not have any functions to create a work log. You must use the documented MBO APIs to create the work log.

Many API invocations are used to create the work log. Because the script is running against the service request (SR) object, the scripting framework offers a handle to the service request object. The *mbo* keyword in the body of the script is used to retrieve the handle. Other related business objects can be accessed from the handle.

- The first API called is the `getMboSet` method on the SR business object. The API is called with the code: `worklogset = mbo.getMboSet ('WORKLOG')`. The `getMboSet` method accepts a parameter that represents a relationship from the current SR business object to the WORKLOG business object. The parameter is a relationship name defined in the data dictionary. The method returns a handle to a set that represents a container for the related object.
- The next API called is the `add` method. The API is called with the code: `worklog = worklogset.add()`. The `add` method returns a business object that can be initialized by setting values into the attributes of the object.
- The next API called is the `setValue` method on the business object. The API is called with the code: `worklog.setValue ('clientviewable, 1')`. The `setValue` method sets the value of the attribute on the business object.
- Additional `setValue` methods are called to set the values of more attributes of the business object. The number of `setValue` invocations depends on the number of primary key and required attributes of the business object that is being created.

The data in the initialized business object is saved. You do not have to invoke a `save` method on the business object from within the script. The work log is now created if the volume of the pipeline is greater than 1000 cubic feet.

Example: Automating communication by using a custom role

The development team at a large maintenance organization must design a process that notifies people when quantities of certain parts are running low. Unexpected disruptions to the supply chain, for example due to adverse weather or industrial disputes, can affect the availability of parts for scheduled maintenance activities. With advance warning of shortages, work supervisors can reschedule non-essential work that requires these parts, conserving supplies and minimizing the effect on schedules.

About this task

The development team creates a custom role that identifies the users that are to receive notifications. An automation script constructs a mailing list of the email addresses from the person records that have been assigned the custom role and an escalation point specifies the quantity of an item that activates a notification. The escalation record uses a communication template to generate the communication that is sent to users.

Procedure

1. In the Roles application, create a custom role and name it, for example *MYTESTCUSTOMROLE*.
The name of the role that you create forms part of the name of the automation script you create to automate this process. The name must contain uppercase letters only.
2. In the Type field, select *Custom class* and, in the Value field, specify `com.ibm.tivoli.maximo.script.ScriptCustomRole`.
This file is a predefined Java™ class.
3. In the Communications Template application, compose a standard email and, in the Recipients tab, specify the custom role that you created in Step 1.
4. In the Escalations application, create an escalation to manage the communication flow:
 - a. Create an escalation point that specifies the minimum quantity of an item that causes a notification to be sent.
 - b. In the Notifications section, specify the role associated with the person group that you created in Step 3.
 - c. Activate the escalation.
5. In the Automation Scripts application, create a simple script based on any standard scripting language. The scripting language in this example is written in Python:
 - a. In the Script field, specify `MAXROLE.MYTESTCUSTOMROLE`.
The name must be a concatenation of MAXROLE followed by the name of the custom role that you created for this process and must contain uppercase letters only.
 - b. Either import a script that you created elsewhere or you can add the script directly into the record. You can use one of the following methods in your script:

Option	Description
<code>evalToPerson(ctx)</code>	Use this method if you want to select a person or a person group for this role. The <i>ctx</i> variable refers to an instance of the <code>com.ibm.tivoli.maximo.script.ScriptRoleContext</code> Java class. The script can call the <code>ctx.setPersonOrGroupMbo(pergroupmbo)</code> class to set the person or persongroup mbo to this <i>ctx</i> variable, where <i>pergroupmbo</i> is the reference to an existing persongroup mbo.
<code>evalToEmail(ctx)</code>	Use this method if you want to select a set of emails. The email addresses do not have to be associated with person records. As with the previous option, the <i>ctx</i> variable in the script is associated with an instance of <code>com.ibm.tivoli.maximo.script.ScriptRoleContext</code> Java class. You can use this <i>ctx</i> variable to set email addresses as shown in the following example: <pre>def evalToEmail (ctx): ctx.addEmailId ("person1@example.com") ctx.addEmailId ("person2@example.com")</pre>

6. Activate the script and save the record.

Launch points

A launch point is a complete script configuration. The configuration consists of the target application or context, the variables that are passed between the application and the script, and the body of the script.

You can create a script and associate a launch point to the script. Alternatively, you can create a launch point and associate it to variables and scripts. You can share a script among multiple launch points. Scripts and launch points can be promoted from development to production by using Migration Manager.

When a launch point is deactivated, the scripts associated with that launch point do not run. To debug an application, you can deactivate a launch point to test the behavior of the application without the script.

The status of the automation script does not affect how the scripting framework executes the script. A script in draft status is treated the same way as a script with a status of Active.

- [Script with an object launch point](#)
An object launch point associates a script with a business object and executes in response to a business object event. Events are associated with a specific context so that the script executes before or after the object is saved or after it is committed to the database. You can, optionally, associate an event with a condition and limit execution to circumstances where the condition is satisfied.
- [Script with an attribute launch point](#)
An attribute launch point associates a script with a specific field of a business object and an event occurring against that field, and executes only when a value is specified for that field.
- [Script with an action launch point](#)
An action launch point associates a script with an action and executes when the specified action occurs. Use the Actions application to configure the associated action.
- [Script with a custom condition launch point](#)
A custom condition launch point associates a script with a custom condition and executes when the condition is satisfied. Use the Conditional Expression Manager application to configure the associated condition.
- [Script without a launch point](#)
You can enter a script in the Automation Scripts application without associating it with a launch point. This approach is useful, for example, if you want to import a library of scripts that you intend to configure at a later stage.

Script with an object launch point

An object launch point associates a script with a business object and executes in response to a business object event. Events are associated with a specific context so that the script executes before or after the object is saved or after it is committed to the database. You can, optionally, associate an event with a condition and limit execution to circumstances where the condition is satisfied.

An object launch point can be based on any object in the database, and you must associate it with at least one of the following events:

Initialize value

Indicates whether the script is executed by the initialize event.

Validate application

Indicates whether the script is executed by the validate event.

Allow object creation

Indicates whether new Maximo® business objects (MBOs) can be created. For example, your business logic can state that when a purchase order is approved, new POLINE objects cannot be created. Only one launch point can be defined for the selected MBO and the Allow object creation event.

Allow object deletion

Indicates whether MBOs can be deleted. For example, your business logic can state that when a work order is approved, WOLINE objects cannot be deleted. Only one launch point can be defined for the selected MBO and the allow object deletion event.

Save

Indicates whether the script is executed by the save event. If you select the Save radio button, you must specify the context for the save in the Save section.

The save event can be executed in any of the following contexts:

Before save

The script is executed and sets values on the business object before the underlying transaction is saved. For example, you can apply a business rule that checks if a specific naming convention has been followed when a new record is being saved. If the naming convention rule has not been followed, the save activity is not allowed and the user receives an error message.

After save

The script is executed after the business object is saved but before the changes are committed. This event context enables you to incorporate a business rule and roll back processing on a transaction if necessary. For example, in an integration scenario, if a transaction update to an external system fails due to a connection issue, the initial transaction can be rolled back so that both databases remain synchronized.

After commit

The script is executed after a transaction has been committed to the database and cannot be rolled back. This event context is typically used to initiate additional actions immediately after the commit of a particular business object. For example, a script initiates sending email notifications when a work order is completed or sends an integration message to notify an external system when a purchase order is created.

In the Object Event Condition field, you can restrict activation of the script by specifying a condition that is related to the event. For example, to redirect a user to a new form when a user attempts to add a person whose language is not English. In this scenario, if the `langcode` attribute for the person is set to English, the script is not activated.

Example of an object launch point

When an asset record is created, the asset number must adhere to a naming convention. The asset number must be prefixed with the type of asset that the user is creating. For example, a Facilities asset must have an FT prefix. If the appropriate prefix is not specified, show an error message to indicate that the prefix is invalid. To implement the requirement, complete the following steps:

1. Define an object launch point on the ASSET business object.
2. Define the script that associates the prefix and associate the script with the object launch point:

```
def setError(prefix) :  
    global errorkey,errorgroup,params  
    errorkey='invalidassetprefix'
```

```

errorgroup='asset'
params=[prefix, assettype]

if assettype_internal=='FACILITIES' and not assetnum.startswith('FT'):
    setError('FT')
elif assettype_internal=='FLEET' and not assetnum.startswith('FL'):
    setError('FL')
elif assettype_internal=='IT' and not assetnum.startswith('IT'):
    setError('IT')
elif assettype_internal=='PRODUCTION' and not assetnum.startswith('PR'):
    setError('PR')

```

3. Test the object launch point and script, and activate or de-activate the launch point as required.

Script with an attribute launch point

An attribute launch point associates a script with a specific field of a business object and an event occurring against that field, and executes only when a value is specified for that field.

Similar to an object launch point, you associate an attribute launch point with a specific object in the database. However, in addition to an object, an attribute launch point must be associated with a specific attribute in that object. An attribute launch point is appropriate if you want to perform a routine every time an object attribute value is initialized, updated, or looked up by using a Lookup dialog box. For example, you can use an attribute launch point to get the account number for an existing customer.

You can associate an attribute launch point with the following events on a field:

Initialize access restriction

Sets the access level for the attribute's field. For example, you can change the access level for an attribute's field from read/write access to read-only access.

Initialize value

Sets the value for the attribute's field. For example, you can automatically enter the account number for an existing customer.

Validate

Checks whether the value in the attribute's field is valid. For example, you can check whether a telephone number is properly formatted or contains enough digits to constitute a valid number.

Retrieve list

Retrieves a list of valid values for the attribute's field. For example, in an invoice, you can set up the supplier field to return a list of approved vendors.

Run action

Runs an action that is based on the value that is in the attribute's field.

You use choice messages to gather and act on user responses. You can define choice messages in the Database Configuration application. You are able to use OK, Close, Cancel, Yes, and No buttons in choice messages. Then, in your automation script, you can create business logic to match the buttons in the choice message.

When you use a combination of buttons, ensure that you have a button for each of your options. For example, you do not want to use only the Yes and OK buttons because these options do not give the user the option to cancel or stop the process.

Example of an attribute launch point

You can define an attribute launch point that runs whenever a user completes the Purchase price field. You define the script that configures the fields and associates the script with the attribute launch point. For example, if the purchase price of an asset is more than \$100, the Vendor field is required. If the purchase price of an asset is less than \$100, the Vendor field is not required. For any purchase price, the replacement cost must be half the purchase price.

To implement this requirement, you complete the following steps:

1. Define an attribute launch point that is executed when a user moves out of the Purchase Price field.
2. Define the script that configures the fields and associate the script with the attribute launch point:

```

if purchaseprice > 200:
    errorgroup = "asset"
    errorkey="purchasepricemsg"
else:
    if purchaseprice >= 100:
        vend_required=True
    else:
        vend_required=False
    rc = purchaseprice/2

```

3. Test the attribute launch point and script and activate or de-activate the launch point as required.

Script with an action launch point

An action launch point associates a script with an action and executes when the specified action occurs. Use the Actions application to configure the associated action.

You can create actions to perform the following tasks:

- Start an application action
- Execute a custom class or specified executable program
- Set the value of a field on a record

To create a script with an action launch point, in the Automation Scripts application, select the Create Script with Action Launch Point action. When you specify a name for the launch point, the value is copied to the Action field, but you can modify it. For example, you can specify the name of an existing action that you intend to use. If you create a new action name, you can use that name when you create the action in the Actions application. Specify the object that can launch this script.

Example of an action launch point

You can use an action launch point to automate tasks that are part of a workflow. When a service request record is worked on as part of a workflow process, the target contact and target start dates must be calculated. A work log entry must also be created for the service request.

To implement this requirement, you complete the following steps:

1. Define an action launch point on the service request object process.
2. Define the script that calculates the target contact and start dates, and generates the work log:

```
from java.util import Calendar

if status=='NEW' and reportedpriority==1 and assetnum is not None:
    cal=Calendar.getInstance()
    cal.add(Calendar.DATE, +1)
    targetcontactdate = cal.getTime()
    cal.add(Calendar.DATE,+1)
    targetstartdate=cal.getTime()

    worklogset = mbo.getMboSet ('WORKLOG')
    worklogentry = worklogset.add()
    worklogentry.setValue('clientviewable',1)
    worklogentry.setValue('logtype','WORK')
    worklogentry.setValue('description','System initiated processing')
```

3. Define the workflow process and associate the action that executes the action launch point with the workflow process. Validate, enable, and activate the workflow.
4. Test the workflow process, action launch point, and script and activate or de-activate the launch point as required.

Script with a custom condition launch point

A custom condition launch point associates a script with a custom condition and executes when the condition is satisfied. Use the Conditional Expression Manager application to configure the associated condition.

In the Conditional Expression Manager application, you can create conditional classes and expressions to restrict user access to fields, tabs, and other user interface controls. When you create a script with a custom condition launch point you specify the precise name of the condition that you create in the Conditional Expression Manager application.

Example of a custom condition launch point

You can use a custom condition launch point to restrict user access. For all users in a security group, for assets that have status of DECOMMISSIONED, the Assets application must not show the Spare Parts tab. You can define a custom condition launch point to evaluate the status of an asset record. You define the condition expression that starts the script and then define the signature option that controls access to the Spare Parts tab. You then associate the condition expression and signature option with the security group.

To implement this requirement, you complete the following steps:

1. Define a custom condition launch point.
2. Define the script that evaluates the status of an asset record:

```
if(status=='DECOMMISSIONED') :
    evalresult=False
else:
    evalresult=True
```

3. Define the condition expression that invokes the script.
4. Define the signature option that controls access to the Spare Parts tab.
5. Associate the condition expression and signature option with the required security group.
6. Test the complete configuration and activate or de-activate the launch point as required.

Script without a launch point

You can enter a script in the Automation Scripts application without associating it with a launch point. This approach is useful, for example, if you want to import a library of scripts that you intend to configure at a later stage.

To create a script without associating it with a launch point, select Create Script.

If you want to later associate the script with a launch point, you can create a script with a launch point and specify this script as the existing script to use.

Another example of an automation script that is not associated with a launch point is an automation script that runs as part of a cron task. You create the script in the Automation Scripts application. In the Cron Task Setup application, you reference the script-aware Java™ class in your cron task definition. Then, you can attach the automation script to the cron task.

Examples of Maximo Business Rules (MBR) scripts

Several examples are provided to illustrate how to use Maximo® Business Rules (MBR) language in several common scripting scenarios.

- [Script for an object launch point to add an MBO to an MBOSet](#)
- [Script for an attribute launch point to manipulate dates](#)
- [Script without a launch point to set an attribute on a duplicate object](#)

Example: Adding an MBO to an MBOSet

When a new asset is added with an asset type of GASENG, the record adds two meters to the meter MBOSet of the asset. The meters are O-PRESSUR and IN-PRESSUR.

Procedure

1. In the Automation Scripts application, create a script that has an object launch point.
2. Specify the launchpoint name and select the ASSET object.
3. In the Events section, select the Save event.
4. In the Save section, specify the context for the event and select Add and Before Save.
5. In the Script section, select the option to add a script and advance to the next page.
6. Specify a script name and set the log level to debug. Advance to the next page.
7. Paste the source code that follows into the Source Code field and click Create to add the script.

```
#my first MBR code for asset
setvar("isgaseng", (asettype == "GASENG" && countf("assetmeter")==0))
if(getvar("isgaseng"), invokescript(":createmeters"))

#my MBR function that will add the two meter MBOs to the asset MBO
:createmeters
newmbo("opressure", "assetmeter")
setvaluetombo("opressure", "metername", "O-PRESSUR")
newmbo("inpressure", "assetmeter")
setvaluetombo("inpressure", "metername", "IN-PRESSUR")
```

Analysis

This script contains two lines of main code and a function. The script is run when a user saves changes to an asset record. In the main code, the following logic is implemented:

1. Create a local variable and set the variable to **TRUE** if both of the following conditions are true:
 - The asset type is GASENG.
 - The meter MBOSet of the asset is empty.
2. Evaluate the local variable. If the local variable is **TRUE**, call a function to add MBOs to the meter MBOSet of the asset. In the createmeters function, the following logic is implemented:
 - a. Add an MBO to the meter MBOSet of the asset.
 - b. Set the name of the MBO to O-PRESSUR.
 - c. Add a second MBO to the meter MBOSet of the asset.
 - d. Set the name of the second MBO to IN-PRESSUR.

The script uses two internal variables, *asettype* and *assetmeter* to derive the asset type and the contents of the meter MBOSet of the asset.

Because this script runs when a user saves their changes, the application transaction framework saves and commits the newly created MBOs as part of the main transaction.

You can move the createmeters function code into a library script. For example, you can move the createmeters function code to a library script that is also called createmeters and then call the library script in the following statement:

```
if(getvar("isgaseng"), invokescript("createmeters"))
```

Example: Manipulating dates

If an asset has a type of BUS, take the following actions:

- Set the end of life date to the installation date plus one year. If the asset does not have an installation date, set the end of life date to the current date plus one year.
- Make the priority attribute mandatory.

Procedure

1. In the Automation Scripts application, create a script that has an attribute launch point.
2. Specify the launch point name, and select the ASSET object and the ASSETTYPE attribute.
3. In the Events section, select the Validate event.
4. In the Script section, select the option for a new script and advance to the next page.
5. Specify a script name and set the log level to debug. Advance to the next page.
6. Paste the source code in the following section into the Source Code field and click Create to add the script.

```
if(asettype=="BUS", setvalue("estendoflife", nvl(installdate, now()) + duration(1, 0, 0, 0, 0, 0))
if(asettype=="BUS", setrequired("priority", TRUE), setrequired("priority", FALSE))
```

Analysis

This script is run when the asset type is modified. In the script, the following logic is implemented:

- If the asset has a type of BUS, set the end of life date:
 1. Evaluate the installation date of the asset.
 2. If the installation date is empty, set the end of life date to the current date plus one year.
 3. If the installation date is populated, set the end of life date to the installation date plus one year.
- If the asset has a type of BUS, make the priority attribute mandatory. If the asset does not have a type of BUS, make the priority attribute optional.

For both of these actions, the script checks to see whether the asset has a type of BUS, which is inefficient. You can improve the script by defining a function, moving both actions into the function, and calling the function if the asset has a type of BUS. The following code demonstrates this improvement:

```
if (assettype=="BUS", invokescript(":seteol"), setrequired("priority", FALSE))
:seteol
setvalue("estendoflife", nvl(installdate, now()) + duration(1, 0, 0, 0, 0))
setrequired("priority", TRUE)
```

The script uses the internal variables *assettype*, *estendoflife*, and *installdate* to derive the values of the type, end of life date, and install date of the asset.

Example: Setting attributes on duplicate objects

When a work order is duplicated, copy the original work order number to a custom attribute in the duplicate work order.

Procedure

1. In the Automation Scripts application, create a script that does not have a launch point.
2. Specify a script name of WORKORDER.DUPLICATE.
3. Specify MBR as the script language if it is not specified.
4. Paste the following source code into the Source Code field and click Create to add the script:

```
setvaluetombo("dupmbo", "copiedfrom", wonum)
```

Analysis

The script name ensures that this script runs when a work order is duplicated. The script copies the original work order number into a custom attribute in the duplicate work order.

The script uses the internal variables *wonum*, *dupmbo*, and *copiedfrom* to derive the values of the original work order number, the duplicate work order number, and the custom attribute on the duplicate work order.

Variables in automation scripts

Variables determine how information is passed into or received from a script. You can configure the variables for the script in the wizards instead of declaring variables within the source code. By using variables, you reduce the complexity of the source code and make it easier to reuse the source code for different purposes.

- [Launch point variables](#)
When you create a launch point you can declare as many variables as required. After you create a script, you can add more variables or modify existing variables.
- [Implicit variables](#)
Implicit variables are variables that you do not define. These variables are automatically provided by the framework. Some implicit variables are valid only when associated with a declared variable while others are not associated with any other variables.
- [Data retrieval by using variable bindings](#)
You use variable bindings to retrieve values for the variables in the script. When variables are bound to business object attributes, the coding required in the script is simplified.

Launch point variables

When you create a launch point you can declare as many variables as required. After you create a script, you can add more variables or modify existing variables.

When you declare a variable you must specify it as one of the following types:

INPUT

Passes information into the script.

OUTPUT

Passes information out from the script.

INPUT/OUTPUT

Passes information into the script and returns information from the script.

The script can modify only the **INPUT** and **OUTPUT** type of variables. Modification of **INPUT** variables in the script has no impact outside the script.

When you create a script with an object launch point, you specify one or more events and the event context when the script is activated. If a script runs after the business object is saved, or after the business object is committed to the database, the only relevant variable type in the context is the **INPUT** variable type.

Variables have bindings that identify the source of the value for the variable. Variables can have a global binding value that is common to all launch points that are associated with the script. You can override the global binding value for specified launch points. The following table lists the binding types and values that you can use:

Binding type	Variable binding value
ATTRIBUTE	The name of an attribute of a business object that provides the value for the variable.
MAXVAR	The name of a system control value that provides the value for the variable.
SYSPROP	The name of a system property that provides the value for the variable.
LITERAL	If you use a literal type of binding, you must specify the value for the variable in the Binding Value field. You must also specify the data type in the Literal Data Type field.

Implicit variables

Implicit variables are variables that you do not define. These variables are automatically provided by the framework. Some implicit variables are valid only when associated with a declared variable while others are not associated with any other variables.

In addition to implicit variables, a Maximo® business object (MBO) is also available to every script. You refer to the current business object by using the *mbo* reserved word.

Implicit variables that are not associated with another variable are set into the script and you can refer to these variables directly by name. For example, *app* or *mbo* are not associated with other variables.

The variables in the following table are not associated with any other variable in use:

Table 1. Implicit variables that are not associated with other variables

Implicit variable	Type	Scope	Description
<i>action</i>	String	Action launch point	Indicates the name of the action that is generated from the action launch point.
<i>app</i>	String	All launch points	Indicates the name of the application that the script is running against. The <i>app</i> variable is passed to the script.
<i>domainid</i>	String	Use this variable only when the attribute launch point implements the retrieve list event.	Specifies the domain that is used to provide the list of values that are shown for the attribute launch point.
<i>errorgroup</i>	String	All launch points	Selects the message group identifier that is defined in the Database Configuration application. The <i>errorgroup</i> variable is set in the script. Together with the <i>errorkey</i> variable, the <i>errorgroup</i> variable identifies an error message that is declared in the message repository.
<i>errorkey</i>	String	All launch points	Enables script authors to set an error message from the script into the business object. The script code selects the Message Key identifier that is defined in the Database Configuration application. The <i>errorkey</i> works with the <i>errorgroup</i> and the <i>params</i> implicit variables. The advantage of setting an error message from the messages repository is that translated messages are automatically picked up. The script code sets the error key that is configured in the Database Configuration application. The <i>errorkey</i> variable is set in the script.
<i>evalresult</i>	Boolean	Condition launch point	Set in the script. Workflow condition evaluation and security conditions scripts return true or false values.
<i>interactive</i>	Boolean	All launch points	Indicates whether the script is running in an active user session or a non-user background session, such as integration transaction processing.
<i>launchPoint</i>	String	All launch points	Indicates the name of the launch point for which the script is run.
<i>listErrorGroup</i>	String	Use this variable only when the attribute launch point implements the retrieve list event. Specify the <i>listErrorGroup</i> and <i>listErrorKey</i> variables together and use the messages facility in the Database Configuration application to select the message that is stored in the MAXMESSAGES table.	Identifies the group ID of the message that the user sees when the retrieve list event fails.
<i>listErrorKey</i>	String	Use this variable only when the attribute launch point implements the retrieve list event. Specify the <i>listErrorGroup</i> and <i>listErrorKey</i> variables together and use the messages facility in the Database Configuration application to select the message that is stored in the MAXMESSAGES table.	Identifies the key ID of the message that the user sees when the retrieve list event fails.
<i>listOrder</i>	String	Use this variable only when the attribute launch point implements the retrieve list event.	Set to any ORDER BY attribute names that are used to order the results of the retrieve list event.
<i>listWhere</i>	String	Use this variable only when the attribute launch point implements the retrieve list event.	Establishes which set of result data is displayed and which filter is set before the results are shown. Set the <i>listWhere</i> variable to a WHERE clause that uses the related MBO.

Implicit variable	Type	Scope	Description
<i>mbo</i>	psdi.mbo.Mbo	All launch points	References the MBO that is being worked on.
<i>mboSet</i>	psdi.mbo.MboSet	Object launch points of Allow Create type	References the MboSet that the new MBO will be added to.
<i>mboName</i>	String	All launch points	Indicates the name of the current MBO in the context of the script that is running.
<i>mboValue</i>	psdi.security.UserInfo	All attribute launch point events	An instance of the MBO attribute for the attribute launch point.
<i>onAdd</i>	Boolean	All launch points. Ideally used with object launch points where the script applies to multiple event types such as add, update, and delete.	Indicates whether the business object that the script is running against is being inserted or created. You can use the <i>onAdd</i> variable to perform conditional actions or validations that are based on the state of the MBO.
<i>onDelete</i>	Boolean	All launch points	Indicates whether the business object that the script is running against is being deleted.
<i>onUpdate</i>	Boolean	All launch points	Indicates whether the business object that the script is running against is being updated.
<i>params</i>	String[]	All launch points	Holds the final resolved parameters to be applied into the error message that is posted from the script. The <i>params</i> implicit variable is an array. A message that is declared in the messages repository might have parameters that are defined. The contents of the message are fully resolved only at run time in the context of the script code. The <i>params</i> variable is used with the <i>errorGroup</i> variable and the <i>errorKey</i> variable to prepare the error message that is posted from the script code. The <i>params</i> variable is set in the script.
<i>relationObject</i>	String	Use this variable only when the attribute launch point implements the retrieve list event. Typically used with the <i>srcKeys</i> and <i>targetKeys</i> implicit variables.	Applies to the related MBO that is searched from the current MBO.
<i>relationWhere</i>	String	Use this variable only when the attribute launch point implements the retrieve list event. Typically used with the <i>srcKeys</i> and <i>targetKeys</i> implicit variables.	Establishes the criteria that is used to perform the retrieve list event. Set to a WHERE clause that queries the related MBO.
<i>scriptHome</i>	psdi.mbo.Mbo	Action launch point	References the MBO that is worked on. The preferred approach to implementing scripts is to use the <i>mbo</i> keyword in the script code.
<i>scriptName</i>	String	All launch points	Provides the name of the script that is running.
<i>service</i>	com.ibm.tivoli.maximo.script.ScriptService	All launch points	Added to a script by the scripting framework at run time.
<i>srcKeys</i>	String[]	When the attribute launch point implements the retrieve list event	Applies to the set of attribute names from the current MBO that is used to lookup a related record in another related or target MBO. For example, the set of attribute names from the current MBO might be used to look up that FAILURECODES field from the ASSET business object.
<i>thisValue</i>	MBO attribute for the attribute launch point	Use this variable as the init value and the init access restriction for attribute launch points	Represents the current attribute. For example, <i>thisValue="abc"</i> sets the current value to abc.
<i>targetKeys</i>	String[]	When the attribute launch point implements the retrieve list event	Applies to the set of attribute names in the target MBO that is looked up from the current MBO on which the attribute launch point is defined.
<i>user</i>	String	All launch points	Provides the user ID of the user who is logged in. The <i>user</i> variable is passed to the script and cannot be set in the code.
<i>userInfo</i>	psdi.security.UserInfo	All launch points	Provides the object for the current context.
<i>wfInstance</i>	psdi.workflow.WFInstance	Action launch point when the action is started from a workflow.	Indicates the workflow instance from which the current action was started.

Some implicit variables are valid only when they are associated with a variable that you declare. You use these implicit variables by typing the variable that you declared, an underscore, and then the implicit variable. For example, if a variable called *siteid* is specified for a script, the line of code *siteid_readonly=True* causes the associated *siteid* attribute of the business object to become read-only. This type of implicit variable is not available for variables that are bound to the MAXVAR, SYSPROP, or LITERAL binding types.

In the following table, *var* represents the name of the variable that you explicitly define in the Automation Scripts application. The implicit variable that is associated with the primary declared variable follows the underscore.

Table 2. Implicit variables that are used with a primary variable in automation scripts

Implicit variable	Type	Scope	Description
<i>var_hidden</i>	Boolean	All launch points	Retrieves or sets the hidden flag for the business object attribute. The script can modify the <i>var_hidden</i> variable if the primary variable is of an OUT or INOUT type.
<i>var_initial</i>	The same type as the MBO attribute that the variable binds to.	All launch points	Provides the initial value for an attribute that is retrieved from the MBO. The <i>var_initial</i> variable is passed to the script. The script cannot modify the <i>var_initial</i> variable.

Implicit variable	Type	Scope	Description
<i>var_internal</i>	The same type as the MBO attribute that the variable binds to.	All launch points	Provides the internal value for an SYNONYMDOMAIN entry. If the primary variable is associated with a MBO attribute that is associated with a synonym domain, the <i>var_internal</i> implicit variable provides the corresponding internal value for the attribute. The <i>var_internal</i> variable is passed to the script. The script cannot modify the <i>var_internal</i> variable.
<i>var_modified</i>	Boolean	All launch points	Provides a flag that indicates whether the value for an attribute was modified. The <i>var_modified</i> variable is passed to the script. The script cannot modify the <i>var_modified</i> variable.
<i>var_previous</i>	The same type as the MBO attribute that the variable binds to.	Attribute launch points but only for the attribute that generated the event.	Provides the previous value for an attribute that is retrieved from the MBO. The <i>var_previous</i> variable is passed to the script. The script cannot modify the <i>var_previous</i> variable.
<i>var_readonly</i>	Boolean	All launch points	Retrieves or sets the read-only flag for a business object attribute. The script can modify <i>var_readonly</i> if the primary variable is of an OUT or INOUT type.
<i>var_required</i>	Boolean	All launch points	Retrieves or sets the required flag for a business object attribute. The script can modify <i>var_required</i> if the primary variable is of an OUT or INOUT type.

- [Service.log\(\) method](#)

The `service.log()` method is used in a script to add log statements to a log file without buffering. Because there is no buffering, the `service.log()` method allows real-time logging.

Service.log() method

The `service.log()` method is used in a script to add log statements to a log file without buffering. Because there is no buffering, the `service.log()` method allows real-time logging.

The `service` in the `service.log()` method is the script global variable that is added to a script by the scripting framework at run time.

To use the `service.log()` method in an object structure script, use the `ctx` input parameter. The `service` variable is passed to the function as the `ctx` input parameter. No `service` variable is passed from the script.

The following example is an object structure definition class script for the `overrideValues` callback:

```
{
    ctx.log(...);
}
```

Data retrieval by using variable bindings

You use variable bindings to retrieve values for the variables in the script. When variables are bound to business object attributes, the coding required in the script is simplified.

- [Relationship notation and path](#)

A notation is the set of characters and symbols used to define an expression. An expression is a complete, usable binding definition in the context of scripting. An expression consists of a combination of business object name, relationship name, attribute name, and notations. The script uses the path defined by the expression to retrieve a value for variables that are associated with the launch point of the script.

- [Single value retrieval](#)

By using the relationships between business objects, you define a path for the script to retrieve a single value for a variable. The script retrieves the value from a business object attribute that is related to the primary business object.

- [Multiple value retrieval](#)

By using the relationships between business objects, you define a path for the script to retrieve multiple values for a variable. The script retrieves the values from a business object attribute that is related to the primary business object. You define the array of values by placing an asterisk after the required attribute.

- [Array notations as filters](#)

You use array notations to filter a set of data so that the script can retrieve a particular value or subset of values. You specify the required value or values by placing square brackets around the filter.

- [Example: Array notations in automation scripts](#)

When variables with relationship path bindings are resolved at run time, the scripting framework constructs and inserts a standard array object into the script code. The script code references the required array of values by the variable name you declared in the launch point configuration.

Relationship notation and path

A notation is the set of characters and symbols used to define an expression. An expression is a complete, usable binding definition in the context of scripting. An expression consists of a combination of business object name, relationship name, attribute name, and notations. The script uses the path defined by the expression to retrieve a value for variables that are associated with the launch point of the script.

The binding for a variable that receives a value from a related business object uses the standard relationship notation. The relationship begins at the current business object and can traverse multiple relationships and business objects to reach the target business object. The relationship notation uses the format of

relationship name, a 'dot' separator, and the name of the target business object attribute. The binding for a variable against a related business object has the following format: <relationship to related business object A>.<relationship to related object B>...<relationship to related object X>.<attribute of X>.

Single value retrieval

By using the relationships between business objects, you define a path for the script to retrieve a single value for a variable. The script retrieves the value from a business object attribute that is related to the primary business object.

Example of an expression to retrieve a single value

If a script needs to retrieve the quantity declared on the distributed cost for the first PO line of a purchase order. The following relationship expression is used:

```
POLINE.POCOST.quantity
```

The expression is interpreted by the script in the following way:

- From the PO business object, traverse to POLINE business object by using the POLINE relationship and retrieve the first POLINE record.
- Traverse to the POCOST business object from the retrieved POLINE record by using the POCOST relationship and retrieve the first POCOST record.
- From the first POCOST record, retrieve the value of the 'quantity' attribute and set it into the launch point variable.

Multiple value retrieval

By using the relationships between business objects, you define a path for the script to retrieve multiple values for a variable. The script retrieves the values from a business object attribute that is related to the primary business object. You define the array of values by placing an asterisk after the required attribute.

Example of an expression to retrieve multiple values

In a script, the following expression retrieves all the quantity values declared on the distributed costs of a PO for all PO lines:

```
POLINE.POCOST.quantity*
```

The following relationship path uses a filter with a WHERE clause. The script retrieves an array of loaded cost values declared on the distributed costs of a PO for a subset of PO lines and PO costs:

```
POLINE[linecost>100].POCOST[percentage<100].loadedcost*
```

The following relationship path uses a filter with a condition. The script retrieves an array of loaded cost values declared on the distributed costs of a PO for a subset of PO lines and PO costs:

```
POLINE[linecost>100].POCOST[cond: PERCENTCOND].loadedcost*
```

Array notations as filters

You use array notations to filter a set of data so that the script can retrieve a particular value or subset of values. You specify the required value or values by placing square brackets around the filter.

You can use filters to specify the value or values that the script must retrieve:

- Array index
- Filter with WHERE clause
- Filter with condition

Array index

If multiple records exist for the same business object, you must specify the particular record for the script to retrieve. You specify the index of the record between the square brackets that represent an array.

Example of an array index

A script must retrieve the quantity declared on the distributed costs of a purchase order for a single PO line. The relationship expression uses an array filter:

```
POLINE[3].POCOST[4].quantity
```

An array is indexed from 0 and the expression is interpreted by the script in the following way:

- From the PO business object, traverse to POLINE business object by using the 'POLINE' relationship and retrieve the fourth POLINE record.
- Traverse to the POCOST business object from the retrieved POLINE record by using the POCOST relationship and retrieve the fifth POCOST record.
- From the fifth POCOST record, retrieve the value of the quantity attribute and set the value into the launch point variable.

Retrieving values by using an array index uses business objects and sets of business objects already loaded into the memory by the business application. Using an array index is therefore *in memory* filtering.

Filter with WHERE clause

If multiple records have the same business object, you specify the particular record or subset of records that the script must retrieve. You specify a WHERE clause between the square brackets that represent an array.

Example of a filter with a WHERE clause

A script must retrieve the quantity declared on the distributed costs of a purchase order for a subset of PO lines. The relationship expression uses a filter:

```
POLINE [linecost>100] .POCOST [percentage<100] .quantity
```

The expression is interpreted by the script in the following way:

- From the PO business object, traverse to those POLINE business objects whose line cost is greater than 100.
- For each of the POLINE business objects, traverse only to the POCOST business objects whose percentage value is less than 100.
- Retrieve the quantity of the first POCOST record that has a percentage value of less than 100.

The WHERE clause is appended to the existing relationship WHERE clause that is pre defined in the data dictionary for the POLINE relationship. Retrieving values by using the WHERE clause filter retrieves data from the database. The values are accessed by the script by applying the complete WHERE clause to the target table or view that the business object represents. This type of filtering involves more processing than retrieving values by index or by condition.

Filter with condition

If multiple records have the same business object, you specify the record or subset of records that the script must retrieve. You specify a condition between the square brackets that represent an array.

Example of a filter with a condition

A script must retrieve a quantity declared on the distributed costs of a purchase order for a subset of PO lines. The relationship expression uses a filter:

```
POLINE [linecost>100] .POCOST [cond: PERCENTCOND] .quantity
```

The expression is interpreted by the script in the following way:

- From the PO business object, traverse to the POLINE business objects that have a line cost that is greater than 100.
- For each of the POLINE business objects, traverse only to the POCOST business objects that meet the condition defined by PERCENTCOND.
- Retrieve the quantity of the first POCOST record that meets the condition.

The condition PERCENTCOND is a condition expression configuration defined with Conditional Expression Manager. You define the configuration before using it in the relationship path. When specifying the condition in the relationship path, ensure that the condition is preceded by the keyword `cond` and the colon. Unlike a filter with a WHERE clause, retrieving values with the condition filter is done *in memory*.

Example: Array notations in automation scripts

When variables with relationship path bindings are resolved at run time, the scripting framework constructs and inserts a standard array object into the script code. The script code references the required array of values by the variable name you declared in the launch point configuration.

Example

Business logic needs to be implemented so that the total material cost that is associated with a work order is calculated. An object launch point is defined on the WORKORDER business object. You define a variable called `matcostarray` to represent the array of material costs. The binding for this variable uses a relationship path `MATUSETRANS .linecost*`. The relationship path traverses a pre defined relationship called MATUSETRANS. Traversing this relationship gives the script access to all of the MATUSETRANS business object records associated with the work order to retrieve all material costs. The variable is directly referenced in the script code:

```
if matcostarray is not None:
    if len(matcostarray)>0:
        for value in matcostarray:
            if value is not None and value !=0:
                totalmatcost += value
```

In the fragment of script code written with Jython, the following logic is implemented:

- Check whether the array object is valid.
- Check whether the array contains multiple elements.
- Loop through the array to retrieve each element.
- Sum the individual values into the local variable `totalmatcost`.

Gathering user input by using choice messages in automation scripts

A choice message gathers user input, which can then be used in the automation script. You can use choice messages in automation scripts to create an interactive user experience. For example, a message can say that a record does not exist and ask if the record should be created.

You can define choice messages in the Database Configuration application. The buttons that you can use on a choice message are OK, Close, Cancel, Yes, and No. You can use curly brackets {} to insert variables into the choice message. For example, in the Labor text field, a user can enter the name of a person, but that person must have a person record. If a person record does not exist, the user receives the following error message: A person record does not exist for {0}. Would you like to create one?

You can use choice messages in automation scripts that are associated with action launch points, the Validate Value event for an attribute launch point or the Run Action event for an attribute launch point. Typically, an automation script that is associated with an attribute launch point presents a choice message to users. Such an automation script must contain code that triggers the display of a choice message, retrieves the user's choice, and performs the selected action for the user's choice.

When you write an automation script that uses a choice message, you first declare the functions that define the business logic that is necessary to process the user input. Then, you link the user input to the appropriate functions. Finally, you implement the business logic checks that are performed so that the user input is retrieved and applied to the dictionary to run the appropriate function.

One of the business logic checks that you can perform is to use the *interaction* implicit variable to check that the situation is interactive. This implicit variable takes a Boolean value of either true or false. If true, the script code is run in the context of an application user interface. If false, the script code is run from a backend service, from a component loading data through the integration framework, or from a cron task.

- **Example: Configuring choice messages**

A company requires that whenever the highest priority level is assigned to an asset, then an email is sent to the asset custodian. An automation script is created to send this email. The automation script uses a choice message to confirm that the email should be sent.

Example: Configuring choice messages

A company requires that whenever the highest priority level is assigned to an asset, then an email is sent to the asset custodian. An automation script is created to send this email. The automation script uses a choice message to confirm that the email should be sent.

About this task

The example launch point and automation script that implements a choice message, and its processing uses the Jython programming language.

Procedure

1. In the Database Configuration application, select the Messages action and create a new message with the following values:

Fields	Values
Message Group	asset
Message Key	assetpriorityemail
Display Method	MSGBOX
Message ID Prefix	BMXZZ
Message ID Suffix	W
Display ID	1
Value	Asset custodian can be notified through email when priority {0} is set. Send email?
Buttons section	Check Yes and No buttons.

2. In the Automation Scripts application, create a script with an attribute launch point to run the Attribute Launch Point wizard.
3. In step 1 of the wizard, specify the launch point name, and select the ASSET object and the PRIORITY attribute.
4. In the Events section, choose the Run Action radio button.
5. In step 2 of the wizard, specify the script name and set the log level to debug.
6. In step 3 of the wizard, paste in the following source code and then click Create:

```
# Business logic implementation if user selects Yes choice (clicks Yes button)
def yes ():
    service.log("Sending Email")

# Business logic implementation if user selects No choice (clicks No button)
def no ():
    service.log("Not Sending Email")

# Business logic to present the choice message initially
def dflt ():
    params=[str(priority)]
    service.log("Throw ERROR")
    # Use the service utility's yncerror() method to push the choice message
    service.yncerror("asset", "assetpriorityemail",params);

service.log ('$$$SAM$ - entering ASSETPRIORITYVAL')
# Declare the user input choices and the corresponding functions implemented in this script
cases = {service.YNC_NULL:dflt, service.YNC_YES:yes, service.YNC_NO:no}

# Make sure the choice message is presented only
#if the field validation was triggered from user interface
if interactive:
    if priority < 2:
        service.log ("About to do something")
        # Use the service utility's yncuserinput() method to trigger the entire interaction
```

```
# User's response is stored in a local variable x
x = service.yncuserinput()
service.log("User input: "+str(x))
# Process the user input using Jython's case statement
cases[x]()
```

What to do next

To test your script, in the Assets application, select a record and set the priority to 1. When a choice message appears, select a choice.

Reusable library scripts in automation scripts

A library script is a reusable piece of programming logic that automation scripts can invoke from within the body of their code. Creating library scripts can save time and effort. Library scripts are stored in the database in the AUTOSCRIPPT table.

An example of a basic script is multiplication. You can create a library script that is named MULTIPLY:

```
z=x*y
```

You can then create a script that uses the MULTIPLY library script and logs the result:

```
service.log("I want to multiply 2 numbers and log the result")
from java.util import HashMap
a=3
b=2
ctx = HashMap()
ctx.put("x",a)
ctx.put("y",b)
service.invokeScript("MULTIPLY",ctx)
service.log("the result is "+str(ctx.get("z")))
```

The implicit variable in the `service` line is used to invoke the MULTIPLY library script: `service.invokeScript("MULTIPLY",ctx)`. When the MULTIPLY library script is invoked, the variables that are required by the script are passed into the script, which is done by the `ctx` lines and argument.

When you use a library script in an automation script, you must then define a Java™ HashMap object, which is done in the example in the `ctx = HashMap()` line. You place the variable names and values into the HashMap object. You must know the required variables for the library script, their names, and their data types, which in the example is accomplished in the `ctx.put("x",a)` line and the `ctx.put("y",b)` line.

If you want to receive output from the library script, then you must also use the name of the response variable in the automation script. The example script uses the response variable in the `service.log("the result is "+str(ctx.get("z")))` line.

Scheduling automation scripts to run as part of cron tasks

Cron tasks are jobs that run automatically on a fixed schedule on the application server. For example, the ESCALATION cron task processes escalations to ensure that critical tasks are processed on time. You can use several predefined cron tasks and you can also define new cron tasks. For new cron tasks, you must provide a Java™ class implementation that contains the business logic that is executed on a schedule.

Automation scripts support new cron tasks by providing the `com.ibm.tivoli.maximo.script.ScriptContask` Java class. By using this Java class reference in your cron task definition, you can attach an automation script that provides the business logic that is executed by the cron task.

- [Creating cron tasks that run automation scripts](#)
When an automation script runs as part of a cron task, the automation script does not require a launch point. You reference the `com.ibm.tivoli.maximo.script.ScriptContask` Java class in your cron task definition, and then you can attach an automation script to the cron task.
- [Variables in automation scripts that run as cron tasks](#)
You can use only variables of type IN because automation scripts that run as cron tasks are unassociated with Maximo® business objects. You can also use the implicit variables `scriptName`, `qName`, and `runAsUserInfo`.

Creating cron tasks that run automation scripts

When an automation script runs as part of a cron task, the automation script does not require a launch point. You reference the `com.ibm.tivoli.maximo.script.ScriptContask` Java™ class in your cron task definition, and then you can attach an automation script to the cron task.

About this task

Cron tasks are jobs that run automatically on a fixed schedule on the application server. For example, the ESCALATION cron task processes escalations to ensure that critical tasks are processed on time. You can use several predefined cron tasks and you can also define new cron tasks. For new cron tasks, you must provide a Java class implementation that contains the business logic that is executed on a schedule. By using this Java class reference in your cron task definition, you can attach an automation script that provides the business logic that is executed by the cron task.

Procedure

1. In the Automation Scripts application, on the List tab, select the Create, Script action.
2. Specify a name, description, and log level for the script.
3. If the script requires variables, in the Variables section, add new rows to declare the variable and bindings.
You cannot specify bindings to a Maximo® business object. You can specify only LITERAL, SYSPROP, and MAXVAR bindings.
4. Enter the source code of the automation script and click Create to save the automation script in the database.
5. In the Cron Task Setup application, create a new cron task definition.
6. In the Class field, enter `com.ibm.tivoli.maximo.script.ScriptCrontask`.
7. Create the cron task instance that runs the automation script.
 - a. In the Cron Task Instances section, add a row.
 - b. Specify the cron task instance name.
 - c. Set the schedule for when the cron task is run.
 - d. Select Run As User.
The security authorizations that are granted to the specified user determines whether business logic that is related to Maximo business object can run in the script code.
For example, a value cannot be set in a record unless the specified user has the security authorization to write values into that record.
8. In the Parameters tab, in the SCRIPTARG row, specify a value that represents an argument for the cron task.
9. In the SCRIPTNAME row, specify the name of the script that you created to run as part of the cron task.
SCRIPTNAME is a mandatory parameter that must be populated. The script name that you specify is passed to the automation script in the form of the `scriptName` implicit variable.
10. In the Details section, select the Active check box to activate the cron task instance.
11. Save the record.

Variables in automation scripts that run as cron tasks

You can use only variables of type IN because automation scripts that run as cron tasks are unassociated with Maximo® business objects. You can also use the implicit variables `scriptName`, `qName`, and `runAsUserInfo`.

The following limitations apply to using type IN variables with automation scripts that run as cron tasks:

- You can use variables with a literal binding to send parameters into an automation script that is run as a cron task.
- You can use variables with a System Property binding to send parameters.
- You can use variables with a MAXVAR binding with variables that are of SYSTEM MAXVAR. You cannot use MAXVAR variables at the site or organization level.

You can use the following implicit variables in automation scripts that run as cron tasks:

Table 1. Implicit variables

Implicit variable	Description
<code>scriptName</code>	Name of the automation script that is run as a cron task.
<code>qName</code>	Name of the cron task instance that is running the automation script as a cron task.
<code>runAsUserInfo</code>	Handle for the UserInfo Java™ object. You can use this object to get additional information about the user that is associated with the cron task.

Adding scripts that run as asynchronous jobs

You can add scripts that can run as asynchronous jobs in the product. Use the asynchronous job framework to submit jobs that need to be run one time asynchronously, such as when you want to run something quickly in the background.

Procedure

1. In the Automation Scripts application, add a script to run the asynchronous job.
The implicit variables `where`, `mboName`, and `userInfo` are available.
2. Specify other information as needed.
3. Register the script in the MAXASYNCJOB table by specifying the nonpersistent Manage business object (MBO), as shown in the following code sample.
The MBO name is ASYNCSCRIPT and is the object that the job acts on. The job name is set by the script to be the same as the script name. The job name is used by the ScriptAsyncJobHandler and is registered with the new entry in the MAXASYNCJOB table to run the script.

```
MboSetRemote msr = get mboSet for ASYNCSCRIPT

((psdi.mbo.NonPersistentMboSet)msr).setup();

MboRemote mbo = msr.moveFirst();

mbo.setValue("autoscript", "TESTASYNC");

mbo.setValue("objectname", "PO");

((psdi.mbo.NonPersistentMboSet)msr).execute();
```

4. Activate the script.
The scripted job is registered and is run one time by the asynchronous job framework.

Example

For example, you can specify the job to fetch an MboSet by using the *userInfo* variable and the name of the MBO. Apply the WHERE clause and process the job for each MBO.

Automation scripts for integration

You can use automation scripts to customize the processing transactions of integration messages by implementing object structure, publish channel, enterprise service, and invocation channel integration components.

Debugging with automation scripts

You debug a script to remove any issues before you customize applications. Print statements can be placed in a script to capture the logs that are specific to a script. Log statements in the scripting framework are automatically sent to the autoscript logger.

- **Log statements in the application framework**
The application framework generates logs on a debug level with information such as launch point name and application name.
 - **Print statements**
Print statements can be placed in a script to capture logs specific to the script. The syntax of print statements depends on the language that is used to write the script.
 - **Finding debug files**
If you have difficulty finding the debug file in the log file, associate the logger to an appender so that the debug file is easier to find.
-

Log statements in the application framework

The application framework generates logs on a debug level with information such as launch point name and application name.

Log statements in the application framework are automatically sent to the autoscript logger. To see the values passed by the script variable, set the autoscript logger to DEBUG, apply the logging settings, and run the script configuration. Variable values are output to the log file or system console.

The scripting framework generates logs on a debug level:

- The launch point name and script name that is executed.
 - The script execution time that is the time that has elapsed between the start and end of script execution.
 - The application name, logged in user name, Maximo® business object (MBO) name, and MBO unique ID values.
 - The variable values passed into the script based on variable bindings (variables that are sourced from MBO attribute, MAXVAR, system property or literal).
-

Print statements

Print statements can be placed in a script to capture logs specific to the script. The syntax of print statements depends on the language that is used to write the script.

The print statements are sent to the logger as ERROR, INFO, or DEBUG statements. The statement level depends on the level you have specified for the automation script you are using. For example, if you set the level of the automation script and autoscript logger to DEBUG, the print statements are written to the log file as DEBUG statements. If you set the autoscript logger to ERROR level, then the print statements inside the automation script are not written to the log file.

Example of a Jython print statement

A print statement can be simple, such as `print "$$Entered automation script xyz"`. The print statement can also be an expression, such as `print "$$Automation script variable site value is:" + siteid`.

Finding debug files

If you have difficulty finding the debug file in the log file, associate the logger to an appender so that the debug file is easier to find.

Procedure

1. In the Logging application, select the autoscript logger.
 2. Click the Manage Appenders icon.
 3. Select the Rolling appender and specify the file name.
-

Testing automation scripts

It is possible to test automation scripts after you create them.

About this task

You can test the following types of automation scripts:

- Object launch point scripts
- Attribute launch point scripts
- Integration scripts
 - Object structure scripts
 - Publish channel scripts
 - Enterprise service scripts
 - Invocation channel scripts
- REST and other scripts

Procedure

1. In the Automation Scripts application, create an automation script or select an existing script.
2. Click Test Script.
3. Specify a launch point if you want, and click Test. You can view the results in the Data and Process Log fields.

Error messages for users

You can display error messages to users from inside a script. For example, you can display an error message for users to see in the Assets application when an asset number does not follow the rules for naming assets.

- [Error messages created with automation scripts](#)
To post error messages, you set the predefined *errorgroup* implicit variable and the predefined *errorkey* implicit variable to the error message group and error key. You can also post error messages by using the `MXApplicationException` class in the API.
- [Displaying error messages](#)
You can display error messages to users from within a script.

Error messages created with automation scripts

To post error messages, you set the predefined *errorgroup* implicit variable and the predefined *errorkey* implicit variable to the error message group and error key. You can also post error messages by using the `MXApplicationException` class in the API.

Example of sending an error message by using the `MXApplicationException` class

You can use the public `MXApplicationException` class and its constructor method. You pass in the message group ID, message key ID, and any parameters for the message into the constructor method `MXApplicationException`. You use the Jython keyword `raise` before the `MXApplicationException` constructor method to send the error message to the user interface.

In the following script sample, the error to indicate that an invalid prefix on a new asset is used as an example:

```
from psdi.util import MXApplicationException
...
if<some condition>:
    params = [prefix, assettype]
    raise MXApplicationException('asset', 'invalidassetprefix', params)
```

Example of sending an error message by using implicit variables

You can raise an error message from the script code by using the implicit variables that are available in the scripting framework. You set the *errorgroup* implicit variable to the error message group. You set the *errorkey* implicit variable to the error key. You set the *params* implicit variable to the prefix and object type, such as an asset.

When execution is complete, the scripting framework detects the error flag and the framework sends the corresponding exception for the error group and error key combination. After the error flags are set in the script, the script execution continues.

For example, you can require that when a new asset record is created in the Assets application, the asset number must adhere to a specific naming convention. You can create an error message to send to a user when the script detects that the asset number has the wrong prefix.

- If the asset type is FACILITIES, the asset number must be prefixed with FT.
- If the asset type is FLEET, the asset number must be prefixed with FL.
- If the asset type is IT, the asset number must be prefixed with IT.
- If the asset type is PRODUCTION, the asset number must be prefixed with PR.

When a new asset record is created and a user clicks Save, the script tests the asset number for a valid prefix. If the prefix is not found, the user receives an error message. The predefined message is picked up by the scripting framework and placed into the predefined variables.

Prefix and *assettype* are script variables in the following sample Jython code:

```
def setError(prefix):
    global errorkey, errorgroup, params
    errorkey=invalidassetprefix
    errorgroup=asset
    params=[prefix, assettype]

if atype_internal=='FACILITIES' and not anum.startswith('FT'):
    setError('FT')
elif atype_internal=='FLEET' and not anum.startswith('FL'):
    setError('FL')
elif atype_internal=='IT' and not anum.startswith('IT'):
    setError('IT')
elif atype_internal=='PRODUCTION' and not anum.startswith('PR'):
    setError('PR')
```

When the script code test of the asset number prefix fails, the code invokes a common function within the script. The script passes parameters for the function to use in the message. The common function sets the *errorgroup*, *errorkey*, and *params* implicit variables to the appropriate message that is defined in the Database Configuration application. The scripting framework recognizes that the implicit variables are used in the script, and after the script execution is finished, the scripting framework pushes the error message to the application user interface.

Displaying error messages

You can display error messages to users from within a script.

About this task

When you are declaring the message in the Database Configuration application, the message is identified by the combination of message group and message key. The message might also contain parameters that are resolved at run time.

Procedure

1. In the Database Configuration application, declare a custom message.
2. In the body of the attribute launch point or the object launch point, place predefined variables that receive the message group and message key.
3. Run the script.

Creating scripts to manage attachments

Maximo® Manage can read or write attachments from any store that is registered with Maximo Application Suite.

About this task

Maximo Manage now has an interface that you can implement with Java™ or automation scripts. This interface accesses the store and reads, writes, or deletes documents from the store. For more information about interface methods and their descriptions, see [Interface methods](#).

Procedure

1. Write a script to access the in-memory store.
2. Use the following commands in the script to manage attachments.

Create attachment

Use `createAttachment(ctx)` to create an attachment in the store, where *ctx* = *filename*. For example,
`ctx.getFileName(ctx.getAttachmentName())`

Delete attachment

Use `deleteAttachment(ctx)` to delete the attachment from the store. Use `ctx.getFileName(ctx.getAttachmentName())` to get the file name and use it as a key to delete the file from the store before you can delete the attachment.

Validate attachment file type

Use `hasAttachment(ctx)` to validate the attachment file type from the file name and to check for duplicate file names. Use `ctx.getFileName(ctx.getAttachmentName())` to get the file name. Set the Boolean flag to true or false by using `ctx.setHasAttachment(Boolean)`. The framework checks the Boolean flag and if it is true, renames the file to avoid duplicates.

3. In the Automation Scripts application, import the script that you created.
 - a. From the More Actions menu, click Create...Script.
 - b. Set Allow Invoking Script Functions to on.
Note: If you do not set Allow Invoking Script Functions to on, callbacks are not called by the framework.
 - c. Click Choose file to select the script that you created.
 - d. Click Import.
 - e. Click Create to save the script.

4. Optional: In System Properties, set the properties to register the new store that you create. The following example uses `custom:doclinks` as the path:

```
mxe.attachmentstorage=script:<script name in caps>
mxe.doclink.doctypes.defpath=custom:doclinks\default
mxe.doclink.doctypes.topLevelPaths=custom:doclinks
mxe.doclink.path01=custom:doclinks=http://<host>:<port>/maximo/oslc/attachstore
```

Note: The `path01` URL route `attachstore` is already provided in Maximo Application Suite, and it is sufficient to set only the host and port. Also, the `mxe.attachmentstorage` can be a Java class or a script. In this example, the script that is created implements the access to the attachment store.

- [Interface methods](#)
Use interface methods to manage attachments.

Interface methods

Use interface methods to manage attachments.

Table 1. Interface methods and descriptions

Interface method	Description
<code>createAttachment(ctx)</code>	Called to create an attachment in the store. Code uses the <code>ctx</code> to get the file name. <ul style="list-style-type: none"> • <code>ctx.getAttachmentName</code> derives the full path-based file name • <code>ctx.getFileName(..)</code> extracts the file name out of it. • <code>ctx.getAttachmentData()</code> returns the attachment as a byte array.
<code>deleteAttachment(ctx)</code>	Called to delete the attachment from the store. Use the same methods as applicable for <code>createAttachment(ctx)</code> to obtain the file name and use it as a key to delete the file from the store.
<code>getAttachment(ctx)</code>	Called to get the attachment. Two scenarios are possible, which the code must address: <ul style="list-style-type: none"> • The <code>ctx</code> has the <code>doclinks mbo</code>. Use it to get the file name to fetch <code>ctx.getFileName (ctx.getMbo () .getString ("urlname"))</code>. • The <code>ctx</code> just has the URL name for the attachment. use <code>ctx.getFileName (ctx.getURLForAttachment ())</code>. Leverage the file name to retrieve the attachment from the store and then set the attachment data as bytes into the <code>ctx</code> , that is, <code>ctx.setAttachmentData(..)</code>
<code>hasAttachment(ctx)</code>	Called for validation the attachment file type from the file name and to check whether the file name is unique. Use the <code>ctx</code> to get the file name through <code>ctx.getFileName (ctx.getAttachmentName ())</code> . Use this file name to check for duplicate names in the store. If a duplicate exists, rename the file in context to make it unique, and prefix it with the <code>mxe.doclink.doctypes.topLevelPaths</code> property value to create a qualified name.

Managing building information model data

Building Information Modeling (BIM) is a process that manages the design and build phases of building construction projects. This process is used as part of the hand-over of the construction building from the contractors to the owners. It is during this process that you can import the data into Maximo® Manage so that you can manage your facility and view the data in 3D.

- [Building information modeling \(BIM\) in Maximo Manage](#)
Building information modeling (BIM) is a 3D digital representation of a building and a set of process that use that representation for construction projects, such as buildings, roads, and bridges. This standard is used during the design and builds phases of construction and is also adopted for building operations.
- [Classifications for building information models](#)
Classifications provide useful information about the role and function of an item for building information models. Before you import Construction-Operations Building information exchange (COBie) data, you can specify a classification type, such as `OmniClass`, `UniFormat`, or a custom classification, to associate attributes with items.
- [Configuring Maximo Manage for Building Information Models \(BIM\) applications](#)
To import Construction-Operations Building information exchange (COBie) data and view building models, you must set up server directories, configure system properties, and create security groups in the applications for Building Information Models module in Maximo Manage.
- [Configuring building information model data](#)
Before you import Construction-Operations Building information exchange (COBie) data into Maximo Manage, you define system settings, such as units of measure and currency codes and specify a classification type. You can also import classifications.
- [Configuring building information modeling \(BIM\) projects](#)
Before you can import Construction-Operations Building information exchange (COBie) data into BIM projects, you define filters, map COBie attributes to existing Manage attributes that include custom attributes, create projects at a site level, and configure global settings for each site.
- [Importing model data into Maximo Manage](#)
After you create a project for facilities, you can import COBie data by using `validate`, `import`, `update`, and `merge` sessions for the project.
- [Exporting data from Maximo Manage to Construction-Operations Building Information Exchange \(COBie\)](#)
An export session extracts data from Maximo Manage and saves it in a .XLSX file in COBie format. The file is attached to the project and can be viewed and downloaded from the Attachments tab. You can export data at a later data that reflects any asset changes in Maximo Manage. This data is useful input into the design process for renovation or for a new build.
- [Commissioning buildings](#)
The as-built state of the building is defined in the model during construction. After you import the as-built model data into the BIM Projects application, you can commission the building and begin the process of maintaining it. Commissioning a building creates a bulk status update for all objects that are related to the building and have the specified starting status.

- [Managing building models](#)
After you import the building model data into Maximo Manage, you can view the data in the assets and locations and also view the import session details.
- [Attribute maps for COBie data](#)
You can map attributes and extension columns in your COBie data to fields in Maximo business objects and to the attribute types in specifications in Maximo Manage.

Building information modeling (BIM) in Maximo Manage

Building information modeling (BIM) is a 3D digital representation of a building and a set of process that use that representation for construction projects, such as buildings, roads, and bridges. This standard is used during the design and builds phases of construction and is also adopted for building operations.

The model that is created during a construction project describes the infrastructure and contents of a building. The data from the model is extracted into Construction-Operations Building information exchange (COBie) format and you can then import the data into the Building Information Modeling (BIM) Projects application in Maximo® Manage.

The model that is provided after construction is the as-built state of the building. Building owners who commission a building need the information in the model to be available in the BIM Projects application before facilities management begins. By using the BIM Projects application, you can collaborate and gather information throughout the design and building phase of a construction project and import the data before the building is completed.

After the data is imported, you can view a 3D visualization of the model in context with the imported data. This visualization can improve the efficiency of the maintenance work planning and execution process. You can export the as-maintained data to update the model for a renovation project.

You can search the Support knowledge base for technotes that are related to [troubleshooting BIM in Maximo Manage](#). If no information is available, the search returns no results.

- [Construction-Operations Building information exchange \(COBie\) standard data](#)
The Construction-Operations Building information exchange (COBie) standard defines information for assets that are delivered as part of a facility construction project and is used to document the data for the building information modeling (BIM) process. You import COBie data files by using the BIM Projects application and manage the data as assets, locations, contacts, and job plan records in Maximo Manage.

Construction-Operations Building information exchange (COBie) standard data

The Construction-Operations Building information exchange (COBie) standard defines information for assets that are delivered as part of a facility construction project and is used to document the data for the building information modeling (BIM) process. You import COBie data files by using the BIM Projects application and manage the data as assets, locations, contacts, and job plan records in Maximo® Manage.

COBie data, which is defined in .CVS or .XLS files, is a series of data fields that are organized in a spreadsheet with multiple worksheets. Each worksheet corresponds to a COBie table.

You can import data into Maximo Manage from the following COBie tables:

- Facility
- Floor
- Space
- Component
- Type
- System
- Zone
- Attribute
- Contact
- Document
- Job
- Tools in the Resources table
- Assembly

To ensure a successful import of COBie data, adhere to the following guidelines:

Adhere to the minimum table requirements.

The facilities and floor tables are required to import COBie data. Use the components table to collect the necessary data to support business processes.

Use unique model IDs.

All spaces and assets require a model ID. The model ID must uniquely identify the model element and must map to a property that is visible in the files in the viewer. This field is loaded from the COBie ExtIdentifier column. For an Autodesk model, the Revit GUID is used for the model ID. For an Industry Foundation Class (IFC) model, the IFC GUID is used for the model ID.

Use unique table IDs.

Each COBie table uses one or more columns for a unique ID. Tables that are referenced by other tables, such as the spaces table, must use a unique ID. If the COBie data was generated by using design tools, the tables might not have unique IDs.

Carefully define the space definitions.

The COBie specification requires that all components reference a space. Ensure that all spaces for every floor in the model, including external service areas, have a space definition. You can copy space definitions into linked models, and you can use the default floor or facility references for components.

Use standardized categorization carefully and consistently.

Use a single unified classification scheme consistently in all project contracts: OmniClass, Unifomat, or a user-defined scheme. The import utility compares the value for the Category attribute in the COBie data set to the values in the classification tables in the Maximo database. When a match is found, the Maximo Manage records that are created from the COBie data are assigned the matching classification. For OmniClass and Unifomat, the category value is processed to extract and normalize the number portion of the value before matching the classification.

Divide large files or large buildings into multiple files.

The import utility accepts multiple files, such as architectural, mechanical, electrical, and plumbing (MEP), and service model files, for input and reassembles them. In some COBie conversion tools, the size of models is limited. You can divide a large file into several smaller files and generate COBie data from each file. You can also use multiple files when the model consists of several linked files or when you have a large building that is divided into wings or sections.

Prevent the import of unnecessary attributes.

Some attributes are not required to use COBie data in Maximo Manage. Careful design and planning of your import can prevent the import of unnecessary attributes.

Spare parts are manifests, not actual inventory.

In Maximo Manage, the spares table from the COBie data is used to list the field-replaceable units for an asset. The spares table from the COBie data is not used as an actual inventory of spare parts in Maximo Manage.

Classifications for building information models

Classifications provide useful information about the role and function of an item for building information models. Before you import Construction-Operations Building information exchange (COBie) data, you can specify a classification type, such as OmniClass, UniFormat, or a custom classification, to associate attributes with items.

COBie supports the classification of the Category field, which maps to a classification in Maximo® Manage. You can assign default classifications for each type of imported object. You can use automatically created classifications if they do not exist in Maximo Manage.

OmniClass classifications

OmniClass is an industry-standard classification system in construction projects. The import utility that is used in Maximo Manage uses OmiClass classifications. OmniClass classifications are stored in a hierarchy table in .CSV, .XLS, or .XLXS formatted spreadsheet.

The required format for the table is the OmniClass Number followed by individual columns for level titles, such as the Level 1 Title column, up to a maximum of seven level titles. The format for the OmniClass number is *NN-NN NN NN*, for example, 11-11 00 00.

The import utility can also use a flat file format that has one classification number per line and the entries in parent-child order. The import utility uses the OmniClass number structure to build the hierarchy.

Specifications and attributes

You can map the COBie attributes to specifications in Maximo Manage. Using specifications, you can associate COBie data with assets, locations, and job plans. Classifications must be applied to records before specifications can be associated with the records.

Default classifications are defined for the project session types so that objects that are stored at the organization level still use the site level defaults for the project. The import utility requires that a classification must be compatible with the level of the associated Maximo business objects that the classification is used with. The following table shows the levels that are required for a standard import:

Table 1. Minimum classification levels

Table	Type	Minimum classification level
Asset	Site	Site
Company contact	Organization	Organization
Job plan	System, Site, or Organization	System, Organization or site
Location	Site	Site
Person	System	System

Configuring Maximo Manage for Building Information Models (BIM) applications

To import Construction-Operations Building information exchange (COBie) data and view building models, you must set up server directories, configure system properties, and create security groups in the applications for Building Information Models module in Maximo® Manage.

Procedure

1. On your server, create directories to store the COBie import files, building model files, and attachments that are added when you import COBie data into Maximo Manage.

Directory	Description
C:/bim/import	The directory where the COBie files that are imported are saved.
C:/bim/models	The directory where the building model files that are used by viewer implementations are saved.
C:/bim/docs	The directory where documents that are imported with a building model are saved.

2. In the System Properties application, add the directories to the Global Value, the Current Value, and the Maximo Default fields of the following system properties:

System Property	Directory
bim.import.dir	C:/bim/import
bim.model.dir	C:/bim/models
bim.import.docdir	C:/bim/docs

3. In the Security Groups application, create the following security groups for BIM users:
- A security group for users who configure and import the COBie data, for example, **DESIGNER**.
 - A security group for users who configure Manage, for example, **FACILITIES**.
 - A security group for users who view the facilities and system information in the BIM applications, for example, **TECHNICIAN**.
4. On the Applications tab, grant signature options access for the applications to the user groups that you created

Security Group	BIM Applications
The security group for users who configure and import the COBie data, for example, DESIGNER.	<ul style="list-style-type: none"> • BIM Projects • Manage BIM Viewer
The security group for users who configure Manage, for example, FACILITIES.	<ul style="list-style-type: none"> • BIM Projects • Manage BIM Viewer
The security group for users who view the facilities and system information in the BIM applications, for example, TECHNICIAN.	Access to 3D View tab in the Locations application, the Assets application, and the Work Order Tracking application

- [Signature options for Building Information Models applications](#)

The signature options for the applications in the Building Information Models module control access to functions in the applications for specific groups of users. The signature options are defined in the Security Groups application.

Signature options for Building Information Models applications

The signature options for the applications in the Building Information Models module control access to functions in the applications for specific groups of users. The signature options are defined in the Security Groups application.

BIM Projects application

In the Security Group application, on the Applications tab, set the signature options to give users access to functions in the BIM Projects application.

Signature option name	Signature option description
BIM_CONFIG	Configure Maximo® Data
MDL_CONFIG	Configure Model Data
BIM_FILTER	Import Filters
BIM_MAP	Map Attributes to Fields
TYPE_MAP	Map Attributes to Specifications
OMNI_ADD	Import OmniClass Classifications
UNI_ADD	Import Unifomat Classifications
OMNI_HIST	Classification Import History
COMMISSION	Commission Building
COMS_HIST	Building Commissioning History
BIM_ADVANCED_OPT	Advanced Options tab in upload dialog

Manage BIM Viewer application

In the Security Group application, on the Applications tab, set the signature options to give users access to functions in the Manage BIM Viewer application.

Signature option name	Signature option description
DELETE	Delete Building Model
INSERT	New Building Model
READ	Read Access to Manage BIM Viewer application
SAVE	Save Building Model

Assets application

In the Security Group application, on the Applications tab, set the signature options to give users access to BIM functions in the Assets application.

Signature option name	Signature option description
BIMVIEWER	3D View tab
BIMDATA	Show BIM Data sections
BIM_IMP	View Building Model Import Sessions
BIM_LOC	Controls the visibility of the BIM Location hierarchy (Facility/Floor/Room) in the Assets application

Locations application

In the Security Group application, on the Applications tab, set the signature options to give users access to BIM functions in the Locations application.

Signature option name	Signature option description
BIMDATA	Show BIM Data sections
BIMVIEWER	3D View tab
BIM_ADDMOD	Add/Edit Building Model
BIM_IMP	View Building Model Import Sessions
BIM_IAD	Inspect Asset Details
BIM_DS	Display System Details
BIM_US	Update/Edit Systems
BIM_NS	Create New System

Work Order Tracking application

In the Security Group application, on the Applications tab, set the signature options to give users access to BIM functions in the Work Order Tracking application.

Signature option name	Signature option description
BIMVIEWER	3D View tab

Configuring building information model data

Before you import Construction-Operations Building information exchange (COBie) data into Maximo® Manage, you define system settings, such as units of measure and currency codes and specify a classification type. You can also import classifications.

- [Defining system settings for building information modeling \(BIM\) data in Maximo Manage](#)
Before you can the import building information modeling (BIM) data, which is in the COBie file format, you can define units of measure, currency codes, and specify a classification type in Maximo Manage.
- [Importing OmniClass classifications](#)
You can import OmniClass classifications to use with Maximo business objects. The import utility uses OmniClass classifications that are stored in a hierarchical table in a .CSV, .XLS, or .XLXS formatted spreadsheet.

Defining system settings for building information modeling (BIM) data in Maximo Manage

Before you can the import building information modeling (BIM) data, which is in the COBie file format, you can define units of measure, currency codes, and specify a classification type in Maximo® Manage.

About this task

Before you import COBie data, you must specify a classification type, such as OmniClass, UniFormat, or a custom classification, to associate attributes with items.

Procedure

1. In the Currency Codes application, create currency codes to define and manage currencies.
2. In the Classifications application, define the units of measure for linear, area, and volume measurements by using the Add/Modify Properties>>Units of Measure action.
3. To use custom classifications with the imported data, create classifications in the Classifications application.
4. To use the Omniclass classifications system with the imported data, import the Omniclass classifications tables.
5. To use the Uniformal classifications system with the imported data, import the Uniformal classifications tables.

Importing OmniClass classifications

You can import OmniClass classifications to use with Maximo® business objects. The import utility uses OmniClass classifications that are stored in a hierarchical table in a .CSV, .XLS, or .XLXS formatted spreadsheet.

Procedure

1. In the BIM Projects application, select the OmniClass Import action.
2. Optional: Specify an organization or a site.
3. Specify the parent classification. If this field is not specified, the OmniClass table name is created as a top-level classification in Maximo Manage.
4. Select the Maximo business objects that are used with the imported OmniClass classifications.
5. Click Import.

Results

The import runs in the background. You can select the OmniClass Import History action to see the history of all import sessions.

Configuring building information modeling (BIM) projects

Before you can import Construction-Operations Building information exchange (COBie) data into BIM projects, you define filters, map COBie attributes to existing Maximo attributes that include custom attributes, create projects at a site level, and configure global settings for each site.

- **Defining filters**
You can use filters to restrict the data that is imported during import, update, merge, and validate sessions. Filters are defined separately from projects at a system, organization, or site level, but can be applied to specific session types. A single filter can be used in any session, so you can create a library of reusable filters. By using filters, you can reduce memory usage of the import because filters are applied immediately when a row is read from an input file.
- **Creating maps from COBie attributes to Maximo business objects specifications and fields**
By creating maps, you can map attributes and extension columns in your COBie data to fields in Maximo business objects and to the attribute types in specifications in Maximo Manage. Field maps are useful if your deployment is customized and has custom fields. Attribute maps for fields also reduce errors in the log files and rework when you validate and import data.
- **Creating projects**
You can use a project to group import sessions for a single location, typically a building. All imported data uses the parent location that is defined for the project, which is a useful way of breaking a large project into subprojects such as wings, floors, or sections in a building.
- **Creating system maps for COBie systems**
By creating system maps, you can map the data elements that are specified in a COBie system to an existing system in Maximo Manage instead of creating a new system.
- **Configuring data for building models**
As a designer, you can configure how the COBie file is processed, how IDs are generated from the COBie data, and how attributes are used. Configuration is done at the site level for all projects in the site.
- **Configuring data for Maximo Manage**
As a facilities manager, you can configure how data is saved in the records that are created during import in the Maximo database. For example, you can specify the classifications that are applied in Maximo Manage and the statuses that are applied to records. Configuration is done at the site level for all projects in the site.

Defining filters

You can use filters to restrict the data that is imported during import, update, merge, and validate sessions. Filters are defined separately from projects at a system, organization, or site level, but can be applied to specific session types. A single filter can be used in any session, so you can create a library of reusable filters. By using filters, you can reduce memory usage of the import because filters are applied immediately when a row is read from an input file.

About this task

Filters process references that are inherent in a single row of data. References are tested before the row is tested and if the referenced row is excluded, the row that is being tested is also excluded.

The following references are tested:

- Attribute references that use both sheet and row
- Document references that use both sheet and row
- Component references to a space
- Component references to a type
- Job reference to a type

Additional processing supports filtering by floor. Spaces that reference an excluded floor are excluded, and then references to the space are also excluded. Since the filter is applied immediately upon reading a row, references that are not resolved and referenced objects are not included in the filter. For example, if a space is excluded, the components that reference the space are excluded, but the attributes and documents that reference the components are not excluded. However, the attribute and documents are not imported because attributes and documents are imported as part of the object that they reference. A validate session reports unresolved references for these attributes and documents.

Procedure

1. In the BIM Projects application, select the Import Filters action.
2. Add a row for the filter and specify a name.
3. Optional: Specify either an organization or a site to create the filter at that level. If you do not specify an organization or site, the filter is created at the system level.
4. Specify the filter type.
5. In the filter table, add the details about the filter.
 - a. Specify the COBie table that you want to filter.
 - b. In the Expression field, specify the value that you are filtering.
 - c. In the Expression Type field, specify how the filter is applied.
6. Save your changes.

Creating maps from COBie attributes to Maximo business objects specifications and fields

By creating maps, you can map attributes and extension columns in your COBie data to fields in Maximo® business objects and to the attribute types in specifications in Maximo Manage. Field maps are useful if your deployment is customized and has custom fields. Attribute maps for fields also reduce errors in the log files and rework when you validate and import data.

About this task

An attribute map can contain the following maps:

- A map that contains COBie attributes that are mapped to fields in a Maximo business object, such as the Asset object, which is useful for populating custom fields.
- A map that contains COBie attributes that are mapped to attribute types that are used in specifications in Maximo Manage.

Attribute maps are applied to project validate, import, update, and merge sessions, so that extra fields are not created unnecessarily with the values that are required in Maximo Manage. Attribute maps are also applied to export sessions, so you can use them to export a custom field in Maximo Manage to a COBie attribute.

Procedure

1. To map a COBie attribute to a field in a Maximo business object, in the BIM Projects application, select Attributes Maps > Map Attributes to Fields.
2. Specify the COBie attributes and the fields that you need to map to in Maximo Manage.
3. To map a COBie attribute to a specification in Maximo Manage, in the BIM Projects application, select Attributes Maps > Map Attributes to Specifications.
4. Specify the Manage attribute types that are used to create specifications from COBie attributes.
5. Save your changes.

Creating projects

You can use a project to group import sessions for a single location, typically a building. All imported data uses the parent location that is defined for the project, which is a useful way of breaking a large project into subprojects such as wings, floors, or sections in a building.

About this task

When a project is saved, a document import directory is created in the directory that is specified in the `bim.import.docdir` system property. This directory must be available for file upload by using a method, such as FTP. Each site is a subdirectory, and each project is a subdirectory of its site. This directory is used for importing the documents that are specified on the COBie document tab.

Procedure

1. In the BIM Projects application, add a project and specify its name.
2. Specify the parent location of the facility in the location hierarchy.
3. Specify the site, which is used for all site-level objects that are created for the project. The site can be different to the default site.
4. Optional: Attach documents to the project.

What to do next

The parent location for the project is verified to ensure that it is a member of the primary system for its site. On the Mappings tab, you can add field and specification maps from the library. These maps apply to all sessions that are created for the project.

Creating system maps for COBie systems

By creating system maps, you can map the data elements that are specified in a COBie system to an existing system in Maximo® Manage instead of creating a new system.

About this task

A system map entry has the following elements:

Map from COBie system

The name of the system from the COBie model files.

Map to existing system in Maximo Manage

The name of the Manage system, which is to be updated with COBie data.

Connection location

A location that is a member of the selected Manage system.

When a system is mapped, a location is created by using either import generated IDs or an autokey that is based on configuration options that are specified in the Configure Model Data dialog box for the project. The location is assigned as a member of the system in Maximo Manage that is updated, and the parent location in that system is the connection location. The operating location that is associated with each component in the COBie system is added to the target system in Maximo Manage as a child of the location.

The system mapping table for a project can be populated with a list of all systems for a building model by selecting the Populate System Map option in a validate session for a project.

Procedure

1. In the BIM Projects application, on the Mappings tab, in the System Map section, specify the COBie system that you need to map to in Maximo Manage.
2. Specify the system in Maximo Manage that the COBie system maps to.
3. If the system in Maximo Manage is not a network system, specify the connection location.
4. Save your changes.

Configuring data for building models

As a designer, you can configure how the COBie file is processed, how IDs are generated from the COBie data, and how attributes are used. Configuration is done at the site level for all projects in the site.

About this task

The configuration applies to the site of the currently active project.

Procedure

1. In the BIM Projects application, open the project and select the Configure Import Data >> Configure Model Data action.
2. On the COBie File tab, select the check boxes for how the COBie file is processed.
3. On the Generate ID tab, specify how IDs are created for attributes, facilities, floors, and spaces.
4. On the Attributes tab, specify how attributes are used.
5. Click OK.

Configuring data for Maximo Manage

As a facilities manager, you can configure how data is saved in the records that are created during import in the Maximo® database. For example, you can specify the classifications that are applied in Maximo Manage and the statuses that are applied to records. Configuration is done at the site level for all projects in the site.

About this task

The configuration applies to the site of the currently active project.

Procedure

1. In the BIM Projects application, open the project and select the Configure Import Data >> Configure Maximo Data action.
2. On the Classifications tab, specify the classifications that are applied to the records in the Maximo database if no other classification is found.
3. On the Import/Update Options tab, on the Record Creation subtab, specify the detail values that apply to each record that is created in the Maximo database during import.
4. On the Import Behavior subtab, specify the processing for contacts, warranties, bar codes, and attributes.
5. On the Import Status subtab, specify the statuses for location, job plan, asset, and facilities that apply to all records that are created during the import.
6. Click OK.

Importing model data into Maximo Manage

After you create a project for facilities, you can import COBie data by using validate, import, update, and merge sessions for the project.

- **Validating data**
Before you import data, you create a validation session to check the integrity of the Construction-Operations Building information exchange (COBie) file and to validate that the COBie data matches with items in the Maximo database, such as units of measure, attribute types, and classifications. You can view the validation messages on the Log Records tab.
- **Importing validated data**
After you validate the data, you can import it into Maximo Manage by using the BIM Projects application.
- **Updating imported data**
You can create an update session to update data that was imported to Maximo Manage to modify data that was imported before a building or complex asset was completed or if refurbishments to the building or complex asset are complete and the data need to be adjusted.
- **Merging design data with existing data**
You can build the model for a building by merging COBie data with existing Maximo Manage data.

Validating data

Before you import data, you create a validation session to check the integrity of the Construction-Operations Building information exchange (COBie) file and to validate that the COBie data matches with items in the Maximo® database, such as units of measure, attribute types, and classifications. You can view the validation messages on the Log Records tab.

About this task

The following items are verified when the integrity of the COBie file is validated:

Duplicate items

Each item on a sheet is checked for uniqueness based on the identifying fields for that sheet. If multiple files are provided for validation, then the same item in different files is not reported as a duplicate. Duplicate items in different files are merged.

Missing references

Every space is checked for a reference to a floor, and every component is checked for a reference to a space.

Missing row references

Attribute and documents tabs are checked for a value in the Row column.

Missing sheet references

Attribute and documents tabs are checked to ensure that a value exists in the Sheet column.

Mismatched values in a list

A message is reported when two attributes that have the same name have different lists of valid values.

Space lists

Component references are checked for more than one space. The COBie specification allows a component to have a comma-separated list of space references, but the import session supports only a single parent for a component. The first space in the list is used.

Uniqueness of asset IDs

If you choose to use the floor tab, room tag, or bar code for the asset ID, these fields are checked for uniqueness.

Unresolved references

Every COBie reference to another COBie item is checked to ensure that the referenced item exists.

The following items are verified against the Maximo database:

Categories

All categories that are listed in the input files are verified as valid classifications that have a Use With value for the object type.

Documents

The sizes and types of the listed documents are checked to ensure that they do not exceed limits in Maximo Manage. The documents are also checked to ensure that their names do not duplicate names of existing attachments.

ID fields

The length of the generated IDs in the COBie file is checked to ensure that they do not exceed the maximum length for the specified fields in the Maximo database.

Location values

If one of the options for user-specified or structured location values is selected, the values are checked to ensure that they do not exceed the maximum length of the location field.

Unit of measurement references

All units that are specified in the import file are verified as existing in the Maximo database.

Select Log All Messages to see which records match data in the Maximo database and which records are added to Maximo Manage.

Procedure

1. In the BIM Projects application, open the project and in the Project Sessions section, add a row.
2. Select Validate for the session type and click OK.
3. Select or add the COBie file that you want to validate and review the settings on the tabs.
4. To populate the system map on the Mappings tab with a list of all the systems that are defined in the COBie files, on the Options tab, select the Populate System Map option.
5. Click Validate.
6. View the results of the validation process on the Log Records tab.

What to do next

After the validation is run, resolve any validate issues and repeat the process until the log file is clean. You must create a new session to repeat the validation or to run an import.

Importing validated data

After you validate the data, you can import it into Maximo® Manage by using the BIM Projects application.

About this task

You can apply a field or specification map to an import session to convert COBie attributes and COBie extension columns to fields in Maximo business objects and attribute types that are used in specifications. Maps are applied when fields are set in a newly created import object.

You can use filters to limit the data that is imported. Filters are applied immediately when a row is read, while attribute maps are applied later in the import process.

Procedure

1. In the BIM Projects application, open the project and in the Project Sessions section, add a session.
2. Select Import for the session type and click OK.
3. On the Files tab, select the COBie files that you want to import.
4. Optional: On the Options tab, specify the specification or field map name.
5. Optional: Specify the default values for the import.
6. Optional: On the Filters tab, specify the filters to use for the import.
7. Optional: On the Advanced tab, modify the default configuration settings.
8. Click Import.

Updating imported data

You can create an update session to update data that was imported to Maximo® Manage to modify data that was imported before a building or complex asset was completed or if refurbishments to the building or complex asset are complete and the data need to be adjusted.

About this task

The selected location is automatically matched to the COBie facility record. Floors, spaces, and components use the following matching rules:

- For floors and spaces, the COBie name is matched to the description, and the value of the BIMUsage field is not used.
- For floors, spaces, and components, COBie records that specify an external identifier and do not match a model ID are matched to records in Maximo Manage that do not have model IDs.

The following update modes are used:

Update only field without values

When an existing record matches an update record, each field that can be updated is checked for a value. If a field does not have a value and the field in the update record has a value, the update value is added to the record.

Overwrite any existing data with updated data

If a record in the Maximo database matches a row in the update data, the associated COBie field that has a valid value is updated in the Maximo record.

Update objects when the updated data is newer than the current data

The value of the CHANGEDATE field in the Maximo database is compared to the COBie CreatedOn field. If both dates are valid, and the CreatedOn date is newer than the CHANGEDATE, then every COBie field that has a valid value is updated in the Maximo database.

Procedure

1. In the BIM Projects application, open the project and in the Import Sessions section, add a row.
2. Specify the location that you are updating.
3. Select Update for the session type and click OK.
4. Select or add the COBie file that you want to use to update.
5. On the Options tab, select the update mode and any options for the update.
6. Optional: Specify the attribute map name.
7. Specify the default values for the update.
8. Optional: On the Filters tab, specify the filters to use for the update.
9. Optional: On the Advanced tab, modify the default configuration settings.
10. Click Update.

Merging design data with existing data

You can build the model for a building by merging COBie data with existing Maximo® Manage data.

Procedure

1. In the BIM Projects application, open the project and in the Project Sessions section, add a row.
2. Select Merge for the session type and click OK.
3. In the Merge with Existing Import field, select the location of the import.
4. Select or add the COBie file that you want to import.
5. Optional: On the Options tab, specify the attribute map name.
6. Specify the default values for the import.
7. Optional: On the Filters tab, specify the filters to use for the import.
8. Optional: On the Advanced tab, modify the default configuration settings.
9. Click Merge.

Exporting data from Maximo Manage to Construction-Operations Building Information Exchange (COBie)

An export session extracts data from Maximo Manage and saves it in a .XLSX file in COBie format. The file is attached to the project and can be viewed and downloaded from the Attachments tab. You can export data at a later date that reflects any asset changes in Maximo Manage. This data is useful input into the design process for renovation or for a new build.

About this task

The name of the exported .XLSX file is created by combining the site name, the prefix, and the session number. The export session checks the entire hierarchy by starting at the facility level.

The following options are used for the export ID:

Import ID

Uses the model ID field for the COBie external identifier. You can select this option to synchronize data back to the import source, such as an IFC or Revit file.

Maximo UID

Uses the Maximo database sequence number for the COBie external identifier. You can select this option when you import data that needs to use web services or other APIs. The Maximo business object that is the source of the export is used for the external object.

IFC or UID

Uses both of the values in comma-separated format. The COBie standard does not specifically define this format. However, many other COBie fields do use a comma-separated list format.

Changed After

Exports only the assets that changed after the selected date.

Procedure

1. In the BIM Projects application, open the project and in the Import Sessions section, add a row.
2. Select Export for the session type and click OK.
3. Specify the facility that you want to export and the type of export ID to use.
4. Optional: Specify the attribute map name.
5. Optional: Specify whether to export attributes that do not contain a value.
6. Select the COBie tables that you want to export and click Export.

Commissioning buildings

The as-built state of the building is defined in the model during construction. After you import the as-built model data into the BIM Projects application, you can commission the building and begin the process of maintaining it. Commissioning a building creates a bulk status update for all objects that are related to the building and have the specified starting status.

About this task

Location and asset records have more fields that are only valid for some status changes. The tabs in the Commission Building window provide the following options for the commissioned building:

Asset tab

Define the status of assets that are included and specify whether to remove references for active routes, safety plans, and update the status of child assets to the commissioned status.

Location tab

Define the status of locations that are included and specify whether to remove references for all routes, safety plans, and job plans.

Procedure

1. In the BIM Projects application, open the project and select the Commission Building action.
2. Specify the building that you want to commission.
3. Select the types of records to update.
4. On the tabs, define the options for the commissioned building.
5. Click Commission.

Managing building models

After you import the building model data into Maximo® Manage, you can view the data in the assets and locations and also view the import session details.

You can also use a building model viewer to view a 3D version of the building. By using the 3D model, you can inspect assets and locations of the building, create work orders and service requests, and search for and create systems from the model. You can also view property data from the original model that includes form model elements that are not tracked in Maximo Manage.

- [Configuring the Building Information Modeling \(BIM\) viewer](#)

To view a 3D version of a building model, you can install a third-party building model viewer in Maximo Manage. You also can install multiple viewers, but only one viewer can be active at a time.

- [Associating building models with locations](#)

When COBie data is imported, the data in the COBie facility table is created as a location record in Maximo Manage. After the COBie data is imported, you can associate the location with the building model to view the 3D model in a BIM viewer.

- [Building models viewer](#)

When you install a building model viewer, you can associate the building model with the imported COBie data. You can then manage the assets, locations, and systems of the building and view the building model in 3D format.

Configuring the Building Information Modeling (BIM) viewer

To view a 3D version of a building model, you can install a third-party building model viewer in Maximo® Manage. You also can install multiple viewers, but only one viewer can be active at a time.

About this task

When the viewer is installed, you can view building models from the 3D View tab in the following applications:

- Manage BIM Viewer
- Assets
- Locations
- Work Order Tracking

If you install multiple viewers, you must specify the value of the active viewer in the `bim.viewer.active` property in the Systems Properties application. The list of values for each viewer that you install is added to the BIMVIEWERTYPE synonym domain. The default viewer value that is called vendor has no viewer functionality and is the active viewer when no other viewer is installed.

Procedure

1. Install a third-party viewer.
2. In the System Properties application, specify the active viewer by changing the value of the viewer in the `bim.viewer.active` property to the value of the active viewer.

Associating building models with locations

When COBie data is imported, the data in the COBie facility table is created as a location record in Maximo® Manage. After the COBie data is imported, you can associate the location with the building model to view the 3D model in a BIM viewer.

Before you begin

Install a building information modeling (BIM) viewer.

About this task

A single location can have more than one model associated with it, for example an architectural model and a mechanical, electrical and plumbing (MEP) model.

Procedure

1. In the Manage BIM Viewer application, create a building model record by selecting the New Building Model action.
2. Specify the location for the building model.
3. Specify the model name or add the URL for the model.
4. Save the record.

What to do next

Select the 3D View tab to view the 3D model.

Building models viewer

When you install a building model viewer, you can associate the building model with the imported COBie data. You can then manage the assets, locations, and systems of the building and view the building model in 3D format.

In the Manage BIM Viewer application, you can associate a location with the building model to view the model in a BIM viewer.

In the Assets application, the Locations application, and the Work Order Tracking application, you can manage the assets, location, and systems of each building. If the current asset or location record has an associated model file, the building model is displayed in the viewer on the 3D View tab. You can then create work orders and service requests and search for and create systems from the model.

Viewing import information

You can view import sessions for the parent facility from any location or asset that was created by the imported data, including project information and settings for the facility. To show the import sessions information for a selected asset or location record, select the View Building Model Import Sessions action in the Assets application or the Locations application.

Inspecting asset details

To access the list of all assets that are associated with the location or child location, in the Locations application, select the Inspect Asset Details action. For example, selecting an operating location, such as an air handler, show the asset that is operating at that location. Selecting a space, such as a room, shows all assets that are associated with the space.

If a viewer is installed, you can select the Inspect Asset Details icon on the viewer toolbar. When the asset list is displayed in the viewer, the result set is highlighted on the model.

Displaying system details

To display a list of all systems for a location, provide a tree view of the system, and access to attachments and classifications for systems, in the Locations application, select the Display System Details action.

If a viewer is installed, you can select the Display System Details icon on the viewer toolbar. When system details are displayed in a viewer, either all or a single member of the system is shown on the model.

Attribute maps for COBie data

You can map attributes and extension columns in your COBie data to fields in Maximo® business objects and to the attribute types in specifications in Maximo Manage.

- **Contacts**
The Contacts table in COBie can be mapped to the PERSON, COMPANIES, and COMPANY CONTACT in Maximo Manage. The import process tracks how a contact is referenced. If it is referenced in the COBie data in a createdBy field, the data can be stored in the PERSON object. Otherwise, the data is stored in the COMPANIES object.
- **Facility**
The Facility table in COBie is mapped to the LOCATION Maximo business object. Additional values from the facility are stored in the import session.
- **Floor**
The Floor table in COBie is mapped to the LOCATION Maximo business object. All location records that are created from floors in the COBie data use the facility location as their parent.
- **Space**
The Space table in COBie is mapped to the LOCATION Maximo business object.
- **Component**
A component in the COBie data is stored in a location record and an asset record in Maximo Manage. The asset record references the location record as its locations. The parent location is the space that is referenced by the component if it is valid. If the space is not valid, the parent location is either a floor, if one can be determined from attributes, or the facility.
- **Zone**
The Zone table in COBie is mapped to the LOCSYSTEM Maximo business object. A location system record is created for each zone. The system is hierarchical and uses the facility location as the root of the system and each space as a child of the facility.
- **System**
The Systems table in COBie is mapped to the LOCSYSTEM Maximo business object. A location system record is created for each zone. The system is hierarchical and uses the facility location as the root of the system. The operating location that is associated with each component is used as a child of the facility.
- **Job**
The Job table in COBie is mapped to the JOBPLAN and JOBTASK Maximo business objects. If the job is preventative maintenance, a master preventive maintenance (PM) record is also created that has a reference to the job plan.
- **Attributes**
The Attributes table in COBie is mapped to several tables in the Maximo database. First, the attributes are grouped by name to create attribute types. Then, the attribute values are added as specifications to the appropriate specification table.
- **Document**
The Document table in COBie is mapped to the ATTACHMENT table in the Maximo database. Both DOCINFO and DOCLINK objects are created. If a single document is referenced more than once, then only a single DOCINFO object is created. Reference is validated by path and name during same import and by document checksum on matches from previous imports.
- **Resource**
The Tool resources in COBie are mapped to the ItemTool Maximo business object. Only resources of type tool are imported.
- **Assembly**
The Assembly table in COBie sets the parent field of the asset.

Contacts

The Contacts table in COBie can be mapped to the PERSON, COMPANIES, and COMPANY CONTACT in Maximo® Manage. The import process tracks how a contact is referenced. If it is referenced in the COBie data in a createdBy field, the data can be stored in the PERSON object. Otherwise, the data is stored in the COMPANIES object.

Person object

Table 1. Contacts table to PERSON object mapping

COBie field	Maximo field	Changed by update session?
Email	PERSONID/ PRIMARYEMAIL	Yes
CreatedBy	Not Mapped	No
CreatedOn	Not Mapped	No
Category	CLASSSTRUCTUREID	Yes
Company	Not Mapped	No
Phone	PRIMARYPHONE	Yes
ExternalSystem	Not Mapped	No
ExternalObject	Not Mapped	No
ExternalIdentifier	Not Mapped	No
Department	DEPARTMENT	Yes
OrganizationCode	Not Mapped	No
GivenName	FIRSTNAME	Yes
FamilyName	LASTNAME	Yes
Street	ADDRESSLINE1	Yes
PostalBox	LASTNAME	Yes
Town	CITY	Yes
StateRegion	STATEPROVINCE	Yes
PostalCode	POSTALCODE	Yes
Country	COUNTRY	Yes

Company and Company Contact objects

Contacts that are referenced from the type table are mapped to COMPANIES and COMPCONTACT. All contacts that share company are grouped as COMPCONTACT records under a single COMPANIES record. The first contact that is encountered is selected as the primary contact.

Table 2. Contacts table to COMPANIES and COMPCONTACT table mapping

COBie field	Maximo field	Changed by update session?
Email	EMAIL	No
CreatedBy	Not Mapped	No
CreatedOn	Not Mapped	No
Category	CLASSSTRUCTUREID	Yes
Company	NAME	No
Phone	VOICEPHONE, PHONE	No
ExternalSystem	Not Mapped	No
ExternalObject	Not Mapped	No
ExternalIdentifier	Not Mapped	No
GivenName	CONTACT	No
FamilyName	CONTACT	No
Street	ADDRESS1	No
PostalBox	ADDRESS1	No
Town	ADDRESS2	No
StateRegion	ADDRESS3	No
PostalCode	ADDRESS4	No
Country	ADDRESS5	No

Facility

The Facility table in COBie is mapped to the LOCATION Maximo® business object. Additional values from the facility are stored in the import session.

Table 1. Facility table to LOCATION object mapping

COBie field	Maximo field	Changed by update session?
Name	DESCRIPTION or FACILITYNAME	Yes
CreatedBy	Not Mapped	No
CreatedOn	Not Mapped	No
Category	CLASSSTRUCTUREID	Yes

COBie field	Maximo field	Changed by update session?
ProjectName	PROJECTNAME	No
SiteName	SITENAME	No
LinearUnits	BIMLINEARUNITS	Yes
	LINEARUNITS	No
AreaUnits	BIMAREAUNITS or AREAUNITS	Yes
VolumeUnits	VOLUMEUNITS	No
CurrencyUnit	CURRENCYCODE	No
AreaMeasurement	AREAMEASUREMENT	No
ExternalSystem	Not Mapped	No
ExternalProjectObject	Not Mapped	No
ExternalProjectIdentifier	Not Mapped	No
ExternalSiteObject	Not Mapped	No
ExternalSiteIdentifier	Not Mapped	No
ExternalFacilityObject	Not Mapped	No
ExternalFacilityIdentifier	MODELID	No
Description	LONG_DESCRIPTION	Yes
ProjectDescription	PROJECTDESC	No
SiteDescription	SITEDESC	No
Phase	PHASE	No

Floor

The Floor table in COBie is mapped to the LOCATION Maximo® business object. All location records that are created from floors in the COBie data use the facility location as their parent.

Table 1. Floor table to LOCATION object mapping

COBie field	Maximo field	Changed by update session?
Name	DESCRIPTION	Yes
CreatedBy	Not Mapped	No
CreatedOn	Not Mapped	No
Category	CLASSTRUCTUREID	Yes
ExtSystem	Not Mapped	No
ExtObject	Not Mapped	No
ExtIdentifier	MODELID	No
Description	LONG_DESCRIPTION	Yes
Elevation	BIMELEVATION	Yes
Height	BIMHEIGHT	Yes

Space

The Space table in COBie is mapped to the LOCATION Maximo® business object.

Table 1. Space table to LOCATION object mapping

COBie field	Maximo field	Changed by update session?
Name	DESCRIPTION	Yes
CreatedBy	Not Mapped	No
CreatedOn	Not Mapped	No
Category	CLASSTRUCTUREID	Yes
FloorName	PARENT	No
ExtSystem	Not Mapped	No
ExtObject	Not Mapped	No
ExtIdentifier	MODELID	No
Description	LONG_DESCRIPTION	Yes
RoomTag	BIMROOMNAME	Yes
UsableHeight	BIMHEIGHT	Yes
GrossArea	BIMGROSSAREA	Yes
NetArea	BIMNETAREA	Yes

Component

A component in the COBie data is stored in a location record and an asset record in Maximo® Manage. The asset record references the location record as its locations. The parent location is the space that is referenced by the component if it is valid. If the space is not valid, the parent location is either a floor, if one can be determined from attributes, or the facility.

Table 1. Component table to LOCATION and ASSET object mapping

COBie field	Maximo field	Changed by update session?
Name	DESCRIPTION	The asset description can be updated but the operating location cannot be updated.
CreatedBy	Not Mapped	No
CreatedOn	Not Mapped	No
TypeName	MANUFACTURER	
Space	PARENT	
Description	LONG_DESCRIPTION	The asset description can be updated but the operating location cannot be updated.
Category	CLASSSTRUCTUREID	Yes
ExtSystem	Not Mapped	No
ExtObject	Not Mapped	No
ExtIdentifier	MODELID	No
SerialNumber	SERIALNUM	Yes
InstallationDate	INSTALLDATE	Yes
WarrantyStartDate	WARRANTYEXPDATE	Yes
TagNumber	ASSETTAG	Yes
BarCode	Configurable	If not Key
AssetIdentifier	Not Mapped	No

Zone

The Zone table in COBie is mapped to the LOCSYSTEM Maximo® business object. A location system record is created for each zone. The system is hierarchical and uses the facility location as the root of the system and each space as a child of the facility.

Table 1. Zone table to LOCSYSTEM object mapping

COBie field	Maximo field	Changed by update session?
Name	DESCRIPTION	The asset description can be updated but the operating location cannot be updated.
CreatedBy	Not Mapped	No
CreatedOn	Not Mapped	No
Category	CLASSSTRUCTUREID	Yes
SpaceNames	Member of System	Yes
ExtSystem	Not Mapped	No
ExtObject	Not Mapped	No
ExtIdentifier	MODELID	No
Description	LONG_DESCRIPTION	The asset description can be updated but the operating location cannot be updated.

System

The Systems table in COBie is mapped to the LOCSYSTEM Maximo® business object. A location system record is created for each zone. The system is hierarchical and uses the facility location as the root of the system. The operating location that is associated with each component is used as a child of the facility.

Table 1. System table to LOCSYSTEM object mapping

COBie field	Maximo field	Changed by update session?
Name	DESCRIPTION	The description can be updated but the operating location cannot be updated.
CreatedBy	Not Mapped	No
CreatedOn	Not Mapped	No
Category	CLASSSTRUCTUREID	Yes
SpaceNames	Member of System	Yes
ExtSystem	Not Mapped	No
ExtObject	Not Mapped	No
ExtIdentifier	MODELID	No, No
Description	LONG_DESCRIPTION	The description can be updated but the operating location cannot be updated.

Job

The Job table in COBie is mapped to the JOBPLAN and JOBTASK Maximo® business objects. If the job is preventative maintenance, a master preventive maintenance (PM) record is also created that has a reference to the job plan.

JOBTASK records are created for each task that is defined for the Job.

Table 1. Job table to JOBPLAN and JOBTASK objects mapping

COBie field	Maximo field	Changed by update session?
Name	DESCRIPTION	No
CreatedBy	Not Mapped	No
CreatedOn	Not Mapped	No
Category	CLASSTRUCTUREID, JOBTYP	No
Status	Not Mapped	No
Description	LONG_DESCRIPTION	No
Duration	JPDURATION, TASKDURATION	
DurationUnit	Not Mapped	No
Start	MNEXTDATE	
TaskStartUnit	Not Mapped	No
Frequency	FREQUENCY	
FrequencyUnit	FREQUNIT	
ExtSystem	Not Mapped	No
ExtObject	Not Mapped	No
ExtIdentifier	MODELID	No
TaskNumber	Not Mapped	No
Priors	Not Mapped	No
ResourceNames	Not Mapped	No

Attributes

The Attributes table in COBie is mapped to several tables in the Maximo® database. First, the attributes are grouped by name to create attribute types. Then, the attribute values are added as specifications to the appropriate specification table.

Attributes can be added to the following table types:

- Asset
- Item
- Job Plan
- Location

Table 1. Attributes table mapping

COBie field	Maximo field	Changed by update session?
Name	DESCRIPTION	Yes
CreatedBy	Not Mapped	No
CreatedOn	Not Mapped	No
Category	Not Mapped	No
SheetName	Reference to Maximo object	No
RowName	Reference to Maximo object	No
Value	ALNVALUE or NUMVALUE	Yes
Unit	MEASUREUNITID	Yes
ExtSystem	Not Mapped	No
ExtObject	Not Mapped	No
ExtIdentifier	Not Mapped	No
AllowedValues	Not Mapped	No

Document

The Document table in COBie is mapped to the ATTACHMENT table in the Maximo® database. Both DOCINFO and DOCLINK objects are created. If a single document is referenced more than once, then only a single DOCINFO object is created. Reference is validated by path and name during same import and by document checksum on matches from previous imports.

Table 1. Document table to ATTACHMENT table mapping

COBie field	Maximo field	Changed by update session?
Name	DOCUMENT	No
CreatedBy	Not Mapped	No
CreatedOn	Not Mapped	No
Category	Not Mapped	No
ApprovalBy	Not Mapped	No
Stage	Not Mapped	No

COBie field	Maximo field	Changed by update session?
SheetName	Reference to Maximo business object	No
RowName	Reference to Maximo business object	No
Directory	URLNAME	No
File	URLNAME	No
ExtSystem	Not Mapped	No
ExtObject	Not Mapped	No
ExtIdentifier	Not Mapped	No
Reference	URLNAME	No

Resource

The Tool resources in COBie are mapped to the ItemTool Maximo® business object. Only resources of type tool are imported.

Table 1. Tool table to ItemTool object mapping

COBie field	Maximo field	Changed by update session?
Name	DESCRIPTION	Yes
CreatedBy	Not Mapped	No
CreatedOn	Not Mapped	No
Category	Not Mapped	No
ExtSystem	Not Mapped	No
ExtObject	Not Mapped	No
ExtIdentifier	Not Mapped	No
Description	LONGDESCRIPTION	Yes

Assembly

The Assembly table in COBie sets the parent field of the asset.

Monitoring maintenance budgets

You can create budget records to monitor maintenance-related transactions in a financial period. Monitoring budget costs can help to ensure that projects or activities, such as work orders, are completed within an agreed budget and can improve estimation of the costs of future projects.

- **[Budget monitoring](#)**
In the Budget Monitoring application, you can create budget records to monitor transactions in a financial period. Monitoring budget costs can help to ensure that projects or activities, such as work orders, are completed within an agreed budget and can improve estimation of the costs of future projects.
- **[Configuring budget monitoring](#)**
In the Budget Monitoring application, you can create or modify focal points and calculation rules. Focal points and calculation rules are used to create budget records that monitor the planned, estimated, and actual costs of transactions.
- **[Creating budget records](#)**
In the Budget Monitoring application, you can create budget records to monitor transactions in a financial period. You create budget records to track estimated, committed, and actual costs of assets, locations, and general ledger accounts or components.
- **[Predefined focal points and calculation rules](#)**
The predefined focal points are provided and are based on assets, location, and general ledger accounts or components. Predefined calculation rules are also available and are based on estimated, committed, and actual costs.

Budget monitoring

In the Budget Monitoring application, you can create budget records to monitor transactions in a financial period. Monitoring budget costs can help to ensure that projects or activities, such as work orders, are completed within an agreed budget and can improve estimation of the costs of future projects.

As an administrator, you can create budget records by configuring focal points and calculation rules. Focal points represent the item that you are monitoring in the budget record, such as assets, locations, or general ledger accounts or components. You create focal points, for example, to track costs on check type master preventive maintenance (PM) records for a specific model of an asset. You can configure calculation rules that are based on estimated, committed, and actual costs.

Users create transactions for work orders, purchase requisitions, purchase orders, receipts, invoices, and issues. The budget records then monitor these transactions and are used to create reports.

Budget reports provide a summarized and detailed view of costs by type, such as labor, tools, services, materials. Budget reports also provide a summarized and detailed view of costs by status such as estimated, committed, and actual costs, and compare them with related budgeted amounts.

Configuring budget monitoring

In the Budget Monitoring application, you can create or modify focal points and calculation rules. Focal points and calculation rules are used to create budget records that monitor the planned, estimated, and actual costs of transactions.

Procedure

1. In the Budget Monitoring application, select Manage Budget Focal Points from the menu.
2. Configure the attributes of the budget focal points.

Option	Description
To configure a predefined focal point	View and modify the predefined focal point attributes.
To create a focal point	Add a new row, set the values for the object and attribute fields, and select OK.

3. Select Manage Rules.
4. Create new rules or apply predefined rules.

Option	Description
To create new rules	Add a new row, select values for all fields, and select OK.
To apply predefined rules	Select Auto-Configuration.

What to do next

You can create budgets that are based on the focal points and conditions that you configured.

Creating budget records

In the Budget Monitoring application, you can create budget records to monitor transactions in a financial period. You create budget records to track estimated, committed, and actual costs of assets, locations, and general ledger accounts or components.

Procedure

1. In the Budget Monitoring application, select New Budget.
2. Specify the financial period or year of the budget and the supervisor who approves the budget.
3. Add a new row and specify the focal points and conditions for the budget record.
4. To update the budget record with transactions, select Generate New Budget Lines from the menu.
5. Update the budgeted amount on each budget line and save the budget record.
6. Select Change Status from the menu and specify a value for the status.
7. Select Approve the Budget, and specify the approved status.

What to do next

Periodically select Update Budget Lines to update the existing transactions for the budget record. The BUDGETUPD cron task is also available to run updates in the background.

Predefined focal points and calculation rules

The predefined focal points are provided and are based on assets, location, and general ledger accounts or components. Predefined calculation rules are also available and are based on estimated, committed, and actual costs.

Table 1. Focal points

Object	Condition	Description
ASSET	None	Budget generation for assets
CHARTOFACCOUNTS	None	Budget generation for GL accounts
GLCOMPONENTS	BUDGL01, BUDGL02, BUDGL03, BUDGL04, BUDGL05, BUDGL06, BUDGL07	Budget generation for segments
LOCATIONS	None	Budget generation for locations

Table 2. Calculation rules

Object	Condition	Description
WPTOOL	BUDMON75	Canceled tools.
WPTOOL	BUDMON77	Committed tools.
WPTOOL	BUDMON76	Estimated tools.
WPSERVICE	BUDMON73.2	Estimated service is canceled if reorder was performed.
WPSERVICE	BUDMON73	Estimated service.
WPMATERIAL	BUDMON51	Canceled stored material.
WPMATERIAL	BUDMON50	Committed stored material.

Object	Condition	Description
WPMATERIAL	BUDMON52	Estimated stored material.
WPMATERIAL	BUDMON54.2	Estimated direct material is canceled if reorder was performed.
WPMATERIAL	BUDMON54	Estimated direct material.
WPLABOR	BUDMON91	Committed external labor is canceled.
WPLABOR	BUDMON93	Committed external labor.
WPLABOR	BUDMON95	Committed internal labor is canceled.
WPLABOR	BUDMON97	Committed internal labor.
WPLABOR	BUDMON90	Estimated external labor is canceled.
WPLABOR	BUDMON92	Estimated external labor.
WPLABOR	BUDMON94	Estimated internal labor is canceled.
WPLABOR	BUDMON96	Estimated internal labor.
PRLINE	BUDMON102	Estimated direct material decrement from purchase request when a purchase order is created.
PRLINE	BUDMON101	Estimated service is canceled.
PRLINE	BUDMON100	Estimated service is canceled when purchase order is canceled.
PRLINE	BUDMON99	Estimated service decrement from purchase request when a purchase order is created.
PRLINE	BUDMON67	Estimated service is canceled.
PRLINE	BUDMON66	Estimated service.
PRLINE	BUDMON71	Estimated direct material is canceled.
PRLINE	BUDMON70	Estimated direct material.
POLINE	BUDMON85	Estimated service is canceled.
POLINE	BUDMON83	Estimated service.
POLINE	BUDMON82	Committed service is canceled.
POLINE	BUDMON84	Committed service.
POLINE	BUDMON89	Estimated direct material is canceled.
POLINE	BUDMON87	Estimated direct material.
POLINE	BUDMON86	Committed direct material is canceled.
POLINE	BUDMON88	Committed direct material.
TOOLTRANS	BUDMON59	Actual tools.
SERVECTTRANS	BUDMON57	Actual service.
MATUSETTRANS	BUDMON79	Actual stored material.
MATUSETTRANS	BUDMON81	Actual direct material.
MATUSETTRANS	BUDMON98	Actual direct material.
LABTRANS	BUDMON63	Actual external labor.
LABTRANS	BUDMON61	Actual internal labor.

Removing personal information from records

To remove personal information from people records, you initially specify the information that you want to remove and then delete the information. In some cases, you can also remove personal information that is stored as a transactional reference.

- **Removal of personal information**
Personal information that is associated with an individual and is stored in person records provides personally identifiable information (PII) about that individual. When this information is no longer required, you can remove that information by specifying the information to be removed and then deleting the information in the People application.
- **Deleting personal information**
If personal information that is contained in a person record, such as a phone number or an email address, is no longer required, you can remove that information by deleting or replacing the data. Before you delete the data, you must specify the information that you want to remove and how that information is removed.
- **Example: Deleting transactional references**
In addition to deleting static personal information, you can also remove information that is stored as a transactional reference to a person. For example, personal information that is entered as free-form text in work orders or service requests rather than selected from a drop-down list. You can use advanced relationships to delete that personal information.

Removal of personal information

Personal information that is associated with an individual and is stored in person records provides personally identifiable information (PII) about that individual. When this information is no longer required, you can remove that information by specifying the information to be removed and then deleting the information in the People application.

Object attributes can be used to store personal information about individuals in person records. By default, you can manage attributes that are related to the following objects to delete personally identifiable information:

- Person
 - Phone
 - Email

- SMS
- Labor
- MAXUSER

To manage an object attribute that is not listed by default, use the Domains application to add the object to the MAXPDOBJ domain. You use the Manage People Data action to specify the removal of personal information, and you use the Delete Person Data action to delete that information.

Typically, when you configure the removal of personal information, you specify a relationship that is based on the PERSONID attribute. Specifying the relationship to the PERSONID attribute ensures that the deleted information is limited to the selected person. If you specify a relationship that is not based on the PERSONID attribute, you risk deleting personal information for multiple people. Exercise caution, back up your database, and thoroughly test advanced relationships before you delete personal information.

Note: Deleted personal information cannot be recovered.

Deleting personal information

If personal information that is contained in a person record, such as a phone number or an email address, is no longer required, you can remove that information by deleting or replacing the data. Before you delete the data, you must specify the information that you want to remove and how that information is removed.

Before you begin

Back up your Manage database.

About this task

How you remove the information depends on the type of data that needs to be removed. For fields that are required, you must randomize the field values. When you randomize a field, the attribute value is replaced with a random alphanumeric string. For non-required fields, you can randomize the field values, or you can clear the field values by using the NULL removal type. Use the DELROW removal type to delete multiple values from a field, for example, phone numbers, SMS addresses, and email addresses.

Procedure

1. In the People application, select the Manage People Data action.
2. Specify the object attributes that you want to remove, specify removal types for each attribute, and specify relationships based on the PERSONID attribute. For example, to delete the email address from a record, specify the following information:

Field	Value
Object	EMAIL
Attribute	EMAILID
Relationship	personid=:personid
Removal Type	DELROW

3. Click OK.
4. Select the person whose personal information you want to remove.
5. Select the Delete Person Data action.

What to do next

The values for the specified attribute values are removed for the selected person. Verify that the data was removed.

Example: Deleting transactional references

In addition to deleting static personal information, you can also remove information that is stored as a transactional reference to a person. For example, personal information that is entered as free-form text in work orders or service requests rather than selected from a drop-down list. You can use advanced relationships to delete that personal information.

About this task

As an example, Louise, a location manager, wants to clean up personally identifiable information (PII) that is no longer necessary to store in the system. In addition to removing static people information, she wants to make sure that no PII remains as transactional references in some records. Users occasionally enter free-form text into some fields and you cannot easily find PII in those fields. Before she implements a stricter policy for users, Louise decides to remove the following personal information:

- Transactional references to the person in the Reported By field in the Service Requests application.
- Transactional references to all people in the On Behalf Of field for all open work orders at the AIR102 location in the Work Order Tracking application.

Since the objects for service requests and work orders are not default objects for removing PII, she must add these objects to the MAXPDOBJ domain before she can remove these transactional references in the People application.

Note: Exercise extreme caution when you use advanced relationships. Ensure that you test relationships thoroughly and back up your Manage database before you delete any personal information. When you delete personal information, the data is not recoverable.

Procedure

1. Back up the Manage database.
2. In the Domains application, click Edit Detail for the MAXPDOBJ domain.
3. In the List Where Clause field, add the objects to the list that are in parentheses.
For example, to remove attribute data from service requests and work orders, add 'SR','WORKORDER' to the list of objects that are in parentheses.
4. In the People application, select the Manage People Data action and insert a row.
5. Specify the attribute details for the data that you want to remove.

For example, to remove the transactional references to the person in the Reported By field in service requests, specify the following information:

Field	Value
Object	SR
Attribute	REPORTEDEY
Relationship	reportedby=:personid
Removal Type	NULL

To remove the transactional references to all people in the On Behalf Of field for all open work orders at the AIR102 location, specify the following information:

Field	Value
Object	WORKORDER
Attribute	ONBEHALFOF
Relationship	location ='AIR102' AND Status in ('WAPPR','APPR','INPRG') Note: The content in the On Behalf Of field is randomized for all people on all open work orders because the relationship is not based on the PERSONID attribute.
Removal Type	RANDOMIZE

6. Click OK.
7. Select the person that has personal information that you want to delete or randomize.
8. Select the Delete Person Data action.

Results

The values for the specified object attributes are deleted or randomized for the selected person or people.

Customizing the application

If you make changes to Maximo® Manage, such as customized Java™ classes or database scripts, you can copy them to a customization archive. Then, you can apply the customizations to server bundles when you deploy Maximo Manage. This feature is useful for moving customizations from a test to a production environment and for upgrades.

- [Customization archive guidelines](#)
The customization archive is a set of files that contain changes and customizations that you make to the application. Customizations can include changes such as Java classes, XML, database scripts, or additional application server files that you created in a development environment.
- [Adding customizations to the application](#)
To customize Maximo Manage, create a customization archive that contains your changes, add the contents of the archive to a compressed file, and add the updated files to the application when you deploy it.
- [Configuring server bundle properties](#)
To provide specific Maximo Manage system properties for your server bundles, you can add bundle-level properties when you deploy the application.
- [Configuring the application server](#)
To customize IBM® WebSphere® Application Server Liberty, you can apply custom configurations when you activate Maximo Manage.
- [Configuring JVM options](#)
Administrators can add Java virtual machine (JVM) configuration options to the IBM WebSphere Application Server Liberty application server on which a server bundle runs. For example, you can specify memory options to improve performance or specify logging options for the server bundle.
- [Retrieving the contents of an administrative image](#)
After you configure Maximo Manage to send build images to an external registry, you can retrieve the administrative image and instantiate it in a Docker container. You can then review the contents of the container or use it as a development environment for customizations.

Customization archive guidelines

The customization archive is a set of files that contain changes and customizations that you make to the application. Customizations can include changes such as Java™ classes, XML, database scripts, or additional application server files that you created in a development environment.

Some customizations might apply only to specific deployments. For example, ejb-jar.xml can be applied to a Maximo® Integration Framework cluster but not to others.

Use the following guidelines to create a customization archive:

Class files, such as Java customizations

Class files must be added to the appropriate directory in the customization archive so that they can be extracted to the existing code in the appropriate hierarchy. Class files can include the following types of customizations:

- MBO customizations
- Field validations

- Maximo Integration Framework customizations
- Other customer-specific code

Deployment descriptors

You can add deployment descriptors, such as web.xml, ejb-jar.xml, and webservices.xml files, that you changed to the customization archive. When the application is redeployed, the customized files override the files that are provided for the deployment. Use the following guidelines to create the structure of your customization archive.

- For server bundles with a bundle type of all, you can use the following directory structure:

```
deployment\was-liberty-default\config-deployment-descriptors\maximo-all\maximouiweb\webmodule\WEB-INFUI
deployment\web.xml
deployment\was-liberty-default\config-deployment-descriptors\maximo-all\maximo-x\webmodule\WEB-INFUI
deployment\web.xml
deployment\was-liberty-default\config-deployment-descriptors\maximo-all\maximo-x\webmodule\WEB-INFUI
deployment\web-guest.xml
deployment\was-liberty-default\config-deployment-descriptors\maximo-all\maximo-x\webmodule\WEB-INFUI
deployment\web.xml
deployment\was-liberty-default\config-deployment-descriptors\maximo-all\maxrestweb\webmodule\WEB-INFUI
deployment\web.xml
deployment\was-liberty-default\config-deployment-descriptors\maximo-all\maximo-x\webmodule\WEB-INFUI
deployment\web.xml
deployment\was-liberty-default\config-deployment-descriptors\maximo-all\mboweb\webmodule\WEB-INFUI
deployment\web.xml
deployment\was-liberty-default\config-deployment-descriptors\maximo-all\meaweb\webmodule\WEB-INFUI
deployment\web.xml
deployment\was-liberty-default\config-deployment-descriptors\maximo-all\mboejb\ejbmodule\META-INF\ejb-jar.xml
```

- For server bundles with a bundle type of ui, you can use the following directory structure:

```
deployment\was-liberty-default\config-deployment-descriptors\maximo-ui\webmodule\WEB-INF\web.xml
```

- For server bundles with a bundle type of mea, you can use the following directory structure:

```
deployment\was-liberty-default\config-deployment-descriptors\maximo-mea\meaweb\webmodule\WEB-INF\web.xml
deployment\was-liberty-default\config-deployment-descriptors\maximo-mea\mboejb\ejbmodule\META-INF\ejb-jar.xml
```

- For server bundles with a bundle type of cron, you can use the following directory structure:

```
deployment\was-liberty-default\config-deployment-descriptors\maximo-cron\webmodule\WEB-INF\web.xml
```

- For server bundles with a bundle type of report, you can use the following directory structure:

```
deployment\was-liberty-default\config-deployment-descriptors\maximo-report\webmodule\WEB-INF\web.xml
```

XSL customizations

If you have XSL customizations that were part of the Maximo EAR or WAR files in previous releases, you can include them in the customization archive. They are copied to the appropriate locations when the application is redeployed. For information about XSL customization, see the documentation for rule-based customization.

Database scripts

To add database scripts to the customization archive, you can create a a_customer.xml file. The a_customer.xml file incorporates system classes that have been customized. All modified class files and scripts must be referenced in the format shown in the following example.

In this example, the update utility runs the scripts representing each successive update version up to and including the referenced V600_01 script. The altered <mboaset objectname> and <mbo object> entries indicate that the purchase order classes have been extended.

```
<?xml version="1.0" encoding="UTF-8"?>
<product>
  <name>Customer Product</name>
  <version>
    <major>6</major>
    <minor>0</minor>
    <patch>0</patch>
    <build>999</build>
  </version>
  <dbmaxvarname>DBCUST</dbmaxvarname>
  <dbscripts>cus</dbscripts>
  <dbversion>V600-01</dbversion>
  <lastdbversion>V520-20</lastdbversion>
  <extensions>
    <mboaset objectname='PO'>psdi.app.cust.POSet</mboaset>
    <mbo objectname='PO'> psdi.app.cust.PO</mbo>
  </extensions>
</product>
```

You can add the a_customer.xml file to the customization archive. After deployment, the database update utility runs and applies your custom scripts.

Additional files for IBM® WebSphere® Application Server Liberty

You can customize WebSphere Application Server Liberty for a server bundle by adding directories and files to the customization archive for the bundle. To add files to WebSphere Application Server Liberty, create an additional-server-files directory in the root directory of your customization archive and add the files to that directory. If necessary, you can also create subdirectories in the additional-server-files directory for your files.

When you configure the server bundles for Maximo Manage for deployment, provide the URL and credentials for the customization archive. When the application is deployed, the files and directories that you added are extracted to the /managefiles/additional-server-files folder on the Liberty server.

For example, if you use an IBM MQ service for messaging, you can add a RAR file for your IBM MQ resource adapter to the additional-server-files directory. When Maximo Manage is deployed, the file is added to the Liberty server.

For tracking purposes, it is a good practice to apply versions your customization archives.

Sample customization archive files

The following sample illustrates the kinds of files that you might want to include in your archive:

classes

```
applications\maximo\businessobjects\classes\cust\app\asset\Asset.class
applications\maximo\businessobjects\classes\cust\app\asset\AssetSet.class
applications\maximo\businessobjects\classes\cust\app\asset\FldAssetNewField.class
```

product XML

```
applications\maximo\properties\product\a_customer.xml
```

script

```
tools\maximo\en\cust\V7612_01.dbc
```

servlets

```
applications\maximo\commonweb\classes\com\ibm\tivoli\maximo\oslc\provider\MyPingServlet.class
```

deployment descriptors (web.xml)

```
deployment\was-liberty-default\config-deployment-descriptors\maximo-mea\meaweb\webmodule\WEB-INF\web.xml
deployment\was-liberty-default\config-deployment-descriptors\maximo-ui\meaui\webmodule\WEB-INF\web.xml
```

Adding customizations to the application

To customize Maximo® Manage, create a customization archive that contains your changes, add the contents of the archive to a compressed file, and add the updated files to the application when you deploy it.

Before you begin

Before you can add customizations to the application, you must create one or more archive files that contain your changes. Review the customization guidelines for details about the structure to use for the archive and the types of files that you can add. Then, complete the following tasks to create an archive:

1. Create a directory that has a structure that matches the /SMP/maximo folder structure that is used for Maximo Manage.
2. Add files that contain your customizations to the archive.
3. When the archive is complete, add the archive to a compressed file.
4. Put the compressed file in a location that is accessible to Maximo Manage.

If you use SSL and have a certificate that is not public, ensure that you provide the certificate details before you deploy the application.

About this task

You can add a single or multiple customization archives through the Maximo Application Suite user interface when you configure Maximo Manage.

Adding customizations by using the Maximo Application Suite user interface

You can add a single customization archive through the Maximo Application Suite user interface when you configure Maximo Manage. When you configure Maximo Manage, you can add customization archives through the Maximo Application Suite interface.

About this task

Previously, only a single customization archive was available when you configured Maximo Manage. You can now add multiple customization archives when you configure Maximo Manage.

Procedure

1. Log in to Maximo Application Suite as a system administrator.
2. To navigate to the application details page:
 - a. From the catalog, in the Applications tab, select the Manage tile.
The application details page displays.
3. To navigate to the Manage Workspace details page :
 - a. Click the gear icon to go to the Suite Administration page.
 - b. Click the Workspaces tile to update a previous configuration.
 - c. In the Applications section, click the Manage tile.
The Manage Workspace details page is displayed.
4. To edit the existing configuration:
 - a. Click Actions and select Update configuration.
 - b. In the Customization row on the Update Manage configuration window, click the Edit icon.
5. In the Customization section of the configuration window, click Add customization archive.

The row in the Customization archives table becomes editable.

- a. Specify a custom alias name in the Alias field or leave the default value.
- b. Specify the URL for the customization archive file in the File address field.

The following URL protocols are supported: HTTP, HTTPS, FTP, and FTPS.

Note: To include more customization archives, click Add customization archive **again**.

6. Optional: If you applied password security to the file or files, in the Credentials field, specify the user ID and password in the following format:

```
user=username password=password
```

7. After you complete all configurations, click Apply changes.

Adding customizations manually to the custom resource

You can also add multiple customization archives to Maximo Manage, manually configure the custom resource for the Maximo Manage workspace.

About this task

If you use both the customization and the customizationList properties, the archive that you add to the customization property is processed last. When you specify a customization list, ensure that you list the files in the order that you want to process them.

Procedure

1. In the Red Hat® OpenShift® Container Platform console, in the Administration section, select Custom Resource Definitions.
2. In the CustomResourcesDefinitions window, select the ManageWorkspace custom resource definition record.
3. In the CustomResourceDefinition details window, on the Instances tab, select the instance that you want to update.
4. On the YAML tab for the instance, in the Settings sub-section, under the Specs section, specify values for the secret name for the archive credentials, the archive name, and the archive URL for each customization archive that you want to add, as shown in the following example:

```
settings:
  customizationList:
    - customizationArchiveCredentials:
        secretName: customization-secret-name
      customizationArchiveName: archive2
      customizationArchiveUrl: >-
        https://url/path_to_customization_archive/CustomArchive.zip
    - customizationArchiveCredentials:
        secretName: customization-secret-name
      customizationArchiveName: archive1
      customizationArchiveUrl: >-
        https://url/path_to_customization_archive/CustomArchive.zip
```

- a. Create a secret:

```
user=username password=password

oc create secret generic <secret-name>
--namespace <manage-namespace-name>
--from-file credentials=<path-to-secret-file>
```

For example,

```
oc create secret generic Archivelsecret --namespace mas-test-manage --from-file credentials=/tmp/secretfile
```

5. Save the custom resource.

Configuring server bundle properties

To provide specific Maximo® Manage system properties for your server bundles, you can add bundle-level properties when you deploy the application.

About this task

Adding Manage properties to a server bundle is useful when you want to handle processes for one bundle in one way and for another bundle in another way. For example, you might want the email address for the administrator of your reports server bundle to be different from the email address of the administrator for your user interface server bundle.

You define Manage bundle level properties after deployment when you activate the application. To change the properties, you can update them and then redeploy the application.

If you add a bundle property, ensure that you add the property to the System Properties application before you deploy application.

Procedure

1. Log in to Maximo Application Suite as a system administrator.
2. From Suite administration, select Workspaces from the side navigation menu and then select the Manage tile.
3. On the Manage workspace details page, click Actions and select Update configuration.
4. In the Server bundles row on the Update Manage configuration window, click the Edit icon.
5. In the Server bundles section of the deployment window, in the Additional properties column, click View.
If no server bundles are added to the deployment, the View option is not displayed.

6. In the Bundle level properties section of the Additional server bundle properties window, click Add property.
7. Specify the name and value of the property or properties that you want to add.
8. Save your changes.
9. After you complete all configurations, select one of the following options:
 - If you are configuring a new deployment, click Activate.
 - If you are updating a deployment, click Apply changes.

Configuring the application server

To customize IBM® WebSphere® Application Server Liberty, you can apply custom configurations when you activate Maximo® Manage.

About this task

You can add custom server properties for the application server in XML format when you configure Maximo Manage. The customizations are applied when Maximo Manage is activated.

When you add application server customizations, ensure that your content conforms to the requirements for adding configuration to server XML files. The rules are provided in the WebSphere Application Server Liberty documentation.

The custom configurations are applied to the server-custom.xml that is used for the Maximo Manage pods and are included in the server.xml as additional configuration. Administrators can view the server-custom.xml file in the Red Hat® OpenShift® console on the Terminal tab for the pod. After deployment, the file is located in the /config/manage/serverxml directory.

Procedure

1. Log in to Maximo Application Suite as a system administrator.
2. From Suite administration, select Workspaces from the side navigation menu and then select the Manage tile.
3. On the Manage workspace details page, click Actions and select Update configuration.
4. In the Server bundles section of the deployment window, in the Additional properties column for the server bundle that you want to configure, click View.
5. In the Route subdomain field of the Additional server bundle properties window, specify the subdomain for the server bundle that you want to configure.
6. In the Additional server config field, enter your custom server properties, as shown in the following example:

```
<?xml version="1.0" encoding="UTF-8"?>
<server description="new server">
  <logging traceSpecification="JMSApi=all:WAS.j2c=all"/>
  <variable name="wmqJmsClient.rar.location" value="{wlp.install.dir}/../wmq/wmq.jmsra.rar"/>
  <!--containerAuthData
id="home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_manage_deploy_t_mas_man_configmap_server_auth1" user="maximomif" password="xxxx"/-->
  <jmsConnectionFactory jndiName="jms/maximo/int/cf/intcf" connectionManagerRef="MIFJMS">
    <properties.wmqJms
      transportType="CLIENT"
      hostName="libertymanager-c553.qm.us-south.mq.appdomain.cloud"
      port="30216"
      channel="CLOUD.APP.SVRCONN"
      applicationName="maxliberty"
      userName="xxx"
      password="xxxxx"
      queueManager="LIBERTYMANAGER"/>
    </properties.wmqJms
  </jmsConnectionFactory>
  <connectionManager
id="home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_manage_deploy_t_mas_man_configmap_server_MIFJMS" maxPoolSize="20"/>
  <jmsQueue
id="home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_manage_deploy_t_mas_man_configmap_server_sqout" jndiName="jms/maximo/int/queues/sqout">
    <properties.wmqJms baseQueueName="sqout" baseQueueManagerName="LIBERTYMANAGER"/>
  </jmsQueue>
  <jmsQueue
id="home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_manage_deploy_t_mas_man_configmap_server_sqin" jndiName="jms/maximo/int/queues/sqin">
    <properties.wmqJms baseQueueName="sqin" baseQueueManagerName="LIBERTYMANAGER"/>
  </jmsQueue>
  <jmsQueue
id="home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_manage_deploy_t_mas_man_configmap_server_jms/maximo/int/queues/cqin" jndiName="jms/maximo/int/queues/cqin">
    <properties.wmqJms baseQueueName="cqin" baseQueueManagerName="LIBERTYMANAGER"/>
  </jmsQueue>
```

7. Save your changes.
8. After you complete all your configuration changes, click Activate.

Configuring JVM options

Administrators can add Java™ virtual machine (JVM) configuration options to the IBM® WebSphere® Application Server Liberty application server on which a server bundle runs. For example, you can specify memory options to improve performance or specify logging options for the server bundle.

About this task

You can add JVM options when you specify additional configurations for a server bundle in the Maximo® Manage workspace.

Procedure

1. Log in to Maximo Application Suite as a system administrator.
2. From Suite administration, select Workspace from the side navigation menu and then select the Manage tile.
3. On the Manage workspace details page, click Actions and select Update configuration.
4. In the Server bundles row on the Update Manage configuration window, click the Edit icon.
5. In the Server bundles section, set the System managed toggle switch to the off position.
6. In the Additional properties column for the server bundle, click View.
If no server bundles are added to the deployment, the View option is not displayed.
7. In the Java virtual machine options section of the Additional server bundle properties window, enter the JVM options that you want to configure, as shown in the following example.

```
-Xms4m\n-Xmx488m\n-XX:MaxPermSize=256m
```

8. Save your changes.
9. After you complete all configurations, select one of the following options:
 - If you are configuring a new deployment, click Activate.
 - If you are updating a deployment, click Apply changes.

Retrieving the contents of an administrative image

After you configure Maximo® Manage to send build images to an external registry, you can retrieve the administrative image and instantiate it in a Docker container. You can then review the contents of the container or use it as a development environment for customizations.

Before you begin

Before you can instantiate a Maximo Manage administrative image in a Docker container, you must complete the following tasks:

1. Install Docker Desktop on your local computer. For more information, see the [Docker Desktop](#) documentation.
2. Configure Maximo Manage to send image builds to an external registry. For more information, see [Storing images in an external registry](#).

Procedure

1. Log in to the Docker image repository, as shown in the following example:

```
docker login -u <username> -p <password> <your_docker_registry_server>
```

2. Pull the administrative image from the repository as shown in the following example:

```
docker pull <your_docker_registry_server>/<image_folder>/<adminimagename:tag>
```

3. Run the **docker image** command and get a container shell.
 - a. Run the **docker image** command to get the image ID for the image that you pulled.
 - b. Run the following command:

```
docker run -d <image id>
```

- c. Use the **docker ps** command to get the container ID that is running the pulled image.
- d. Run the following command:

```
docker exec -it <container id> /bin/bash
```

4. Update the properties in the `/opt/IBM/SMP/maximo/applications/maximo/properties` maximo.properties file with the URL, user name, and password for your Maximo Manage database.

Setting up a local Maximo Manage development environment

You can set up a local Maximo® Manage development environment to develop and test Maximo Manage Java™ code locally, without having to deploy development images on a remote Red Hat® OpenShift® cluster.

Before you begin

You must have the following prerequisites before you begin:

- Access to a Red Hat OpenShift cluster with minimum Maximo Application Suite 8.9 and Maximo Manage 8.5.
- You must install Podman, which is the container engine for this project, on your system or local development environment. Podman is used to deploy and run a Maximo Manage image locally inside an Open Container Initiative (OCI) container, without Red Hat OpenShift and Maximo Application Suite.

- A build Docker file, which automates the process of building new Manage WebSphere® Application Server Liberty images. These images can then be deployed and run inside a Podman container. The multi-stage docker file contains commands to do the following tasks:
 - Add or replace Manage Java or JSP class files from the local file system to the MWLP image.
 - Configure the web deployment descriptors for local form authentication.
 - Build the EAR file.
 - Build the final MWLP image.
 - Set the necessary environment variables.

About this task

The development environment is based on Maximo Manage images, specifically the Admin and ServerBundle images, which are downloaded from an Red Hat OpenShift internal image registry.

- [Installing Podman and exposing the default route](#)
Install Podman on your development system to deploy and test the development images.
- [Preparing a development environment](#)
Before building or deploying new development images, you must first download some images from the Red Hat OpenShift image registry, and tag and push them to a local Podman registry.

Installing Podman and exposing the default route

Install Podman on your development system to deploy and test the development images.

About this task

For more information on downloading and installing Podman, see [Podman Installation Instructions](#).

The development environment uses the Manage Admin and ServerBundle images as a base to build new development images. Therefore, these images must be downloaded from the Red Hat® OpenShift® cluster and tagged or pushed into the local Podman registry. However, before you can download the images, the Red Hat OpenShift internal image registry must be opened up for external access. You can open it up for external access by exposing a route to the internal registry. It is possible to expose custom routes, but it is enough to expose the default Route for this purpose. For more information on exposing routes, see [Exposing the registry](#).

Procedure

1. From the Red Hat OpenShift command-line interface, use `oc patch` to patch the `imageregistry spec` by setting the `defaultRoute` to `true`.

```
oc patch
configs.imageregistry.operator.openshift.io/cluster --patch '{"spec":{"defaultRoute":true}}'
--type=merge
```
2. Get the login token from whoami and save it somewhere. It is necessary to download the images. The login token looks like `sha256~iqcyr4n41Q4Xc2tZTweRz2qvP9~_utG8kXN9RmE2qTI`

```
oc whoami -t
```

Results

The basic building blocks are now in place to start developing and creating development images.

Preparing a development environment

Before building or deploying new development images, you must first download some images from the Red Hat® OpenShift® image registry, and tag and push them to a local Podman registry.

- [Pulling and tagging base images](#)
The `manage-admin` and `manage-bundle` builds are used as base images to build new development images.
- [Building and deploying development images](#)
Your local environment is ready for building and deploying Maximo Manage into a Podman container after you complete pulling and tagging base images.

Pulling and tagging base images

The `manage-admin` and `manage-bundle` builds are used as base images to build new development images.

About this task

Pulling and tagging base images is typically a one-time activity until you must have new base images.

Procedure

1. Open a command-line shell like Windows Powershell or Mac Terminal and login to your Red Hat® OpenShift® cluster from Podman by using the following command.


```
podman login -u <username> -p <login token from whoami saved earlier> --tls-verify=false default-route-openshift-image-registry.<cluster hostname>
```

 For example, `podman login -u kubeadmin -p sha256~06hW1xtAWvSqFP5WHXqTYDxyAAZtLQJAimXamEIHoOA --tls-verify=false default-route-openshift-image-registry.apps.sachttest.cp.fyre.ibm.com`
2. Pull the Manage admin base image first by using the **podman pull** command.


```
podman pull default-route-openshift-image-registry.<cluster hostname>/<namespace>/<image name> --tls-verify=false
```

 Note: "namespace" is the project namespace where Manage is installed on Red Hat OpenShift. The "admin image name" is the name of the admin image. It typically has the instance and workspace that is prefixed to -admin, delimited by a hyphen. For example, `sach-quick-sachdev-admin` where `sach-quick` is the instance name and `sachdev` is the workspace.
 For example, `podman pull default-route-openshift-image-registry.apps.gushily.cp.fyre.ibm.com/mas-sach-quick-manage/sach-quick-sachdev-admin --tls-verify=false`
3. Pull the Manage Bundle image in the same way as the Manage Admin image, by using the **podman pull** command.


```
podman pull default-route-openshift-image-registry.<cluster hostname>/<namespace>/<image name> --tls-verify=false
```

 Note: "namespace" is the project namespace where Manage is installed on Red Hat OpenShift. The "bundle image name" is the name of the bundle image. It typically has the instance and workspace prefixed to -, delimited by a hyphen. For example, `sach-quick-sachdev-all` where `sach-quick` is the instance name and `sachdev` is the workspace. A specific server bundle contains the WebSphere® Application Server Liberty image with the Manage EAR file. This is the image that runs inside the Podman container and opens MXServer.
 For example, `podman pull default-route-openshift-image-registry.apps.gushily.cp.fyre.ibm.com/mas-sach-quick-manage/sach-quick-sachdev-all --tls-verify=false`
4. Tag both the Admin and the Bundle images by using the **podman tag** command.


```
podman tag default-route-openshift-image-registry.<cluster hostname>/<namespace>/<imagename> <tag>
```

 For example, `podman tag default-route-openshift-image-registry.apps.gushily.cp.fyre.ibm.com/mas-sach-quick-manage/sach-quick-sachdev-all manage-all-dev`

Building and deploying development images

Your local environment is ready for building and deploying Maximo® Manage into a Podman container after you complete pulling and tagging base images.

About this task

You can use a docker build file to build new development images.

The development flow and process can be described in the following way:

1. Make changes and add customizations, and so on, to Java class files.
2. Copy the class files by following the appropriate folder structure.
3. Build the new WLP development image by using the Docker build file. Download the [build](#) file.
4. Deploy the new development image into a new Podman container, which initiates the MXServer.
5. Access the Manage application by using the browser.

Procedure

1. Before you build a new development image, you must update the Docker build file you downloaded. The following environment variables must be edited to reflect your database details.

```
ENV MXE_DB_URL='jdbc:db2://9.30.213.13:50000/bludb'
ENV MXE_DB_SCHEMAOWNER=maximo
ENV MXE_DB_DRIVER='com.ibm.db2.jcc.DB2Driver'
ENV MXE_SECURITY_OLD_CRYPTO_KEY=SzUwFenwARerIQCMotXkisoU
ENV MXE_SECURITY_CRYPTO_KEY=SzUwFenwARerIQCMotXkisoU
ENV MXE_DB_USER=maximo
ENV MXE_DB_PASSWORD=maximo
```

2. After you update the environment variables, use the following command to run the docker file relative to the `./manage-developer/Dockerfile` path.

```
podman build --build-arg BUNDLE=all --tag managedev:latest -f
./manage-developer/Dockerfile
```

Note: The server bundle type can be passed as a build arg. In this example, you are building the "all" wlp image. Depending on the bundle image type that was downloaded from the Red Hat® OpenShift® registry, the appropriate bundle image type arg must be passed. Valid bundle types are all, ui, cron, report and mea. Tag the new development image, for example, `--tag managedev:latest`.

3. When the build is complete, use the following command to see all the images inside the local image registry.

```
podman images
```

You can see at least three images, `manage-all-dev`, `manage-admin-dev`, and `managedev`.

4. After building the development image, you must deploy and run the image inside a Podman container. Run the following command to create a container and star a new process for the image.

```
podman run -dt --name maximo_dev -p 8080:80/tcp
localhost/managedev:latest
```

The -p option publishes the host and container TCP ports. The URL for the Manage application, in this example is <http://localhost:8080/maximo> or <http://localhost/maximo>. The --name flag assigns a name for the container. If this flag is not set, an arbitrary name is assigned.

5. To check if the maximo_dev process is running, run the following command.

```
podman ps -a
```

You can see a container process named maximo_dev listed for the managedev image.

6. Start the maximo_dev container.

The development image is a Websphere Liberty Profile (WLP) image and deploys the Manage application into Liberty and starts MXServer. The following command starts the container in an interactive mode by passing the -i option. It is necessary to run the container in interactive mode so that MXserver can be up and running until the user stops it.

```
podman start -a -i maximo_dev
```

At this point, you can see MXServer starting and all the services, like BulletinBoard, Workorder, Scheduler, and others. When the server is up, you are able to access Manage from the browser.

Note: While testing, it was noticed that during server startup, sometimes the Podman container displays an out-of-memory exception. The reason for this is not yet known. However, recreating the machine typically resolves the issue. Also, adjusting the CPU and memory allocation during machine initialization might help in resolving the issue. The following commands are helpful:

```
podman machine stop
podman machine rm
podman machine init --cpus 2 --memory 2048 --disk-size 20
podman machine start
```

You can refer to a discussion thread to resolve the out-of-memory issue. For more information, see [How can I increase the number of CPUs?](#)

Note: Useful Podman commands:

```
podman machine start (or stop)
podman machine ls (status)
podman images
podman machine rm (removes the VM. Will lose local registry and everything else)
podman machine init (initializes and creates a new VM - start fresh)
podman ps -a
```

Configuring the Help menu

You can add custom menu links to the Maximo® Manage Help menu from Maximo Manage version 8.5 onwards.

Procedure

1. Open menus.xml from resources\presentations\system.
2. Search and check whether the menu ID MASHELP exists.
If the MASHELP menu ID does not exist, create a new menu with the MASHELP ID.
Note: The menu ID must be specified by using uppercase letters.
3. Define the custom menu links to appear in the Help menu.
4. Import the menus.xml file by using Application Designer.
The following example menu entry defines two menu items to appear in the Help menu.

```
<menu
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_config_t_config_help_menu_MASHELP">

<menuitem event="loadlink"
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_config_t_config_help_menu_esupportmam11"
label="Support1" link="http://www.ibm.com/support/docview.wss?uid=swg21418666&ibmprd=tivmx7"/>

<menuitem event="loadlink"
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_config_t_config_help_menu_esupportmam22"
label="Support2" link="http://www.ibm.com"/>

</menu>
```

Note:

- Only links are supported.
- The event must be defined as loadlink.
- The link property must be defined with a valid link.

Managing Maximo Mobile

Maximo® Mobile is a next-generation mobile application platform that allows users to securely access Maximo Manage functionality from a mobile device.

When Maximo Mobile is enabled, inspections are conducted through the Maximo Mobile user interface. Manage Inspection Forms are located on the Work Center. If Maximo Mobile is not enabled, inspections are conducted on the Work Center.

The Maximo Mobile app is available for download from Google Play and the Apple App Store. After a mobile user installs the app on their device and connects to the Maximo Application Suite server, role based apps that are mobile enabled are downloaded to the device, such as the Technician, Inspections, Service Request and other apps.

- [Introduction to Maximo Mobile](#)
Maximo Application Suite customers who deployed and activated Maximo Manage can download the Maximo Mobile app from the Apple App Store or Google Play store.
- [Overview of Maximo Mobile authentication and data flow](#)
You can use the Maximo Mobile application in online and offline scenarios. In an online scenario, the application is connected to Maximo Manage and uses the services and data that are provided. In an offline scenario, the application is not connected to Maximo Manage but continues to operate by using locally stored data.
- [Device requirements for Maximo Mobile](#)
Device requirements include the operating system level, biometric authentication, and device sharing requirements.
- [Defining security privileges for Maximo Mobile role-based applications](#)
Maximo Mobile role-based applications such as Technician and Inspections are hybrid applications. These applications can work in a browser, in connected mode or through the mobile application which also supports offline mode. Each mobile application can have one or more settings and object structures that control access to mobile data.
- [Installing the Maximo Mobile app on mobile devices](#)
For Android or iOS devices, users install the IBM® Maximo Mobile app from Google Play or the Apple App Store.
- [Setting the URL of the Maximo Application Suite server in the Maximo Mobile app](#)
To use the Maximo Mobile app with IBM Maximo Manage, the URL of your Maximo Application Suite server must be set in the app. The URL can be set manually by the mobile user or set centrally for each user by using a Mobile Device Management (MDM) application.
- [Configuring Map Manager](#)
Configure Map Manager in an environment with Maximo Spatial Asset Management.
- [Creating a service address with map location](#)
Create a service address that includes map location data.
- [Preloaded data on mobile devices](#)
Instead of downloading individual records to initialize a Maximo Mobile application on mobile devices, you can download a compressed database that contains all supporting data.
- [Refreshing data](#)
You can update the supporting data that is used by Maximo Mobile functions that are running on your mobile device.
- [Troubleshooting Maximo Mobile](#)
You can identify and correct most errors by responding to the error messages that are displayed on your mobile device.
- [Configuring Maximo Mobile](#)
After Maximo Manage is installed, the mobile apps are ready for use. Depending on your business needs, you can configure certain aspects of the apps.
- [Configuring and customizing applications with the Maximo Application Framework \(MAF\) Configuration application](#)
- [Anatomy of an application XML file](#)
The app.xml file contains global elements and attributes that are defined at the beginning of the file.
- [Maximo Mobile Queries](#)
Maximo Mobile uses queries to retrieve record data from the Maximo Manage server.
- [Adding an owner group reference on a work order](#)
In the Maximo Mobile Technician application, a Create Work Order page is used by a technician to create a new work order. In some organizations, the technician might be responsible for assigning the ownership of the work order.
- [Maximo Mobile REST APIs](#)
Maximo Mobile uses REST APIs to download data from Maximo Manage to a user's device.
- [Maximo Mobile application object structures, query information, and security authorization](#)
Object structures, query information, and related security authorizations that are used in the Technician, Approvals, Inspections, and Service Request applications are listed here. Security authorization listed for applications that are installed using the same security group.

Related concepts

- [What's new in Maximo Mobile](#)

Introduction to Maximo Mobile

Maximo® Application Suite customers who deployed and activated Maximo Manage can download the Maximo Mobile app from the Apple App Store or Google Play store.

The functions in Maximo Mobile are also available in Maximo Manage. From the side navigation menu, click Work Orders > Role Based Applications or for inventory features, click Inventory > Role Based Applications.

The navigator

The navigator is the home page of the app. From here, you can begin many of your key tasks for the day. If you have the correct permissions, you can even create records from the navigator. Tap the plus to create records such as work orders, service requests, and inspections. You can return to the navigator from any page in the app by tapping the navigator menu in the footer.

Overview of functions

Note: Depending on your permissions, you might not see all the functions.

Table 1. Standard functions

Function	Description	Availability
Approvals	Approve, assign, and monitor work. This function is only visible to users who have the authority to approve work.	From Maximo Mobile version 8.3 and Maximo Application Suite version 8.6
Assets	See the details of all your assets, including their specifications and associated meters.	From version 8.9

Function	Description	Availability
Assets & Digital Twin	Access real-time data from operating assets to learn, diagnose, and take action.	Not available from version 8.10.
Defects	Create defects and use artificial intelligence to analyze photos to identify defects. The Defects function is only available to IBM® Maximo Civil Infrastructure customers.	From version 8.8
Help & Support	Learn more about how to use the app.	All releases
Inspections	Input results in predefined forms and easily review previous results. Create reports from the results of in progress and completed inspections by using the REP_INSPRESULTFORM object structure.	All releases
Inventory Counting	Use count books, ad hoc counts, and reconciliation to ensure valid inventory balances.	From version 8.8
Inventory Receiving	In the Inventory Receiving function, storeroom clerks can receive materials from purchase orders. As part of the receiving activity, the storeroom clerk can inspect and return items, and view or void receipts.	From version 8.10
Map	View the locations of your work on a map and plan your route. The map function requires IBM Maximo Spatial to be installed.	All releases
Materials & Tools	See a checklist of the materials and tools that you need to complete your work.	All releases
My Schedule	View detailed information about your work and complete work orders.	All releases
Service Request	Open a service request to report an issue.	From Maximo Mobile version 8.3 and Maximo Application Suite version 8.6
Settings	Specify your preferences for the app.	All releases

Table 2. Optional functions

Function	Description	Availability
Assist	Get AI insights to increase your fix rate and receive remote expert assistance.	All releases
Parts Identifier	Search for and identify industrial parts by using visual and text-based AI.	From Maximo Mobile version 8.2 and Maximo Application Suite version 8.5

Table 3. Map functions

Icon	Description	Availability
	Add or remove layers to see different information on the map.	All releases
	Save your GPS location.	From Maximo Mobile version 8.3 and Maximo Application Suite version 8.6
	Identify both visible and hidden features on the map.	From Maximo Mobile version 8.3 and Maximo Application Suite version 8.6
	Access more options.	From Maximo Mobile version 8.9
	Download the map for offline use.	From Maximo Mobile version 8.8
	Select a building and view the floor plans.	From Maximo Mobile version 8.9
	Search the map.	From Maximo Mobile version 8.9
	View related records.	From Maximo Mobile version 8.9

Overview video

Check out the video to learn more about how a technician can complete a work order and an inspection:



IBM Internet of Things Community

The [IBM Internet of Things Maximo community](#) provides additional information in the form of comprehensive application configuration examples, application upgrade guidance, and other developer resources.

Related concepts

- [What's new in Maximo Mobile](#)

Overview of Maximo Mobile authentication and data flow

You can use the Maximo® Mobile application in online and offline scenarios. In an online scenario, the application is connected to Maximo Manage and uses the services and data that are provided. In an offline scenario, the application is not connected to Maximo Manage but continues to operate by using locally stored data.

Login and authentication

The first time that a user logs in to the Maximo Mobile application, they must have network connectivity, so they can connect to Maximo Application Suite. To log in to the Maximo Mobile application, the user must enter the credentials that they use in Maximo Application Suite. Using a single sign-on, the user is also authenticated with Maximo Manage, and the mobile apps that are on the Maximo Manage server are set up on the device. As part of the initial setup, a local JSON data store is created on the device. The data store is a repository for data that is downloaded from the Maximo Manage server. The data store is encrypted by using a unique key that is saved in the device's keystore. Each time a user opens the Maximo Mobile app, they are prompted for their device's security credentials so the application can access the local data store.

When a user authenticates to Maximo Application Suite, they are granted a token, which is used to authenticate all requests to the server. The token lasts for 12 hours after which the user is prompted to authenticate to Maximo Application Suite again. If the user does not authenticate successfully, they work offline until they authenticate to Maximo Application Suite again. A user can authenticate to Maximo Application Suite at any time by clicking the cloud icon from the application screen.

When you successfully use a biometric method to log in to a mobile device and you authenticate with the server through SSO, you have access to your own local database on the device that is used in offline mode. If another user uses biometrics to log in to the same mobile device, but they do not authenticate with the server, they are still able to access data as the last user to authenticate. If the second user was in offline mode, they would access the local database of the first user. The next time the device was used by the second user in online mode, they are given the option to switch users. If they accept, they can now access their own local database when in offline mode.

A user that has access to the device biometrics may access their own local DB after server authentication success. If user does not pass server authentication and he/she is a second user for the app that has access to the device biometrics, he/she would still be able to access as the last user that logged online if they were to access the application offline(they would use the last user's local DB). Then, if he/she logged online, there will be a popup message to let user confirm whether to switch user, if user confirmed, then the app would load current user's local DB. if not, the user would still access the application offline.

For information about Maximo Mobile security, see [Security and user management](#).

Online and offline operations

When mobile users are online, Maximo Mobile apps interact with Maximo Manage and exchange data that is represented in JSON format. In Maximo Manage, requests are processed by an OSLC service provider, and a response is returned.

The data that is retrieved from Maximo Manage is automatically saved to the local data store on the device. The availability of locally stored data makes online data operations more efficient, and users can continue to work when a planned or unexpected disconnection occurs. While users are online, local data is automatically synchronized to maintain consistency with Maximo Manage. Users can also manually synchronize data.

When mobile users are offline, requests are processed on the device by using data that was retrieved during online operations. When connectivity is restored, local data is automatically synchronized. Mobile devices are considered offline when the following conditions are met:

- The device is in airplane mode.
- The network adapter of the device is disabled.
- Network bandwidth is low.
- The Maximo Manage is not reachable by the mobile device.
- The login session expires.

Some applications, like Assist and Parts Identifier, require the user to be online.

Device requirements for Maximo Mobile

Device requirements include the operating system level, biometric authentication, and device sharing requirements.

To run Maximo® Mobile, a device must meet the following system requirements:

- Android version 11 or higher, iOS version 14.3 or higher, or Windows 10 version 10.0.17763.0 or better, or Windows 11 operating system installed.
- If the device is shared between users, the device sharing must be managed by the device operating system, and each user must have their own workspace and user profile. On iOS devices, to support device sharing, a mobile device management (MDM) solution must be installed on the device.
- Windows devices must include the WebView2 Runtime.
- Android devices must support AR Core if you intend to support the Assist application. Refer to [ARCore Supported devices](#) for more information.

Ensure that you have the latest version of Maximo Mobile applications available from public mobile app stores or, if you are using Windows, from the IBM portal.

Defining security privileges for Maximo Mobile role-based applications

Maximo® Mobile role-based applications such as Technician and Inspections are hybrid applications. These applications can work in a browser, in connected mode or through the mobile application which also supports offline mode. Each mobile application can have one or more settings and object structures that control access to mobile data.

By default, role-based applications do not grant access during installation. Add access to existing security groups. The security for role based applications is made of three parts.

Table 1. Maximo Mobile application security components

Security component	Overview	Example
Object structure	Role-based applications can rely on Maximo Asset Management and multiple object structures to send data and updates. Role-based applications use OSLC/REST calls to exchange data with Maximo Asset Management. You define the level of access to an object structure from the Object Structure tab of the Maximo Asset Management Security groups application.	When you are editing an asset, the MXAPIVENDOR object can provide a list of vendor companies in the application. READ access is the minimum required to view the list of vendor companies in the role-based application.
Object security	Maximo Asset Management does not have an object level security itself. It grants access to object structures which does not ensure that a user has access to the Maximo Asset Management application that owns the object. In the Application security tab of the Maximo Asset Management Security groups application, you can control the level of access to the application and its associated objects.	Maximo Asset Management Companies application must have READ access at minimum to allow the MXAPIVENDOR to access the COMPANIES object.
Application option	Some role-based applications provide the ability to determine what the end user can do. These permissions are determined by the object structure associated with a role-based application. User permissions are defined in the Security options section accessed from the Object Structure tab of the Maximo Asset Management Security groups application.	The Technician role-based application uses the MXAPIWODETAIL object structure. When you select MXAPIWODETAIL from the Object Structure tab, you can control multiple end user features, like status changes, actual reporting and more.

Each application has a security group template. This template gives users the privileges that are needed by each role based application based on the security groups assigned to the user. You can use templates to grant all privileges needed by a role-based application. You can also use templates to view the options available to be configured. You can use the access the Manage/Apply security template option from the Applications tab of the Security Groups application. You can view the application and object structures required by the role-based application. You can grant everyone in a security group access to an application with the Apply Template option.

Related information

- [Creating Work Center and Tool security groups](#)

Installing the Maximo Mobile app on mobile devices

For Android or iOS devices, users install the IBM® Maximo® Mobile app from Google Play or the Apple App Store.

If the Maximo Mobile app was installed previously for use with the Maximo Mobile Assist app for technicians, you must uninstall the app from each device and install it again.

- **[Configuring self-signed certificates for the Maximo Application Suite server on iOS devices](#)**
A self-signed certificate can be installed on the Maximo Application Suite server for iOS devices. The certificate must be imported to each iOS device. This feature is intended for testing and development purposes and not intended for production use. Do not use self-signed certificates for production deployments as they can create a security vulnerability.
- **[Configuring self-signed certificates for Maximo Application Suite on Android devices](#)**
A self-signed certificate can be installed on the Maximo Application Suite server for Android devices. The certificate must be imported on each Android device. This feature is intended for testing and development purposes and not intended for production use. Do not use self-signed certificates for production deployments as they can create a security vulnerability.
- **[Configuring self-signed certificates for the Maximo Mobile Windows application](#)**
A self-signed certificate can be installed on the Maximo Application Suite server for the Maximo Mobile Windows application. This feature is intended for testing and development purposes and not intended for production use. Do not use self-signed certificates for production deployments as they can create a security vulnerability.

Configuring self-signed certificates for the Maximo Application Suite server on iOS devices

A self-signed certificate can be installed on the Maximo® Application Suite server for iOS devices. The certificate must be imported to each iOS device. This feature is intended for testing and development purposes and not intended for production use. Do not use self-signed certificates for production deployments as they can create a security vulnerability.

Procedure

1. Download the certificate file.
 - a. Access the Maximo Application Suite server page in your browser on a desktop computer. A message indicates that the connection is not private.
 - b. Find and save the certificate of the root certificate authority. On Safari, click to view the certificate, select the root certificate, and drag the file to a folder.
2. Install the certificate profile.
 - a. Use Airdrop to send the saved root certificate file to your iOS device.
 - b. Open the Device Settings page.
 - c. In the User details section of the device settings, click Profile Downloaded.
 - d. In the Install Profile page, click Install.
 - e. If you are prompted, enter the iOS device passcode. A certificate warning is displayed.
 - f. Click Install and click Install again if you are prompted.
 - g. On the Profile Installed page, click Done.
3. Trust the certificate.
 - a. On the device, go to Settings > General > About > Certificate Trust Settings. The installed root certificate is displayed in the Enable Full Trust for Root Certificates.
 - b. Turn on trust for the certificate that you installed and click Continue. The certificate is trusted and enabled and you can proceed to use the Technician and Inspections apps in the Maximo Mobile app.

Configuring self-signed certificates for Maximo Application Suite on Android devices

A self-signed certificate can be installed on the Maximo® Application Suite server for Android devices. The certificate must be imported on each Android device. This feature is intended for testing and development purposes and not intended for production use. Do not use self-signed certificates for production deployments as they can create a security vulnerability.

Procedure

1. Download the certificate file.
 - a. On a desktop computer, in a browser, access the Maximo Application Suite server page. A message indicates that the connection is not private.
 - b. Find and save the certificate of the root certificate authority.
 - c. Copy the certificate file to the Android device.
2. Install the certificate profile on the Android device.
 - a. Open Android settings and then select Encryption & credentials.
 - b. Select Install a certificate and then select CA certificate.
 - c. Select the certificate file that you downloaded.
 - d. After the installation process is complete, select Trusted credentials to ensure that the certificate was successfully installed.

Configuring self-signed certificates for the Maximo Mobile Windows application

A self-signed certificate can be installed on the Maximo® Application Suite server for the Maximo Mobile Windows application. This feature is intended for testing and development purposes and not intended for production use. Do not use self-signed certificates for production deployments as they can create a security vulnerability.

Procedure

1. Export the certificate in Google Chrome.
 - a. On a Windows system, start Google Chrome, and then open the URL for the Maximo Application Suite server.
 - b. In the address bar of the browser, click Not secure and then click Certificate is not valid.
 - c. In the certificate window, on the Certification Path tab, select the first certificate that is listed in the Certification path tree and then click View Certificate.
 - d. In the new Certificate window, on the Details tab, click Copy to File.
 - e. In the Certificate Export Wizard Welcome panel, click Next.
 - f. Select DER encoded binary X.509(.CER) and then click Next.
 - g. Specify an export file location and then click Next.
 - h. When the export process is complete, click Finish.
2. Import the certificate to the Trusted Root certificate authorities.
 - a. Right-click the exported certificate file and then select Install Certificate.
 - b. In the Certificate Import Wizard panel, select Local Machine and then click Next.
 - c. Select Place all certificates in the following store and then click Browse.
 - d. Select Trusted Root Certification Authorities and then click OK.
 - e. Click Next and then click Finish.

Setting the URL of the Maximo Application Suite server in the Maximo Mobile app

To use the Maximo® Mobile app with IBM® Maximo Manage, the URL of your Maximo Application Suite server must be set in the app. The URL can be set manually by the mobile user or set centrally for each user by using a Mobile Device Management (MDM) application.

Maximo Mobile supports the standard approach to centrally configuring mobile applications that is defined by the [Appconfig](#) Community. When you load the Maximo Mobile Android app in an MDM application, the configurable settings are displayed, and you can set their values. For the Maximo Mobile iOS app, some MDM applications can load the configurable settings from an AppConfig.xml file. If your MDM application, can load the configuration setting from an AppConfig.xml file, create an appconfig.xml file and copy the following text to the file:

```
<managedAppConfiguration>
  <version>1</version>
  <bundleId>com.ibm.iot.maximo.mobile</bundleId>
  <dict>
    <string keyName="serverURL">
    </string>
    <boolean keyName="allowURLtoBeChanged">
      <defaultValue>
        <value>>true</value>
      </defaultValue>
    </boolean>
    <boolean keyName="useSystemBrowserLogin">
      <defaultValue>
        <value>>false</value>
      </defaultValue>
    </boolean>
  </dict>
  <presentation defaultLocale="en-US">
    <field keyName="serverURL" type="input">
      <label>
        <language value="en-US">Server URL</language>
      </label>
      <description>
        <language value="en-US"/>
      </description>
    </field>
    <field keyName="allowURLtoBeChanged" type="checkbox">
      <label>
        <language value="en-US">Allow URL to be changed?</language>
      </label>
      <description>
        <language value="en-US"/>
      </description>
    </field>
    <field keyName="useSystemBrowserLogin" type="checkbox">
      <label>
        <language value="en-US"> Use the system browser to log in?</language>
      </label>
      <description>
        <language value="en-US"/>
      </description>
    </field>
  </presentation>
</managedAppConfiguration>
```

For more information, see the documentation for your MDM application.

If your MDM application does not support the AppConfig.xml file, you can add the following settings and their values in your MDM application:

Table 1. AppConfig settings supported by Maximo Mobile

Setting	Type	Description
serverURL	String	The URL of the Maximo Application Suite server to which users connect.
allowURLtoBeChanged	Boolean	Allow the user to change the server URL in the Maximo Mobile application. The default value is <code>true</code> , which allows a user to change the URL in the app if, for example, they want to connect to a different server.
useSystemBrowserLogin	Boolean	The user logs in using the system browser instead of the embedded browser of the app. The default value is <code>false</code> . The user logs in using the system default browser when using the MDM application is used and <code>useSystemBrowserLogin</code> is set to <code>true</code> .

If you are not using an MDM application to manage your devices, you must send the URL of the Maximo Application Suite server to each Maximo Mobile user. Each user must then manually enter the URL of the server in the Maximo Mobile app.

After the URL of the server is set in the Maximo Mobile app, the Maximo Mobile applications, which are deployed on the Maximo Manage server, are set up on the device.

Configuring Map Manager

Configure Map Manager in an environment with Maximo® Spatial Asset Management.

Before you begin

Maximo Spatial Asset Management must be deployed in your environment before you can configure Map Manager.

Procedure

- Log in as an administrator. Select your organization from the Organizations application.
- From the More Actions menu, select Service Address Options.
- Select the coordinate option X and Y and then click OK.
- Open the Map Manager application, select New Map Manager.
- Configure Map Manager general properties.
 - Enter a name and description.
 - Select a measurement unit from the Length and Distance Unit menu.
 - Select Maximo Spatial from the Map provider name menu.
 - Select Enable map?.
- Configure Map Manager map provider properties.
 - Set the geographic information system.
 - For example,
 - Geocode service URL:
`https://geocode.arcgis.com/arcgis/rest/services/World/GeocodeServer`
 - Route service URL:
`https://route.arcgis.com/arcgis/rest/services/World/Route/NAServer/Route_World`
 - Add one or more map services:
 - For example,
 - Name:
`Basemap`
 - URL:
`https://basemaps.arcgis.com/arcgis/rest/services/World_Basemap_v2/VectorTileServer`
 - Order:
`100`
 - % Transparency:
`0`
 - Visible:
`Selected`
- Select the Services tab and add services.
 - From the Geocode Services section, add a new row.
 - For example,
 - Name:
`GeoCodeServer`
 - URL:
`https://geocode.arcgis.com/arcgis/rest/services/World/GeocodeServer`
 - From Geometry Service section, add the URL.
 - `https://sampleserver6.arcgisonline.com/arcgis/rest/services/Utilities/Geometry/GeometryServer`
 - Click Save.
- Add a new site.
 - Select the Map Manager tab.
 - Click New Row and select a site.

- c. Click Map Initial Extent and then click OK.
 - d. Click Save.
9. Configure map tools.
- a. From the Common Actions menu, select Configure Map Tools.
 - b. Search for `Service Address`.
 - c. Click Enable All Map Tools for Selected Application.
 - d. Click OK.
- [Offline areas](#)
You can create map areas to use when your mobile device is offline.
 - [Map toolbar functions](#)
The map toolbar contains all the tools that you use to work with the map.

Offline areas

You can create map areas to use when your mobile device is offline.

You can edit the local map data on your mobile device while it is offline. When connectivity is available, you can synchronize the data with the Maximo® Manage server.

- [Creating replicas and downloading to mobile devices](#)
You can create a copy of map data for offline mobile devices.
- [Creating and downloading vector tile packages](#)
You can create vector tile packages for offline mobile devices.

Creating replicas and downloading to mobile devices

You can create a copy of map data for offline mobile devices.

Procedure

1. Create and configure the map manager record.
 - a. In the Map Manager application, create a new record.
 - b. Choose Maximo Spatial for the map provider name, add a site, and then enable the MAF map component option.
 - c. Add and configure map services. Map service layers must be enabled for replicas.
 - d. Save the map manager record and then enable the Enable Map option.
 - e. Expand the site that you configured to display the Offline Area Extent section and then add a row.
 - f. Enter an area name and then click Preview.
 - g. Zoom in to select the area on the map that you want to replicate for offline use and then click OK.
 - h. For each Map Replica map service that is listed, click Create Replica.
After the map replica is created, the Create Replica button is disabled, and Delete Replica button is enabled.
 - i. After the replica is created, click Create Offline Package.
To download the replica to a device, an offline package must be created. An administrator can create an offline package at any time. This package contains all the replicas of that offline area.
 - j. After the offline package is created, the Package Ready? option is automatically selected which enables the package for download.
 - k. Select the Enable Preload? option to download the replica as preload data to mobile devices.
 - l. Select Configure Mobile Properties from the More Actions menu and then configure the following properties.
 - `pluss.replica.sync.daysToExpire`
The number of days before an offline map expires. A 0 value indicates that the map never expires.
 - `pluss.replica.device.androidPath`
The folder name that contains the unextracted VTPK file on the mobile device.
 - `pluss.replica.device.iosPath`
The folder name that contains the unextracted VTPK file on the mobile device.
 - `pluss.replica.device.windowsPath`
The folder name that contains the unextracted VTPK file on the mobile device.
 - m. Save the map manager record.
2. Download the offline replica to your mobile device.
 - a. On your mobile device, open the IBM® Maximo® Mobile application and log in.
 - b. Open the mobile application, for example, Technician or Inspections, and then open the map that includes the areas that were selected for the replica.
 - c. Click Offline Area and then click Replicas.
 - d. Select the replica that you want to download and then tap the download icon.
3. Delete the offline replica from your mobile device.
 - a. Open the IBM Maximo Mobile application from your mobile device and log in.
 - b. Open the mobile application, for example, Technician or Inspections, and then open the map that includes the areas that were selected for the replica.
 - c. Click Offline Area and then click Replicas.
 - d. Select the replica that you want and then click the trash icon to delete the replica.
4. Sync the offline replica on your mobile device.
 - a. Open the IBM Maximo Mobile application from your mobile device and log in.

- b. Open the mobile application, for example, Technician or Inspections, and then open the map that includes the areas that were selected for the replica.
- c. Click Offline Area and then click Replicas.
- d. Select the replica that you want and then click the sync icon to synchronize the replica with the server.

Creating and downloading vector tile packages

You can create vector tile packages for offline mobile devices.

Before you begin

You must have a .vtpk file available to upload to Maximo® Manage. This file that contains map vector tile data and graphic style resources. You can create a .vtpk file with the Package Toolset of the ArcGIS Data Management toolbox. See [Create Vector Tile Package \(Data Management\)](#) for more information.

Procedure

1. Create the vector tile package.
 - a. In the Map Manager application, create a new record.
 - b. Choose Maximo Spatial for the map provider name, add a site, and then enable the MAF map component option.
 - c. Add and configure a basemap.
 - d. Save the map manager record and then enable the Enable Map option.
 - e. From the Common Actions menu, click Configure Tile Package .
 - f. In the Upload Offline Tile Packages window, expand the basemap row.
 - g. In the Specify VTPK file section, click Browse.
 - h. Select a .vtpk file from your local system and then click Open.
 - i. Click OK.
The package file is uploaded to Maximo Manage.
2. Download the .vtpk file to your mobile device.
 - a. On your mobile device, open the IBM Maximo Mobile application and log in.
 - b. Open the Inspections application and then open the map that includes the areas that were selected for the .vtpk file.
 - c. Tap Offline Area and then tap Vector Tile Packages.
 - d. Select the map that you want and then tap the download icon to download the .vtpk file to your mobile device.

Map toolbar functions

The map toolbar contains all the tools that you use to work with the map.

Table 1. Map toolbar functions

Tool	Icon	Function
Zoom to Previous Extent Tool		Focus on the previous map view.
Zoom to Next Extent Tool		Focus on the updated map view.
Zoom to Initial Extent Tool		Focus on the initial map view.
Zoom to Full Extent Tool		Focus on the entire map.
Basemaps		Dynamically apply basemaps to the current Spatial map. Default basemaps are provided with Maximo Spatial. These basemaps cannot be customized and must be used with Maximo Spatial maps only.
Add or edit a feature on the map		Can be used to edit or add new features to the map. New features are linked to the current record. You must grant users access to the current service layer from the security application to add or edit features with the edit tool.
Full Screen		Expands the map to full screen.
Geocoder		Configure a geocode service for a map manager to find a position on the map with location information. Configure a geocode service from the services tab of the map manager.
Identify		Use the identify tool to show layer data from a selected point on the map. The tolerance control defines the size of a radius that surrounds the selected point. Data from multiple points can be shown. You can add identified feature to the Results window. If the feature is linked to an application record, you can set the record that is associated with the feature as the current record.
Linear Visual Controller		Only available if you installed Maximo Linear.
Print and Export		Specify the URL of a print and export service server on the Services tab of a map to print a copy of the map or export it as a file.

Tool	Icon	Function
Query by Attributes		You create simple or complex attribute queries to identify features on the map and add data to the Results window.
Refresh		Refresh map data.
Results		Opens the Results window so you can view results of feature queries. You can update the map with results in the List tab, or update the List tab with results on the map by using the update functions. You can also merge the results from both sources into one set of results on the List tab and the Results window.
Selection		Opens the Selection Tools window. This window contains the different tools for selecting an area on the map and adding data to the Results window.
Sketch Tool		Draw figures and enter text on a map. When you are finished, you can save the sketch for the record. You can reload the saved sketch the next time you open the map.
Layers		Show all ArcGIS layers and related legend information.
Show Related Work Order		Displays the assets and locations related to a work order.
Find Location		Enter address information to find a location in the current extent of a map. When the address is located, a label is displayed on the map with the address details of the current record.

Creating a service address with map location

Create a service address that includes map location data.

Before you begin

Map manager must be configured with a map provider and map services.

About this task

Service addresses can be associated to assets, locations and work orders. A map pin indicates the record location.

Procedure

1. Log in as an administrator and open the Service address application.
2. Select New Service Address.
3. Enter a name, description, and site.
4. Select the Map tab.
5. Right-click on any area of the map and select Set record location.
6. Click Save.

Preloaded data on mobile devices

Instead of downloading individual records to initialize a Maximo® Mobile application on mobile devices, you can download a compressed database that contains all supporting data.

Overview

In previous releases, initializing a Maximo Mobile application for the first time on a mobile device might take an extended amount of time. Downloading applications and storing supporting data from the server to the mobile device took up most of the time that is spent during the onboarding process.

You can now download a per-populated SQLCipher database that contains all supporting data that is needed by the mobile applications. Each database is customized for a group and delivered as a compressed package to a mobile device.

This database is built on the server regularly by the MobileDbCronTask crontask. When applications are updated, the crontask updates the prepopulated database.

Person groups

Maximo Mobile determines which prepopulated database to download based on assigned person groups. If a user belongs to more than one person group, then they are shown a list of available databases.

When you update a user profile, confirm that the user is a member of the intended group to ensure that they receive the correct database.

Crontask configuration considerations

How often your data changes dictates how often the MobileDbCronTask is run. If your data changes daily, you might consider running the crontask weekly. If your organization establishes new users intermittently, you might consider configuring the crontask to run less frequently. Existing users can always refresh data in their mobile application to ensure that they have the latest information.

Troubleshooting

If an error occurs during the creation of the SQLCipher database, the log file provides information about the object structure, query, and select statement that generated the error. Returned fields include USERID, SELECT, TABLENAME, SAVEDQUERY, OBJECTSTRUCTURE, and ERRORMESSAGE. The ERRORMESSAGE field contains the error message that is returned by the OSLC integration and the page that generated the error. The administrator receives an email about the crontask failure with log information.

In addition, the administrator can retrieve status information from the browser by opening `HTTPS://hostname:port/maximo/oslc/graphite/mobile/db?info=1&user=username`. The complete mobile ID record is displayed in JSON for the user who is specified in the user parameter. If no user is specified, information for the user who is logged in is displayed. If the info parameter is set to `all`, then all of the mobile ID records are returned as JSON.

You can download the entire database as a compressed file to examine its contents. For example, you might want to verify that all expected data is included. Retrieve the database file from the browser by opening `HTTPS://hostname:port/maximo/oslc/graphite/mobile/db?mobileDbId=mobiledbid`.

The `mobiledbid` value can be found in the Maximo Mobile logs by searching for MOBILEDBID.

- [Creating preloaded data for mobile devices](#)

You can create a preloaded database that contains all supporting data to save mobile application users time when they are onboarding.

Related information

- [Maximo Mobile - How to setup preloaded database to improve lookup download performance?](#)

Creating preloaded data for mobile devices

You can create a preloaded database that contains all supporting data to save mobile application users time when they are onboarding.

About this task

Create a cron task that creates the preloaded database that includes the data for all lookup data sources that are defined in Maximo® Mobile applications.

Procedure

1. Log in as an administrator and create a user.
This user is the template user that is used by Maximo Mobile to create the preloaded database. The cron task queries that are used to retrieve the data to load in the database are sent by the template user.
2. Define a default insert site for the user.
3. Assign the user to any standard groups that are used by your organization.
4. Create a person group.
5. Assign the template user as the default user of the new person group.
6. Assign other users to the new person group, so they can receive the preloaded database that is associated with that group.
7. Open the Cron Task Setup application, search for the MobileDbGeneration cron task and then click to configure it.
8. Click New Row to create a new instance for the MobileDbGeneration cron task and then name it.
9. Specify the schedule for the cron task, mark it as active, and then enter the template user in the Run as User field.

Results

Whenever the cron task runs, the preloaded database is created and stored in the Maximo database.

Refreshing data

You can update the supporting data that is used by Maximo® Mobile functions that are running on your mobile device.

About this task

The Maximo Mobile navigator consolidates transaction upload and data download tasks. You can refresh several types of data. Transaction data includes a transaction list to upload to the server. Configuration data includes user data and system configuration data. Functions data used to download a compressed file. Record data consists of function data that supports working in offline mode.

Procedure

1. Open the Maximo Mobile navigator on your mobile device.
2. Refresh data with default updates.

- a. Open the Data update screen.
 - b. Tap the refresh icon.
Record data is refreshed according to the options that you selected from the Record data options screen.
- All data is refreshed, including transactions, configurations, functions, and record data.
3. Refresh record data with custom updates.
 - a. Open the Data update screen.
 - b. Tap the Options icon.
 - c. Select the data that you want to update.
Choices include Supporting data, Map data, Work list data, and attachments. If Work list data is selected, attachments cannot also be selected. To enable the download of attachments, select the option from the Offline data screen from Settings.
4. Refresh with all updates of record data.
 - a. Open the Settings screen.
 - b. Select Full record update, and then tap Update all record data.
All record data is downloaded.

Results

All functions are placed in a waiting status, and they cannot be accessed until the data download is completed.

Troubleshooting Maximo Mobile

You can identify and correct most errors by responding to the error messages that are displayed on your mobile device.

- [Troubleshooting applications on Android](#)
A debug version of Maximo Mobile for troubleshooting issues is available from IBM® Support.

Troubleshooting applications on Android

A debug version of Maximo® Mobile for troubleshooting issues is available from IBM® Support.

About this task

If you encounter issues while using Maximo Mobile, you can contact IBM Support to receive the debug version of Maximo Mobile.

Procedure

1. Uninstall the release version of Maximo Mobile that you downloaded from the Google Play store.
2. On the mobile device, install the APK file for the debug application.
3. Verify that the Developer Options setting is ON.
4. Enable USB debugging in Settings > System > Advanced > Developer Options > USB debugging.
5. Connect the mobile device to your desktop by using a USB cable.
6. On the desktop, start the Chrome web browser and open the Web Inspector and Debugger tool.
7. Locate the mobile device and application.
Application entries are named com.ibm.iot.maximo.mobile or com.ibm.iot.maximo.mobileeam.
8. Click Inspect.
There are two inspectors available for an application. To inspect Network Requests, use Maximo Mobile Network/DB Inspector. To debug other issues or to inspect the DOM, use the default inspector.
9. Review the collected data.

Results

You can review the collected data. You can use the debug version for up to 30 days. If you need to continue collecting data, you must reinstall the debug version of the application.

Configuring Maximo Mobile

After Maximo® Manage is installed, the mobile apps are ready for use. Depending on your business needs, you can configure certain aspects of the apps.

- [Configuring default bar code formats](#)
By default, the bar code reader in the Maximo Mobile applications tries to read all bar code formats. To reduce the number of formats that the bar code reader tries to read, you must specify one or more default formats that are used in your organization.
- [Configuring properties that affect mobile apps](#)
In Maximo Manage, you can set system properties that affect the Maximo Mobile Technician and Inspections apps.
- [Push notifications](#)
Push notifications are messages sent from the server to mobile devices when Maximo Mobile applications are being used.

- [Recording physical signatures](#)
Maximo Mobile applications can be configured to require physical signatures for work orders based on their statuses. For example, before a work order is completed, the Technician application can prompt the user to sign the work order and then change its status to complete. This feature is not enabled by default.
- [Recording e-signature keys](#)
Use e-signature keys on your mobile device to confirm that a change is complete and valid.
- [Configuring application links](#)
You can configure an application to open from the field of another application. For example, you can open the Inspections application from a field in the Work Order Tracking application.
- [Enabling photo analysis by IBM Maximo Visual Inspection](#)
To help inspectors detect defects during inspections, you can enable analysis of the photos that the inspector takes during the inspection. The analysis is completed by IBM® Maximo Visual Inspection.

Configuring default bar code formats

By default, the bar code reader in the Maximo® Mobile applications tries to read all bar code formats. To reduce the number of formats that the bar code reader tries to read, you must specify one or more default formats that are used in your organization.

Before you begin

Bar code scanning must be performed by using the camera on your mobile device. No other methods are supported. In addition to bar codes, QR codes are also supported.

Procedure

1. Open the controller.js file for each app.
2. Locate the following line in the file:
`'mxe.barcode.readers':
['all_formats']`
3. Change the default value of the property, which is `all_formats`, to the default formats that you want to use. If you want to specify multiple formats, use a comma separator, for example:
`'mxe.barcode.readers':
['code_128_reader', 'upc_reader']`
The following bar code formats are supported:
 - code_128_reader
 - ean_reader
 - ean_8_reader
 - code_39_reader
 - code_39_vin_reader
 - codabar_reader
 - upc_reader
 - upc_e_reader
 - i2of5_reader
 - 2of5_reader
 - code_93_reader
4. Save the controller.js file.
5. Optional: In the Technician and Inspections apps, any button that scans bar codes tries to read all of the default bar code formats that you specified. In the app.xml for either app, you can override the default bar codes formats that an individual button in the app tries to read.
 - a. For each app, open the app.xml file.
 - b. Locate the line that contains the button that you want to configure, for example:
`<barcode-button
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_config_barcodebut
ton1" on-scan="handleBarcodeScan" timeout="30"
label="ScanBarcode"/>`
 - c. Add the readers property to the line and specify one or more bar code formats, for example:
`<barcode-button
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_config_barcodebut
ton1" on-scan="handleBarcodeScan" timeout="30"
label="ScanBarcode"/> readers="{ ['ean_reader'] }"/>`
 - d. Save the app.xml file.
6. Build the apps and deploy them to the Maximo Manage server.

Configuring properties that affect mobile apps

In Maximo® Manage, you can set system properties that affect the Maximo Mobile Technician and Inspections apps.

You configure system properties in the System Properties application in Maximo Manage. The following table describes the system properties that you can configure for mobile apps.

Table 1. System properties that affect mobile apps

Property	Description
----------	-------------

Property	Description
mx.e.mobile.travel.radius	The radius from the user's GPS location to the work order over which travel time can be tracked. Depending on the user's region, the value is measured in kilometers or miles.
mx.e.mobile.travel.prompt	Users can track travel time when the value in mx.e.mobile.travel.radius is matched or exceeded. Set to 1 to enable.
mx.e.mobile.travel.navigation	In the Maximo Mobile Technician and Inspections apps, when a user clicks Start travel, a map opens to help the user get to the location of the work. Set to 1 to enable.
mx.e.mobile.navigation.ios	When you start a trip, a Maximo Mobile application opens a map service to help you navigate to your destination. Valid values for this property are <code>AppleMaps</code> , <code>GoogleMaps</code> , or <code>Waze</code> . This property requires the <code>mx.e.mobile.travel.navigation</code> property to be enabled. Longitude and latitude coordinates are reported. Information about x and y axes is not provided. IOS devices default to using <code>AppleMaps</code> .
mx.e.mobile.navigation.android	When you start a trip, a Maximo Mobile application opens a map service to help you navigate to your destination. Valid values for this property are <code>AppleMaps</code> , <code>GoogleMaps</code> , or <code>Waze</code> . This property requires the <code>mx.e.mobile.travel.navigation</code> property to be enabled. Longitude and latitude coordinates are reported. Information about x and y axes is not provided. Android devices default to using <code>GoogleMaps</code> .
mx.e.mobile.navigation.windows	When you start a trip, a Maximo Mobile application opens a map service to help you navigate to your destination. Valid values for this property are <code>AppleMaps</code> , <code>GoogleMaps</code> , or <code>Waze</code> . This property requires the <code>mx.e.mobile.travel.navigation</code> property to be enabled. Longitude and latitude coordinates are reported. Information about x and y axes is not provided. Windows devices default to using <code>GoogleMaps</code> .
maximo.mobile.fetch.timeout	The time in milliseconds that the Maximo Mobile app waits for a response from the server and also the minimum time that the app stays offline if a response is not received. After the minimum time that the app stays offline expires, the app tries to connect to the server the next time that the mobile user sends a request to the server.
mx.e.app.workorder.InspectionBatchRecord	Set to 1 to create batch records for inspections in the same work order, regardless of the hierarchy of the work order. This property is set to 1 by default.
mx.e.app.workorder.StatusToCreateInspection	Defines the internal work order status where the inspection result is created.
mx.e.app.inspection.UpdatePendingResults	Set to 1 to update pending inspection results with the newest active revision.
mx.e.mobile.inspection.mobilefeatures	Enables features in Maximo Mobile that are not supported in Conduct an Inspection Work Center.
mx.e.mobile.inspection.features.signature	Enables signature input on Inspections forms.
mx.e.mobile.inspection.features.multiselect	Enable multi-select input on Inspections forms.
maximo.mobile.usetimer	Specifies whether Start work starts the timer. Set to 0 to change status only and not start the timer.
maximo.mobile.statusforphysicalsignature	The status that requires the user to provide a physical signature.
maximo.mobile ldap.isForm	This property is used by Maximo Mobile to detect what LDAP authentication method is used.
maximo.mobile.completestatus	The status that the work order changes to <code>Complete</code> when work is tapped in Maximo Mobile.
mx.e.webclient.resetMobileSCCache	Reset the mobile start center cache. Resetting the cache might cause portlet loading issues.
maximo.mobile.allowmultipletimers	Determines whether multiple timers can be started at the same time. The default value is <code>true</code> . When set to <code>false</code> , the user can start one timer at a time in Maximo Mobile. Multiple work orders can still have In Progress status. This value applies only for transactions that are started by the user who is logged in to the mobile device.
maximo.mobile.attachments.bulkDownload.automatically	Automatically downloads files that are attached to a record every time transactional records such as work orders are downloaded or refreshed on a mobile device. You do not need to open each mobile application to download attachments. The default value is <code>true</code> .
maximo.mobile.attachments.bulkdownload.filesizelimit	The maximum file size for a file that can be downloaded in the bulk download process. Users can still download the file through the attachment page. The default value is 5120 KB.
maximo.mobile.attachments.bulkDownload.zipcount	The increment used to communicate progress of the bulk download of attachments. Progress count is displayed at the interval of the increment. For example, 10 of 100 is displayed, followed by 20 of 100. The default increment display value is 10.
maximo.mobile.attachments.bulkdownload.filetypes	Attachment file types available for bulk download. File types include <code>jpg</code> , <code>png</code> , <code>mp4</code> , <code>pdf</code> , <code>doc</code> , <code>xls</code> , and <code>xlst</code> . All file types are included by default.
maximo.mobile.ios.zipdownload.timeout	Dictates the timeout value in milliseconds for IOS native zip file downloads. IOS native zip file downloads include application files, the preloaded database package, and attachments.
mci.mvi.apikey	The API key of your Maximo Visual Inspection instance. This property is associated with the <code>mx.e.mobile.inspection.features.mviintegration</code> property.

Property	Description
mci.mvi.apiurl	The URL of your Maximo Visual Inspection instance. This property is associated with the mxm.mobile.inspection.features.mviintegration property.
mxm.mobile.inspection.features.mviintegration	Enables Maximo Visual Inspection photo analysis in Maximo Mobile.
maximo.mobile.esignatureenabled	Set to true to enable e-signatures to be used to confirm the status change of a work order in the Technician application.
maximo.mobile.wostat.usforesig	Set to a work order status that requires an e-signature. For example, COMP.
mxm.allownativeesig	Set to true to require a native key for Maximo Asset Management instead of user credentials. This property is required to enable e-signatures in Maximo Asset Management.

Push notifications

Push notifications are messages sent from the server to mobile devices when Maximo® Mobile applications are being used.

Creating and implementing push notifications consists of several configuration steps.

- Configuring Apache Kafka or JMS queues.
- Configuring Maximo Manage notifications and subscribers.
- Generating and configuring an API Key for Maximo Application Suite.
- [Integrating Apache Kafka queues with Maximo Manage](#)
Integrate Apache Kafka queues with Maximo Manage to implement notification messaging.
- [Integrating JMS queues with Maximo Manage](#)
Integrate JMS queues with Maximo Manage to implement notification messaging.
- [Creating and configuring API keys for push notifications](#)
Push notifications require API Keys.
- [Configuring Maximo Application Suite notifications](#)
Configure a Maximo Application Suite notification and set user subscriptions.

Integrating Apache Kafka queues with Maximo Manage

Integrate Apache Kafka queues with Maximo® Manage to implement notification messaging.

Before you begin

This example assumes you already have a notification queue created in Kafka. For this example, the notification queue is named notfqueue.

Procedure

1. Add a Kafka provider.
 - a. From Maximo Manage, open the External Systems application.
 - b. Add or select the external system and then select Add/Modify Message Providers to open the Message Hub Provider dialog box.
 - c. Set a name for your provider, KAFKA for example, and then set the properties required to connect to your Kafka server.
For more information, see [Specifying Kafka providers for message processing](#).
2. Add the Kafka queue to Maximo Manage.
 - a. From the External Systems application, select Add/Modify Queues.
 - b. Click the new row icon. For the Message Provider field, click the lookup icon and select the Kafka message provider that you specified.
 - c. For the Queue JNDI Name field, click the lookup icon and select the Kafka notification queue.
For example, notfqueue.
 - d. Deselect Inbound.
Notification queues are sequential outbound.
 - e. Click OK.
For more information, see [Adding queues to external systems](#).
3. Create a Kafka cron task instance.
 - a. Open the Cron Task Setup application.
 - b. From the Cron Task field, search for Kafka.
 - c. Click the Kafka row to open the cron task.
 - d. From the Cron Task Instances list, click the new row icon to add an instance for the notification queue.
 - e. In the Details section, enter a Cron Task Instance Name.
For example, kafkanotf.
 - f. Enter values for Schedule, Run as User, and other fields as required.
 - g. Enable the Active? option.
 - h. In the Parameters section, enter a name in the Value field of the TOPIC cron task parameter.
For example, notfqueue.
 - i. Set the PARTITION parameter to 0.
 - j. Set the MESSAGEPROCESSOR parameter to com.ibm.tivoli.maximo.notification.NotificationMessageProcessor.

- k. Set the MESSAGEHUB parameter to the name of your message provider.
For example, KAFKA.
- l. Save the record.

For more information, see [Configuration of the Kafka cron task](#).

4. Set the notification external system.
 - a. Open the External Systems application.
 - b. From the System field, search for NOTIFICATION.
 - c. Click the NOTIFICATION row to open the NOTIFICATION record.
The NOTIFICATION system is the default system used for notifications. Use this system for all notification configuration. Do not create a new system to handle notifications.
 - d. If the Enable? option is enabled, deselect the option to disable it, and then save the record.
 - e. For the Outbound Sequential Queue field, click the lookup icon and select the Kafka notification queue.
For example, notfqueue.
 - f. Enable the Enable? option, and then save the record.

Integrating JMS queues with Maximo Manage

Integrate JMS queues with Maximo® Manage to implement notification messaging.

Before you begin

This example assumes you have a `standalonejms` JMS server configured in the Maximo Manage environment with a notification queue named `notf`. For more information, see [Configuring JMS servers for Maximo Manage](#) and [Configuring Manage JMS Resources](#).

Procedure

1. Create a JMS cron task instance.
 - a. Open the Cron Task Setup application.
 - b. From the Cron Task field, search for JMS.
 - c. Click the JMSSEQCONSUMER row to open the cron task.
 - d. From the Cron Task Instances list, click the new row icon to add an instance for the notification queue.
 - e. In the Details section, enter a Cron Task Instance Name.
For example, `jmsnotf`.
 - f. Enter values for Schedule, Run as User, and other fields as required.
 - g. Enable the Active? option.
 - h. Set the QUEUENAME parameter to `jms/maximo/int/queues/notf`.
 - i. Set the MESSAGEPROCESSOR parameter to the name of your message provider.
For example, `com.ibm.tivoli.maximo.notification.NotificationMessageProcessor`.
 - j. Save the record.
2. Set the notification external system.
 - a. Open the External Systems application.
 - b. From the System field, search for NOTIFICATION.
 - c. Click the NOTIFICATION row to open the NOTIFICATION record.
 - d. If the Enable? option is enabled, deselect the option to disable it, and then save the record.
 - e. For the Outbound Sequential Queue field, click the lookup icon and select the JMS notification queue.
For example, `jms/maximo/int/queues/notf`.
 - f. Enable the Enable? option, and then save the record.

Creating and configuring API keys for push notifications

Push notifications require API Keys.

Procedure

1. Generate an API Key.
 - a. Open a browser and enter <https://c069b665.us-south.apigw.appdomain.cloud/auth/login>.
 - b. Click Sign in or up.
 - c. Log in to IBM with an IBMid.
 - d. Enter a name for the API Key and then click Generate API Key.
 - e. Copy the API Key value.
2. Configure the API Key in Maximo® Application Suite.
 - a. Log in to Maximo Application Suite.
 - b. Click the Administration icon and then click Configurations.
 - c. In the Users and identity section, click Push Notification.
 - d. Click Edit and enter the following values:

Bundle identifier:
`com.ibm.iot.maximo.mobile`
URL:

<https://c069b665.us-south.apigw.appdomain.cloud/pushnotification/sendPushNotification>

API Key

Enter the API Key value that you copied.

e. Click OK.

Configuring Maximo Application Suite notifications

Configure a Maximo® Application Suite notification and set user subscriptions.

About this task

In this example, you create a notification for the Technician application and add the user Smith to the Notification User Subscription. For more information, see [Creating notification events](#).

Procedure

1. From Maximo Manage, open the Notifications application.
2. Click Create Notification from the Common Actions menu.
3. In the Event name field, enter `MXAPIWODETAIL`.
This value is the name of an API used by the Technician application.
4. Enter a description of the event.
For example, type `Send emergency work order notification`.
5. Enter a condition for the Apply to Condition field.
For example, create a condition that sends a notification for work order approvals.
 - a. For the Apply to Condition field, click the lookup icon and select Go To Conditional Expression Manager.
 - b. From the Conditional Expression Manager application, click the new row icon.
 - c. For the Condition field, enter `WOAPPR`.
 - d. For the Type field, select `EXPRESSION`.
 - e. For the Expression field, enter `:status='APPR'`.
 - f. Select the Always Evaluate? option.
 - g. Click Save Condition from the Common Actions menu.
 - h. Click Return With Value.For more information, see [Conditional Expression Manager](#).
6. In the Apply To Condition field, enter `WOAPPR`.
7. In the Object Structure field, enter `MXAPIWODETAIL`.
8. Create a notification message template.
 - a. Click Notification Message Template from the More Actions menu.
 - b. Click New Row.
 - c. In the Notification Template field, enter `WOAPPR` for the name for the notification template.
 - d. Select Message Text as the Notification Message Type and enter `Work order :wonum was approved.` for the message.
 - e. Click OK.For more information, see [Creating notification message templates](#).
9. For the Use With field, click the lookup icon and select `TECHMOBILE` to select the Technician application.
10. For the Message Template field, click the lookup icon and select `WOAPPR` to select the work order approval message template.
11. Select the On Update? option to trigger the event when the work order is approved.
12. Select the Using AND option for Attribute Conditions.
You can set other conditions as needed.

Apply to
Defines the objects affected by an event when it occurs. Use this attribute to filter the list of notification events for an object. This condition, if set, is combined with the event filter condition using an AND operator. These two conditions determine when the notification event occurs.

Event filter
The Event filter condition is combined with both the Attribute condition and the Apply to condition using an AND operator. Like the Apply to condition, the Event filter condition applies to the whole object.

Attribute condition
Attribute conditions can be combined with AND or OR operators. Use Attribute condition to track the state of the object attribute whether it has been modified or not. Optionally, you can also compare the attribute value.

All attribute conditions can be combined with an object operation, on Add, Update, or Delete, using an AND operator.
13. Click New Row from the Attributes list.
14. For the Modified Attribute field, click the lookup icon, select `WOPRIORITY`, and then set the Value field to `1`.
15. Save the record.
16. Configure notification recipients.
 - a. Click Notification User Subscriptions from the More Actions menu.
 - b. Click New Row.
 - c. In the Event For User field, select `SMITH`.
As an alternative, you can configure the owner of the work order to receive the notification by entering `:OWNER`.
 - d. In the User Notification Type field, select `PUSHNOTIFICATION`.
 - e. Click OK.For more information, see [Creating notification message templates](#).

Recording physical signatures

Maximo® Mobile applications can be configured to require physical signatures for work orders based on their statuses. For example, before a work order is completed, the Technician application can prompt the user to sign the work order and then change its status to complete. This feature is not enabled by default.

About this task

You can record and store images of signatures that are submitted from Maximo Mobile applications. Each signature is stored as an image and as part of an attachment object. The attachment description is automatically populated with the signature and the date and the time of the signature. A default name is also given to the image, which includes the status of the record it is associated with. After a signature is recorded, it can be retrieved from the attachment list of the signature's associated work order or item.

The signatures can be recorded in both connected and disconnected mode, but the signatures cannot be modified after they are recorded.

Procedure

1. Log in to Maximo Manage and in the System Properties application, open the maximo.mobile.statusforphysicalsignature property.
2. Clear the Nulls Allowed checkbox.
3. Enter one or more status values in the Global Value field.
For example, enter `APPR` or `COMP`.
4. Save the changes.
5. On a mobile device, open the Technician application and then open the details page for a work order.
6. Change the status of the work order to Approved.
7. Write your signature and click OK.
The status of the work order is set to Approved.

Recording e-signature keys

Use e-signature keys on your mobile device to confirm that a change is complete and valid.

Before you begin

E-signature keys must be enabled in the Maximo® Manage system properties before you can use them. Enable the following system settings:

Table 1. Configuring e-signature system properties

Property	Summary
maximo.mobile.esignature enabled	Set to true to enable e-signatures to be used to confirm the status change of a work order in the Technician application.
maximo.mobile.wostatusf oresig	Set to a work order status that requires an e-signature. For example, <code>COMP</code> .
mxe.allownativeesig	Set to true to require a native key for Maximo Asset Management instead of user credentials. This property is required to enable e-signatures in Maximo Asset Management.

About this task

Maximo Manage e-signature keys capture and validate work order status changes on the My Schedule page in the Technician application. E-signature keys can also be used with applications that are duplicated from the Technician application.

When you change the status of a work order, and you enter an e-signature key on your mobile device, the work order status change transaction is sent to the Maximo Manage server. The e-signature verification request is sent to the Maximo Manage server after the status change transaction is completed. If you lose your connection to the Maximo Manage server before the e-signature key is sent, it is sent when you reconnect. Due to many factors, it might take an extended amount of time for the status change transaction to be completed.

When it is created, an e-signature key is stored both on the server and the mobile device. When you enter an e-signature key on your mobile device, the Technician application verifies it with the e-signature key that is stored on the Maximo Manage server. If you are using your device in either online or offline mode, the e-signature key is verified against the e-signature that is stored on your device. If your e-signature key is changed on the Maximo Manage server while you are logged in to the mobile device, you must log out and log back in to use the new e-signature key.

You can create an e-signature key from your mobile device during the Maximo Mobile onboarding process. If the Technician application is not installed on your device, you are still prompted for an e-signature if it is enabled on the Maximo Manage server. Alternatively, an e-signature key can be captured and stored on the server in the user profile. E-signature keys can be changed only on the Maximo Manage server.

If you log out of Maximo Mobile on your mobile device, then you are prompted for an e-signature key when you next log in. If you refresh data on the Data update page in Maximo Mobile, then you are prompted for an e-signature key.

IBM® Maximo Asset Management and IBM Maximo Application Suite both require e-signature keys to sign off on work order status changes. When you switch from Maximo Asset Management to IBM Maximo Application Suite, you must enable e-signature system properties and create an e-signature key in each user profile.

E-signatures keys are not supported in the web version of the Technician application.

Every object and attribute in Maximo Manage can be configured to require an e-signature key. The e-signature key is tracked by using the logintracking object, which validates the change and associates the user, date, time, the originator record, and the reason for the change.

Procedure

1. As a new user, log in to the Technician application on a mobile device.
2. When prompted, set an e-signature key.
 - a. Enter your user ID.
 - b. Enter and verify a new e-signature key.
E-signature keys must include at least one uppercase character, one lowercase character, a number, and a special character, such as !, @ #, or \$.
 - c. Tap Save.

Configuring application links

You can configure an application to open from the field of another application. For example, you can open the Inspections application from a field in the Work Order Tracking application.

Procedure

1. Log in to Maximo® Manage and open the Application Designer application.
2. Search for the application you want to modify.
For example, search for `WOTRACK` to open the Work Order Tracking application.
3. Select a field in the application.
For example, select the Inspection Result field of the Work Order Tracking application.
4. Open the Properties window for the field.
5. From the Go To Applications field, click the magnifying glass icon to open the application search window.
6. Search for a Mobile application.
For example, `INSPECTION`.
7. Click the name of the application and then click OK.

Results

You can now open the Inspection application from the Inspection Result field of the Work Order Tracking application.

Enabling photo analysis by IBM Maximo Visual Inspection

To help inspectors detect defects during inspections, you can enable analysis of the photos that the inspector takes during the inspection. The analysis is completed by IBM® Maximo® Visual Inspection.

Before you begin

If Maximo Civil Infrastructure is not installed, configure the object structures:

1. Log in to Maximo Manage as an administrator.
2. Go to System Configuration > Migration > Object Structures.
3. Open the MXAPIINSPECTIONRES object structure.
4. In the Source Objects for MXAPIINSPECTIONRES table, add a row.
5. In the Object field, select INSPECTIONIMAGEINFERENCE.
6. In the Parent Object field, select INSPFIELDRESULT.
7. In the Relationship field, select IMAGEINFERENCE.
8. Save your changes.

About this task

This feature is only available to customers who have both Maximo Manage and Maximo Visual Inspection. If a suitable model for the inspection type does not exist, you must ask your Maximo Visual Inspection administrator to create the model.

Procedure

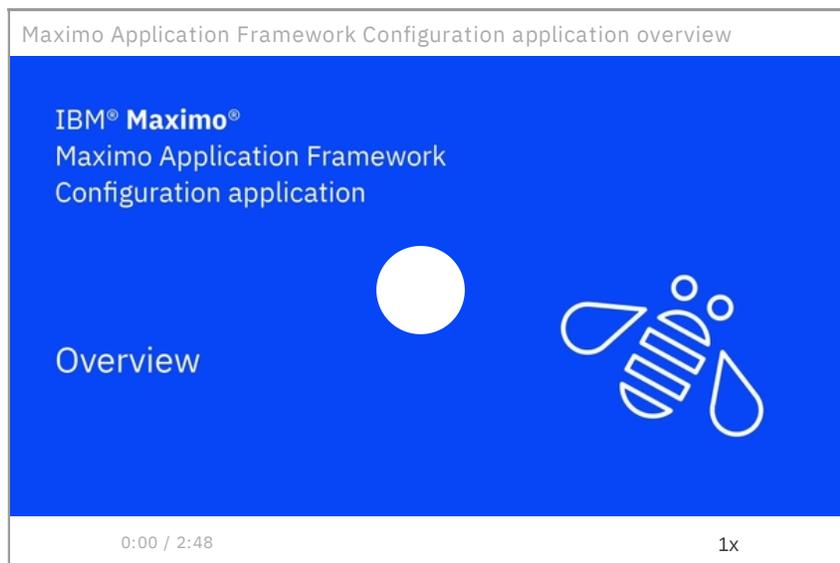
1. From the side navigation menu, click Planning > Manage Inspection Forms.
2. Create an inspection form or create a revision of an existing inspection.
3. Open the inspection form and add a question.
4. Complete the details of the question and from the Response Fields menu, select Media > File upload so that the inspector can upload the photo for analysis.
5. In the Model field, select the name of the model that you want Maximo Visual Inspection to use to analyze the photo.
If you do not see the Model field, ask your system administrator to check the values in the required system properties.
6. Click Done.

Results

During an inspection, an inspector can upload a photo and select Analyze photo. The inspector can continue the inspection while the photo is analyzed to detect anomalies. When the analysis is complete, the inspector can review and edit the results.

Configuring and customizing applications with the Maximo Application Framework (MAF) Configuration application

You can use the MAF Configuration application to update applications that are built with the Maximo Application Framework. The MAF Configuration application supports IBM® Maximo® Mobile, IBM Maximo Health, and IBM Maximo Manage. Additionally, you can also configure non-mobile, role-based applications, such as Workflow Assignments.



The MAF Configuration application works through Docker container technology and Maximo Application Framework tools. Maximo Application Framework tools are used to create a configuration environment within a Docker image on your local system. You can download, modify, preview, and publish your configured IBM Maximo Manage applications with minimal setup.

- [Prerequisites](#)
- [Component reference](#)
- [Deprecated Maximo Application Framework components](#)
Maximo Application Framework application components are sometimes deprecated and replaced.
- [Serviceability](#)
- [Removing Docker containers through the command line](#)
Downloading Docker images and instantiating multiple containers can use significant disk space. Remove unneeded Docker containers periodically.
- [Command variable legend](#)
- [Configuration and customization summary](#)
- [Maximo Application Framework Configuration application deployment](#)
- [Maximo Application Framework Configuration application use](#)
- [Application upgrade](#)
After you configure an application, create an upgrade plan for fix packs and upgrades.

Prerequisites

Get your environment ready to deploy the Maximo Application Framework Configuration application.

- A minimum of 8 GB RAM on the development system (16 GB recommended).
- Docker Desktop (<https://docs.docker.com/desktop/>) or Docker Engine (<https://docs.docker.com/engine/>) installed on your development system. Docker engine can be installed natively on Linux® systems. For Windows, Docker must be installed on a Windows Subsystem for Linux (WSL) version 2 backend. For Mac OS, a Docker engine-supported operating system must be installed on VM. Ensure that your system meets all Docker requirements. Set the Memory Resources preference in Docker Desktop to 8 GB of memory.
- A working directory on your local system. The working directory is used to run Docker commands to start the Maximo Application Framework Configuration application. Make a note of the location of your working directory for future configuration efforts.
- Ensure that API Key is enabled on the Maximo® Manage application server. You must configure the `mxe.oslc.webappurl` system property with the name of your Maximo Asset Management or Maximo Manage server. For more information, see [API Keys](#) and [Setting system properties](#).
- If you are using Windows, you must have the Windows Subsystem for Linux (WSL) version 2 installed on your system.
- To configure the Maximo Application Framework Configuration application as an ODIC client for Maximo Application Suite, see [Manage OpenID client for Configuration Tool](#).

Component reference

A Maximo® Manage component reference is available from the side panel of the application. This information describes the properties and XML code of Maximo Manage application components.

Deprecated Maximo Application Framework components

Maximo Application Framework application components are sometimes deprecated and replaced.

- [container](#)

The Maximo Application Framework container component used to configure application layout is deprecated in Maximo® Application Suite v8.10. The box and border-layout components are now used for application layout. Refer to the [graphite component reference guide](#) for the latest information about Maximo Application Framework components and properties.

container

The Maximo Application Framework container component used to configure application layout is deprecated in Maximo® Application Suite v8.10. The box and border-layout components are now used for application layout. Refer to the [graphite component reference guide](#) for the latest information about Maximo Application Framework components and properties.

Table 1. Layout component properties. Property information for migrating from the container component to the box component

container		box		Remarks
Property	Value	Property	Value	
layout	<ul style="list-style-type: none"> • vertical • horizontal 	direction	<ul style="list-style-type: none"> • column • row 	
align-self	<ul style="list-style-type: none"> • start • end 			The box component does not support the align-self property. Use the horizontal-align and vertical-align properties as an alternative.
hidden	<ul style="list-style-type: none"> • true • false 	hidden	<ul style="list-style-type: none"> • true • false 	
halign-items	<ul style="list-style-type: none"> • start • center • end • between • around • evenly 	horizontal-align	<ul style="list-style-type: none"> • start • center • end 	
valign-items	<ul style="list-style-type: none"> • start • center • end • between • around • evenly 	vertical-align	<ul style="list-style-type: none"> • start • center • end 	
min-width	<i>number#/%</i>	min-width	<i>number#/%</i>	min-width is a string and can be used with PX or %.
grow	<ul style="list-style-type: none"> • <i>number</i> • true • false 	children-sizes + fill-parent		
shrink	<ul style="list-style-type: none"> • <i>number</i> • true • false 			
padding	<ul style="list-style-type: none"> • internal • internal-external • external 	<ul style="list-style-type: none"> • padding • padding-top • padding-bottom • padding-left • padding-right 		The box component padding property applies the margin value. Applied in fraction of REM.
border	<ul style="list-style-type: none"> • true • false 	border	<ul style="list-style-type: none"> • true • false 	
border-color	Color code	border-color	Color code	

container		box		Remarks
border-top	<ul style="list-style-type: none"> • true • false 	border-top	<ul style="list-style-type: none"> • true • false 	
border-bottom	<ul style="list-style-type: none"> • true • false 	border-bottom	<ul style="list-style-type: none"> • true • false 	
border-start	<ul style="list-style-type: none"> • true • false 	border-start	<ul style="list-style-type: none"> • true • false 	
border-end	<ul style="list-style-type: none"> • true • false 	border-end	<ul style="list-style-type: none"> • true • false 	
border-width	<i>number</i>	border-width	<i>number</i>	
background-color	Color code	background-color	Color code	
max-width	Pixel size	children-sizes	Percentage	
disable-auto-layout				
children-fill-parent-width	<ul style="list-style-type: none"> • true • false 	fill-parent	<ul style="list-style-type: none"> • true • false 	
display	<ul style="list-style-type: none"> • flex • inline-flex • grid 			
overflow		children-hide-overflow	<ul style="list-style-type: none"> • true • false 	
size		size	<i>number</i>	
		manage-children	<ul style="list-style-type: none"> • true • false 	When set to true, children divide and equal the width of the parent. When set to false, children shrink to fit their width.

Related information

- [IBM Maximo Application Framework Component Reference](#)

Serviceability

The Maximo Application Framework Configuration application Docker image includes network tools that are commonly used to troubleshoot deployment issues. IBM Support can direct you to use tools such as **ping**, **tracpath**, **nano**, **ifconfig**, **netstat**, **traceroute**, and **dig** to collect information about your deployment to assist them in troubleshooting issues.

Removing Docker containers through the command line

Downloading Docker images and instantiating multiple containers can use significant disk space. Remove unneeded Docker containers periodically.

To remove a Docker container from your system, complete the following steps.

1. List all Docker containers.

```
docker container ls -a
```

The output lists all running containers and their numeric IDs.

2. Stop the container.

```
docker container stop container_id
```

3. Remove the stopped container.

```
docker container rm container_id
```

Commands that use a *container_id* value can typically accept a *container_name* value instead. Refer to Docker documentation for more information..

Command variable legend

These variables are used in examples.

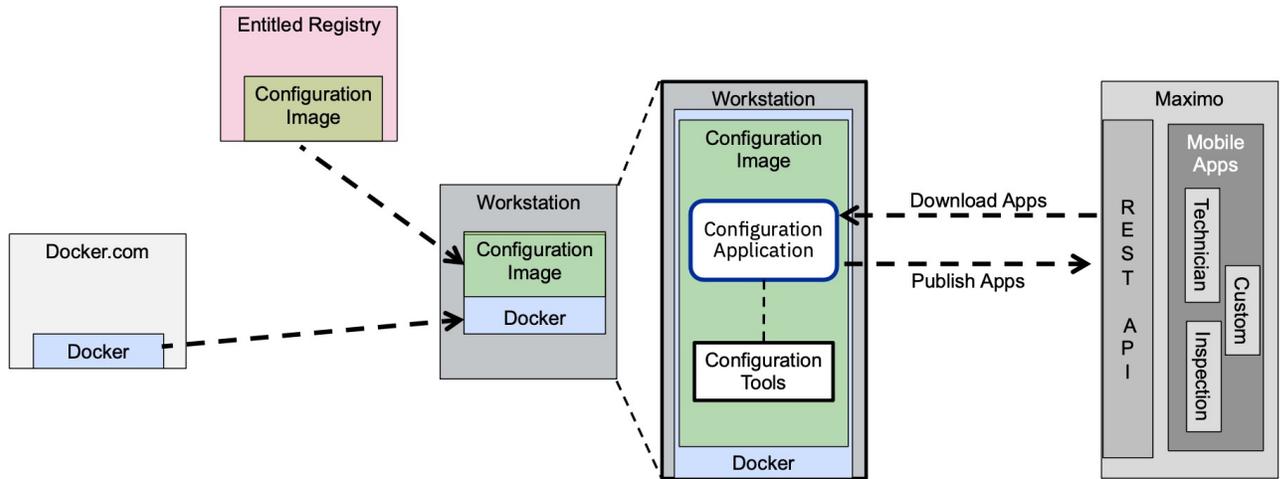
Table 1. Standard functions

Variable	Description
<code>\${maximo_workspace_directory}</code>	The working directory that you create on your local system.
<code>\${app_directory}</code>	The directory on your local system that contains application code when you download an application for configuring.
<code>\${maximo_app_name}</code>	The name of the Maximo® Mobile application that you are configuring. For example, Inspections or Technician.

Configuration and customization summary

Configuration refers to updates to the display data contained in application XML code. *Customization* refers to the creation of JavaScript code to support application functions. For example, you might configure an application by adding a field to an application page. If the field requires JavaScript to retrieve data, you would customize the application by creating JavaScript to support that field.

Deployment - (Maximo 7.6.1.2 & MAS 8.x)



To configure and customize an IBM® Maximo® Application Suite application, complete the following steps:

1. Install Docker on your local development system.
2. Download the Maximo Application Framework Configuration application Docker image from the IBM Entitlement Registry.
3. Configure the [IBM Maximo application server application authorization settings](#).
4. Start the Maximo Application Framework Configuration application Docker container.
5. Log in to the Configuration application which requires an IBM Maximo Manage server and related credentials.
6. Select a Maximo Application Suite application to modify.
7. Modify the application.
8. Save your changes.
9. You can view changes to components with the component preview pane, or view the entire updated application locally by using the Preview function. Previewing an application rebuilds the application and starts a React server.
10. Publish the application to the IBM Maximo Manage server.

Maximo Application Framework Configuration application deployment

Download the Maximo Application Framework Configuration application Docker image and start it as a new Docker container.

- [Environment configuration](#)
- [Downloading the Docker container image](#)
- [Running the Docker image](#)

Environment configuration

You can either host your entire environment in a single virtual machine (VM) or you can host the IBM® Maximo® Manage application Server in a VM and your Maximo Application Framework Configuration application and browser on a local system.

1. Host your entire environment in a single VM. Your environment includes the IBM Maximo Manage application server, the Maximo Application Framework Configuration application, and your browser.
2. Host a IBM Maximo Manage server in a VM and host your Maximo Application Framework Configuration application and browser on your local system. Ensure that you can access the IBM Maximo Manage server VM from your local system.

Do not host the Maximo Application Framework Configuration application and your browser in one VM and deploy the IBM Maximo Manage server in a separate VM. This configuration causes performance issues.

Container network accessibility can cause access issues for the IBM Maximo Manage server if the following conditions occur:

- The Maximo Application Framework Configuration application Docker image is hosted in a VM.
- You cannot access the IBM Maximo Manage server during the configuration login.
- You can access the IBM Maximo Manage server from a browser that is hosted in the same VM.

Maintain separate workspaces for each version of IBM Maximo Manage deployed in your environment. For example, establish separate workspaces for version 8.7, 8.8 and 8.9.

Downloading the Docker container image

The Maximo Application Framework Configuration application is provided in a Docker container image that is stored in the IBM® Entitled Registry. You need an entitlement key to download the container image.

1. Log in to the [My IBM container software library](#) by using the IBMid and password.
2. In the Entitlement keys section, click Get entitlement key.
3. Click Copy key.
4. Paste the key into an empty file. You need the key to deploy the Maximo Application Framework Configuration application with Docker.
5. Run the following command to log in to the IBM Entitled Registry. Replace the *entitlement_key* variable with the key that you copied.

```
docker login cp.icr.io --username cp --password entitlement_key
```

6. Run the following command to download the Docker container image:

```
docker pull cp.icr.io/cp/manage/maf-tools:8.9
```

Running the Docker image

After the image download is completed, you can run the Docker image to start the Maximo Application Framework Configuration application.

```
docker run -it --privileged -p 3001:3001 -p 3006:3006 -v maximo_workspace_directory:/graphite/.workspace -it cp.icr.io/cp/manage/maf-tools:8.8
```

Replace the *maximo_workspace_directory* variable with a working directory on your local system. Specify a port number with a value in the range 3000 - 3050. If you are using a Microsoft Windows system, you have to enable file sharing for your workspace directory.

If you run the Docker image by using a Windows system, you must include the *-e* parameter.

The following code is an example of the command with the parameter included.

```
docker run -it --privileged -p 3001:3001 -p 3006:3006 -v maximo_workspace_directory:/graphite/.workspace -it -e CHOKIDAR_USEPOLLING=true cp.icr.io/cp/manage/maf-tools:8.8
```

```
docker run -it --privileged -p 3001:3001 -p 3006:3006 -v maximo_workspace_directory:/graphite/.workspace -it -e CHOKIDAR_USEPOLLING=true cp.icr.io/cp/manage/maf-tools:8.9
```

You can use the GRAPHITE_RELEASE parameter to reduce the size of the application package that you publish back to the Maximo® Manage server. Using this parameter can affect performance of the Maximo Application Framework Configuration application. To improve performance, you can increase the memory that is assigned to the Docker container.

The following code is an example of the command with the parameter included.

```
docker run -it --privileged --env GRAPHITE_RELEASE=1 -p 3001:3001 -p 3006:3006 -v maximo_workspace_directory:/graphite/.workspace -it cp.icr.io/cp/manage/maf-tools:8.8
```

```
docker run -it --privileged --env GRAPHITE_RELEASE=1 -p 3001:3001 -p 3006:3006 -v maximo_workspace_directory:/graphite/.workspace -it cp.icr.io/cp/manage/maf-tools:8.9
```

Maximo Manage requires a valid security certificate to retrieve and publish applications from the Maximo Application Framework Configuration application in production environments. In development or demonstration environments, you can use the NODE_TLS_REJECT_UNAUTHORIZED parameter to bypass system checks for a valid security certificate.

The following code is an example of the command with the parameter included.

```
docker run -it --privileged --env NODE_TLS_REJECT_UNAUTHORIZED=0 -p 3001:3001 -p 3006:3006 -v maximo_workspace_directory:/graphite/.workspace -it cp.icr.io/cp/manage/maf-tools:8.8
```

```
docker run -it --privileged --env NODE_TLS_REJECT_UNAUTHORIZED=0 -p 3001:3001 -p 3006:3006 -v maximo_workspace_directory:/graphite/.workspace -it cp.icr.io/cp/manage/maf-tools:8.9
```

Do not forget to stop the Maximo Application Framework Configuration application Docker container when you are done with your work to free up system resources.

Related information

- [Command variable legend](#)

Maximo Application Framework Configuration application use

After the Maximo Application Framework Configuration application is installed, you can configure and customize IBM® Maximo® Mobile applications.

- [Authorizing with the Maximo Manage server](#)
- [Connect to the Maximo Manage server](#)
- [Modifying applications](#)
- [Duplicating applications](#)
- [Redownloading applications](#)
- [Deleting applications](#)

If you don't want to modify a default application, you can duplicate it, give it a new name, and then change the new application.

Authorizing with the Maximo Manage server

1. Log in to Maximo® Manage
2. Open the Object Structures application and select the OSLCMAFAPPDATA object structure.
3. Select Configure Object Structure Security and then select Use Object Structure for Authorization Name.
4. Open the Security Group application and choose a security group or create a new group.
5. Grant the Maximo Application Framework Configuration application user group access to the OSLCMAFAPPDATA object structure.
6. Assign the user group to the user you want to authorize to use the Maximo Application Framework Configuration application.

Repeat this process for the MXAPIWPEDITSETTING object structure.

If you add an object structure in a Maximo data source to an existing or duplicated application, you need to grant access to that object structure.

Connect to the Maximo Manage server

There are three ways to connect to the Maximo® Manage server from the Maximo Application Framework Configuration application.

1. Open a browser and go to <http://localhost:3001>.
2. From the Maximo Application Framework Configuration application log in screen, select an authentication method.
 - **API Key**
API Key is the default authentication method. Enter the Maximo Asset Management or Maximo Manage server URL and the API Key value assigned to your user.
 - **Maximo Application Suite Token**
Enter the URL for the Maximo Manage server and then select Login. You are re-directed to the Maximo Application Suite log in page. After you log into Maximo Application Suite, you are re-directed back to the Maximo Application Framework Configuration application.
 - **Maximo Asset Management Credentials**
Enter the URL for the Maximo Asset Management server and then enter your user name and password.

Modifying applications

After you log in to the Maximo Application Framework Configuration application, you can create or modify Maximo® Manage applications.

The Application list page displays the applications that you are authorized to run. Each application listed includes description information, the last time it was modified, and the current revision. Each application listed has an edit menu that you can use to duplicate the application, re-download it from the server, delete it, or view the history of each past revision of the application. Click the name of an application to open it in the Editor page.

The application XML code is available for editing in the XML editor. Select the file that you want to modify and edit it with the embedded XML editor.

Use the Navigator tree to locate specific components in the XML code. Select an entry to locate the component in the application XML file. For example, select the pages component to show all the pages that are defined in the application.

You can use the component search field to filter entries in the Navigator. For example, if you search for `dialog`, the Navigator displays only dialog components that are found in application pages. Alternatively, you can also search for a component ID. By default, searches return results that are like the term you entered. To search for an exact term, add an equals sign before the search entry. For example, `=id771`.

As an alternative to the XML editor, you can use the Properties editor to update component values in the XML file. Select a component from the Navigator or in the XML editor to view the properties for that component. Required properties are marked with an asterisk.

Property names must be declared using lowercase letters, for example, `item.somename`. Properties must always be declared and used in lowercase because the Maximo application server provides the data field in JSON as lowercase.

If your changes require custom JavaScript to implement, add code to the `AppCustomizations.js` file, and then reference it in the application XML code.

Do not publish an application immediately after you start editing the application. When you start editing an application, the local React preview server starts and can take a few minutes to complete the startup process. Errors can occur if you publish at the same time that the React server is starting. View the console for the

message that the preview server is available.

After an application is published, mobile devices can then download the new version of the application. If you edit application files outside of the Maximo Application Framework Configuration application, then you must ensure the integrity of those files. Use a virus or malware scanner before you publish the files to the Maximo application server.

When you open or re-download an application, the application is copied to the workspace directory that you specified in the Docker Run command. To facilitate the upgrade of your configured application to a new future version of the base application, you should create a backup of the files that you configure, for example, the app.xml file.

- [Application revisions](#)
You can view the revision history of an application from the Maximo Application Framework Configuration application.
- [Application preview](#)
You can preview changes that you make in an application before you publish it.

Application revisions

You can view the revision history of an application from the Maximo Application Framework Configuration application.

You can view revision details for an application in the Application list. Click the Application's three dot menu and select History.

The revision history includes read-only information about any updates made to that application. Details include the publish date, the user that published it, the version of the application, and the status of each revision. A new revision is created whenever an application is published or when a new version of Maximo® Asset Management or Maximo Manage is deployed or patched.

Application preview

You can preview changes that you make in an application before you publish it.

When you change the XML of an application, you can preview your changes in two ways.

Canvas preview

After you change a component of the application in the XML editor, you can preview how it renders in the Canvas panel. The component is not functional in this preview, but it can help you evaluate its design. Not all application components are available to preview. Components such as pages and menus can be previewed, while datasources cannot. By default, when you select a component, the entire page that contains the component is displayed in the Canvas panel. You can choose to display only the component by selecting the option from the Canvas panel. You can also enable the ability to highlight the XML code for a component in the XML editor when you hover over a component in the canvas.

When you click components displayed in the Canvas panel, the XML code for that component is highlighted in the XML editor. The properties for the component are displayed in the Properties panel. The Navigator also opens to the entry for that component.

Application preview

You can preview the entire application using the Preview button. When you preview the application, a React server starts and the application is loaded in a new browser tab. The application is functional, so you can test changes that you make before you publish the application.

Duplicating applications

If you don't want to modify a default application, you can duplicate it, give it a new name, and then change the new application.

Custom or cloned applications cannot be used to circumvent licensing terms. You cannot use custom applications to grant users functions or access beyond your license agreement.

Select the application that you want to duplicate and then select Duplicate from the application menu.

Specify a name for the new application and provide a brief description.

When you duplicate a mobile application, the Mobile? option is not selected by default. The Mobile? option prevents the duplicated application from automatically being pushed to mobile devices.

When you duplicate an application, it inherits the security settings from the original application. You can change security settings for an application with the Security Groups application. For more information, see [Creating security groups](#).

Editing applications

You can modify the description of any application from the application list by selecting the Edit action.

You can select the option to designate the duplicated application as a mobile application, making it available to mobile devices. The Mobile? option cannot be enabled for non-mobile applications.

Redownloading applications

You can download the most recently published version of an application from the Maximo® Manage server anytime by selecting Redownload from the application menu.

When you redownload an application, any unpublished updates that you made to an application are discarded.

Deleting applications

You can delete applications that you have created through the duplication process from the application menu. Default applications cannot be deleted.

Application upgrade

After you configure an application, create an upgrade plan for fix packs and upgrades.

Process

The Maximo Application Framework Configuration application allows you to configure a default Maximo Application Framework application, such as the Maximo® Mobile Technician application, which is named TECHMOBILE. You can also duplicate a default application, name it something like MYTECHMOBILE, and then configure that duplicated application. When you upgrade Maximo Mobile or Maximo Manage, or apply a fix pack, the default applications are automatically updated to new versions.

If you configured a default application, it is archived during an upgrade or after you apply a fix pack, and the new application becomes the active version of the application. Alternatively, if you configure a duplicate application, the application is not impacted by an upgrade or fix pack.

During the upgrade process you create a delta file. This file contains the differences between the default application and the configured application. You use this delta file to reapply your configuration values after you upgrade. Use version 8.9.2 or later of the Maximo Application Framework configuration application to apply delta changes.

Do not change component ID values in the application XML files of default Maximo Mobile applications. Before an upgrade, if you changed default Maximo Mobile applications, you can generate a delta file that contains your configuration changes. The delta file relies on the component IDs of the default applications to identify changes.

Environments

It is beneficial to complete an upgrade in a test environment before you upgrade other environments. Features and functions that are included with a new release might prevent you from applying your existing configuration values without some modification. When you plan for an upgrade, ideally you would have three environments:

- An environment that includes your existing application. For example, version 8.8.
- An environment with the new default version of the application. For example, version 8.9.
- An environment with the new version of the application that includes your configuration changes.

Having these three environments can help you diagnose any configuration issues that result from the upgrade. Any changes included in a new version of Maximo Manage, such as automation scripts or domain configurations, can impact your configured application. This can limit your ability to test the new version of the application.

Applications

Applications are stored as compressed files in the Maximo Manage database. The compressed file contains application XML files and related JavaScript files. When a new version of an application is deployed or if a fix pack is applied, a new row is created in the database table. That row contains the active version of the application. The previous application is disabled and is no longer available to use or configure.

Workspace files

When you open an application in the Maximo Application Framework configuration application, the application is downloaded to a local workspace directory on your system. The workspace directory name includes information about the server and credentials that are used to download the application. In the workspace directory there are two subdirectories that are named after the application. For example, if you downloaded the Technician application, two directories, TECHMOBILE and TECHMOBILE_backup, are created in your workspace. The backup folder contains the XML files of the application. These files can be used to generate a delta file, which can be used to migrate configuration information.

If you re-download an application using the Maximo Application Framework configuration application, the application XML files in the backup folder are updated to the last published version. An app.orig.xml file is created that contains the XML code for the original version of the application.

File management

You manage multiple versions of configured application files to facilitate the upgrade. You can track versions of application files by using a hierarchy of folders.

```

/88to89 (Main folder)
  /88ORIG (Contains the original version 8.8 files before configuration changes.)
    /TECHMOBILE (Folder for each application to upgrade. Only modified files listed.)
      app.xml
      wo-card-group.xml
  /88CONF (Contains the configured version 8.8 files.)
  /88DIFF (Contains the version 8.8 delta files.)
  /89ORIG (Contains the original versions of the version 8.9 files before configuration changes.)
  /89CONF (Contains the upgraded files for version 8.9)

```

Two processes are used to migrate configuration information. The *diff* process compares the XML files that are located in the /88ORIG folder to the XML files located in the /88CONF folder. The differences are recorded in XML files and stored in the /88DIFF folder. The *apply* process applies any changes found in the diff file located in the /88DIFF folder to the version 8.9 base file located in the /88ORIG folder and writes the resulting file to the /88CONF folder.

- [Upgrade example](#)
This example demonstrates how to configure an application and then upgrade it to the next version of Maximo Mobile.

Upgrade example

This example demonstrates how to configure an application and then upgrade it to the next version of Maximo® Mobile.

This example references the Maximo Mobile Technician application, however, you can use these steps for duplicated applications.

- [Configuring an application](#)
In this example, you add a Risk field to the Create work order page of the Technician application.
- [Creating a delta file](#)
Create a delta file that contains application configuration changes made since the last time the application was published.
- [Applying the delta file](#)
Apply configuration changes recorded in the delta file to the new version of the application. In this example, you merge configuration changes made to version 8.8 of the Technician application to the newer 8.9 version of the application.
- [Upgrading duplicated applications](#)
There are deviations and additional steps to the upgrade process if you are upgrading a duplicated application.

Configuring an application

In this example, you add a Risk field to the Create work order page of the Technician application.

Procedure

1. Open the Maximo Application Framework configuration application and log in to a Maximo® Manage server.
2. Select TECHMOBILE from the list of applications.
3. From the XML editor, in the app.xml file, locate the Create work page.

```

<page
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_upgrading_an_application_create
wo" title="Create work order" path="/createwo" comp-group-valid-chg="{page.state.cgvc=event}"
controller="WorkOrderCreateController">

```

4. Add a risk attribute after the wopriority attribute for the dsCreateWo datasource.

```

<maximo-datasource
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_upgrading_an_application_dsCrea
teWo" object-structure="mxapiwodetail" where="wonum=&quot;0&quot;"
item-url="{app.device.isMaximoMobile ? 'nohref' : undefined}" auto-save="false">
  <schema
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_upgrading_an_application_w224k"
>
    <attribute name="workorderid" searchable="true" unique-
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_upgrading_an_application_true"
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_upgrading_an_application_bj6qp"
/>
    <attribute name="wonum" searchable="true"
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_upgrading_an_application_n52n8"
/>
    <attribute name="description" max-length="100"
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_upgrading_an_application_y7g99"
/>
    <attribute name="description_longdescription"
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_upgrading_an_application_r8gpn"
/>
    <attribute name="wopriority"
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_upgrading_an_application_je34g"
/>
    <attribute name="risk"
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_upgrading_an_application_re34g"
/>

```

5. Add the Risk field and display it under the Priority field.

```

<box direction="row" children-sizes="100" fill-parent="true" fill-child="true" padding-top=".5" padding-bottom=".5"
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_upgrading_an_application_a5ezy"
>
<smart-input label="Priority" hide-step-buttons="true" placeholder="Enter {page.state.minPriority} to
{page.state.maxPriority}" value="{dsCreateWo.item.wopriority}" on-blur="validateFields" min="{
page.state.minPriority}" max="{page.state.maxPriority}"
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_upgrading_an_application_j8265"
/>
</box>
<box children-sizes="100" direction="row" fill-child="true" fill-parent="true" padding-bottom=".5" padding-top=".5">
<smart-input hide-step-buttons="true" label="Risk" value="{dsCreateWo.item.risk}"/>
</box>

```

6. Save the application and then click Preview.
7. From the preview of the Technician application, open the Create work order page and confirm that the Risk field is displayed it under the Priority field.
8. Publish the configured application to the Maximo Manage server.

Results

After you publish the configured application, a copy of the updated app.xml file is written to the TECHMOBILE/src workspace folder. A copy of the unmodified app.xml file is located in the TECHMOBILE_backup/src folder.

What to do next

The next step is to create a delta file by using these two files.

Creating a delta file

Create a delta file that contains application configuration changes made since the last time the application was published.

Before you begin

For this example, the following folder structure exists under the Users/myuser/Documents filepath.

```

/88to89
  /88ORIG
    /TECHMOBILE
  /88CONF
    /TECHMOBILE
  /88DIFF
    /TECHMOBILE
  /89ORIG
    /TECHMOBILE
  /89CONF
    /TECHMOBILE

```

The workspace folder used is /aconfig88/MaximoUser-Maximohost:port/TECHMOBILE.

Procedure

1. Copy the /aconfig88/MaximoUser-Maximohost:port/TECHMOBILE/src/app.xml file to the /88to89/88CONF/TECHMOBILE folder.
2. Copy the TECHMOBILE application app.xml file to the 88to89/88ORIG/TECHMOBILE folder.
3. Generate the diff file.

```

docker run -it --privileged --entrypoint "/graphite/scripts/graphite-tools.js" --workdir /graphite/app
-v/Users/myuser/Documents/88to89:/graphite/app cp.icr.io/cp/manage/maf-tools:8.9.2 diff --original
88ORIG/TECHMOBILE/app.xml
--modified 88CONF/TECHMOBILE/app.xml --deltaOutput 88DIFF/TECHMOBILE/app.xml -d

```

The -d parameter is for debug mode. Debug mode produces the detailed output. Copy the diff command output from the console and save to a file. Refer to this output information to troubleshoot during testing.

The diff command generates a delta file with content similar to the following example.

```

<?xml version="1.0" encoding="UTF-8"?>
<updatescript version="">
  <app apptype="maf"
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_creating_a_delta_file_TECHMOBIL
E">
  <add before="xd5k8" container="w224k" control="attribute">
    <set property="id" value="jvvggb"/>
    <set property="name" value="risk"/>
  </add>
  <add before="dr9pg" container="gvvvyv" control="box">
    <set property="children-sizes" value="100"/>
    <set property="direction" value="row"/>
    <set property="fill-child" value="true"/>
    <set property="fill-parent" value="true"/>
    <set property="id" value="ww34n"/>

```

```

        <set property="padding-bottom" value=".5"/>
        <set property="padding-top" value=".5"/>
    </add>
    <add container="wv34n" control="smart-input">
        <set property="hide-step-buttons" value="true"/>
        <set property="id" value="xb269"/>
        <set property="label" value="Risk"/>
        <set property="value" value="{dsCreateWo.item.risk}"/>
    </add>
</app>
</updatescript>

```

Applying the delta file

Apply configuration changes recorded in the delta file to the new version of the application. In this example, you merge configuration changes made to version 8.8 of the Technician application to the newer 8.9 version of the application.

Procedure

1. Open the Maximo Application Framework configuration application and log in to the Maximo® Manage server.
2. Select TECHMOBILE from the list of applications.
3. Copy the `/aconfig89/MaximoUser-Maximohost:port/TECHMOBILE/src/app.xml` file to the `/88to89/89ORIG/TECHMOBILE` folder.
4. Apply the delta file to create a version 8.9 Technician application that includes your version 8.8 configuration data.

```

docker run -it --privileged --entrypoint "/graphite/scripts/graphite-tools.js" --workdir /graphite/app
-v/Users/myuser/Documents/88to89:/graphite/app cp.icr.io/cp/manage/maf-tools:8.9.2 apply
--delta 88DIFF/TECHMOBILE/app.xml --input 89ORIG/TECHMOBILE/app.xml --output 89CONF/TECHMOBILE/app.xml -d

```

Copy the apply command output from the console and save to a file. Refer to this output information to troubleshoot during testing. The apply command merges configuration changes to the version 8.9 Technician application. The apply command also generates output statements based on the configuration changes.

```

--      ADD: label (emnww) to e_bm6 before b7w3z
           set id to emnww
           set label to Inspection Summary:
           set wrap to true

--      REMOVE: y4_eq from rzvz4
           RemoveNode: Removing: y4_eq

--      MODIFY: aw99_
           clear slot

-- Warning: (techmobile) Cannot MOVE control (brq_e) to CONTAINER (jjwgb). NOT_FOUND_ERR: An attempt is made to
reference a node in a context where it does not exist.
.
.
.

--      MOVE: brq_e to CONTAINER (jjwgb) before bynje

```

The apply process attempts to resolve any warnings encountered earlier in the process. You might encounter an error related to a configuration change you made to an application component that was deprecated in the latest version of the application. In this case, you must reevaluate the change to determine if it is still needed. If the configuration change is required, you must re-implement it using a different component in the app.xml file.

5. Copy the app.xml file to the TECHMOBILE/src folder of your local workspace. If your configuration introduced new XML files, they can be copied from the version 8.8 workspace folder. If you created JavaScript code, the AppCustomizations.js file can be copied to the version 8.9 TECHMOBILE/src folder.

Upgrading duplicated applications

There are deviations and additional steps to the upgrade process if you are upgrading a duplicated application.

Procedure

1. After you create the delta file, open the version 8.9 TECHMOBILE and the TECHDUP applications to download their files to your local workspace.
2. Copy the contents of the TECHMOBILE/src folder and overwrite the contents of the TECHDUP/src folder.
3. Open the app.xml file of the TECHDUP application in a text editor. Change the ID attribute of the maximo-application element from techmobile to techdup.

```

<maximo-application navigator-tile-order="100" controller="AppController" theme="touch" product-name="Maximo"
product-name-adaptive="Maximo" title="Maximo"
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_upgrading_duplicated_applicatio
ns_techdup" version="8.9.0.0" default-log-level="error"
user-menu-enabled="true" nav-initial-open-state="false" mas-enabled="false">

```

4. Copy the TECHDUP app.xml file to the 89ORIG folder.
5. Run the apply command.

Anatomy of an application XML file

The app.xml file contains global elements and attributes that are defined at the beginning of the file.

Individual pages and elements of those pages are defined later in the file.

Maximo-application

- Application navigation menu
 - Application navigation tiles for mobile navigation
- Application state that defines variables for all application pages
- Application data sources that defines data sources for all pages
- Pages container that includes all application pages.
 - Individual page
 - Page state variables
 - Page level data sources
 - Page header
 - Page body
 - Dialogs used in the page

At the beginning of the Technician application XML file, a section is used to define global elements and properties. The datasources that are defined at the beginning of the file can be referenced and used by elements that are defined throughout the file.

Figure 1. Technician global datasource definition

```

1 <maximo-application controller="AppController" theme="touch" product-name="Max
2 > <properties id="nba7e"> ...
6 </properties>
7 > <menu slot="navigation-items" id="k9p4v"> ...
11 </menu>
12 > <maximo-datasource id="synonymdomainData" lookup-data="true" object-structur
23 </maximo-datasource>
24 > <maximo-datasource id="dsFailureList" lookup-data="true" default="true" page-
34 </maximo-datasource>
35 > <pages id="pages"> ...
2001 </pages>
2002 > <messages id="n5_2r"> ...
2025 </messages>
2026 </maximo-application>

```

Table 1. Application XML elements

XML element	Description
<maximo-application>	The root element of the Maximo application XML file.
<properties>	The property definitions used across the application.
<menu>	The navigational side bar appearing on the left side of the application.
<maximo-datasource>	The definition of a Maximo datasource. It can be defined at a global level or more targeted if nested within a component structure. Data sources provide data to a component that is defined in application XML. The <maximo-datasource> element identifies a Maximo Object Structure (API) that is used to retrieve data for that data source. If you add a data source, include only the attributes that you need. Including all attributes of the datasource can lead to performance issues.
<pages>	This element contains the details of each page that is displayed in the application. Most configuration work involves page structures.
<messages>	This element contains information about messages that are used by the application.

Datasources that are defined in the page structure portion of the application XML file are referenced and used by elements that are defined within the local page definition.

Figure 2. Technician local datasource definition

```

35 <pages id="pages">
36   <page padding="true" id="schedule" path="/schedule" title="My Schedule" icon="maximo:schedule" contr
37   <states id="nmvrw">...
51   </states>
52   <maximo-datasource id="dswolist" object-structure="mxapiwodetail" saved-query="uxtechnicianownerfi
53   <schema id="gjlw7p">...
118   </schema>
119   <maximo-datasource-override id="todaywoassignedDS" pre-load="true" saved-query="ASSIGNEDWOLIST"/>
120   <maximo-datasource-override id="pmduewolistDS" saved-query="PMWOLIST" where="schedfinish=>=&quot;{
121   </maximo-datasource>
122   <maximo-datasource id="wodetails" object-structure="mxapiwodetail" item-url="{page.params.href}">...
147   </maximo-datasource>
148   <maximo-datasource id="dsnewreading" lookup-data="true" object-structure="mxapiindomain" page-size
157   </maximo-datasource>
158   <json-datasource id="dsstatusDomainList" src="{}" items="statusItems" selection-mode="single" id
163   </json-datasource>
164   <header-template hide-breadcrumb="true" title-column-width="{app.state.screen.size === 'md' ? 48 :
173   </header-template>
174   <stacked-panel selected-index="{page.state.selectedSwitch}" id="qzfnm">...
183   </stacked-panel>
184   <dialogs id="wnynq">...
194   </dialogs>
250   </page>

```

Table 2. Application XML elements

XML element	Description
<states>	Properties that are used across the application.
<maximo-datasource>	The definition of a Maximo data source. In this example, it is embedded within a <page> element. This data source is defined for only that page. If you add a data source, include only the attributes that you need. Including all attributes of the data source can lead to performance issues.
<json-datasource>	A JSON data source that provides static data to a component that is defined in application XML. In this example, it is embedded within a <page> element. This data source is defined for only that page.
<header-template>	A layout for a header section of a page.
<stacked-panel>	This element defines the panels that are used in the page.
<dialogs>	This element defines the dialog boxes that open in the page.
<id>	A unique identifier for an element. When you add an element, you do not need to assign a value to this attribute. The application build process assigns the element a unique ID. If you plan to reference this element in another part of the XML, you can create a unique ID value. Do not change an ID value after it is assigned.

Referencing other application XML files

Splitting application XML components across several files can help with maintenance and modularization efforts. You can reference an application XML file by using the <include> element.

In the following example for the Technician application, an XML file that contains work order card components is included in the main app.xml file.

```

<include src="/home/markdown/jenkins/workspace/Transform/in/SSLPL8_cd/com.ibm.mam.doc/mobile/wo-card-group.xml"
id="home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_c_anatomy_of_an_application_xml_file_j
wq72"/>

```

Comments

You can add comments to any application XML file by using the code-comment component.

The XML parser ignores any text that appears in the text attribute of the code-comment tags.

```

<maximo-application
id="home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_c_anatomy_of_an_application_xml_file_a
ttributeAppAppWithComments2">
  <code-comment text="This datasource is used to get a list of inspections" />
  <maximo-datasource
id="home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_c_anatomy_of_an_application_xml_file_i
nspectionsDsAppWithComments2">
    <schema>
      <attribute name="inspectionresultid" unique-
id="home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_c_anatomy_of_an_application_xml_file_t
rue"/>
      <attribute name="siteid"/>
      <attribute name="totalcostformula" title="Total Cost" is-formula="true" />
    </schema>
  </maximo-datasource>
</maximo-application>

```

The XML parser ignores any XML components that appears between the code-comment tags.

```
<maximo-application
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_c_anatomy_of_an_application_xml_file_a
ttributeAppWithComments1">
  <maximo-datasource
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_c_anatomy_of_an_application_xml_file_a
ttributeDsAppWithComments1">
    <schema>
      <code-comment text="this section is commented out for now">
        <attribute name="inspectionresultid" unique-
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_c_anatomy_of_an_application_xml_file_t
rue"/>
        <attribute name="siteid"/>
      </code-comment>
      <attribute name="totalcostformula" title="Total Cost" is-formula="true" />
    </schema>
  </maximo-datasource>
</maximo-application>
```

- [Datasources](#)

Datasources provide data to a component that is defined in application XML. A JSON data source provides static data. A Maximo datasource identifies a Maximo Object Structure (API) that is used to retrieve data from the Maximo application server for that datasource.

Related information

- [IBM Maximo Application Framework Component Reference](#)

Datasources

Datasources provide data to a component that is defined in application XML. A JSON data source provides static data. A Maximo datasource identifies a Maximo Object Structure (API) that is used to retrieve data from the Maximo application server for that datasource.

The following screen shows a JSON datasource:

Figure 1. JSON datasource

```
766 <json-datasource id="jtoolsds" src="{[]}" items="wptool" schema="schema" id-attribute="wpitemid">
767 <schema id="a8vqr">
768 <attribute name="itemnum" id="dgy62"/>
769 <attribute name="description" id="y2wmq"/>
770 <attribute name="itemqty" id="e8xk5"/>
771 <attribute name="location" id="qz7dd"/>
772 <attribute name="locationDesc" id="qzdwy"/>
773 <attribute name="wonumDesc" id="z8_nm"/>
774 <attribute name="locHours" id="vpgxp"/>
775 <attribute name="itemnumDesc" id="n9r2v"/>
776 <attribute name="wpitemid" id="grz5a"/>
777 </schema>
778 </json-datasource>
```

The following two screens show snippets of Maximo datasource definitions:

Figure 2. Maximo datasource 1

```
52 <maximo-datasource id="dswolist" object-structure="mxapiwodetail" saved-query="uxtechnicianownerfilter" order-by="wopriority"
53 pre-load="false" controller="ScheduleDataController" selection-mode="none">
54 <schema id="gjw7p">
55 <attribute name="plussgeojson" id="wymyz"/>
56 <attribute name="wonum" unique-id="true" searchable="true" id="g4dk9"/>
57 <attribute name="description" searchable="true" id="ej423"/>
58 <attribute name="location.description" searchable="true" id="d_m_3"/>
59 <attribute name="location.location" searchable="true" id="gy6zb"/>
60 <attribute name="wopriority" searchable="true" id="x3nyj"/>
```

Figure 3. Maximo datasource 2

```
849 <maximo-datasource id="woDetailResource" default="true" object-structure="mxapiwodetail"
850 where="wonum=&quot;{page.params.wonum}&quot; and siteid=&quot;{page.params.siteid}&quot;" controller="WorkOrderDataController"
851 item-url="{page.params.href}">
852 <schema id="qmvzy">
853 <attribute name="plussgeojson" id="yn258"/>
854 <attribute name="workorderid" unique-id="true" id="p6d4b"/>
855 <attribute name="wonum" id="q9qm"/>
856 <attribute name="title" id="gmp_2"/>
857 <attribute name="description" id="kq9yq"/>
```

Each data source has an *id* attribute, which is used when a UI component references the datasource.

The *saved-query* attribute references an object structure query that is associated to the object structure that is defined in the object-structure attribute. The *where* clause identifies the filtering of the data in the datasource. The schema consists of a list of attributes. These attributes identify the API fields that are available to

the UI component using this datasource.

A Maximo datasource can include child datasources which show data that is related to the parent or outer datasource. For example, the outer datasource might be work order data. A child datasource might be tasks that are related to an instance of the outer work order datasource.

A field can be identified as `{item.wonum}`, where `item` represents the current record of the datasource. The term `item` is a reserved variable. Do not confuse it with the use of `item`, as a Maximo dot notation that refers to a Maximo relationship name that called `item`. The following Maximo datasource snippet shows an example of how to override the `saved-query` and where properties of the `pmduewolistDS` datasource:

Figure 4. Saved-query override in a datasource

```
121 <maximo-datasource-override id="pmduewolistDS" saved-query="PMWOLIST"
122 where="schedfinish=&quot;&amp;SYSDAY&amp;&quot; and schedfinish<=&quot;&amp;SYSDAY&amp;+7D&quot;"/>
```

A Maximo data source can be overridden where any property of the data can be replaced by a property value in the override. Do not override the object-structure property.

In this next series of examples, a `wo` datasource is used in several contexts.

```
<maximo-datasource id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_c_datasources_wo"
object-structure="mxapiwodetail"
where="location=&quot;SHIPPING&quot;" pre-load="false" page-size="10"
include-counts="false" order-by="wonum ascending"
controller="WODetailController">
  <maximo-datasource
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_c_datasources_taskWO"
relationship="showtasks">
  </maximo-datasource>
</maximo-datasource>
```

In the following table example, `wo` is a detail data source for work order details and `taskWO` includes the work order tasks for that datasource. It is updated at the current `Item` of the parent whenever it is updated.

```
<table datasource="wo"
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_c_datasources_gexqa">
  <table-column name="wonum" sigoption="workview.read"
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_c_datasources_jw2jb">
    <link label="{item.wonum}" page="woDetailPage"
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_c_datasources_n8wnx"/>
  </table-column>
  <table-column name="estlabcost" license="tpaebase"
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_c_datasources_sadsd"/>
</table>
```

In this case, the table is using the `wo` data source. The table column `wonum` uses a custom cell render to render a `link` and the value of the link is `item.wonum`. The `item` variable always points to the current item or record in a datasource as it is being rendered.

Consider the following data sources:

```
<maximo-datasource id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_c_datasources_wo"
object-structure="mxapiwodetail"
where="location=&quot;SHIPPING&quot;" pre-load="false" page-size="10"
include-counts="false" order-by="wonum ascending"
controller="WODetailController">
</maximo-datasource>
```

```
<maximo-datasource
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_c_datasources_woview" object-
structure="mxapiwodetail"
where="location=&quot;SHIPPING&quot;" pre-load="false" page-size="10"
include-counts="false" order-by="wonum ascending"
controller="WODetailController">
</maximo-datasource>
```

These two datasources have no relationship to each other. A typical application can have several datasources. Some datasources are related while others are not.

Consider the following fields:

```
<field value="{wo.item.description}" />
<field value="{woview.item.description}" />
```

The `wo` and `wodescription` values are datasources. The `item` value is the current record. The `description` value is the value that is specified for the field. If the datasource moves to a new item or record, then this field is updated.

Maximo Mobile Queries

Maximo® Mobile uses queries to retrieve record data from the Maximo Manage server.

Queries that are used in Maximo Mobile and Maximo Manage role-based apps are defined through a Maximo datasource. Datasources are defined in the application XML file. The datasource references the Maximo object structure that provides the data to the datasource.

As an example, the `dsworktype` datasource that is defined in the Technician application references the `mxapiworktype` object structure.

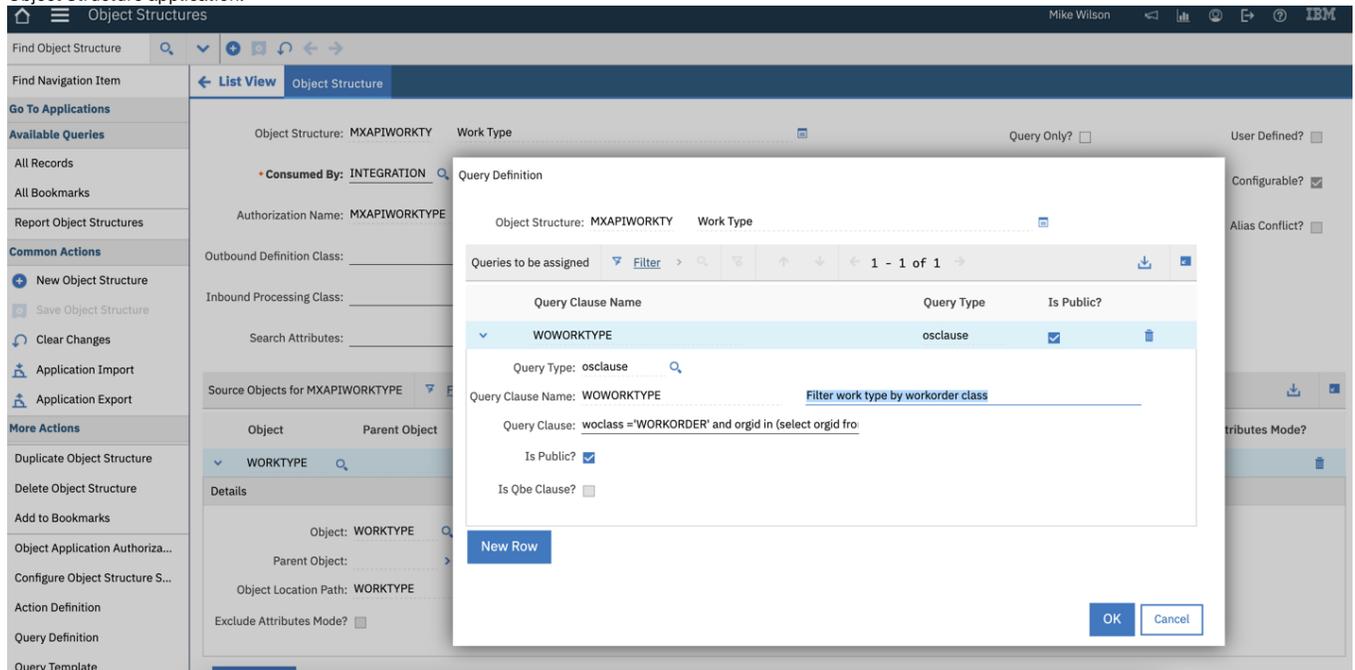
```
<maximo-datasource
id=" home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_maximo_mobile_queries_dsworktype">
```

```

offline-immediate-download="true" selection-mode="single" saved-query="WOWORKTYPE" lookup-data="true" pre-load="true"
object-structure="mxapiworktype" page-size="100">
  <schema
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_maximo_mobile_queries_b2rkz">
  <attribute name="worktype" searchable="true" unique-
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_maximo_mobile_queries_true"
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_maximo_mobile_queries_rrpez"/>
  <attribute name="wtypedesc" searchable="true"
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_maximo_mobile_queries_w5_zm"/>
  <attribute name="woclass" searchable="true"
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_maximo_mobile_queries_b8w9r"/>
  <attribute name="orgid" searchable="true"
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_maximo_mobile_queries_b_jdj"/>
  <attribute name="promptdown"
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_maximo_mobile_queries_n_5q4"/>
  <attribute name="startstatus"
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_maximo_mobile_queries_vm3ke"/>
  <attribute name="completestatus"
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_maximo_mobile_queries_a5yen"/>
  </schema>
</maximo-datasource>

```

The `dsworktype` datasource identifies a saved query that is associated with the `WOWORKTYPE` object structure. You can manage this query in the Maximo Manage Object Structure application.



If you modify the Query Clause value, you change the work type data that is used by the Technician application and any other application or API client that references that saved query.

You can also extend a saved query by adding a WHERE clause in the datasource. Do this instead of changing the query itself, which could be used by many applications. Extending a saved query in this way appends it to the saved query.

```

<maximo-datasource-override
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_maximo_mobile_queries_pmduewolistDS"
saved-query="PMWOLIST"
where="schedfinish=&quot;&amp;SYSDAY&amp;&quot;
and schedfinish<=&quot;&amp;SYSDAY&amp;+7D&quot;" mobile-qbe-filter="{ 'status_maxvalue' :
'!=COMP,CAN,CLOSE,WAPPER' }" offline-immediate-download="true"/>

```

To find the default Technician application queries, you can search for the `dropdown-item` component in the application XML file.. You could also search for the value that is displayed in the drop-down query menu when you are using the Technician application.

```

<header-template hide-breadcrumb="true" title-column-width="{page.state.breadcrumbWidth ? page.state.breadcrumbWidth :
app.state.screen.size === 'md' ? 50 : app.state.screen.size === 'lg' ? 30 : app.state.screen.size === 'xlg' ? 21 : 65}"
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_maximo_mobile_queries_zewd">
  <dropdown slot="dropdown" background-color="white" selected-item="{page.state.selectedDS}"
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_maximo_mobile_queries_rzvz4" on-
change="loadWOListData" hide-unselected-placeholder="true">
  <dropdown-item value="todaywoassignedDS" text="Assigned work"
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_maximo_mobile_queries_njkmd"/>
  <dropdown-item value="pmduewolistDS" text="PMS due this week"
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_maximo_mobile_queries_jxr9k"/>
  <dropdown-item value="myworkDS" text="Work created by me" hidden="{app.device.isMaximoMobile}"
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_maximo_mobile_queries_wgadv"/>
  <dropdown-item value="myworkCreatedLocally" text="Work created on device" hidden="{!app.device.isMaximoMobile}"
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_maximo_mobile_queries_wgbb8"/>
  <dropdown-item value="myWorkOrder" sigoption="MXAPIWODETAIL.uxtechlist" text="My work order"
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_maximo_mobile_queries_d3v_7"/>
</dropdown>

```

- [Filtering records returned from a query](#)

The number of records returned from a query can sometimes be unmanageable on mobile devices. In some cases, you might want to limit the number of records received. For example, you might want to limit the number of records displayed in a work list.

- [Changing a query](#)

Queries can be extended to return different sets of records.

Filtering records returned from a query

The number of records returned from a query can sometimes be unmanageable on mobile devices. In some cases, you might want to limit the number of records received. For example, you might want to limit the number of records displayed in a work list.

You can modify the query located on the Maximo application server using the Object Structure application. For example, if you want to use the work order owner value instead of assignments, you can change the ASSIGNEDWOLIST query located within the MXAPIWODETAIL object structure. The new WHERE clause would be:

```
(siteid = (select defsitemaxuser where userid =:USER) and status in
(select value from synonymdomain where domainid = 'WOSTATUS' and maxvalue not
in ('CAN', 'CLOSE', 'COMP', 'WAPPR')) and istask=0 and owner= (select laborcode
from labor, maxuser where labor.personid = maxuser.personid and
maxuser.userid=:USER)
```

Then, in the XML file that you are configuring, change the uxtechnicianownerfilter value to ASSIGNEDWOLIST.

```
<maximo-datasource controller="ScheduleDataController"
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_c_filtering_record_returned_from_a_que
ry_dswolist" object-
structure="mxapiwodetail" order-by="wopriority" pre-load="false" saved-
query="ASSIGNEDWOLIST" selection-mode="single" where=wopriority
```

Changing a query

Queries can be extended to return different sets of records.

The Assigned Work query is the default query in the Technician application. The Assigned Work query references the `dswolist` datasource, which is configured to use the `mxapiwodetail` object structure or API, and the `assignedwolist` saved query. The `dswolist` datasource has an override that is called `todaywoassignedDS`.

```
(siteid = (select defsitemaxuser where userid =:USER) and status in
(select value from synonymdomain where domainid = 'WOSTATUS' and maxvalue not in
('CAN', 'CLOSE', 'COMP', 'WAPPR')) and wonum in (select wonum from assignment where
laborcode = (select laborcode from labor, maxuser where labor.personid = maxuser.personid
and maxuser.userid=:USER and labor.orgid = (select orgid from site where siteid = (select
defsitemaxuser where userid =:USER))) and (siteid = (select defsitemaxuser
where userid =:USER))))
```

In the Object Structure application, you can select the `mxapiwodetail` object structure and then select the Query Definition action. To change the default query, copy the WHERE clause, create a new row, and create a new `OSCLAUSE` query called `NEWASSIGNEDWOLIST`. If you wanted the query to include unapproved Work Orders, you can remove the `WAPPR` entry from the status list:

```
(siteid = (select defsitemaxuser where userid =:USER) and status in
(select value from synonymdomain where domainid = 'WOSTATUS' and maxvalue not in
('CAN', 'CLOSE', 'COMP')) and wonum in (select wonum from assignment where laborcode =
(select laborcode from labor, maxuser where labor.personid = maxuser.personid and
maxuser.userid=:USER and labor.orgid = (select orgid from site where siteid =
(select defsitemaxuser where userid =:USER))) and (siteid =
(select defsitemaxuser where userid =:USER))))
```

Once saved, you can change the saved query on the datasource override in the app.xml file:

```
<maximo-datasource-override
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_c_changing_a_query_todaywoassignedDS"
mobile-qbe-filter="{ 'status_maxvalue': '!=COMP,CAN,CLOSE,WAPPR' } }"
offline-immediate-download="true" saved-query="NEWASSIGNEDWOLIST"/>
```

When you test the application, the Assigned Work query now includes Waiting on Approval work orders.

Adding an owner group reference on a work order

In the Maximo® Mobile Technician application, a Create Work Order page is used by a technician to create a new work order. In some organizations, the technician might be responsible for assigning the ownership of the work order.

About this task

Add the Owner Group field and its associated look-up capability on the Work Order Create page. by configuring the app.xml file of the Technician application for Maximo Mobile 8.8 or higher.

Procedure

1. Use the Maximo Application Framework Configuration application to download the **TECHMOBILE** application and begin editing it in the XML editor.
2. Add the datasource at the beginning of the application XML code.
The datasource must be added before the **pages** component.

```
<maximo-datasource
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_add_owner_group_on_work_order_p
ersongroupLookupDS" lookup-data="true" object-structure="mxapipersongroup" offline-immediate-download="true"
selection-mode="single">
  <schema>
    <attribute name="persongroup" searchable="true" unique-
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_add_owner_group_on_work_order_t
rue"/>
    <attribute name="description" searchable="true"/>
  </schema>
</maximo-datasource>
```

3. Before the **pages** component, add the **dialogs** component at the top of the application XML code.
Placing the **dialogs** component at the beginning of the application XML code allows this look up action to be used on multiple pages.

```
<dialogs
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_add_owner_group_on_work_order_d
emoLookups">
  <lookup-with-filter datasource="persongroupLookupDS"
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mam.doc_mobile_t_add_owner_group_on_work_order_o
wnergroupLookup" lookup-attributes="{['persongroup', 'description']}" search-placeholder="Search Owner Group"/>
</dialogs>
```

4. Locate the **Create WO** page XML component and then add the **ownergroup** attribute to the **dsCreateWo** datasource.

```
<attribute name="ownergroup"/>
```

5. Define the **Owner Lookup** action to display it and retrieve the attribute.

```
<box children-sizes="50" direction="row" fill-child="true" fill-parent="true" padding-bottom=".5"
padding-top=".5">
  <smart-input enable-lookup-buttongroup="true" label="Owner Group" lookup="ownergroupLookup" select-
lookup-attribute="persongroup" value="{dsCreateWo.item.ownergroup}"/>
</box>
```

6. Verify that the changes work as expected by previewing the **TECHMOBILE** application in the Maximo Application Framework Configuration application.
7. Republish the **TECHMOBILE** application to the Maximo Manage server.

Maximo Mobile REST APIs

Maximo® Mobile uses REST APIs to download data from Maximo Manage to a user's device.

Maximo Mobile endpoints

The Maximo Mobile APIs use the following endpoints:

- /maximo/oslc/ping.jsp
- /maximo/oslc/Login
- /maximo/oslc/whoami
- /maximo/oslc/systeminfo
- /maximo/oslc/permission/allowedappoptions
- /maximo/oslc/licenseinfo
- /maximo/oslc/service/system

Data downloaded by Maximo Mobile APIs

The following table lists the data that is downloaded by the Maximo Mobile APIs for each Maximo Mobile app.

Table 1. Data downloaded by the c APIs

API	Technician app	Approvals app	Inspections app	Service Request app	Inventory Counting app
MXAPIDOMAIN	All data	All data	All data	All data	No data
MXAPIALNDOMAIN	All data	All data	All data	All data	No data
MXAPISYNONYMDOMAIN	domainid in ['WOSTATUS','LTTYPE','TIMERSTATUS','ISSUETYP','LINETYPE','ITEMTYPE','ITEMSTATUS','WOCLASS']	domainid in ['WOSTATUS','LTTYPE','TIMERSTATUS','ISSUETYP','LINETYPE','ITEMTYPE','ITEMSTATUS','WOCLASS']	domainid = ['INSPRESULTSTATUS']	MOBILEDOMAIN	domainid=COUNTBOOKSTATUS
MXAPIFAILURELIST	FAILUREMOB	FAILUREMOB	No data	No data	No data
MXAPIWODETAIL	ASSIGNEDWOLIST	SUPWOTOAPPR	No data	No data	No data

API	Technician app	Approvals app	Inspections app	Service Request app	Inventory Counting app
MXAPIPERSON	No data	No data	No data	All data	No data
MXAPILABOR	LABORSITEMOB	LABORSITEMOB	No data	All data	No data
MXAPILABORCRAFRATE	LABORSITEMOB	LABORSITEMOB	No data	No data	No data
MXAPIINVBAL	ACTIVEITEMSITE	ACTIVEITEMSITE	No data	No data	MOBILEINVCNT MOBILEINVCNT REC
MXAPIASSET	SHOWROTATINGASSET	SHOWROTATINGASSET	No data	MOBILEASSET	No data
MXAPILOCATIONS	SHOWLOCATIONS	SHOWLOCATIONS	No data	No data	No data
MXAPILOCANCESTOR	No data	No data	No data	All data	No data
MXAPIOPERLOC	No data	No data	No data	MOBILELOCATION MOBILEROOTLOCATION	All data
MXAPIITEM	SHOWITEMS	SHOWITEMS	No data	No data	No data
MXAPIINVENTORY	SHOWINVENTORY	SHOWINVENTORY	No data	No data	No data
MXAPIOOLITEM	No data	All data	No data	No data	No data
MXAPIWORKTYPE	All data	All data	No data	No data	No data
PLUSSMAPCONFIGURATION	All data	All data	All data	All data	No data
MXAPIINSPECTIONRES	No data	No data	INSPRESULTALL	No data	No data
MXAPIBOOKMARK	No data	No data	No data	SERVICEREQUESTBOOKMARK	No data
MXAPICLASSSTRUCTURE	No data	No data	No data	All data	No data
MXAPICOMPONENT	No data	No data	No data	designcomps	No data
MXAPINOTIFICATION	No data	No data	No data	No data	No data
MXAPIPROP	No data	No data	No data	No data	No data
MXAPIISR	No data	No data	No data	SERVICEREQUEST SERVICEREQUEST HISTORY	No data
MXAPISTATEMANAGER	No data	No data	No data	All data	No data
MXAPIKCLASS	No data	No data	No data	SRSUBCATEGORY SRSUBCATEGORY SITE	No data
MXAPIKTEMPLATE	No data	No data	No data	SERVICEREQUEST TKTEMPLATE	No data
MXAPIWORKCOUNTERFILES	No data	No data	No data	No data	No data
MXAPIWORKLOG	No data	No data	No data	WORKLOGRELATEDOSR	No data
MXAPICNTBOOK	No data	No data	No data	No data	MOBILECNTBOOK
MXAPICNTBOOKLINE	No data	No data	No data	No data	All data

Maximo Mobile application object structures, query information, and security authorization

Object structures, query information, and related security authorizations that are used in the Technician, Approvals, Inspections, and Service Request applications are listed here. Security authorization listed for applications that are installed using the same security group.

Technician and Approvals

Table 1. Technician and Approvals applications object structures, query information, and security authorizations

Object structure API	Saved query	Data source WHERE clause	Application page location	Object structure authorizations
mxapisynonymdomain	MOBILEDOMAIN	where="domainid="ISSUETYP" and maxvalue in ["ISSUE";"RETURN"]"	Report work	Read
mxapiwodetail	uxtechnicianowner filter	where="wonum="{page.params.wonum}" and siteid="{page.params.siteid}"" where="wonum="0""	<ul style="list-style-type: none"> My Schedule Work Order 	<ul style="list-style-type: none"> Read Save Insert
mxapifailurelist	FAILUREMOB	Not applicable	Not applicable	<ul style="list-style-type: none"> Read Save Insert
mxapiwpeditsetting	Not applicable	Not applicable	Not applicable	Read
mxapiorganization	Not applicable	where="orgid="{app.client.userInfo.defaultOrg}""	Not applicable	<ul style="list-style-type: none"> Read Save Insert Delete
MXAPIASSET	MOBILEASSET	Not applicable	Report work	<ul style="list-style-type: none"> Read Save
MXAPIOPERLOC	MOBILELOCATION	Not applicable	Not applicable	Read
mxapialndomain	Not applicable	Not applicable	Not applicable	Read
MXAPIINVENTORY	SHOWINVENTORY	Not applicable	<ul style="list-style-type: none"> Material request Report work 	<ul style="list-style-type: none"> Read Save Insert Delete
MXAPIITEM	SHOWITEMS	Not applicable	<ul style="list-style-type: none"> Material request Report work 	<ul style="list-style-type: none"> Read Save Insert Delete
MXAPILOCATIONS	SHOWLOCATIONS	Not applicable	<ul style="list-style-type: none"> Material request Report work 	Read
MXAPITOOLITEM	USERTOOLLIST	Not applicable	Report work	Read
mxapiinvbal	ACTIVEITEMSITE	Not applicable	Report work	<ul style="list-style-type: none"> Read Save Insert Delete
mxapilaborcraftsite	LABORSITEMOB	Not applicable	Report work	Read
mxapilabor	LABORSITEMOB	Not applicable	Report work	Read

Inspections

Table 2. Inspections application object structures, query information, and security authorizations

Object Structure API	Saved Query	Data source WHERE clause	Application page location	Object structure authorizations
mxapisynonymdomain	MOBILEDOMAIN	Not applicable		Read
mxapiinspectionresults	INSPRESULTALL	where="inspectionresultid={page.params.inspectionresultid}"	<ul style="list-style-type: none"> Main Transition 	Read

Service Request

Table 3. Service Request application object structures, query information, and security authorizations

Object Structure API	Saved Query	Data source WHERE clause	Application page location	Object structure authorizations
mxapisynonymdomain	MOBILEDOMAIN	Not applicable	Not applicable	Not applicable
mxapialndomain		Not applicable	Not applicable	Not applicable
mxapitktemplate	SERVICEREQUESTTKEMPLATE	Not applicable	New Request	<ul style="list-style-type: none"> Read Save Insert Delete

Object Structure API	Saved Query	Data source WHERE clause	Application page location	Object structure authorizations
mxapisr	SERVICEREQUEST	<pre>where="ticketid=&quot; {page.params.ticketid}&quot;"; where="ticketid=&quot;0&quot;";</pre>	<ul style="list-style-type: none"> • My active requests • Service Request • New Request 	<ul style="list-style-type: none"> • Read • Save • Insert • Delete
MXAPIPERSON	SERVICEREQUEST	Not applicable	New Request	Read
MXAPIOPERLOC	MOBILELOCATION	Not applicable	New Request	Read
MXAPIASSET	MOBILEASSET	Not applicable	New Request	<ul style="list-style-type: none"> • Read • Save
mxapitkclass	SRSUBCATEGORY	Not applicable	Subcategory	<ul style="list-style-type: none"> • Read • Save • Insert • Delete

Security and user management

You use the applications in the Security module to implement and to manage security for users and groups. Users are added and authenticated in the administrative console of Maximo® Application Suite. Users that have an entitlement to Maximo Manage are synchronized to Maximo Manage by a process that continuously queries the user registry in Maximo Application Suite.

Authorization enables access to applications, application actions, and data in Maximo Manage. Authorization is provided by assigning users to one or more security groups in Maximo Manage.

- [User creation, authentication, and synchronization](#)

You add and authenticate users in Maximo Application Suite. Then, if users have entitlement to Maximo Manage, their user data is synchronized to Maximo Manage. Data to be synchronized can be customized to include or exclude fields.

- [Security group synchronization and default assignments](#)

Authorization to applications, actions, and data is provided by assigning users to one or more security groups in Maximo Manage.

- [User processing by the integration framework](#)

User and user group data that is synchronized from Maximo Application Suite is processed by enterprise services of the integration framework in Maximo Manage.

- [License type updates](#)

License type information updates can be sent to Maximo Application Suite when authorizations change or when the calculated license type has a different entitlement value in Maximo Manage.

- [Upgrade of users from Maximo Asset Management to Maximo Application Suite](#)

Users are added in Maximo Application Suite and their profiles, login information, and application entitlements are managed in Maximo Application Suite. If you are upgrading from Maximo Asset Management to Maximo Application Suite with Maximo Manage, user data is upgraded.

- [Configuring security groups](#)

You can configure many types of security groups to support different roles in your organization. You can configure standard security groups that include default start centers and applications, and you can configure Work Center security groups to manage authorization to the user interface components and data required for a role.

- [Managing users](#)

User records contain identifying information and security profiles that determine the applications, options, and data that a user can access. Users are added in the administrative console of Maximo Application Suite. Certain aspects of user records are managed in Maximo Application Suite. You use Maximo Manage to manage their authorizations, or security privileges and some default settings.

- [Implementing additional security](#)

You can implement additional security measures to protect your organization, including login tracking, setting encryption properties, and safeguarding against intrusion and malicious attacks.

User creation, authentication, and synchronization

You add and authenticate users in Maximo® Application Suite. Then, if users have entitlement to Maximo Manage, their user data is synchronized to Maximo Manage. Data to be synchronized can be customized to include or exclude fields.

User creation and authentication

Users are added and authenticated in the administrative console of Maximo Application Suite. Authentication validates the user by verifying the supplied credentials.

Users can be added and authenticated in the Maximo Application Suite in several ways. Refer to the related links for more information about adding and authenticating users.

Synchronization to Maximo Manage

Users who have an entitlement to Maximo Manage are synchronized from Maximo Application Suite to Maximo Manage by an agent process that continuously queries the user registry in Maximo Application Suite. Users who have a PENDING or DELETE_PENDING status are synchronized to Maximo Manage. The synchronization status for a user who is synchronized successfully is SUCCESS. The synchronization status for a user who fails to be synchronized is ERROR. You can view status information in the administrative console of Maximo Application Suite or in the output logs.

Synchronized user data is processed as a series of messages by an enterprise service of the integration framework in Maximo Manage.

Synchronized users are listed in the Users application. Users who are updated to be deleted or to have no access entitlement in Maximo Application Suite are made inactive in Maximo Manage, but they are not deleted.

When a user's data is synchronized from Maximo Application Suite to Maximo Manage, if the user has a phone type or an email type that does not exist in Maximo Manage, the phone type or email type is automatically added to the PHONETYPE or EMAILTYPE domain, respectively. If the phone type or email type already exists, the types are not added.

Because the length and type of the Maximo Application Suite user IDs do not match the length and type of user IDs in Maximo Manage, errors might occur when you create new users. Configuration of user lengths and types should be performed in Maximo Application Suite and then propagated to Maximo Manage. The following tables provide information about the length and type of Maximo Application Suite user ID fields.

Table 1. User Synchronization

Attributes	Manage object and attribute	Type	Length	Values that are allowed
_id	USER.LOGINID	ALN	100	
username	USER.USERID, PERSON.PERSONID	UPPER	100	
displayName	PERSON.DISPLAYNAME	ALN	82	
familyName	PERSON.LASTNAME	ALN	30	
givenName	PERSON.FIRSTNAME	ALN	50	
title	PERSON.TITLE	ALN	30	
issuer	PERSON.MASISSUER	ALN	20	local, ldap, saml
preferences.locale.language	PERSON.LOCALE	ALN	10	
preferences.timezone	PERSON.TIMEZONE	ALN	33	
email.value	EMAIL.EMAILADDRESS	ALN	100	
email.type	EMAIL.TYPE	UPPER	10	HOME,WORK
email.primary	EMAIL.ISPRIMARY	BOOLEAN	1	
phoneNumbers.value	PHONE.PHONENUM	ALN	20	
phoneNumbers.type	PHONE.TYPE	UPPER	10	HOME,MOBILE,WORK
phoneNumbers.primary	PHONE.ISPRIMARY	BOOLEAN	1	
address.streetAddress	PERSON.ADDRESSLINE1 + PERSON.ADDRESSLINE2 + PERSON.ADDRESSLINE3	ALN	169	
address.locality	PERSON.CITY	ALN	36	
address.region	PERSON.STATEPROVINCE	ALN	36	
address.country	PERSON.COUNTRY	ALN	36	
address.postalCode	PERSON.POSTALCODE	ALN	12	
entitlement.application	MAXDOMAIN	ALN	25	

Table 2. Group Synchronization

Attributes	Manage attribute and object	Type	Length
id	MAXGROUP.GROUPNAME	ALN	30
members	GROUPUSER.USERID	ALN	30
displayName	MAXGROUP.DESCRPTION	ALN	200

Customization of inbound data

You can customize the data that is synchronized for users in several ways. For example, you can specify more user data, such as security group and information about employee ID and cost center. Synchronization of inbound user data is handled by an enterprise service of the integration framework in Maximo Manage. Sample inbound integration messages from Maximo Application Suite are shown in the [masuser.json](#) file and the [masgroup.json file](#).

You can customize messages by supplying extra values to the extensions attributes that are not part of the default mapping of a message. The sample file [masuser-mapped.json](#) shows the result in the Maximo Manage object structures after the masuser.json file is mapped by using the supplied user exit. You can use this file to understand how to further customize the mapping.

Experienced administrators whose expertise includes the integration framework and customization can customize mapping in the following ways:

- Create a Java™ user exit. Use the output of the default mapping, such as masuser-mapped.json, as the input.
- Create an automation script that acts on the user exit. Use the output of the default mapping, such as masuser-mapped.json, as the input.
- Create a JSON map. Use the output of the default mapping, such as masuser-mapped.json, as the input.
- Create a JSON map to replace the provided default mapping by replacing the psdi.iface.migexits.MASUserMapperExit user exit class with the com.ibm.tivoli.maximo.fdmbo.JSONMapperExit standard user exit. Input is the user object that is synchronized from Maximo Application Suite, for example, masuser.json.

Security group synchronization and default assignments

Authorization to applications, actions, and data is provided by assigning users to one or more security groups in Maximo® Manage.

Security group synchronization

Synchronized users are assigned to one or more default security groups. You can assign synchronized users to other security groups in any of the following ways. If you use an LDAP identity provider and manage user groups in the identity provider, you can synchronize group data to n and then to Maximo Manage. Your security group setup can depend on whether you maintain user groups in an LDAP provider.

- Synchronize locally added users from n and then assign users to security groups in Maximo Manage.
- Synchronize a user registry that does not include groups from n and assign those users to security groups in Maximo Manage.
- Synchronize a user registry that includes user groups after you determine the mapping of the user groups to Maximo Manage security groups. Configure the synchronization of that information in Maximo Application Suite. Groups are not visible in Maximo Application Suite. Information then is synchronized to Maximo Manage.

All existing users in a security group are replaced by synchronized users that map to that group. This means that users might be added or removed from a group. Users in security groups must be valid users of Maximo Manage.

Synchronized group data is processed as a series of messages by an enterprise service of the integration framework in Maximo Manage.

Default group assignments

All new Maximo Manage users are added to the DEFAULTREG group and to the group that is specified by the value of the *NEWUSERGROUP* varname in the MAXVARS table. The default value of the *NEWUSERGROUP* varname is MAXEVERYONE.

Users that are upgraded from Maximo Asset Management are assigned to groups that are defined by the values of the *NEWUSERGROUP* and *ALLUSERGROUP* varnames in the MAXVARS table.

Users who are given one of the administrator entitlements in Maximo Application Suite and then synchronized to Maximo Manage are assigned to the security groups that are specified by values of the *ADMINGROUP* varname in the MAXVARS table. The default value for this varname is MAXADMIN. These users also can be assigned to other administrative security groups.

Users that are only in the DEFLTREG security group are limited to changing their passwords or accessing the Start Center until an administrator assigns them to other groups.

User processing by the integration framework

User and user group data that is synchronized from Maximo® Application Suite is processed by enterprise services of the integration framework in Maximo Manage.

Processing of user messages

To process messages about users, the following integration framework components are used:

- MASPERUSER enterprise service
- MASPERUSER object structure
- MASSYNC external system

Each synchronization processes one user and adds or updates the following objects in Maximo Manage:

- PERSON
- MAXUSER
- GROUPUSER
- EMAIL
- PHONE

A sample inbound integration message for users is shown in the [masuser.json](#) file.

Processing of group messages

To process messages about groups, the following integration framework components are used:

- MASGROUP enterprise service
- MASGROUP object structure
- MASSYNC external system

Each synchronization adds or updates the following objects in Maximo Manage:

- MAXGROUP
- GROUPUSER

Synchronization details and a sample inbound integration message for groups is shown in the [masgroup.json](#) file.

License type updates

License type information updates can be sent to Maximo® Application Suite when authorizations change or when the calculated license type has a different entitlement value in Maximo Manage.

License types are set in Maximo Application Suite and that data is synchronized to Maximo Manage with each new user. License type becomes part of the user profile.

In Maximo Manage, the MasUserAnalyzer cron task regularly reviews and calculates license types, according to the number or type of applications that users can access. License type is sent from Maximo Manage to Maximo Application Suite if one of the following conditions is met:

- A change to authorizations in Maximo Manage causes a change in the license type calculation.
- The calculated license type is higher than the entitlement value that was synchronized from Maximo Application Suite.

For example, a user is not given administrator entitlement in Maximo Application Suite. This user is synchronized to Manage and is added to a system administrator security group later. The new license type is sent to Maximo Application Suite.

Upgrade of users from Maximo Asset Management to Maximo Application Suite

Users are added in Maximo® Application Suite and their profiles, login information, and application entitlements are managed in Maximo Application Suite. If you are upgrading from Maximo Asset Management to Maximo Application Suite with Maximo Manage, user data is upgraded.

If you are upgrading from Maximo Asset Management and use an integration to create or update users, you must send user data to Maximo Application Suite and not to Maximo Manage.

Note:

When you upgrade Maximo Asset Management to Maximo Application Suite, user and administrator records in the Maximo database are imported by Maximo Application Suite if they do not exist there or if they are not managed by an identity provider. Information includes language, time zone, and locale. Imported users are considered as already synchronized to Maximo Manage. User records also remain in the database that was upgraded.

If SMTP is enabled in Maximo Application Suite, a welcome email is sent to the email address that is associated with the user ID when the user or administrator account is created. If the SMTP email security is set to [email passwords to all users](#), a second email is sent with the user or administrator password. If SMTP is not set up, or if passwords are not emailed to users or administrators, a Maximo Application Suite administrator must supply the password.

Configuring security groups

You can configure many types of security groups to support different roles in your organization. You can configure standard security groups that include default start centers and applications, and you can configure Work Center security groups to manage authorization to the user interface components and data required for a role.

- [Security groups overview](#)
You use security groups to grant read, insert, save, or delete access to the applications, actions, and data that users can access. Predefined security groups are provided to enable basic functionality, but until you create security groups and add users to them, users cannot access sites, start centers, applications, and work centers.
- [Creating security groups](#)
You create security groups to manage authorizations to start centers, applications, actions, and data.
- [Creating Work Center and Tool security groups](#)
Security group templates are provided to authorize users to access Work Centers and Tools and Tasks. When you apply a security group template, members of the group are authorized to access the default applications for the Work Center or Tool. If you want to modify the default authorizations, you duplicate a security group template to create a user-defined template.
- [Granting administrative login authorization for database configuration](#)
To configure the database in administration mode, you must have administrative login authorization. Authorization is granted by security group.
- [Authorizing standard services for security groups](#)
When you assign a signature option (SIGOPTION) to a standard service, only users or groups that are authorized for that option can execute the standard service.
- [Authorizing security group reassignments for users](#)
For security purposes, you can specify the users who are authorized to add or to remove users from a security group.
- [Setting user defaults](#)
You use the Security Controls action to specify the defaults for user records. You can access the Security Controls action from either the Security Groups application or the Users application.
- [Deleting users from security groups](#)
The security group to which a user belongs controls the level of access and privileges for the user within the system. To address changes in your security needs, you can remove a user from a security group.

Security groups overview

You use security groups to grant read, insert, save, or delete access to the applications, actions, and data that users can access. Predefined security groups are provided to enable basic functionality, but until you create security groups and add users to them, users cannot access sites, start centers, applications, and work centers.

All users are added to the DEFLTREG group and to the group that is specified by the value of the *NEWUSERGROUP* varname in the MAXVARS table. The default value of the *NEWUSERGROUP* varname is MAXEVERYONE. Users that are upgraded from is are assigned to groups that are defined by the values of the *NEWUSERGROUP* and *ALLUSERGROUP* varnames in the MAXVARS table.

Security groups can provide broad authorizations to many applications, or you can take a modular approach by adding users to multiple groups that grant fewer access privileges. You can specify different levels of authorization, which can be a combination of read, insert, save and delete, or all levels.

When you add users to multiple groups, authorizations are combined across the groups in most cases. However, if you specify that a security group is independent of other groups, the privileges do not combine with privileges from other groups.

In multisite implementations, the security architecture is designed to use sites as the first level of security. If your company has multiple sites, you can create a group for each site. You can then create functional groups such as administration or maintenance, to grant functional privileges. Combined membership of site groups and functional groups provides users with modular sets of security privileges. If you create an independent group, you must grant access to at least one site and one application because privileges cannot be combined with other groups.

To enable access to work centers, you must create a separate security group for each work center. A template is provided for each work center group that enables default privileges for the work center. You can apply the template, or you can duplicate it to create a user-defined group where you can modify the default privileges.

If you are using in authentication, you create security groups in the Security Groups application. If you manage users in an LDAP user registry, you create groups in the user registry and synchronize the data to Maximo® Application Suite so that it can be synchronized to in . Map your LDAP groups to in security groups before you synchronize them to the suite. You can configure more access privileges for the imported security groups in the Security Groups application.

You can configure the following authorizations and restrictions for security groups:

Sites

Grant access to all sites, individually-selected sites, or no site. If site access is not authorized for a group, members must be also members of a group that grants site access.

Applications

Grant access to applications, including work centers, and configure signature options for individual applications.

Object structures

Grant access to object structure APIs to enable users to exchange data with work centers and external applications.

Storerooms

Grant access to users to perform inventory transactions with all storerooms or in specific storerooms.

Labor

Grant access to all labor records, sets of labor records, or to individual labor records.

General Ledger Components

Grant access to all general ledger components or to individual records.

Limits and Tolerances

Specify approval limits on the value of purchase orders, purchase requests, material requisitions, invoices, and contracts. You can also specify the amount that invoices, taxes, and services can deviate from an initial agreement.

Data restrictions

Restrict access to data in applications and fields. You can also specify conditions when data restrictions apply. You define conditional expressions in the Expression Manager application.

- [Combination of security groups](#)

When you add users to multiple security groups, the authorization privileges of the security groups combine except for security groups that are set as independent.

- [Authorizations for security groups](#)

A security group grants access to members of the group to start centers, applications, Work Centers, and object structures. The access options can be read, insert, save, and delete. You can use conditions to hide fields, tabs, and menus from group members, and you can set data restrictions on objects and attributes.

- [Security profiles](#)

A security profile is the list of rights a user derives from the security groups to which the user belongs. The user rights define the ability of a user to access asset management system applications and to perform specific application functions. You can view a user security profile list in the Security Profile tab in the Users application.

Combination of security groups

When you add users to multiple security groups, the authorization privileges of the security groups combine except for security groups that are set as independent.

When you combine security groups, the following rules apply:

- If you specify that a security group is independent, privileges do not combine with other security groups.
- The privileges of all other security groups are combined.
- When you combine privileges, the highest privileges prevail. If a user belongs to multiple security groups that define the same privilege at different levels, the user has the highest privilege. For example, security group A has a purchase order limit of \$5,000. Security group B has a purchase order limit of \$10,000. A user who is a member of both security groups has a purchasing limit of \$10,000.
- Using the Security Controls action in the Security Groups application or Users application, you can specify the group for all users, the MAXEVERYONE group. The MAXEVERYONE group always combines, even if the group is specified as independent.

Combination rules in a multiple site environment

Combining privileges is useful when you have multiple sites. Typically, you set up security groups that only define site access. You set up other security groups to define application privileges, purchasing approval limits, and so on. For example, your organization has three sites, site 1, site 2, and site 3. You have a user for whom you created a security profile that includes site 1 and associated privileges. You want the user to have the same privileges at site 2, therefore, you add site 2 to the profile for the user.

You can also define some security groups as independent, so that when you combine security groups, a user has a set of privileges at one site and a different set of privileges at another site.

Combination rules for data restrictions

The following combination rules apply when you set data restrictions on security groups:

- If a user is a member of multiple groups, and you specify data restrictions on one of those security groups, the user is granted the highest privileges across the security groups. For example, take two security groups: the Managers security group and the Maintenance security group. The user has access to pay rate information in the Managers security group, but does not have access to the information in the Maintenance security group. When the two security groups are combined, the user has access to pay rate information in the Maintenance group.
- When you add a user to a security group that has data restrictions, the restrictions are added to the security profile for the user. This action can reduce the access rights that were otherwise granted by the combined security groups. Data restrictions always combine across security groups by using the OR operator. For example, take two security groups: one security group contains a READONLY data restriction condition `":orgid [equals character] 'EAGLENA'"`. The second security group contains a READONLY data restriction condition `":orgid [equals character] 'EAGLEUK'"`. The restrictions combine to make the object or attribute read only if the ORGID is EAGLENA_OR_ EAGLEUK.

Combination rules for approval limits and tolerances

The following rules apply to limits and tolerances when you add users to multiple security groups:

- The limits and tolerances that you authorize for a security group are at the organizational level. Users inherit authorizations for only those sites to which they have access.
- If there are two different values for the same approval limit, the higher value is applied to the security profile for the user.
- If there are two different values for the same tolerance type, the higher value is applied to the security profile for the user.
- If there are two different values for the same tolerance type, but the security groups that grant the tolerance amount have sites in different organizations, the higher value for sites within the same organization is applied to the security profile for the user.
- If a user has access to two different organizations with different limits and tolerances in each organization, the user inherits the limits and tolerances for each site to which the user has access in each organization.

Combination rules for general ledger components

The following rules apply to general ledger components when you add users to multiple security groups:

- If any of the security groups to which a user belongs grants authorization to change all general ledger components or specific general ledger components, the security profile for the user reflects the maximum amount of general ledger component authorization.
- If you do not authorize a security group to change all general components, and you do not authorize individual components for the security group, a user cannot change general ledger components.
- The general ledger component authorizations specified for security groups apply to all of the applications, sites, and organizations for those security groups for the user.
- The general ledger component authorizations specified for an independent security group apply exclusively to the applications, sites, and the organizations associated with that security group.

Combination rules for labor authorization

The following rules apply to labor authorization when you add users to multiple security groups:

- All labor in an organization.
- All labor in the same crew as the user.
- All labor in the same person group as the user.
- All labor that the user supervises.
- Only the labor records for the user.
- Individual labor records that are listed in the table window.

Combination rules for site and storeroom authorization

The following rules apply to site and storeroom authorization when you add users to multiple security groups:

- A user must have access to both a storeroom and the site for the storeroom before the storeroom authorization is added to the security profile for the user.
- The storeroom authorizations specified for all security groups apply to all sites that are specified for the security groups.
- The storeroom authorizations that are specified for an independent security group apply exclusively to the sites associated with that security group.
- If any of the security groups to which a user belongs grants access to all or specific storerooms at a given site, then the security profile for the user reflects the maximum amount of storeroom access.
- You can give a user access to the Users application and Security Groups application, but not grant that user access to any storeroom records. In this scenario, the user can use these applications to authorize access to all storerooms, but cannot add specific storerooms records.

Authorizations for security groups

A security group grants access to members of the group to start centers, applications, Work Centers, and object structures. The access options can be read, insert, save, and delete. You can use conditions to hide fields, tabs, and menus from group members, and you can set data restrictions on objects and attributes.

Start center access

You can specify a default start center for a security group to provide quick access to the tools and key performance indicators that members need. When users log in, they see a start center based on a template for their security group. If users belong to more than one security group, they can see tabs representing a start center page for each security group. You can grant users authorization to configure their start centers. You control the portlets that users can view and can configure.

Work Center access

Security group templates are provided for Work Centers and Tools and Tasks application types. You can duplicate a template to create a user-defined Work Center security group, or you can apply the template to use the default security options provided for the Work Center. When a user logs in, the Work Center landing page opens and contains the Work Centers and Tools and Tasks that the user is authorized to access.

The Work Center landing page includes a link to the landing page for Maximo® Manage. If you want Work Center users to have access to standard Maximo Manage applications, they must also be members of a security group that grants access to these applications.

Application access levels

You can grant access for a security group to all options for an application or you can restrict access to only specific options. For example, in a security group for managers, you can grant access to read work order histories, costs, and warranties, but not to insert work orders or service requests. You must configure each application for read access so that users can select additional application access options.

When you specify an access option for an application, related options are set. Read access also grants the standard system options of clear, bookmark, next, previous, viewhist, and drilldown. Insert access for an application also grants save access. The following table describes the related options for each access option.

Table 1. Standard options for prerequisite, also grants, and also revokes access

Standard options	Relationships between options
Standard prerequisite <ul style="list-style-type: none"> • Duplicate • Delete 	Prerequisite <ul style="list-style-type: none"> • Insert • Save
Standard also grants <ul style="list-style-type: none"> • Insert • Read 	Also grants <ul style="list-style-type: none"> • Save • Clear, bookmark, next, previous, viewhist, drilldown
Standard also revokes <ul style="list-style-type: none"> • Read • Save • Insert 	Also revokes <ul style="list-style-type: none"> • All options • Insert, duplicate • Duplicate

The relationships between options in individual applications can sometimes vary. Access options for applications are stored in the SIGOPTION table in the database. You can use an SQL editor to search the SIGOPTION table.

Object structure access

Object structure access authorizes group members to access specified object structure APIs to support the integration of data with external applications.

Conditional access

You can define conditions, either as expressions or as custom class files, and use them to control access to applications and to controls in applications. In the Security Groups application, you can use conditions, for example, to restrict access to application fields and tabs to certain users or to restrict a field to read-only access. Conditional access is granted in the security groups application. If a user is in multiple security groups, the highest level of access is granted when the security groups are combined.

Data restrictions

Data restrictions on objects and attributes limit the data that is available to group members, to hide records, or to make records read-only. Because these restrictions exist at the data-level, the restrictions apply to any user interface element or application that uses an object or attribute.

Data restrictions provide the following ways to restrict access to data for groups of users:

- You can make an object hidden or read-only, conditionally or unconditionally, for all Maximo Manage users, or for members of a specific security group.
- You can associate an object with a condition to qualify the data that is returned by the database. This configuration differs from data that is fetched from the database but is hidden in a certain condition. Qualified data restrictions apply only to top-level objects in lookup menus and dialog windows that are configured to allow them.
- You can set data restrictions for attributes within objects, either with or without an application specified.
- Data restrictions for a security group supersede any restrictions that you set in the Application Designer application.
- Data restrictions that you set in the Security Groups application apply wherever an attribute is used, while Application Designer configurations do not.
- Application Designer configurations are always for one application. Configurations that use data restrictions can apply to all applications that use the object or attribute or to one specific application.
- If you create a data restriction on an object, the restriction does not apply to views of that object. For the restriction to apply to all views of the object, you create a separate restriction for each view.

Security profiles

A security profile is the list of rights a user derives from the security groups to which the user belongs. The user rights define the ability of a user to access asset management system applications and to perform specific application functions. You can view a user security profile list in the Security Profile tab in the Users application.

Before you can view a user security profile list, you must first create a user in the Users application. You must then assign the user to a security group and allocate group rights in the Security Groups application. When you assign a user to more than one group, the user inherits the security rights from the assigned groups.

You can use the Security Groups application to define user rights according to the following asset management system security components:

- Site
- Application
- Storeroom
- Labor
- GL Component
- Limit and tolerance
- Data restriction

By default, the asset management system includes the following user rights:

- The ability to change and a password at login, even when a password expires
- The ability to access the asset management system start center

If your implementation uses a Lightweight Directory Access Protocol (LDAP) directory server to authenticate an external directory, do not use the asset management system security settings to perform the following functions:

- Self registration
- Password and password hint changes

Creating security groups

You create security groups to manage authorizations to start centers, applications, actions, and data.

About this task

This task describes how to create a security group in the product. If you manage users in an LDAP user registry, you create groups in the user registry and synchronize the data to Maximo® Application Suite so that it can be synchronized to Manage. Map your LDAP groups to Manage security groups before you synchronize them to the suite.

Procedure

1. In the Security Groups application, create a group, name it, specify a default start center, and set other optional values.
2. On the Sites tab, authorize group members to have access to all sites or specify individual sites.
3. On the Applications tab, select the applications that you want to authorize and grant the appropriate types of access to each.
4. Optional: If you want to enable group members to share data with external applications, on the Object Structures tab, authorize access to object structure APIs.
5. Authorize the storerooms, labor, general ledger components and limits and tolerances for members of the security group.
6. On the Data Restrictions tab, you can restrict access to objects, attributes, and collections.
7. On the Users tab, add users to the group.

Creating Work Center and Tool security groups

Security group templates are provided to authorize users to access Work Centers and Tools and Tasks. When you apply a security group template, members of the group are authorized to access the default applications for the Work Center or Tool. If you want to modify the default authorizations, you duplicate a security group template to create a user-defined template.

Procedure

1. In the Security Groups application, create a new group and name it.
2. On the Sites tab, select Authorize Group for All Sites? to enable the group to access all sites, or specify individual sites.
3. On the Applications tab, define a security group for a Work Center or Tool:
 - a. In the Application Type column, filter for Tools and Tasks.
 - b. Select a record.
 - c. Click Manage/Apply Template. In the Add/Modify Authorization Template window, click Apply Template to create a group based on the predefined authorization settings of the template.
 - d. Optional: Click Add/Modify Signature Options to set signature options at the level of the application.
 - e. Optional: Click Object Structure Authorizations to specify access to data at the level of the application.
 - f. Click OK.

4. On the Object Structures tab, specify access to data at the security group level:
 - a. Select the MXAPIPERUSER object structure and grant access to Read and Save authorizations.
This authorization authenticates to the user interface for the Work Center or Tool.
 - b. Optional: Grant access to any other object structures that you want members of the security group to have access to.
This authorization is necessary if you want to enable access to data from external applications.
 5. Authorize the storerooms, labor, general ledger components, and limits and tolerances for members of the security group.
 6. On the Data Restrictions tab, you can restrict access to objects, attributes, and collections.
 7. On the Users tab, add users to the group.
- **Example: Specifying security access for inventory clerks**
You can create security groups that grant different types of security access to features in the Manage Inventory Work Center. Typically, inventory clerks are granted security access to several features on each page of the Work Center.
 - **Example: Specifying security access for technicians**
When you apply a security group template to a Technician application users group, members of the group are authorized to access the Technican application.
 - **Application templates**
Applications use the following security group templates to authorize application access to users.

Example: Specifying security access for inventory clerks

You can create security groups that grant different types of security access to features in the Manage Inventory Work Center. Typically, inventory clerks are granted security access to several features on each page of the Work Center.

Before you begin

Review information in the topic *Authorizations for security groups* that explains the security authorization levels more completely. It also provides information about more granular security permissions that you can configure.

About this task

Security groups for Work Centers need to have authorizations to object structures and menu features that are used by the Work Centers. The Security Groups application includes templates for all Work Centers to help you create role-based security groups more easily. Typically, you provide an inventory clerk with fewer authorizations than you provide to a manager or planner, so you clear check boxes to remove authorizations that are granted by the template.

Procedure

1. In the Security Groups application, add a group. Specify the Manage Inventory Work Center as the default application to open when the user logs in. Save the record.
2. On the Sites tab, specify the sites that the group can access or authorize access to all sites and save the record.
3. On the Applications tab, filter the list by selecting the Work Center application type, and then select Manage Inventory. In the Options for Manage Inventory section, grant access to the Inventory Management app and save the record.
4. Select Manage/Apply Template to access the Inventory security template.
5. Duplicate the template and select the new copy. Maximize the Security Template Authorizations section.
You can review all authorizations that the template provides by maximizing the Security Template Authorizations section and selecting each tab.
6. On the Object Structures Authorizations tab, select an object structure name and modify authorizations that are granted by the original template.
Tip: If you want to grant any access to an object structure, you must grant Read access. If you grant Edit access to an object, you must grant Save access. If you grant Insert access, users also have Save access.
For this role, you clear all but the following authorizations:
 - Grant all of the accesses to the MXAPIITEM object structure.
 - Grant all of the accesses to the MXAPIINVENTORY object structure. With Delete access, users can set the status of an inventory item to Obsolete.
 - Grant all of the accesses to the MXAPIINVRES object structure. Ensure that you granted Insert and Save access to MXAPIINVENTORY and the required access in the application or Work Center where the reservation originates.
 - Grant the following accesses to the MXAPIINVISSUE object structure:
 - Grant Insert and Save access to this object and ensure that you grant Insert and Save access to MXAPIINVENTORY.
 - Grant Return issued items access to this object.
7. Save the new template and apply the new template to this group.
8. Optional: If this security group needs access to object structures that are not contained in the template, select the Object Structures tab and grant access to other object structures.
9. Select the storerooms that the group can access and any GL segments that they can modify.
You also can specify limits to spending and approvals, objects and attributes, and collections.
10. Add users to the group and save the record.

What to do next

Open the Work Center as a member of the group and test that you can see and work with the correct features.

Example: Specifying security access for technicians

When you apply a security group template to a Technician application users group, members of the group are authorized to access the Technican application.

Before you begin

Review information in the topic [Authorizations for security groups](#) that explains the security authorization levels more completely. It also provides information about more granular security permissions that you can configure.

About this task

Security groups for applications require authorizations to object structures and menu features that are used by the application. Complete these steps to authorize a new user for the Technician application. In this example, you create a new user and group to ensure that the security template is applied correctly to the Technician application.

Note: After you verify this process, you can repeat it and authorize existing users and groups for the application.

Procedure

1. Create a new user.
2. In the Security Groups application, create a new group and name it `Technician_group`.
3. On the Sites tab, select Authorize Group for All Sites? to enable the group to access all sites, or specify individual sites.
4. On the Applications tab, configure the `Technician_group` as the security group for the Technician application:
 - a. In the Application Type column, filter for Tools and Tasks.
 - b. Select the Technician record.
 - c. Click Manage/Apply Template. In the Add/Modify Authorization Template window, click Apply Template to create a group based on the predefined authorization settings of the TECHMOBILE template.
 - d. Optional: Click Add/Modify Signature Options to set signature options at the level of the application.
 - e. Optional: Click Object Structure Authorizations to specify access to data at the level of the application.
 - f. Click OK.
5. On the Object Structures tab, specify access to data at the security group level:
 - a. Select the MXAPIPERUSER object structure and grant access to Read and Save authorizations.
This authorization is required to authenticate to the user interface for the application.
 - b. Optional: Grant access to any other object structures that you want members of the `Technician_group` security group to have access to.
This authorization is necessary if you want to enable access to data from external applications.
6. Authorize the storerooms, labor, general ledger components and limits and tolerances for members of the security group.
7. On the Data Restrictions tab, you can restrict access to objects, attributes, and collections.
8. On the Users tab, add your new user you created to the `Technician_group` group.

Results

The user you created should now have access to the Technician application. You can verify access by logging in as the new user and opening the application.

Application templates

Applications use the following security group templates to authorize application access to users.

Table 1. Application templates

Template	Description	Applications
SUPMOBILE	Full access to the Work Approvals application.	Work Approvals
TECHMOBILE	Full access to the Technician application.	Technician
SRMOBILE	Full access to the Service Requests application.	Service Requests
INSPECTION	Full access to the Inspection application.	Inspection
OPDASHBOARD	Full access to the Operational dashboard.	Operational dashboard
WOSUMMARY	Full access to the Work Orders application.	Work Orders
WFASSIGN	Full access to the Workflow Assignments application.	Workflow Assignments

Granting administrative login authorization for database configuration

To configure the database in administration mode, you must have administrative login authorization. Authorization is granted by security group.

Procedure

1. In the Security Groups application, select a security group and then click the Applications tab.
2. In the Applications section, search for Start Center.
3. In the Options for Start Center section, select Can Log In During Admin Mode and click Grant Listed Options for This Application.

Authorizing standard services for security groups

When you assign a signature option (SIGOPTION) to a standard service, only users or groups that are authorized for that option can execute the standard service.

About this task

Standard service authorization does not support the use of conditions that may be associated with the signature option. Any condition assigned will be ignored.

Procedure

1. In the Security Groups application, select the Standard Service Authorization action.
2. In the Standard Service Authorization window, click New Row.
3. Specify values for service, method, and option.
After you specify these values, the Application field is populated with a value.
4. Click OK.

Results

The standard service is assigned a signature option. Any user that calls the standard service by means of the integration framework (HTTP, EJB, or SOAP) requires their authorization to the signature option to execute the standard service.

Authorizing security group reassignments for users

For security purposes, you can specify the users who are authorized to add or to remove users from a security group.

Procedure

1. In the Security Groups application, select the group for which you want to authorize group reassignment.
2. Select the Authorize Group Reassignment action.
3. In the Authorize Group Reassignment window, click New Row.
4. To authorize users, click Select Users.
5. Click OK.

Setting user defaults

You use the Security Controls action to specify the defaults for user records. You can access the Security Controls action from either the Security Groups application or the Users application.

About this task

You can specify the following defaults for user records:

- Default security group for new users - New users are automatically assigned to a security group. The default group defines their security permissions until they are assigned to additional groups. The default group is MAXDEFLTREG. The permissions for this group are limited to access to the Start Center. Users can change their own passwords.
- Default status for new user records - The default status is NEWREG. The NEWREG status allows you to search for new user records. You can also route records into a workflow process.
- Group for all users - The default security group for global permissions is MAXEVERYONE. When you select Group for All Users in Security Controls, the user is added to MAXEVERYONE.
- Electronic signature dialog - When you select Display User ID in the Electronic Signature Dialog in Security Controls, the system displays the user ID in the window, and prompts the user to enter a password.

Your implementation might use an application server to authenticate with an external directory by means of the Lightweight Directory Access Protocol (LDAP). In this case, you do not use the system to perform some functions. These functions might include:

- Self registration - This function is not supported in conjunction with an external directory.
- Setting or changing passwords and password hints - All password-related functions are managed by the directory.

By default, when you use an application server for authentication, the directory manages user and group creation. You can set properties to allow user and group creation to be performed directly in the system. The settings of these properties result in certain features being enabled or disabled in the system.

Procedure

1. Select the Security Controls action.
2. In the User Defaults section, specify the following defaults:
 - a. In the Default Group for New Users field, type the name of the group, or click Detail Menu.
 - b. In the Initial Self-Registered User Status field, type a user status.
 - c. In the Group for All Users field, specify the group for global permissions. The default is MAXEVERYONE.
 - d. Select the Display User ID in the Electronic Signature Dialog check box to display the user ID in the window when the system prompts users to enter their passwords. If you implement electronic signatures, you must enable login tracking.

3. Click OK.

Deleting users from security groups

The security group to which a user belongs controls the level of access and privileges for the user within the system. To address changes in your security needs, you can remove a user from a security group.

Before you begin

You must delete a security group from the application server before you can remove users from a security group. To remove a user from a group, you must be authorized to reassign users to that group. Use the Authorize Group Reassignment action in the Security Groups application or the Users application to grant this authorization.

About this task

If you delete a security group in the directory server, but you do not want to delete the group from the system, you can delete the users from that group. The users will then no longer have access to the applications to which the group previously had access. If your implementation uses an application server to authenticate with a directory, you can associate users with groups in the directory or in the system, depending on your settings. You cannot delete users from the MAXEVERYONE group.

Procedure

1. In the directory server, delete the users from the security group that you want to delete.
You must wait until the VMMSYNC cron task has fully synchronized the users and security groups in the directory server with the users and groups in the system.
2. Delete the security group in the directory server.
3. In the Security Groups application, select the group containing the relevant user.
4. Click the Users tab.
5. Delete the user.
6. Save your changes

- [Deleting security groups](#)

As your business needs change, you can delete security groups. You can delete security groups in the Security Groups application, set up an archiving process, or create a cron task to remove the groups.

Deleting security groups

As your business needs change, you can delete security groups. You can delete security groups in the Security Groups application, set up an archiving process, or create a cron task to remove the groups.

Before you begin

You must delete a security groups from the application server before you can delete the security group from the system.

About this task

You can delete a security group in the directory server but the VMMSYNC cron task does not delete the group from the system tables. If there are users associated with a security group or if a security group is specified as the default security group for all users, that security group cannot be deleted. You cannot delete the MAXEVERYONE group.

Procedure

1. In the directory server, delete the users from the security group that you want to delete.
You must wait until the VMMSYNC cron task has fully synchronized the users and security groups in the directory server with the users and groups in the system.
2. Delete the security group in the directory server.
3. In the Security Groups application, select the group that you want to delete.
4. Select the Delete Group action.
5. Click Yes.

What to do next

If implementation uses an application server to authenticate with an external directory (by means of LDAP), a user that is deleted in the directory is not automatically deleted in the system. You must manually delete it.

Managing users

User records contain identifying information and security profiles that determine the applications, options, and data that a user can access. Users are added in the administrative console of Maximo® Application Suite. Certain aspects of user records are managed in Maximo Application Suite. You use Maximo Manage to manage their authorizations, or security privileges and some default settings.

About this task

To manage user security privileges and some default settings, you can take the following actions:

- View user status.
- View user security profile.
- Add users to security groups.
- Specify various user defaults, such as default insert site, default storeroom, default language, and default general ledger accounts for purchasing. The default purchasing account is the general ledger account that is used for desktop requisitions, but not for all purchasing.
- Grant users the right to access inactive sites.
- Specify which users can access a screen reader to assist in interacting with the system.
- Set system-wide security controls and new user default groups.
- Create database users (if you are using an external identity provider, this feature is not available).
- [Users overview](#)
Users are added or synchronized to Maximo Application Suite and synchronized to Maximo Manage if they have entitlement to Manage.
- [Working with users](#)
You manage users by adding them, by assigning them to security groups, by changing general ledger accounts for users, and by performing other administrative tasks.
- [Setting signature key requirements](#)
You can set requirements for electronic signature keys. Requirements include things like specifying minimum length, inclusion of character types, and disallowed words.
- [Configuring user authorizations](#)
You must configure authorizations for users, such as specifying security groups and specifying security profiles.
- [Setting user defaults](#)
You use the Security Controls action to specify the defaults for user records. You can access the Security Controls action from either the Security Groups application or the Users application.

Users overview

Users are added or synchronized to Maximo® Application Suite and synchronized to Maximo Manage if they have entitlement to Manage.

Users need initial access privileges. To provide this access, you assign all new users to a security group that includes default privileges. When new users authenticate to the product or to their identity provider, they can change their password and have access to a default start center.

- [Administrative users](#)
Administrative users have full or restricted access to the Security Groups application and to the Users application. Administrative users are responsible for implementing and maintaining security services, such as adding users, building profiles, or managing general site administration.
- [Database users](#)
Database users are granted access to read, insert, update, and delete specific objects that define a set of fields and business rules. These objects can also update one or more database tables.
- [System users](#)
There are certain user IDs, like MAXADMIN and MAXREG, that are required for the system to run properly. These user IDs are known as system users
- [Self service users](#)
Self service users can add service requests and view their service requests.
- [Security controls](#)
You can implement security controls for users, such as authorizations and security profiles.

Administrative users

Administrative users have full or restricted access to the Security Groups application and to the Users application. Administrative users are responsible for implementing and maintaining security services, such as adding users, building profiles, or managing general site administration.

Administrative users might need access to the following applications to perform system administration"

- Actions
- Application Designer
- Calendars
- Chart of Accounts
- Classifications
- Communication Templates
- Cron Task Setup
- Database Configuration
- Currency Codes

- Domains
- E-mail Listeners
- Escalations
- Exchange Rates
- Integration
- Launch in Context
- Logging
- Object Structures
- Organizations
- Roles
- Security Groups
- Sets
- System Properties
- Users
- Web Services Library
- Workflow Administration
- Workflow Designer

Some users might assign management functions that are administrative in nature to supervisors or managers, especially in the areas of Information Technology Asset Management and Service Desk operations. These users are not considered administrative users.

Database users

Database users are granted access to read, insert, update, and delete specific objects that define a set of fields and business rules. These objects can also update one or more database tables.

In the Users application, you use the Database Access action to create database users. If you implement databases that need operating system IDs, you must create the operating system ID.

The default database username is `maximo`.

The following commands detail the standard authorizations that are required:

- Create user *dbusername* identified by the system
- Alter user *dbusername* default table space quota as unlimited
- Alter user *dbusername* temporary table space temp
- Grant create trigger to *dbusername*
- Grant create session to *dbusername*
- Grant create sequence to *dbusername*
- Grant create synonym to *dbusername*
- Grant create table to *dbusername*
- Grant create view to *dbusername*
- Grant create procedure to *dbusername*
- Grant alter session to *dbusername*
- Grant execute on `ctxsys.ctx_ddl` to *dbusername*

To allow database access to users, the following commands detail the additional grants that are required to create database users:

- Grant create user to *dbusername*
- Grant drop user to *dbusername*
- Grant create session to *dbusername* with admin option
- Grant alter user to *dbusername*

System users

There are certain user IDs, like MAXADMIN and MAXREG, that are required for the system to run properly. These user IDs are known as system users

The system users MAXADMIN and MAXREG are part of the database. To create system users, you use the system account option in the Users application. You cannot delete a system user.

Self service users

Self service users can add service requests and view their service requests.

New self service users are added to the DEFAULTREG group and to the group that is specified by value of the *NEWUSERGROUP* varname in the MAXVARS table. The default value of the *NEWUSERGROUP* varname is MAXEVERYONE. Upgraded users are assigned to groups that are defined by the values of the *NEWUSERGROUP* and the *ALLUSERGROUP* varnames in the MAXVARS table.

In the Users application or Security Groups application, an administrator can replace the default security group with another security group, such as the SELFSERVICE group.

Security controls

You can implement security controls for users, such as authorizations and security profiles.

- [Security profiles for users](#)
You can specify the security profile for a user. You can assign the user to groups and set other security attributes. These attributes include default insert sites, storeroom sites, and default storerooms.
- [Database access for users](#)
By default, users do not have authorization to access the database. However, in some instances, users need access to the database. For example, a user might need database authorization to view tables and columns to create reports.
- [Default insert sites for users](#)
In the Users application, you assign users to a default insert site to insert records. The records that users view pertain only to the default insert site. Without a default insert site, some applications cannot function. For example, without a default insert site, users cannot add purchase orders in a site-level application.

Security profiles for users

You can specify the security profile for a user. You can assign the user to groups and set other security attributes. These attributes include default insert sites, storeroom sites, and default storerooms.

The following points are applicable to security profiles:

- The default insert site is the default value to use when a user creates a record. The value in the Organization field is the organization to which the default insert site belongs.
- By default, new users are assigned to the MAXDEFLTREG group. You cannot delete this group from a security profile.
- If the use default insert site as a display filter option is selected, the user views records for only the default insert site on the List tab of all applications.
- The value for default storeroom applies to when a user creates a material requisition. You can specify a value for the storeroom site only. However, if you specify a default storeroom, you must also specify the storeroom site. If you enter a default insert site or storeroom site, you must grant the user privileges to a group with that site.
- [Resending multiple users from Maximo Manage to Maximo Application Suite](#)
You can use a cron task parameter to resend multiple users from Maximo® Manage to Maximo Application Suite.

Resending multiple users from Maximo Manage to Maximo Application Suite

You can use a cron task parameter to resend multiple users from Maximo® Manage to Maximo Application Suite.

In Maximo Manage 8.5 and earlier versions, users who are migrated from Maximo Manage Maximo Application Suite during upgrade, could not be resent without editing the database.

In Maximo Manage 8.5, you can reset the RESENDUSERSSEL cron task parameter to resend multiple users from Maximo Manage to Maximo Application Suite.

Cron task parameter	Description
RESENDUSERSSEL	Specifies a WHERE clause that selects all users that you want to resend from Maximo Manage to Maximo Application Suite.

Database access for users

By default, users do not have authorization to access the database. However, in some instances, users need access to the database. For example, a user might need database authorization to view tables and columns to create reports.

You can grant a user authorization to read, insert, update, and delete specific objects that define a set of fields and business rules, and that update one or more database tables. Before you can grant database access, you must complete additional steps to grant authorization to database users. To provide a user complete database authorization, use the tools and procedures of your database platform.

Database passwords

The database user ID and password do not have to be the same. However, the database password must meet the requirements of your database platform. For example, if you are using the Oracle database platform, you cannot create a password with certain special characters that Oracle does not support.

You use the Change Password action to change a password for database users. You can set a database user password to match a system password. However, the database user password must support the password requirements. Users cannot change their own database passwords.

Default insert sites for users

In the Users application, you assign users to a default insert site to insert records. The records that users view pertain only to the default insert site. Without a default insert site, some applications cannot function. For example, without a default insert site, users cannot add purchase orders in a site-level application.

For site-level records, the site defaults to the value of the default insert site. For organization-level records, the organization defaults to the organization of the site that is specified as the default insert site. The Profile link in the navigation bar enables users to change their default insert site.

The Use Default Insert Site as a Display Filter setting is a filter that allows users to view only records from their default insert site. However, if the application is at the organizational level, this setting allows users to view all records from all sites within the organization. If you do not use this setting, users can view records for all the sites to which they have access.

Working with users

You manage users by adding them, by assigning them to security groups, by changing general ledger accounts for users, and by performing other administrative tasks.

- [Assigning users to security groups](#)
To manage security settings and to grant user privileges, you can assign users to security groups. New users are assigned to the default group (MAXDEFLTREG) and the group for all users (MAXEVERYONE). The default group is used to give newly registered users basic privileges, and the group for all users is used to specify global settings.
- [Authorizing users to assign other users to security groups](#)
When you create a security group, you are authorized to assign users to that group. As an administrator, you can authorize a user to assign other users to security groups.
- [Changing persons associated with users](#)
You can manage your work force information by associating user IDs with specific person records. Once an association is no longer being used, you can reuse the user ID with another person record.
- [Configuring user settings](#)
You can configure user settings, such as the settings for storerooms, insert sites, GL accounts, locale, language, time zone, and screen reader access. Configure the settings for a single user or for a selected group of users.
- [Deleting security groups from user profiles](#)
To manage the security privileges associated with user records, you can delete a security group from a user profile.

Assigning users to security groups

To manage security settings and to grant user privileges, you can assign users to security groups. New users are assigned to the default group (MAXDEFLTREG) and the group for all users (MAXEVERYONE). The default group is used to give newly registered users basic privileges, and the group for all users is used to specify global settings.

About this task

You can add only security groups that you are authorized to manage. You can delete a security group from a user profile when the user is assigned to another security group.

Procedure

1. In the Users application, select the user to whom you would like to assign security groups and select the Groups tab.
2. In the Groups section, complete one of the following steps.

Option	Description
Click New Row	Specify a security group for a user
Click Select Groups	Specify multiple security groups

3. Click OK.

Authorizing users to assign other users to security groups

When you create a security group, you are authorized to assign users to that group. As an administrator, you can authorize a user to assign other users to security groups.

Procedure

1. In the Users application, access the user whom you want to authorize.
2. Select the Authorize Group Reassignment action.
3. To authorize assignments to security groups, select one of the following options:
 - To authorize one security group, in the Group field, specify a group.
 - To authorize several security groups, click Select Groups and select the check boxes next to the groups that you want to add.
4. Click OK.

Changing persons associated with users

You can manage your work force information by associating user IDs with specific person records. Once an association is no longer being used, you can reuse the user ID with another person record.

Procedure

1. In the Users application, access the user for whom you want to make an association.
2. Select the Change Person action.
3. In the New Person field in the Change Person window, specify a new person record.
4. Click OK.

Example

For example, there is a user ID with the value of contractor 1 that is associated with Bob Smith from XYZ Consulting. The contract for Bob Smith expired. Therefore, you can associate the user ID, contractor 1, with another user ID.

Configuring user settings

You can configure user settings, such as the settings for storerooms, insert sites, GL accounts, locale, language, time zone, and screen reader access. Configure the settings for a single user or for a selected group of users.

All of the configurations are optional.

About this task

You can specify settings for multiple users by selecting them on the main tab of the Users application and then selecting the Set Security Profile action.

- Add, remove, or replace security groups for the users.
- Specify the default insert site and use the default insert site as a display filter.
- Specify the default storeroom and storeroom site for filling material requisitions for these users.

Procedure

1. To configure settings for a single user, select the user in the Users application.
2. Specify settings about the default insert site to be used on records that the user creates.
 - a. Specify the default insert site.
 - b. Specify whether to use the default insert site as a display filter.
3. Specify storeroom information for material requisitions submitted by this user.
 - a. Specify the default storeroom.
 - b. Specify the site of the default storeroom.
4. Enable access to work with records that reference inactive sites.
5. Set display settings.
 - a. Specify settings for language, locale, or time zone.

If you change the setting for the language that was synchronized from Maximo® Application Suite, it is not overwritten by a future synchronization from Maximo Application Suite.
 - b. Enable use of a screen reader.
6. Specify purchasing information by adding the organization and default debit general ledger (GL) account.

This information can be overwritten by a GL account that defaults from some other relationship.
7. Save your changes.

Deleting security groups from user profiles

To manage the security privileges associated with user records, you can delete a security group from a user profile.

Before you begin

You can delete a security group from a user profile once the user is assigned to another security group.

About this task

When you delete a security group from a user profile, the association between the security group and the user is removed. The group then remains in the database.

Procedure

1. In the Users application, open the user record whose groups you want to change.
2. Click the Groups tab.
3. To delete a group, click Mark Row for Delete.
4. Save your changes.

Setting signature key requirements

You can set requirements for electronic signature keys. Requirements include things like specifying minimum length, inclusion of character types, and disallowed words. Electronic signature keys that are created manually or that are generated automatically conform to the requirements that you specify.

Procedure

1. In the Users application, select a user and then select the Security Controls action. In the Security Controls window, configure settings in the following sections:

Option	Description
E-Signature Key Requirements	Specify a minimum length, the number of allowed identical adjacent characters, and whether the key can contain the user login ID. These rules are enforced whether a user creates the key or whether a reset is done.
Required E-Signature Key Characters	Specify the allowed and required character types. These rules are enforced whether a user creates the key or whether a reset is done.
Allowed Placement of E-Signature Key Characters	Specify the allowed placement of characters. These rules are enforced whether a user creates the key or whether a reset is done.
Excluded E-Signature Key List	Add a row for each word that you want to exclude from use. These rules are enforced whether a user creates the key or whether a reset is done.

2. Save your changes.

Configuring user authorizations

You must configure authorizations for users, such as specifying security groups and specifying security profiles.

- [Specifying security groups for users](#)
To grant users the privileges that are associated with a security group, you can specify a security group for that user.
- [Specifying security profiles for users](#)
When you specify a security profile for multiple users, you assign the users to groups and set other security attributes. The groups and security attributes include the default insert site, the use default insert site as a display filter, the storeroom site, and the default storeroom.
- [Specifying security profiles for multiple users](#)
When you specify a security profile for multiple users, you assign the users to groups and set other security attributes. These groups and security attributes include the default insert site, the use default insert site as a display filter, the storeroom site, and the default storeroom.
- [Granting user access to Oracle and Structured Query Language server databases](#)
You can grant a user authorization to read, insert, update, and delete specific objects that define a set of fields and business rules, and that update one or more database tables.
- [Changing user access to Oracle and Structured Query Language server databases](#)
To manage database access for users, you can change their existing access. You can remove rights to objects, and add, delete, or change existing rights.
- [Removing user access to Oracle and Structured Query Language server databases](#)
You can remove access for a user to read, insert, update, and delete specific objects. These objects define a set of fields and business rules, and update one or more database tables.

Specifying security groups for users

To grant users the privileges that are associated with a security group, you can specify a security group for that user.

Procedure

1. In the Users application, select the user to whom you would like to assign security groups and select the Groups tab.
2. In the Groups section, click Select Groups.
3. Complete one of the following steps:
 - Select the check box next to the security group that you want to select.
 - To select all of the groups, select the Group check box in the table heading row.
4. Click OK.

Specifying security profiles for users

When you specify a security profile for multiple users, you assign the users to groups and set other security attributes. The groups and security attributes include the default insert site, the use default insert site as a display filter, the storeroom site, and the default storeroom.

Procedure

1. In the Users application, select one or more users.
2. Select the Set Security Profile action.
If you selected multiple users, the User Count field displays the number of users.
3. In the Set Security Profile window, select whether you want to add, remove, or replace groups.
4. Click New Row and specify a group.
5. In the Update User Defaults section, select the Edit check box for each default that you want to specify, and specify a value for each default.
6. Click OK.

Results

The number of records that you updated is not always the same as the number in the User Count field. A record is not updated unless the change affects the current security profile. For example, if the security profile for a user contains groups A and B and you add group A, then the record for the user is not updated.

Specifying security profiles for multiple users

When you specify a security profile for multiple users, you assign the users to groups and set other security attributes. These groups and security attributes include the default insert site, the use default insert site as a display filter, the storeroom site, and the default storeroom.

Procedure

1. In the Users application on the List tab, select the user records for which you want to specify security profiles.
2. Select the Set Security Profile action.
In the Set Security Profile window, the User Count field displays the number of users that you selected.
3. In the Set Security Profile window, select whether you want to add, remove, or replace groups.
4. Click New Row and specify a group.
5. In the Update User Defaults section, select the Edit check box for the default settings that you want to specify.
6. Specify settings for default insert site, use default insert site as a display filter, storeroom site for self-service requisitions, and default storeroom for self-service requisitions.
7. Click OK.

Results

The number of records that you updated is not always the same as the number in the User Count field. A record is not updated unless the change affects the current security profile. For example, if the security profile for a user contains groups A and B and you add group A, then the record for the user is not updated.

Granting user access to Oracle and Structured Query Language server databases

You can grant a user authorization to read, insert, update, and delete specific objects that define a set of fields and business rules, and that update one or more database tables.

Before you begin

Before you can grant database access, you must perform additional steps to grant authorization to database users. To provide a user complete database authorization, use the tools and procedures of your database platform. If you use the IBM® Db2® database platform, you must use Db2 tools to provide database access rights. If you use an application server for authentication and user management, you cannot use change database access.

Procedure

1. In the Users application, access the user who needs database access.
2. Select the Database Access action.
3. In the Database Access window, type an ID for the user. The ID must meet the requirements of the database platform and can be different from the user ID.
4. In the Database Password field and Confirm Password fields, type a database password. This password can be different than the user password.
5. To grant a user access to specific tables or objects in the database, complete the following steps:
 - a. Click New Row.
 - b. Specify the name of the object.
The name of the entity populates the Entity Name field.
 - c. To define user rights to the tables associated with the object, select the Read, Insert, Update and Delete check boxes.
6. Click OK.

Changing user access to Oracle and Structured Query Language server databases

To manage database access for users, you can change their existing access. You can remove rights to objects, and add, delete, or change existing rights.

Before you begin

If you use the IBM® Db2® database platform, you must use IBM Db2 tools to provide database access rights. If you use an application server for authentication and user management, you cannot change database access.

Procedure

1. In the Users application, open the user for whom you want to change database access.
2. Select the Database Access action.
3. In the Database Access window, remove specific object rights; and add, delete, or change the rows.
4. Click OK.

Removing user access to Oracle and Structured Query Language server databases

You can remove access for a user to read, insert, update, and delete specific objects. These objects define a set of fields and business rules, and update one or more database tables.

Before you begin

If you use the IBM® Db2® database platform, you must use Db2 tools to provide database access rights. If you use an application server for authentication and user management, you cannot use change database access.

Procedure

1. In the Users application, access the user for whom you want to delete database access.
2. Select the Database Access action.
3. In the Database Access window, click Drop Database User.
4. Click OK.

Setting user defaults

You use the Security Controls action to specify the defaults for user records. You can access the Security Controls action from either the Security Groups application or the Users application.

About this task

You can specify the following defaults for user records:

- Default security group for new users - New users are automatically assigned to a security group. The default group defines their security permissions until they are assigned to additional groups. The default group is MAXDEFLTREG. The permissions for this group are limited to access to the Start Center. Users can change their own passwords.
- Default status for new user records - The default status is NEWREG. The NEWREG status allows you to search for new user records. You can also route records into a workflow process.
- Group for all users - The default security group for global permissions is MAXEVERYONE. When you select Group for All Users in Security Controls, the user is added to MAXEVERYONE.
- Electronic signature dialog - When you select Display User ID in the Electronic Signature Dialog in Security Controls, the system displays the user ID in the window, and prompts the user to enter a password.

Your implementation might use an application server to authenticate with an external directory by means of the Lightweight Directory Access Protocol (LDAP). In this case, you do not use the system to perform some functions. These functions might include:

- Self registration - This function is not supported in conjunction with an external directory.
- Setting or changing passwords and password hints - All password-related functions are managed by the directory.

By default, when you use an application server for authentication, the directory manages user and group creation. You can set properties to allow user and group creation to be performed directly in the system. The settings of these properties result in certain features being enabled or disabled in the system.

Procedure

1. Select the Security Controls action.
2. In the User Defaults section, specify the following defaults:
 - a. In the Default Group for New Users field, type the name of the group, or click Detail Menu.
 - b. In the Initial Self-Registered User Status field, type a user status.
 - c. In the Group for All Users field, specify the group for global permissions. The default is MAXEVERYONE.
 - d. Select the Display User ID in the Electronic Signature Dialog check box to display the user ID in the window when the system prompts users to enter their passwords. If you implement electronic signatures, you must enable login tracking.
3. Click OK.

Implementing additional security

You can implement additional security measures to protect your organization, including login tracking, setting encryption properties, and safeguarding against intrusion and malicious attacks.

- [Login tracking](#)
You use login tracking to track the number of login attempts and view the current login status for a user.

Login tracking

You use login tracking to track the number of login attempts and view the current login status for a user.

By default, login tracking is enabled in Maximo® Manage. Login tracking enhances security, however, this tracking can sometimes impact system performance.

When login tracking is enabled, all successful and unsuccessful login attempts are tracked. Login tracking must be enabled if you use electronic signatures. You enable or disable login tracking by setting the `VARVALUE` variable values in the `MAXVARS` table.

- [Enabling and disabling login tracking](#)
By default, login tracking is enabled in Maximo Manage. Login tracking enhances security, however, this tracking can sometimes impact system performance.

Enabling and disabling login tracking

By default, login tracking is enabled in Maximo® Manage. Login tracking enhances security, however, this tracking can sometimes impact system performance.

About this task

When you enable login tracking, the product logs all sign in attempts, successful and unsuccessful. You enable or disable login tracking by setting variable values in the `MAXVARS` table.

Procedure

1. Run one of the following SQL statements on the database to enable or disable login tracking:
 - Enable tracking with the following statement: `update MAXVARS set VARVALUE = '1' where VARNAME= 'LOGINTRACKING'`
 - Disable tracking with the following statement: `update MAXVARS set VARVALUE = '0' where VARNAME= 'LOGINTRACKING'`
2. Restart the server.

Work Centers

Work Centers are role-based user interfaces where users can access and complete daily tasks. By using Work Centers, you can access system data and complete tasks without opening multiple applications. You can use tools to complete specific tasks such as creating a service request, designing data sets for business analysis, or creating inspection forms.

Note: Starting in Maximo Application Suite 8.9 and Maximo Manage 8.5, the following work centers are no longer available: Business Analysis, Design Data Sets, Conduct an Inspection, Work Execution, Work Supervisor, Service Request, Assets, and Administration. The documentation that is provided for those work centers applies only to Maximo Manage 8.4 and earlier versions.

If you have access to multiple Work Centers and tools, you can set one Work Center or tool as your default.

- [Introduction to Work Centers](#)
Work Centers offer you a simpler, task-based, and role-based interface that is responsive on desktops, notebooks, tablets, and smartphones. Because these Work Centers offer only the features that you need to complete your most critical work, your learning curve can be shortened, and you work more efficiently.
- [Administering Work Centers](#)
Work Centers are role-based user interfaces where users can access and complete daily tasks. After you have access to a Work Center, either you or your administrator can apply extra configurations.
- [Configuring service requests](#)
Administrators can use the Service Request Configuration page of the Administration Work Center to configure the options that users have when they create service requests.
- [Configuring integration](#)
As the system administrator, you can integrate your Manage system with other applications in your enterprise or with an external system or application. In the Administration Work Center, on the Integration tab, you can access some predefined integration components that enable integration with Manage business objects, and you can create and configure message templates and API keys. You use message templates and API keys as part of the Maximo® Integration Framework. You can create, edit, and review other integration components for the Maximo Integration Framework in Manage applications.
- [Analyzing data](#)
Business analysts can use the Business Analysis Work Center to analyze information and monitor and identify trends to improve operator performance.

- **Managing inventory**
In the Manage Inventory Work Center, you manage your item catalog, inventory reservations, and inventory in storerooms. These activities help you maintain adequate item balances and manage carrying costs so that your teams have the items that they need to maintain your assets.
- **Managing assets and locations**
In the Manage Assets Work Center, you manage corporate assets and locations.
- **Work Supervision Work Center**
The Work Supervision Work Center facilitates the work management activities of supervisors. As a supervisor, you can manage the workload of technicians and assign owners to the work.
- **Work Execution Work Center**
As a maintenance technician, you can use the Work Execution Work Center on a computer or mobile device to manage work orders that you own.
- **Work Center Configuration**
Business analysts and administrators can evaluate business requirements and configure the top-level information for the Work Supervision and Work Execution Work Centers to make them more specific to certain user roles.
- **Managing inspection forms**
In the Manage Inspection Forms tool, you create inspection forms by adding questions and defining responses. The inspection forms that you create are then available to inspectors in the Conduct an Inspection tool.
- **Conducting inspections**
In the Conduct an Inspection tool, you conduct inspections that have been defined in the Manage Inspection Forms tool. You can also review the results of completed inspections, and create unscheduled inspections as necessary.
- **Submitting service requests**
You use the Submit a Service Request tool to quickly create service requests by using your computer or mobile device. You can also monitor the status of existing service requests that you created or are affected by.

Introduction to Work Centers

Work Centers offer you a simpler, task-based, and role-based interface that is responsive on desktops, notebooks, tablets, and smartphones. Because these Work Centers offer only the features that you need to complete your most critical work, your learning curve can be shortened, and you work more efficiently.

Several related tools are available for activities such as designing data sets for business analysis, creating inspection forms, and quickly entering service requests.

Business administrators can configure parts of the Work Centers for Work Supervision and Work Execution.

Several Work Centers provide short tours about Work Center features. Available tours are listed in your Profile menu in a Work Center.

Work Center or feature	Description
Administration Configuring service requests	Complete administrative tasks. Administrators can customize the selections that users make in the Service Requests tool by creating categories and adding issues as options for each category.
Manage Assets	Manage corporate assets and locations.
Business Analysis Work Center	Analyze information, and monitor and identify trends. Business analysts can use the data that is provided by the Work Center to improve operation and user performance.
Conduct an Inspection	Conduct and review inspections.
Manage Inspection Forms	Create inspection forms by adding questions and defining responses.
Manage Inventory	Manage your item catalog, inventory reservations, and inventory in storerooms.
Service Requests	Create service requests by using your desktop computer, notebook computer, or mobile device. You can also monitor the status of existing service requests that you created or are affected by.
Work Execution	Manage work orders that you own. Maintenance technicians can use the Work Execution Work Center on a desktop computer or mobile device.
Work Supervision	Manage the work of your team. As a supervisor, you can manage the workload of technicians and assign owners to the work.
Work Center Configuration	Business administrators can configure parts of the Work Supervision and Work Execution Work Centers.

Administering Work Centers

Work Centers are role-based user interfaces where users can access and complete daily tasks. After you have access to a Work Center, either you or your administrator can apply extra configurations.

- **Enabling tasks as work orders**
For scheduling and tracking purposes, some businesses want to process work tasks as work orders. To view tasks as work orders in Work Supervision and Work Execution Work Centers, administrators must configure the object structure for work orders.
- **Enabling technicians to create work orders**
By default, technicians cannot create work orders in the Work Execution Work Center. Administrators can give technicians permission to create work orders. Administrators must also configure the Work Center to display work orders that technicians create.
- **Disabling access to Learn more links from Work Centers**
You can access information about Maximo® Manage, such as announcements about new products and releases, support information, and training from the Learn more link on the landing page for the Work Centers. To disable access to this information, you must deactivate the EXTLINK escalation and disable the Learn more link.

- [Managing notifications](#)

Notifications are used to communicate the status of your assets. In the Notifications application, you can create, update, or delete notifications. In the Work Center, you can manage notifications and your subscriptions to notifications.

Enabling tasks as work orders

For scheduling and tracking purposes, some businesses want to process work tasks as work orders. To view tasks as work orders in Work Supervision and Work Execution Work Centers, administrators must configure the object structure for work orders.

About this task

Businesses can choose to process work order tasks as separate work orders. For example, when a work order for an office renovation includes electrical work and painting, you might want to display the electrical task as a work order for the electrician and the painting task as a work order for the painter.

By default, tasks are not processed as work orders. The following procedures explain how to enable tasks as work orders for your Work Supervision and Work Execution Work Centers.

Enabling tasks as work orders for technicians

To enable tasks as work orders for technicians, an administrator must configure the query clause for technicians.

About this task

To configure tasks as work orders for technicians, an administrator must edit the `uxtechnicianownerfilter` query clause in the `MXAPIWODETAIL` object structure.

Procedure

1. In the Object Structures application, filter to locate the `MXAPIWODETAIL` object structure and select that object.
2. From the More Actions menu, select Query Definition.
3. In the Query Definition window, filter for the `uxtechnicianownerfilter` query clause.
4. Expand the row for the query clause.
5. In the Query Clause field, specify the appropriate clause for your needs, as shown in the following table.

To enable tasks as work orders, the `istask` parameter must be set to `istask=1`.

Table 1. Sample code for technician query clauses

To display the following information...	Specify this query
Technician sees only regular work orders. This option is the default. To keep this option, no action is needed.	<code>owner = :&personid& or ownergroup in (select persongroup from persongroupteam where resparty=:&personid&) and istask=0</code>
Technician sees only task work orders.	<code>owner = :&personid& or ownergroup in (select persongroup from persongroupteam where resparty=:&personid&) and istask=1</code>
Technician sees both task and regular work orders.	<code>owner = :&personid& or ownergroup in (select persongroup from persongroupteam where resparty=:&personid&)</code>

6. Click OK.

Results

After you complete the configuration, if you specify the value 1 for the `istask` parameter in the query, tasks are displayed as work orders.

Enabling tasks as work orders for supervisors

To enable tasks as work orders for supervisors, an administrator must configure the query clauses for supervisors.

About this task

To configure tasks as work orders for supervisors, an administrator must edit the following query clauses in the `MXAPIWODETAIL` object structure: `APPROVEWORK`, `CLOSEWORK`, `MONITORWORK`, `FINDOWNERWORK`, and `CLOSEDWORK`.

Procedure

1. In the Object Structures application, filter to locate the `MXAPIWODETAIL` object structure and select that object.
2. From the More Actions menu, select Query Definition.
3. In the Query Definition window, filter for the query clause that you want to update.
4. Expand the row for the query clause.
5. In the Query Clause field, specify the appropriate clause for your needs, as shown in the following table:

Table 2. Sample code for supervisor query clauses

To display the following information...	Specify this query
Supervisor sees only regular work orders. This option is the default. To keep this option, no action is needed.	<code>(woclass =(select value from synonymdomain where domainid ='WOCCLASS' and maxvalue = 'WORKORDER') and historyflag=0 and istask=0 and supervisor=:&personid&)</code>

To display the following information...	Specify this query
Supervisor sees only task work orders.	<code>(woclass =(select value from synonymdomain where domainid ='WOCLASS' and maxvalue = 'ACTIVITY') and historyflag=0 and istask=1 and supervisor=:&personid&)</code>
Supervisor sees both task and regular work orders.	<code>(woclass IN (select value from synonymdomain where domainid ='WOCLASS' and maxvalue IN ('ACTIVITY', 'WORKORDER')) and historyflag=0 and supervisor=:&personid&)</code>

6. Click OK.

Enabling technicians to create work orders

By default, technicians cannot create work orders in the Work Execution Work Center. Administrators can give technicians permission to create work orders. Administrators must also configure the Work Center to display work orders that technicians create.

About this task

Note: Starting in Maximo Application Suite 8.9 and Maximo Manage 8.5, this work center is no longer available. The information that is provided here applies only to Maximo Manage 8.4 and earlier versions.

Granting technicians permission to create work orders

To grant technicians permission to create work orders, administrators must give the security group for technicians Insert permission for the MXAPIWODETAIL object structure.

Procedure

1. In the Security Groups application, filter to locate the security group for technicians and select that security group.
2. On the Object Structures tab, filter to locate the MXAPIWODETAIL object structure and select that object structure.
3. Select the Grant Access check box for the Insert MAXAPIWODETIAL option.
4. Click Grant Listed Options for This Object Structure.
5. Click OK.
6. Save the record.
Technicians now have permission to create work orders.
7. To complete the configuration, complete the following steps to clear the technician user sessions from the admin log:
 - a. Go to the Users application.
 - b. From the More Actions menu, select Manage Sessions.
 - c. In the Manage Sessions window, delete all sessions for the users who are logged in as technicians.
 - d. Click OK.
 - e. In response to the system message about errors that occurred, click OK.
 - f. To confirm that you want to log out the users, click Yes.
8. Log in to the system as a technician and verify that you can create work orders.

Configuring tabs to display work orders that a technician creates

If administrators give technicians permission to create work orders, they must also configure one of the tabs in the Work Execution Work Center to display the work orders that a technician creates. To configure a tab to display work orders created by a technician, use the Design mode for the Work Execution Work Center.

Procedure

1. Log in to the Work Execution Work Center as an administrator with design configuration rights.
2. Click Edit to enter Design mode
3. Select the column that you want to edit.
4. In the Design work panel, enter a new name for the column, such as *Created by Me*.
5. Select the REST query option.
6. Replace the existing clause in the Where clause field with the following clause:

```
{ "qbewhere": { "siteid": { "operator": "=", "value": "-dfaltsite-", "status":
{ "operator": "in", "valueset": { "APPR", "WPCOND", "HISTEDIT", "INPRG", "WAPPR",
"WMATL", "WSCH" } }, "reportedby": { "operator": "=", "value": "-personid-" } } }
```

7. Click Save.
8. To publish the changes, complete the following steps:
 - a. Click Manage.
 - b. Select the Publish as active workcenter action.
 - c. In the Publish your Work Center window, click Publish.

Disabling access to Learn more links from Work Centers

You can access information about Maximo® Manage, such as announcements about new products and releases, support information, and training from the Learn more link on the landing page for the Work Centers. To disable access to this information, you must deactivate the EXTLINK escalation and disable the Learn more link.

About this task

By default, the EXTLINK escalation verifies whether web portals or other resources on a specific server are available and the `disableAllLinks` attribute is set to `false` in the `ext-link-config.json` file.

Procedure

1. In the Escalation application, select the EXTLINK escalation.
2. Deactivate the escalation from the More Actions menu.
By default, the escalation is set to run every 12 hours.
3. Disable the Learn more link to hide the link on the landing page for the Work Centers.
 - a. In the `install_home\applications\maximo-x\script` directory, open the `ext-link-config.json` file.
 - b. Change the value for the `disableAllLinks` attribute to `True`.
4. Build the Work Center WAR file, `maximo-x.war`, by running the `buildmaximo-xwar` command.
The `maximo-x.war` file is created in the `install_home\deployment\default` directory.
5. Deploy the Work Center WAR file, `maximo-x.war`.

Managing notifications

Notifications are used to communicate the status of your assets. In the Notifications application, you can create, update, or delete notifications. In the Work Center, you can manage notifications and your subscriptions to notifications.

- [Creating notification message templates](#)
You create notification message templates to define notifications.
- [Creating notification events](#)
You create notification events to notify users of asset and work order information by way of email, SMS, or a Work Center notification.
- [Consuming notification events](#)
Notifications can be silent or endpoint-based notifications.
- [Changing the deletion frequency of notifications](#)
The `NOTFDELETE` cron task controls which notifications are deleted from the system. You can change the `PURGETIME` parameter for this cron task to change how old a notification is before it is deleted.

Creating notification message templates

You create notification message templates to define notifications.

Procedure

1. Start Maximo® Manage.
2. In the Notifications application, select the Notification Message Template.
3. Select New Row.
4. In the Notification Template field, enter a name and description for the notification template.
5. Select the Message Properties or Message Text notification message type, and specify the properties or text to include in the notification.
The notification message type indicates the content of the messages to be sent as part of the notification.

Option	Description
Message Properties	Work Center notifications. For example, <code>assetnum,description,status</code>
Message Text	Email or SMS notifications For example, <code>The following asset :assetnum has changed its status to :status.</code>

6. Save your changes.

Creating notification events

You create notification events to notify users of asset and work order information by way of email, SMS, or a Work Center notification.

About this task

The Maximo® Manage Notifications application is used to configure notification events based on object structures. Events consist of a set of conditions for a specific Maximo business object which is the root object of the object structure. If event conditions are met, the event occurs. Event messages can be configured as a message template from the Notification Message Template dialog. Users can subscribe themselves to an event. Alternatively, a system administrator can subscribe a user to an event. Use the Notification User Subscription dialog in the Notifications application to manage subscriptions..

Procedure

1. Start Maximo Manage.
2. In the Notifications application, click Create Notification.
3. In the Notification field, specify a value.
4. In the Object Structure field, specify an object structure.
You can specify any object structure. For example, the MXAPIASSET object structure is typically used for assets.
5. In the Message Template field, specify a value.
For more information, see [Creating notification message templates](#).
6. Optional: Specify when the event results in a notification by selecting the On Add, On Update, or On Delete check box.
7. Optional: In the Event Filter Condition field, specify any conditions that are required to send a notification.
Conditions include attribute conditions and conditional operators such as OR, AND, or WHILE that are evaluated and dictate whether an attribute is modified.
8. Optional: Select Notification User Subscription under More Actions.
 - a. Click the New Row icon to add a user for the notification event.
 - b. Specify the person ID in the Event For User field and click OK.
 - c. Specify the person ID in the User field and click OK.
9. Save your changes.

Consuming notification events

Notifications can be silent or endpoint-based notifications.

Silent notifications

This type of notifications does not use any queuing technology.

Endpoint-based notifications

This type of notifications uses a queuing technology.

In uid , you can use either JMS or Kafka queuing for endpoint-based notifications. You can set up the queuing method in the External Systems application, by using the NOTIFICATION external system. Set up only the outbound queue for this external system because all notifications in Maximo® Manage are outbound notifications.

Before Maximo Application Suite 8.8, Kafka outbound notification queues were consumed only sequentially. So, if one notification message got stuck in the Kafka queue, all subsequent notification messages were stuck in the queue behind it. This setup is not ideal for notifications and was changed to a continuous processing method in Maximo Application Suite 8.8.

JMS notification queues did not have this limitation because you can set up message-driven beans to proceed with the notification messages continuously.

Changing the deletion frequency of notifications

The NOTFDELETE cron task controls which notifications are deleted from the system. You can change the PURGETIME parameter for this cron task to change how old a notification is before it is deleted.

About this task

The default schedule of the NOTFDELETE cron task is set to once a day. The default value for the PURGETIME parameter is one day. By default, the cron task runs once a day and deletes any notification that is more than a day old.

Procedure

1. In the Cron Task Setup application, select the NOTFDELETE cron task.
2. On the Parameters tab, enter a new value for the PURGETIME parameter. The value must be a whole number followed by **D** for day, **M** for month, or **Y** for year.

Configuring service requests

Administrators can use the Service Request Configuration page of the Administration Work Center to configure the options that users have when they create service requests.

Note: Starting in Maximo Application Suite 8.9 and Maximo Manage 8.5, this work center is no longer available. The information that is provided here applies only to Maximo Manage 8.4 and earlier versions.

You can configure categories for users to select from when they create new requests and set default values for service requests that are created in Work Centers.

To configure service requests, you must have access to do so. In the Security Groups application, go to the Applications tab and select Administration Work Center. Select the Grant Access checkbox for the View Service Request Configuration option.

- [Configuring service request properties](#)
Using the Service Request Configuration page, you can define certain values for service requests that are created in work centers.
- [Configuring categories for service requests](#)
You customize the selections that users make in the Submit a Service Request tool by creating categories and adding issues as options for each category.

You configure this information by using the Service Request Configuration page.

Configuring service request properties

Using the Service Request Configuration page, you can define certain values for service requests that are created in work centers.

Procedure

1. In the Service Request Configuration page of the Administration Work Center, click the Properties tab.
2. Enter a value in the Reported priority field.
This value is the priority for service requests that are created with the High priority check box cleared.
3. Enter a value in the High priority field.
This value is the priority for service requests that are created with the High priority check box selected. If the SET_PRIORITY signature option is turned off in the Security Groups application, users do not see the High priority check box when they enter service requests in the Submit a Service Request tool.
4. In the Source field, enter the value that you want to use for service requests that are entered by using Work Centers.
All service requests that are created in work centers can be identified by using a specific source type. You can use this information to report on the volume of requests that were created in the work center versus service requests that were created from the Service Requests application. The default value for service requests created in the work centers is SRWC.
5. Enter a value in the "Describe the Issue" class structure ID field. You can select a value from the menu or start typing in the field to see a list of values. The value that you define must be a valid service request classification.
When users create a service request and select a category, a class structure ID value is assigned to the service request. If users do not select a category and use the Describe the Issue option, the value defined in the "Describe the Issue" class structure ID field is used.
6. If you want users to have access to only site-specific information (like categories, people, locations, and assets) when they enter service requests, turn on the Filter on person site toggle.

What to do next

Refresh the Submit a Service Request tool to show the changes.

Configuring categories for service requests

You customize the selections that users make in the Submit a Service Request tool by creating categories and adding issues as options for each category. You configure this information by using the Service Request Configuration page.

About this task

A category must have at least one issue that is assigned before the category is shown in the Submit a Service Request tool.

For example, you want to add a category that is called Heat and Air that has the following issues:

- It's too hot.
- It's too cold.
- The system is noisy.

You create a category and name it `Heat and Air`. Then, create the category issues, such as `It's too hot`.

Procedure

1. In the Service Request Configuration page of the Administration Work Center, click the Categories tab. Specify who can create service requests. You can specify the domain name of a company, for example @companyxyz.com, to allow anyone who works there to create requests, or you can list the email addresses of specific users.
2. Click Add.
3. In the Service Requests Categories section, select a category for the type of issues that users can enter. You can enter categories in the following ways:
 - Choose from an existing category in the Category list.
 - To edit a category description, click the pencil icon for the category. Edit the category description, then click the Save icon.
 - Create a category by clicking the + sign next to the category header and typing in the Enter category field. Click the Save icon.
4. Select a subcategory. Choose from existing subcategories, modify a subcategory, or enter a new one.
5. Add common issues that are associated with that category. Choose from existing issues, modify an existing issue, or create a new one.
A category must have at least one issue that is assigned before the category is shown in the Submit a Service Request tool.
6. Add categories and issues as needed. Your changes are automatically saved.

What to do next

Refresh the Submit a Service Request tool to show the categories and associated category issues.

Configuring integration

As the system administrator, you can integrate your Manage system with other applications in your enterprise or with an external system or application. In the Administration Work Center, on the Integration tab, you can access some predefined integration components that enable integration with Manage business objects, and you can create and configure message templates and API keys. You use message templates and API keys as part of the Maximo® Integration Framework. You can create, edit, and review other integration components for the Maximo Integration Framework in Manage applications.

Analyzing data

Business analysts can use the Business Analysis Work Center to analyze information and monitor and identify trends to improve operator performance.

- [Business Analysis Work Center](#)
As a business analyst, you can use the Business Analysis Work Center to analyze information, and monitor and identify trends. You can use the data that is provided by the Work Center to improve operation and user performance.
- [Data Set Designer](#)
Business analysts can use the Data Set Designer to create data sets quickly and without the involvement of IT personnel.

Business Analysis Work Center

As a business analyst, you can use the Business Analysis Work Center to analyze information, and monitor and identify trends. You can use the data that is provided by the Work Center to improve operation and user performance.

Note: Starting in Maximo Application Suite 8.9 and Maximo Manage 8.5, this work center is no longer available. The information that is provided here applies only to Maximo Manage 8.4 and earlier versions.

The Business Analysis Work Center converts Manage data to different formats for the various aspects of your organization. These areas include work efficiency, schedule compliance, supply rates, and inventory balances. Converted data is displayed in multiple chart types to ensure that information is easy to understand and analyze. You can download charts as images to share and present data, or you can change the chart type to meet your viewing needs.

Additionally, you can view your data in KPIs to monitor operational performance. New KPIs focus on data quality and allow you to collect, track, and measure the most important data for your organization.

You can use the Data Set Designer tool to create data sets. Data sets can be downloaded in a comma-separated value (CSV) format.

Before you can access the Business Analysis Work Center, an administrator must add you to the security group template for the Work Center. Security group templates are provided to enable access to work centers and tools and tasks.

Data Set Designer

Business analysts can use the Data Set Designer to create data sets quickly and without the involvement of IT personnel.

Note: Starting in Maximo Application Suite 8.9 and Maximo Manage 8.5, this work center is no longer available. The information that is provided here applies only to Maximo Manage 8.4 and earlier versions.

Building a data set in the Data Set Designer involves selecting an object set and specifying the content or fields that you want to include. You can then configure the content by selecting fields and applying filters and sorting. While you are configuring the data set, you can use the preview feature.

You can apply either an existing application query to your data set or you can create a new one. After you save the data set, you can export its contents to comma-separated value (CSV) format.

Before you can access the Data Set Designer, an administrator must add you to the security group template. Security group templates are provided to enable access to Work Centers and tools and tasks.

Update to report object structures (ROS)

To support Data Set Designer features, report object structures (ROS) are updated to enable the Support Flat Structure field. Report object structures are used in a variety of locations in Maximo® Manage, including QBR (Ad Hoc) Reporting, Result Set portlets, and Cognos® metadata package publishing.

All standard report object structures are updated and a script is provided to update any custom report object structures that you created.

Review your custom report object structures for alias conflicts. Alias conflicts occur when the same attribute name is used in multiple objects in the object structure. If you do not correct alias conflicts, problems might occur if you use them in the Data Set Designer features.

For more information about handling alias conflicts for object structures, see [Resolving alias conflicts](#).

Managing inventory

In the Manage Inventory Work Center, you manage your item catalog, inventory reservations, and inventory in storerooms. These activities help you maintain adequate item balances and manage carrying costs so that your teams have the items that they need to maintain your assets.

In several areas of the Work Center, you can reduce manual data entry effort by scanning bar codes. For example, you can scan a code to select an existing bin or lot when you issue or transfer items.

The following pages help you to manage your inventory:

Reservations

View and manage reservations for storeroom inventory. Reservations are sometimes made automatically when materials are specified on approved work orders or tasks. You can issue or transfer reserved items individually or in batches.

Storerooms

When items are stocked in storerooms as inventory, they can be managed and made available for asset maintenance. You can manage details about balances, costs, bins and lots, and reordering. Issue and transfer items. Perform cycle counts and reconcile balances.

All Items

Add or import items and add details about items before they are added to storerooms. Details can include issue and order units, status, lot and bin information, indicator for rotating items, default vendor, commodity information, and attachments. Items automatically receive an identifier that can be edited.

Some activities are completed by an administrator in other applications. These activities include setting up security, financial processes, detailed item master information, detailed inventory information, and more complex inventory usage. Administrators can refer to the related links for more help.

- [Items](#)
You can add or import items to your master item list on the All Items page. Items then can be added to storerooms and managed as inventory.
- [Storeroom management](#)
Storeroom management activities involve balancing inventory availability with carrying costs.
- [Reservations](#)
You can view and manage reservations for inventory. Reservations help prevent problems with insufficient balances in a storeroom.
- [Picking and staging inventory](#)
To help maximize efficient movement of inventory out of storage locations, you can add inventory pick lists and issue inventory by line or by batch. Optionally, you can specify intermediate staging locations. You can monitor list status as all lines move forward through the process.

Items

You can add or import items to your master item list on the All Items page. Items then can be added to storerooms and managed as inventory.

Storage and uniqueness of item data

All items belong to an item set. Item sets are at a level above the level for organizations. This means that in an item set, multiple organizations can share item data. You do not see item set information unless your company uses more than one item set.

Item numbering

When you add items, they are automatically numbered, but you can edit the identifiers. Identifiers must be unique at the item set level.

An administrator can specify the seeds and prefixes for automatically numbered items in the Organizations application.

Specifying item details

After you add or import items, you can specify the following information:

- Units in which you issue and order items. Your administrator sets up conversion factors that convert order units to issue units.
- Status of the item. Items must be active before they can be moved to storerooms.
- Lot indicator. A lotted item has a shelf life and calculated expiration date.
- Bin identifier. The first bin that you specify becomes the default bin, but you can change it.
- Rotating item indicator. A rotating item represents a set of interchangeable assets that can be tracked as they change locations. These assets are repaired rather than replaced.
- Default vendor for restocking the item.
- Attachments, such as images, specifications, and safety data sheets.
- Commodity group and code. This information helps you to analyze product use and costs.

Adding items to storerooms

Items can be added to a storeroom that you select. An administrator can limit this action so that it is available only if the storeroom is associated with control and debit GL accounts. You can add items to storerooms in the following ways:

- Add items to a storeroom on the Storerooms tab of the All Items page for a selected item.
- Add items to a storeroom that you select from the Storerooms page.
- [Importing item data](#)
You can import data for many items by using an item import template.
- [Item statuses](#)
An item record has various statuses during its lifecycle. You can apply a status change to an item or to the item in all storerooms in one or more organizations for the item set.
- [Condition-enabled items](#)
To help you to track inventory costs and charges accurately, you can enable conditions on items, and then you can assign condition codes and their associated condition rates. A condition code describes the current physical condition of the item, and the rate specifies the value or cost of the item in that condition.

Importing item data

You can import data for many items by using an item import template.

About this task

Modify the provided template and then import your item data file. The item data file adds and replaces data. If an existing item is not included in the data file, its data is not changed. The data file must be uploaded as a .csv file.

Procedure

1. On the All Items page of the Manage Inventory Work Center, select Add item > Import list.
You can review the template help to understand the field requirements, field values, and allowed lengths.
2. In the Upload item file dialog box, select the option to download the template file.
3. Modify the file and upload it as a .csv file.
4. On the All Items page, review your imported items.

Item statuses

An item record has various statuses during its lifecycle. You can apply a status change to an item or to the item in all storerooms in one or more organizations for the item set.

The default insert status of an item for all organizations in an item set is specified in the Organizations application.

Changing the item status

You can change the item status on the Items page of the Manage Inventory Work Center. Then, you can apply that status to the stocked item in storerooms that belong to an organization that uses this item set.

You also can change the item status in the Item Master application. Then, you can apply that status to the stocked item in storerooms that belong to some organizations or to all organizations that use this item set. In the Item Master application, you can take one of the following actions:

Apply a change to storerooms in specified organizations

Select the Item/Organization Details action, specify the status for one or more organizations and then apply the new status to the item in inventory.

Apply a change to all storerooms in all organizations

Select the Change Status action and then apply the new status to the item in inventory.

The status of the master item record can be different from the status of an item in inventory. This difference occurs if a status change was made to the item but was not applied to the item in all inventory locations. It can also occur if the status of a stocked item was changed in the Inventory application.

Item statuses

An item can have one of the following statuses:

Pending

Pending items are available only in the Manage Inventory Work Center and in the Item Master and Inventory applications. Financial transactions cannot be created for pending items, and they are not available in lookup lists.

Planning

Planning items can be referenced by work order plans, purchase orders, and purchase requisitions, but financial transactions cannot be created for them.

Active

Active items can be used in Work Centers and applications without any restrictions.

Pending Obsolescence

Pending Obsolescence items can be depleted from storerooms, but existing balances cannot be replenished.

Obsolete

Obsolete items cannot be used except to generate invoices and view for historical purposes. Items that have an obsolete status are not available in lookup lists. If you change an item to this status, the status change is also applied to the item wherever it is stocked in locations that belong to this item set. This status change cannot be reversed.

Condition-enabled items

To help you to track inventory costs and charges accurately, you can enable conditions on items, and then you can assign condition codes and their associated condition rates. A condition code describes the current physical condition of the item, and the rate specifies the value or cost of the item in that condition.

As an item's physical condition changes, applying the appropriate code and rate helps you to charge or otherwise track accurate item costs. For example, a rotating item that is part of a motor assembly might cost \$5000.00 when new. That full amount is charged when the rotating item is placed into service. After several years, the item needs repair and is later reissued at a rebuilt, or 50%, cost.

Condition codes are defined at the item set level, so they are available to all items in organizations that belong to the item set. Lotted items cannot be condition-enabled.

After an item is condition-enabled, its condition is specified each time that the item is added or returned to inventory, or picked, staged, issued, or transferred. The first time that an item is added to a storeroom, its condition is specified at the 100% rate. Inventory cost transactions are recorded for each of these actions.

Enabling conditions on items

Items are condition-enabled on the Detail page for an item. If you add a set of condition codes, you must add one code for the full, or 100%, rate. Other codes and values represent a percentage of the full rate or cost.

You also can add condition codes and rates in the Condition Codes application and associate them with items in the Master Item application.

When existing inventory is condition-enabled, the 100% rate is applied to that inventory.

Disabling conditions on items

You can disable conditions on items unless they include codes that are being used. A code is being used if the item is in inventory with either costs or balances. If you disable conditions on an item, the codes are removed from the item, but they are available to other items in the item set. In the code list for the item, you also can remove individual codes that are not being used with the item.

Purchasing condition-enabled items

Conditions can be specified in purchasing documents for condition-enabled items, so, for example, you can purchase a mix of new and rebuilt motors.

- [Adding condition codes and rates to items](#)

You can enable conditions on items and assign condition codes and the rates that describe different physical conditions of the items. An assigned code and rate help determine the item's value at that time. All conditions are measured against the value of the full, or 100%, rate.

Adding condition codes and rates to items

You can enable conditions on items and assign condition codes and the rates that describe different physical conditions of the items. An assigned code and rate help determine the item's value at that time. All conditions are measured against the value of the full, or 100%, rate.

About this task

Enable conditions and select or add condition codes for an item in the item Details page of the Manage Inventory Work Center. You also can add condition codes in the Condition Codes application and associate condition codes with items in the Master Item application.

Condition codes are added to an item set and are available to all items in the set.

Lotted items cannot be condition-enabled.

Procedure

1. On the Items page of the Manage Inventory Work Center, select or add an item.
2. Edit the Condition-enabled tile and set the switch to Yes. Save your changes to open the Condition Codes list.
3. In the Condition Codes list, take one of the following actions:
 - Select one or more condition codes and rates for the item and save your changes. You must select one code for the 100% condition rate and you can select other codes as needed.
 - Select Add and add condition codes, then select the appropriate codes. At least one code for the 100% rate must be listed and selected for the item.For example, you select the following condition codes and rates for a tire:
 - New (condition rate is 100%)
 - Good (condition rate is 80%)
 - Fair (condition rate is 50%)
 - Poor (condition rate is 20%)

Results

After an item is condition-enabled, its condition is specified each time that the item is added or returned to inventory, or staged, issued, or transferred. Referring to the example in Step 3, tires with a 100% condition rate are valued at \$300. Tires with a New condition are issued at a cost of 100% of \$300. Tires with a Good condition are issued at a cost of 80% of \$300, or \$240, and so on.

Storeroom management

Storeroom management activities involve balancing inventory availability with carrying costs.

In the Storerooms page of the Inventory Management Work Center, you can add storerooms, monitor balances and availability of inventory items, record physical counts and reconcile them, and take other actions. Select a storeroom to work with its inventory.

You can manage inventory balances for a selected storeroom in the Balances tab. Add existing items and specify bin or lot, starting balance, cost type, costs, issue and order units, default bin, reorder information, and count frequency. Balances that are specified in the Reserved column include hard balances and back order balances only.

The following actions might be available to you from the Actions menu on an item row, depending on your security options:

- Edit most information for the item, including balances of non-rotating items and the default bin.
- Issue items to a work order, asset, location, or general ledger account.
- Transfer items to another storeroom or to another bin or lot in the same storeroom.
- Manage reordering. You can specify a default vendor, manufacturer, reorder point, lead time, and the order quantity that minimizes carrying costs. Your administrator can set up automated reordering processes that use this information to create purchasing records. You also can view past orders from various vendors and manufacturers.
- View information about the rotating assets that are associated with rotating items.

In the Counts tab, you can record physical counts of items that you select. You can sort the table by multiple column headers, including the due date for the count.

In the Reconcile tab, you can reconcile your most recent physical count with any transactions that have completed since that date and time. You can preview balance changes that occur from a reconcile action.

If you need to work with more storeroom features, on a storeroom card, select Open storeroom details to open the record in the Storerooms application.

Adding items to storerooms

Items can be added to a storeroom that you select. An administrator can limit this action so that it is available only if the storeroom is associated with debit and credit GL accounts. You can add items to storerooms in the following ways:

- Add items to a storeroom that you select from the Storerooms page.
- Add items to a storeroom on the Storerooms tab of the All Items page for a selected item.
- [Issuing items](#)
In the Inventory Work Center, you can issue items directly from a storeroom or from a list of items that are reserved in work order plans.
- [Transferring rotating items](#)
You can transfer rotating items and their associated assets from one storeroom to another.
- [Managing reorder rules](#)
You can specify reorder rules for items that are stocked in storerooms. Then, when the specified criteria for the rules are met, an automated reorder process can create purchasing records for the items.
- [Cycle counting your inventory](#)
You can validate inventory balances by periodically counting a set of inventory in storerooms. Counting can help ensure that all inventory is validated at least annually and that your most valuable or most frequently used inventory is validated more often.
- [Reconciling inventory balances](#)
In the Manage Inventory Work Center, you can help ensure accurate balances by reconciling your current inventory balances with your physical counts. This activity ensures that the final current balance includes transactions that occurred between the date and time that you saved the physical count data and the date and time that you reconcile the balances.

Issuing items

In the Inventory Work Center, you can issue items directly from a storeroom or from a list of items that are reserved in work order plans.

About this task

When you issue items, material use transactions are created and item costs are charged to one of several debit GL accounts. If items are issued from a reservation, the charged entity is already specified on the associated work order or task. If items are issued from a storeroom, you specify the entity to issue to, and the following rules are used to charge the associated GL account:

- When you issue items to a task or work order, the cost is charged to the GL account for the task or work order.
- When you issue items to an asset, the cost is charged to the GL account for the asset.
- When you issue items to a location that has a single asset, the cost is charged to the GL account for the asset. If more than one asset is in the location, the cost is charged to the location.
- If none of these situations apply, such as for a set of cleaning items, specify a debit GL account to be charged for the item cost.

Procedure

Issue items in one of the following ways:

Task	Description
Issue items from a storeroom	<ol style="list-style-type: none"> 1. In the Balances tab of a storeroom that is opened from the Storerooms page, select the row detail for the item and then select Issue. 2. Specify the charging entity to which the item is issued. A rotating item is always issued to a location. For a rotating item, you also need to specify identifiers for the rotating assets that this item quantity represents
Issue reserved items	<ul style="list-style-type: none"> • Issue a single reservation: in the Reservations tab of the Reservations page, select the row detail of the reserved item and then select Issue. A rotating item is always issued to a location. For a rotating item, you also need to specify identifiers for the rotating assets that this item quantity represents. • Create a batch of reservations and issue the batch.

Transferring rotating items

You can transfer rotating items and their associated assets from one storeroom to another.

About this task

A rotating item that has a storeroom and balance represents the balance of a group of serialized, rotating assets. You can transfer the items to another storeroom.

Procedure

1. On the Storerooms page, select the storeroom and then select the rotating item.
2. From the Actions menu on the row, select Transfer to open the Transfer to storeroom dialog box.
3. Enter information about the transfer. In the Rotating asset list, select one or more assets.
The quantity of rotating assets that you select must match the quantity of items that you specify for the transfer.
4. Transfer the items.

Managing reorder rules

You can specify reorder rules for items that are stocked in storerooms. Then, when the specified criteria for the rules are met, an automated reorder process can create purchasing records for the items.

Before you begin

Reorder rules take effect after an administrator enables the automated reorder schedule in the Cron Task application and automated purchasing records in the Organizations application.

About this task

You can enable automated reordering on existing storeroom items or when you add items to a storeroom. This task describes adding reorder information to an existing storeroom item, but the task is similar in both cases.

Procedure

1. On the Storerooms page, select the storeroom to open the item list for the storeroom.
2. On an item row, select the Actions menu and then select Reorder rules.
3. Set the Enable reordering switch to Yes to display the reorder fields and the Vendor table.
4. Specify reorder information, including a primary vendor and the manufacturer for the vendor.
You can view vendor and price data from past orders in the Vendor table. Listed vendors might not be primary vendors.
5. Save your changes to enable reordering.

Related information

- [↗ Configuring settings for automated reorder and automated purchasing](#)

Cycle counting your inventory

You can validate inventory balances by periodically counting a set of inventory in storerooms. Counting can help ensure that all inventory is validated at least annually and that your most valuable or most frequently used inventory is validated more often.

About this task

By default, inventory that has an overdue or nearly due count date is shown at the top of the Counts table. The count due date for an item is calculated based on the date of the last physical count in this storeroom and the count frequency.

Count frequencies often relate to the value of the items or how quickly certain items are consumed. The count frequencies can be specified manually for items in storerooms. They also can be assigned by associating an ABC type with the items in that storeroom and running the ABC analysis report in the Inventory application. The frequency values for the ABC types are specified in the Organizations application.

If an item is located in multiple bins, the Counts table shows a row for each bin. Obsolete items and items in staging bins are not included in the table.

Procedure

1. On the Storerooms page, select the storeroom that has inventory that you want to count and then select the Counts tab.
Storeroom inventory can be filtered or sorted by several criteria to help you identify which inventory to count.

2. Specify a new count value for the items that you selected and counted.
Before you update the New count field, it shows a numerical value if the previous balance was counted but not reconciled. If the previous balance was counted and reconciled, the field shows two dashes.
3. Save your changes.

Results

Saved counts are updated. Current® balances are not adjusted until balances are reconciled.

What to do next

Reconcile the balances. Balances can be reconciled on the Reconcile tab of the Storerooms page. Balances also can be reconciled in the Inventory application by using the Inventory Adjustments_>Reconcile Balances action. Reconciliation records any losses or gains to the GL accounts of the storeroom.

Reconciling inventory balances

In the Manage Inventory Work Center, you can help ensure accurate balances by reconciling your current inventory balances with your physical counts. This activity ensures that the final current balance includes transactions that occurred between the date and time that you saved the physical count data and the date and time that you reconcile the balances.

About this task

You typically reconcile inventory balances for a storeroom soon after a physical count. Sometimes a delay occurs between counting and reconciling, and during the delay, transactions, such as issues, returns, transfers, and receipts can change the current balances. You want to include these transactions with the physical count updates to get accurate current balances. You can preview balance changes that a reconcile action would cause.

Inventory items can be reconciled if they are associated with control and shrinkage GL accounts. Typically, these accounts are applied to the storeroom and all inventory added to the storeroom becomes associated with those GL accounts. If needed, you can associate inventory with the storeroom GL accounts during reconciliation.

Balances do not include staged, obsolete, or rotating items.

Procedure

1. In the Manage Inventory Work Center, select a storeroom from the Storerooms page and then select the Reconcile tab.
You can sort or filter the Reconcile table by multiple criteria, including sorting by the balance change.
2. Select a group of items to reconcile balances for or select all items.
The Reconcile table includes a Preview section that shows the physical count balances and calculated new balances. The calculated new balances are from the physical count plus or minus transactions that occur between the date and time of the physical count and the date and time of the table refresh. You can refresh the table to see the latest changes.
For example, yesterday, a physical count of item ITD357 was 17. Its current balance before the count was 15. Earlier today, 10 of the items were received and stocked in this storeroom. You refresh the table. The Calculated column shows a balance of 27, with an increase to the physical count of 10. When you reconcile the balance, the current balance is updated to 27.
3. Select Reconcile to accept the new balances as the current balances for the items.
If one or more of the inventory records is not associated with the control and shrinkage GL account of the storeroom, the row has an alert indicator. Select an alert indicator to update the GL information for that row or for all rows with alert indicators. Rows that still have alert indicators when you reconcile are not updated with new current balances.

Reservations

You can view and manage reservations for inventory. Reservations help prevent problems with insufficient balances in a storeroom.

Inventory can be automatically reserved when materials are specified on approved work orders or tasks. View details about inventory reservations on the Reservations page of the Manage Inventory Work Center. *Soft* reservations indicate that the reserved items are not needed at a specific time. Soft reservations do not affect available balances. *Hard* reservations indicate that material is needed by a specified date. Hard reservations affect current and available balances. *Backorder* reservations are created when a hard reservation causes the available balance in the bin to drop below zero and the option to disallow negative available balances is set in the Organizations application. Automatic reservations are specified as hard or soft based on the required date.

When you open the Reservations tab, the reservation list is filtered by time, site, and storeroom. Change the filters to show more or fewer records.

The following actions might be available to you from the Action menu on a reservation row, depending on your security options:

- Edit information such as the item type, date, and quantity.
- Issue inventory after you specify the quantity and the applicable bin or lot information. You can issue more or less than the reserved amount. If the full amount is issued, the reservation line is deleted.
- Issue rotating items after you specify the associated rotating assets in the data list. You can issue more or less than the reserved amount and you can issue from multiple bins. If the full amount is issued, the reservation line is deleted.
- Delete a reservation.

You can view information about issued items, including items that were issued from reservations, on the Issued Items tab of the Reservations page.

- [Issuing items](#)
In the Inventory Work Center, you can issue items directly from a storeroom or from a list of items that are reserved in work order plans.
- [Returning issued items](#)
You can return issued items to a storeroom. The Issued Items tab lists items that were issued with and without reservations.
- [Issuing, transferring, or deleting reservation batches](#)
You can create batches of reservations and issue, transfer, or delete the batch.

Issuing items

In the Inventory Work Center, you can issue items directly from a storeroom or from a list of items that are reserved in work order plans.

About this task

When you issue items, material use transactions are created and item costs are charged to one of several debit GL accounts. If items are issued from a reservation, the charged entity is already specified on the associated work order or task. If items are issued from a storeroom, you specify the entity to issue to, and the following rules are used to charge the associated GL account:

- When you issue items to a task or work order, the cost is charged to the GL account for the task or work order.
- When you issue items to an asset, the cost is charged to the GL account for the asset.
- When you issue items to a location that has a single asset, the cost is charged to the GL account for the asset. If more than one asset is in the location, the cost is charged to the location.
- If none of these situations apply, such as for a set of cleaning items, specify a debit GL account to be charged for the item cost.

Procedure

Issue items in one of the following ways:

Task	Description
Issue items from a storeroom	<ol style="list-style-type: none"> 1. In the Balances tab of a storeroom that is opened from the Storerooms page, select the row detail for the item and then select Issue. 2. Specify the charging entity to which the item is issued. A rotating item is always issued to a location. For a rotating item, you also need to specify identifiers for the rotating assets that this item quantity represents
Issue reserved items	<ul style="list-style-type: none"> • Issue a single reservation: in the Reservations tab of the Reservations page, select the row detail of the reserved item and then select Issue. A rotating item is always issued to a location. For a rotating item, you also need to specify identifiers for the rotating assets that this item quantity represents. • Create a batch of reservations and issue the batch.

Returning issued items

You can return issued items to a storeroom. The Issued Items tab lists items that were issued with and without reservations.

Procedure

1. On the Issued Items tab of the Reservations page, go to the item issue row that you want to act on.
2. Click the Return icon and specify the return quantity. Specify the lot or bin, if applicable.
The return quantity can be less than the number that was issued.

Results

When the return is saved, a return type transaction with a negative line cost is recorded for this inventory item. The affected GL accounts are the same accounts that were used in the item issue transaction. The returned items increase the item current balance.

Issuing, transferring, or deleting reservation batches

You can create batches of reservations and issue, transfer, or delete the batch.

Procedure

1. In the Reservations tab of the Reservations page, select one or more reservations to manage.
You can use filter criteria to find reservations and use the multiselect check box at the top of the list to select them all.
2. In the action bar that appears, select the action to issue all or delete all of the selected reservations.
The issue action includes the ability to transfer to another storeroom. If you choose to issue all, each reservation detail appears in sequence for you to review and specify more information. You can issue or transfer and continue, or you can skip that issue or transfer and continue. If you exit from any selection, the remaining issues are canceled.

Results

Inventory issues change the inventory balances in the originating storeroom. Inventory transfers change the inventory balances in the originating and in any receiving storeroom.

Picking and staging inventory

To help maximize efficient movement of inventory out of storage locations, you can add inventory pick lists and issue inventory by line or by batch. Optionally, you can specify intermediate staging locations. You can monitor list status as all lines move forward through the process.

To create a pick list, select one or more inventory reservations for a storeroom. You add pick lists for reservations on the Reservations page of the Manage Inventory Work Center. Complete any of the following tasks in pick lists:

- Select multiple item reservations and add a pick list for them. Add more reservation lines to a list as needed.
- Move list items through the different states of a pick list to indicate their position in the process. You can move list items to a Picked, Staged, or Issued state either by line or by batch. All inventory transactions have corresponding inventory usage documents.
- Use scanning technology when you are managing inventory from a bin, lot, or rotating asset list.
- Automatically select and split quantities between multiple bins, lots, or rotating assets to fulfill a needed inventory quantity, whether you are scanning or manually progressing inventory.
- Return or restock inventory by line or by batch.
- Review all state changes and transaction history for pick lists.
- [Inventory pick and stage](#)
You can create and manage pick lists of reserved inventory in ways that model your business processes. You can issue from a picked list or from intermediate staging locations. You can work with individual lines or batched lines. The autosplit feature helps with bin and lot selection. All transactions are recorded for later review.
- [Creating and processing pick lists](#)
You can improve storeroom management efficiency by creating lists of reserved inventory to be picked and issued. You also can specify intermediate staging locations and then issue from those locations. You can work with reservation lines individually or by batch.

Inventory pick and stage

You can create and manage pick lists of reserved inventory in ways that model your business processes. You can issue from a picked list or from intermediate staging locations. You can work with individual lines or batched lines. The autosplit feature helps with bin and lot selection. All transactions are recorded for later review.

Pick and stage overview

The pick and stage process starts when you select one or more inventory reservations for a storeroom and add them to a new pick list. For example, you might search for all reservations for a high priority work order, and select those reservations for a new pick list.

A pick list has several states. States are similar to statuses and correspond to phases of the pick and stage process. Each state has a tab to show items and their quantities that are in that state. A corresponding InvUseLine document that references the pick list also lists items and their quantities for each state.

In a new pick list, lines from the selected reservations are added to the Open state of a pick list and are removed from the reservations list. From the Open state, you can move your inventory in a way that matches your business processes. If you pick and stage inventory before you issue it, you select item quantities to move from the Open state to the Picked state and then to the Staged state. Unselected quantities remain in the Open state until they are acted on. If your processes are simpler, you can issue item quantities either from the Open or Picked state and any unselected quantities remain in the Open state.

Pick lists

A pick list can be created for reserved items from a single storeroom. After you select reservations, you select the Create picks action to add a list for those reservation lines. The list specifies the required date for the reservations to be processed. If needed, you can add other reservations from the same storeroom to an unclosed list.

After you pick, stage, or issue quantities for items on a line, the specified quantity is moved from the Open state and the Open tab to the state and tab that matches the action that you take.

The count value on each tab is the number of reservation lines that have some or all of the quantity in that state. Partial picks or other partial moves mean that the same line can be included in the count value for more than one tab.

In the InvUseLine document, when an item's quantity is moved to another state in a pick list, its quantities for the former state and the new state are updated.

Batch actions

You can work with the pick list lines individually or add several lines to a batch and work with the batch. When you work with a batch, each pick line detail appears in sequence for you to review and specify more information. You can take the action on the line and continue, or you can skip that line and continue. If you cancel the action from any line, actions on the remaining lines are canceled.

Autosplit selection of inventory

When inventory is being picked, staged, or issued, the required quantity is selected from the default bin or lot. If the default bin or lot does not contain the required quantity, the selection is automatically split to other bins or lots. You can modify quantities and select different values. To refresh the original view, select Autosplit.

Whenever more than one bin or lot is required, an InvUseSplit document is created for the line to specify details about the split.

Condition-enabled items

When a reservation specifies a condition for an item, items that meet the condition requirement are selected as you work with the list. If you need to select a different item, you can see the item conditions on the selection lists.

Lotted items

Similar to condition-enabled items, if a lot is specified on the reservation, items that are in the specified lot are selected as you act on the item. If you need to select a different item, you can see the lot information in the selection lists.

Removing, restocking, and returning

You can remove pick list lines that are in the Open state. This action lists the reservation lines again on the Reservations page.

You can restock inventory in pick lists that are in the Picked or Staged state. Inventory can be restocked to a different bin than the original bin. Lot and condition code cannot be changed. These actions list the reservation lines again on the Reservations page.

You can return inventory to the storeroom from the Issued state.

Transaction history

On the Review tab of the pick list, you can view transaction history for the list items. A transaction occurs whenever list lines move from the Open state to any other state and whenever further actions are taken on the inventory.

Pick list statuses

A new pick list has a status of Entered. The list status changes to In Progress if any list items are picked, staged, or issued. You also can change to In Progress manually.

From the In Progress status, a list can be manually changed to Completed or Canceled. Lists are changed to the Completed status automatically when quantities that are open, picked, or staged are equal to zero. Lists can be manually canceled if quantities that are picked, staged, or issued are equal to zero. Canceling a pick list returns the reservation lines to the Reservations page, where they can be acted on again.

From the Completed status, a list can be changed to In Progress, or it can be changed to Closed.

Lists that have a Closed status cannot be modified further.

Creating and processing pick lists

You can improve storeroom management efficiency by creating lists of reserved inventory to be picked and issued. You also can specify intermediate staging locations and then issue from those locations. You can work with reservation lines individually or by batch.

About this task

Pick lists are created from material reservations for items that originate from the same storeroom. You can sort and filter to select reservation criteria, such as required date, work order, bin, item, and quantity. Process the pick list lines individually or select several lines to process as a batch.

When using many list actions, you can select the Scan icon to scan bar codes and then scan by bin, lot, or rotating asset as applicable. For example, when you are picking items, you scan for the default bin. If there is no default bin, you are shown results either for the default lot or rotating asset. Quantities are automatically split to select bins or lots from the storeroom that fulfill the reservation requirement.

Pick lists have various states as inventory is moved through the picking and issuing process. Each state has a corresponding tab to show the inventory that is in that state. A single reservation can be split among more than one state.

Procedure

1. On the Reservations page of the Manage Inventory Work Center, select one or more reservations for a storeroom and then select Create picks.

2. Add a description, specify the date by which the items must be issued, and create the list.

The list is created and reservation lines are put into the Open state and are displayed on the Open tab. Reservations that are added to the pick list are removed from the Reservations list.

3. Select one of the following choices, depending on whether you want to work with single lines or with batched lines:

Option	Description
Single lines	<ol style="list-style-type: none">a. From the Actions menu at the end of a row, select whether to pick, stage, or issue the items.b. Specify the item quantity for the new item state and then select the action. The required quantity is selected and automatically split between bins, lots, or rotating assets. Default entities are chosen first. You can modify quantities and select different values. You can refresh the original view by selecting Autosplit.

Option	Description
Batched lines	a. Select list lines to create a batch. From the actions bar, select whether to pick, stage, or issue the lines. Each line opens so that you can review and update quantities. You can act on the line or skip the line. The required quantity is selected and automatically split between bins, lots, or rotating assets. Default entities are chosen first. You can modify quantities and select different values. You can refresh the original view by selecting Autosplit.

4. Select the tab for the new inventory state and continue processing the inventory by line or by batch. You can restock the inventory either from the Picked or Staged state. You can return the inventory from the Issued state. All transaction history is available on the Review tab.

Managing assets and locations

In the Manage Assets Work Center, you manage corporate assets and locations.

Note: Starting in Maximo Application Suite 8.9 and Maximo Manage 8.5, this work center is no longer available. The information that is provided here applies only to Maximo Manage 8.4 and earlier versions.

Before you can access the Manage Assets Work Center, an administrator must add you to the security group template for the Work Center. Security group templates are provided to enable access to work centers and tools and tasks.

The Manage Assets Work Center organizes asset management activities into the following pages:

Summary

A quick view of the number of assets and locations that you have. On the Summary page, you can quickly add a single asset or location, or you can download a template file and use that file to import data about many assets or locations.

Assets

The resources that you maintain and repair, such as equipment, machinery, or technology. Use the Assets page to manage these resources.

Places

The locations where you store, operate, or repair your assets. Use the Places page to manage locations.

- [Assets](#)
Assets are the resources that you maintain and repair, such as equipment, machinery, or technology. To view, add, or edit asset information, use the Assets page in the Manage Assets Work Center.
- [Locations](#)
A location is a place where assets are operated, stored, or repaired. You can use the Places page in the Manage Assets Work Center to view, add, or edit information about locations, service addresses, or systems.
- [Configuring autonumbering for assets and locations](#)
To automatically generate a unique identifier when a user creates an asset or location record in the Manage Assets Work Center, administrators can configure autonumbering for locations and assets.

Assets

Assets are the resources that you maintain and repair, such as equipment, machinery, or technology. To view, add, or edit asset information, use the Assets page in the Manage Assets Work Center.

After you enter the initial details for an asset, essential information about the asset is displayed on a card on the Assets page. When you select a card, you can add, review, and edit the following information:

- A unique name and a description that identify the asset
- Location of the asset. If necessary, you can move the asset to a new site when you specify a location.
- A type to group assets that are similar so that you can search for any asset in that category. When you specify a type, you can add or edit asset types.
- Status to indicate whether the asset is not ready, active, or decommissioned
- Serial number
- Priority
- Failure class. When you specify a failure class, you can also go to the Failure Codes application to manage failure classes.
- Rotating item if the asset is associated with a rotating item
- Files or images that are attached to the asset record
- Parent asset
- A list of child assets that are related to the asset
- A history of the work orders that are associated with the asset
- [Adding asset types](#)
In the Manage Assets Work Center, you can add asset types to organize your assets into meaningful categories for your business.
- [Importing assets](#)
In the Manage Assets Work Center, you can upload a CSV file to import multiple assets all at once.
- [Asset import guidelines](#)
The CSV template file that you download from the Manage Assets Work Center includes eight columns. You must provide a value for ASSETNUM. All other columns either contain a default value or are optional.
- [Moving assets](#)
You can move an asset from one location to another location in the same site or to a location in a different site.

Adding asset types

In the Manage Assets Work Center, you can add asset types to organize your assets into meaningful categories for your business.

About this task

The asset type value that you add must be a unique identifier. An asset type that you add is a synonym of an internal value that is provided for asset types in the product's business logic.

You cannot add or remove internal values. However, you can create new asset type values that are based on an internal value. For example, PRODUCTION is an internal value for asset types. You can specify values, such as Turbines, HVAC, or Robotic, all of which use the internal value PRODUCTION. Your users can select the value that is the best match for their asset type.

You cannot delete an asset type if it is a default asset type. You cannot edit the asset type to remove its default status. Instead, you must designate a different type as the default asset type, which removes the original type as the default. After you save, you can delete the original asset type.

Procedure

1. In the Manage Assets Work Center, select the Assets page and open an asset.
2. Edit the Type tile.
3. On the Asset Type panel, click Manage asset types.
4. Click Add type.
5. Enter the following information:

Field	Description
Asset type description	A meaningful, short description of the asset type
Asset type	A unique identifier for the asset type
Internal value	The internal value to associate with the new asset type

6. Click Add asset type.
The asset type that you added is displayed in the list of asset types.
7. Optional: If you want to make the new asset type the default, edit the row for the asset type, select in the Default field, and save the asset type.
The type that you designated becomes the default asset type, and the original default asset is no longer the default.
8. When the asset type is complete, click Done.

Importing assets

In the Manage Assets Work Center, you can upload a CSV file to import multiple assets all at once.

About this task

Uploading an asset file adds and replaces asset data. If an existing asset is not included in the CSV file, its data will remain unchanged.

Before you upload asset data, review the requirements for asset records. Some fields are required. Note that in most cases, the values that you specify must be uppercase alphanumeric values.

Information about the required data is provided in the template help page in the product and in [Asset import guidelines](#).

Procedure

1. In the Manage Assets Work Center, select the Summary page.
2. On the Assets tile, click Import list.
3. Download the CSV template for asset data.
4. Review the template help and add the information about your assets to the downloaded CSV template file.
5. When your CSV file is complete, click Upload .csv to import the asset data.
When the upload is complete, a message is displayed to indicate the number of records that were added.

Asset import guidelines

The CSV template file that you download from the Manage Assets Work Center includes eight columns. You must provide a value for ASSETNUM. All other columns either contain a default value or are optional.

Table 1. Guidelines for importing asset data

Field	Description	Field Type	Max Characters	Notes
ASSETNUM	The short unique identifier of the asset.	Uppercase alphanumeric	12	This field is required.

Field	Description	Field Type	Max Characters	Notes
DESCRIPTION	The name or description of the asset.	Alphanumeric	100	Add a description to provide a meaningful reference about the asset.
LOCATION	The unique identifier of the location of the asset.	Uppercase alphanumeric	12	You must specify the unique identifier of a location that already exists in the system. Import or add all your locations first, then import assets.
PARENT	The unique identifier of the parent asset.	Uppercase alphanumeric	12	When importing assets, import parent assets first. Then import child assets and specify the unique identifier of a parent asset in this field.
STATUS	The status of the asset.	Uppercase alphanumeric		Values for asset status include OPERATING, NOT READY, and DECOMMISSIONED. If no status is specified, the default status OPERATING, which is displayed as Active in the Work Center, is applied to the asset.
ASSETTYPE	The type of the asset.	Uppercase alphanumeric		Values for asset types include PRODUCTION, FACILITIES, FLEET, and IT. You can create synonym values for asset types if needed. If you want to use a custom asset type, add the asset type before you import asset data.
SERIALNUM	The serial number of the asset.	Uppercase alphanumeric	64	
SITEID	The unique identifier of the site for the asset.	Uppercase alphanumeric	8	You must create at least one site for an organization. Sites are facilities or subdivisions in an organization where work and supply chain activities are managed. Each site can track inventory and related data separately from other sites. Sites do not have to be physical locations. If you want to load assets for a site that is not your default site, you must supply a site ID.

Moving assets

You can move an asset from one location to another location in the same site or to a location in a different site.

About this task

To move assets to a different site or to a new location in the same site, use the Locations tile on the Assets page in the Manage Assets Work Center.

If you try to move an asset to a new site where an asset with that number already exists, you get an error message. You can then edit the New asset number field to add a new number for the asset that you are moving.

Procedure

1. On the Assets page, edit the Location tile.
2. Click the Lookup icon to open the Location panel.
3. From the list of locations, select one of the following options:

Option	Description
Move the asset to a new location	On the Location panel, select the new location for the asset.
Move the asset to a new site	On the Location panel, complete the following steps: <ol style="list-style-type: none"> a. Click Move to new site. b. Specify a new site, location, and parent. c. Click Move.

Locations

A location is a place where assets are operated, stored, or repaired. You can use the Places page in the Manage Assets Work Center to view, add, or edit information about locations, service addresses, or systems.

Using systems of locations and specifying the location for assets on asset records provides the groundwork for gathering and tracking valuable information about assets, including the history of the asset's movement from location to location and asset performance at specific sites.

After you enter initial details about a location, essential information about the location is displayed on a card on the Places page. When you select a card, you can use the following tabs to add, change, or view information about the location.

Tab	Description
-----	-------------

Tab	Description
Locations	<p>The Locations tab displays tiles with the following information about a location:</p> <ul style="list-style-type: none"> • Service address • Type of location, such as operating or repair location • Status of the location, such as operating or decommissioned • GL Account that is associated with the location • Assets that are in this location • Other locations that are related to this location, such as child or parent locations <p>In addition, you can perform the following actions on the tab:</p> <ul style="list-style-type: none"> • Add the location to one or more systems • Add and edit custom location types
Service Addresses	You can add, view, or change details about the physical address of the location.
Systems	You can add, view, or change the systems that organize your locations into logical hierarchies. You can also designate the primary system for a site.

- [Defining locations](#)
Defining locations is an important part of planning your asset management implementation. Locations are associated with assets and affect many asset management processes, including work management, purchasing, and asset tracking.
- [Systems](#)
A system is a group of locations that is organized into a logical hierarchy of parent and child locations to help you track assets and manage work more effectively.
- [Location import guidelines](#)
The CSV template file that you download from the Manage Assets Work Center includes ten columns for importing locations data.
- [Adding locations to systems](#)
In the Manage Assets Work Center, you can add operating locations to systems.
- [Adding location types](#)
On the Places page in the Manage Assets Work Center, you can add location types to organize your locations into meaningful categories for your business.

Defining locations

Defining locations is an important part of planning your asset management implementation. Locations are associated with assets and affect many asset management processes, including work management, purchasing, and asset tracking.

When planning locations, analyze the way that your teams and business segments define locations.

For some businesses, a location can be a city, a town, multiple buildings, a single building, a room in a building, or segmented parts of a room. To meet your business requirements, ask questions about why your company needs locations that are defined in these ways. You need to differentiate what is considered a location from what is considered an organization, a site, or even a storeroom. The answers to the questions can help you to build your location hierarchies. This location-related information is used with many areas of asset management, including work orders, assets, and service requests.

You can organize locations into systems, which are logical hierarchies that represent functional areas of your organization. One system in a site must be designated as the primary system. The primary system is the first system that is associated with a site and represents the primary location hierarchy for the site. If necessary, you can add other systems. The systems can be based on usage or physical qualities that locations have in common. For example, you can create an Electrical system to help you manage electrical equipment.

Analyze the types of locations that you need to manage and use that analysis to plan a successful implementation.

Related concepts

- [Systems](#)

Systems

A system is a group of locations that is organized into a logical hierarchy of parent and child locations to help you track assets and manage work more effectively.

You can use systems to categorize the use or physical qualities of locations and to build a hierarchy of locations within a site. For example, a system can represent a group of buildings at a site or even the whole site.

A site can have multiple systems, but one system in the site must be designated as the primary system. The first system that is associated with a site is automatically the primary system, but you can designate a different system as the primary system if necessary. The primary system must be hierarchical, meaning that there is a parent-child relationship between each location in the system.

Consider the following factors when you add locations to systems.

Location Type

Each location has a location type. Location types are associated with internal type values that are provided for locations in the product's business logic. For example, OPERATING and SALVAGE are internal type values in the business logic. You cannot add or remove internal values. However, you can create new location type values that are associated with an internal value.

For example, you might specify custom values, such as Datacenter or Warehouse, and associate them with the internal value OPERATING. Then, your users can select the value that is the best match for their location type.

Only locations that have a type that is based on the internal value OPERATING can be assigned to systems.

Parent-child Relationships

The first location that is added to a system is the top-level location in the system.

The second location that is added becomes the child to the top-level location.

Any location that is added later must be a child to the top-level location or to another location that exists in the system.

A location can belong to more than one system. When a location belongs to more than one system, it can have a different parent in each system. However, within a system, a location can have only one parent.

Location import guidelines

The CSV template file that you download from the Manage Assets Work Center includes ten columns for importing locations data.

You must provide a value for the LOCATION and SITEID columns. For columns that are optional, a default value is supplied if you do not provide a value. For columns that are conditional, values are required under specific conditions, which are described in the notes in the following table.

Table 1. Guidelines for importing location data

Field	Description	Field Type	Required	Max Characters	Notes
LOCATION	The short unique identifier of the location.	Upper case alphanumeric	Required	12	
DESCRIPTION	The name or description of the location.	Alphanumeric	Optional	100	Add a description to provide a meaningful reference to the location.
TYPE	The type of the location.	Uppercase alphanumeric	Optional	16	Values for location type include REPAIR, OPERATING, and HOLDING. If no location type is specified, the default value OPERATING is applied to the location. You can specify only one HOLDING location per site.
STATUS	The status of the location.	Uppercase alphanumeric	Optional	20	Values for location status include ACTIVE, NOT READY, and DECOMMISSIONED. If no status is specified, the default status ACTIVE is applied to the location.
SITEID	The unique identifier of the site for the location.	Uppercase alphanumeric	Required	8	Site ID of the location to be added or modified. Sites are facilities or subdivisions in an organization where work and supply chain activities are managed. Each site can track inventory and related data separately from other sites. Sites do not have to be physical locations.
LOCHIER_LOCATION	The unique identifier of the location that you are adding or modifying.	Uppercase alphanumeric	Conditional	12	The unique identifier of the location within the system hierarchy. When you add a location to a system or change the parent of a location in a system, you must provide a value in this field. The value must be the same value that is specified in the LOCATION field.
LOCHIER_SITEID	The unique identifier of the site that you are assigning the location to.	Uppercase alphanumeric	Conditional	8	When you add a location to a system or change the parent of a location in a system, you must provide the Site ID of the location that you specified for LOCATION.
LOCHIER_SYSTEMID	The unique identifier of the system that you are assigning the location to.	Uppercase alphanumeric	Conditional	12	When you add a location to a system or change the parent of a location in a system, you must provide the System ID of the location that you specified for LOCATION.
LOCHIER_PARENT	The unique identifier of the parent that you are assigning the location to.	Uppercase alphanumeric	Conditional	12	If the location that you are adding is the first location in a system, do not provide a value for this attribute. By default, the first location that you add becomes the top-level location, which has no parent. For other locations that you add, you must specify a parent location.
LOCHIER_NEWPARENT	The unique identifier of the new parent that you are assigning the location to.	Uppercase alphanumeric	Conditional	12	When you assign an existing location in a system to a different parent location that already exists in the system, specify a value for the LOCHIER_NEWPARENT attribute. Assigning a new parent removes the original parent assignment of the location.

Adding locations to systems

In the Manage Assets Work Center, you can add operating locations to systems.

About this task

Only locations that have a type that is based on the internal value of OPERATING can be assigned to systems.

Because there can be only one top-level parent location in a system, in most cases, when you add a location to a system, you must also specify a parent for the location. After you select a system, a list of the locations in that system is displayed, and you can select a parent for the location that you are adding.

Procedure

1. On the Locations tab of the Places page, select the card for the location that you want to add to a system.
2. In the Relationship section of the card details page, click Add to system.
3. From the System list, select the system that you want to add the location to.
4. From the Location list, which appears after the system is selected, select the parent location that you want to add this location to. The parent that you select is displayed in the Relationship section.

Related concepts

- [Systems](#)

Adding location types

On the Places page in the Manage Assets Work Center, you can add location types to organize your locations into meaningful categories for your business.

About this task

Each custom type that you add is a synonym of an internal value that is provided for location types in the product's business logic.

You cannot add or remove internal values. However, you can create new location type values that are based on an internal value. For example, OPERATING is an internal value for location types. You can specify values, such as Warehouse, Datacenter or Office, all of which use the internal value OPERATING. Your users can select the type that is the best match for their location. The same rules that apply to locations of type OPERATING also apply to locations with the type Warehouse, Datacenter or Office.

The following business rules apply to location types that you create:

- You cannot delete a location type if it is a default location type.
- You cannot delete a location type if it is associated with any location record.
- You cannot edit a location type to remove its default status. Instead, you must designate a different type as the default location type, which removes the original type as the default. After you save, you can delete the original location type.

The location type value that you add must be a unique identifier.

Procedure

1. In the Manage Assets Work Center, select the Places page and open a location.
2. Edit the Type tile.
3. On the Location Type panel, click Manage location types.
4. Click Add type.
5. Enter the following information:

Field	Description
Location type description	A meaningful, short description of the location type
Location type	A unique identifier for the location type
Internal value	The internal value to associate with the new location type

6. Click Add location type.
The location type that you added is displayed in the list of location types.
7. Optional: If you want to make the new location type the default, edit the row for the location type, select in the Default field, and save the location type. The type that you designated becomes the default location type, and the original default location is no longer the default.
8. When the location type is complete, click Done.

Location import guidelines

The CSV template file that you download from the Manage Assets Work Center includes ten columns for importing locations data.

You must provide a value for the LOCATION and SITEID columns. For columns that are optional, a default value is supplied if you do not provide a value. For columns that are conditional, values are required under specific conditions, which are described in the notes in the following table.

Table 1. Guidelines for importing location data

Field	Description	Field Type	Required	Max Characters	Notes
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STATUS	The status of the location.	Uppercase alphanumeric	Optional	20	Values for location status include ACTIVE, NOT READY, and DECOMMISSIONED. If no status is specified, the default status ACTIVE is applied to the location.
SITEID	The unique identifier of the site for the location.	Uppercase alphanumeric	Required	8	Site ID of the location to be added or modified. Sites are facilities or subdivisions in an organization where work and supply chain activities are managed. Each site can track inventory and related data separately from other sites. Sites do not have to be physical locations.
LOCHIER_LOCATION	The unique identifier of the location that you are adding or modifying.	Uppercase alphanumeric	Conditional	12	The unique identifier of the location within the system hierarchy. When you add a location to a system or change the parent of a location in a system, you must provide a value in this field. The value must be the same value that is specified in the LOCATION field.
LOCHIER_SITEID	The unique identifier of the site that you are assigning the location to.	Uppercase alphanumeric	Conditional	8	When you add a location to a system or change the parent of a location in a system, you must provide the Site ID of the location that you specified for LOCATION.
LOCHIER_SYSTEMID	The unique identifier of the system that you are assigning the location to.	Uppercase alphanumeric	Conditional	12	When you add a location to a system or change the parent of a location in a system, you must provide the System ID of the location that you specified for LOCATION.
LOCHIER_PARENT	The unique identifier of the parent that you are assigning the location to.	Uppercase alphanumeric	Conditional	12	If the location that you are adding is the first location in a system, do not provide a value for this attribute. By default, the first location that you add becomes the top-level location, which has no parent. For other locations that you add, you must specify a parent location.
LOCHIER_NEWPARENT	The unique identifier of the new parent that you are assigning the location to.	Uppercase alphanumeric	Conditional	12	When you assign an existing location in a system to a different parent location that already exists in the system, specify a value for the LOCHIER_NEWPARENT attribute. Assigning a new parent removes the original parent assignment of the location.

Configuring autonumbering for assets and locations

To automatically generate a unique identifier when a user creates an asset or location record in the Manage Assets Work Center, administrators can configure autonumbering for locations and assets.

About this task

After you set up autonumbering, when a user creates a record, the record identifier field begins with the seed value that you specify as a starting point. Each time a record is added, the autonumber is incremented by one.

Procedure

1. In the Organizations application, select the organization for which you want to set up autonumbering.
2. From the More Actions menu, select the Autonumber Setup action and choose the Site Level option.
3. In the Site Level window, select the site that you want to specify autonumbers for.
4. In the Autonumber for Site table, click New Row.
5. In the Autonumber Name field, search for the attribute that you want to autonumber.
For example, you can search for asset to find the assetnum attribute.
6. In the Seed field, specify the value for the starting point for the numbering.
7. Optional: To display a value before the autonumber, specify a value for prefix.
For example, AN, for asset number, can precede the autonumber.
8. Click OK.

Work Supervision Work Center

The Work Supervision Work Center facilitates the work management activities of supervisors. As a supervisor, you can manage the workload of technicians and assign owners to the work.

Note: Starting in Maximo Application Suite 8.9 and Maximo Manage 8.5, this work center is no longer available. The information that is provided here applies only to Maximo Manage 8.4 and earlier versions.

Before you can access the Work Supervision Work Center, an administrator must add you to the security group template for the Work Center. Security group templates are provided to enable access to work centers and tools and tasks.

The Work Supervision Work Center organizes your activities into three main pages: Work Progress, Closed Work, and Review Service Requests.

Work Progress

Work supervisors create and manage work orders on the Work Progress page.

The Work Progress page displays a card for each work order. The page organizes your work orders into four sections that correspond to the tasks you perform as the work progresses through its lifecycle. On laptops and tablets, the sections are sequential, and a work order progresses through its lifecycle from approving work to completing work.

The following table summarizes the tasks that you can perform in each section.

Section	Description
Approve Work	<p>The Approve Work section displays work orders that are not approved. When you review work orders, you can complete the following actions:</p> <ul style="list-style-type: none">• Quickly approve a work order directly from a card after you review the description of the problem, the priority, the location, and when the work is scheduled to start• Add details to the work plan, such as the tasks, labor, items, tools, or services that are needed to complete the work• Assign an owner or owner group to the work order• Assign labor and crafts• Add comments to communicate with your technicians• Add attachments
Assign Owner	<p>The Assign Owner section displays work orders that are not assigned to an owner or owner group. You can specify an owner or owner group. The owner can then access the work order in the Work Execution Work Center.</p>
Monitor Work	<p>The Monitor Work section displays work that is assigned to an owner or owner group. You can monitor work orders that are in progress. You can view when the work started and the scheduled finish time, and you can add comments to communicate with the owner of the work order.</p>
Close Work	<p>The Close Work section displays work that your technicians completed. When a work order is completed, you can close the work order, or you can select multiple work orders to close. Before you close the work order, you can review the work details that technicians reported, such as the time that was spent and the items, materials, tools, and services that were used.</p> <p>You can also approve outstanding labor transactions and create labor transactions for your technicians. If required, you can create follow-up work.</p>

You can expand each section to full screen mode.

After you expand the sections, you can choose to display work orders in either a card format or a list format.

When work orders are in list format, you can select multiple records and apply actions to them. For example, you can select 10 work orders and approve them in one action.

Closed Work

When work is completed and you close the work order, you can review all work orders that you closed on the Closed Work page. You can also view any work that was canceled.

Review Service Requests

On the Review Service Requests page, you review requests and then create work orders for service, provide comments to the requester, or close requests. The page provides search capability and the ability to filter and sort service requests.

- [Work order management](#)
In the Work Supervision Work Center, a card displays essential information about each work order. You can select the card to view, enter, or update details about the work.
- [Work orders and job plans](#)
As a supervisor, you can add job plans to work orders that you create in the Work Supervision Work Center.
- [Work orders and inspections](#)
As a supervisor, you can add inspections to work orders that you create in the Work Supervision Work Center.
- [Creating work orders](#)
Work supervisors create work orders on the Work Progress page in the Work Supervision Work Center.
- [Reviewing service requests](#)
As a supervisor, you can review service requests on the Review Service Requests page in the Work Center and create work orders to fulfill requests.

Work order management

In the Work Supervision Work Center, a card displays essential information about each work order. You can select the card to view, enter, or update details about the work.

To create work orders for assets and locations, click Create work on the Work Progress page and enter information about the work.

After you enter initial details about the work and save the work order, you can use the additional tiles on the Details tab and extra tabs to add other information about the work. Each tab displays the tiles and action features that help you manage technicians and work orders, as shown in the following table.

Tab	Description
Details	<p>You can view, add, or edit the following important information about the work:</p> <ul style="list-style-type: none"> • Details about the work's status, priority, and type of work • Assets that are associated with the work • Locations and the site that are associated with the work • Problems and failures that are associated with the work • Job plan that is associated with the work • Inspections that are associated with the work • Site address • Schedule for the work, including scheduled start and finish dates, target start and finish dates, and duration of the work • Related records, such as follow-up work orders, parent or child work orders, and the originating record • Responsible parties for the work, including the person who reported it, the technician or group that owns it, and the supervisor or lead who manages the work
Inspections	You can view inspections that are associated with this work order.
Plans	You can add tasks, labor, items and materials, services, and tools that are required to complete the work.
Assignments	You can use Assignments as an alternative way to find labor for a work order if you do not want to use the Owner or Owner Group features. Assignments are a more powerful way to assign work. Using Assignments, you can add crews and you can assign multiple labors to a job, for example, crafts with different craft and skill levels. Assignments also use a labor's shift and calendar to determine availability.
Comments	You can add comments to communicate with your technician about the work.
Attachments	You can add attachments, such as pictures or other files.
Reported Work	<p>You can review the work that was reported by the technician.</p> <ul style="list-style-type: none"> • Time that was spent completing the work • Items or materials that were used • Tools that were used • Services that were used • Reported failures and information about problems, causes, and remedies <p>If necessary, you can add time to the work order.</p>

Work orders and job plans

As a supervisor, you can add job plans to work orders that you create in the Work Supervision Work Center.

Job plans that are used in the Work Supervision and Work Execution Work Centers are created in the Job Plans application.

In the Work Supervision Work Center, supervisors can add job plans to work orders on the Job Plan tile that is available when a work order is created. When a job plan is associated with a work order, the Plans tab displays information about tasks, labor, items, services, and tools that are associated with the work. Supervisors can also add tasks, labor, items, services, and tools if necessary.

For more information about creating job plans, see the documentation for the [Job Plans application](#).

Work orders and inspections

As a supervisor, you can add inspections to work orders that you create in the Work Supervision Work Center.

Inspections that are used in the Work Supervision and Work Execution Work Centers are created with the Manage Inspection Forms tool.

In the Work Supervision Work Center, supervisors can add inspections to work orders on the Inspections tile, which is available after a work order is created and saved. Supervisors can also associate a specific inspection form with the tasks that they add on the Plans tab.

When an inspection is associated with a work order, an Inspections tab is displayed for that work order in the Work Supervision and Work Execution Work Centers. Supervisors and technicians can view information about the inspection and, if necessary, launch an inspection to complete the work.

For more information about creating inspections, see [Manage Inspection Forms tool](#).

Creating work orders

Work supervisors create work orders on the Work Progress page in the Work Supervision Work Center.

About this task

When you click Create work on the Work Progress page, you can enter essential details about the work. After you save the work order, a number is assigned to the work order, and you can enter more details about the work.

Procedure

1. Click Create work and enter the essential details about the work, such as status, scheduling information, and related records.
2. Save the work order.
A number is assigned to the work order, and additional tiles and tabs are available.
3. Add more details, such as information about failures, problems, and inspections. On the tabs, enter information, such as plans, comments, and attachments.

Reviewing service requests

As a supervisor, you can review service requests on the Review Service Requests page in the Work Center and create work orders to fulfill requests.

The Review Service Requests page displays service requests for your default site. If necessary, you can choose to view service requests for all sites.

From the Review Service Requests page, you can use the multi-select feature to perform the following actions on the service requests that you select:

- create work orders
- change the status of the service request
- assign an owner or owner group

When a service request is canceled, the status on the Originating Record tile on the Details tab of a work order is updated. You can check the status to determine whether to create a work order or to cancel one that you already created.

Work Execution Work Center

As a maintenance technician, you can use the Work Execution Work Center on a computer or mobile device to manage work orders that you own.

Note: Starting in Maximo Application Suite 8.9 and Maximo Manage 8.5, this work center is no longer available. The information that is provided here applies only to Maximo Manage 8.4 and earlier versions.

Before you can access the Work Execution Work Center, an administrator must add you to the security group template for the Work Center. Security group templates are provided to enable access to work centers and tools and tasks.

The Work Execution Work Center organizes your work orders and displays them on tabs that are based on due dates: Overdue, Today, Tomorrow, Next 3-5 Days, Completed, and All.

Each work order card displays the most essential information about the work. Select a card to open a work order. When you open a work order, several tabs organize the tasks that are needed to review and manage the work order: Details, Inspections, Plans, Comments, and Attachments. Each tab displays the tiles and action features that help you complete your work.

When you select Start on a card to begin work, the work order's status changes to in progress, and the timer tracks the time that you spend resolving the issue. You can stop and restart the timer if needed.

The following table summarizes the tasks that you can perform in each tab.

Tab	Description
Details	You can add details or view important information about the work, including status, priority, the assets and locations that are associated with the work, work schedule, and other related records. You can also perform the following actions: <ul style="list-style-type: none">• Create follow-up work orders• Report asset downtime• Enter meter readings for assets and locations• Select Report Work to report the following information:<ul style="list-style-type: none">◦ The actual time that you spent completing the work◦ The items or materials that you used◦ The tools that you used◦ Any failures and information about problems, causes, and remedies
Inspections	You can view inspections that are associated with this work order and, if necessary, complete an inspection as part of the work.
Plans	You can review work plans, which can include the tasks, items and materials, and tools that are required to complete the work.
Comments	You can add comments to communicate with your supervisor about the work.
Attachments	You can add attachments, such as pictures or other files.

When all work is done, you can change the status of the work order to completed. Completed work orders are reviewed and closed by the supervisor.

- **Creating work orders**
If your administrator gives technicians the ability to create work orders, you can create a work order in the Work Execution Work Center.

Creating work orders

If your administrator gives technicians the ability to create work orders, you can create a work order in the Work Execution Work Center.

About this task

If your administrator configures the Work Center to allow technicians to create work orders, you can click Create work and enter essential details about the work. After you save the work order, a number is assigned to the work order, and you can enter more details about the work.

Administrators can also configure the Work Center to display work that you create in a separate tab.

Procedure

1. Click Create work and enter the essential details about the work, such as priority, assets or locations that are associated with the work, and scheduling information.
2. Save the work order.
A number is assigned to the work order, and additional tiles and tabs are available.
3. Add more details, such as information about failures and problems, service addresses, and follow-up work orders. On the tabs, enter information, such as plans, comments, and attachments.

Work Center Configuration

Business analysts and administrators can evaluate business requirements and configure the top-level information for the Work Supervision and Work Execution Work Centers to make them more specific to certain user roles.

Getting started

You can log in to a Work Center and enter Design mode to see a representation of that Work Center. When you hover on parts of the Work Center, configurable elements are outlined. You can configure the following parts the Work Execution Work Center and the Work Progress page of the Work Supervision Work Center:

- Header elements, such as the name of the Work Center and the display name.
- The subheader in Work Execution.
- The subset of cards that each panel or tab can display.
- Field labels and attributes in cards.

After you configure the content, you can save configurations as a draft version and save comments to your draft version. The next time that you open the Work Center in Design mode, you can view or modify the saved draft. When you're finished making changes, you can add comments about the version and publish the configured Work Centers to your users. You also can delete the saved draft and start from the most recent published version. Version history is available to view.

A few other things to know

- One person at a time can configure a Work Center, because changes might be overwritten or not saved.
- The configuration features are supported on desktops and notebooks that have a recent Chrome browser. They are not supported on tablets or smartphones or with other browsers.
- Configuration changes are available in the base language only.
- [Configuring header information](#)
You can configure the text for header elements in the Work Centers. Header elements are the display name of the Work Center and the header label.
- [Configuring panel or tab information](#)
You can configure or hide several types of information in panels or tabs of the Work Centers.
- [Configuring cards](#)
You can configure cards on a panel or tab of the Work Execution or Work Supervision Work Center to [hide and show field labels and attributes](#), [change field labels](#), or [replace field attributes or labels and attributes](#).
- [Saving and publishing configurations](#)
As you configure a Work Center, you can save your changes. After you review your changes, publish the Work Center so that the configuration changes are available to your users.
- [Viewing revision history](#)
You can view information about the revisions to the Work Center, including the current draft version, the current published version, and previously published versions.

Configuring header information

You can configure the text for header elements in the Work Centers. Header elements are the display name of the Work Center and the header label.

About this task

- Configuration changes that you make to the header label and the Work Center display name are available immediately. They do not need to be published.

- You can delete the text for the header label if you don't want to show a label.
- Changes that you make to the display name of the Work Center appear to all users of that Work Center and appear in the list of Work Centers in the Go To menu.

Procedure

1. In the Work Execution or Work Supervision Work Center, click Edit to enter Design mode.
 2. Select the header label or display name to open the Configure workspace component dialog box. Edit the text and save your changes.
- **Configuring subheader information**
In the Work Execution Work Center, you can configure the label that says Work Orders.

Configuring subheader information

In the Work Execution Work Center, you can configure the label that says Work Orders.

Procedure

1. In the Work Execution Work Center, click Edit to enter Design mode.
2. Select the Work Orders text to open the Configure component dialog box.
3. Make any of the following changes and then save them:
 - Edit the Label text. Label text is required, even if the label is hidden.
 - Hide or show the label by setting Display to Off or On.

Configuring panel or tab information

You can configure or hide several types of information in panels or tabs of the Work Centers.

About this task

The records that are displayed in the six work panels in the Work Execution Work Center and the four tabs in the Work Supervision Work Center are derived from queries. You can edit the applied query for a panel or tab to show different record results. For example, you can configure a panel in the Work Execution Work Center to show only emergency work orders that are due within the next four hours.

The product is delivered with each panel and tab configured with an object structure query and REST query. If you configure a panel or tab to use different queries or types of queries and save the change, the default information is removed. You can retrieve copies of the default queries by clicking Get help and reviewing the REST query document.

Procedure

1. In the Work Execution or Work Supervision Work Center, click Edit to enter Design mode.
You can make any of the following changes:
 - Hide or show the display of a panel or tab by setting Display to Off or On. If a panel or tab is hidden, a strikethrough mark is shown on the label text in Design mode. If the change is published, the other panels or tabs resize to take more space.
 - Edit the panel or tab name. A name is required, even if the panel or tab is hidden.
 - Edit the query that selects the content that is shown in a panel or tab. A help document that contains examples is available for these queries by selecting Get Help.
Select one the following queries or combination of queries:
 - Object structure query
Displays content from the object structure that is applicable to a user of this Work Center. You can select a different query from the list.
 - Saved query
Select from a public query for work orders, including queries for the Quick Reporting application. To view more information about a public query, click Launch to open the associated application. Then, view public queries on the List tab.
 - REST query
Retrieves and filters records based on parameters that you specify. You can test the REST query before you save it.
 - Object structure and REST query
A combination of the object structure query and the REST query. You can test the REST query before you save it.
 - Saved and REST query
A combination of the Saved and the REST query. You can test the REST query before you save it.
2. Save your changes.

Configuring cards

You can configure cards on a panel or tab of the Work Execution or Work Supervision Work Center to [hide and show field labels and attributes](#), [change field labels](#), or [replace field attributes or labels and attributes](#).

Before you begin

1. In the Work Execution or Work Supervision Work Center, click Edit to enter Design mode.
2. In a panel or tab, select the representation of the card to open the Design card dialog box.

About this task

- In the Work Execution Work Center, you work with one card for all tabs in the Work Center. In the Work Supervision Work Center, you work with one card for each panel in the Work Center.
- Some fields consist of a label and a field value, or *attribute*. Other fields consist of the attribute only. When you configure different elements on a card, you might work with different configuration dialog boxes. In the following tasks, these dialog boxes are described generically as "the configuration dialog box."
- Image attributes and card actions are not currently configurable.

Hiding or showing field labels or attributes

Hidden fields are shown in Design mode with a strikethrough style. If the change is published, other fields move to take the space.

Procedure

1. Select a field in the card to open the configuration dialog box.
2. Set the Display control to Off or On.
3. Click OK to close this dialog box.
4. In the Design card dialog box, save your changes.

Changing field labels

The first label changes that you want to make available to users must be published. Subsequent changes are made available to users when the changes are saved. They do not need to be published.

Procedure

1. Select a field label in the card to open the configuration dialog box.
2. In the Label field, edit the text.
If the field also has an attribute, you also can delete the label text so that only the associated attribute value is displayed on the card.
3. Click OK to close this dialog box.
4. In the Design card dialog box, save your changes.

Replacing field labels and attributes or field attributes

In some fields, you can replace both labels and attributes. In other fields, you can replace only attributes. Examples of attribute-only fields include statuses and work types.

The Objects list includes the WORKORDER object and child objects that have a 1:1, or *single cardinality*, relationship with the WORKORDER object. For example, a work order can be associated with one location.

Procedure

1. In the Objects list, select the WORKORDER object or an object that has a relationship with the WORKORDER object.
You can expand or narrow the selection scope by setting the Show only required database fields control to Off or On.
2. If a selected child object has more than one relationship to the WORKORDER object, select the appropriate relationship in the Relationships list.
3. In the Search for field value field, enter a term to search field and attribute names and descriptions.
4. In the Fields list, select and drag a field to replace a field in the card and save your changes.

Example

In the following example, you are configuring a card for a work supervisor. This work supervisor approves PM work orders and often wants to know the identifier of the originating PM record. You want to replace the Location field label and attribute with the PM field label and attribute.

1. In the Work Supervision Work Center, you enter Design mode and select the card in the Approve Work panel. The Design card dialog box opens.
2. You narrow the selection scope by setting the Show only required database fields control to On.
3. In the Objects list, select the child PM object. The Relationships list includes one relationship for PM. You select the Information icon to learn more about the relationship.
4. In the Search for field value field, you enter "pmnum" and search.
5. In the Fields list, you select the PM field. You select the Information icon to learn more about the field. This field is the field that you want on the card, so you select PM and drag it to replace the Location field in the card.
6. You save your changes.

Saving and publishing configurations

As you configure a Work Center, you can save your changes. After you review your changes, publish the Work Center so that the configuration changes are available to your users.

About this task

As you work in various configuration dialog boxes, you can save changes to the draft Work Center. All saved, unpublished changes accumulate in this draft. When you publish the draft, it becomes the active version, and the previous active version becomes an inactive version.

Procedure

1. In the Work Execution or Work Supervision Work Center, click Edit to enter Design mode.
2. Click Manage to open the Manage Work Center configuration dialog box.
3. Select one of the following options:

Option	Description
View revision history	Opens the Work Center design history dialog box, where you can review data and remarks about each revision and delete the current draft. The active version is the published version. Inactive versions are previously published versions.
Save as draft	Opens the Save your Work Center dialog box, where you can enter and save comments about the draft.
Publish as active Work Center	Opens the Publish your Work Center dialog box, where you can enter comments about the version and then publish it as the active version. The active version is available to your users.
Exit design	Exits Design mode without publishing. If you made changes and want to enter comments about them, select Save as draft before you exit.
Close	Closes the dialog box and returns you to the Work Center in Design mode.

Viewing revision history

You can view information about the revisions to the Work Center, including the current draft version, the current published version, and previously published versions.

Procedure

Select **Manage > View revision history** to open the Work Center design history dialog box. Depending on the configuration activity in this Work Center, you might see any of the following revision statuses:

Draft

The version of the Work Center that contains unpublished changes to the active version. A draft is viewable in Design mode only. A Work Center can have one draft version. The draft can be deleted.

Active

The version of the Work Center that is active to your users. This Work Center is visible when you leave Design mode. A Work Center can have one active version.

Inactive

The previous active versions of the Work Center. The most recent one was replaced by the active version. A Work Center can have multiple inactive versions.

Managing inspection forms

In the Manage Inspection Forms tool, you create inspection forms by adding questions and defining responses. The inspection forms that you create are then available to inspectors in the Conduct an Inspection tool.

Before you can access the Manage Inspection Forms tool, an administrator must add you to the security group template for the tool. Security group templates are provided to enable access to work centers and tools and tasks.

When you create an inspection form, the form is added to the form library in draft status. You can add optional or required questions and define the type of answers, such as text, numbers, meters, attachments, or selectable options that you can choose as a valid answer. You can also provide extra instructions for the inspector, and you can group questions together. You can also specify a type for the form, such as a condition assessment or inspection.

You can add conditions to the response fields of existing questions on inspection forms to gather more information. You can determine which additional response fields appear to inspectors, depending on the answers they gave to inspection form questions. For example, a question might ask, "Is corrosion present?" If the response is yes, another question might ask, "What percentage of the area has corrosion?"

When you complete the draft form, you can change the form to active status. Activated forms are then available to use for inspections. You can also revise forms to change existing information. While the form is pending revision, the current active version is still available for use by the inspector.

When you complete an inspection form, you can view the asset, location, work order, and inspection details that are associated with the work.

You configure the REP_INSPRESULTFORM object structure so that users can create reports from inspections.

When inspections are completed, you can review the results. To view the results of a completed inspection, in the Go To menu, select Conduct Inspections and then select the Completed tab.

Because inspection forms can become complex with many form questions and conditions, the Manage Inspections Forms tool is best viewed on a full-sized screen.

- [Creating inspection forms](#)
You can create inspection forms that detail the questions and types of responses that you want to collect. The inspection forms that you create are then available to inspectors in the Conduct an Inspection tool.
- [Revising inspection forms](#)
You can create revisions of active inspection forms from the Inspection Form Library.
- [Adding conditions to inspection form responses](#)
You can add conditions to the response fields of existing questions on inspection forms to gather more information. You can determine which additional response fields appear to inspectors, depending on the answers they gave to inspection form questions.
- [Duplicating inspection forms](#)
If you want to reuse an existing inspection form as a template for a new form, you can duplicate the form and then add or remove questions and instructions.
- [Associating inspections with work records](#)
After you create inspection forms, you can associate them with assets, locations, and work orders.
- [Configuring actions for inspections](#)
By using automation scripts, system administrators can define custom actions that are available to inspectors and inspector supervisors when they complete an inspection.
- [Enabling voice-guided inspections](#)
You enable the voice inspection feature so that inspectors can complete hands-free inspections on a mobile device. The inspection form is read aloud to the inspector and the inspector's verbal responses are recorded in the inspection form.

Creating inspection forms

You can create inspection forms that detail the questions and types of responses that you want to collect. The inspection forms that you create are then available to inspectors in the Conduct an Inspection tool.

Procedure

1. In the Manage Inspection Forms tool, click Create Form.
2. Enter a name for the form.
3. Enter a form type. For example, select condition assessment.
4. Click Form Instructions to add any specific instructions for inspectors to the inspection form. Click Save.
5. Click Add Question. In the Question field, enter the question that you want to add to the inspection form. For example, to record an odometer reading, enter `What is the odometer reading?`.
6. From the Response Fields menu, choose the type of response that you want the inspector to record for that question. For example, if you want the inspector to record the time and date of the reading, select Date/Time.
7. If you want a response to be required, set Required to Yes.
8. Enter an example of the response you want to see for inspectors to reference.
9. Optional: Choose multiple options from the Response Fields menu for a single question. For example, select Meter Readings to give the inspector a location to record the odometer reading.
10. When you have finished adding the response fields for the question, click Done.
11. Optional: Add more questions to the form.
12. Click Save to save the inspection form.

What to do next

- To make the inspection form available to inspectors, you must change the status of the form to Active. In the Inspection Form Library, click the Draft switch to activate the form.
- You can associate the inspection form with specific assets and locations. In the Assets or Locations application, select the record, and choose Associate Inspection Form from the Actions menu.

Revising inspection forms

You can create revisions of active inspection forms from the Inspection Form Library.

Procedure

1. In the Manage Inspection Forms tool, in the Inspection Form Library, select the inspection form that you want to revise.
2. On the Revision History page, click Create Revision.
The new revision line appears in the revision list.
3. Click the pencil icon for the revision line that you want to edit.
4. Edit the inspection form. You can change the form type, or add and delete questions and instructions.
5. When you're finished making your changes, click Save.
6. Click the preview icon to review the form.

What to do next

To replace the existing inspection form, you must change the status of the form to Active. From the Inspection Form Library, click the Draft switch to activate the form.

Adding conditions to inspection form responses

You can add conditions to the response fields of existing questions on inspection forms to gather more information. You can determine which additional response fields appear to inspectors, depending on the answers they gave to inspection form questions.

About this task

Conditions can only be added to responses on existing form questions that are defined as single choice response or characteristic meter readings. The inspection form must be in Draft or Pending Revision status.

Procedure

1. In the Manage Inspection Forms tool, in the Inspection Form Library, select the inspection form that you want to add conditions to.
2. On the Revision History page, click Conditional Settings .
3. In the Groups and Questions column, select the question whose response you want to add a condition to. Click Add Condition.
4. Select the response that you want to add a condition to, and then select the response field that you want managed by the condition.
5. Define whether the selected response field is visible. If you want the response field to be hidden from inspectors, turn off the Visible toggle.
6. Define whether the selected response field is required.
7. Click Save.

Duplicating inspection forms

If you want to reuse an existing inspection form as a template for a new form, you can duplicate the form and then add or remove questions and instructions.

Procedure

1. In the Manage Inspection Forms tool, in the Inspection Form Library, click the Duplicate icon for inspection form that you want to duplicate.
2. Change the name of the inspection form. You can choose a new form type or add additional instructions.
3. Add, edit, or delete inspection form questions.
4. Save the inspection form.

What to do next

To make the inspection form available to inspectors, you must change the status of the form to Active. In the Inspection Form Library, click the Draft switch to activate the form.

Associating inspections with work records

After you create inspection forms, you can associate them with assets, locations, and work orders.

Associating inspection forms with assets and locations

In the Assets application or the Locations application, select the records that you want to associate with an inspection form and choose Associate Inspection Form from the Actions menu. Select the inspection form, click OK, and save the record.

Associating inspection forms with work orders

You can associate inspection forms with work orders in the Work Order Tracking application. When you open the work order, you can associate an inspection form with it in any of the following ways:

- In the Job Details section of the Work Order tab, click the Detail menu in the Inspection Form field to open the Select an Inspection Form window.
- In the Multiple Assets, Locations and CIs section of the Work Order tab, click the Detail menu in the Inspection Form field for the line you want to associate the form with.
- On the Plans tab, you can associate an inspection form with a child work order in the Children section or a task in the Tasks section.

Configuring actions for inspections

By using automation scripts, system administrators can define custom actions that are available to inspectors and inspector supervisors when they complete an inspection.

Procedure

1. In the Automation Scripts application, from the More Actions menu, select Create, then select Script for Integration.
 2. In the Create Script for Integration window, in the Object Structure field, type `MXAPIINSPECTIONRES`
 3. Select the Action Processing radio button. In the Action Name field, enter a name for your script.
 4. In the Script Details section, enter a description for your script.
 5. In the Source Code field, enter the source code for your script.
 6. Click Create.
- The action is now available to associate with inspection forms in the Manage Inspection Forms tool.
7. Optional: Enable security for the action in the Object Structures application.
 - a. In the Object Structures application, open the `MXAPIINSPRESULT` record.
 - b. From the More Actions menu, select the security option that you want to apply.

Enabling voice-guided inspections

You enable the voice inspection feature so that inspectors can complete hands-free inspections on a mobile device. The inspection form is read aloud to the inspector and the inspector's verbal responses are recorded in the inspection form.

Before you begin

Voice inspections are available to customers who have IBM® Maximo® Manage, IBM Maximo Assist, and IBM Maximo Mobile. To enable voice inspections, you must ask your sales representative for the IBM Watson® service instance and API key information.

Procedure

1. In Maximo Application Suite, configure Maximo Assist for IBM Watson™ services:
 - a. Log in to Maximo Application Suite.
 - b. On the Suite administration page, select catalog from the menu, then click the Assist tile.
 - c. Select View deployment details, find your workspace, and select Go to workspace details page.
 - d. From the Actions menu, select Update configuration.
 - e. In the Configurations list, edit one of the IBM Watson services.
 - f. In the Endpoint field, specify your IBM Watson service instance.
 - g. Required: Configure the API key for IBM Watson services:
 - h. Repeat steps 1d - 1f for all other IBM Watson services in the Configurations list.
 - i. Select Apply changes and then select Activate.

Option	Description
If you are configuring IBM Watson services for the first time	Enter the API key for your IBM Watson service.
If you are updating an existing configuration for IBM Watson services.	Click Replace secret.

2. Assign the Assist user role to the inspectors who want to complete voice inspections:
 - a. On the Suite administration page, select Users from the menu, and open the user record for the inspector.
 - b. Click Edit and in the Application access section of the user record, in the Assist row, in the Access field, select User as the user role.
 - c. Save the changes and wait for the update to complete.
 - d. Repeat steps 2a - 2c for other inspectors who want to complete voice inspections.
3. In Maximo Assist, create the Assist API key:
 - a. Log in to Maximo Assist, select Configuration, API keys, and click Create API key.
 - b. Specify a name and description for the new API key.
 - c. In the Role association section, select the Voice APIs role and then click Save.
 - d. Required: In the API key successfully created dialog box, copy and save the generated API key.
The API key details are required to configure a system property for voice inspections.
4. In Maximo Manage, configure voice inspections:
 - a. Log in to Maximo Manage and in the System properties application, add the following properties:

Property	Description	Type	Value
<code>mxe.mobile.inspection.features.assistvoice</code>	Enables the voice assistant in mobile inspection forms in Maximo Application Suite.	Yorn	1
<code>mxe.mobile.inspection.features.assistvoice.epname</code>	Defines the endpoint name that is used by the voice assistant.	ALN	ASSIST_VOICE
<code>mxe.mobile.inspection.features.assistvoice.domain</code>	Defines the voice assistant domain. The domain must contain the protocol, hostname, and port of the service.	ALN	The URL of the Maximo Assist application
<code>mxe.mobile.inspection.features.assistvoice.apikey</code>	Defines the API key that is used to authenticate the voice assistant.	ALN	The API key generated in step 3d

- b. Save your changes, select the four new properties, and then click Live Refresh.
5. Add a crontask for voice inspections:
 - a. In the Cron Task Setup application, select New crontask Definition and enter the following details:

```

Cron Task
  AssistVoiceCronTask
Class
  psdi.app.inspection.AssistVoiceCronTask
Access Level
  FULL

```

- b. Add a crontask instance with the following details:

Cron Task Instance Name
DailyTask
Schedule
1d,0,0,0,*,*,*,*
Run as User
MAXADMIN

- c. Set the crontask to active and save the definition.
6. Enable voice inspections:
 - a. In the Manage Inspection Forms tool, create a revision of the inspection that you want to enable voice inspections for.
 - b. Open Form settings, select Enable voice inspection, save the inspection, and set the revision to active.

Results

In Maximo Mobile, in the inspection record, the inspector can tap the microphone icon to start a voice inspection. Voice inspections can be completed on inspections that have a status of in progress.

Conducting inspections

In the Conduct an Inspection tool, you conduct inspections that have been defined in the Manage Inspection Forms tool. You can also review the results of completed inspections, and create unscheduled inspections as necessary.

Note: Starting in Maximo Application Suite 8.9 and Maximo Manage 8.5, this work center is no longer available. The information that is provided here applies only to Maximo Manage 8.4 and earlier versions.

As an inspector, you complete inspections and record inspection results. You can also create an unscheduled inspection form or view inspection results from the Assets, Locations, and Work Order Tracking applications. Select Go To > Conduct an Inspection in the Inspection Result field or by using the Create > Unscheduled Inspection action in the Assets and Locations applications. You can conduct bulk unscheduled inspections on assets or locations.

When an inspection form is activated, use the form to inspect an asset or location. Filter your inspections by pending, in progress, and completed status. During an inspection, filter the list of questions on the form to show the required or incomplete questions. Answers to each question are automatically saved. After you answer all required questions, review your responses in the Inspections Summary window and complete the inspection.

- [Conducting inspections](#)
As an inspector, you can complete inspections and record inspection results.
- [Creating unscheduled inspections](#)
As an inspector, you can conduct an unscheduled inspection if the need arises.

Conducting inspections

As an inspector, you can complete inspections and record inspection results.

Procedure

1. In the Conduct an Inspection tool, select the inspection that you want to conduct. You can choose from inspections that are pending or in progress. To conduct multiple inspections at the same time, hover over each inspection card until a check box appears and then select it. When you're done selecting inspections, click Open Selected.
2. When the inspection form opens, click Start or Start Batch if you're conducting multiple inspections.
3. Answer the questions in the inspection.
Answers to your questions are saved automatically. You can click Hide optional questions to see only the required questions on the form.
4. Click Complete when the inspection is finished.
5. Click Exit to return to the inspection form.
6. Optional: Click Take Action to view an inspection summary or details about the associated location or asset.
7. Click Exit again to return to the Inspections page.

Creating unscheduled inspections

As an inspector, you can conduct an unscheduled inspection if the need arises.

Procedure

1. On the Inspections page of the Conduct an Inspection tool, click Unscheduled Inspection.
2. Specify the asset or location that you want to create an inspection for.
3. Select an inspection form to use for the inspection. You can choose from recommended forms that are associated with the asset or location, or you can search through all forms.
4. When the inspection form opens, click Start.
5. Conduct the inspection.
6. Click Complete when the inspection is finished.

7. Click Exit to return to the inspection form.
8. Click Exit again to return to the Inspections page.

Submitting service requests

You use the Submit a Service Request tool to quickly create service requests by using your computer or mobile device. You can also monitor the status of existing service requests that you created or are affected by.

Note: Starting in Maximo Application Suite 8.9 and Maximo Manage 8.5, this work center is no longer available. The information that is provided here applies only to Maximo Manage 8.4 and earlier versions.

You add new service requests by specifying the request category, identifying the location, defining the asset, and providing a description. You can upload photographs or videos to requests to provide more information.

After you enter a service request, you automatically receive notifications when the request is resolved or closed.

Before you can access the Submit a Service Request tool, an administrator must add you to the security group template for service requests. Security group templates are provided to enable access to Work Centers and Tools and Tasks.

- **Creating service requests**
You create service requests to report issues and monitor their resolution.
- **Example: Responding to a user problem**
When a user opens a service request to report a problem, a work order is created. A maintenance supervisor reviews and approves the work order, then selects a technician as the owner. A storeroom clerk supplies any parts that are required to fix the problem. As the technician completes the work, the user who opened the service request can track the progress until it is completed.

Creating service requests

You create service requests to report issues and monitor their resolution.

Procedure

1. In the Submit a Service Request tool, choose from the list of service request categories, or click Describe the Issue.
2. Describe the issue that the service request is being created for.
3. Click Next.
4. If you are entering the service request on behalf of another person, edit the information on the Affected Person screen.
5. Click Next.
6. Optional: Attach a photo or video of the problem.
7. Specify the location of the issue. You can search for a location, or you can find the location in the following ways:
 - Scan a QR code for the location.
 - Click the compass icon to use GPS to get a list of locations near you.
8. Click Set Location.
9. Specify the asset. You can search for an asset, or you can locate the asset in the following ways:
 - Scan a QR code for the asset.
 - Click the compass icon to use GPS to get a list of assets near you.
10. Click Set Asset.
11. Review your request. Select the High priority check box if applicable.
12. Click Submit Request.

Example: Responding to a user problem

When a user opens a service request to report a problem, a work order is created. A maintenance supervisor reviews and approves the work order, then selects a technician as the owner. A storeroom clerk supplies any parts that are required to fix the problem. As the technician completes the work, the user who opened the service request can track the progress until it is completed.

Who are the users involved?

Fran, an administrator in the warehouse of a beverage manufacturer, arrives to work and finds that her office is uncomfortably hot. She also notices that a rattling sound is coming from one of the air vents in the ceiling. Fran must use the Manage Service Requests application to report this problem.

Ed, a maintenance supervisor in the same company as Fran, begins his day by checking the Work Supervision Work Center to review the status of all maintenance work.

Sam, an electrician, is a technician on Ed's team. When Sam arrives to work, he opens the Work Execution Work Center to decide which work order to complete first.

Step 1: Fran opens a service request

1. Fran opens the Service Request application on her phone, scrolls through the listed categories, and selects Heating & Air.

2. On the Describe the issue screen, Fran chooses It's too hot, then clicks Next.
3. In the Additional Comments box, Fran enters `The air conditioning vent is not working and it's making weird noises.`
4. To illustrate the problem, Fran takes a video of the vent and attaches it to the service request.
5. Fran specifies her location and reviews the details of the service request to confirm that everything is correct.
6. Fran selects the Urgent request check box, because she knows she can't work in the current conditions.
7. Fran submits the service request.

Step 2: Ed reviews Fran's request

1. In the Work Supervision Work Center, Ed opens the Review Service Requests page and sees Fran's request for service.
2. Ed opens Fran's service request, reviews the problem, determines that a work order is needed, and selects Create Work to create a work order.
3. On the work order, Ed adds the tasks and items that are required to complete the work.
4. After Ed adds all the tasks and items that are needed for the work, he selects the Status tile and approves the work.
5. On the Owner tile, Ed selects Sam as the owner because this problem requires an electrician.
6. Ed enters the following comment: `Sam, I passed Fran's office on my way in and the noise from the vent is really awful.`

Step 3: Sam investigates the problem

1. In the Work Execution Work Center, Sam reviews all the work orders that he owns. He sees that Fran's problem is high priority and reads Ed's comment about the noise, so he clicks Start on that work order.
2. Sam checks the location of the problem, views the video that Fran uploaded, then grabs his tools and heads to Fran's office.
3. While Fran leaves to get a coffee, Sam inspects the fan and discovers that two of the fan blades are badly damaged and must be replaced.
4. Sam remembers that about six months ago, the company switched to a new HVAC vendor, and recently, many of the work orders involve faulty blades. Sam suspects that the blades from this new vendor might be of lower quality, so when he removes the damaged blades, he takes a photo and attaches the photo to the work order.
5. Sam also opens the Comments screen and enters the following comment to his supervisor: `Ed, we must investigate these blades from the new vendor. I seem to be replacing a lot of them recently. See the photo.`
6. Sam leaves Fran's office to get replacement blades.

Step 4: Sam fixes the problem

1. Sam returns to Fran's office and replaces the fan blades.
2. Sam clicks Stop on the work order to indicate that he is finished working and sets it to complete.
3. The work took longer than anticipated and required new fan blades, so on the Report My Work screen, Sam adds an additional 30 minutes to the time and specifies the blades as unplanned items.

Step 5: Ed closes the work order

1. In the Work Supervision Work Center, Ed monitors Sam's work and sees that the work order is now in the Close Work section.
2. Ed opens the photo that Sam attached to the work order and also suspects that the blades from the new vendor are poor quality.
3. Ed reads Sam's comment about the new HVAC vendor and enters the following comment: `Yeah recently I've noticed a lot of work orders for fans too. We'll look into it.`
4. After he reviews the work order, Ed is confident that Sam did the work correctly, so he clicks Close Work.

Step 6: Fran sees that her request is closed

1. After finishing her coffee, Fran takes out her phone and checks the Service Requests application for an update.
2. Fran sees a notification that says her service request is complete.
3. Fran returns to work in a nice cool office.

Application development

You can develop new applications and modify existing applications using the Application Designer application. You can also use Application Designer to export XML presentations, which you can then modify using a text editor before importing them with Application Designer.

- [Application framework](#)
The application framework includes user interface components for developing applications and organizational components that provide access to them.
- [Preparing the development environment](#)
Before using the Application Designer, set up the development environment and familiarize yourself with the workspace and with the design guidelines.
- [Developing applications](#)
Before you create or modify applications, review the design guidelines and explore the workspace in the Application Designer.
- [Application developer properties](#)
Each control has its own set of properties that you can set. You can also set user interface properties to control the behavior of many aspects of user interface behavior.

Application framework

The application framework includes user interface components for developing applications and organizational components that provide access to them.

The user interface consists of controls, such as text boxes, buttons, and tabs, and each control has attributes that determine its behavior. Each application has a presentation.xml file that contains all of the information that is required to build the application user interface. When you create an application, it is automatically added to the navigation structure for modules and applications.

User interface controls

Controls are predefined components that are used to construct the elements of an application window. In Application Designer, you can select individual controls, view and modify the control properties, or drag new controls into the application from the Control Palette. You cannot change the code of a control, but you can modify its behavior by specifying appropriate values in the properties window for the control. For example, you can set a control to be a required field, associate a control with a lookup table, or link a control to an event.

Some controls, such as sections, tab groups, or button groups are container controls. Most container controls serve no purpose other than to contain other controls. Controls that are not containers must be placed within a container control. In Application Designer, you can drag controls from the Control Palette onto the application workspace, and then modify the control in the Control Properties window.

The positioning of controls is relative to other controls and is not based on pixels or a grid and provides for dynamic sizing of the width of a section and its columns. For example, if a section contains fields of various widths, the width of each field is automatically set to the width of the widest field in that section.

Application XML files

Every application has a presentation.xml file that contains all the information that is required to build the application user interface. All presentation.xml files are stored in the MAXPRESENTATION table in the database. Controls are predefined components that are used to construct the elements of an application window. In Application Designer, you can select individual controls, view and modify the control properties, or drag new controls into the application from the Control Palette. You cannot change the code of a control, but you can modify its behavior by specifying appropriate values in the properties window for the control. For example, you can set a control to be a required field, associate a control with a lookup table, or link a control to an event.

The presentation.xml file for an application includes a tag for each control that is used in the application user interface. Each control has a unique ID and attributes that determine how the control behaves when you view the application. The relative location of control tags in the presentation.xml file determines the order and sequence of the user interface elements that you see in an application window.

When a user starts an application, the presentation.xml file is retrieved from the database and is placed in the memory of the application server. The application framework retrieves the code for each control and creates an HTML description of it, based on the attributes specified in the presentation.xml. The rendering process is incremental, and the application server stores HTML descriptions for each control in memory until all controls in an application window are rendered. When all HTML elements are rendered, the application server passes the HTML to the user's web browser (client). The presentation.xml file is retained in the server cache, ready for the next time a user accesses the application.

When you open an application in the Application Designer, the presentation.xml file is loaded into memory. Any changes that you make apply only to the stored version of the file until you save the application. When you save the presentation.xml, the modified information is committed to the database and you can then see the changes when you open the application.

Although you can perform most modifications to an application in Application Designer, you can edit the presentation.xml file if required. Sometimes, modifying the presentation.xml file is the most efficient approach to use, for example to change a specific term by using search and replace. In an application with multiple tabs and windows, this task requires that you open each individual window in Application Designer, which is both time-consuming and prone to error. Some applications use hidden tabs that are not visible in Application Designer. You cannot modify these tabs in Application Designer and must edit the presentation.xml file to change them.

Application organization

All applications are contained within modules. When you create an application, you must specify its module and the type of application to create. Applications are categorized into three different types although each type uses the same structure and components. The available application types are:

- A power application is the standard type of application that contains multiple tabs, a Select Action menu, and toolbar buttons.
- A self-service application is used to create a record and does not include a List Table window or a toolbar.
- A single-page application is a non-tabbed application but it can include a Select Action menu and toolbar buttons.

After you create an application, it is added to Go To menu within the module that you specify when you create it.

Preparing the development environment

Before using the Application Designer, set up the development environment and familiarize yourself with the workspace and with the design guidelines.

- **Setting up the environment**
Plan and prepare the development environment before you start working with Application Designer.
- **Exploring the workspace**
When you open an application in the Application Designer, the Workspace tab opens, containing the layout of the controls that make up the application. Within the workspace, you can select individual controls to modify them and to position new controls in the application user interface.
- **Design guidelines**
Use the Application Designer and, if necessary, the application XML files, with an appropriate design process to develop applications that are easy and efficient to use.
- **Data validation**
The system validates data to ensure that users are working with the correct data. Data can be validated on the server-side or the client-side.
- **Property configurations**
The behavior and characteristics of various user interface components can be determined by the values set as system properties or by values set for

individual controls. Filter for **webclient** in the System Properties application to view and modify interface properties. Modify properties for an individual control in the Application Designer.

Setting up the environment

Plan and prepare the development environment before you start working with Application Designer.

Procedure

1. Establish separate environments for the following activities to protect your development environment against configuration changes you make.
 - a. Perform development activities on a dedicated workstation.
 - b. Merge your configurations to a server for testing.
 - c. Migrate the tested configurations to the production environment.
2. Set the screen resolution of your monitor to 1280x768 to optimize the amount of information that you can see without scrolling.
With this screen resolution, it is easier to position the Control Palette and Properties windows outside of the application workspace where you perform configurations.

Exploring the workspace

When you open an application in the Application Designer, the Workspace tab opens, containing the layout of the controls that make up the application. Within the workspace, you can select individual controls to modify them and to position new controls in the application user interface.

About this task

The workspace opens the main tab of an application but some tabs, windows, controls, and configuration tools are not immediately visible. Before you start developing applications with the Application Designer, use the following procedures to familiarize yourself with the workspace.

Procedure

1. Open an application that you are familiar with in the Application Designer.
The application opens in the workspace, typically on the application List tab.
2. Review the contents of the workspace when it opens, clicking on controls to select them.
3. In the Select Action menu, click **Toggle/Show All Controls**.
You can use this action repeatedly to show or hide controls that are less frequently modified to conserve space on the workspace.
4. Select any control in the workspace and either right-click and select **Properties** or click the **Control Properties** icon on the toolbar.
The properties window for the control opens where you can review the properties that are configured for the control.
5. In the Workspace, select a **Section** control and click the **Control Palette** icon on the toolbar.
6. Drag a control icon from the palette into the selected **Section** control.
If the control cannot be placed within a **Section** control, it is not added to it. For example, you must place a **Tab** control within a **Tab Group** control and you must place a **Button** control within a **Button Group** control.
7. Click the **Edit Dialogs** icon on the toolbar to see a list of the dialog windows that are configured for the application.
8. Select a dialog to open it for review or modification in a temporary workspace.
9. Click on the **Applications** tab to close the workspace and do not save the changes when you are prompted to do so.
Changes you make in the workspace are stored temporarily until you click **Save**, when the changes are committed to the database.

Design guidelines

Use the Application Designer and, if necessary, the application XML files, with an appropriate design process to develop applications that are easy and efficient to use.

Review user goals

Before you start developing or modifying an application, review the user goals for the application. Divide users into groups, based on the tasks that they perform. Instead of creating one large application to serve all users, consider creating smaller applications that serve specific needs. Give users only what they need, and nothing more.

Prioritize information

Consider the circumstances when users need access to secondary information and choose where to locate this information from the following options:

- On a separate tab.
If you place secondary information on a separate tab, it does not load until the user clicks the tab, which makes startup performance faster. The information is available with one click when the user needs it.
- Below the screen area (fold line)

Users can ignore information at the bottom of the screen and can scroll down to see it when it is necessary. Including the information on the lower screen can increase load-time, but vertical scrolling is easier, faster, and less error-prone than clicking.

When an application requires a lot of data entry, arrange the input fields to optimize the use of the Tab key to navigate between fields. The tabbing order of a window goes from top to bottom and from left to right.

If you want to change the location of a number of data input fields in an application, consider duplicating the application and then changing the order of the input fields. When you are modifying an application, you can delete fields that are not needed for data entry, or move those fields to another screen.

Use appropriate controls

Controls are predefined components, such as text boxes, buttons, and tabs, that are used to build the application user interface. In the Application Designer, you can select a control from the Control Palette and drag it to the workspace to add it to the user interface. You then configure properties for the control, for example specifying an image file to use for a button control or setting a text control as a required field.

The following controls are the main layout controls:

- Presentation
- Page
- Dialog

The presentation control is the main control for an application, representing the presentation.xml file that defines all of the user interface components. Each application has just one page control, typically the main tab of the application. Use tab controls or dialog controls to create additional windows. These controls are the outermost containers for application components. Other container controls include:

- Section
- Tab group
- Table
- Push-button group

Within a container control, you can place multiple controls such as placing multiple text boxes, combination boxes, and list boxes into a section, or placing multiple buttons into a button group. There are a number of benefits in grouping related content within the same container control. The grouping provides a logical order and convenience for the user and, if you move the container to another location, all of the controls that it contains move with it.

Organize navigation

The application framework includes a number of predefined navigation structures that you can use to provide quick and easy access to your application and application components. Use the following navigation structures:

- The Go To menu lists all of the product modules and their applications. When you create an application, you must specify its module. When you duplicate an application, the new application is automatically added to the same module as the application that you copied.
- You can add buttons and links to the application toolbar to provide quick access to application features.
- You can create an option in the Select Action menu for a common task. You can also restrict access to this option based on user group or conditions.

Data validation

The system validates data to ensure that users are working with the correct data. Data can be validated on the server-side or the client-side.

- **Server-side validation**
When you enter information in an application, it is placed in the queue for server-side validation where the data is validated with data on the server. Server-side validation consists of asynchronous and synchronous validation. Asynchronous validation helps users to work faster because they can move from field to field, entering data without waiting for information to be validated.
- **Client-side validation**
To improve performance, the system validates data on the client browser before validating on the server.
- **Best practices for data validation types**
In some circumstances, one type of data validation can be more efficient to use than another. All validation types work on textboxes, multiple-part textboxes, and check boxes. Synchronous and asynchronous validation also work on multiple-part text boxes and check boxes while client-side validation works on the first part of multiple-part check boxes.

Server-side validation

When you enter information in an application, it is placed in the queue for server-side validation where the data is validated with data on the server. Server-side validation consists of asynchronous and synchronous validation. Asynchronous validation helps users to work faster because they can move from field to field, entering data without waiting for information to be validated.

Asynchronous validation is disabled automatically when a screen reader is being used.

In synchronous processing, values are validated when they are entered; asynchronous values remain in the queue until one of three conditions is met:

- When the threshold for the number of asynchronous values in the queue is reached. The default value is 2.
- When there is no action on the user interface, and the default timeout is reached. The default value is 10 seconds.
- When a user completes an action that triggers a synchronous validation.

When one or more of these conditions is met, all values in the queue are then sent to the server to be validated.

Asynchronous validation of user-entered data is enabled at the system level by default. You can disable asynchronous validation for the system, you can disable it for individual controls, and you can change the validation process for the system.

Table 1. Data validation levels

Data validation level	Where	How
Enable background validation at the system level	System Properties application	Disable or enable the <code>mxe.webclient.async</code> system property.
Configure background validation for individual controls	Application Designer application	Configure autofill properties: type-ahead, set values, and filters.
Modify the validation process system-wide	System Properties application	<ul style="list-style-type: none">Change the value for the <code>mxe.webclient.asyncrendertimelimit</code> system property.Change the value for the <code>mxe.webclient.asyncerrortooltipwaitbeforeopen</code> system property.Change the value for the <code>mxe.webclient.asyncrequestsbeforerender</code> system property.

Error notification during asynchronous validation

If an error occurs during asynchronous validation, an error indicator appears on the relevant field. When you click the error icon, a message opens. If there are errors on more than one tab, an error icon is also set at tab level for each tab that contains unresolved messages.

The threshold for the queue ensures that only asynchronous values are sent to the server for validation when the default value is passed.

Client-side validation

To improve performance, the system validates data on the client browser before validating on the server.

- Autofill properties**
The autofill function populates fields based on the data that you enter in other fields. You can configure autofill properties so that fields are populated with cached data instead of server data to improve performance.
- Configuring autofill properties**
To improve performance, fields in forms can be automatically filled with cached data. If your network latency is over 100 milliseconds, you can specify the fields to be automatically filled.
- Example: Configuring autofill for the Affected Person field in service requests**
If you frequently open service requests for the same users, you can configure autofill on the Affected Person field. The next time you open a service request, as you type in the Affected Person field a list of one or more possible matches for the data is listed.
- Error notification for client-side validation**
The values for data type fields are validated locally in the browser. If an error occurs, the user is notified immediately before a server round trip is needed.

Autofill properties

The autofill function populates fields based on the data that you enter in other fields. You can configure autofill properties so that fields are populated with cached data instead of server data to improve performance.

On a high latency network, the use of cached data can be more efficient. A high latency network is a network with a latency of more than 100 milliseconds.

You can configure autofill for a text box or a multipart text box. When you configure autofill properties, a data store is created in the user's browser. The data store on a browser is limited in size so configure autofill properties for the most important text boxes and multipart text boxes.

The autofill properties that you can configure are type-ahead, set values, and filters.

Type-ahead is an incremental search feature. As you type data in a field, one or more possible matches for the data is listed. You can configure type-ahead so that the list of possible matches includes one or more business objects. You must set the `mxe.webclient.ClientDataValidation` property to a value of `1` for type-ahead to work. You must configure type-ahead before you can configure set values and filters.

All fields that are associated with ALN, numeric, or synonym domains support type-ahead when you set the value of the `mxe.webclient.ClientDataValidation` property to `1`, but you can also configure autofill for additional fields. Simple client-side error validation is also enabled with the `mxe.webclient.ClientDataValidation` property.

You configure set values so that the data that a user enters in one field populates other fields. For example, if you configure a set value for the Asset field, when a user enters a value in the Asset field, other text boxes, multipart text boxes, combination boxes, or check boxes are populated with data.

You configure filters in a field to limit the type-ahead choices for a user based on information in another text box, multipart text box, combination box, or check box.

After you configure autofill properties, the information is validated with the data on the server. If the autofill configuration data is different from the server data, the fields are updated with the server data.

Configuring autofill properties

To improve performance, fields in forms can be automatically filled with cached data. If your network latency is over 100 milliseconds, you can specify the fields to be automatically filled.

About this task

You can configure autofill for a text box or a multipart text box. The autofill properties that you can configure are type-ahead, set values, and filters. You can configure type-ahead so that the list of possible matches includes one or more business objects. You configure set values so that the data that a user enters in one field populates other fields. You configure filters in a field to limit the type-ahead choices for a user based on information in another text box, multipart text box, combination box, or check box.

Procedure

1. In the System Properties application, set the value of the `mxe.webclient.ClientDataValidation` property to `1`.
2. In the Application Designer application, select an application, highlight the field to configure, and open the properties sheet.
3. Click the Advanced tab. In the Autofill Properties section, configure the type-ahead feature.
 - a. If a domain is not specified, complete the Domain field by identifying a domain in the Database Configuration application.
 - b. Add the key domain attribute.
To specify a domain attribute, you choose the primary key of that object as an attribute in the Attribute table that the domain is pointing to, and set the key Boolean value to `true`.
 - c. Optional: To provide more information about the key attribute and to distinguish it from other type-ahead choices, add another attribute.
 - d. Click OK.
4. Configure the set values.
 - a. Specify an attribute that corresponds to the field whose value you want to set.
 - b. Specify the domain attribute of the field where the set value comes from and click OK.
5. Configure filters.
 - a. Specify the field to act as a filter for the type-ahead choices.
 - b. Specify the domain attribute of the field with the type-ahead choices.
6. Save the application definition.

Example: Configuring autofill for the Affected Person field in service requests

If you frequently open service requests for the same users, you can configure autofill on the Affected Person field. The next time you open a service request, as you type in the Affected Person field a list of one or more possible matches for the data is listed.

Procedure

1. In the System Properties application, set the value of the `mxe.webclient.ClientDataValidation` property to `1`.
2. In the Application Designer application, select the Create Service Request application, highlight the Affected Person field and open the properties sheet.
3. Click the Advanced tab. In the Autofill Properties section, click Configure Type-Ahead.
4. If a domain is not specified, go to the Database Configuration application to define a domain and complete the Domain field.
5. Add the domain attribute.
To specify a domain attribute, you choose the primary key of that object as an attribute in the Attribute table that the domain is pointing to, and set the key Boolean value to `true`.
6. Optional: To provide more information about the key attribute and to distinguish it from other type-ahead choices, add another attribute.
7. Click OK and then save the application definition.

Error notification for client-side validation

The values for data type fields are validated locally in the browser. If an error occurs, the user is notified immediately before a server round trip is needed.

For example, when you specify a value in an alphabetic field, the length of the value is validated in the browser. The error is added to the queue with the asynchronous values, but the error value is not counted in the threshold for the queue.

The error values are validated the next time the queue is validated, either when the threshold or timeout for asynchronous values is reached or when a synchronous event is triggered.

Error values for smart-fill fields and simple data entry values are also not included in the queue threshold.

Best practices for data validation types

In some circumstances, one type of data validation can be more efficient to use than another. All validation types work on textboxes, multiple-part textboxes, and check boxes. Synchronous and asynchronous validation also work on multiple-part text boxes and check boxes while client-side validation works on the first part of multiple-part check boxes.

Table 1. Data validation types and use cases

Validation type	Behavior setting	Configuration options	User interaction	Best practice	Interaction with smart-fill
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Validation type	Behavior setting	Configuration options	User interaction	Best practice	Interaction with smart-fill
Synchronous	Available if the asynchronous setting is turned off.	System Properties application or Application Designer application	Users must correct the errors in the current field before moving to next field.	Fields that affect the behavior of other fields. For example, if a particular entry in field A causes field B to become read-only, you can turn off asynchronous validation for field A. Users then cannot tab out to field B inadvertently before field A validates.	When users tab out of a field, the Select Value window opens containing filtered values. Users can specify the necessary value.
Asynchronous	Default behavior	System Properties application or Application Designer application	Errors and warnings are indicated at the field level. Users can resolve the errors and warnings at any time, in any order before saving.	In applications where users enter data quickly.	When users tab out of a field, the Smart Fill icon appears in the field. Users can click the icon and the Select Value windows opens containing filtered values. Alternatively, while in field users can press Ctrl+Enter on the keyboard to invoke the Select Value windows containing filtered values.
Client-side	Default behavior for data type validation	Asynchronous system setting must be turned on. Configurable for filters and set values in the Application Designer application.	Errors and warnings icons are indicated at the field level before server validation. Users can also see values in fields. If type-ahead is configured, users can see the information before server validation.	In applications where users experience network latency and for whom server round-trips for validation takes too long.	You can configure type-ahead to allow users to see a list of available options as drop-down values for a field. The available options in the list reduce as each successive letter is typed. The filtered Select Value window does not appear when a choice is made using the type-ahead list.

Property configurations

The behavior and characteristics of various user interface components can be determined by the values set as system properties or by values set for individual controls. Filter for `webclient` in the System Properties application to view and modify interface properties. Modify properties for an individual control in the Application Designer.

Common user interface (webclient) properties include properties that determine browser behavior when a connection is lost and properties that identify the location of login and log out pages. It can be practical to change these and other property values, depending on the type of application behavior you want to develop.

If the `webclient.smartfill` system property is enabled, when a user enters partial data in a field and an exact match is found in the database, the field updates with this value. If multiple possible matches are found, the user can select from a list of possible matches to update the field. The combined use of smartfill and asynchronous validation on a field can, in some cases, cause confusion. If required, you can disable smartfill for the system or for an individual control.

If you intend to use rich text editing capabilities that use custom fonts, you can add these fonts to the `webclient.richtext.fontlist` property. The Rich Text Editor control supports generic fonts by default, such as serif and sans-serif.

Developing applications

Before you create or modify applications, review the design guidelines and explore the workspace in the Application Designer.

- [Creating and modifying applications](#)
You can either create an application or duplicate an existing application to use as a template. You can then modify the application to suit your business needs. You can also delete user-defined applications but you cannot delete predefined applications.
- [Arranging the layout of controls](#)
The layout of components is relative to the other components in a user interface. Use container controls, like sections and tables, to group associated controls. Arrange controls to make it easy for users to enter information in an orderly and efficient manner.
- [Configuring default values for controls](#)
You can change the labels for fields, specify default values and filters for fields, and you can configure value lists for fields.
- [Moving application controls](#)
Use the Application Designer to move controls across tabs or across applications. You can also move controls and applications to a different server and export multiple applications.
- [Adding navigation components](#)
You can link to applications and to external URLs, and you can add menus and buttons to organize application navigation.
- [Configuring related information for fields](#)
To see information related to a field without leaving the record, you add a hover window to the field. Hover windows are immediately enabled on some fields but you can also enable these existing hover windows on other fields or you can create a hover window depending on your requirements.
- [Providing user information](#)
You can provide information to help users in the windows and tabs in the user interface. You can create links from windows and tabs, and also from field

help, to topics in the product Knowledge Center. You can also add new error messages to an application.

- [Configuring dialog windows for an application](#)
You can modify dialog windows that are specific to an application in the Application Designer. To modify dialog windows that are shared with other applications, you must modify a system XML file. You can also create a dialog and add it to an application.
- [Transferring data between applications](#)
To move data from a field in an application to another field in a different application, you can use linked objects and .
- [Configuring conditional user interface components](#)
By applying conditions to control application behavior and to the user interface (UI), you can configure the UI to support your business processes. You can achieve the user interface behavior you require by configuring conditional data restrictions, by configuring conditional UI control behavior in Application Designer, or by configuring conditional security restrictions. For example, you can apply conditions to change the color of controls, the content of menus for different user groups, or the properties of the data shown.

Creating and modifying applications

You can either create an application or duplicate an existing application to use as a template. You can then modify the application to suit your business needs. You can also delete user-defined applications but you cannot delete predefined applications.

- [Duplicating applications](#)
You can duplicate an existing application to use as a template for a new application. You can then extend and modify the functionality of the base application in the Application Designer.
- [Creating applications](#)
You can create three types of application in the Application Designer; a power application, a single-page application, or a self-service application. After you create an application, it is automatically added to the Go To menu.
- [Deleting an application](#)
You can only delete an application that you created or duplicated in the Application Designer. You must use a database editor (for example, SQL Plus) to delete an application.
- [Creating restrictions](#)
To restrict the records that a user can see in an application, you add a query to the application. To restrict the data that users see for a control, you add the allowqualifiedrestriction property to the XML for a control in an application.
- [Defining signature options for an application](#)
Signature options specify privileges for using applications, menu options, and toolbar items. You apply signature options to groups of users to control their access to data, to applications, and to controls. New applications are automatically assigned a READ signature option. You can add more signature options in the Application Designer.

Duplicating applications

You can duplicate an existing application to use as a template for a new application. You can then extend and modify the functionality of the base application in the Application Designer.

Procedure

1. Open the application you want to duplicate in the Application Designer.
2. Select the Duplicate Application Definition action to open the Duplicate Application window.
3. In the Application field, specify a unique name for the application.
Use a clear and consistent naming convention, such as using your company name as a prefix. Choose application names that are easy to identify in menus, and easy to recognize in log files and during a system upgrade.
4. In the Description field, specify a text description.
This text shows in the navigation bar of the application.
5. Click OK and then click Save.

Results

The duplicated application is listed in the Go To menu in the same module as the original application. To view the new application, sign out of the system to refresh the list of applications in the Go To menu. When you sign back into the system, the new application is available in the Go To menu.

What to do next

Open the application in the Application Designer and make the changes needed to adapt the application to your business needs.

Creating applications

You can create three types of application in the Application Designer; a power application, a single-page application, or a self-service application. After you create an application, it is automatically added to the Go To menu.

Before you begin

Before you create an application, the main object for the application must exist in the database. If you intend to associate the application with a new object, define the object in the Database Configuration application before you create the application.

Procedure

1. Click New Application Definition in the toolbar of the Application Designer.
2. In the Application field, specify a unique name for the application.
Use a clear and consistent naming convention, such as using your company name as a prefix. Choose application names that are easy to identify in menus, and easy to recognize in log files and during a system upgrade.
3. In the Description field, specify a text description.
This text shows in the navigation bar of the application.
4. Specify a key attribute for the application.
5. Specify the name of the main object for the application.
 - a. If the object is set at the SYSTEMORGSITE level, you must create a site text box field and an organization text box field.
6. Specify the name of the module that is to include the application.
Every application must be located within a module.
7. Click the button that corresponds to the type of application that you want to create.
The new application opens in the workspace.
8. Click Save Application Definition.

Results

To view the new application in the Go To menu, sign out and then sign back into the system.

What to do next

Filter for the new application in the List tab of the Application Designer to start working on the new application.

The default security setting for new applications is Read. All users who have access to the application in their security profiles can read records but cannot insert or delete information. Select Add/Modify Signature Options in the Select Action menu to define additional signature options for the new application.

Deleting an application

You can only delete an application that you created or duplicated in the Application Designer. You must use a database editor (for example, SQL Plus) to delete an application.

Before you begin

You must shut down the application server before you delete an application. If you delete an application, you do not remove any custom tables, fields, or domains that you created to support the application.

Procedure

1. Login to a database editor as an administrator.
2. Enter the following commands, and replace the variable `<APPLICATION NAME>` with the name of the application you want to delete. Enter the application name in all uppercase. For example, if the name of the application you want to delete is Test, replace APPLICATION NAME with TEST in all the commands.
 - a. `delete from maxapps where app='<APPLICATION NAME>';`
 - b. `delete from maxpresentation where app='<APPLICATION NAME>';`
 - c. `delete from sigoption where app='<APPLICATION NAME>';`
 - d. `delete from applicationauth where app='<APPLICATION NAME>';`
 - e. `delete from maxlabels where app='<APPLICATION NAME>';`
 - f. `delete from maxmenu where app='<APPLICATION NAME>' and menutype != 'MODULE';`
 - g. `delete from maxmenu where where elementtype='APP' and keyvalue='<APPLICATION NAME>';`
 - h. `delete from appdoctype where app='<APPLICATION NAME>';`
 - i. `delete from sigoptflag where app='<APPLICATION NAME>';`
3. Logout of the database editor.

Creating restrictions

To restrict the records that a user can see in an application, you add a query to the application. To restrict the data that users see for a control, you add the `allowqualifiedrestriction` property to the XML for a control in an application.

- [Creating application restrictions](#)

You add a query to an application to restrict the records that a user can see. To hide inactive users in the Users application for example, you use the query "status != 'INACTIVE'". You create restrictions for power applications and single-page applications in Application Designer.

- [Restricting data](#)

You add the `allowqualifiedrestriction` property to the XML for an application to restrict the data that is returned from the database. You can add the restriction when data is shown but not used for calculations. You can add the restriction for data that is used to route a process through steps. You can also restrict the records that are returned when using lookups.

Creating application restrictions

You add a query to an application to restrict the records that a user can see. To hide inactive users in the Users application for example, you use the query "status != 'INACTIVE'". You create restrictions for power applications and single-page applications in Application Designer.

Procedure

1. Open the application in Application Designer.
2. In the Select Action menu, click **Toggle Show All Controls**.
3. Select the presentation control and click the **Control Properties** icon.
4. In the **Presentation Properties** window, enter the query in the **Application Restrictions** field.
5. Save the application definition.

Restricting data

You add the `allowqualifiedrestriction` property to the XML for an application to restrict the data that is returned from the database. You can add the restriction when data is shown but not used for calculations. You can add the restriction for data that is used to route a process through steps. You can also restrict the records that are returned when using lookups.

- [Restricting the data returned from the database](#)

You restrict data by adding the `allowqualifiedrestriction` property. For example, you can restrict the classifications available to users who are classifying a service request.

- [Examples of restrictions on the data that users see](#)

You control the data that users see by restricting the data that is returned from the database. For example, you can restrict the person groups that users see when selecting an owner in the Change application.

Restricting the data returned from the database

You restrict data by adding the `allowqualifiedrestriction` property. For example, you can restrict the classifications available to users who are classifying a service request.

About this task

You do not apply the restriction to child objects. You manually add the `allowqualifiedrestriction` property to the XML controls that create a data source. The controls that create a data source have an object, a relationship, or a bean class. The following controls are supported:

- `datasrc`
- `section`
- `simpleheadertable`
- `tab`
- `table`
- `tree`

Some controls inherit data sources from higher-level controls. When you add the property to the XML, you also make the data read-only. Editing a restricted data set can have unexpected results.

Procedure

1. Open the application XML and search for the control where the data source is needed.
2. Add `allowqualifiedrestriction= true` to the XML.
3. Import the modified XML.

Examples of restrictions on the data that users see

You control the data that users see by restricting the data that is returned from the database. For example, you can restrict the person groups that users see when selecting an owner in the Change application.

Example: Restricting the person groups that users see when selecting an owner in the Change application

In this example, you set the `allowqualifiedrestriction` property into the XML for the tab in the window:

```
<dialog
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_eg_data_restrictions_owner"
label="Select Owner">
  <tabgroup
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_eg_data_restrictions_owner_labor">
    <tab
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_eg_data_restrictions_owner_labor_group" label="Person Groups" mboname="persongroup" allowqualifiedrestriction="true"
beanclass="psdi.webclient.beans.common.OwnerGroupBean">
```

Example: Restricting when users see the 'View Work Details' window in the Assets application

In this example, you set the `allowqualifiedrestriction` property into the XML for the tab in the table in the window:

```
<dialog
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_eg_data_restrictions_wopms_byasset"
label="View Work Details" relationship="VIEWWOPMS"
beanclass="psdi.webclient.beans.common.ViewWOPMsBeanAsset" width="975" height="400">
  <section
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_eg_data_restrictions_viewWOandPMS_ViewWOandPMSFieldGridAsset" border="true">
    <multiparttextbox
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_eg_data_restrictions_viewWOandPMS_ViewWOandPMSFieldGrid_2" dataattribute="assetnum" inputmode="readonly"
descdataattribute="asset.description" longdescinputmode="readonly" descinputmode="readonly" />
    <checkbox
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_eg_data_restrictions_viewWOandPMS_ViewWOandPMSFieldGrid_3a" dataattribute="showchildren" />
    <checkbox
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_eg_data_restrictions_viewWOandPMS_ViewWOandPMSFieldGrid_3b" dataattribute="showparents" />
  <buttongroup
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_eg_data_restrictions_viewWOandPMS_ViewWOandPMSFieldGridAsset99">
    <pushbutton
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_eg_data_restrictions_viewWOandPMS_ViewWOandPMSFieldGridAsset98" label="Refresh" default="true" mxevent="doRefresh"
targetid=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_eg_data_restrictions_wopms_byasset"/>
  </buttongroup>
</section>
  <tabgroup
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_eg_data_restrictions_viewWOandPMS_ViewWOandPMSAsset">
    <tab
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_eg_data_restrictions_viewWOandPMS_ViewWOandPMSAsset_ViewWO_tab" default="true" label="Work">
      <table
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_eg_data_restrictions_viewWOandPMS_ViewWOandPMSAsset_ViewWO" label="Work" relationship="VIEWWORK_BYASSET"
allowqualifiedrestriction="true" beanclass="psdi.webclient.beans.common.ViewWOByAssetBean" selectmode="multiple">
        <defaultvalue
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_eg_data_restrictions_viewwoasset_historyflag_default" dataattribute="historyflag" value="N"
defaulttype="query" />
        <defaultvalue
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_eg_data_restrictions_viewwoasset_istask_default" dataattribute="istask" value="N" defaulttype="query" />
```

Example: Restricting the classifications that users see when classifying a service request in the Service Request application

In this example, you set the `allowqualifiedrestriction` property into the XML for the table in the tree in the window:

```
<dialog
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_eg_data_restrictions_associateClassification" label="Classify">
  <tree mboname="CLASSSTRUCTURE" allowqualifiedrestriction="true"
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_eg_data_restrictions_associateClassification_tree">
```

```
beanclass="psdi.webclient.beans.assetcat.AssociateSpecBean" width="600" height="250" openfirstlevel="false" maxchildren="1000">
```

Defining signature options for an application

Signature options specify privileges for using applications, menu options, and toolbar items. You apply signature options to groups of users to control their access to data, to applications, and to controls. New applications are automatically assigned a READ signature option. You can add more signature options in the Application Designer.

Procedure

1. Open the application in the Application Designer.
2. Select the Add Modify Signature Options in the Select Action menu and click New Row.
3. Specify a signature option in the Option field.
4. Optional: Add additional signature options in the Option Also Grants field.
Use commas to separate multiple entries if you want to enable more than one additional signature option.
For example, if the signature option grants access to the People application, you can add signature options that grant access to a related application, such as the Users application.
5. Optional: In the Option Also Revokes field, specify any signature options that are revoked as a result of adding the primary option.
For example, you add a signature option that allows read-only access to an application. You want to remove any write access to the application that users with the read-only signature option have. To remove the write access, you specify the signature option that grants write access to the application in the Option Also Revokes field.
6. Save the signature options.

Arranging the layout of controls

The layout of components is relative to the other components in a user interface. Use container controls, like sections and tables, to group associated controls. Arrange controls to make it easy for users to enter information in an orderly and efficient manner.

- [Laying out a new tab](#)
In standard applications, the information is contained in multiple tabs, including the List tab, the application main tab, and additional tabs as required.
- [Merging classification attribute values into one column](#)
Multiple columns are used to display classification attributes and their values which makes the display complex. You can merge the data for the three columns into one column to make more space available in the table for additional columns to be added. This size reduction ensures that the table is not so large that users have to scroll to see columns.
- [Controlling the size of fields](#)
You change the size of a single field by modifying the width value for that field in the presentation.xml file. You can also define a range of values for a data type in the field-size-config.xml file.
- [Adding images](#)
The Application Designer includes controls that you can use to add images such as icons, to an application. The images directory contains existing images that you can reuse or you can add new images to the directory. Images must be in a file format supported by a browser.

Laying out a new tab

In standard applications, the information is contained in multiple tabs, including the List tab, the application main tab, and additional tabs as required.

Procedure

1. Optional: To add a new tab, highlight the Tab Group control in the Application Designer and drag a Tab control to it from the Control Palette.
2. Highlight this new tab control and drag a Section control to it from the Control Palette. Repeat this step if you want to create multiple sections that create vertical division in the tab.
A section control is a container for other controls and is not visible in the application.
3. Add section column controls to a section if you want to divide a section horizontally.
4. After you create horizontal and vertical sections, you can add data controls, such as text boxes or buttons, within each section or section column.

Merging classification attribute values into one column

Multiple columns are used to display classification attributes and their values which makes the display complex. You can merge the data for the three columns into one column to make more space available in the table for additional columns to be added. This size reduction ensures that the table is not so large that users have to scroll to see columns.

Before you begin

The Maximo® business object (MBO) that the Classification Specifications table is bound to must contain ALNVALUE, NUMVALUE, and TABLEVALUE attributes. If the MBO does not contain the attributes, you cannot merge classification attribute values. The Classification Specifications table must also contain either a field class or a MBO validation class. The inclusion of either a field class or a MBO validation class ensures that all the value fields are read-only. The only exception is the value field associated with the data type of an attribute. For example, if the datatype is alphanumeric, the alphanumeric MBO attribute is read/write while the numeric and table value MBO attributes are read-only.

About this task

You can merge classification attribute values only for the classification specification attributes.

Procedure

1. In the Application Designer application, open the application that you want to change.
2. In the Specifications table on the Specifications tab, click the attribute that you want to change.
3. Delete the alphanumeric value column, the numeric value column, and the table value column by using the Context menu.
4. In the toolbar, click Control Palette and select the Table Column icon.
5. Drag the table column onto the Specifications table and close the Controls window.
6. Open the Context menu, click Properties, and specify the label name for the column.
If you do not specify a name, the label from the alphanumeric value attribute is used.
7. Specify {CLASSSPECVALUE} as the attribute value, and clear the Show Filter check box.
8. Ensure that the Sortable check box and the Filterable check box are clear.
9. Save the changes.

Controlling the size of fields

You change the size of a single field by modifying the width value for that field in the presentation.xml file. You can also define a range of values for a data type in the field-size-config.xml file.

- [Specifying size ranges for data types](#)
You control the size range of a data type in the user interface by modifying the value in the field-size-config.xml file. The size of a field in the user interface depends on a setting for each data type and the length of the column in the database. This dependency creates a uniform appearance in the UI when fields of different lengths are beside or on top of each other in the same section.
- [Specifying the size of single fields](#)
You modify the width attribute in the presentation.xml file to change the width of a single field.

Specifying size ranges for data types

You control the size range of a data type in the user interface by modifying the value in the field-size-config.xml file. The size of a field in the user interface depends on a setting for each data type and the length of the column in the database. This dependency creates a uniform appearance in the UI when fields of different lengths are beside or on top of each other in the same section.

About this task

Field sizes are defined in the <root>\applications\maximo\properties\field-size-config.xml. For example, for an ALN field:

```
<maxtype name="aln">  
<range below="2" size="2"/>  
<range upper="30" size="10"/>  
<range upper="31" size="40"/>  
</maxtype>
```

In this example if the ALN value is defined with a length of 1 or 2, the field displays 2 characters. If the value is defined from 3 to 30, the field displays 10 characters. If the field is defined with a size of 31 or greater, the field displays 40 characters.

Procedure

1. Open the field-size-config.xml file in a text editor.
2. Search for the data type and change the size range that is specified for the field.
3. Save the file.
4. Rebuild and redeploy the .EAR files on the application server for your changes to take effect.

Specifying the size of single fields

You modify the width attribute in the presentation.xml file to change the width of a single field.

Procedure

1. Open the presentation.xml file.
2. Identify the field that you want to change the width of.
3. Check that the `description id` has a width attribute and add a width attribute if it is absent.
4. Change the width attribute in the `description id` to specify the size of the field.

For example, you use the following code to change the width of a field to 100 pixels:

```
<tablecol dataattribute="description"
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_t_define_value_field_results_sh
owlist_tablebody_3" width="100"/>
```

5. Save the presentation.xml file.

Adding images

The Application Designer includes controls that you can use to add images such as icons, to an application. The images directory contains existing images that you can reuse or you can add new images to the directory. Images must be in a file format supported by a browser.

- [Adding images to the images directory](#)
All images used in applications must be stored in the images directory. You can add new images to this directory.
- [Adding a record image to an application](#)
You can add a record image control to an application to create a placeholder for a record image, typically an expandable thumbnail image that a user can click to enlarge. When you add the record image to the application, the image displays automatically in the placeholders you created with the record image control.

Adding images to the images directory

All images used in applications must be stored in the images directory. You can add new images to this directory.

Before you begin

Images must be in a format that is supported by a browser, such as .gif, .jpg, or .bmp formats.

Procedure

1. Copy an image (in a supported format) into the images directory, at `<root>\applications\maximo\maximouiweb\webmodule\webclient\images`.
2. If the image is .gif format, no further action is necessary before you use the image in the Application Designer.
3. If the image is not in .gif format, you must redeploy the .EAR files on the application server before you can use it.

Adding a record image to an application

You can add a record image control to an application to create a placeholder for a record image, typically an expandable thumbnail image that a user can click to enlarge. When you add the record image to the application, the image displays automatically in the placeholders you created with the record image control.

Before you begin

The record image file must be located in the images directory before you can add it to an application. If the Add Modify Image option is not included in the Select Action menu, you must add this menu option before you can add the record image to the application.

About this task

You can add only one record image to an application but you can use the same image multiple times within the application by inserting multiple record image controls.

Procedure

1. Highlight a container control and drag the Record Image control to it from the Control Palette.
You can place a record image control into any container control.
2. Select the Record Image control and click Control Properties to open the Record Image Properties window.
3. Optional: Deselect Is Thumbnail if you only want to display a full-size version of the image.
The default behavior for record images is to display an expandable thumbnail image that a user can click to enlarge. If you do not want to provide a thumbnail version of the image, you must specify a value in the Label field that overwrites the default label, Click to enlarge.
4. Optional: You can specify a label for the image or you can leave this field blank to use the default label text, Click here to enlarge.
5. Specify appropriate values in the Height and Width fields, based on the size of the image you intend to use.
The default values generate a thumbnail image of 100 x 100 pixels, appropriate for a square image. To avoid distortion of the image, ensure that the size values are proportionate to the size of the image.
6. Provide a text description of the image in the ALT Text on Image field.

- Alternative text is used as a substitute for the image when images are not supported, for example by screen readers.
- Repeat the preceding steps if you want to add placeholders for the record image in other positions in the application, such as on another tab.
 - Select the Add Modify Image option in the Select Action menu to specify the record image to use for the application.
The image can be in .gif or .jpg format and must be located in the images directory.

Configuring default values for controls

You can change the labels for fields, specify default values and filters for fields, and you can configure value lists for fields.

- [Assigning a default label to an attribute](#)
You can specify a default value for an attribute, and all text box controls that bind to the attribute inherit this value. The value is saved in the database.
- [Saving changes to the database](#)
After you make changes to the database in the Database Configuration application, you must commit the changes to the database. The data on the server is then reloaded and the user interface (UI) is updated with the changes that you made. For example, new fields are added or field labels are updated.
- [Overriding a value in the default label field](#)
You can specify a label for a text box that overrides the default label.
- [Assigning a default value to an application field](#)
You can assign a default value for a field that is specific to an application. The default value does not apply to fields in other applications that are associated with the same attribute.
- [Setting default filters for a table window](#)
You can define a default filter for a table window using the Default Value control in the Application Designer.
- [Adding a value list to a text field](#)
You can add a lookup icon to a text box control and configure a list of values that users can select from when they click the icon.

Assigning a default label to an attribute

You can specify a default value for an attribute, and all text box controls that bind to the attribute inherit this value. The value is saved in the database.

Before you begin

This procedure describes how to update objects in the database. Backup the database and make any necessary arrangements before you restart the database and the application server.

Procedure

- In the Database Configuration application, select the appropriate object.
- Select the appropriate attribute or click New Row to specify a new attribute.
- In the Attributes table, complete the following steps to find a supplemental attribute for the comment field:
 - Click Filter.
 - In the Description field, enter `supplemental`.
- Specify the value you want to use as the default label for the attribute in the Title field.
- Click Save.
- Run the `configdb` command to save the changes to the database. Sign out of the system and stop the application server.
- To add the attribute to an application, in the Application Designer, drag a text box control from the Control Palette into a section control in the workspace.
- Select the text box control and click Control Properties.
- Specify the attribute that you configured.
The window refreshes, and the Default Label field contains the value that you configured.

Saving changes to the database

After you make changes to the database in the Database Configuration application, you must commit the changes to the database. The data on the server is then reloaded and the user interface (UI) is updated with the changes that you made. For example, new fields are added or field labels are updated.

Procedure

- In the Database Configuration application, make your changes.
- From the More Actions menu, select Manage Admin Mode.
- In the Turn Admin Mode ON window, click Turn Admin Mode ON and click Close.
- From the Select Action menu, select Apply Configuration Changes.
- From the More Actions menu, select Manage Admin Mode.
- In the Turn Admin Mode ON window, click Cancel Admin Mode and click Close.
- Sign out of Maximo® Manage.
- Sign in to Maximo Manage.

Restarting the server

Although you do not have to stop and restart the server when you apply configuration changes, you can also choose that option to apply database changes.

Procedure

1. Log in to Maximo Application Suite as a system administrator.
2. From the catalog, on the Applications tab, select the Manage tile.
3. On the application details page, click Actions and select Update configuration.
4. In the Update Manage configuration window, select Update configuration.
5. Click Show advanced settings.
6. To turn off the server, complete the following steps:
 - a. In the Server mode section of the deployment window, in the Mode field, select Off.
 - b. Click Activate.
 - c. In the Confirmation window, click Activate.
7. To restart the server, complete the following steps:
 - a. In the Server mode section of the deployment window, in the Mode field, select On.
 - b. Click Activate.
 - c. In the Confirmation window, click Activate.

Overriding a value in the default label field

You can specify a label for a text box that overrides the default label.

About this task

The label that you specify applies to this specific application and does not replace the default value that you configured for the attribute.

Procedure

1. Select the text box in the workspace and click Control Properties.
2. Specify the value that you want to use in the Label field.
The label for the text box updates in the workspace.
3. Click Save.

Assigning a default value to an application field

You can assign a default value for a field that is specific to an application. The default value does not apply to fields in other applications that are associated with the same attribute.

Procedure

1. Select the section control that contains the field and click Control Properties.
2. Drag the Default Value control to the section from the Control Palette.
If you do not see the Default Value control when the workspace refreshes, click Toggle Show All Controls in the Select Action menu.
3. Select the Default Value control and click Control Properties.
4. Specify an attribute in the Attribute field and specify its default value in the Value field.
When you associate a text box in the section with the same attribute, the default value is set to this value.
5. Optional: To use the value you selected for each new record, specify Insert as the Default Type.
6. Optional: To inherit the default value from another data source and attribute, complete the From Data Source ID and From Attribute fields.

Setting default filters for a table window

You can define a default filter for a table window using the Default Value control in the Application Designer,

Procedure

1. Drag the Default Value control from the Control Palette into the section control that contains the table to filter.
If the Default Value control is not visible after the workspace refreshes, click Toggle Show All Controls in the Select Action menu.
2. Specify the attribute to filter.
3. Specify one or more values to use as filters in the Value field.
Use commas to separate multiple values. You can also use % as a wildcard or = to specify an exact match.
4. Select Query in the Default Type field.
5. Click Save.

Adding a value list to a text field

You can add a lookup icon to a text box control and configure a list of values that users can select from when they click the icon.

Before you begin

You can use an existing lookup value list or you can configure a new one.

To create a value list, configure a domain that contains the values, associate the domain with an attribute, and update the presentation XML for the application to include the value list.

To use an existing lookup value list, export the system XML and locate the relevant Lookup ID in the lookups.xml file.

When you assign lookups for a field that has a table domain, you use a lookup from the application that the field is in. You cannot use the VALUelist lookup with table domains.

Procedure

1. In the Domains application, click Add New Domain > Add New ALN Domain.
2. In the ALN Domain window, specify values in the required fields.
You must use precisely the same values when you configure the associated attribute in the Database Configuration application. The data type determines whether options in the list are displayed as uppercase, lowercase, or either. The length determines the width of the list. A length of 10 is adequate for most purposes.
3. Click New Row, specify a value, and click OK.
This value becomes an item in the value list.
4. Repeat Step 3 for each additional value.
5. Click Save.
6. In the Database Configuration application, open the application to which you intend to add the value list.
7. In the Attributes tab, click New Row and configure the attribute by using the precise values you specified for the domain.
8. To save the changes to the database:
 - a. From the More Actions menu, select Manage Admin Mode.
 - b. In the Turn Admin Mode ON window, click Turn Admin Mode ON and click Close.
 - c. From the Select Action menu, select Apply Configuration Changes.
 - d. From the More Actions menu, select Manage Admin Mode.
 - e. In the Turn Admin Mode ON window, click Cancel Admin Mode and click Close.
 - f. Sign out of Maximo® Manage.
 - g. Sign in to Maximo Manage.
9. In the Application Designer, open the application that you want to change and drag a text box control from the Control Palette to a section in the workspace.
An Invalid binding message is displayed in the text box. When you associate the control with an attribute, the message no longer displays.
10. Select the text box control and click Control Properties.
11. In the Textbox Properties window, specify values in the following fields:

Option	Description
Label	Label to display for the field.
Attribute	Attribute for this field. Specify the same name for the attribute as the name you configured in the database.
Lookup	Valuelist

A lookup icon is displayed next to the text box control and the Invalid message is no longer displayed.

12. Click Save.

Moving application controls

Use the Application Designer to move controls across tabs or across applications. You can also move controls and applications to a different server and export multiple applications.

- [Moving controls across tabs](#)
You can move a control or a group of controls from one tab to another within an application.
- [Moving controls across applications](#)
You must edit the presentation.xml files to move a control or a group of controls from one application to another.
- [Moving components and applications across servers](#)
You can move user interface components and applications across servers, for example to move from a nonproduction environment to a production environment. Different members of the organization can configure different applications and then move them to a centralized test environment.
- [Exporting multiple applications](#)
You can copy multiple applications at the same time to another server by exporting the presentation XML for each application to a single XML file.

Moving controls across tabs

You can move a control or a group of controls from one tab to another within an application.

About this task

When you move a container control, all of the controls it contains move with it.

Procedure

1. Select a control or a group of controls, typically a section.
2. Right click the mouse, and click Copy or Cut.
3. Click the tab where you want to copy or move the control.
4. Select the target control (usually a section).
5. Click Paste.

Moving controls across applications

You must edit the presentation.xml files to move a control or a group of controls from one application to another.

Procedure

1. Open the source application in the Application Designer and click Export Application Definition.
The XML definition opens in the browser.
2. Save the XML definition to a file.
3. Open the target application and perform the same steps to export the XML definition and save it to a file.
4. Open the XML file for the source application in a text editor.
5. Locate the control ID or the section control ID that you want to move.
You can use the unique control ID that is listed in the Control Properties window to search for the control in the XML file.
6. Select the relevant code and copy it to the clipboard.
7. Open the XML file for the target application in a text editor.
8. Navigate to where you want to insert the control and Paste the code that is stored on the clipboard.
9. Save both XML files.
10. Open the target application in the Application Designer and click Import Application Definition.
11. Specify the target application XML file that you modified, and click OK.

Results

When you copy a multipart text box control to a different application, the control must link to an attribute that exists in the main object table for both applications. If the attribute relationship does not exist, the multipart text box control in the target application does not contain any property values.

Moving components and applications across servers

You can move user interface components and applications across servers, for example to move from a nonproduction environment to a production environment. Different members of the organization can configure different applications and then move them to a centralized test environment.

Procedure

1. Create a backup directory for the XML files you are moving.
You can use the backup files to restore application definitions in the future, if necessary.
2. Open the application on the source server, and click Export Application Definition.
3. Save the code as an XML file in the backup directory you created.
4. Repeat steps 2 and 3 for each application that you want to export.
5. Make a copy of the XML file(s) you created.
6. Paste the copy of the XML files onto the target server.
7. Open the Application Designer on the target server, click Import Application Definition, and navigate to the XML files.
When you import an application, you overwrite the application in the database and not in the directory of presentation.xml files.

Exporting multiple applications

You can copy multiple applications at the same time to another server by exporting the presentation XML for each application to a single XML file.

Procedure

1. In the Applications tab of the Application Designer, press the Return key.
The screen refreshes with a list of all applications.
2. Scroll to the end of the screen and click Select Records check box.
The screen refreshes and includes a selection check box for each record.
3. Check each application whose XML presentation you want to export.
4. In the Workspace tab, click Export Application Definition from the Select Action menu.
5. An XML file opens in a browser window that includes the presentation code for each application you selected for export.
You can find the start point for an application by searching for the **presentation id** string.
6. Save the XML file to a directory.

What to do next

To import the XML file into another system, in the Application Designer click Import Application Definition and navigate to the XML file. The import reads the beginning and end point for each application embedded in the XML file and loads the applications accordingly.

Adding navigation components

You can link to applications and to external URLs, and you can add menus and buttons to organize application navigation.

- [Navigation components](#)
There are several ways that you can integrate a new application into the existing navigation and you can add new navigation components if required.
- [Linking to an external URL](#)
You can create a link to an external website from an application using a hyperlink control.
- [Linking to an application from a text field](#)
You can configure a pull-down menu associated with a text field to have options that take the user to different applications.
- [Adding buttons to the application toolbar or Common Actions menu](#)
You can include extra buttons on the application toolbar or in the Common Actions section of the side navigation menu. Toolbar buttons provide quick access to common actions, such as Save and Insert, and can be seen in all application tabs or can be limited to a specific tab.
- [Adding buttons next to text boxes](#)
You can add buttons next to text boxes for the menu items that are most frequently used. You can add up to three buttons to a text box.
- [Adding options to the Select Action menu or More Actions menu](#)
You can include options in the Select Action menu or in the More Actions menu. You add more options to give users access to the actions that they occasionally require.
- [Modifying links in a self-service application](#)
To change the links in the application bar of a self-service application, you must configure a property in the presentation.xml file for the application. You can configure these links for a self-service application that you duplicated from an existing application or for a new self-service application that you create.

Navigation components

There are several ways that you can integrate a new application into the existing navigation and you can add new navigation components if required.

The Application Designer provides several navigation components that you can modify to add a link to an application, an application tab, or an application popup window.

- Go To menu
- Application toolbar
- Select Action menu
- Menu templates
- Application bar menu in self-service applications

Go To menu

The Go To menu lists all of the modules and applications that a user can access. The menu is hierarchical and lists modules at the top level. When the user clicks a module, a submenu lists the applications in that module. When you create an application in the Application Designer, you specify its module and the application name is added under this module in the Go To menu. When you duplicate an application, the new application is added to the same module as the original application.

The contents of the Go To menu are generated automatically and you cannot customize them in the Application Designer.

Application toolbar

The application toolbar contains buttons that are arranged in a horizontal line at the top of the application window. You can add new buttons to the toolbar and modify existing ones in the Application Designer. Buttons can be specific to the toolbar in one application tab, or can be visible in all tabs.

Button images are stored in the images directory and you can add new images or reuse existing images.

Select Action menu

The Select Action menu lists application-specific actions. You can add new options to the Select Action menu and modify its existing options in the Application Designer.

Menu templates

You can reuse the code for existing menus as a template for a new menu. Use the Application Designer to export the menus.xml file, modify the file in a text editor, and then import the updated file back into the Application Designer.

You can use the XML code for any of the menus in the menus.xml file as a template for a new menu.

Application bar menu

Self-service applications do not have a Go To menu and provide access to applications in a menu at the top of the application window. You can export the presentation.xml file to add a navigation property to the application bar of a self-service application. If you customize the application bar menu, any preconfigured links are ignored.

Linking to an external URL

You can create a link to an external website from an application using a hyperlink control.

Procedure

1. Open the application in the Application Designer.
2. Select either a section control or a table control and drag a hyperlink control to it from the Control Palette.
3. Specify a value in the Label field.
This value becomes the text link that a user clicks to go to the URL.
4. Specify a valid URL for the destination site.
5. Optional: Specify values in the Image Filename and Image Alignment fields if you want to associate an image with the hyperlink.
6. Optional: Specify a value in the CSS Class Name field if you want to change the appearance of the hyperlink.

Results

When a user clicks the link within the application, the destination website opens in a new browser window.

Linking to an application from a text field

You can configure a pull-down menu associated with a text field to have options that take the user to different applications.

Procedure

1. Open the application in the Application Designer.
2. Select a text box control and click Control Properties.
You can also configure an application menu for multipart text box control and a table column control.
3. Add the name of an application that you want to link to in the GOTO Application field.
4. Specify a value in the Menu Type field that corresponds to the application you specified.
Click Export System XML in the Select Action menu to export the menus.xml file. You can search this file for the appropriate menu type value.

Adding buttons to the application toolbar or Common Actions menu

You can include extra buttons on the application toolbar or in the Common Actions section of the side navigation menu. Toolbar buttons provide quick access to common actions, such as Save and Insert, and can be seen in all application tabs or can be limited to a specific tab.

About this task

If the side navigation menu is enabled, any buttons that you add to the toolbar are displayed in the Common Actions section of the side navigation menu.

Procedure

1. Open the application in the Application Designer.
2. In the Select Action menu, select the Add/Modify Toolbar Menu option.
3. Create a row and select an Element Type.
4. Select a Key Value.
The key value represents the button action and is visible when the user moves the mouse over the button.
5. Specify an image to use for the button that is located in the images directory and is in a supported format.
6. Enter position values that determine the location of the button relative to the other buttons in the toolbar.
7. Specify the tabs where the option is visible.

Example

To add a Change Password button to the toolbar in the Main tab of the Person application:

1. Set the Element Type to App (application).
2. Select ChgPassword as the Key Value.
3. Set Position to 60 and Subposition to 0.
4. Specify the nav_icon_changepassword.gif file in the Image field.
5. Select the Main tab option.

What to do next

You can add buttons that act as separators if you want to group several buttons together in a section.

Adding buttons next to text boxes

You can add buttons next to text boxes for the menu items that are most frequently used. You can add up to three buttons to a text box.

About this task

You can select existing menus from the menus.xml file, or you can define new menus in the menus.xml file. The menu items must contain the label, event, and image attributes, for example:

```
label="Select Value" event="selectvalue" image="menu_icon_find.gif
```

The following restrictions apply when you add buttons next to text boxes and multipart text boxes:

- Select Value menu items are not displayed if there is no lookup attribute defined for the text box. For example, Select Value menu items are not displayed next to Long description fields.
- If the button is a link to an application and the user does not have access to the application, the button is not displayed.
- If the menu item is defined with any conditional expressions, the button is not displayed.

Procedure

1. In Application Designer, select the field that you want to add buttons to and open the Control Properties window.
2. Specify the ID of the menu.
3. Save the application definition.

- **Example: Adding buttons next to a multipart text box**

You want to add buttons next to a multipart text box so that users do not have to search the Select Action or Detail menus. You identify the menu items that users require most frequently for the multipart text box. No existing menus include the items so you create a menu that is called ICONTEST1 in the menus.xml file.

Example: Adding buttons next to a multipart text box

You want to add buttons next to a multipart text box so that users do not have to search the Select Action or Detail menus. You identify the menu items that users require most frequently for the multipart text box. No existing menus include the items so you create a menu that is called ICONTEST1 in the menus.xml file.

When there are no restrictions on the text box or user, the first three menu items that are defined in the menu are displayed. When there are restrictions on the text box or user, a menu item might not be displayed and the next menu item is displayed instead.

You identified the five menu items that users require most often:

- Select Value
- Application link to the Configuration Items application
- Application link to the Assets application
- Classification search
- Attribute search

You create a menu that is called ICONTEST1 that specifies five menu items:

```
<menu
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_example_add_buttons_textbox_ICONTEST1">
  <menuItem
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_example_add_buttons_textbox_icontest1_mi1" label="Select Value" event="selectvalue" image="menu_icon_find.gif" />
  <menuItem
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_example_add_buttons_textbox_icontest1_mi2" label="Go To" event="applink" image="menu_icon_link.gif"
applinkid=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_example_add_buttons_textbox_ci" />
  <menuItem
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_example_add_buttons_textbox_icontest1_mi3" label="Go To" event="applink" image="menu_icon_link.gif"
applinkid=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_example_add_buttons_textbox_asset" />
  <menuItem
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_example_add_buttons_textbox_icontest1_mi4" label="Classifications(w/Sigopt)" event="searchClassificationCI"
image="action_insert_launch.gif" sigoption="REFICONS" />
  <menuItem
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_c_example_add_buttons_textbox_icontest1_mi5" label="Attributes" event="searchAttributeCI" image="menu_icon_catalog.gif" />
</menu>
```

In the Control Properties window of Application Designer, you specify `ICONTEST1` as the ID.

Look up icons or Select value menu items are not shown next to Long description fields so the first button is not displayed. If the user group does not have access to the sigoption REFICONS, the fourth menu item is also not displayed. In this case, only the buttons for menu items 2, 3, and 5 are displayed as buttons next to the Long description field.

Adding options to the Select Action menu or More Actions menu

You can include options in the Select Action menu or in the More Actions menu. You add more options to give users access to the actions that they occasionally require.

About this task

If the side navigation menu is enabled, options that you add to the Select Action menu are displayed in the More Actions section of the side navigation menu.

Procedure

1. Open the application in the Application Designer.
2. In the Select Action menu, select the Add/Modify Select Action Menu option.
3. Create a row and select an Element Type and Key Value.
4. Enter position values that determine the location of the option in the menu.
5. Specify the tabs where the option is visible in the Select Action or More Actions menu.

Modifying links in a self-service application

To change the links in the application bar of a self-service application, you must configure a property in the presentation.xml file for the application. You can configure these links for a self-service application that you duplicated from an existing application or for a new self-service application that you create.

About this task

When you configure the `appbarlinks` property, any existing links that are found in the database are ignored, and only the customized links are displayed.

Procedure

1. Open the application in the Application Designer.
2. Select the Export System XML option in the Select Action menu.
3. Save the XML file to a local directory and open it in a text editor.
4. Search for the `appbar` tag in the XML file.
5. Add `appbarlinks=" "` to the `appbar` tag to add the navigation menu to the application bar control.
6. Insert the links, separated by semicolons.
7. For each link, you can specify up to three attributes, separated by commas.
 - a. ID of the linked application
 - b. Text description to display in the application bar
 - c. Image to display next to the description

For example:

```
appbarlinks="Application1,Description1,image1.gif:  
Application2,Description2,image2.gif"
```

8. Save the changes to the XML file.
9. Import the file into the Application Designer to save the new menu information.

Configuring related information for fields

To see information related to a field without leaving the record, you add a hover window to the field. Hover windows are immediately enabled on some fields but you can also enable these existing hover windows on other fields or you can create a hover window depending on your requirements.

- [Example: Enabling an existing hover window](#)
You can enable existing hover windows on fields to suit your needs. For example, you can add a hover window to show the contact details for the owners of service requests. In general, you can show related information on any fields that support lookup.
- [Example: Creating hover windows](#)
If none of the existing hover windows suit your needs, you can create a hover window. For example, you can create a hover window to show the organizations where failure classes occur. You design the hover window and specify the fields that appear.

Example: Enabling an existing hover window

You can enable existing hover windows on fields to suit your needs. For example, you can add a hover window to show the contact details for the owners of service requests. In general, you can show related information on any fields that support lookup.

About this task

The following hover windows are immediately available on some fields but can be enabled on other fields:

Field	ID
Asset	<i>asset_recordhover</i>
Work Order	<i>wo_recordhover</i>
Person	<i>person_recordhover</i>
Item	<i>item_recordhover</i>

In a large company, a supervisor is responsible for ensuring that service requests are assigned to the correct responder. To get contact information for the owner, the supervisor typically navigates to the Person record, which takes time and decreases efficiency. The supervisor wants to be able to hover the mouse over the Owner field and see the details of the owner of a service request. You can enable a hover window on the Owner field in the Service Requests application so that the supervisor can hover over the field and see the full name, email address and telephone number of the owner of the service request, without leaving the record.

Procedure

1. In Application Designer, open the Service Requests application, click the Owner field and select Control Properties.
2. On the Advanced tab, specify *person_recordhover* as the ID of the hover window and save the application definition.

Example: Creating hover windows

If none of the existing hover windows suit your needs, you can create a hover window. For example, you can create a hover window to show the organizations where failure classes occur. You design the hover window and specify the fields that appear.

About this task

The following widget types are supported:

- recordhoversection
- recordhoversectioncol
- recordhoversectionrow
- recordhovertextbox
- recordhovermultiparttextbox

In a multinational company, an administrator is noting the organizations where failure classes are reported as assets seem to be failing more frequently in some organizations. The administrator wants to hover over the Failure Class field to see the name of the organization where the failure occurred.

You review the list of hovers and determine that none suit this scenario, so you create a hover for the Failure Class field.

Procedure

1. In Application Designer, select the Export System XML action and export the RECHOVERS.XML file.
2. Open the RECHOVERS.XML file in a text editor and add the following lines:

```
</recordhover>
<recordhover
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_t_eg_create_hover_window_fc_rec
ordhover">
  <recordhoversection
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_t_eg_create_hover_window_fc_rhs
_1" label="Failure Class Details">
    <recordhoversectioncol
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_t_eg_create_hover_window_fc_rhs
c_1">
      <recordhoversection
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_t_eg_create_hover_window_fc_rhs
_2">
        <recordhovertextbox dataattribute="ORGID"
id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mbs.doc_designer_t_eg_create_hover_window_fc_rh
1" label="Organization">
        </recordhoversection>
      </recordhoversectioncol>
    </recordhoversection>
  </recordhover>
</recordhover>
```

3. Save the RECHOVERS.XML file and import it.
4. Open the Assets application, click Failure Class and select Control Properties.
5. In the Advanced tab, specify *fc_recordhover* as the ID of the hover window and save the application definition.

Providing user information

You can provide information to help users in the windows and tabs in the user interface. You can create links from windows and tabs, and also from field help, to topics in the product Knowledge Center. You can also add new error messages to an application.

- [Adding messages to the messages table](#)

You can add new messages to an application that help the user to resolve issues when the application encounters errors. Messages are displayed to the user and are added to logs to help with error resolution. When you add a message in the Application Designer, it becomes available for translation into supported languages.

- [Linking to user information](#)

You can add a link to a topic in the product Knowledge Center from a help grid control, or from the field help for any other control.

Adding messages to the messages table

You can add new messages to an application that help the user to resolve issues when the application encounters errors. Messages are displayed to the user and are added to logs to help with error resolution. When you add a message in the Application Designer, it becomes available for translation into supported languages.

About this task

Single quotation marks (') do not appear in the displayed message. To include quotation marks in the displayed message, you must use double quotation marks (") when you write the text of the message.

Procedure

1. Open the application in the Application Designer.
2. Select the Messages option from the Select Action menu.
3. Specify the identifier for the Message Group.
4. Specify a Message Key that is unique in this message group.
5. Select a Message ID.
6. Specify the text of the message in the Value field.
7. Complete any other relevant fields and click OK.

Linking to user information

You can add a link to a topic in the product Knowledge Center from a help grid control, or from the field help for any other control.

About this task

The URL for an Knowledge Center topic must have the following format: `com.ibm.mbs.doc,application/helpfile.html`

Procedure

1. To create a link from a help grid control, specify the URL for the topic in the More information field in the Help Grid Properties window.
2. To create a link from the field help for a control, specify the URL for the topic in the More information field in the control properties window
When the user clicks Alt + F1, a More information link is available in the help window.

Results

When the user clicks a more information link, the relevant topic in the Knowledge Center opens in a new tab. You can add links from multiple controls to one topic, or you can link to multiple topics. You must add links manually to each individual control. If an Knowledge Center topic is moved or deleted, users can encounter broken links if you do not update each control.

Configuring dialog windows for an application

You can modify dialog windows that are specific to an application in the Application Designer. To modify dialog windows that are shared with other applications, you must modify a system XML file. You can also create a dialog and add it to an application.

- [Modifying an application dialog window](#)

You can modify a dialog window that is specific to an application in the Application Designer.

- [Modifying a system dialog window](#)

To modify a system dialog window, you must export the library.xml file and modify the XML file in a text editor.

- [Creating a dialog window](#)

You can add a new dialog window to a specific application or you can make it available for use by all applications. You must modify an XML file to create a dialog window and import the modified file into the Application Designer. After importing it, you can modify the new dialog window in the Application Designer.

Modifying an application dialog window

You can modify a dialog window that is specific to an application in the Application Designer.

About this task

This procedure applies to dialog windows that are specific to the current application. If the dialog window is not available in the Edit Dialogs window, the window is probably a system dialog window that is shared by other applications.

Procedure

1. In the Application Designer, click Edit Dialogs and select the dialog window that you want to modify.
2. In the Workspace, perform the modifications in the same manner as you modify an application.
3. Click Save.

Modifying a system dialog window

To modify a system dialog window, you must export the library.xml file and modify the XML file in a text editor.

Before you begin

Do not modify the library.xml file while other applications are using it.

About this task

System dialog windows, such as the Change Status window, are shared by multiple applications and any changes you make apply to all applications that use the dialog. If you do not want to modify the window for all applications, copy the XML code for the dialog element and use this as a template for a new window that is specific to an application.

Procedure

1. In the Application Designer, click the Export System XML option in the Select Action menu.
2. In the Export System XML window, select the Library option and click the Export XML icon.
The library.xml file opens in a new browser window.
3. Save the library.xml file to a local file and open it in a text editor.
4. Locate the dialog element that you want to change in the XML file and modify as required.
5. Save the XML file.
6. In the Workspace of the Application Designer, click the Import Application Definition icon on the toolbar.
7. Browse to the local copy of the library.xml file that you changed and select it.
The modified XML definition is saved to the database and the changes that you made are now available to all applications.

Creating a dialog window

You can add a new dialog window to a specific application or you can make it available for use by all applications. You must modify an XML file to create a dialog window and import the modified file into the Application Designer. After importing it, you can modify the new dialog window in the Application Designer.

Procedure

1. In the Application Designer, export one of the following XML files:
 - a. In the List tab, click Export System XML in the Select Action menu to export the library.xml file if you want to add a new dialog for use by all applications.
 - b. In the Workspace tab, click the Export Application Definition icon to export the presentation.xml file if you want to add a new dialog for use by a specific application.The XML definition opens in a new browser window.
2. Save the XML definition to a local file and open it with a text editor.
3. Add a code snippet for the dialog at the end of the XML file, just before the final closing tag, either the `</systemlib>` tag or the `</presentation>` tag.
The following code creates a View History dialog window to the end of a presentation.xml file:

```
<dialog id="newviewhist" label="View History">
</dialog>
</presentation>
```

4. Save the changes to the XML file.
5. In the Application Designer, click the Import Application Definition icon, navigate to the modified XML file and import it.
6. Click the Edit Dialogs icon and select the dialog window you created.
7. In the Workspace tab, modify the dialog window as required.

Transferring data between applications

To move data from a field in an application to another field in a different application, you can use linked objects and .

- [Data transfer options](#)
Although similar in purpose, there are distinct differences between the two configuration options that you can use to transfer data from a field in one application to a field in another. These data transfer options are based on either linked objects or on crossover domains.
- [Linking objects to share data between applications](#)
User interface controls are bound to database attributes that present data from the application parent (and child) objects in a browser window. Most applications present data that resides in other objects and you can use relationships, defined in the Relationships application, to indicate the connection between these objects. This scenario describes how to add user comments about an asset to a work order when you add the asset to a work order.
- [Using crossover domains to share data between applications](#)
The following scenario describes how to use a crossover domain to display comments about an asset on work orders. In this case, you use a crossover domain value to establish a link between the Workorder and Asset objects instead of using a database relationship to link objects. When using a crossover domain to copy data across applications, you cannot edit the asset comment value in the destination application.

Data transfer options

Although similar in purpose, there are distinct differences between the two configuration options that you can use to transfer data from a field in one application to a field in another. These data transfer options are based on either linked objects or on crossover domains.

Linked objects can pass data from a source application to a target application using database relationships. In the destination application, the data value can be read, or read/write, depending on how you configure the input field. If you configure the destination input field to be read/write, the application framework automatically updates the source application and parent object if you update a displayed value.

Crossover domains pass data from one application to a different application using domains. A copy of the data value from a source application is passed to a destination application using the crossover domain as a trigger mechanism. You cannot edit the data value in the destination application, and the copied data value is static.

Database relationships that link objects and crossover domains enable the export of information from a source object to a destination object using WHERE clauses to filter for list and validation values. You can use a database relationship or a crossover domain to accomplish the following objectives:

- Enter an asset number in the Items application, retrieve the serial number of the asset from the ASSET object, and copy this value into a field.
- Enter an asset number for a new work order, retrieve the parent asset number from the ASSET object, and insert this value into a field.
- Enter a user name in an application, retrieve the user's phone number and address from the PERSON object, and insert the information into two different fields.
- Enter the user name for a person that is creating a material receipt record, retrieve the name of the user's supervisor from the PERSON object, and insert it into a field.

Linking objects to share data between applications

User interface controls are bound to database attributes that present data from the application parent (and child) objects in a browser window. Most applications present data that resides in other objects and you can use relationships, defined in the Relationships application, to indicate the connection between these objects. This scenario describes how to add user comments about an asset to a work order when you add the asset to a work order.

- [Adding a comment attribute to an asset](#)
You must add an attribute (if one does not already exist) to the asset object as the first step in capturing user comment information about an asset.
- [Linking objects in different applications](#)
To capture comments associated with an asset on a work order, you must create a relationship or link between the ASSET and WORKORDER objects. Linking these objects enables the Work Order Tracking application to display and update information stored in the ASSET object.
- [Adding a text box for comments](#)
Your next step in the scenario is to add text box controls to the Assets application and to the Work Order Tracking application . The text box in the Assets application lets you input or edit a comment value for an asset. You can view these comments in the text box in the Work Order Tracking application.

Adding a comment attribute to an asset

You must add an attribute (if one does not already exist) to the asset object as the first step in capturing user comment information about an asset.

Procedure

1. In the Database Configuration application, filter for the ASSET object and click the Attributes tab.
2. In the Details section, click New Row.
3. Specify values in the following required fields or accept default values where appropriate:

Field label	Input value	Description
Attribute	Assetcomment	Attribute name
Description	User comments regarding the asset	Text description of attribute

Field label	Input value	Description
Type	ALN	The default
Length	100	Field length
Title	Comment	Alias name to substitute in messages and window labels
Search Type	Wildcard	Search on this attribute using wild card characters like * and %

- Click Save.
- Perform the usual procedures to run the ConfigDB tool to update the database to enable these database changes to take effect.

Linking objects in different applications

To capture comments associated with an asset on a work order, you must create a relationship or link between the ASSET and WORKORDER objects. Linking these objects enables the Work Order Tracking application to display and update information stored in the ASSET object.

Procedure

- In the Database Configuration application, select the Work Order application and then open the Relationships tab.
- Click New Row.
- In the Details window, specify the following values:

Field label	Input value	Description
Relationship	ASSET2WOLINK	The name of the database relationship
Child Object	ASSET	The name of the child object. WORKORDER is the parent object.
Where Clause	assetnum=:assetnum and siteid=:siteid	SQL Where Clause condition or conditions. The system does not validate your input in the Where Clause field. Verify that your syntax is correct.
Remarks	<text>	A description of the relationship. For example: This relationship binds WORKORDER and ASSET objects when you enter an asset number in a work order.

The following table describes the logic of the Where Clause conditions for this example:

WHERE clause syntax	Description
:assetnum	Represents asset number value entered in work order screen
assetnum=	Look in Asset object for the asset number that matches the value entered in the work order screen
:siteid	The Site value entered in work order screen
siteid=	Look in Asset object for the Site value that matches the current value in the work order screen

The Where Clause above joins the Work Order and Asset objects and locates a unique record.

- Click Save.

What to do next

To complete the process of capturing asset comment information on work orders, continue to the next procedure that describes how to add a textbox control to Work Order Tracking in the Application Designer.

Adding a text box for comments

Your next step in the scenario is to add text box controls to the Assets application and to the Work Order Tracking application. The text box in the Assets application lets you input or edit a comment value for an asset. You can view these comments in the text box in the Work Order Tracking application.

Before you begin

Before you start, verify that you have added the assetcomment attribute to the Asset object.

Procedure

- In the main tab of the Assets application in Application Designer, click the section that holds the Asset field.
- Click Control Palette and drag a text box control into the Asset section.
- Open the Control Properties window for the text box control.
- Specify the following information to bind the control to the assetcomment attribute:

Field input	Value	Description
Default Label	Defaults to the default label for the attribute	When you specify <code>assetcomment</code> in the Attribute field, this field defaults to the default label value of the attribute (if available). You can assign your own label value for this attribute that is specific to the application in the Label field. For example, you might enter <code>Asset Comments</code> .
Label	Comments	The value you enter here, for example, <code>Comments</code> , overrides the Default Label setting within the application. The value you enter for Label is specific to the application and not stored in an object.
Attribute	assetcomment	The name of the asset comment attribute in the Asset object.
Input Mode	DEFAULT	The Default option configures the Input Mode for the Comment field to be Read/Write or Edit mode.

- Click Save.
- In Application Designer, open the Work Order Tracking application and then select the Asset section of the application.
- Drag a text box control from the Control Palette to the workspace and position it between the Asset and the Parent WO fields.

8. Open the Control Properties for the text box and specify the following values:

Field input	Value	Description
Default Label	Defaults to the default label for the attribute	When you specify <code>assetcomment</code> in the Attribute field, this field defaults to the default label value of the attribute (if available). You can assign your own label value for this attribute that is specific to the application in the Label field. For example, you might enter <code>Asset Comments</code> .
Label	Comments	The value you enter here, for example, <code>Comments</code> , overrides the Default Label setting within the application. The value you enter for Label is specific to the application and not stored in an object.
Attribute	<code>asset2wmlink.assetcomment</code>	Type the name of the asset comment attribute in the Asset object. You must preface the attribute with the name of the database relationship that binds the Asset and Workorder objects and a dot. For example, <code>asset2wmlink.assetcomment</code> .
Input Mode	DEFAULT or READONLY	The Default option configures the Input Mode for the Comment field to be Read/Write or Edit mode. You can also configure the Comment field to be Read Only.

Results

After this configuration, the Comments field is populated in the Work Order Tracking application whenever you add an asset record to a work order.

Using crossover domains to share data between applications

The following scenario describes how to use a crossover domain to display comments about an asset on work orders. In this case, you use a crossover domain value to establish a link between the Workorder and Asset objects instead of using a database relationship to link objects. When using a crossover domain to copy data across applications, you cannot edit the asset comment value in the destination application.

- [Adding a comment attribute to an asset](#)
You must add an attribute (if one does not already exist) to the asset object as the first step in capturing user comment information about an asset.
- [Adding a comment attribute to a work order](#)
You must add an attribute (if one does not already exist) to the work order object.
- [Creating a crossover domain](#)
You can create a crossover domain in the Domains application.
- [Applying a crossover domain](#)
After you create a crossover domain, you must apply the domain that you created to a field that triggers the crossover conditions.
- [Adding a text box for comments](#)
Your next step in the scenario is to add text box controls to the Assets application and to the Work Order Tracking application. The text box in the Assets application lets you input or edit a comment value for an asset. You can view these comments in the text box in the Work Order Tracking application.

Adding a comment attribute to an asset

You must add an attribute (if one does not already exist) to the asset object as the first step in capturing user comment information about an asset.

Procedure

1. In the Database Configuration application, filter for the ASSET object and click the Attributes tab.
2. In the Details section, click New Row.
3. Specify values in the following required fields or accept default values where appropriate:

Field label	Input value	Description
Attribute	Assetcomment	Attribute name
Description	User comments regarding the asset	Text description of attribute
Type	ALN	The default
Length	100	Field length
Title	Comment	Alias name to substitute in messages and window labels
Search Type	Wildcard	Search on this attribute using wild card characters like * and %

4. Click Save.
5. Perform the usual procedures to run the ConfigDB tool to update the database to enable these database changes to take effect.

Adding a comment attribute to a work order

You must add an attribute (if one does not already exist) to the work order object.

Procedure

1. In the Database Configuration application, filter for the WORKORDER object and click the Attributes tab.
2. In the Details section, click New Row.
3. Specify values in the following required fields or accept default values where appropriate:

Field label	Input value	Description
-------------	-------------	-------------

Field label	Input value	Description
Attribute	Woassetcomment	Attribute name
Description	User comments regarding the asset	Text description of attribute
Type	ALN	The default
Length	100	Field length
Title	Comment	Alias name to substitute in messages and window labels
Search Type	Wildcard	Search on this attribute using wild card characters like * and %

- Click Save.
- Perform the usual procedures to run the ConfigDB tool to update the database to enable these database changes to take effect.

Creating a crossover domain

You can create a crossover domain in the Domains application.

Procedure

- In the Domains application, click Add New Domain > Add New CROSSOVER Domain to open the Crossover Domain window.
- Specify a domain name and full description for the domain, for example `ASSET2WO` as the domain name and `Asset to Work Order Crossover Domain` as the full description.
- Click New Row in the Crossover Domain section to open the detail section.
- Specify `Asset` in the Object field to define Asset as the source object of the crossover.
- Enter `assetnum=:assetnum` and `siteid=:siteid` in the Validation Where Clause field.
- Click New Row in the Crossover Fields section to open the detail section.
- Use the lookup to select the attribute that you chose from the Asset object in the Source field.
- In the Destination field, type the attribute that you chose for the work order.
- Click OK.

What to do next

After you create the crossover domain for the asset, apply the crossover domain to a work order field that triggers the crossover conditions.

Applying a crossover domain

After you create a crossover domain, you must apply the domain that you created to a field that triggers the crossover conditions.

Procedure

- In the Database Configuration application, open the Workorder object and click the Attributes tab.
- Click Filter, and specify `ASSETNUM` in the Attribute field.
- Press Enter to open the ASSETNUM details section, and specify `asset2wo` in the Domain field.
- Click Save.

What to do next

After you apply the crossover domain for the asset, add the crossover domain to the application for work orders.

Adding a text box for comments

Your next step in the scenario is to add text box controls to the Assets application and to the Work Order Tracking application. The text box in the Assets application lets you input or edit a comment value for an asset. You can view these comments in the text box in the Work Order Tracking application.

Before you begin

Before you start, verify that you have added the assetcomment attribute to the Asset object.

Procedure

- In the main tab of the Assets application in Application Designer, click the section that holds the Asset field.
- Click Control Palette and drag a text box control into the Asset section.
- Open the Control Properties window for the text box control.
- Specify the following information to bind the control to the assetcomment attribute:

Field input	Value	Description

Field input	Value	Description
Default Label	Defaults to the default label for the attribute	When you specify <code>assetcomment</code> in the Attribute field, this field defaults to the default label value of the attribute (if available). You can assign your own label value for this attribute that is specific to the application in the Label field. For example, you might enter <code>Asset Comments</code> .
Label	Comments	The value you enter here, for example, <code>Comments</code> , overrides the Default Label setting within the application. The value you enter for Label is specific to the application and not stored in an object.
Attribute	<code>assetcomment</code>	The name of the asset comment attribute in the Asset object.
Input Mode	DEFAULT	The Default option configures the Input Mode for the Comment field to be Read/Write or Edit mode.

- Click Save.
- In Application Designer, open the Work Order Tracking application and then select the Asset section of the application.
- Drag a text box control from the Control Palette to the workspace and position it between the Asset and the Parent WO fields.
- Open the Control Properties for the text box and specify the following values:

Field input	Value	Description
Default Label	Defaults to the default label for the attribute	When you specify <code>assetcomment</code> in the Attribute field, this field defaults to the default label value of the attribute (if available). You can assign your own label value for this attribute that is specific to the application in the Label field. For example, you might enter <code>Asset Comments</code> .
Label	Comments	The value you enter here, for example, <code>Comments</code> , overrides the Default Label setting within the application. The value you enter for Label is specific to the application and not stored in an object.
Attribute	<code>asset2wolink.assetcomment</code>	Type the name of the asset comment attribute in the Asset object. You must preface the attribute with the name of the database relationship that binds the Asset and Workorder objects and a dot. For example, <code>asset2wolink.assetcomment</code> .
Input Mode	DEFAULT or READONLY	The Default option configures the Input Mode for the Comment field to be Read/Write or Edit mode. You can also configure the Comment field to be Read Only.

Results

After this configuration, the Comments field is populated in the Work Order Tracking application whenever you add an asset record to a work order.

Configuring conditional user interface components

By applying conditions to control application behavior and to the user interface (UI), you can configure the UI to support your business processes. You can achieve the user interface behavior you require by configuring conditional data restrictions, by configuring conditional UI control behavior in Application Designer, or by configuring conditional security restrictions. For example, you can apply conditions to change the color of controls, the content of menus for different user groups, or the properties of the data shown.

- Conditional user interface**
 Conditions are clauses or classes that evaluate to true or false when they are evaluated against an object. Conditions can be applied to user interface (UI) controls to control how the UI is shown to users and to support your business processes. You can apply conditional data restrictions, signature options to conditionally control access to controls, or conditional control properties to configure the UI.
- Creating conditions**
 You can create conditions in the Conditional Expression Manager. Then, you can apply the conditions to fields, tabs, and other user interface controls in applications to control how the UI looks and behaves. You can also apply conditions to security groups to control access to applications, controls, and data.
- Applying conditional security**
 You can limit access to data and to elements of the user interface to users that have the right level of access.
- Applying conditional data restrictions**
 To support your business processes, you can apply conditions to restrict access to data for a user or for a user group. The data can be hidden, read-only, or required.
- Adding conditions to the properties of UI fields**
 You can control how the user interface (UI) is shown to users and to support your business processes. When a control is bound to a signature option or an attribute, you can configure conditional properties in the Application Designer.

Related information

- [🔗 Technotes about conditional user interface features delivered with your product.](#)

Conditional user interface

Conditions are clauses or classes that evaluate to true or false when they are evaluated against an object. Conditions can be applied to user interface (UI) controls to control how the UI is shown to users and to support your business processes. You can apply conditional data restrictions, signature options to conditionally control access to controls, or conditional control properties to configure the UI.

You can bind any UI control to a signature option to grant or revoke access to the control by groups of users. You can also apply conditions to the properties of a control so that the control looks or behaves differently for specified groups of users based on the evaluation of the applied conditions. For example, you can apply conditions to a control so that the color of the control changes depending on the value shown.

You can use the Application Designer to associate a control with a signature option and conditions. When a control is bound to a signature option or an attribute, you can take the following actions:

- Configure its behavior by setting a data restriction or conditional data restriction in Security Groups
- Grant the option in the Security Groups application

- Configure conditional properties in the Application Designer

When you are planning your conditional user interface system, you choose between the implementation methods listed. Data restrictions are useful for implementations where you want the restriction that you create to apply to every user interface element or application that uses an object or attribute. Security restrictions are useful when you want to restrict access to a control or to data to a specific group of users.

Example: Showing status options based on the status of the current record

XYZ Corporation requires that the work order status that is available to work order dispatchers is based on the current work order status. For this company, when a work order status is Waiting on Approval, only the values Approved and Canceled are available to the dispatchers.

To implement this business process, in the Condition Expression Manager, create the following conditional expression:

```
WOSTATUSAPPR :status = 'WAPPR'
```

Then in the Application Designer application, apply that condition to the domain values WOSTATUS|APPR and WOSTATUS|CAN. The status options shown on the UI reflect the status of the current work order.

Example: Changing historical data to read-only

ABC Inc. requires that all users see completed work orders from previous financial accounting periods as read-only. To implement this behavior, the application developer creates a condition that is true if the date checked is in the past. The date condition is evaluated against the date on completed work order records. The developer applies the condition to work order data in the Security Groups application for the security group that contains all users.

When the condition is evaluated, it returns a value of true if the work order date is from a previous financial period. All users see work order records from previous financial periods as read-only on the UI.

- [Hierarchy of restrictions](#)

The conditional restrictions that you define are applied hierarchically. For example, if you make an attribute read-only by using a data restriction, you cannot use the Application Designer application to make a field that is bound to the attribute editable.

Hierarchy of restrictions

The conditional restrictions that you define are applied hierarchically. For example, if you make an attribute read-only by using a data restriction, you cannot use the Application Designer application to make a field that is bound to the attribute editable.

The restrictions are applied as follows:

1. Database configurations
2. Data restrictions
3. Application configurations

Database configurations take priority over data restrictions and data restrictions take priority over application configurations.

If you define an object as read-only in the database, you cannot use data restrictions or the Application Designer application to make the object editable.

Data restrictions take priority over application configurations made in the Application Designer application. For example, if an attribute is made read-only using a data restriction, you cannot use the Application Designer application to make the attribute editable.

Configurations that are made with data™ restrictions apply everywhere an attribute is used. Application configurations made in Application Designer apply to that application only. For example, if you want to restrict access to a field that is in the header section of multiple tabs, you can put a data restriction on the field every instance of the field has the access restriction. If you configure the restriction in Application Designer, you must apply the restriction to each instance of the field on each tab.

Creating conditions

You can create conditions in the Conditional Expression Manager. Then, you can apply the conditions to fields, tabs, and other user interface controls in applications to control how the UI looks and behaves. You can also apply conditions to security groups to control access to applications, controls, and data.

- [Conditions overview](#)

A condition is a clause or class that evaluates to true or false when evaluated against an object. You can create and maintain a library of conditions. You can apply the conditions to fields, tabs, and other user interface controls to control the presentation. You can also apply conditions to security groups to control access to data, applications, and controls.

- [Creating conditional expressions and classes](#)

You can create conditional expression-type and class-type conditions. Then you can apply the conditions to control access to data and to user interface controls.

- [Conditional expression syntax](#)

You enter conditional expressions using a syntax similar to Structured Query Language (SQL) with some additional variables.

- [Sample conditional class files](#)

Sample condition class files are stored in a folder under the root directory of the product installation. You can use the sample files when you create class-type conditions.

Conditions overview

A condition is a clause or class that evaluates to true or false when evaluated against an object. You can create and maintain a library of conditions. You can apply the conditions to fields, tabs, and other user interface controls to control the presentation. You can also apply conditions to security groups to control access to data, applications, and controls.

There are two types of conditions:

Expression-type condition

An expression-type condition is a clause that evaluates data and returns a result of true or false. The expression syntax is similar to structured query language (SQL) expressions, but it supports substitution variables. Use expressions to define simple conditions.

Class-type condition

For class-type conditions, the condition logic is contained in Java™ classes that are stored in a file under the root product folder. You can create the class files that contain the condition logic. When the class-type condition is evaluated, it returns a true or false result. Use a class-type condition if the logic to be evaluated is too complex to be accomplished with a simple expression.

Conditions are created and managed in the Conditional Expression Manager. Describe each condition that you create to help you identify the conditions to apply to user interface elements or security groups.

You can use the Application Designer to apply conditions to user interface elements. You can also apply conditions in the Security Groups application to control access to applications and to actions within applications.

You can modify expression-type conditions. When you modify the condition, access to all data and to all user interface controls that use the condition is modified. You can determine whether a condition is applied to user interface controls, security groups, or data restrictions by checking the reference count field. If the reference count field is zero then the condition is not applied.

Creating conditional expressions and classes

You can create conditional expression-type and class-type conditions. Then you can apply the conditions to control access to data and to user interface controls.

About this task

To handle complex operations with multiple conditions, you can create an automation script that contains the condition logic. For more information, see [Automating routine tasks with automation scripts](#). Then, you can create a single condition that references the automation script and applies the condition as needed.

Procedure

1. In the Conditional Expression Manager, add a row and change the auto-generated Condition identifier to a meaningful identifier. Enter a complete description of the condition in the Description field.
A meaningful identifier and a complete description help you identify a condition later.
2. Select the condition type and enter the condition.
 - a. If you selected expression type, enter an expression, or click Condition Expression Builder to build an expression in the Condition Expression Builder.
 - b. If you selected class type, enter the class file name. The file must be in a folder under the root of the product folder, for example
`Maximo_home\maximo\samples`
3. Save the condition.

Conditional expression syntax

You enter conditional expressions using a syntax similar to Structured Query Language (SQL) with some additional variables.

When you create a conditional expression, use a colon (:) to define a variable. The colon is used to avoid ambiguity when you create expressions that relate the current record to a different, specific record.

You can have subselect in an expression,

```
exists (select 1 from workorder where wonum=:wonus).
```

The first *wonus* is the *wonus* attribute on the work order object. At run time, the second *wonus* is replaced with the value of the *wonus* attribute for the current record.

Replacement variables

Syntax	Description	Comments
:yes	true	Logically true, 1 if stored in the database
:no	false	Logically false, 0 if stored in the database
:%date%	Current® date	
:%datetime%	Current date and time	

Syntax	Description	Comments
:&user&	Logged in user	For example, if a user is signed in as Smith, :owner.id=&user& converts to :ownerid='SMITH'
:&personid&	Person ID of logged in user	For example, if a user is logged in as Smith, :reportby=&personid& converts to :reportby='SMITH'
:&appname&	Application name	For example, in the Work Order Tracking application, :&appname& = WOTRACK converts to WOTRACK = WOTRACK. This variable is useful for setting different behavior for different copies of an application.
:&mboname&	Name of the current business object	For example, in the work order object, object = :&mboname& converts to object = WORKORDER
:&ownername&	Name of the owner business object	For example, in the Work Order Tracking application, :&ownername&.jobplan.priority>&ownername&.priority converts to workorder.jobplan.priority>workorder.priority

Bind variables

Syntax	Description	Examples
:<relationship name>.<attrname>	Value of an attribute of a related business object of the current business object	:location.description
:&owner&.<attrname>	Value of an attribute of the owner business object	When you apply a job plan to a work order, the system copies the priority of the job plan to the child work order. The condition can be: :&owner&.jobplan.priority>&owner&.priority. In this example, the system copies this information if the job plan has a higher priority than the parent work order.
:&owner&.<relationship name>.<attrname>	Value of an attribute of the related business object of the owner business object	See the example for :&owner&.<attrname>
:&old_<attrname>	The initial value from the database of the attribute	For example, if you change the value of a field from 1 to 2 to 3 to 4, the original value is 1.

Conditional expressions examples

- :wostatus='APPR'
- :type='EM'
- :ownerid=:&user&
- :supervisor!=:&personid&
- :asset.assettype = 'IT' and :&personid&=:owner
- :reportby=:&personid&
- :assetspec.classstructureid = 122
- :po.poline.receivedqty=0
- :&owner&.jobplan.priority>&owner&.priority
- :owner.&po.\$old_description like '%Turbin%'

Sample conditional class files

Sample condition class files are stored in a folder under the root directory of the product installation. You can use the sample files when you create class-type conditions.

To use a sample condition class, enter the file name in the Class field in the Conditional Expression Manager application.

Sample condition classes

- Evaluates to true: psdi.common.condition.AlwaysTrue
- Evaluates to false: psdi.common.condition.AlwaysFalse

Applying conditional security

You can limit access to data and to elements of the user interface to users that have the right level of access.

- [Conditional security](#)
You can apply these conditions to security groups, to enforce security measures, for example, you can limit access to certain elements of the user interface to users with the right level of access.
- [Defining signature options for an application](#)
Signature options specify privileges for using applications, menu options, and toolbar items. You apply signature options to groups of users to control their access to data, to applications, and to controls. New applications are automatically assigned a READ signature option. You can add more signature options in the Application Designer.
- [Removing a signature option from a UI control](#)
To remove a signature option from a user interface (UI) control, you must first delete all security groups that are associated with the signature option.
- [Applying signature options to show user interface controls](#)
You can grant access to a user interface (UI) control by associating it with a signature option. Then, users who belong to the security groups that are

associated with this signature option are granted access to the control. Security groups that are not associated with the signature option do not have access to the control.

- [Showing controls to some users](#)

A user can be a member of many security groups. A user can have read-only access to an application in one group. As a member of another group the same user can have conditional access to the application. When the security groups combine, the user can access the application when the condition is true. When the condition is false, the user cannot access the application.

Conditional security

You can apply these conditions to security groups, to enforce security measures, for example, you can limit access to certain elements of the user interface to users with the right level of access.

In the condition library, you can define conditions, either as expressions or as custom class files. You can control access to applications and to controls in applications by applying conditions to security groups. The conditions are applied to signature options (SIGOPTION) that are then granted to the security group. Conditional access is granted in the security groups application. If a user is in multiple security groups, the highest level of access is granted when the security groups are joined.

The following are some examples of the types of conditional access that you can set:

- Give read-only access to the information that is shown in a field.
- Give read/write access to the information that is shown in a field.
- Give a user group read-only access to a specific field in an application.
- Give all members of a user group read/write access to an application.
- Hide a field or tab in an application from certain users.
- Grant access to application options in the Select Action menu or side navigation menu for a security group.
- Configure any property in a control for a group, such as making a control hidden, masked, read-only, or required.
- Configure other properties, such as color, label, and application link, to be different for on the user group that is accessing the UI.
- Show or hide a data attribute globally or for a security group.

Defining signature options for an application

Signature options specify privileges for using applications, menu options, and toolbar items. You apply signature options to groups of users to control their access to data, to applications, and to controls. New applications are automatically assigned a READ signature option. You can add more signature options in the Application Designer.

Procedure

1. Open the application in the Application Designer.
2. Select the Add Modify Signature Options in the Select Action menu and click New Row.
3. Specify a signature option in the Option field.
4. Optional: Add additional signature options in the Option Also Grants field.
Use commas to separate multiple entries if you want to enable more than one additional signature option.
For example, if the signature option grants access to the People application, you can add signature options that grant access to a related application, such as the Users application.
5. Optional: In the Option Also Revokes field, specify any signature options that are revoked as a result of adding the primary option.
For example, you add a signature option that allows read-only access to an application. You want to remove any write access to the application that users with the read-only signature option have. To remove the write access, you specify the signature option that grants write access to the application in the Option Also Revokes field.
6. Save the signature options.

Removing a signature option from a UI control

To remove a signature option from a user interface (UI) control, you must first delete all security groups that are associated with the signature option.

Procedure

1. In the Application Designer workspace, select the control and click Control Properties.
2. In the Control Properties window, click Configure Conditional Properties.
3. Delete all rows in the Security Groups section and click OK.
4. Delete the signature option in the Control Properties window.
5. Click Save.

Results

The default behavior of the UI control is restored.

Applying signature options to show user interface controls

You can grant access to a user interface (UI) control by associating it with a signature option. Then, users who belong to the security groups that are associated with this signature option are granted access to the control. Security groups that are not associated with the signature option do not have access to the control.

About this task

Multiple controls can be associated with one signature option. Then, access to the controls can be granted or revoked as a group.

Procedure

1. In the Application Designer workspace, select the application that you want to configure.
2. Select Add/Modify Signature Options and create a signature option.
3. Select the control that you want to configure and click Control Properties. Select the signature option that you created and close the window.
4. Click Save.
5. In the Security Groups application, create a group or select an existing group.
6. In the Options for Actions section of the Applications tab, select the Grant Access check box for the access types that you want to provide to the application.
7. Select the Grant Access check box for the signature option that you applied to the control in step 2.
8. Click Save.

Results

The control is visible only to the users in the security groups that this signature option is granted to.

Showing controls to some users

A user can be a member of many security groups. A user can have read-only access to an application in one group. As a member of another group the same user can have conditional access to the application. When the security groups combine, the user can access the application when the condition is true. When the condition is false, the user cannot access the application.

Procedure

1. In the Application Designer workspace, select the control and click Control Properties.
2. Select a signature option and close the window.
3. Click Save.
4. In the Conditional Expression Manager application, create a condition that grants access to a control when the condition is true.
5. In the Security Groups application, select the security group that contains all users.
For example, select the MAXEVERYONE security group.
6. Click the Applications tab and filter for the application that you want to apply the condition to.
7. In the signature options row, check Grant Access, and specify the identifier of the condition you created in Step 4 in the Condition field.
8. On the List tab, select another security group.
For example, select the PROJECTMANAGERS security group.
9. In the Applications tab, check Grant Access in the Read Access to Actions row.
10. Add the same user to both security groups.

Results

You have one group of users, PROJECTMANAGERS that has read-access to the application. The security group that contains all users, MAXEVERYONE, has conditional access to the control. When the two groups are combined, users have access to the control when the condition is true. Users who do not have read-access to the application in any group do not have access to the control.

Applying conditional data restrictions

To support your business processes, you can apply conditions to restrict access to data for a user or for a user group. The data can be hidden, read-only, or required.

- [Conditional data restrictions](#)
Data restrictions can be conditional or unconditional. You can restrict access to data for a user or user group. The data can be hidden, read-only, or required.
- [Specifying data restrictions for security groups](#)
To customize your security settings, you can specify restrictions on which records a security group can access. You can use a conditional expression or a conditional class file to define and apply these restrictions.
- [Specifying global data restrictions for security groups](#)
Using global data restrictions, you can use a condition to specify restrictions on which records can be accessed by security groups.

Conditional data restrictions

Data restrictions can be conditional or unconditional. You can restrict access to data for a user or user group. The data can be hidden, read-only, or required.

You can use these methods to restrict a user's access to data:

- Database configuration of objects and attributes
- Data restrictions on objects and attributes
- Application configurations

Data restrictions are configured in the Security Groups application. You can also set data restrictions for attributes in objects, either with or without a specified application. Data restrictions that are applied to an object do not apply to views of the object. You must create a separate restriction for the object view.

You can apply conditions to objects to hide them, to make them required, or to make them be read-only. You can apply the condition for every user, or just to a particular security group. Objects or objects within the context of an application can also be associated with a condition to determine what data is shown in the application. Only data that satisfies the condition is returned when the database is queried.

You can also apply conditions to attributes within objects, either with or without an associated application. When you view records in an application, the evaluation of conditions can change the presentation of controls bound to objects or attributes with conditional restrictions applied.

You associate objects or attributes with conditions in the Security Groups application.

If you apply multiple conditions, the conditions are joined by an OR operator when they are evaluated.

You can apply two or more conditions joined by an AND operator to an object or attribute. You can append the second and subsequent conditions to the first one with an AND function between them.

As an application developer, you are implementing a data restriction that causes information about an asset to be shown on the UI. The asset is shown if the following conditions are met:

- The asset is a calibration asset
- The asset has asset meter records

You create two conditions in the Condition Expression Manager:

- Condition 1 displays calibration-related fields for the asset if it is a calibration asset:

```
iscalibration=1:
```

- Condition 2 checks for any asset meter records:

```
exists (select 1 from assetmeter where assetnum = :assetnum and orgid =:orgid)
```

You append Condition 2 to Condition 1 with an AND operator:

```
iscalibration=1:and exists (select 1 from assetmeter where assetnum = :assetnum and orgid =:orgid)
```

You apply the appended condition to the required asset object or attribute.

Specifying data restrictions for security groups

To customize your security settings, you can specify restrictions on which records a security group can access. You can use a conditional expression or a conditional class file to define and apply these restrictions.

Procedure

1. In the Security Groups application, select the group for which you want to set restrictions.
2. On the Data Restrictions tab, select the type of restriction:
 - To specify restrictions on objects, click Object Restrictions.
 - To specify restrictions on attributes, click Attribute Restrictions.
3. Click New Row.
4. In the Object field, specify the table or view on which to set the restriction.
5. Optional: If you are specifying an attributes restriction, specify the attribute that you want to restrict.
6. Optional: In the Application field, specify the application to which you are applying the restriction. Leave the field blank to apply the restriction to all applications that use the object or attribute.
7. Specify the type of restriction.
8. Optional: Specify the following options for restrictions:

Option	Description
Reevaluate	Select this option for the restriction condition to be reevaluated when the user tabs to another field. If you do not select this option, the restriction conditions are evaluated after the changes to a field are saved.
Condition	Specify a conditional expression.

9. Save your changes.

Specifying global data restrictions for security groups

Using global data restrictions, you can use a condition to specify restrictions on which records can be accessed by security groups.

Procedure

1. Optional: In the Conditional Expression Manager application, create one or more conditions to be evaluated to control access.
2. In the Security Groups application, select the Global Data Restrictions action.
3. In the Global Data Restrictions window, select the type of restriction, and specify the details of the restriction.

Adding conditions to the properties of UI fields

You can control how the user interface (UI) is shown to users and to support your business processes. When a control is bound to a signature option or an attribute, you can configure conditional properties in the Application Designer.

- [Adding conditions to determine access to UI controls](#)
You can conditionally modify the default access to user interface (UI) controls. UI controls include text boxes, check boxes, and radio buttons.
- [Adding conditions to hide UI controls](#)
You can create and apply a signature option to a user interface (UI) control to deny access based on satisfying a condition. When the condition is true, access is granted to all of the controls who are associated with the signature option. Conditional access is granted to all users who belong to the security groups that are associated with the signature option.

Adding conditions to determine access to UI controls

You can conditionally modify the default access to user interface (UI) controls. UI controls include text boxes, check boxes, and radio buttons.

Procedure

1. In the Conditional Expression Manager application, create one or more conditions that grant access to a UI control when the condition is true.
2. In the Security Groups application, create or identify the security groups that can access the UI control.
3. In the Application Designer workspace, select Add/Modify Signature Options, and create a signature option.
4. Select the UI control that you want to configure, and select Control Properties.
5. Click Configure Conditional Properties and specify the following options:

Option	Description
Signature Option	Specify the signature option you created for the control.
Security Groups	Specify the groups that you want to provide with access to the control.
Conditions for a Security Group	Specify the conditions you created in step 1. The conditions apply only to the security groups that you specified.
Property Values for Condition	Specify the names and values of the properties to be controlled by the condition.

6. In the Security Groups application, grant the signature option to the security group.

Results

The users in the security groups that you specified can see the UI control when the conditions you apply are true. Other users cannot see the UI control.

Adding conditions to hide UI controls

You can create and apply a signature option to a user interface (UI) control to deny access based on satisfying a condition. When the condition is true, access is granted to all of the controls who are associated with the signature option. Conditional access is granted to all users who belong to the security groups that are associated with the signature option.

Procedure

1. In the Conditional Expression Manager application, create one or more conditions that denies access to a UI control when the condition is true.
2. In the Security Groups application, create or identify the security groups that cannot access the UI control.
3. In the Application Designer workspace, select Add/Modify Signature Options, and create a signature option.
4. Select the UI control that you want to configure, and select Control Properties.
5. Click Configure Conditional Properties and specify the following options:

Option	Description
Signature Option	Specify the signature option you created for the control.
Security Groups	Specify the groups that you want to hide the UI control from.
Conditions for a Security Group	Specify the conditions you created in step 1. The conditions apply only to the security groups that you specified.
Property Values for Condition	Specify the names and values of the properties to be controlled by the condition.

6. In the Security Groups application, grant the signature option to the security group.

Results

The users in the security groups that you specified do not see the UI control when the condition you apply is true. Users in other security groups can see the UI control.

Application developer properties

Each control has its own set of properties that you can set. You can also set user interface properties to control the behavior of many aspects of user interface behavior.

- [Control properties](#)
You can configure the properties for each individual user control in an application user interface.

Control properties

You can configure the properties for each individual user control in an application user interface.

- [Application bar control](#)
The application bar (or appbar) control, is a menu bar that lists all applications in a module except the currently active application. An application bar is always open at the top of the window in a self-service application.
- [Attachments control](#)
You can activate the drop-down menus and windows associated with attachments by dropping the control into any section container in an application. However, you cannot access the functions used to build the attachments control through the interface of the Application Designer.
- [Blank line control](#)
A blank line control inserts vertical white space in a section. Blank lines provide spacing between controls to improve readability or to visually separate different types of controls within a section.
- [Breadcrumbs control](#)
You can use the breadcrumb control to enhance navigational functionality in an application. Breadcrumb navigation tracks the steps you take in an application and helps you to retrace steps quickly. You can use a breadcrumb control by itself or in conjunction with another control, such as a tree control. You can place this control inside any container control.
- [Button group control](#)
A button group is a container control that holds push button controls. The button group defines the layout for the buttons it contains, including alignment within the container and the title for the group. Place this control within a section control or a table control.
- [Check box control](#)
With a check box control, a user can indicate a yes or no response to a question or select one or more items from a list. A check box is a text type control because it has a text field or a label that is visible to the user. Place this control inside a section control.
- [Combo box control](#)
With a combo box control, a user can select one or more options from a list drop down menu. Place this control inside a section control.
- [Data source control](#)
Use a data source control to override the default data source, or the current data source, for an application. This control is used primarily in dialog windows to reference a business object that controls in the window can use as a data source. A data source control is transparent and does not render any visible element.
- [Default value control](#)
You can use a default value control to speed up a database insert or query by restricting the action to a limited set of records. The default value control is transparent and does not render anything visible in the user interface. You can place the default value control in a section control, a table control, or in the presentation control.
- [Help grid control](#)
A help grid control contains HTML text that you can insert in the user interface, typically to provide brief instructions on how to enter data and perform tasks. For complex information, help grids can include hyperlinks to additional information in a Knowledge Center topic. You can place help grid controls within Section, Section Column, Tab, and Dialog controls.
- [Hover window control](#)
A hover window is a read-only pop-up window that is applied to a user interface control to display more information about an attribute.
- [Hyperlink control](#)
You can configure text or a graphic as a hyperlink that opens a menu or window, or a destination inside or outside the application. Place this control inside a section control.
- [Icon menu control](#)
The icon menu control displays menu items next to a text box or multipart text box. You can use the `mxe.webclient.iconsToDisplay` system property to limit the number of menu items to display but the default is three.
- [Image control](#)
You can add an image control to create a visual marker to identify an application you can open or an action you can perform. You can configure the height, width, and alignment for the specified image file. You can place an image control with a section control.
- [Include control](#)
You can use include controls to reuse dialog windows, layouts, and data tables from an existing application in the presentation.xml file of a new application. You can place an include control within a page, tab, or section control.
- [List box control](#)
A list box control displays a list of items in a box that is always open. Place this control inside a section control.
- [Menu bar control](#)
The menu bar control is similar to an application bar control but the menu options typically contain drop down menus with additional option choices. The menu bar at the top of the List tab in most applications is a typical example. You can place a menu bar control only in a tab control.
- [Multiline text box control](#)
A multiline text box control is a large text box that can display several lines of text or accept this text from user input. Text boxes are often linked to select value lookups and detailed menus. You can place a multiline text box control within a section control.
- [Multipart text box control](#)
A multipart text box contains two text boxes, positioned side-by-side, that can contain information from different sources. You can input information, populate a box by selecting a value from a list, or show an attribute description from a table. You can place a multipart text box within a section control.
- [Parameter value control](#)
A parameter value control can display dynamic values in the label of a section control or a table control.

- **[Parameter values control](#)**
A parameter values control is a container control that can contain a parameter value to show a dynamic value that represents a replaceable value in the label of a Section Header control.
- **[Presentation control](#)**
The presentation control manages the appearance of the user interface display, and all other controls are contained by this control. The presentation control contains only one page control. The page control specifies the main page of an application and uses the entire client area of the browser. All other application windows are dialogs that open as popup windows. You can add the definition for a dialog window to the PRESENTATION.XML file, or you can include the definition of an existing dialog from the LIBRARY.XML file.
- **[Push button control](#)**
A push button control initiates an event such as opening a window with a list of records or opening an empty row where a user can enter a record. Place this control inside a button group control.
- **[Radio button control](#)**
A radio button is a control that allows users to choose one of a predefined set of options. Radio buttons are organized in groups of two or more. Radio buttons typically appear as little circles that are either empty (for unselected) or contain a dot (selected). When you select a radio button, the previously selected button in the same group is deselected.
- **[Radio button group control](#)**
A radio button group is a container control that holds radio buttons. The radio button group defines the layout for the buttons it contains, including a group title, text alignment for button labels, and whether or not to show a border. You can place a radio button group control within a section control.
- **[Record image control](#)**
You can use the record image control to associate an image with a record, including an expandable thumbnail image. You can then add this image to an application from within the application user interface. A user can click on a thumbnail image to view its full size and can drag the mouse over the image to see a text description. You can place a record image control in any container control.
- **[Rich text editor control](#)**
The rich text editor control provides the ability to add rich text formatting to a field with long description characteristics.
- **[Rich text viewer control](#)**
The rich text viewer control provides the ability to view rich text formatting in a field with long description characteristics.
- **[Section control](#)**
A section control is one of the core container controls that you use to organize the layout of an application. Container controls occupy space on a page and provide storage for other controls, such as tables, buttons, and text fields.
- **[Section column control](#)**
A section column control is a vertical column that you can use to divide a section row into columns with headings. A section column is a container that can hold child section controls and is also a child to the parent section control. When you move a section control, all of its child controls automatically move with it.
- **[Section header control](#)**
Use a section header control to display a text heading for a section or a table. The text in the heading can be dynamic, based on variables you configure in parameter and parameter values controls. A section header control is a container control and is transparent in the user interface.
- **[Section row control](#)**
A section row control is a layout control that contains section column controls. A section row creates a horizontal row that you can partition into columns that hold child sections. A section row is a child to a parent section control. When you move a section, all of its child controls automatically move with it.
- **[Static text control](#)**
You can use a static text control to add text to a section control or to specify a database attribute that you can configure and position within a section as if it were unbound text. Static text is, typically, used in Date search windows in applications, where To and From labels are static text controls.
- **[Tab properties](#)**
A tab control is a container in which you place other controls such as tables and sections. Formatting tabs is, typically, the starting point for designing the structure and layout of a new application or extending the layout of an existing application. Place this control inside a tab group control.
- **[Tab group control](#)**
A tab group control is a container control that holds tabs. Tab groups are part of the template for power applications. When you create a power application, a tab group control is provided with the standard List and Workspace tabs.
- **[Table control](#)**
The table control is a container with the basic layout elements of a table window, including a toolbar with filter and search functionality and icons for previous and next row and page. You can place a table control within a section, tab, or window control and you can place a table column control or a section control within a table control.
- **[Table column control](#)**
The table column control is a container that you can use to add columns and column headings to a table. You can place a table column control within a table control.
- **[Text box control](#)**
A text box control is a single-line text box that displays information the user either enters or selects from a list. Text boxes have labels that are typically visible in the user interface. Labels are text fields that describe the type of information displayed in the box. You can place a text box within a section control.
- **[Tree control](#)**
Use a tree control as a container for tree node and tree attribute controls to build dynamic, hierarchical tree structures with specific business objects that support hierarchical data. You can place a tree control within a dialog control or a tab control. You can place a tree node control into a tree control.
- **[Tree attribute control](#)**
The tree attribute control describes the data that appears in each tree node. For example, the tree attributes in the Classifications application display classification IDs and descriptions in the user interface. You can place a tree attribute control within a tree node control.
- **[Tree node control](#)**
The Tree Node control is a container type of control that works with the Tree and Tree Attribute controls. A Tree Node defines the structure of a hierarchical tree.

Application bar control

The application bar (or appbar) control, is a menu bar that lists all applications in a module except the currently active application. An application bar is always open at the top of the window in a self-service application.

You can place an application bar inside the client area control. You can also place this control in a section control if you use the correct layout options.

Properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Label	Specify a text value in this field if you want the application bar to have a label. This label is specific to the application and is not stored in the MAXATTRIBUTE or APPFIELDDEFAULTS tables.
Appbarlinks	Specify the links to add to the application bar.
Signature Option	You can specify a signature option that can restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click the Configure Conditional Properties button.
Sig Option Data Source ID	An MBO must be used to evaluate whether or not a user has access to a signature option. Specify the value of the data source that performs this evaluation if it is different to the data source that is configured for this control.

Attachments control

You can activate the drop-down menus and windows associated with attachments by dropping the control into any section container in an application. However, you cannot access the functions used to build the attachments control through the interface of the Application Designer.

Properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Label	You can specify a text value in this field to override the default label for the control, which is Attachment. This label is specific to the application and is not stored in the MAXATTRIBUTE or APPFIELDDEFAULTS tables.
Signature Option	You can specify a signature option that can restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click the Configure Conditional Properties button.
Sig Option Data Source ID	An MBO must be used to evaluate whether or not a user has access to a signature option. Specify the value of the data source that performs this evaluation if it is different to the data source that is configured for this control.

Blank line control

A blank line control inserts vertical white space in a section. Blank lines provide spacing between controls to improve readability or to visually separate different types of controls within a section.

A blank line control functions as a graphic element, is transparent in the user interface, and does not have configurable properties. Place a blank line control inside a section container control.

Breadcrumbs control

You can use the breadcrumb control to enhance navigational functionality in an application. Breadcrumb navigation tracks the steps you take in an application and helps you to retrace steps quickly. You can use a breadcrumb control by itself or in conjunction with another control, such as a tree control. You can place this control inside any container control.

A breadcrumb trail complements a hierarchical tree structure by showing a horizontal representation of where the user is in a menu structure or a service catalog. You can configure a delimiter character to separate items in the breadcrumb trail, such as the greater than character (>) or a colon (:). Each phrase or identifier between delimiters represents one step in a hierarchy.

To synchronize a tree control and a breadcrumb controls, copy the Data Source ID property from the tree control to the breadcrumb control. The following table describes how a tree control and breadcrumb control behave in the user interface when they are used in combination.

When you click . . .	This happens
The label of any node	A new breadcrumb trail replaces any existing breadcrumb trail and: <ul style="list-style-type: none">• Highlights the node label in the tree• Displays the node label in breadcrumb• All levels in the tree hierarchy above the highlighted node label appear in the breadcrumb (in descending order from left to right)
The plus sign in a tree	No effect.
The minus sign in a tree	Highlights the right-most breadcrumb, which is the same as the node label next to the minus sign.
The dot sign in a tree	The corresponding node label highlights in the tree and displays in the breadcrumb. All levels in the tree hierarchy above the highlighted node label appear in the breadcrumb (in descending order from left to right).
Any node label in the breadcrumb	Equivalent to clicking the node label in the tree. The tree contracts to the level of the node label and any breadcrumb links to the right of the clicked node label disappear.

When you click . . .	This happens
A delimiter in the breadcrumb	No effect.

You can expect the following user interface behavior when navigating a tree or breadcrumb:

- Any time you highlight a node label in a tree or breadcrumb, the window displays information related to that label.
- Clicking a plus sign in a tree expands the node, but does not affect window content, label highlighting, or the breadcrumb.
- Clicking a minus sign in a tree does not affect window content, but does highlight the node label associated with the minus sign and the breadcrumb reflects the new hierarchy ending with the highlighted node.
- The highlighted node label in a tree always reflects the right-most element in the breadcrumb. The breadcrumb elements to the left reflect the intervening levels in the tree hierarchy.

Properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Label	You can specify a text value to use as a label for the control. This label is specific to the application and is not stored in the MAXATTRIBUTE or APPFIELDDEFAULTS tables.
Bean Class	You can specify the name of a data bean class to use when creating the data source for the control. If not defined and the control is creating a data source, the default <code>psdi.webclient.system.DataBean</code> class is used. Typically, you use this property to create custom event methods or to override the manner in which the data source obtains its <code>MboSet</code> .
Data Source ID	Specify a data source ID if you want this control to use a different data source than the parent. If the control is creating a data source and the Data Source ID property is not set, the ID defaults to the ID of the control. If the data source is blank, the control inherits the data source from the parent. If no parent controls have a data source specified or if the parent is the application, MAINRECORD is the data source because it is the primary data source for the application.
Business Object	Specify the name of a MBO in this field to determine which MBO the control uses to show and process information. If a MBO is not specified, the control uses the data source of its parent control. When you set a MBO for this control a data source is created that can be referenced from other controls.
CSS Class Name	If you want to change the layout and appearance of the hyperlink, enter the name of the CSS class to use. For example, the "powerwhite" class name changes the font color of a hyperlink to white. You can search for CSS class names in the <code><root>\applications\maximo\maximouiweb\webmodule\webclient</code> directory.
Separator	Specify the delimiter to use between breadcrumb trail entries, for example <code>></code> .
Relationship	If you specified a value in the Parent Data Source ID field, specify a value in this field that identifies the relationship between this control and the new data source. A relationship uses a WHERE clause to determine what to show and process from the data source. The control creates a <code>datasource</code> that is by default used by the child controls. You can search for relationship values in the Database Configuration_>_Relationships tab.
Breadcrumbs	The source ID of the breadcrumb control.
Source Method	Specify a source method to apply to the source
Align	Specify the alignment options for the breadcrumbs.
Signature Option	You can specify a signature option that can restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click the Configure Conditional Properties button.
Sig Option Data Source ID	An MBO must be used to evaluate whether or not a user has access to a signature option. Specify the value of the data source that performs this evaluation if it is different to the data source that is configured for this control.

Button group control

A button group is a container control that holds push button controls. The button group defines the layout for the buttons it contains, including alignment within the container and the title for the group. Place this control within a section control or a table control.

Properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Label	You can specify a text value in this field to provide a label for the button group. Most button groups do not have a label, because the control functions primarily as a container that holds a layout for its children push button controls. This label is specific to the application and is not stored in the MAXATTRIBUTE or APPFIELDDEFAULTS tables.
Text Alignment	If you specified a label for the control, you can set the label to align to the Left, Center, or Right. The text label always displays to the left of any push buttons you add to the group.
Button Alignment	Reserved for future use.
Show Container	If you select this property, a shaded background of horizontal lines is visible for the button group. You cannot show background shading for a button group control in a table container.

Check box control

With a check box control, a user can indicate a yes or no response to a question or select one or more items from a list. A check box is a text type control because it has a text field or a label that is visible to the user. Place this control inside a section control.

General properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Default Label	This read-only value is the label associated with the database attribute bound to this control. The label for a check box control ends with a question mark, for example GL Account?.
Label	You can specify a text value in this field to override the Default Label for the control. This label is specific to the application and is not stored in the MAXATTRIBUTE or APPFIELDDEFAULTS tables.
Attribute	You can associate this control with a database attribute. Not all attributes have a Default Label value.
Data Source ID	Specify a data source ID if you want this control to use a different data source than the parent. If the control is creating a data source and the Data Source ID property is not set, the ID defaults to the ID of the control. If the data source is blank, the control inherits the data source from the parent. If no parent controls have a data source specified or if the parent is the application, MAINRECORD is the data source because it is the primary data source for the application.
Input Mode	Input mode options are: <ul style="list-style-type: none"> • Blank: An input mode with no value is read/write. Any information entered in this field is stored in the database column specified in the Attribute field. • Default: This mode is used for quick entry of default table data in tables. • Query: This mode is read-only and shows a typed value. • Readonly: This mode is read-only and shows grayed-out text. • Required: This mode is read/write and the record cannot be saved unless the user enters a value in the field.

Advanced properties

Attribute name	Description
Data Change Event	You can configure a control to perform one of the following actions in the event of a data change to the control: <ul style="list-style-type: none"> • The REFRESHABLE event refreshes the data source table for the control. • The RESETCHILDREN event deletes any child objects of the data bean of the control which then reacquires its MBOSetRemote references.
Always Synchronous	If deselected, the control can communicate with the database without pausing user activities. If cleared, the user cannot perform activities in other fields until validations for this field are completed. Synchronous activity is disabled by default. If there are dependencies between values specified for this control and other controls in the application, you can enable synchronous activity for the dependent controls.
Notify Portlets	If selected, this control can send notifications to a portlet, if communication with a Tivoli® Integration Portlet is configured.
More information	You can specify the values to construct a URL for an Knowledge Center topic using the following format: com.ibm.mbs.doc,application/helpfile.html The server address and other information for the URL are controlled by the mx.help properties which you can review and configure in the System Properties application. If you specify a URL, a More Information link is added to the field help (Alt + F1) for the control. When the user clicks the link, the target topic opens in the Knowledge Center. The property is specific to the field ID in the presentation XML file. If you want to provide the same link in other controls or other applications, you must manually add the URL to each individual control.
Signature Option	You can specify a signature option that can restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click the Configure Conditional Properties button.
Sig Option Data Source ID	An MBO must be used to evaluate whether or not a user has access to a signature option. Specify the value of the data source that performs this evaluation if it is different to the data source that is configured for this control.

Combo box control

With a combo box control, a user can select one or more options from a list drop down menu. Place this control inside a section control.

General properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Default Label	This read-only value is the label associated with the database attribute bound to this control.
Label	You can specify a text value in this field to override the Default Label for the control. This label is specific to the application and is not stored in the MAXATTRIBUTE or APPFIELDDEFAULTS tables.
Attribute	You can associate this control with a database attribute. Not all attributes have a Default Label value.

Attribute name	Description
Data Source ID	Specify a data source ID if you want this control to use a different data source than the parent. If the control is creating a data source and the Data Source ID property is not set, the ID defaults to the ID of the control. If the data source is blank, the control inherits the data source from the parent. If no parent controls have a data source specified or if the parent is the application, MAINRECORD is the data source because it is the primary data source for the application.
Display Attribute	Specify the attributes to show as options in the drop down menu for the combo box control. For example, if you create a combo box called Status, you can specify values such as Waiting for Approval and Approved. The values are bound to the data source and the attribute specified for the control.
Input Mode	Input mode options are: <ul style="list-style-type: none"> • Blank: An input mode with no value is read/write. Any information entered in this field is stored in the database column specified in the Attribute field. • Default: This mode is used for quick entry of default table data in tables. • Query: This mode is read-only and shows a typed value. • Readonly: This mode is read-only and shows grayed-out text. • Required: This mode is read/write and the record cannot be saved unless the user enters a value in the field.
Width	The standard width for a combo box control is 120 pixels. To make the control narrower or wider, enter a numeric value, for example 60 (narrower) or 200 (wider).

Advanced properties

Attribute name	Description
Select Attribute	This value provides a synonym or abbreviation for the Display Attribute in the text box area of the combo box. For example, for the Status combo box, you can specify WAPPR and APPR as Select Attributes abbreviations for the Waiting for Approval and Approved display attributes.
Data Change Event	You can configure a control to perform one of the following actions in the event of a data change to the control: <ul style="list-style-type: none"> • The REFRESHABLE event refreshes the data source table for the control. • The RESETCHILDREN event deletes any child objects of the data bean of the control which then reacquires its MBOSetRemote references.
More information	You can construct a URL for an Knowledge Center topic using the following format: <code>com.ibm.mbs.doc,application/helpfile.html</code> If you construct a URL, a more information link is added to the field help (Alt + F1) for the control. When the user clicks the link, the target topic opens in the Knowledge Center. The property is specific to the field ID in the presentation XML file. If you want to provide the same link in other controls or other applications, you must manually add the URL to each individual control.
Notify Portlets	Reserved for future use.
Signature Option	You can specify a signature option that can restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click the Configure Conditional Properties button.
Sig Option Data Source ID	An MBO must be used to evaluate whether or not a user has access to a signature option. Specify the value of the data source that performs this evaluation if it is different to the data source that is configured for this control.

Data source control

Use a data source control to override the default data source, or the current data source, for an application. This control is used primarily in dialog windows to reference a business object that controls in the window can use as a data source. A data source control is transparent and does not render any visible element.

You can place a data source control inside the following controls:

- Client area
- Dialog
- Page
- Section
- Tab
- Table

Properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Bean Class	You can specify the name of a data bean class to use when creating the data source for the control. If not defined and the control is creating a data source, the default <code>psdi.webclient.system.DataBean</code> class is used. Typically, you use this property to create custom event methods or to override the manner in which the data source obtains its <code>MboSet</code> .
Business Object	Specify the name of a MBO in this field to determine which MBO the control uses to show and process information. If a MBO is not specified, the control uses the data source of its parent control. When you set a MBO for this control a data source is created that can be referenced from other controls.
Parent Data Source ID	You can specify the ID of a data source to use as the parent object for a relationship, or to specify a parent object for a bean class if necessary. Then specify the relationship that uses this parent in the Relationship field. If the field is left blank, the control uses the data source ID of its parent control as the Parent Data Source ID.

Attribute name	Description
Relationships	If you specified a value in the Parent Data Source ID field, specify a value in this field that identifies the relationship between this control and the new data source. A relationship uses a WHERE clause to determine what to show and process from the data source. The control creates a datasource that is by default used by the child controls. You can search for relationship values in the Database Configuration_>_Relationships tab.
Order By	You can specify the order in which a SQL query fetches data for the data source for this control.
Where Clause	You can specify a WHERE clause that the data source for this control uses to retrieve data. This WHERE clause is used in addition to any default WHERE clause used by the business object of the data source.
Listeners	Enter the ID or IDs of one or more data sources that you want to refresh whenever there are changes to this control. Listener controls can be located anywhere within the application. Separate multiple values with a comma.

Default value control

You can use a default value control to speed up a database insert or query by restricting the action to a limited set of records. The default value control is transparent and does not render anything visible in the user interface. You can place the default value control in a section control, a table control, or in the presentation control.

Properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Attribute	Select an attribute from a data source to update or query. You can set an update or query value using one of the following methods: <ul style="list-style-type: none"> Specify a static value in the Value field. Specify values in the From Data Source ID and the From Attribute fields to read a value from the database.
Value	The alphanumeric value in this field provides a static default value for an insert or query action for the specified Attribute value. In the Person application, for example, you can specify DEPARTMENT in the Attribute field and MAINTENANCE in the Value field, to restrict queries to people working in the maintenance department.
From Data Source ID	If you do not configure a static default value in the Value field, specify the data source ID to use as the data source for the From Attribute field.
From Attribute	If you do not configure a static default value in the Value field, specify a From Attribute that updates or queries the database with its value.
Default Type	Specify the appropriate type of action for this default query.

Help grid control

A help grid control contains HTML text that you can insert in the user interface, typically to provide brief instructions on how to enter data and perform tasks. For complex information, help grids can include hyperlinks to additional information in a Knowledge Center topic. You can place help grid controls within Section, Section Column, Tab, and Dialog controls.

General properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Label	You can specify a text value in this field if you want to associate a label with this control. This label is specific to the application and is not stored in the MAXATTRIBUTE or APPFIELDDEFAULTS tables.
HTML Content	You can add text and a More Information link to a help grid control. A help grid control can contain HTML text for the user interface, typically to provide brief instructions about how to enter data and perform tasks. For complex information, help grids can include hyperlinks to additional information in a Knowledge Center topic. You can place help grid controls within Section, Section Column, Tab, and Dialog controls: <ol style="list-style-type: none"> In Application Designer, select the help grid control to modify. Modify the HTML Content attribute to add display text. Optionally, link from that text to a Knowledge Center topic by specifying the URL for the topic in the morehelp attribute. The URL is in this format: <documentation plugin name>,<path and filename.extension>. For example, a link from an assets tab to an overview topic about assets could take this form: com.ibm.mam.doc,asset/c_asset_overview.html.
More information	You can add a More information button and link to field help. A more information button and link in field help can provide technical or contextual details that do not fit in field help. <ol style="list-style-type: none"> In Application Designer, select the control that you want to modify, such as a field or check box. In the More information property, specify the URL to the help topic. The URL is in this format: <documentation plugin name>,<path and filename.extension>. For example, a link from an asset check box to a topic about classifying assets could take this form: com.ibm.mbs.doc,assetcat/c_classify_item_desc.html.
Signature Option	You can specify a signature option to restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click Configure Conditional Properties.
Sig Option Data Source ID	A MBO must be used to evaluate whether a user has access to a signature option. Specify the value of the data source if it is different to the data source that is configured for this control.

Hover window control

A hover window is a read-only pop-up window that is applied to a user interface control to display more information about an attribute.

Properties

Attribute name	Description
Hover Window ID	Can be applied to the multiline text box, multipart text box, table column, and text box controls. At runtime, a circular icon with an <i>i</i> in the center indicates that a hover window is enabled for a control. Available hover windows are defined in the RECHOVERS.XML file in the system library. To apply one of these hover windows to a control, you specify the ID of the hover window as defined in the RECHOVERS.XML file.
Hover Window Attribute	By default, a hover window uses the data attribute of the field. Use this attribute when you want the hover window to use a different attribute than the data attribute of the field.

Hyperlink control

You can configure text or a graphic as a hyperlink that opens a menu or window, or a destination inside or outside the application. Place this control inside a section control.

General properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Label	If you specify a text value, it forms a link that the user clicks to initiate the hyperlink.
Event Type	<p>You can associate a hyperlink with an event and, when the user clicks the hyperlink, the event is triggered. To configure a hyperlink event, you must specify the event type, the event value, and, optionally, the ID of a control that processes the event. For example, to configure an event that opens the Go To menu, specify <code>showmenu</code> in the Event Type field, specify <code>goto</code> in the Event Value field, and specify <code>pageTitlebar</code> in the Control Target ID field.</p> <p>Events are processed in the following order:</p> <ol style="list-style-type: none">1. If you specify a control target ID, the event is sent to this data source for processing.2. If you do not specify a control target ID, the event is sent to the main JSP page of the application for processing.3. The window associated with the specified event loads. <p>To view all of the events defined in the system, export the system .XML files and search these files for MXEVENT entries.</p>
Control Target ID	If you associate an event with the hyperlink, you can specify the ID of a target control to process the event that is different from the current control. The target ID for the Go To hyperlink, for example, is <code>pageTitlebar</code> .
Event Value	If you associate an event with the hyperlink, specify the value of the event. The event value for the Go To hyperlink, for example, is <code>goto</code> .
Text Alignment	Aligns the hyperlink label to the left, right, or center within a section.
Image Filename	You can associate an image with the hyperlink. Specify the name of an image file that is stored in the <code><root>\applications\maximo\maximouiweb\webmodule\webclient\images</code> directory. It is not necessary to enter the path to the images directory.
Image Alignment	If the hyperlink includes an image, aligns the image to the left or right of the hyperlink label.
CSS Classname	If you want to change the layout and appearance of the hyperlink, enter the name of the CSS class to use. For example, the <code>powerwhite</code> class name changes the font color of a hyperlink to white. You can search for CSS class names in the <code><root>\applications\maximo\maximouiweb\webmodule\webclient</code> directory.
Access key	Specify a letter that is used in the hyperlink label that acts as a keyboard shortcut. For example, the access key for the Go To hyperlink is G and when the user presses ALT + G the Go To menu drops down. The access key is underlined in the user interface.
Separator	Reserved for future use.

Advanced properties

Attribute name	Description
Column	You can specify a number that positions a hyperlink in a specific column. Each section control has 7 columns that are not visible to the user. If you specify the value 3 in this field and set text alignment to center, the hyperlink is centered above or below column three. If the hyperlink is wider than its column, the width of the column extends automatically to contain the hyperlink.
URL	If you want the hyperlink to link to a URL, specify the value here.
Signature Option	You can specify a signature option that can restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click the Configure Conditional Properties button.
Sig Option Data Source ID	An MBO must be used to evaluate whether or not a user has access to a signature option. Specify the value of the data source that performs this evaluation if it is different to the data source that is configured for this control.

Icon menu control

The icon menu control displays menu items next to a text box or multipart text box. You can use the `mxe.webclient.iconsToDisplay` system property to limit the number of menu items to display but the default is three.

Properties

Attribute name	Description
Icon Menu ID	Displays detail menu items as buttons next to a text box or the first part of a multipart text box.
Description Icon Menu ID	Displays detail menu items as buttons next to the second part of a multipart text box.

Image control

You can add an image control to create a visual marker to identify an application you can open or an action you can perform. You can configure the height, width, and alignment for the specified image file. You can place an image control with a section control.

The image files provided as application icons are in the `<root>\applications\maximo\maximouiweb\webmodule\webclient\images` directory. You can access the files in this directory using the image control.

Properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Filename	You can specify the filename of any file stored in the images directory at <code><root>\applications\maximo\maximouiweb\webmodule\webclient\images</code> . You can reuse any existing images or you can add new images to the directory. Images can be in any format supported by a browser. When you add a .gif file, you can use it immediately. If you add other file formats, such as .jpg or .bmp files, you must redeploy the .EAR file on the application server to add the images to the user interface.
Height	Enter a numeric value in this field that will increase or decrease the height of the image. If you change the default dimensions, the image can become distorted.
Width	Enter a numeric value in this field that will increase or decrease the width of the image. If you change the default dimensions, the image can become distorted.
Align Image	Specify where to align the image, to the Left, Center, or Right of the section that contains it.
Column	You can use columns to manipulate the position of an image. A section has four invisible columns. You can specify a number (1-4) to position an image in the corresponding column. You can change the position of the image by moving the graphic into one of the columns.
Signature Option	You can specify a signature option that can restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click the Configure Conditional Properties button.
Sig Option Data Source ID	An MBO must be used to evaluate whether or not a user has access to a signature option. Specify the value of the data source that performs this evaluation if it is different to the data source that is configured for this control.

Include control

You can use include controls to reuse dialog windows, layouts, and data tables from an existing application in the presentation.xml file of a new application. You can place an include control within a page, tab, or section control.

The include control is used with the presentation, page, and client area controls to create the presentation.xml file for an application. Include controls are typically used to obtain common application functions like header and footer from the LIBRARY.XML file. You can also use an include control within the client area to, for example, obtain table definitions for application log files from the LIBRARY.XML file.

Properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Control ID to Clone	You can specify any Control ID from the library.xml file. This property enables you to include the same library element multiple times in a presentation.

List box control

A list box control displays a list of items in a box that is always open. Place this control inside a section control.

General properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Default Label	This read-only value is the text value that is associated with the database attribute bound to this control.

Attribute name	Description
Label	You can specify a text value in this field to override the Default Label for the control. This label is specific to the application and is not stored in the MAXATTRIBUTE or APPFIELDDEFAULTS tables.
Attribute	You can associate this control with a database attribute. Not all attributes have a Default Label value.
Business Object Name	Specify the name of a MBO in this field to determine which MBO the control uses to show and process information. If a MBO is not specified, the control uses the data source of its parent control. When you set a MBO for this control a data source is created that can be referenced from other controls.
Parent Data Source ID	You can specify the ID of a data source to use as the parent object for a relationship, or to specify a parent object for a bean class if necessary. Then specify the relationship that uses this parent in the Relationship field. If the field is blank, the control uses the data source ID of its parent control as the Parent Data Source ID.
Key Attribute	You can specify a different attribute of the business object to use as a key attribute for the list other than the key attribute specified for the MBO.
Key Value	You can specify an option in the list to display as the default value.
Input Mode	Input mode options are: <ul style="list-style-type: none"> • Blank: An input mode with no value is read/write. Any information entered in this field is stored in the database column specified in the Attribute field. • Default: This mode is used for quick entry of default table data in tables. • Query: This mode is read-only and shows a typed value. • Readonly: This mode is read-only and shows grayed-out text. • Required: This mode is read/write and the record cannot be saved unless the user enters a value in the field.
Height	To make the control shorter or longer, enter a numeric value.
Width	To make the control narrower or wider, enter a numeric value.

Advanced properties

Attribute name	Description
Bean class	You can specify the name of a data bean class to use when creating the data source for the control. If not defined and the control is creating a data source, the default <code>psdi.webclient.system.DataBean</code> class is used. Typically, you use this property to create custom event methods or to override the manner in which the data source obtains its <code>MboSet</code> .
Where Clause	You can specify a WHERE clause that the data source for this control uses to retrieve data. This WHERE clause is used in addition to any default WHERE clause used by the business object of the data source.
Order By	You can specify the order in which a SQL query fetches data for the data source for this control.
Auto-Refresh	If selected, information in this control refreshes automatically when there is a change to the business object.
Always Synchronous	If deselected, the control can communicate with the database without pausing user activities. If cleared, the user cannot perform activities in other fields until validations for this field are completed. Synchronous activity is disabled by default. If there are dependencies between values specified for this control and other controls in the application, you can enable synchronous activity for the dependent controls.
Signature Option	You can specify a signature option that can restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click the Configure Conditional Properties button.
Sig Option Data Source ID	An MBO must be used to evaluate whether or not a user has access to a signature option. Specify the value of the data source that performs this evaluation if it is different to the data source that is configured for this control.

Menu bar control

The menu bar control is similar to an application bar control but the menu options typically contain drop down menus with additional option choices. The menu bar at the top of the List tab in most applications is a typical example. You can place a menu bar control only in a tab control.

Properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Label	You can specify a label for the menu bar. The label is not visible in the user interface. This label is specific to the application and is not stored in the MAXATTRIBUTE or APPFIELDDEFAULTS tables.
Source Method	Specify the name of the method used in the code to call the menu bar, including its signature options, and layout information. The method that calls the standard search menu bar is <code>getAppSearchOptions</code> .
Event Value	Specifies the event called when you select an option on the menu bar. For example, the event value for the search menu bar is <code>search</code> .

Multiline text box control

A multiline text box control is a large text box that can display several lines of text or accept this text from user input. Text boxes are often linked to select value lookups and detailed menus. You can place a multiline text box control within a section control.

General properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Default Label	This read-only value is the text value that is associated with the database attribute bound to this control.
Label	If you enter a text value in this field, it overrides the Default Label for the control. This label is specific to the application and is not stored in the MAXATTRIBUTE or APPFIELDDEFAULTS tables.
Hide Label	By default, the label is visible in the user interface. Select this check box to hide the label.
Attribute	You can associate this control with a database attribute. Not all attributes have a Default Label value.
Rows	Enter the number of rows you want in the multi line textbox.
Columns	Most multiline text boxes have a default width of 35. To increase or decrease the width of the box, enter a different value.
Data Source ID	Specify a data source ID if you want this control to use a different data source than the parent. If the control is creating a data source and the Data Source ID property is not set, the ID defaults to the ID of the control. If the data source is blank, the control inherits the data source from the parent. If no parent controls have a data source specified or if the parent is the application, MAINRECORD is the data source because it is the primary data source for the application.
Lookup	You can specify a lookup ID to link this control to a pre-formatted lookup table that pulls records from the main table. A user can select a record from the lookup table to use in this control. Lookup IDs are stored in the lookups.xml file. To view the content of this file, export the system XML files.
Input Mode	Input mode options are: <ul style="list-style-type: none"> • Blank: An input mode with no value is read/write. Any information entered in this field is stored in the database column specified in the Attribute field. • Default: This mode is used for quick entry of default table data in tables. • Password: This input mode is not available for multiline text box controls. • Password Readonly: This input mode is not available for multiline text box controls. • Password Required: This input mode is not available for multiline text box controls. • Query: This mode is read-only and shows a typed value. • Readonly: This mode is read-only and shows grayed-out text. • Required: This mode is read/write and the record cannot be saved unless the user enters a value in the field.
Menu Type	You can specify the value of a menu ID in this field to link the control to a preformatted drop-down menu. Menu IDs are stored in the menus.xml file. To view the content of this file, export the system XML files.

Advanced properties

Attribute name	Description
Data Change Event	You can configure a control to perform one of the following actions if there is any data change to the control: <ul style="list-style-type: none"> • The REFRESHABLE event refreshes the data source table for the control. • The RESETCHILDREN event deletes any child objects of the data bean of the control which then reacquires its MBOSetRemote references.
Always Synchronous	When deselected, the control can communicate with the database without pausing user activities. If selected, the user cannot perform activities in other fields until validations for this field are completed. Synchronous activity is disabled by default. If there are dependencies between values specified for this control and other controls in the application, you can enable synchronous activity for the dependent controls.
Notify Portlets	If selected, this control can send notifications to a portlet, if communication with a Tivoli® Integration Portlet is configured.
More information	You can specify the values to construct a URL for a Knowledge Center topic using the following format: com.ibm.mbs.doc,application/helpfile.html The server address and other information for the URL are controlled by the mx.help properties which you can review and configure in the System Properties application. If you specify a URL, a More Information link is added to the field help (Alt + F1) for the control. When the user clicks the link, the target topic opens in the Knowledge Center. The property is specific to the field ID in the presentation XML file. If you want to provide the same link in other controls or other applications, you must manually add the URL to each individual control.
Move to Data Source ID	Specify a record stored in a different object that the user can move to. You can select any data source ID from the presentation control. By default, the system sends the move to event to the ResultsBean , which contains a set of records displayed in the List tab. The move to event affects the Move to Data Source ID object.
Signature Option	You can specify a signature option that can restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click the Configure Conditional Properties button.
Sig Option Data Source ID	An MBO must be used to evaluate whether or not a user has access to a signature option. Specify the value of the data source that performs this evaluation if it is different to the data source that is configured for this control.

Multipart text box control

A multipart text box contains two text boxes, positioned side-by-side, that can contain information from different sources. You can input information, populate a box by selecting a value from a list, or show an attribute description from a table. You can place a multipart text box within a section control.

Typically, a multipart text box has a visible label, a pull-down menu in one text box, and the description of an attribute in the second box. Labels describe the type of information displayed in the box. Text boxes are often linked to select value lookups and detailed menus. Most applications typically use the second part of a multipart text box to provide a description for the value contained in the first text box.

General properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Default Label	This read-only value is the text value that is associated with the database attribute bound to this control.
Label	If you enter a text value in this field, it overrides the Default Label for the control. This label is specific to the application and is not stored in the MAXATTRIBUTE or APPFIELDDEFAULTS tables.
Attribute	You can associate this control with a database attribute. Not all attributes have a Default Label value.
Attribute for Part 2	You can associate the second part of a multipart text box with a different attribute than the one specified in the Attribute field. Typically, you configure the second part of a multipart control to display the description information for the record selected in the first part.
Data Source ID	Specify a data source ID if you want this control to use a different data source than the parent. If the control is creating a data source and the Data Source ID property is not set, the ID defaults to the ID of the control. If the data source is blank, the control inherits the data source from the parent. If no parent controls have a data source specified or if the parent is the application, MAINRECORD is the data source because it is the primary data source for the application. In a multipart text box, the attributes for both parts must reference the same object.
Lookup	You can specify a lookup ID to link the first part of a multipart text box to a pre-formatted lookup table that pulls records from the main table. A user can select a record from the lookup table to use in this control. Lookup IDs are stored in the lookups.xml file. To view the content of this file, export the system XML files.
Lookup for Part 2	You can specify a lookup ID to link the second part of a multipart text box to a pre-formatted lookup table that pulls records from the main table. A user can select a record from the lookup table to use in this control. Lookup IDs are stored in the lookups.xml file. To view the content of this file, export the system XML files.
Go To Applications	You can associate a pull-down menu with this control and add application names to it that take the user to different applications.
Input Mode	Input mode options are: <ul style="list-style-type: none"> • Blank: An input mode with no value is read/write. Any information entered in this field is stored in the database column specified in the Attribute field. • Default: This mode is used for quick entry of default table data in tables. • Password: This mode is read/write and displays asterisks. • Password Readonly: This mode is read-only and displays asterisks. • Password Required: This mode is read/write and displays asterisks. The record cannot be saved unless there is a value in the field. • Query: This mode is read-only and shows a typed value. • Readonly: This mode is read-only and shows grayed-out text. • Required: This mode is read/write and the record cannot be saved unless the user enters a value in the field.
Input Mode for Part 2	In most cases, where the second part of a multipart text box contains a full description, the property value will be read-only. In other cases, standard input mode options can apply.
Menu Type	You can specify the value of a menu ID in this field to link the control to a preformatted drop-down menu. Menu IDs are stored in the menus.xml file. To view the content of this file, export the system XML files.

Advanced properties

Attribute name	Description
Change Event	You can configure a control to perform one of the following actions in the event of a data change to the control: <ul style="list-style-type: none"> • The REFRESHABLE event refreshes the data source table for the control. • The RESETCHILDREN event deletes any child objects of the data bean of the control which then reacquires its MBOSetRemote references.
Turn Smart Fill Off?	Check this option if you want to disable smart fill which is turned on by default. Smart fill enables a user to enter a partial value in a text box which the system attempts to match to a valid value, or values, in the database. When a matching value is found, the value is entered in the text box. If the system finds more than one matching value, the user can select one from a list of matching values. If you turn smart fill off, user text is not validated during entry.
Readonly Long Description	If the value of Attribute for Part 2 is a long description, you can select this box to set the description to read only. If you leave this field cleared (the default), users can edit the long description.
Always Synchronous	If deselected, the control can communicate with the database without pausing user activities. If selected, the user cannot perform activities in other fields until validations for this field are completed. Synchronous activity is disabled by default. If there are dependencies between values specified for this control and other controls in the application, you can enable synchronous activity for the dependent controls.
Part 2 Always Synchronous	If deselected, the control can communicate with the database without pausing user activities. If selected, the user cannot perform activities in other fields until validations for this field are completed. Synchronous activity is disabled by default. If there are dependencies between values specified for this control and other controls in the application, you can enable synchronous activity for the dependent controls.
Notify Portlets	If selected, this control can send notifications to a portlet, if communication with a Tivoli® Integration Portlet is configured.

Attribute name	Description
More information	<p>You can specify the values to construct a URL for a Knowledge Center topic using the following format: com.ibm.mbs.doc,application/helpfile.html The server address and other information for the URL are controlled by the <code>mx.help</code> properties which you can review and configure in the System Properties application.</p> <p>If you specify a URL, a More Information link is added to the field help (Alt + F1) for the control. When the user clicks the link, the target topic opens in the Knowledge Center.</p> <p>The property is specific to the field ID in the presentation XML file. If you want to provide the same link in other controls or other applications, you must manually add the URL to each individual control.</p>
Move to Data Source ID	<p>Specify a record stored in a different object that the user can move to. You can select any Data Source ID from the presentation control.</p> <p>By default, the system sends the Move To event to the <code>ResultsBean</code>, which contains a set of records displayed in the List tab. The Move To event affects the Move to Data Source ID object.</p>
Signature Option	You can specify a signature option that can restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click the Configure Conditional Properties button.
Sig Option Data Source ID	An MBO must be used to evaluate whether or not a user has access to a signature option. Specify the value of the data source that performs this evaluation if it is different to the data source that is configured for this control.

Parameter value control

A parameter value control can display dynamic values in the label of a section control or a table control.

Properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Parameter Position	This property points to the Parameter Values Property field you want to replace. See the Parameter Values Property field for more information.
Attribute	You can associate this control with a database attribute to display as the Label property in a table or section control.
Data Source ID	Specify a data source ID if you want this control to use a different data source than the parent. If the data source is blank, the control inherits the data source from the parent. If no parent controls have a data source specified or if the parent is the application, <code>MAINRECORD</code> is the data source because it is the primary data source for the application.

Parameter values control

A parameter values control is a container control that can contain a parameter value to show a dynamic value that represents a replaceable value in the label of a Section Header control.

Properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Property	The Property field has a default value of Label, which is a variable that displays dynamic values inherited from the Parameter Value control in the Table or Section control.

Presentation control

The presentation control manages the appearance of the user interface display, and all other controls are contained by this control. The presentation control contains only one page control. The page control specifies the main page of an application and uses the entire client area of the browser. All other application windows are dialogs that open as popup windows. You can add the definition for a dialog window to the PRESENTATION.XML file, or you can include the definition of an existing dialog from the LIBRARY.XML file.

Rules

The presentation control is the outermost control for all presentations and can contain all other controls.

General properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.

Attribute name	Description
Business Object	Specify the name of a MBO in this field to determine which MBO the control uses to show and process information. If a MBO is not specified, the control uses the data source of its parent control. When you set a MBO for this control a data source is created that can be referenced from other controls.
App Bean Class	You can specify the name of a data bean class to use when creating the data source for the control. If not defined and the control is creating a data source, the default <code>psdi.webclient.system.DataBean</code> class is used. Typically, you use this property to create custom event methods or to override the manner in which the data source obtains its <code>MboSet</code> .
Order By	You can specify the order in which a SQL query fetches data for the data source for this control.
Where Clause	You can specify a WHERE clause that the data source for this control uses to retrieve data. This WHERE clause is used in addition to any default WHERE clause used by the business object of the data source.
Application Restrictions	You can set restrictions for the application at the level of the presentation.xml.
Results Table ID	You can specify the ID of the results table.
Application help	You can specify the URL that takes the user to context-specific help for this application in a Knowledge Center.

Advanced properties

Attribute name	Description
Viewport	If this application is optimized to be viewed in a viewport other than the standard viewport, specify that viewport in this field.
Is Mobile	A Boolean value that indicates whether the application is designed for access on a mobile device.
Always Synchronous	If deselected, the control can communicate with the database without pausing user activities. If cleared, the user cannot perform activities in other fields until validations for this field are completed. Synchronous activity is disabled by default. If there are dependencies between values specified for this control and other controls in the application, you can enable synchronous activity for the dependent controls.
Debug	You can set a debug level for the application.

Push button control

A push button control initiates an event such as opening a window with a list of records or opening an empty row where a user can enter a record. Place this control inside a button group control.

General properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Label	You can specify a label that identifies the control to the user. If you do not enter a label, the button is blank. This label is specific to the application and is not stored in the MAXATTRIBUTE or APPFIELDDEFAULTS tables.
Event	<p>You can associate a push button with an event and, when the user clicks the button, the event is triggered. To configure a push button event, specify the event and, optionally, the ID of a control that processes the event.</p> <p>Events are processed in the following order:</p> <ol style="list-style-type: none"> 1. If you specify a control target ID, the event is sent to this data source for processing. 2. If you do not specify a control target ID, the event is sent to the main JSP page of the application for processing. 3. The window associated with the specified event loads. <p>To view all of the events defined in the system, export the system .XML files and search these files for MXEVENT entries.</p>
Target ID	If you associate an event with the hyperlink, you can specify the ID of a target control to process the event that is different from the current control. The target ID for the Go To hyperlink, for example, is <code>pageTitlebar</code> .
Value	Reserved for future use.
Default Button	If selected, this button becomes the default button in a button group. You can configure the most frequently used button, for example, New Row, as the default button.
Menu Type	You can specify the value of a menu ID in this field to link the control to a preformatted drop-down menu. Menu IDs are stored in the <code>menus.xml</code> file. To view the content of this file, export the system XML files.

Advanced properties

Attribute name	Description
Image Filename	You can associate an image with the push button. Specify the name of an image file that is stored in the <code><root>\applications\maximo\maximouiweb\web module\webclient\images</code> directory. It is not necessary to enter the path to the images directory.
Signature Option	You can specify a signature option that can restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click the Configure Conditional Properties button.
Sig Option Data Source ID	An MBO must be used to evaluate whether or not a user has access to a signature option. Specify the value of the data source that performs this evaluation if it is different to the data source that is configured for this control.

Radio button control

A radio button is a control that allows users to choose one of a predefined set of options. Radio buttons are organized in groups of two or more. Radio buttons typically appear as little circles that are either empty (for unselected) or contain a dot (selected). When you select a radio button, the previously selected button in the same group is deselected.

Properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Default Label	This read-only value is the label defaults to the database attribute bound to the radio button group control.
Label	You can specify a label that identifies the control to the user. If you do not enter a label, the button is blank. This label is specific to the application and is not stored in the MAXATTRIBUTE or APPFIELDDEFAULTS tables.
Button Value	Specify a data attribute for an individual button control. If you do not automatically populate a Radio Button Group with a predefined list of values linked to a data attribute, then you can enter individual values for each button that you manually add to a group.
Signature Option	You can specify a signature option that can restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click the Configure Conditional Properties button.
Sig Option Data Source ID	An MBO must be used to evaluate whether or not a user has access to a signature option. Specify the value of the data source that performs this evaluation if it is different to the data source that is configured for this control.

Radio button group control

A radio button group is a container control that holds radio buttons. The radio button group defines the layout for the buttons it contains, including a group title, text alignment for button labels, and whether or not to show a border. You can place a radio button group control within a section control.

You can bind a radio button group to a database attribute that automatically populates the group with buttons, label values, and so on. Binding to a database attribute saves time because you do not have to define the individual radio button controls for the group. When the user makes a selection in the radio button group, the value automatically updates the attribute in the database. If you link a radio button group to a database attribute, you can then edit the group in the Database Configuration application and in the Domains application.

General properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Default Label	This read-only value is the text value that is associated with the database attribute bound to this control.
Label	You can specify a text value in this field to override the Default Label for the control. This label is specific to the application and is not stored in the MAXATTRIBUTE or APPFIELDDEFAULTS tables.
Hide Label	By default, the label value always appears in the user interface. Select this check box if you want the label to be invisible.
Attribute	You can associate this control with a database attribute. Not all attributes have a Default Label value.
Value Attribute	Optionally, if you do not automatically populate a radio button group with a list of buttons, you can specify a value in this field that automatically updates the database when you select a button. For example, if you have a button with a Description Attribute of Waiting for Approval, you can define a Value Attribute of WAPPR. When the user clicks the radio button, WAPPR is written to the database and Waiting for Approval is shown in the user interface.
Description Attribute	Optionally, you can specify a data attribute that displays a text label for the Value Attribute in the user interface.
Show Border	Select this check box to show a rectangular border around the control.
Data Source ID	Specify a data source ID if you want this control to use a different data source than the parent. If the control is creating a data source and the Data Source ID property is not set, the ID defaults to the ID of the control. If the data source is blank, the control inherits the data source from the parent. If no parent controls have a data source specified or if the parent is the application, MAINRECORD is the data source because it is the primary data source for the application.

Advanced properties

Attribute name	Description
Text Alignment	Select Left, Center, or Right to align button text relative to button images. The label for the radio button group always aligns to the left of any buttons that you add to the group.

Attribute name	Description
Input Mode	Input mode options are: <ul style="list-style-type: none"> • Default: The default input mode is read/write. Any information entered in this field is stored in the database column specified in the Attribute field. • Password: This mode is read/write and displays asterisks. • Password Readonly: This mode is read-only and displays asterisks. • Password Required: This mode is read/write and displays asterisks. The record cannot be saved unless there is a value in the field. • Query: This mode is read-only and shows a typed value. • Readonly: This mode is read-only and shows grayed-out text. • Required: This mode is read/write and the record cannot be saved unless the user enters a value in the field.
Change Event	You can configure a control to perform one of the following actions in the event of a data change to the control: <ul style="list-style-type: none"> • The REFRESHABLE event refreshes the data source table for the control. • The RESETCHILDREN event deletes any child objects of the data bean of the control which then reacquires its MBOSetRemote references.
Always Synchronous	If deselected, the control can communicate with the database without pausing user activities. If cleared, the user cannot perform activities in other fields until validations for this field are completed. Synchronous activity is disabled by default. If there are dependencies between values specified for this control and other controls in the application, you can enable synchronous activity for the dependent controls.
Signature Option	You can specify a signature option that can restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click the Configure Conditional Properties button.
Sig Option Data Source ID	An MBO must be used to evaluate whether or not a user has access to a signature option. Specify the value of the data source that performs this evaluation if it is different to the data source that is configured for this control.

Record image control

You can use the record image control to associate an image with a record, including an expandable thumbnail image. You can then add this image to an application from within the application user interface. A user can click on a thumbnail image to view its full size and can drag the mouse over the image to see a text description. You can place a record image control in any container control.

When you add a record image to an application, you are inserting a placeholder but not the actual image. You can add only one record image to an application but you can use the same image multiple times within the application. For example, you can show an image in more than one application tab.

After creating a record image control, open the application and click the Add Modify Image option from the Select Action menu. If necessary, use an autodb script to add the Add Modify Image option to the Select Action menu item. You can add images that have a .jpg or .gif extension.

You can configure the record image control to view images associated with other records that are not part of the current application. Use View Image in the Details menu to open an image in a popup window. To add View Image to a Details menu, edit the `menu.xml` file. When you are finished, use Import Application Definition in the Application Designer to import the menu.xml file.

Properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Label	You can specify a text value in this field to override the Default Label for the control. This label is specific to the application and is not stored in the MAXATTRIBUTE or APPFIELDDEFAULTS tables.
Data Source ID	Specify a data source ID if you want this control to use a different data source than the parent. If the control is creating a data source and the Data Source ID property is not set, the ID defaults to the ID of the control. If the data source is blank, the control inherits the data source from the parent. If no parent controls have a data source specified or if the parent is the application, MAINRECORD is the data source because it is the primary data source for the application.
CSS Class Name	You can specify the name of a CSS class to use if you want to change the layout or appearance of the record image. You can search for CSS class names in the <code><root>\applications\maximo\maximouiweb\webmodule\webclient</code> directory.
Height	Enter a numeric value in this field that will increase or decrease the height of the image. If you change the default dimensions, the image can become distorted.
Width	Enter a numeric value in this field that will increase or decrease the width of the image. If you change the default dimensions, the image can become distorted.
Is Thumbnail	Identifies whether or not the image is an expandable thumbnail image.
ALT Text on Image	You can specify a text description of the image that is visible when the user drags a mouse over the image. An ALT text description provides a text substitute for the image to users with a visual impairment that use screen readers.
Signature Option	You can specify a signature option that can restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click the Configure Conditional Properties button.
Sig Option Data Source ID	An MBO must be used to evaluate whether or not a user has access to a signature option. Specify the value of the data source that performs this evaluation if it is different to the data source that is configured for this control.

Rich text editor control

The rich text editor control provides the ability to add rich text formatting to a field with long description characteristics.

The rich text editor control can be placed inside standard container controls, including sections, tabs, and tables. A rich text editor control provides users with a toolbar that helps them to apply rich text formats to the text entered in the text area. Rich text formatting is not appropriate for a field that is the subject of routine searches or for fields that contain a large quantity of information, because the addition of HTML tags to the text can exceed the character limit set for the field in the database.

Table 1. General properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Default Label	This read-only value is the text value that is associated with the database attribute bound to this control.
Label	If you enter a text value in this field, it overrides the Default Label for the control. This label is specific to the application and is not stored in the MAXATTRIBUTE or APPFIELDDEFAULTS tables.
Hide Label	By default, the label value always appears in the user interface. Select this check box to make the label invisible.
Attribute	You can associate this control with a database attribute. Not all attributes have a Default Label value.
Data Source ID	Specify a data source ID if you want this control to use a different data source than the parent. If the control is creating a data source and the Data Source ID property is not set, the ID defaults to the ID of the control. If the data source is blank, the control inherits the data source from the parent. If no parent controls have a data source specified or if the parent is the application, MAINRECORD is the data source because it is the primary data source for the application.
Lookup	Specify a lookup ID to link this control to a pre-formatted lookup table that pulls records from the main table. A user can select a record from the lookup table to use in this control. Lookup IDs are stored in the lookups.xml file. To view the content of this file, export the system XML files.
Input Mode	Input mode options are: <ul style="list-style-type: none"> • Blank: An input mode with no value is read/write. Any information entered in this field is stored in the database column specified in the Attribute field. • Default: This mode is used for quick entry of default table data in tables. • Query: This mode is read-only and shows a typed value. • Readonly: This mode is read-only and shows grayed-out text. • Required: This mode is read/write and the record cannot be saved unless the user enters a value in the field.
Menu Type	You can specify the value of a menu ID in this field to link the control to a preformatted drop-down menu. Menu IDs are stored in the menus.xml file. To view the content of this file, export the system XML files.
Width	You can enter a numeric value in this field to change the width of the editor area.
Height	You can enter a numeric value in this field to change the height of the editor area.

Advanced properties

Attribute name	Description
Plug-ins	The plug-ins that you specify determine the items that are displayed in the editor toolbar. The default value for plug-ins in the toolbar is <pre>['undo','redo','| ','cut','copy','paste','| ','bold','italic','underline','strikethrough','| ','insertOrderedList','insertUnorderedList','indent','outdent','| ','justifyLeft','justifyRight','justifyCenter','justifyFull']</pre> You can remove, reorder, or add additional plug-ins. To remove all these items from the toolbar, set the value to []. For more information about available plug-ins, go to the Dojo Toolkit website (http://www.dojotoolkit.org) and search for the reference guide.
Signature Option	You can specify a signature option that can restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click the Configure Conditional Properties button.
Sig Option Data Source ID	An MBO must be used to evaluate whether or not a user has access to a signature option. Specify the value of the data source that performs this evaluation if it is different to the data source that is configured for this control.

Rich text viewer control

The rich text viewer control provides the ability to view rich text formatting in a field with long description characteristics.

The rich text viewer control can be placed inside standard container controls, including sections, tabs, and tables.

Table 1. General properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Label	If you enter a text value in this field, it overrides the Default Label for the control. This label is specific to the application and is not stored in the MAXATTRIBUTE or APPFIELDDEFAULTS tables.
Hide Label	By default, the label value always appears in the user interface. Select this check box to make the label invisible.
Attribute	You can associate this control with a database attribute. Not all attributes have a Default Label value.

Attribute name	Description
Data Source ID	Specify a data source ID if you want this control to use a different data source than the parent. If the control is creating a data source and the Data Source ID property is not set, the ID defaults to the ID of the control. If the data source is blank, the control inherits the data source from the parent. If no parent controls have a data source specified or if the parent is the application, MAINRECORD is the data source because it is the primary data source for the application.
Width	You can enter a numeric value in this field to change the width of the viewer area.
Height	You can enter a numeric value in this field to change the height of the viewer area.

Section control

A section control is one of the core container controls that you use to organize the layout of an application. Container controls occupy space on a page and provide storage for other controls, such as tables, buttons, and text fields.

Section controls without labels do not have visible borders and are transparent in an application page. A section control with a label includes a visible horizontal blue bar with a minimize icon at the top of the section. You start all new application layouts by inserting a section container. Most applications have multiple pages with many sections and columns.

Rules

You can place the following controls in a section:

- Attachments
- Blank Line
- Button Group
- Checkbox
- Combobox
- Data Source
- Default Value
- Hyperlink
- Image
- Include
- Listbox
- Multiline Textbox
- Radio Button Group
- Section Header
- Section Row
- Static Text
- Textbox

You can place a section inside the following container controls:

- Dialogs
- Tab
- Table
- Section Columns

General properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Label	This value identifies the control to the user. If you do not enter a label, the section does not have a title. The label you enter here is specific to the application and is not stored in the MAXATTRIBUTE or APPFIELDDEFAULTS tables.
Show Border	Select this option to add a horizontal rule to the top and bottom of the section. If you define a label for the section, the horizontal rules are not added.
Collapsed	If you check this box, the section is collapsed by default in the user interface and the user must click to maximize the section.
Description	You can specify text to show under the label in the title bar of the section.
Data Source ID	Specify a data source ID if you want this control to use a different data source than the parent. If the control is creating a data source and the Data Source ID property is not set, the ID defaults to the ID of the control. If the data source is blank, the control inherits the data source from the parent. If no parent controls have a data source specified or if the parent is the application, MAINRECORD is the data source because it is the primary data source for the application.
Business Object	Specify the name of a MBO in this field to determine which MBO the control uses to show and process information. If a MBO is not specified, the control uses the data source of its parent control. When you set a MBO for this control a data source is created that can be referenced from other controls.
Parent Data Source ID	You can specify the ID of a data source to use as the parent object for a relationship, or to specify a parent object for a bean class if necessary. Then specify the relationship that uses this parent in the Relationship field. If the field is left blank, the control uses the data source ID of its parent control as the Parent Data Source ID

Attribute name	Description
Input Mode	<p>Input mode options are:</p> <ul style="list-style-type: none"> • Default: The default input mode is read/write. Any information entered in this field is stored in the database column specified in the Attribute field. • Password: This mode is read/write and displays asterisks. • Password Readonly: This mode is read-only and displays asterisks. • Password Required: This mode is read/write and displays asterisks. The record cannot be saved unless there is a value in the field. • Query: This mode is read-only and shows a typed value. • Readonly: This mode is read-only and shows grayed-out text. • Required: This mode is read/write and the record cannot be saved unless the user enters a value in the field.

Advanced properties

Attribute name	Description
Listeners	Enter the ID or IDs of one or more data sources that you want to refresh whenever there are changes to this control. Listener controls can be located anywhere within the application. Separate multiple values with a comma.
Signature Option	You can specify a signature option that can restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click the Configure Conditional Properties button.
Sig Option Data Source ID	An MBO must be used to evaluate whether or not a user has access to a signature option. Specify the value of the data source that performs this evaluation if it is different to the data source that is configured for this control.

Section column control

A section column control is a vertical column that you can use to divide a section row into columns with headings. A section column is a container that can hold child section controls and is also a child to the parent section control. When you move a section control, all of its child controls automatically move with it.

You can insert section columns into section rows. When you drag a section column into a section row, it automatically creates two section columns. A section column does not have a label and is transparent in the user interface. A child section can hold, for example, a section header that lets you assign column headings for a multicolumn section. Except for tables, all graphical elements with multiple columns have a transparent section column within a section row, all contained within a parent section.

A section column control has only one property, the control ID property.

Section header control

Use a section header control to display a text heading for a section or a table. The text in the heading can be dynamic, based on variables you configure in parameter and parameter values controls. A section header control is a container control and is transparent in the user interface.

Properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Label	The label contains a variable that displays dynamic values inherited from the parameter value and values controls in the section control.
Plain Text	If selected, the CSS (cascading style sheet) class definition for the label is removed so that it looks like plain text in the user interface.
Data Source ID	Specify a data source ID if you want this control to use a different data source than the parent. If the control is creating a data source and the Data Source ID property is not set, the ID defaults to the ID of the control. If the data source is blank, the control inherits the data source from the parent. If no parent controls have a data source specified or if the parent is the application, MAINRECORD is the data source because it is the primary data source for the application.
Signature Option	You can specify a signature option that can restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click the Configure Conditional Properties button.
Sig Option Data Source ID	An MBO must be used to evaluate whether or not a user has access to a signature option. Specify the value of the data source that performs this evaluation if it is different to the data source that is configured for this control.

Section row control

A section row control is a layout control that contains section column controls. A section row creates a horizontal row that you can partition into columns that hold child sections. A section row is a child to a parent section control. When you move a section, all of its child controls automatically move with it.

You can insert section columns into section rows. A section row does not have a label and is transparent in the user interface. A section row control has only one property, the control ID.

Static text control

You can use a static text control to add text to a section control or to specify a database attribute that you can configure and position within a section as if it were unbound text. Static text is, typically, used in Date search windows in applications, where To and From labels are static text controls.

You can also configure the text to function as a hyperlink that takes the user to a URL when clicked. When configured as a URL, the static text displays in a larger font and is styled to look more like a URL string than plain text. You can place static text within a section control.

General properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Default Label	This read-only value is the text value that is associated with the database attribute bound to this control.
Label	If you enter a text value in this field, it overrides the Default Label for the control. This label is specific to the application and is not stored in the MAXATTRIBUTE or APPFIELDDEFAULTS tables.
Attribute	You can associate this control with a database attribute. Not all attributes have a Default Label value.
Text Alignment	Select Left, Center, or Right to align static text in a section control. Typically, you associate static text with a control in a section. You can place the text above or below the control.
Span	You can specify a number in this field if you want the static text to span more than one column.

Advanced properties

Attribute name	Description
Column	You can specify a number in this field to position static text in a specific column. Each section control has seven columns that are transparent to the user. If you enter the value 3 in this field and select the Center value for Text Alignment, the static text is centered above or below column three. If the text is wider than its column, the width of the column extends automatically to contain it.
Display as Link	By default, static text does not display as a URL link. Select this option if you want to configure the control to display as a URL link
Display as Plain Text	Selecting this check box removes the CSS (cascading style sheet) class definition so that text is displayed as plain text in the user interface.
Signature Option	You can specify a signature option that can restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click the Configure Conditional Properties button.
Sig Option Data Source ID	An MBO must be used to evaluate whether or not a user has access to a signature option. Specify the value of the data source that performs this evaluation if it is different to the data source that is configured for this control.

Tab properties

A tab control is a container in which you place other controls such as tables and sections. Formatting tabs is, typically, the starting point for designing the structure and layout of a new application or extending the layout of an existing application. Place this control inside a tab group control.

General properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Label	Specify the label for the tab control. This label is specific to the application and is not stored in the MAXATTRIBUTE or APPFIELDDEFAULTS tables.
Type	Some tabs have a type attribute that you must set: <ul style="list-style-type: none">• Set the type as "list" if the tab is a List tab.• Set the type as "insert" if the tab is a Main tab.• Leave this field blank for all other tabs.
Default	Select this option if you want this tab to be the default tab that opens when a user opens an application. The default tab can be a list tab or an insert tab except in a power application, when the default tab must be a list tab.
Bean Class	You can specify the name of a data bean class to use when creating the data source for the control. If not defined and the control is creating a data source, the default psdi.webclient.system.DataBean class is used. Typically, you use this property to create custom event methods or to override the manner in which the data source obtains its MboSet.
Business Object	Specify the name of a MBO in this field to determine which MBO the control uses to show and process information. If a MBO is not specified, the control uses the data source of its parent control. When you set a MBO for this control a data source is created that can be referenced from other controls.
Parent Data Source ID	You can specify the ID of a data source to use as the parent object for a relationship, or to specify a parent object for a bean class if necessary. Then specify the relationship that uses this parent in the Relationship field. If the field is left blank, the control uses the data source ID of its parent control as the Parent Data Source ID

Attribute name	Description
Relationship	If you specified a value in the Parent Data Source ID field, specify a value in this field that identifies the relationship between this control and the new data source. A relationship uses a WHERE clause to determine what to show and process from the data source. The control creates a datasource that is by default used by the child controls. You can search for relationship values in the Database Configuration > Relationships tab.

Advanced properties

Attribute name	Description
Where Clause	You can specify a WHERE clause that the data source for this control uses to retrieve data. This WHERE clause is used in addition to any default WHERE clause used by the business object of the data source.
Order By	You can specify the order in which a SQL query fetches data for the data source for this control.
Listeners	Enter the ID or IDs of one or more data sources that you want to refresh whenever there are changes to this control. Listener controls can be located anywhere within the application. Separate multiple values with a comma.
Signature Option	You can specify a signature option that can restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click the Configure Conditional Properties button.
Sig Option Data Source ID	An MBO must be used to evaluate whether or not a user has access to a signature option. Specify the value of the data source that performs this evaluation if it is different to the data source that is configured for this control.

Tab group control

A tab group control is a container control that holds tabs. Tab groups are part of the template for power applications. When you create a power application, a tab group control is provided with the standard List and Workspace tabs.

Properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Format	Leave blank (the default) or specify one of the following layout options: <ul style="list-style-type: none"> CARDDECK DEFAULT WIZARD <p>The wizard option replaces the standard tab layout with arrows that point to the tab headings. The cardeck option appears in single-page applications that do not use tabs.</p>
Style	The Style option defaults to FORM, which is a style attribute for the control. The Form style defines the appearance of the main tab group.
Change Event	Reserved for future use.

Table control

The table control is a container with the basic layout elements of a table window, including a toolbar with filter and search functionality and icons for previous and next row and page. You can place a table control within a section, tab, or window control and you can place a table column control or a section control within a table control.

The table control layout also includes a table column control and a details box where you can enter a section. The table control is similar to the table window in the List tab of most applications. The tables enable the user to search for and display records from one or more tables in a columnar format. You can use the standard filter feature to display only records that meet specified criteria.

You can insert a section control into the details section of a table control. The details section is an empty, rectangular box at the bottom of the window.

General properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Label	Enter a text value for the label. This label is specific to the application and is not stored in the MAXATTRIBUTE or APPFIELDDEFAULTS tables.
Input Mode	Input mode options are: <ul style="list-style-type: none"> Blank: An input mode with no value is read/write. Any information entered in this field is stored in the database column specified in the Attribute field. Default: This mode is used for quick entry of default table data in tables. Query: This mode is read-only and shows a typed value. Readonly: This mode is read-only and shows grayed-out text. Required: This mode is read/write and the record cannot be saved unless the user enters a value in the field.

Attribute name	Description
Select Mode	The select mode controls whether a table shows a single record or multiple records.
Bean Class	You can specify the name of a data bean class to use when creating the data source for the control. If not defined and the control is creating a data source, the default <code>psdi.webclient.system.DataBean</code> class is used. Typically, you use this property to create custom event methods or to override the manner in which the data source obtains its <code>MboSet</code> .
Order By	You can specify the order in which a SQL query fetches data for the data source for this control.
Data Source ID	Specify a data source ID if you want this control to use a different data source than the parent. If the control is creating a data source and the Data Source ID property is not set, the ID defaults to the ID of the control. If the data source is blank, the control inherits the data source from the parent. If no parent controls have a data source specified or if the parent is the application, MAINRECORD is the data source because it is the primary data source for the application. Each application has a presentation file that defines the main MBO for the application, the MAINRECORD . To inherit data from a different MBO for this control (or group of controls) specify an alternative Data Source ID in this field.
Business Object	Specify the name of a MBO in this field to determine which MBO the control uses to show and process information. If a MBO is not specified, the control uses the data source of its parent control. When you set a MBO for this control a data source is created that can be referenced from other controls.
Parent Data Source ID	You can specify the ID of a data source to use as the parent object for a relationship, or to specify a parent object for a bean class if necessary. Then specify the relationship that uses this parent in the Relationship field. If the field is left blank, the control uses the data source ID of its parent control as the Parent Data Source ID
Relationship	If you specified a value in the Parent Data Source ID field, specify a value in this field that identifies the relationship between this control and the new data source. A relationship uses a WHERE clause to determine what to show and process from the data source. The control creates a datasource that is by default used by the child controls. You can search for relationship values in the Database Configuration > Relationships tab.
Width	Specify a number to change the default width of the table. The default width for a table is 1000. You can decrease the width of a table to 400°, the minimum width required to maintain the contents of the toolbar, including the table title and icons.
Description	Text in this field displays under the label in the title bar of the table.
Title Attributes	Reserved for future use.
Start Empty	If you select this option, the table always opens without displaying records. If you do not select the option (the default), the table automatically shows records that match the search query when opened.
Filterable	If you select this option, a filter row is provided to enable the user to search the table. The Filterable property is enabled by default and the setting automatically applies to table columns in the table. This option must be selected if you want to use the Filter Expanded property.
Collapsed	If you select this check box, the section is collapsed by default in the user interface and the user must click to maximize the section.

Advanced properties

Attribute name	Description
Collapsed Empty Label	You can specify a value that will override the table title (label property) when the table is collapsed and empty.
Collapsed Label	You can specify a value that will override the table title (label property) when the table is collapsed.
Parent Empty Label	If this table is a child of a parent table, and that table is empty, this value overrides the title of the parent table.
Row Details Expanded	Select this check box if you want a table to display the expanded detail sections for each record in the table. The default setting is not to expand the detail sections for a table row.
Application Restrictions	Enter a Where Clause that filters information displayed in the table. If you enter a restriction, it modifies the overall Where Clause for the application. You cannot change the restriction at runtime.
Listeners	Enter the ID or IDs of one or more data sources that you want to refresh whenever there are changes to this control. Listener controls can be located anywhere within the application. Separate multiple values with a comma.
Signature Option	You can specify a signature option that can restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click the Configure Conditional Properties button.
Sig Option Data Source ID	An MBO must be used to evaluate whether or not a user has access to a signature option. Specify the value of the data source that performs this evaluation if it is different to the data source that is configured for this control.

Table column control

The table column control is a container that you can use to add columns and column headings to a table. You can place a table column control within a table control.

At runtime, a table column dynamically generates either a text box control or a check box control to show its data. A check box is used if the data type for the field is YORN. If the data type for the field is not YORN, a text box is used.

You can add a text box to a table column if you want to bind a field with a YORN data type to a text box, instead of to a check box. Unless you want to override the use of a check box for a field with a YORN data type, do not add a control to a table column control.

You can use the standard filter feature to display only records that meet specified criteria.

General properties

Attribute name	Description
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Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Default Label	This read-only value is the text value that is associated with the database attribute that is bound to this control.
Label	If you enter a text value in this field, it overrides the Default Label for the control. This label is specific to the application and is not stored in the MAXATTRIBUTE or APPFIELDDEFAULTS tables.
Attribute	You can associate this control with a database attribute. Not all attributes have a Default Label value.
Type	A table column can trigger an event or provide a link. If you select Link, the value, such as a record number, is underlined. When the user clicks this link, the record opens. If you select Event, enter appropriate values for the Event Type, Event Description, and Event Icon properties. For example, if you specify the TOGGLEDETAILSTATE event, the user can click a View/Show icon to open or close the details section for a selected record.
Sortable	If you select this option, the user can sort records in a table by clicking the label of a column. The first click sorts the records in ascending order. The second click a label sorts the records in descending order.
Turn Smart Fill Off	Select this option to disable smart fill, which is turned on by default. Smart fill enables a user to enter a partial value in a text box, which the system attempts to match to a valid value, or values, in the database. When a matching value is found, the value is entered in the text box. If the system finds more than one matching value, the user can select one from a list of matching values. If you turn smart fill off, user text is not validated during entry.
Show Filter	If you select the Filterable and Show Filter properties, a filter text box for this column is displayed in the filter row of the table.
Filterable	If you set the Filterable property for a table, the setting also applies to each column in the table. You can override the Filterable setting for a table at the table column level. When you select this option, the user can search on the attribute that is associated with the label of the table column.
Event	If you select Event as the Type property, specify the event in this field. There is no directory of events but you can search for events and event descriptions in the system XML files. To export the files, in a main tab in the Application Designer, choose Select Action > Export System XML. This action exports the library.xml, lookups.xml, and menus.xml files to the <root>\resources\presentation\system directory. You can search these files for MXEVENT and mxevent_desc entries. You can also create your own events.
Target ID	Enter a target control ID, if different from the current control, where an event (if defined) is sent for processing.
Event Description	This property provides a tooltip for an event (if defined).
Event Icon	This property can point to a .gif file of an image that represents an event. The icons in the user interface are stored in the <root>\applications\maximo\maximouiweb\webmodule\webclient\images directory. The image control in the Application Designer provides access to the files in the images directory.
Change Event	You can configure a control to perform one of the following actions in the event of a data change to the control: <ul style="list-style-type: none"> The REFRESHABLE event refreshes the data source table for the control. The RESETCHILDREN event deletes any child objects of the data bean of the control, which then reacquires its MBOSetRemote references.
CSS Class Name	If you want to change the layout and appearance of the control, enter the CSS class name to use. You can search for CSS class names in the applications\maximo\maximouiweb\webmodule\webclient directory.
Lookup	You can specify a lookup ID to link this control to a preformatted lookup table that pulls records from the main table. A user can select a record from the lookup table to use in this control. Lookup IDs are stored in the lookups.xml file. To view the content of this file, export the system XML files.
Go To Applications	You can associate a pull-down menu with this control and add application names to it that users can click to go to different applications.
Input Mode	Input mode options are: <ul style="list-style-type: none"> Blank: An input mode with no value is read/write. Any information that is entered in this field is stored in the database column that is specified in the Attribute field. Default: This mode is used for quick entry of default table data in tables. Password: This mode is read/write and displays asterisks. Password Readonly: This mode is read-only and displays asterisks. Password Required: This mode is read/write and displays asterisks. The record cannot be saved unless there is a value in the field. Query: This mode is read-only and shows a typed value. Readonly: This mode is read-only and shows disabled text. Required: This mode is read/write and the record cannot be saved unless the user enters a value in the field.

Advanced properties

Attribute name	Description
Label Attributes	You can enter a comma-separated list of data attributes used to create the Default Label for this control. Label Attributes and Label Source ID enable you to display dynamic values in the Default Label for a table column.
Label Source ID	Enter an object name that is the data source for the Label Attributes property.
Title Attributes	Reserved for future use.
URL Attribute	Enter a URL value if you set the Type property for this control to Link. The URL value becomes a hyperlink.
Is LD Readonly	By default, the system sets a long description that is associated with a table column attribute to editable. Select this field to make the long description read-only.
Always Synchronous	If cleared, the control can communicate with the database without pausing user activities. If cleared, the user cannot perform activities in other fields until validations for this field are completed. Synchronous activity is disabled by default. If there are dependencies between values that are specified for this control and other controls in the application, you can enable synchronous activity for the dependent controls.

Attribute name	Description
Linked Controls ID	You can enter a control ID that is automatically updated whenever there is a change to the attribute value in this column. The control ID must exist somewhere within the application.
More information	<p>You can specify the values to construct a URL for an IBM® Knowledge Center topic using the following format: <code>com.ibm.mbs.doc,application/helpfile.html</code>. The server address and other information for the URL are controlled by the <code>mx.help</code> properties, which you can review and configure in the System Properties application.</p> <p>If you specify a URL, a More Information link is added to the field help (Alt + F1) for the control. When the user clicks the link, the target topic opens in the Knowledge Center.</p> <p>The property is specific to the field ID in the presentation XML file. If you want to provide the same link in other controls or other applications, you must manually add the URL to each individual control.</p>
Signature Option	You can specify a signature option that can restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click the Configure Conditional Properties button.
Sig Option Data Source ID	A MBO must be used to evaluate whether a user has access to a signature option. Specify the value of the data source that performs this evaluation if it is different from the data source that is configured for this control.

Text box control

A text box control is a single-line text box that displays information the user either enters or selects from a list. Text boxes have labels that are typically visible in the user interface. Labels are text fields that describe the type of information displayed in the box. You can place a text box within a section control.

Text boxes are often linked to select value lookups and detailed menus. A select value lookup lets you select and then display a single value from a list of records. A text box linked to a detailed menu can contain diverse options, such as a Select Value window, jumps to other applications, or views of different records. The Menu Type property you configure for a text box controls the format and content of the detailed menu.

General properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Default Label	This read-only value is the text value that is associated with the database attribute bound to this control.
Label	If you enter a text value in this field, it overrides the Default Label for the control. This label is specific to the application and is not stored in the <code>MAXATTRIBUTE</code> or <code>APPFIELDDEFAULTS</code> tables.
Hide Label	By default, the label value always appears in the user interface. Select this check box to make the label invisible.
Turn Smart Fill Off	Select this option to disable smart fill which is turned on by default. Smart fill enables a user to enter a partial value in a text box which the system attempts to match to a valid value, or values, in the database. When a matching value is found, the value is entered in the text box. If the system finds more than one matching value, the user can select one from a list of matching values. If you turn smart fill off, user text is not validated during entry.
Attribute	You can associate this control with a database attribute. Not all attributes have a Default Label value.
Data Source ID	Specify a data source ID if you want this control to use a different data source than the parent. If the control is creating a data source and the Data Source ID property is not set, the ID defaults to the ID of the control. If the data source is blank, the control inherits the data source from the parent. If no parent controls have a data source specified or if the parent is the application, <code>MAINRECORD</code> is the data source because it is the primary data source for the application.
Lookup	<p>You can specify a lookup ID to link this control to a pre-formatted lookup table that pulls records from the main table. A user can select a record from the lookup table to use in this control.</p> <p>Lookup IDs are stored in the <code>lookups.xml</code> file. To view the content of this file, export the system XML files.</p>
Go To Applications	You can associate a pull-down menu with this control and add application names to it that users can click to go to different applications.
Input Mode	<p>Input mode options are:</p> <ul style="list-style-type: none"> Blank: An input mode with no value is read/write. Any information entered in this field is stored in the database column specified in the Attribute field. Default: This mode is used for quick entry of default table data in tables. Password: This mode is read/write and displays asterisks. Password Readonly: This mode is read-only and displays asterisks. Password Required: This mode is read/write and displays asterisks. The record cannot be saved unless there is a value in the field. Query: This mode is read-only and shows a typed value. Readonly: This mode is read-only and shows grayed-out text. Required: This mode is read/write and the record cannot be saved unless the user enters a value in the field.
Menu Type	You can specify the value of a menu ID in this field to link the control to a preformatted drop-down menu. Menu IDs are stored in the <code>menus.xml</code> file. To view the content of this file, export the system XML files.

Advanced properties

Attribute name	Description
Detail Image	Reserved for future use.

Attribute name	Description
QBE Prepend	If you set the Input Mode to Query, you can filter the search by adding a text prefix that acts as filter. For example, the More Search Fields window uses QBE Prepend to add date search filters similar to ">=". You can specify the value here to save key strokes when searching for records that meet specific date criteria.
Change Event	You can configure a control to perform one of the following actions in the event of a data change to the control: <ul style="list-style-type: none"> The REFRESHABLE event refreshes the data source table for the control. The RESETCHILDREN event deletes any child objects of the data bean of the control which then reacquires its MBOSetRemote references.
Always Synchronous	If deselected, the control can communicate with the database without pausing user activities. If cleared, the user cannot perform activities in other fields until validations for this field are completed. Synchronous activity is disabled by default. If there are dependencies between values specified for this control and other controls in the application, you can enable synchronous activity for the dependent controls.
Readonly Long Description	By default, the system sets a long description associated with a table column attribute to editable. Select this field to make the long description read-only.
Display Type	Reserved for future use.
More information	You can specify the values to construct a URL for a Knowledge Center topic using the following format: com.ibm.mbs.doc,application/helpfile.html The server address and other information for the URL are controlled by the <code>mx.help</code> properties which you can review and configure in the System Properties application. If you specify a URL, a More Information link is added to the field help (Alt + F1) for the control. When the user clicks the link, the target topic opens in the Knowledge Center. The property is specific to the field ID in the presentation XML file. If you want to provide the same link in other controls or other applications, you must manually add the URL to each individual control.
Move To Data Source ID	Specify a record stored in a different object that the user can move to. You can select any Data Source ID from the presentation control. By default, the system sends the Move To event to the ResultsBean , which contains a set of records displayed in the List tab. The Move To event affects the Move to Data Source ID object.
Signature Option	You can specify a signature option that can restrict access to this control or change the properties of this control based on a condition that you specify. To create a signature option, click Add/Modify Signature Options in the Select Action menu. To specify a condition, click the Configure Conditional Properties button.
Sig Option Data Source ID	An MBO must be used to evaluate whether or not a user has access to a signature option. Specify the value of the data source that performs this evaluation if it is different to the data source that is configured for this control.

Tree control

Use a tree control as a container for tree node and tree attribute controls to build dynamic, hierarchical tree structures with specific business objects that support hierarchical data. You can place a tree control within a dialog control or a tab control. You can place a tree node control into a tree control.

The Classifications application uses tree controls to construct classification hierarchies and the Users application uses tree controls to construct the security profile hierarchy.

When you click	What happens
Plus sign	Expands the tree node without highlighting the corresponding node label. The plus sign becomes a minus sign. If you highlighted a node label prior to clicking a plus sign, it remains highlighted.
Minus sign	Contracts the tree node and highlights the corresponding node label.
Dot sign (If node label is not selected)	Highlights the node label and removes any existing highlights.
Dot sign (If node label is selected)	No effect.
Node label (Next to a plus sign)	Highlights the node label and removes any existing highlights. Highlighted node does not expand. window displays hierarchical levels below the highlighted node.
Node label (Next to a minus sign)	Highlights the node label and removes any existing highlights. Highlighted node does not contract. window displays hierarchical levels below the highlighted node.
Node label (Next to a dot sign)	Highlights the node label and removes any existing highlights. Highlighted node does not expand or contract. window displays any items or information related to the node label.

Properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Height	Enter a numeric value in this field that will increase or decrease the height of the image. If you change the default dimensions, the image can become distorted.
Width	Enter a numeric value in this field that will increase or decrease the width of the image. If you change the default dimensions, the image can become distorted.
Bean Class	You can specify the name of a data bean class to use when creating the data source for the control. If not defined and the control is creating a data source, the default <code>psdi.webclient.system.DataBean</code> class is used. Typically, you use this property to create custom event methods or to override the manner in which the data source obtains its <code>MboSet</code> .

Attribute name	Description
Business Object	Specify the name of a MBO in this field to determine which MBO the control uses to show and process information. If a MBO is not specified, the control uses the data source of its parent control. When you set a MBO for this control a data source is created that can be referenced from other controls.
Relationship	If you specified a value in the Parent Data Source ID field, specify a value in this field that identifies the relationship between this control and the new data source. A relationship uses a WHERE clause to determine what to show and process from the data source. The control creates a datasource that is by default used by the child controls. You can search for relationship values in the Database Configuration > Relationships tab.
Use Data Source	Reserved for future use.
Order By	You can specify the order in which a SQL query fetches data for the data source for this control.

Tree attribute control

The tree attribute control describes the data that appears in each tree node. For example, the tree attributes in the Classifications application display classification IDs and descriptions in the user interface. You can place a tree attribute control within a tree node control.

Properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Display	Select this option to display the Attribute value in the tree node.
Attribute	You can associate the values that display in a tree node with a database attribute. To create a classification example, you can enter "classstructure" in the Object field to display all the attributes in the CLASSSTRUCTURE table. Select the "CLASSIFICATIONID" attribute to display Classification ID as one of the Tree Node properties. In the Tree example, you also define another Tree Attribute property called "CLASSIFICATION.DESCRPTION" to display the Classification Description value.

Tree node control

The Tree Node control is a container type of control that works with the Tree and Tree Attribute controls. A Tree Node defines the structure of a hierarchical tree.

Rules

You can place the Tree Attribute control in this container control.

You can place this control inside the Tree container control.

General properties

Attribute name	Description
Control ID	Each control in a presentation is assigned a unique Control ID that is read-only.
Image	You can specify the file name of any file stored in the images directory at <root>\applications\maximo\maximouiweb\webmodule\webclient\images. You can reuse any existing images or you can add new images to the directory. Images can be in any format supported by a browser. You must redeploy the .EAR file on the application server to add the images to the user interface.
Display Key Attribute	Select this property to display the Key Attribute as part of the tree node label.
Display Object Name	Select this property to display the Object Name as part of the tree node label.
Key Attribute	You can specify a different attribute of the business object to use as a key attribute, other than the key attribute specified for the MBO.
Key Value	You can specify an option to display as the default value.
Return Attribute	Enter an attribute name whose value gets returned to the browser when you click the icon of a tree node line item.
Enable Return	Select this property to enable the Return Attribute property functionality.

Financial processes reference

Financial managers can refer to detailed information about financial processes, such as how the default GL account codes are determined.

- [Security and database configuration](#)
You use the applications in the security module to implement and to manage security for users and groups. You use the Database Configuration application to perform different actions, such as configuring the GL account and applying configuration changes.
- [Valid GL accounts](#)
You can set up GL accounts so that they correspond to accounts that you use in your external accounting system.

- [Financial processes common information](#)
The information in these topics is common for financial processes in all applications.
- [Financial processes in the Assets module](#)
Various financial processes occur in the Assets and Locations applications.
- [Financial processes in the Inventory module](#)
Various financial processes occur in the Item Master, Inventory, Inventory Usage, and Tools applications.
- [Financial processes in the Preventive Maintenance module](#)
Various financial processes occur in the Preventive Maintenance application.
- [Financial processes in the Purchasing module](#)
Various financial processes occur in the Companies, Purchase Requisitions, Purchase Orders, Receiving, and Invoices applications.
- [Financial processes in the Resources module](#)
Various financial processes occur in the Labour application.
- [Financial processes in the Service Desk module](#)
Various financial processes occur in the Service Requests, Incidents, and Problems applications.
- [Financial processes in the Work Orders module](#)
Various financial processes occur in the Work Order Tracking, Quick Reporting, and Labor Reporting applications.
- [General ledger database columns](#)
The table in this appendix lists the GL account columns found in user applications. It shows the application, table, and column name for each column. The table also indicates whether you must fully specify the GL account.

Security and database configuration

You use the applications in the security module to implement and to manage security for users and groups. You use the Database Configuration application to perform different actions, such as configuring the GL account and applying configuration changes.

- [Security](#)
Security is important when implementing GL account codes so that the application can communicate with a financial system.
- [Database configuration](#)
You can configure the relationships, objects, queries, and other aspects of databases using the Database Configuration application.

Security

Security is important when implementing GL account codes so that the application can communicate with a financial system.

You can implement security to manage which users can log in and which applications users can access. You can set up security privileges for users by group. You create the groups using the Security Groups application. For each group, you specify security settings, such as application privileges and restrictions. You grant security rights to users by assigning them membership in one or more groups. The combination of groups to which a user belongs determines the security privileges for the user.

Database configuration

You can configure the relationships, objects, queries, and other aspects of databases using the Database Configuration application.

- [Authorizing general ledger component access](#)
You can restrict users from editing GL account codes. You can also restrict users from updating specified general ledger components.
- [Configuring your GL account](#)
You can use the GL Account Configuration action in the Database Configuration application to specify the basic format of GL account codes. You can create general ledger account structures that are specific to organizations in your enterprise. To support different configurations for each organization, configure your general ledger components to the maximum length that any organization might use.
- [Using the Chart of Accounts application](#)
In the Chart of Accounts application, you can set up organization-specific GL accounts and resource codes for standard accounting functions. You create accounts and resource codes to correspond with accounts that you use in your external accounting system. You can also set up financial periods, and specify general validation options.
- [Specifying validation options for GL account codes](#)
You use validation options to specify how GL accounts are validated. GL accounts are validated when they are used in GL account fields.
- [Working with locations](#)
Locations and location hierarchies represent functional areas of an organization. Use locations to track movement of assets from place to place. Locations typically are static areas while assets might move to various locations. Write work orders and tickets for locations and charge the costs either to the location or asset. Some locations are virtual, rather than physical.

Authorizing general ledger component access

You can restrict users from editing GL account codes. You can also restrict users from updating specified general ledger components.

You set up GL account code formats using the GL Account Configuration action in the Database Configuration application in the Configuration module.

You use the GL Components tab in the Security Groups application to specify which groups can edit the account codes. You can specify edit privileges for each component of the account code.

Configuring your GL account

You can use the GL Account Configuration action in the Database Configuration application to specify the basic format of GL account codes. You can create general ledger account structures that are specific to organizations in your enterprise. To support different configurations for each organization, configure your general ledger components to the maximum length that any organization might use.

- [Account components](#)
Each GL account code consists of several components (segments) that are separated by delimiters, such as 6100-400®-SAF.
- [Mandatory and optional components](#)
Some GL account components are mandatory while other components are optional.

Account components

Each GL account code consists of several components (segments) that are separated by delimiters, such as 6100-400®-SAF.

You can define the number, length, and data type of components, whether the components are required, and any delimiter, in the Database Configuration application. The account structures that you define are the default, system-level structures.

For easy identification, use delimiters to separate components when they are shown. For example, use hyphens to separate components: 6100-400-SAF. Delimiters are written to the database. A component that has not been assigned a value is represented by placeholder characters, such as 6000-???-350.

The first component of the GL account code is the cost center. You can use up to three characters to define your own cost center, for example:

- FIN (Finance Group)
- RD (Research and Development)
- SM (Sales and Marketing)

Mandatory and optional components

Some GL account components are mandatory while other components are optional.

In a fully defined account, specify all mandatory components. In a partially defined account, you can identify the mandatory component by the placeholder characters that it contains.

You do not have to specify an optional component. However, to display the optional component, you must specify it. Any optional components must come at the end of the account string. You cannot place an optional component between two mandatory components.

Example

You designated the first three components of an account as mandatory and the fourth as optional, making **1234-567** an unacceptable account code. Since the third component is required, you must assign characters to the third component, even if you use placeholders. If both the third and fourth components are unknown, the account code would be **1234-567-???**. Since the fourth component is both optional and unknown, that component is not shown.

Using the Chart of Accounts application

In the Chart of Accounts application, you can set up organization-specific GL accounts and resource codes for standard accounting functions. You create accounts and resource codes to correspond with accounts that you use in your external accounting system. You can also set up financial periods, and specify general validation options.

You use the Chart of Accounts application to identify GL accounts. By using the GL Account Configuration action in the Database Configuration application, you can configure the application to use the GL accounts in your external financial system. Using the same account structure, the application can work interactively with your external financial system.

To ensure that your system represents your external financial system GL accounts properly, check the Chart of Accounts application.

Specifying validation options for GL account codes

You use validation options to specify how GL accounts are validated. GL accounts are validated when they are used in GL account fields.

Before you begin

You specify the system-level, default format of GL account codes using the GL Account Configuration window in the Database Configuration application. You specify organization-specific GL account codes using the Add/Modify Account Structure option in the Chart of Accounts application.

Procedure

1. In the Chart of Accounts application, select the organization for which you want to specify validation rules.
2. From the Select Action menu, select Validation Options.
3. Select or clear the appropriate check boxes in the following list:

Option	Description
Deactivate GL Validations	If this option is selected, general ledger fields are not validated. If this option is not selected, the entries in GL account fields are validated by using the values in the Chart of Accounts application.
Validate GL Component Combinations	If this option is selected, only valid GL account entries are accepted. If you do not select this option, any combination of valid component values is accepted.
Validate Financial Periods	If this option is selected, checks are performed to ensure that a transaction occurs within an open, valid financial period. If this option is not selected, validations are not performed to require defined financial periods.
Require Valid GL Account for All Transactions	If this option is selected, valid general ledger debit and credit accounts must be present on all financial transactions. If this option is not selected, transactions without a valid GL account are allowed.

4. Click OK.

Working with locations

Locations and location hierarchies represent functional areas of an organization. Use locations to track movement of assets from place to place. Locations typically are static areas while assets might move to various locations. Write work orders and tickets for locations and charge the costs either to the location or asset. Some locations are virtual, rather than physical.

- **Types of locations**

A location is defined as a place where assets are operated, are stored, or are repaired. Using systems of locations and specifying the location for assets on asset records provides the groundwork for gathering and tracking valuable information about the history of assets, including asset performance at specific sites, and as an asset is moved from location to location.

Types of locations

A location is defined as a place where assets are operated, are stored, or are repaired. Using systems of locations and specifying the location for assets on asset records provides the groundwork for gathering and tracking valuable information about the history of assets, including asset performance at specific sites, and as an asset is moved from location to location.

Locations can be of the following types:

- Operating locations are the location in which an asset operates. Work orders and tickets are written either against the location itself or against the asset in an operating location. Use operating locations when building a location hierarchy.
- Asset types of locations are vendor, salvage, and repair. Assets can be located in asset types of locations. You can track an asset not only as it moves from one operating location to another, but as it moves to a vendor or to a repair location, and perhaps to a salvage location.
- Inventory types of locations are labor and courier. These locations can maintain a balance of an item or items issued from a storeroom. For example, a courier location holding a batch of items issued from a storeroom is responsible for the items until they are received into another location.

Valid GL accounts

You can set up GL accounts so that they correspond to accounts that you use in your external accounting system.

When you create your chart of accounts, you can match the account codes in your accounting system to the account names in the Chart of Accounts application.

Transactions have a debit and a credit entry. For each transaction, an account is written to the database as the debit account. However, the cost of the transaction can be negative or positive to create the correct net accounting effect. In other words, the net effect of a credit is to create a given account by debiting that account with a negative cost amount.

Table 1. Valid GL accounts

GL Account	Description	Account type	Object and attribute	Application
Accounts payable control account	Summarizes the amount that is owed to suppliers and other creditors.	Company-related	COMPANIES.APCONTR OLACC	Companies Action, Default Company Accounts
Accounts payable suspense account	The value of invoices that are approved, but not paid.	Company-related	COMPANIES.APSUSPE NSEACC	Companies Action, Default Company Accounts
Asset GL account	The default debit account for work orders, purchase orders, and other types of accounts against an asset.	Location and asset	LOCATIONS.GLACCOU NT ASSET.GLACCOUNT	Locations

GL Account	Description	Account type	Object and attribute	Application
Consignment suspense accounts	The values of inventory that are owned by an external vendor.	Company-related	COMPANIES.CONSACCT	Companies
Currency variance account	Differences between the receipt price and the invoice cost that result from changes in the exchange rate.	Inventory-related	LOCATIONS.CURVARACC	Storeroom
External labor control account	The credit account for work done by outside vendors.	Resource control	ACCOUNTDEFAULTS.GLDEFAULT DFTLGROUP = LABRESCODE GROUPVALUE = 1	Chart of Accounts Action, External Labor Control Accounts
External tools control account	The credit account for any external tool transaction.	Resource control	ACCOUNTDEFAULTS.GLDEFAULT DFTLGROUP = TOOLRESCODE GROUPVALUE = 0	Chart of Accounts Action, Resource Codes
Internal labor control account	The credit account for work done by internal employees.	Resource control	ACCOUNTDEFAULTS.GLDEFAULT DFTLGROUP = LABRESCODE GROUPVALUE = 0	Chart of Accounts Action, Resource Codes
Internal tools control account	The credit account for any internal tool transaction.	Resource control	ACCOUNTDEFAULTS.GLDEFAULT DFTLGROUP = TOOLRESCODE GROUPVALUE = 0	Chart of Accounts Action, Resource Codes
Inventory control account	The monetary value of the stock in the associated storeroom location.	Inventory-related	LOCATIONS.CONTROLACC	Storeroom
Inventory cost adjustment account	The changes in the average cost or standard cost of your inventory.	Inventory-related	LOCATIONS.INVCOSTADJACC	Storeroom
Inventory GL account	The resource code that is associated with the commodity group that you set up in the Chart of Accounts application.	Inventory-related	LOCATIONS.CONTROLACC	Storeroom
Inventory resource code	The inventory resource component of the debit account in a transaction.	Resource	ACCOUNTDEFAULTS.GLDEFAULT DFTLGROUP = INVRESCODE GROUPVALUE = Commodity Group Name	Chart of Accounts Action, Resource Codes
Invoice cost variance account	The variances in the price, expressed in the vendor currency, between receipt and invoice for the associated storeroom location.	Inventory-related	LOCATIONS.CURVARACC	Storeroom
Labor resource code	The labor resource component of the debit account in a transaction.	Resource	ACCOUNTDEFAULTS.GLDEFAULT DFTLGROUP = TOOLRESCODE GROUPVALUE = 0	Chart of Accounts Action, Resource Codes
Operating location GL account	The default debit account for work orders, purchase orders, and other types of accounts against the location.	Location and asset	LOCATIONS.GLACCOUNT	Location
Paid tax GL account	The accrual account for tax that you pay to a vendor or supplier.	Tax	TAXTYPE.INCLUSIVEGL	Organizations Action, Purchasing/Tax Options
Preventive maintenance GL account	Used when a preventive maintenance record generates a work order.	Preventive maintenance	PM.GLACCOUNT	Preventative Maintenance
Purchase variance account	The purchase variance account is not used for any transactions.	Inventory-related	LOCATIONS.PURCHVARACC	Storeroom
Receipts price variance account	The differences between the inventory standard cost and the receipt cost for items in the associated storeroom location.	Inventory-related	LOCATIONS.RECEIPTVARACC	Storeroom
Received but not invoiced account	The materials and services that you have received, but that you have not yet invoiced.	Company-related	COMPANIES.RBNIACC	Companies Action, Default Company Accounts
Rotating suspense account	The accumulated cost of repairs to an asset until you move the asset into a storeroom.	Inventory-related	ASSET.ROTSUSPACCT	Chart of Accounts Action, Default Organization Accounts
Shrinkage cost account	The differences between actual inventory quantities and calculated quantities.	Inventory-related	LOCATIONS.SHRIKAGEACC	Storeroom
Tool control accounts	The default account used to track transactions on a tool that is owned by an external vendor.	Company-related	COMPANIES.TOOLCONTROLACCOUNT	Companies Action, Default Organization Accounts

GL Account	Description	Account type	Object and attribute	Application
Tool resource code	The tool resource component of the debit account in a transaction.	Resource	ACCOUNTDEFAULTS.G LDEFAULT DFTLGROUP = TOOLRESCODE GROUPVALUE = 0 ITEMORGINFO.GLACC OUNT	Chart of Accounts Action, Resource Codes Action, Tool/Org Details
Unpaid tax GL account	The accrual account for unpaid tax.	Tax	TAXTYPE.EXCLUSIVEG L	Organizations Action, Purchasing/Tax Options

- **[Company-related accounts](#)**
Company-related accounts are default GL accounts for types of companies that use payment.
- **[Inventory-related accounts](#)**
You can track the volume and the price of your stock, and the costs associated with your stock.
- **[Location and asset accounts](#)**
The default debit accounts for work orders, purchase orders, and other types of accounts against locations and assets.
- **[Preventive maintenance GL account](#)**
The preventive maintenance GL account is used when a preventive maintenance record generates a work order. Typically, you specify one segment of the account code to represent the type of work. You establish this account directly on the preventive maintenance record.
- **[Resource codes](#)**
A resource code typically consists of one component of the account code. You can associate resource codes with resources used on work orders.
- **[Resource control accounts](#)**
The credit accounts for labor and tool resources.
- **[Tax accounts](#)**
You can specify default tax GL accounts to calculate the amount of tax that is due on a purchase requisition, request for quotation, purchase order, or invoice.

Company-related accounts

Company-related accounts are default GL accounts for types of companies that use payment.

- **[Accounts payable suspense account](#)**
The accounts payable suspense account holds the value of invoices that you have approved, but not paid. When you approve an invoice, the account payable suspense account for the invoice total transaction is credited, and the received but not invoiced account is debited.
- **[Received but not invoiced account](#)**
The received but not invoiced account is used to track materials and services that you have received, but that you have not yet invoiced. When you receive an item, the received but not invoiced account is credited. When you approve the invoice for that item, the received but not invoiced account is debited for the invoice total transaction.
- **[Accounts payable control account](#)**
The accounts payable control account summarizes the amount that is owed to suppliers and other creditors.
- **[Consignment suspense accounts](#)**
In the consignment suspense account, you can track the values of inventory that are owned by an external vendor.
- **[Tool control accounts](#)**
The tool control account is the default account used to track transactions on a tool that is owned by an external vendor.

Accounts payable suspense account

The accounts payable suspense account holds the value of invoices that you have approved, but not paid. When you approve an invoice, the account payable suspense account for the invoice total transaction is credited, and the received but not invoiced account is debited.

You can establish the accounts payable suspense account on a company-by-company basis. If you do not specify an account for a particular company, the accounts payable suspense account defaults in the Chart of Accounts application. You can see the list of accounts payable suspense accounts by company type by selecting the Company-Related Accounts action.

Received but not invoiced account

The received but not invoiced account is used to track materials and services that you have received, but that you have not yet invoiced. When you receive an item, the received but not invoiced account is credited. When you approve the invoice for that item, the received but not invoiced account is debited for the invoice total transaction.

You can establish the received but not invoiced account on a company-by-company basis. If you do not specify an account for a particular company, the received but not invoiced account defaults in the Chart of Accounts application. You can see the list of received but not invoiced accounts by company type by selecting the Company-Related Accounts action.

Accounts payable control account

The accounts payable control account summarizes the amount that is owed to suppliers and other creditors.

You can see the list of accounts payable control accounts by company type by selecting the Company-Related Accounts action.

Consignment suspense accounts

In the consignment suspense account, you can track the values of inventory that are owned by an external vendor.

The consignment suspense account is the holding account that is used for consignment inventory. This account valuation is external to your organization. When you consume consignment items from inventory, you purchase the items from the external vendor.

When you create an inventory record for consignment items, the consignment suspense account is set as the default control account. The consignment suspense account is credited and debited as an inventory control account similar to other inventory financial processes.

Tool control accounts

The tool control account is the default account used to track transactions on a tool that is owned by an external vendor.

When you use external tools, you credit the tool control account for the rate and time you use the tool. The balance value of the tool control account is the value of the credit. You debit the work order charge account.

Inventory-related accounts

You can track the volume and the price of your stock, and the costs associated with your stock.

- **[Currency variance account](#)**
You can track differences between the receipt price and the invoice cost that result from changes in the exchange rate.
 - **[Inventory control account](#)**
You can track the monetary value of the stock in the associated storeroom location. When you transfer an item, the receiving storeroom is debited and the issuing storeroom is credited.
 - **[Inventory cost adjustment account](#)**
You can track changes in the average cost or standard cost of your inventory.
 - **[Inventory GL account](#)**
The inventory GL account holds the resource code associated with the commodity group that you set up in the Chart of Accounts application. The account is shown as a segment of merged accounts in transactions such as issues, returns, and transfers of the item from the storeroom location.
 - **[Invoice cost variance account](#)**
You can track variances in the price, expressed in the vendor currency, between receipt and invoice for the associated storeroom location.
 - **[Purchase variance account](#)**
The purchase variance account is not used for any transactions.
 - **[Receipts price variance account](#)**
You can track differences between the inventory standard cost and the receipt cost for items in the associated storeroom location.
 - **[Rotating suspense account](#)**
The rotating suspense account holds the accumulated cost of repairs to an asset until you move the asset into a storeroom.
 - **[Shrinkage cost account](#)**
You can track differences between actual inventory quantities and calculated quantities.
-

Currency variance account

You can track differences between the receipt price and the invoice cost that result from changes in the exchange rate.

The currency variance account is debited if either of the following conditions are true:

- You cleared the Update Cost/Currency Variances on Inventory Costs check box.
- You selected the Update Cost/Currency Variances on Inventory Costs check box and the invoice amount exceeds the current balance.

If you use standard cost, clear the Update Cost/Currency Variances on Inventory Costs check box.

If you clear the check box, the transaction amount is written to the currency variance account. If you select the check box and the invoice amount exceeds its current balance, the difference is written to the currency variance account.

The Update Cost/Currency Variances on Inventory Costs check box is located in the Inventory Defaults window.

The currency variance account is written in a currency variance transaction. If an exchange rate change causes the invoice cost in base currency to exceed the receipt cost in base currency, the transaction amount is positive. If an exchange rate change causes the invoice cost in base currency to be less than the receipt

cost in base currency, the transaction amount is negative.

The currency variance account is paired with the inventory control account: when the currency variance account value increases, the inventory control account value decreases.

Variance accounts track price variances by storeroom location, not by item.

Inventory control account

You can track the monetary value of the stock in the associated storeroom location. When you transfer an item, the receiving storeroom is debited and the issuing storeroom is credited.

The inventory control account is credited for the following transactions involving inventory items:

- Receipts price variance
- Invoice cost variance
- Currency variance
- Material issue or use

The inventory control account is debited for the following transactions involving inventory items:

- Receipt
- Total cost variance
- Return

The inventory control account is also the debit account when a stock adjustment results from the following actions:

- Adjust current balance
- Adjust standard cost
- Change capitalized status
- Reconcile balances

Inventory cost adjustment account

You can track changes in the average cost or standard cost of your inventory.

The inventory cost adjustment account is credited in an average cost adjustment or standard cost adjustment transaction. The inventory cost adjustment account is paired with the inventory control account. When the inventory cost adjustment account is credited, it debits the inventory control account. When the average or standard cost increases, the transaction amount is positive.

Inventory GL account

The inventory GL account holds the resource code associated with the commodity group that you set up in the Chart of Accounts application. The account is shown as a segment of merged accounts in transactions such as issues, returns, and transfers of the item from the storeroom location.

Invoice cost variance account

You can track variances in the price, expressed in the vendor currency, between receipt and invoice for the associated storeroom location.

If the cost changes between receipt and invoice, this account is debited if either of the following conditions is true:

- UPDATEINVENTORY in the MAXVARS table is set to 0.
- UPDATEINVENTORY in the MAXVARS table is set to 1, and the invoice monetary value exceeds the current balance.

If you use the standard cost, set the UpdateInventory flag to 0.

If the flag is set to 0, the amount of the transaction is written to the invoice cost variance account. If the flag is 1 and the invoice amount exceeds the account balance, the difference is written to the invoice cost variance account.

The invoice cost variance account is debited in an invoice cost variance transaction. When the invoice line cost exceeds the receipt cost, the transaction amount is positive. When the invoice line cost is less than the receipt cost, the transaction amount is negative.

This account is paired with the inventory control account. When the invoice cost variance account value increases, the inventory control account value decreases.

Variance accounts track price variances by storeroom location, not by item.

Purchase variance account

The purchase variance account is not used for any transactions.

Receipts price variance account

You can track differences between the inventory standard cost and the receipt cost for items in the associated storeroom location.

The return price variance account is debited in an inventory standard receipt adjustment transaction. When the purchase price at receipt exceeds the standard cost, the transaction amount is positive. When the purchase price at receipt is less than the standard cost, the transaction amount is negative.

The receipts price variance account is paired with the inventory control account; when the receipts price variance account value increases, the inventory control account value decreases.

Variance accounts track price variances by storeroom location, not by item.

Rotating suspense account

The rotating suspense account holds the accumulated cost of repairs to an asset until you move the asset into a storeroom.

The rotating suspense account is the debit account for work orders that you charge to a storeroom. This account is charged when you use material, labor, or tools to complete the work order. When this account is debited for resource use, it credits the appropriate resource control account.

The rotating suspense account is debited when you receive a service associated with rotating assets. If the cost of the service on the approved invoice exceeds the cost at receipt, this account is debited for the variance. When the rotating suspense account is debited for the received or invoiced service, it credits the received but not invoiced account for the vendor.

The rotating suspense account is the credit account when you move rotating assets from a non-storeroom location to an inventory-type location. When you move the assets into the storeroom, a transaction of type TRANSFER is written to the MATRECTRANS table. The transfer transaction causes the rotating suspense account to be credited and the rotating suspense account to be debited for the receiving storeroom.

In the Chart of Accounts application, you can specify a global rotating suspense account code. To specify this account code, select the Organization Default Account action and enter a value in the Global Rotating Suspense Account field. The value that you enter becomes the default for the Rotating Suspense Account field in the Assets application or you can specify a new value in this field.

By default, the Rotating Suspense Account field is not visible.

Shrinkage cost account

You can track differences between actual inventory quantities and calculated quantities.

This account is credited in a current balance adjustment transaction and in a reconciling balances transaction. When the actual inventory quantity exceeds the calculated current balance, the transaction amount is positive.

This account is paired with the inventory control account, which is the debit account in a current balance adjustment transaction.

Location and asset accounts

The default debit accounts for work orders, purchase orders, and other types of accounts against locations and assets.

- [Asset GL account](#)
The asset GL account is the default debit account for work orders, purchase orders, and other types of accounts against an asset. You establish this GL account on the asset record.
- [Operating location GL account](#)
The operating location GL account is the default debit account for work orders, purchase orders, and other types of accounts against the location. You can only establish this account on the operating location record.

Asset GL account

The asset GL account is the default debit account for work orders, purchase orders, and other types of accounts against an asset. You establish this GL account on the asset record.

Assign GL accounts to locations instead of to assets. To specify a GL account for a particular asset, you must display the Asset GL Account field in the Assets application.

If you fully specify an asset GL account, work order costs are never charged related to that asset to the operating location GL account. This occurs regardless of the asset location. Any account components that you specify in creating the asset GL account overrides those same components in the operating location GL account.

For example, if you create a work order in asset with GL account 1111-222-???, and the work order is to be performed at an operating location with GL account 1111-333-444, the general ledger debit account for the work order is 1111-222-444.

Operating location GL account

The operating location GL account is the default debit account for work orders, purchase orders, and other types of accounts against the location. You can only establish this account on the operating location record.

Preventive maintenance GL account

The preventive maintenance GL account is used when a preventive maintenance record generates a work order. Typically, you specify one segment of the account code to represent the type of work. You establish this account directly on the preventive maintenance record.

On the work order, the account is merged with the asset and location GL account codes, if those codes exist. In the merger, if codes have defined components in the same segment, the preventive maintenance GL account components have the highest priority. This means that the preventive maintenance GL account code segments override defined segments in the same position from the location and asset GL account codes.

Resource codes

A resource code typically consists of one component of the account code. You can associate resource codes with resources used on work orders.

- [Inventory resource code](#)

Inventory resource codes are the inventory resource component of the debit account in a transaction. For example, when you create a work order requiring an inventory item, that work order line item includes the inventory resource account component in the general ledger debit account code.

- [Labor resource code](#)

The labor resource code is the labor resource component of the debit account in a transaction. For example, when you create a work order requiring labor, the work order line item includes the labor resource account segment in the GL debit account code.

- [Tool resource code](#)

Tool resource codes are the tool resource component of the debit account in a transaction. For example, when you create a work order requiring a tool, that work order line item includes the tool resource account component in the general ledger debit account code.

Inventory resource code

Inventory resource codes are the inventory resource component of the debit account in a transaction. For example, when you create a work order requiring an inventory item, that work order line item includes the inventory resource account component in the general ledger debit account code.

In the Chart of Accounts application, you can define inventory resource codes by commodity group. To track items by identifiers, display the GL account field in the Item Master application and overwrite the code on the item record.

Labor resource code

The labor resource code is the labor resource component of the debit account in a transaction. For example, when you create a work order requiring labor, the work order line item includes the labor resource account segment in the GL debit account code.

In the Chart of Accounts application, you can define one labor resource code for internal labor and another for external labor. Additionally, to track laborers by identifiers, display the GL account field in the Labor application and overwrite the code on the labor record.

Tool resource code

Tool resource codes are the tool resource component of the debit account in a transaction. For example, when you create a work order requiring a tool, that work order line item includes the tool resource account component in the general ledger debit account code.

In the Chart of Accounts application, you can create two resource codes: one for internal resource tools and one for external resource tools. To change the default resource code by identifier, click [Inventory > Tools](#) and select the Tool tab. From the Select Action menu, select Tool/Organization Details.

Resource control accounts

The credit accounts for labor and tool resources.

- **External labor control account**
The external labor control account is used as the credit account for work done by outside vendors. It is the accrual account for the value of external labor issued to work orders or other activities. For example, this account is credited when you report external labor use on a work order.
- **External tools control account**
The external tools control account is used as the credit account for any external tool transaction. The accrual account contains the value of external tools issued to work orders or other activities. For example, this account is credited when you report external tool use on a work order.
- **Internal labor control account**
The internal labor control account is used as the credit account for work done by internal employees.
- **Internal tools control account**
The internal tools control account is used as the credit account for any internal tool transaction. It is the accrual account for the value of internal tools issued to work orders or other activities. For example, this account is credited when you report internal tool use on a work order.

External labor control account

The external labor control account is used as the credit account for work done by outside vendors. It is the accrual account for the value of external labor issued to work orders or other activities. For example, this account is credited when you report external labor use on a work order.

You define the external labor control account in the Chart of Accounts application for all external labor. You also can define default accounts by the external labor vendor.

You can overwrite the account code on the individual labor record. To do so, display the Labor Control Account field in the Labor application.

This account is paired with the debit account in the transaction, which includes the labor resource code as a component.

External tools control account

The external tools control account is used as the credit account for any external tool transaction. The accrual account contains the value of external tools issued to work orders or other activities. For example, this account is credited when you report external tool use on a work order.

You define the external tools control account for each vendor in the Companies application for all external tools owned by that vendor. In the Chart of Accounts application, you can create two resource codes: one for internal resource tools and one for external resource tools. To change the default resource code by identifier, click Inventory...Tools, select the Tools tab. From the Select Action menu, select Tool/ Organization Details.

The external tools control account is paired with the debit account in the transaction, which includes the tool resource code as a component.

Internal labor control account

The internal labor control account is used as the credit account for work done by internal employees.

Each labor record might have one or more craft and skill levels, and each craft and skill level might have a defined labor rate. If no vendor is specified on the defined labor rate, the rate is considered internal and has an internal labor control account. The internal labor control account is the internal labor account from the work location for the labor. When you update the work location, the internal labor account from the new work location is placed in each of the internal rates for the labor.

You can use the Application Designer to display or update the labor control account in the detail area of each of the labor rates. However, if the labor work location is then changed, the account that you entered is overwritten by the internal labor account of the new work location.

Internal tools control account

The internal tools control account is used as the credit account for any internal tool transaction. It is the accrual account for the value of internal tools issued to work orders or other activities. For example, this account is credited when you report internal tool use on a work order.

To define the default internal tools control account, click Financial...Chart of Accounts. From the Select Action menu, select Organization Default Accounts.

You can overwrite the account code on the individual tool record. To display the Control Account field, click Inventory...Tools. From the Select Action menu, select Tool/Organization Details.

This account is paired with the debit account in the transaction, which would include the tool resource code as a component.

Tax accounts

You can specify default tax GL accounts to calculate the amount of tax that is due on a purchase requisition, request for quotation, purchase order, or invoice.

- **Paid tax GL account**
The paid tax GL account is the accrual account for tax that you pay to a vendor or supplier. In most countries, you pay tax to a vendor or supplier, instead of a government tax authority.

- [Unpaid tax GL account](#)

This account is the accrual account for unpaid tax. You use this account for invoices that require you to pay tax directly to a government tax authority, instead of vendors or suppliers.

Paid tax GL account

The paid tax GL account is the accrual account for tax that you pay to a vendor or supplier. In most countries, you pay tax to a vendor or supplier, instead of a government tax authority.

You can specify the paid tax GL account in two ways:

- You can specify a value for individual tax codes, or specify a tax type GL account.
- You can specify a paid tax GL account for tax types 1 through n , where $n \leq 27$.

When you approve an invoice that includes tax, the paid tax GL account is debited. The paid tax GL account is defined for each tax code. If an individual GL account has not been assigned for the tax code, the GL account that is specified for the tax type is used.

The transaction amount is the sum of the amounts specified for each tax type in the invoice lines. For a credit invoice, the amount is negative.

When the invoice includes tax, the paid tax GL account is paired with the received but not invoiced account. When the paid tax GL account is debited, it credits the received but not invoiced account.

When the invoice does not include tax, the paid tax GL account is paired with the unpaid tax GL account. When the unpaid tax GL account is debited, it credits the paid tax account.

Unpaid tax GL account

This account is the accrual account for unpaid tax. You use this account for invoices that require you to pay tax directly to a government tax authority, instead of vendors or suppliers.

The Update Cost/Currency Variances on Inventory Costs check box is located in the Inventory Defaults window in the Organizations application.

To create and manage the unpaid tax GL account go to the Organizations application and from the Select Action menu, select Purchasing Options > Tax Options.

You can specify the unpaid tax GL account in two ways:

- Specify an unpaid tax GL account for tax type 1 through n , where $n \leq 27$. This account is used as the default.
- Specify a value for each individual tax code.

When you approve an invoice, the unpaid tax GL account is debited. The unpaid tax GL account is defined for each tax code. If an individual GL account has not been assigned for the tax code, the GL account for the tax type is used.

The transaction amount is the sum of the amounts specified for each tax type in the invoice lines. For a credit invoice, the amount is negative. When the unpaid tax GL account is debited, it credits the paid tax GL account.

Financial processes common information

The information in these topics is common for financial processes in all applications.

- [GL account transaction processes](#)

Some processes cause GL account transactions to be written. Generally, the transactions are in transaction tables, which you can map to your external financial system.

- [GL account tracking](#)

Most users do not have to specify GL account codes. After you define the accounts and associated codes in the Chart of Accounts application or specify them in some records, most GL account fields default to the correct value.

GL account transaction processes

Some processes cause GL account transactions to be written. Generally, the transactions are in transaction tables, which you can map to your external financial system.

Default codes

Processes resulting in debit or credit transactions use decimal fields and amount (cost) fields. To minimize the effects of rounding in calculations, use the Database Configuration application. Use the application to set the scale of the fields to six or more places. The scale is the number of places calculated and displayed after the decimal point.

For a process to assign a default code to a particular account, you first must establish the default code in the Chart of Accounts application.

For example, if you insert a company record for a vendor, a default code is assigned to the received but not invoiced account. For the assignment to occur, you first must establish which code to use for the received but not invoiced account for vendors.

To establish your vendor received but not invoiced account code, use the Company-Related Accounts action in the Chart of Accounts application.

To overwrite the default code for an account, you must have authorization.

If you have authorization to edit account codes, you might have to display the field in the relevant application. For example, suppose that for a certain labor record, you want to use a code other than the default for the GL account. To overwrite the default account code, you first must make the GL Account field visible in the Labor application.

Merged account codes

Some processes cause the creation or use of a merged account code. For example, reporting labor use against a work order typically causes a debit to a merged account. The sources of the merged account are the labor GL account and the work order GL account.

In the following example, both the labor GL account and the work order GL account are merged because neither one typically has all of its components specified. For example, if the labor GL account is ???-??-300, and the work order GL account is 6000-300-??, the debit account for labor use is 6000-300-300.

Table 1. Debit account for labor use from merger of labor and work order GL accounts

Account	Number
Labor GL account	???-??-300
Work order GL account	6000-300-??
Debit account for labor use	6000-300-300

However, if the two accounts both have the second component specified, the second component of one account code must take precedence over the second component of the other account code. Rules determine which accounts take precedence over other accounts.

For the relevant processes, a table is shown with a numbered list of source accounts. For these processes, the account with the higher priority (lower number) takes precedence over the account with the lower priority (higher number). For example, in the report internal labor usage process, the sources of the debit and credit accounts are displayed in priority in the following table:

Table 2. Debit and credit accounts for the report internal labor usage process

Source of GL account	Debit	Credit	Source of GL account
1. Labor GL account	\$15.00 x 2 = \$30.00	\$15.00 x 2 = \$30.00	Labor control account
2. Work Order GL account			
3. Asset GL account			
4. Operating Location GL account			

The merge order of the debit account components for this particular process illustrates a general rule: if you charge a financial transaction that involves a resource to a work order, an asset, or an operating location, the merge order of the components of the relevant GL accounts always has the listed priority.

Example

For example, the following GL account codes are specified on the preventive maintenance, asset, and operating location records named in the Work Orders application:

Table 3. Merged accounts and account numbers

Account	Number
Preventive maintenance record GL account (priority 1)	2345-??-??
Asset GL account (priority 2)	6789-787-??
Operating location GL account (priority 3)	5555-999-XYZ
Work order GL account	2345-787-XYZ

Example

For example, purchase a bearing that you charge to work order 1020:

- Work order 1020 is for repairing a forklift in the shipping and receiving department.
- The item resource code for a bearing is ???-??-200.
- The work order GL account for work order 1020 is ???-301-201.
- The forklift has no specified GL account.
- The location GL account for shipping and receiving is 6500-300-??.

The resulting general ledger debit account for the transaction is 6500-300-200:

- You specify the first component for only the location general ledger (6500).
- You specify the second component both in the work order general ledger (301) and the location general ledger (300), and the location general ledger takes priority,
- You specify the third component for both the item resource code (200) and the work order general ledger (201), and the item resource code takes priority.

Table 4. General ledger debit account and account numbers

Account	Number
Item resource code	???-??-200

Account	Number
Work order GL account	????-301-201
Location GL account	6500-300-???
General ledger debit account	6500-300-200

Merged account code errors

When account codes merge, the result can be an account code that is not established in the Chart of Accounts application. An error message is displayed and you cannot complete the current transaction.

If your company intends to use the merged account codes, an authorized user must establish the account code in the Chart of Accounts application before you can proceed with the attempted transaction.

If your company does not use the merged account codes, ensure that you are attempting a valid transaction.

GL account tracking

Most users do not have to specify GL account codes. After you define the accounts and associated codes in the Chart of Accounts application or specify them in some records, most GL account fields default to the correct value.

- **Displayed fields**
The displayed fields sections of the financial processes topics specify the general ledger field in the user interface, an associated field, or the field that is the source of the general ledger code.
- **Database fields**
The Database fields sections of the financial processes topics provide the database table and column names.

Displayed fields

The displayed fields sections of the financial processes topics specify the general ledger field in the user interface, an associated field, or the field that is the source of the general ledger code.

When the value in another field is used as the default source field, the field that contains the default value might be listed as the origin of the source.

The financial processes topics show the information in the following format:

Field name (COLUMNNAME) ← Source field on source page ← Source field or page

The ← symbol in the financial processes topics means “comes from” or “defaults to.” When you read a statement starting on the left of the page, the symbol describes the path that is used to fill the general ledger field that is named before the first arrow.

Example

For example, the GL Debit Account field on the PR Lines tab:

GL Debit Account (GLDEBITACT) ← GL Control Account field (not displayed) for storeroom location in the Inventory application.

The field after the last arrow must meet one of the following criteria:

- It is the field where a user entered the GL account code or segment, typically in the Chart of Accounts application.
- It is a field in another application and is described in another topic. To trace the GL account code to its entry in the Chart of Accounts application or other source application, see the related topic.

Most fields in applications are associated with a column in a database table. Although some fields are calculated for display on the page (that is, they have no associated database table column where the value is stored), all general ledger fields have associated database table columns. By using the standard page views, you can see some values from the general ledger-related columns in the database table.

However, other general ledger-related fields are not displayed automatically. Although a database column in the table is associated with the application, the data is not displayed in that column unless you make the field visible.

Account code priorities

Some instances exist where the general ledger code in a field can come from more than one potential source field. If general ledger codes are in more than one potential source field, those codes are merged. When these codes merge, there is an order of priority for the multiple sources. This priority exists so that when codes or segments of codes compete, the codes or segments to use are known. The possible sources are listed in order of their priority in the potential merger. Codes or segments from higher-priority (lower number) sources take precedence over codes or segments from lower-priority (higher number) sources.

Example

For example, the GL Account field in the Work Orders application:

GL Account (GLACCOUNT) ←

1. Preventive Maintenance GL Account field ⇐ manual entry (no default);
2. Asset GL Account field (not displayed) ⇐ manual entry (no default);
3. Locations GL Account field ⇐ manual entry (no default).

The preventive maintenance, asset, and location fields on a work order provide possible links to the preventive maintenance, asset, and operating location records of the GL accounts. For any fields that are filled on the work order record, the corresponding records are checked and the GL accounts are obtained from the fields according to the priorities 1 through 3.

For example, if GL accounts exist for all three, the preventive GL account takes priority over both the asset GL account and the location GL account. If no preventive maintenance record exists (or no preventive maintenance GL account), the GL account of the asset record has next priority. If a preventive maintenance GL account or an asset GL account does not exist, the location GL account is used.

The account inserted into the GL Account field in the Work Orders application can be a combination, or merger, of the three references accounts. If an account with higher priority is only partially defined (for example, 2345-??-??), and an account of lower priority has defined segments where the higher priority does not, the segments from the account with the lower priority complete the undefined segments in the higher priority account.

Intermediate sources of account codes

Several cases of general ledger fields might have one or more intermediate source fields between the online field and its ultimate source. For example, the general ledger fields on a purchase order line come from the purchase requisition line if a purchase requisition exists; otherwise, they come directly from the source. Such possible intermediate sources are in parentheses.

Example

For example, the GL Debit Account field on the inventory transactions report:

GL Debit Account (GLDEBITACCT) ⇐ GL Debit Account field on PO Lines tab ⇐ (GL Debit Account field on the PR Lines application) ⇐ GL Control Account field (not displayed) for storeroom location in the Inventory application

Database fields

The Database fields sections of the financial processes topics provide the database table and column names.

Table and column name information is shown in the following format:

TABLENAME1.COLUMNNAME ⇐ TABLENAME2.COLUMNNAME

Financial processes in the Assets module

Various financial processes occur in the Assets and Locations applications.

- [Financial processes in the Assets application](#)
To enter an account code, you must expose the GL Account field on an asset record by modifying the presentation XML.
- [Financial processes in the Locations application](#)
Besides the GLACCOUNT column, the LOCATIONS database table also contains the following columns: CONTROLACC, INVOICEVARACC, CURVARACC, SHRINKAGEACC, INVCOSTADJACC, and RECEIPTVARACC. These database columns are relevant to inventory-type locations only.

Financial processes in the Assets application

To enter an account code, you must expose the GL Account field on an asset record by modifying the presentation XML.

The Rotating Suspense Account field contains a code when the asset is rotating (that is, an item number is specified on the asset record).

Database fields	ASSET.GLACCOUNT ⇐ manual entry (no default)
	ASSET.ROTSUSPACCT ⇐ ACCOUNTDEFAULTS.GLDEFAULT (where DFLTGROUP = INVRELACC and GROUPVALUE = ROTSPACCT) (Global Rotating Suspense Account field on the Inventory-Related Accounts window in the Chart of Accounts application)

- [Move/Modify Assets action](#)
To complete this process, select Move/Modify Assets from the Select Action menu in the Asset application.
- [Move and modify assets between operating or other non-storeroom locations](#)
Moving and modifying assets does not create any general ledger financial transactions, or change any GL account fields on asset or location records. However, when you enter the new location on the Move/Modify Assets window, if you have defined an asset GL account, a preliminary account validation is performed.
- [Move rotating assets from non-storeroom location to storeroom or inventory control location](#)
Moving a rotating asset from a non-storeroom location to a storeroom or other inventory-type location (labor, courier) creates two transactions.
- [Move rotating assets from non-storeroom location to storeroom or other inventory-type location](#)
A move to an inventory location results in an asset moving transaction (ASSETTRANS table) and a financial transaction (MATRECTRANS table).
- [Swap Assets action](#)
To swap an asset, select Swap Assets from the Select Action menu in the Assets application. Swapping assets involves replacing one asset with another.

Move/Modify Assets action

To complete this process, select Move/Modify Assets from the Select Action menu in the Asset application.

Moving and modifying assets between non-storeroom locations (for example, between operating locations, or from an operating location to a repair location) has no financial implications. However, an asset-move transaction is recorded and validated GL accounts are listed.

Moving and modifying rotating assets from a non-storeroom location to an inventory-type location does have financial implications: an asset-move transaction and a financial transaction are recorded.

Move and modify assets between operating or other non-storeroom locations

Moving and modifying assets does not create any general ledger financial transactions, or change any GL account fields on asset or location records. However, when you enter the new location on the Move/Modify Assets window, if you have defined an asset GL account, a preliminary account validation is performed.

More specifically, it is determined if merging the GL account of an asset and the GL account of a new location produces a valid account code.

The following table illustrates how a valid account code is determined.

Table 1. Move or modify assets account validation

Account	Number
Asset GL account	????-??-200
Destination location GL account	6004-304-???
Merged GL account	6004-304-200

If 6004-304-200 is a valid account, the asset can be moved and modified. The validated account codes are stored with the transaction record. To view the account stored with the transaction, select the View Asset History action from the Select Action menu.

If merging the asset GL account and the destination location GL account does not produce a valid account, entering the destination location in the Move/Modify Assets window produces an error message.

Using the previous example, suppose that 6004-304-200 is not valid. The first line of the error message reads, *GL account 6004-304-200 is invalid.* The message shows the source account codes (for example, 6004-304-?? and ???-300-200) that merged into the invalid account code. As stated in the error message, you move and modify the asset by changing the asset GL account and the destination location GL account to make the merger valid. Alternatively, an authorized user can establish the currently invalid account code as a valid account code in the Chart of Accounts application.

In the Move/Modify Assets window, and in the asset transaction record, the GL Credit Account field displays the old merged GL account (for example, of the asset and from the location) and the GL Debit Account field displays the new merged GL account (for example, of the asset and to the location). You cannot modify the credit or debit account while moving the asset.

In a standard move or modify transaction, no GL accounts are changed, credited, or debited that might have been associated with the asset by displaying the GL Account field on the asset record. If the asset is a rotating asset and has an associated rotating suspense account, moving and modifying it does not affect that suspense account, except when moving the rotating asset to a storeroom.

You can see the fields for an asset-move/modify transaction in the Move/Modify Assets window.

Displayed fields	GL Debit Account (GLDEBITACCT) ← GL Account field in the Locations application for the destination or to location.
	GL Credit Account (GLCREDITACCT) ← GL Account field in the Locations application for the source or from the location.

Again, these transactions in ASSETTRANS are not financial transactions, but rather, move and modify asset transactions.

Displayed fields	Again, these transactions in ASSETTRANS are not financial transactions, but rather, move and modify asset transactions.
	ASSETTRANS.GLDEBITACCT ← ASSET.GLACCOUNT (GL Account field in Asset)
	ASSETTRANS.GLCREDITACCT ← ASSET.GLACCOUNT (GL Account field in Asset)

Move rotating assets from non-storeroom location to storeroom or inventory control location

Moving a rotating asset from a non-storeroom location to a storeroom or other inventory-type location (labor, courier) creates two transactions.

The two transactions are:

- An asset moving transaction
- A financial transaction (an inventory material receipt transaction, TRANSFER) written to the MATRECTRANS table.

The asset moving transaction displays, in the GL Debit Account field, the merger of the asset GL account (if any) and the storeroom location GL account. The move transaction shows, in the GL Credit Account field, the merger of the asset GL account and the from location GL account.

The storeroom control account of the location is debited, and the rotating suspense account is credited.

This financial transaction uses the control account of the storeroom location as the debit account and the rotating suspense account as the credit account.

Primary transaction

When you click View Details tab for an asset record in the Move/Modify Assets window, the GL Credit Account and GL Debit Account fields are displayed. These fields are read-only.

The control account of the storeroom is debited and the rotating suspense account of the rotating asset is credited. Click OK to create both transactions:

- The asset moving transaction
- The material receipt of the storeroom transaction

The date and time are used in the Changed Date field in the Move/Modify Assets window to determine the financial period for the transaction. The Changed Date field defaults to the system date and time.

Move a rotating asset, asset #11430, from its current operating location to the central storeroom.

Table 1. Source of GL account for a moved rotating asset

Source of GL account	Debit	Credit	Source of GL account
Inventory control account	\$150.00	\$150.00	Rotating suspense account

If you have not applied any charges to the asset, the amount of the transaction is zero.

The charges against the rotating asset are stored in the rotating suspense account of the asset. At the time of the move, the storeroom control account is debited and the rotating suspense account is credited.

Move rotating assets from non-storeroom location to storeroom or other inventory-type location

A move to an inventory location results in an asset moving transaction (ASSETTRANS table) and a financial transaction (MATRECTRANS table).

The fields are on the Move/Modify Assets window (asset moving transaction).

Displayed fields

GL Debit Account (GLDEBITACCT) ← Inventory Control Account field for item at destination location in the Inventory application (not displayed) ← Inventory Control Account field on the Inventory-Related Accounts window in the Chart of Accounts application for the associated inventory-type location.

If the to location is a labor or courier location, the GL Debit Account field defaults to the Control Account field of the transit location record associated with the labor or courier.

GL Credit Account (GLCREDITACCT) ← Rotating Suspense Account field (not displayed) in Asset ← Global Rotating Suspense Account field on the Inventory-Related Accounts window in the Chart of Accounts application.

Database fields

The following transactions in ASSETTRANS are move and modify asset transactions, not financial transactions:

ASSETTRANS.GLDEBITACCT ← INVCOST.CONTROLACC (or INVLIFOFIFOCOST.CONTROLACC) for item at destination location ← LOCATIONS.CONTROLACC

ASSETTRANS.GLCREDITACCT ← ASSET.ROTSUSPACCT ← ACCOUNTDEFAULTS.GLDEFAULT (where DFLTGROUP = INVRELACC and GROUPVALUE = ROTSPACCT)

The following transactions to MATRECTRANS are financial transactions:

MATRECTRANS.GLDEBITACCT ← INVCOST.CONTROLACC (or INVLIFOFIFOCOST.CONTROLACC) for item at destination location ← LOCATIONS.CONTROLACC

MATRECTRANS.GLCREDITACCT ← ASSET.ROTSUSPACCT ← ACCOUNTDEFAULTS.GLDEFAULT (where DFLTGROUP = INVRELACC and GROUPVALUE = ROTSPACCT)

Swap Assets action

To swap an asset, select Swap Assets from the Select Action menu in the Assets application. Swapping assets involves replacing one asset with another.

If the asset you are replacing is moved from an operating location or a non-storeroom location to another operating location or another non-storeroom location, the general ledger financial transaction for swapping the asset is identical to moving and modifying assets between operating or other non-storeroom locations.

If the asset you are replacing is moved from an operating location or a non-storeroom location to a storeroom or other inventory control-type location, the general ledger financial transaction for swapping the asset is identical to moving rotating assets from non-storeroom locations to storerooms or inventory control locations.

You can move a replacement asset from a non-storeroom location to an operating location, and the general ledger financial transaction for swapping the asset is identical to moving and modifying assets between operating or other non-storeroom locations.

Financial processes in the Locations application

Besides the GLACCOUNT column, the LOCATIONS database table also contains the following columns: CONTROLACC, INVOICEVARACC, CURVARACC, SHRINKAGEACC, INVCOSTADJACC, and RECEIPTVARACC. These database columns are relevant to inventory-type locations only.

Displayed field

GL Account (GLACCOUNT) ⇐ manual entry (no default).

Database field

LOCATIONS.GLACCOUNT ⇐ manual entry (no default)

Financial processes in the Inventory module

Various financial processes occur in the Item Master, Inventory, Inventory Usage, and Tools applications.

- [Financial processes in the Item Master application](#)
You can use the Change Capitalized Status action in the Item Master application to write GL account transactions.
- [Financial processes in the Inventory application](#)
Eight accounts are associated with inventory records that are used for inventory transactions, for material receipt transactions, and for material usage transactions.
- [Financial processes in the Inventory Usage application](#)
Various financial processes occur in the Inventory Usage application.
- [Financial processes in the Tools application](#)
Both the tools GL accounts (tool resource codes) and the tools control accounts can be divided into two different types: internal and external. For the tools GL account, the tool resource code that you assign to Outside = N becomes the default for the internal tools GL account, whereas the code that you assign to Outside = Y becomes the default for the external tools GL account.
- [Financial processes in the Issues and Transfers application](#)
Various financial processes occur in the Issues and Transfers application.

Financial processes in the Item Master application

You can use the Change Capitalized Status action in the Item Master application to write GL account transactions.

- [Change status from non-capitalized to capitalized](#)
To change the status of an item from non-capitalized to capitalized, select Change Capitalized Status from the Select Action menu.
- [Change status from capitalized to non-capitalized](#)
To change the capitalized status to non-capitalized, select Change Capitalized Status from the Select Action menu in Item Master application.

Change status from non-capitalized to capitalized

To change the status of an item from non-capitalized to capitalized, select Change Capitalized Status from the Select Action menu.

In the Change Capitalized Status window, enter an account code that you plan to use as the capital GL account. A default capital GL account is not provided.

When you change the status of an item, the storeroom status is changed to capitalized, and the average, last, and standard costs are set to zero in all storerooms containing the item.

The system date and time are used to determine the financial period for the transaction.

Primary transactions

When you select the Current Capitalized Status check box on the Change Capitalized Status window, the account code you manually entered in the Capital GL Account field is associated with the item, for all storerooms containing the item. In the CONTROLACC column of the INVCOST table, the inventory control account code is replaced with the capital GL account code for all storerooms containing the item. In effect, this transfers the charge or value associated with the item from the inventory control account to the capital GL account.

In the INVCOST table, for each row that corresponds to an item, the SHRINKAGEACC and INVCOSTADJACC columns are cleared. For each storeroom that contains the item, a CAPCSTADJ transaction is written to the INVTRANS table.

Displayed fields	GL Debit Account (GLDEBITACCT) ⇐ manually entered Capital GL Account field in the Change Capitalized Status window in the Item Master application. GL Credit Account (GLCREDITACCT) ⇐ GL Control Account field (not displayed) in the Inventory application ⇐ Inventory Control Account field on the Inventory-Related Accounts window in the Chart of Accounts application.
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Database fields	INVTRANS.GLDEBITACCT ← manual entry on the Change Capitalized Status window (no default)
	INVTRANS.GLCREDITACCT ← INVCOST.CONTROLACC (or INVLIFOFIFOCOST.CONTROLACC) ← LOCATIONS.CONTROLACC

Example

For example, a pump is currently in the central storeroom at last, standard, and average costs of \$6400. The current balance of pumps in the central storeroom is 2. The same pump is in the garage storeroom at last, standard, and average cost of \$6500. The current balance of pumps in the garage storeroom is 3.

You change the capitalized status from non-capitalized to capitalized for the pump. Because two storerooms contain the pump, two transactions are shown in INVTRANS:

Table 1. Source of GL account for change capitalized status

Source of GL account	Debit	Credit	Source of GL account
Manually entered capital GL account	2 x \$6,400 ⁰⁰ = \$12,800.00	2 x \$6,400.00 = \$12,800.00	Inventory control account of central storeroom
Manually entered capital GL account	3 x \$6,500.00 = \$19,500.00	3 x \$6,500.00 = \$19,500.00	Inventory control account of garage storeroom

The value of a transaction is determined by using the following formula:

Line cost = current balance x issue cost

where

Issue cost = average cost or standard cost, depending on the setting specified in the Multisite Setup application for issue cost.

Example

A pump is currently stored in one storeroom at last cost of \$6200, standard cost of \$6400, and average cost of \$6300. The current balance of pumps is 2. You change its capitalized status from non-capitalized to capitalized. The average cost is in place (that is, the default issue cost is set to average in the Multisite Setup application).

Table 2. Source of GL account for capitalized item

Source of GL account	Debit	Credit	Source of GL account
Manually entered capital GL account	2 x \$6,300.00 = \$12,600.00	2 x \$6,300.00 = \$12,600.00	Inventory control account

If you use standard cost, the value of the transaction is \$12,800, two times the standard cost of \$6400.

Secondary transaction

The values in the Standard Cost and Average Cost fields are set to zero. When you issue the now-capitalized item, the item is issued at zero cost.

In the INVCOST table, both the SHRINKAGEACC (shrinkage cost account) and INVCOSTADJACC (inventory cost adjustment account) columns are cleared. If you later perform a transaction that causes a debit either to the shrinkage cost account or the inventory cost adjustment account, the GLDEBITACCT column is blank for that transaction. Similarly, if you perform a transaction that causes a credit either to the shrinkage cost account or to the inventory cost adjustment account, the GLCREDITACCT column is blank for that transaction.

In the INVCOST table, the CONTROLACC column contains the capital GL account code. If you perform a transaction, such as a transfer, with the capitalized item, the account code that you enter in the Capital GL Account field acts as the control account in the transaction.

For example, you capitalize a pump, and you enter 7000-800-900 as the capital GL account code. Now, you transfer the capitalized pump from the central storeroom to the garage storeroom.

If the pump is not capitalized, the debit account is the inventory control account of the garage storeroom, and the credit account is the inventory control account of the central storeroom. Since the pump is capitalized, the following transaction occurs:

Table 3. Source of GL account for capitalized item

Source of GL account	Debit	Credit	Source of GL account
7000-800-900 (capital GL account)	\$0.00	\$0.00	7000-800-900 (capital GL account)

Change status from capitalized to non-capitalized

To change the capitalized status to non-capitalized, select Change Capitalized Status from the Select Action menu in Item Master application.

You can enter a memo in the Memo field, but the Current Capitalized Status field is read-only in the Change Capitalized Status window.

The status is changed to non-capitalized for all storerooms containing the item. The average, last, and standard costs remain at zero for all storerooms. You establish these default account codes in the Storeroom application.

The system date and time is used to determine the financial period for the transaction.

Primary transaction

When you select Change Capitalized Status on the Change Capitalized Status window, TRANSTYPE = CAPCSTADJ is written to the INVTRANS table for each storeroom containing the item. The line cost of the transaction from Y to N is always zero.

To set the issue cost of an item to a non-zero value, select an action from the Select Action menu in the Inventory application.

If you issue items at average cost, select Inventory_>Inventory Adjustments_>Average Cost.

If you do not want the cost of an item to be zero in any storeroom, select Inventory_>Inventory Adjustments_>Standard Cost.

Displayed fields	GL Credit Account (GLDEBITACCT) ← Inventory Control Account field on the Inventory-Related Accounts window in the Chart of Accounts application.
	GL Credit Account (GLCREDITACCT) ← read-only Capital GL Account field on the Change Capitalized Status window in the Item Master application ← GL Control Account field (not displayed) in the Inventory application ← manual entry on displayed field; or ← account code manually entered on Change Capitalized Status window in the Item Master application if there was a previous transaction from non-capitalized to capitalized. (In that earlier transaction from non-capitalized to capitalized, the code you entered in the Capital GL Account field is written to the GL Control Account field on the item or location record.)
Database fields	INVTRANS.GLDEBITACCT ← LOCATIONS.CONTROLACC.
	INVTRANS.GLCREDITACCT ← INVCOST.CONTROLACC (or INVLIFOFIFOCOST.CONTROLACC) ← manual entry (no default)

Example

A capitalized pump is currently stocked both in the central storeroom and in the garage storeroom. Since the pump is capitalized, the last, standard, and average costs equal zero in both storerooms. You change the status from capitalized to non-capitalized for that pump.

Since two storerooms contain the pump, two transactions are shown in INVTRANS:

Table 1. Source of GL account for capitalized item

Source of GL account	Debit	Credit	Source of GL account
Inventory control account of central	\$0.00	\$0.00	Capital GL account
Inventory control account of garage	\$0.00	\$0.00	Capital GL account

Secondary transaction

When the item becomes non-capitalized, the control, shrinkage, and inventory cost adjustment account codes default according to storeroom location. In the database, this event occurs in the INVCOST table. You establish these default account codes in the Storerooms application.

Financial processes in the Inventory application

Eight accounts are associated with inventory records that are used for inventory transactions, for material receipt transactions, and for material usage transactions.

Inventory accounts default to the type and location of the item. Additionally, items can have item and location-specific accounts.

To establish the default inventory general ledger resource account code, use the Inventory Resource Code window in the Chart of Accounts application.

To establish the default account codes for location accounts, use the Inventory-Related Accounts window in the Chart of Accounts application.

Also, when adding a storeroom in the Storerooms application, you can specify the default account codes on the Storeroom tab.

When you add items to storerooms, the storeroom location accounts are used as the default for that item or location record. When you specify an item type, the general ledger resource account code is used for that item type as the default.

To edit codes assigned to the storeroom location accounts, display the fields in the Inventory application. Editing the code by using the Inventory application changes the code for the item and location record that is shown.

Example

Suppose that all items in the central storeroom have the default inventory control account of 6600-800-800. Item #1001 is showing in the Inventory application, and you change the code showing in the Control Account field to 6600-800-801. As a result, item #1001 in the central storeroom now has control account code 6600-800-801, but other items in the central storeroom still have control account code 6600-800-800.

The remaining four inventory-related accounts are in the locations database table, not in the inventory table. The following four accounts are in the locations table:

- Currency variance account
- Invoice cost variance account
- Purchase variance account
- Receipts price variance account

- **Inventory costing**

Several account fields are associated with the inventory cost record of the item and location account. Like the field for the inventory GL account, the Inventory application does not display these fields.

- **Insert Item action**

Inserting a master item or item and location record is not a financial transaction.

- **Adjust Current Balance actions**

The Current Balance Adjustment and Reconcile Balances actions create a CURBALADJ transaction. The account in the Control GL Account field is used as the debit account. The account in the Shrinkage Cost Account field is used as the credit account.

- **Adjust Physical Count action**

When you select Physical Count Adjustment from the Select Action menu, a physical count adjustment transaction (PCOUNTADJ) is written to the inventory

transactions table.

- **Reconcile Balances action**
When you select Reconcile Balances from the Select Action menu, a current balance adjustment (RECBALADJ) transaction is created.
- **Adjust Standard Cost action**
When you select Standard Cost Adjustment from the Select Action menu, a standard cost adjustment (STDCSTADJ) transaction is written. The account in the Control GL Account field is used as the debit account. The account in the Cost Adjustment GL Account field is used as the credit account.
- **Adjust Average Cost action**
When you select Average Cost Adjustment from the Select Action menu, an average cost adjustment (AVGCSTADJ) transaction is created. The Control GL Account field is used as the debit account and the Cost Adjustment GL Account field is used as the credit account.
- **Issue Current Item action**
For both issues and returns, the GL account fields in the Issue Current Item window default in the same way that the GL account fields default in the Issues and Transfers application.
- **Return an Item action**
To return an item, select Issue Current Item from the Select Action menu.
- **Transfer Current Item action**
Transferring items in the Inventory application has implications on your financial processes.
- **Assemble and Disassemble Kit actions**
You can gather items to create a kit or take a kit apart.
- **Receipt adjustment transactions**
Transactions that adjust receipts.

Inventory costing

Several account fields are associated with the inventory cost record of the item and location account. Like the field for the inventory GL account, the Inventory application does not display these fields.

For standard average costing, the INVCOST table is used. For last-in first-out (LIFO) and first-in first-out (FIFO) accounting, the accounts in the INVENTORY table are used.

For LIFO and FIFO transactions that increase inventory, multiple cost records can affect how financial transactions occur.

If you display any of these account fields, you can edit the codes in those fields to make them item-specific. Editing the account codes in the Inventory application does not change the account for all items in that inventory location, but rather, only for that location record.

Database fields	INVCOST.CONTROLACC ⇐ LOCATIONS.CONTROLACC (Inventory Control Account field on the Inventory-Related Accounts window in the Chart of Accounts application and on the Storeroom tab of the Storeroom application) ⇐ direct entry (no default)
	INVCOST.SHRIKAGEACC ⇐ LOCATIONS.SHRIKAGEACC (Shrinkage Cost Account field in the Inventory-Related Accounts window in the Chart of Accounts application and on the Storeroom tab of the Storeroom application) ⇐ direct entry (no default)
	INVCOST.INVCOSTADJACC ⇐ LOCATIONS.INVCOSTADJACC (Inventory Cost Adjustment account field both on the Inventory-Related Accounts window in the Chart of Accounts application and on the Storeroom tab of the Storeroom application) ⇐ direct entry (no default)

Accounts that are only in the Locations table

Four account fields are not associated with the inventory cost table, but with the locations table. You can view and edit these four fields on the Storeroom tab in the Storeroom application.

Displayed fields	Receipts variance account (RECEIPTVARACC) ⇐ Receipts Price Variance Account field
	Invoice variance account (INVOICEVARACC) ⇐ Invoice Cost Variance Account field
	Currency variance account (CURVARACC) ⇐ Currency Variance Account field
	Purchase variance account (PURCHVARACC) ⇐ Purchase Variance Account field

Do not use the purchase variance account for any transactions. If you want to use commitment accounting, you can customize this account to store differences between purchase order costs and invoice costs when using a budget.

Database fields	LOCATIONS.RECEIPTVARACC ⇐ direct entry (no default)
	LOCATIONS.INVOICEVARACC ⇐ direct entry (no default)
	LOCATIONS.CURVARACC ⇐ direct entry (no default)
	LOCATIONS.PURCHVARACC ⇐ direct entry (no default)

Account that is only in the Inventory Cost table

One inventory GL account (item resource code) is associated with the inventory cost record (that is, the INVCOST table) of the item and location accounts. To establish the default inventory GL account (item resource) code, use the Inventory Resource Code window in the Chart of Accounts application. The codes on the Inventory Resource Code window vary by item type.

A GL Account field is also in the Inventory application that you can make visible. You can edit the account code to make the code specific to an item and location record.

Database fields	INVCOST.GLACCOUNT ⇐ ACCOUNTDEFAULTS.GLDEFAULT (where DFLTGROUP = INVRESCODE) (Inventory Resource field for the item type on
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Inventory Resource Codes window in the Chart of Accounts application. (This item resource code is typically only one component of the Inventory GL Account field.) ⇐ direct entry (no default)

Insert Item action

Inserting a master item or item and location record is not a financial transaction.

Inserting items does not cause any GL account codes to be written to the GL Debit Account and GL Credit Account fields in the transaction record.

Adjust Current® Balance actions

The Current Balance Adjustment and Reconcile Balances actions create a CURBALADJ transaction. The account in the Control GL Account field is used as the debit account. The account in the Shrinkage Cost Account field is used as the credit account.

The Current Balance Adjustment window in the Inventory application adjusts the current balance of a stocked item. The current balance is a running total of how many instances of that item are in a storeroom. For each bin in this storeroom, you can enter a new current balance and specify the control and shrinkage account numbers associated with this adjustment.

To adjust the current balance of an item, complete the following steps:

1. From the Inventory application, display the item record whose current balance you want to adjust.
2. From the Select Action menu, click Inventory Adjustments > Current Balance. The Current Balance Adjustment window opens, with the item name and description fields populated.
3. In the New Balance field, enter a new balance value for each bin that you want to adjust.
4. Click OK. The Current Balance Adjustment window closes, and the new balance for each bin is saved.

A CURBALADJ (current balance adjustment) transaction is written to the INVTRANS table.

The INVCOST table is the primary source of the default codes for the inventory control account and the shrinkage GL account.

The system date and time is used to determine the financial period for the transaction.

Important: For LIFO and FIFO costing, if the current balance is increased, you must specify a unit cost and date so that the LIFO and FIFO item has the correct cost basis. If the current balance is decreased, multiple financial transactions might be generated. The transactions correspond to the actual cost that is used from the INVLIFOFIFOCOST table.

Example

Adjust the current balance of a bearing. The default issue cost in the Organizations application is set to average cost and the bearing in inventory has an average cost of \$22.00. Both the physical count and current balance are 4, but you know that the current balance is actually 3.

Table 1. Source of GL account for adjust current balance

Source GL account	Debit	Credit	Source of GL account
Inventory control account	(3-4) x \$22.00= -\$22.00	(3-4) x \$22.00= -\$22.00	Shrinkage cost account

If you capitalize the item, the default debit account is the capital GL account, the default credit account is empty, and the line cost is zero.

Inventory transaction for Type=CURBALADJ

When you select Adjust Current Balance or Reconcile Balances from the Select Action menu, a current balance adjustment (CURBALADJ) transaction is written to the inventory transactions (INVTRANS) table.

Displayed fields	GL Debit Account (GLDEBITACCT) ⇐ GL Control Account field (not displayed) in the Inventory application ⇐ Inventory Control Account field on the Inventory-Related Accounts window in the Chart of Accounts application.
	GL Credit Account (GLCREDITACCT) ⇐ GL Shrinkage Account field (not displayed) in the Inventory application ⇐ Shrinkage Cost Account field on the Inventory-Related Accounts window in the Chart of Accounts application.
Database fields	INVTRANS.GLDEBITACCT ⇐ INVCOST.CONTROLACC ⇐ LOCATIONS.CONTROLACC
	INVTRANS.GLCREDITACCT ⇐ INVCOST.SHRINKAGEACC ⇐ LOCATIONS.SHRINKAGEACC

Adjust Physical Count action

When you select Physical Count Adjustment from the Select Action menu, a physical count adjustment transaction (PCOUNTADJ) is written to the inventory transactions table.

The physical count is typically a number you adjust at predefined intervals, such as monthly, quarterly, or annually. For each storeroom that carries an item, you can view the bin number, lot number, and the physical count that is currently reported.

After you perform an inventory count, you can adjust the physical count for any storeroom and enter the count date. You can then reconcile the balance to the current count.

To adjust the physical count of an item, complete the following steps:

1. From the List tab of the Inventory application, display the item you want.
2. From the Select Action menu, select Inventory Adjustments > Physical Count. The Physical Count Adjustment window opens, with item name location, and count information.
3. In the Count Date field, enter the date when you took the physical count or click Select Date and Time to retrieve the date. If you use the Physical Count Date field in the header section, the date for all rows in the table window is changed. If you do not want to adjust the count date for all rows, edit the Count Date field for each row you want to change.
4. Click Refresh to update the count dates in the table window.
5. For each bin that you want to adjust, enter a new physical count value in the New Count field.
6. Click OK. The Physical Count Adjustment window closes. The new physical count is saved for each storeroom and a record is written, TRANSTYPE = PCOUNTADJ, to the INVTRANS table.

Example

Adjust the physical count of a bearing, currently in inventory at last, standard, and average cost of \$22.00. The physical count is shown as 4, but the new physical count is 2.

Table 1. Source of GL account for adjust physical count transaction

Source GL account	Debit	Credit	Source of GL account
Shrinkage cost account	$(-2) \times \$22.00 = -\44.00	$(-2) \times \$22.00 = -\44.00	Shrinkage cost account

Adjusting the physical count has no net effect accounts in the general ledger. The net effect occurs only when you complete the reconcile balances process.

Inventory transaction for Type=PCOUNTADJ

A physical count adjustment writes a transaction to the INVTRANS table, and is shown in the Inventory Transactions application. Since the transaction uses the same account for the debit side and the credit side, the transaction has no net effect on the general ledger.

Displayed fields	GL Debit Account (GLDEBITACCT) ← GL Shrinkage Account field (not displayed) in the Inventory application ← Shrinkage Cost Account field on the Inventory-Related Accounts window in the Chart of Accounts application.
	GL Credit Account (GLCREDITACCT) ← GL Shrinkage Account field (not displayed) in the Inventory application ← Shrinkage Cost Account field on the Inventory-Related Accounts window in the Chart of Accounts application.
Database fields	INVTRANS.GLDEBITACCT ← INVCOST.SHRINKAGEACC ← LOCATIONS.SHRINKAGEACC
	INVTRANS.GLCREDITACCT ← INVCOST.SHRINKAGEACC ← LOCATIONS.SHRINKAGEACC

Reconcile Balances action

When you select Reconcile Balances from the Select Action menu, a current balance adjustment (RECBALADJ) transaction is created.

This process sets the current balance equal to the physical count plus or minus any transactions that occur between the physical count and reconciliation. From a GL account perspective, the Reconcile Balances action is like the Adjust Current Balances action. In the Reconcile Balances window, both the Control GL Account field and the Shrinkage GL Account field display their respective default account codes, as defined for that item and location record.

For example, if you reconcile the current balance of an item in the central storeroom, the Control GL Account field defaults to the inventory control account for that item, in the central storeroom.

The INVCOST table is the primary source of the default codes for the inventory control account and the shrinkage GL account.

The system date and time is used to determine the financial period for the transaction.

When you click OK in the Reconcile Balances window, a reconcile balance adjustment (RECBALADJ) transaction is written to the INVTRANS table.

Important: For LIFO and FIFO costing, if the current balance is increased, you must specify a unit cost and date so that the LIFO and FIFO item has the correct cost basis. If the current balance is decreased, multiple financial transactions might be generated. The transactions correspond to the actual cost that is used from the INVLIFOIFOCOST table.

Example

Reconcile the current balance of a bearing, currently in inventory at last, standard, and average cost of \$22.00. The physical count is 2, but the current balance is initially 3.

Table 1. Source of GL account for reconcile balance

Source GL account	Debit	Credit	Source of GL account
Inventory control account	$(4-3) \times \$22.00 = -\22.00	$(4-3) \times \$22.00 = -\22.00	Shrinkage cost account

If you capitalize the item, the default debit account is the capital GL account, the default credit account is blank, and the line cost is zero.

Adjust Standard Cost action

When you select Standard Cost Adjustment from the Select Action menu, a standard cost adjustment (STDCSTADJ) transaction is written. The account in the Control GL Account field is used as the debit account. The account in the Cost Adjustment GL Account field is used as the credit account.

The INVCOST table is the primary source of the default code for the inventory control account. The system date and time is used to determine the financial period for the transaction.

The Standard Cost field on the Inventory tab is read-only so you must use the Adjust Standard Cost window to change the standard cost.

The Standard Cost Adjustment window contains the following columns:

- Condition code
- Condition rate
- Description
- Standard cost

The Standard Cost Adjustment window contains the following columns you can edit:

- Control account for the INVCOST record
- Cost adjustment account for the INVCOST record
- New standard cost

To adjust standard cost of an item, complete the following steps:

1. From the List tab of the Inventory application, display the item whose standard cost you want to adjust.
2. Click the Inventory tab to see the inventory information of that item.
3. From the Select Action menu, select Inventory Adjustments_> Standard Cost. The Standard Cost Adjustment window opens. The standard cost value is shown in the Standard Cost field.
4. Type the adjusted standard cost value in the New Standard Cost field. If you are adjusting the cost of an item that is condition-enabled, you can adjust the costs for all condition levels.
5. Update the GL account information in the Control Account and Cost Adjustment fields. Adjusting the standard cost affects these values.
6. Click OK. The Standard Cost field on the Inventory tab displays the new value. The standard cost adjustment is recorded in the inventory transactions table and an STDCSTADJ (standard cost adjustment) transaction is written to the INVTRANS table.

Use the Standard Cost Adjustment action only if you use standard cost management.

Example

Adjust the standard cost of a bearing from \$22.00 to \$25.00. The current balance of the item is 2.

Table 1. Source of GL account for adjust current balance

Source GL account	Debit	Credit	Source of GL account
Inventory control account	$(\$25.00 - \$22.00) \times 2 = \$6.00$	$(\$25.00 - \$22.00) \times 2 = \$6.00$	Inventory cost adjustment account

If you capitalize the item, the standard cost is zero, and you cannot perform the transaction.

Inventory transactions for Type=STDCSTADJ

When you select Adjust Standard Cost from the Select Action menu, an STDCSTADJ transaction is written to the inventory transactions (INVTRANS) table.

Displayed fields	GL Debit Account (GLDEBITACCT) ← GL Control Account field (not displayed) in the Inventory application ← Inventory Control Account field on the Inventory-Related Accounts window in the Chart of Accounts application. GL Credit Account (GLCREDITACCT) ← GL Cost Adjustment Account field (not displayed) in the Inventory application ← Inventory Cost Adjustment Account field on the Inventory-Related Accounts window in the Chart of Accounts application.
Database fields	INVTRANS.GLDEBITACCT ← INVCOST.CONTROLACC (or INVLIFOFIFOCOST.CONTROLACC) ← LOCATIONS.CONTROLACC INVTRANS.GLCREDITACCT ← INVCOST.INVCOSTADJACC (or INVLIFOFIFOCOST.INVCOSTADJACC) ← LOCATIONS.INVCOSTADJACC

Adjust Average Cost action

When you select Average Cost Adjustment from the Select Action menu, an average cost adjustment (AVGCSTADJ) transaction is created. The Control GL Account field is used as the debit account and the Cost Adjustment GL Account field is used as the credit account.

If you issue items at average cost and want any price increases reflected immediately in the issue cost, you might want to adjust the average cost value.

To adjust the average cost of an item, complete the following steps:

1. From the List tab of the Inventory application, display the item whose average cost you want to adjust.
2. Click the Inventory tab and from Select Action menu, select Inventory Adjustments_> Average Cost.
3. Enter the average cost value in the Average Cost field. If you are adjusting the cost of a condition-enabled item, you can adjust the costs for all condition levels. You can enter a new value for the average cost directly, or you can specify a percentage increase or decrease by which to adjust the average cost in the Cost % field. If you enter a figure in the Cost % field, the New Average Cost field is updated accordingly.

4. Update the GL account information in the Control Account and Cost Adjustment Account fields. Adjusting the current balance figure affects these values.
5. Click OK. The Average Cost field on the Inventory tab displays the new value. The average cost adjustment is recorded in the inventory transactions table.

The INVCOST table is the primary source of the default account code for the inventory control account.

The system date and time are used to determine the financial period for the transaction.

When you click OK on the Average Cost Adjustment window, an AVGCSTADJ transaction is written to the INVTRANS table.

Example

Adjust the average cost of a bearing from \$22.00 to \$25.00. The current balance of the item is 2

Table 1. Source of GL account for average cost adjustment

Source GL account	Debit	Credit	Source of GL account
Inventory control account	$(\$25.00 - \$22.00) \times 2 = \$6.00$	$(\$25.00 - \$22.00) \times 2 = \$6.00$	Inventory cost adjustment account

If you capitalize the item, the average cost is zero, and you cannot perform the transaction.

Inventory transactions for Type=AVGCSTADJ

When you select Adjust Average Cost from the Select Action menu, an AVGCSTADJ transaction is written to the inventory transactions (INVTRANS) table.

Displayed fields	GL Debit Account (GLDEBITACCT) ← GL Control Account field (hidden) in the Inventory application ← Inventory Control Account field on the Inventory-Related Accounts window in the Chart of Accounts application.
	GL Debit Account (GLCREDITACCT) ← GL Cost Adjustment Account field (hidden) in the Inventory application ← Inventory Cost Adjustment Account field on the Inventory-Related Accounts window in the Chart of Accounts application.
Database fields	INVTRANS.GLDEBITACCT ← INVCOST.CONTROLACC ← LOCATIONS.CONTROLACC
	INVTRANS.GLCREDITACCT ← INVCOST.INVCOSTADJACC ← LOCATIONS.INVCOSTADJACC

Issue Current® Item action

For both issues and returns, the GL account fields in the Issue Current Item window default in the same way that the GL account fields default in the Issues and Transfers application.

In the Inventory application, to issue an item, select Issue Current Item from the Select Action menu.

The date and time in the Entered Date field in the Issue Current Item window is used to determine the financial period for the transaction. The Entered Date field defaults to the system date and time.

When you click Save to issue the item, ISSUETYPE = ISSUE is written to the MATUSETRANS table.

Important: For LIFO and FIFO costing, if the current balance is decreased, multiple financial transactions might be generated. The transactions correspond to the actual cost that is used from the INVLIFOFIFOCOST table.

Example

Issue 20 bearings at \$0.50 (issue cost).

Table 1. Source of GL account for average cost adjustment

Source GL account	Debit	Credit	Source of GL account
1. Inventory GL account (item resource code)	$20 \times \$0.50 = \10.00	$20 \times \$0.50 = \10.00	Inventory control account
2. If issued to a work order, uses work order GL account			
3. If issued to asset <ul style="list-style-type: none"> • Asset GL account • GL account of the location for an asset 			
4. If issued to a location <ul style="list-style-type: none"> • If only one asset at location, asset GL account • Location GL account 			

If you capitalize the item (bearings), the default credit account is the capital GL account, and the line cost is zero.

Return an Item action

To return an item, select Issue Current Item from the Select Action menu.

The date and time is used in the Entered Date field on the Issue Current Item page to determine the financial period for the transaction. The Entered Date field defaults to the system date and time.

When you click Save, ISSUETYPE = RETURN is written to the MATUSETRANS table.

When returning an item, the GL accounts remain the same as the issue transaction that is being returned. The sign of the line cost is changed to a negative to reverse the financial amount of the transaction.

Example

Return 4 bearings at \$0.50 (issue cost).

Table 1. Source of GL account for returning an item

Source GL account	Debit	Credit	Source of GL account
1. Inventory GL account (item resource code)	4 x \$0.50 = -\$2.00	4 x \$0.50 = -\$2.00	Inventory control account
2. If returned from a work order GL account			
3. If returned from asset <ul style="list-style-type: none"> • Asset GL account • GL account of the location for an asset 			
4. If returned from a location <ul style="list-style-type: none"> • If only one asset at location, asset GL account • Location GL account 			

If you capitalize the item, the default debit account is the capital GL account, and the line cost is zero.

Transfer Current® Item action

Transferring items in the Inventory application has implications on your financial processes.

Important: For LIFO and FIFO costing, if the current balance is decreased, multiple financial transactions might be generated. The transactions correspond to the actual cost that is used from the INVLIFOFIFOCOST table.

Displayed fields	GL Debit Account (GLDEBITACCT) ← If the item is transferred to a labor or courier location, the Control Account field for the labor or courier in the Location application; otherwise, If in response to an internal purchase order, the GL Debit Account field on the PO Lines tab; otherwise, GL Control Account field (not displayed) in the Inventory application for the to location ← Inventory Account field on the Inventory-Related Accounts window in the Chart of Accounts application. GL Credit Account (GLCREDITACCT) ← the GL Credit Account on the PO Lines tab if in response to an internal purchase order; otherwise, GL Control Account (not displayed) in the Inventory application for from location < Inventory Account field on the Inventory-Related Accounts window in the Chart of Accounts application.
Database fields	MATRECTRANS.GLDEBITACCT ← If transferred to a labor or courier location, LOCATIONS.CONTROLACC; otherwise, If in response to an internal purchase order, POLINE.GLDEBITACCT; otherwise, INVCOST.CONTROLACC for to location ← LOCATIONS.CONTROLACC MATRECTRANS.GLCREDITACCT ← INVCOST.CONTROLACC for from location ← LOCATIONS.CONTROLACC

Assemble and Disassemble Kit actions

You can gather items to create a kit or take a kit apart.

When you assemble a kit, you increase the balance of the kit record and you reduce the balance of the items in the kit.

When you disassemble a kit, you increase the balance of the items in the kit and you reduce the balance of the kit record.

If a discrepancy exists between the value of a kit and the combined cost of the components in that kit, a kit cost variance (KITCOSTVAR) transaction is written that represents the variance between the two (the cost of a kit and the combined cost of that kit components).

This financial transaction uses the control account for the storeroom location as the debit account and the receipt variance account as the credit account.

Important: For LIFO and FIFO costing of kits or kit items, multiple financial transactions might be generated.

Example

Disassemble a kit using the standard cost: the value of the kit is \$430 (standard cost), the combined standard cost of the components is \$410. This action results in a cost variance of \$20.

Table 1. Source of GL account code for kit cost variance

Source GL account	Debit	Credit	Source of GL account
Control account of the storeroom location	\$20.00	\$20.00	Receipt variance account

Receipt adjustment transactions

Transactions that adjust receipts.

Transfer transactions

You can view transaction records for transfers on the Transactions tab in the Inventory application, just as you can view them in the Issues application and the Transfers application.

The issue type for this transaction is TRANSFER, which is written to the database table. However, it is not shown in the Issue Type field on the page.

Purchase order material receipts transactions

For storeroom purchases (Issue on Receipt? = N) from an outside vendor:

Displayed fields	GL Debit Account (GLDEBITACCT) ⇐ GL Debit Account field on PO Lines tab ⇐ (GL Debit Account field on PR Lines tab) ⇐ GL Control Account field (hidden) for storeroom location in the Inventory application. GL Credit Account (GLCREDITACCT) ⇐ GL Credit Account field on PO Lines tab ⇐ (GL Credit Account field on PR Lines tab) ⇐ RBNI field for vendor in Companies ⇐ RBNI field for company type for vendor on Company-Related Accounts window in the Chart of Accounts application.
Database fields	MATRECTRANS.GLDEBITACCT ⇐ POLINE.GLDEBITACCT ⇐ (PRLINE.GLDEBITACCT) ⇐ INVCOST.CONTROLACC MATRECTRANS.GLCREDITACCT ⇐ POLINE.GLCREDITACCT ⇐ (PRLINE.GLCREDITACCT) ⇐ COMPANIES.RBNIACC ⇐ COMPANYYACCDEF.RBNIACC (where TYPE = type of vendor company)

For storeroom purchases (where the Issue on Receipt check box is N) from an internal vendor (another storeroom):

Displayed fields	GL Debit Account (GLDEBITACCT) ⇐ GL Debit Account field on PO Lines tab ⇐ (GL Debit Account field on PR Lines tab) ⇐ GL Control Account field (hidden) for receiving storeroom location ⇐ Inventory Control Account field on the Inventory-Related Accounts window in the Chart of Accounts application. GL Credit Account (GLCREDITACCT) ⇐ GL Credit Account field on PO Lines tab ⇐ (GL Credit Account field on PR Lines tab) ⇐ GL Control Account field (hidden) for vendor storeroom location ⇐ Inventory Control Account field on the Inventory-Related Accounts window in the Chart of Accounts application.
Database fields	MATRECTRANS.GLDEBITACCT ⇐ POLINE.GLDEBITACCT ⇐ (PRLINE.GLDEBITACCT) ⇐ INVCOST.CONTROLACC (of receiving storeroom location) MATRECTRANS.GLCREDITACCT ⇐ POLINE.GLCREDITACCT ⇐ (PRLINE.GLCREDITACCT) ⇐ INVCOST.CONTROLACC (of vendor storeroom location)

For direct issue purchases (Issue on Receipt? = Y) from an outside vendor:

Displayed fields	GL Debit Account (GLDEBITACCT) ⇐ GL Debit Account field on PO Lines tab ⇐ (GL Debit Account field on PR Lines tab) ⇐ 1. GL Account field (hidden) in the Inventory application ⇐ Inventory Resource field for item Type field on Inventory Resource Codes window in the Chart of Accounts application; 2. Work Order GL Account field; 3. Asset GL Account field (hidden); 4. Location GL Account field. GL Credit Account (GLCREDITACCT) ⇐ GL Credit Account field on PO Lines tab ⇐ (GL Credit Account field on PR Lines tab) ⇐ RBNI field for vendor in Companies ⇐ RBNI field for Company Type field (for vendor on purchase order line) on Company-Related Accounts window in the Chart of Accounts application.
Database fields	MATRECTRANS.GLDEBITACCT ⇐ POLINE.GLDEBITACCT ⇐ (PRLINE.GLDEBITACCT) ⇐ 1. INVCOST.GLACCOUNT ⇐ ACCOUNTDEFAULTS.GLDEFAULT (where DFLTGROUP = INVRESCODE and GROUPVALUE = item type for item on purchase order line) 2. WORKORDER.GLACCOUNT 3. ASSET.GLACCOUNT 4. LOCATIONS.ACCOUNT MATRECTRANS.GLCREDITACCT ⇐ POLINE.GLCREDITACCT ⇐ (PRLINE.GLCREDITACCT) ⇐ COMPANIES.RBNIACC ⇐ COMPANYYACCDEF.RBNIACC (where TYPE = type of vendor company)

You can create direct issue purchase requisitions and purchase orders only for external vendors.

The sources for service receipt GL accounts are the same, except that no item resource code (Inventory GL Account field) is involved with services.

Standard receipt adjustment transactions

When you use the standard cost, you can create this transaction as a secondary transaction to a material receipt transaction when the receipt price differs from the standard cost.

Displayed fields	GL Debit Account (GLDEBITACCT) ⇐ Receipts Price Variance Account field for storeroom location ⇐ Receipts Price Variance Account field on the Inventory-Related Accounts window in the Chart of Accounts application. GL Credit Account (GLCREDITACCT) ⇐ GL Control Account field (not displayed) in the Inventory application ⇐ Inventory Control Account field on the Inventory-Related Accounts window in the Chart of Accounts application.
Database fields	INVTRANS.GLDEBITACCT ⇐ LOCATIONS.RECEIPTVARACC INVTRANS.GLCREDITACCT ⇐ INVCOST.CONTROLACC ⇐ LOCATIONS.CONTROLACC

Financial processes in the Inventory Usage application

Various financial processes occur in the Inventory Usage application.

- **Issue an item within one site**
In the Inventory Usage application, you can issue an item by inserting a record, similar to a purchase order. A financial transaction occurs only when the status changes.
- **Issue an item between sites within the same organization**
In the Inventory Usage application, you can issue an item within the same organization by inserting a record, similar to a purchase order. A financial transaction occurs only when the status changes.
- **Return a previously issued item**
To return an item, click Select Items for Return.
- **Transferring items**
To transfer an item, click Select Items for Transfer.
- **Transferring items via shipments**
In the Inventory Usage application, you can transfer items using an intermediary, such as a shipper or courier, by creating a shipment records.
- **Database transactions**
In the Inventory Usage application, you can transfer an item against an internal purchase order. This section explains the general ledger transactions for all materials usage scenarios.

Issue an item within one site

In the Inventory Usage application, you can issue an item by inserting a record, similar to a purchase order. A financial transaction occurs only when the status changes.

The date and time in the Actual Date field is used to determine the financial period for the transaction. The Actual Date field defaults to the system date and time.

When the document status changes to COMPLETE, a transaction of ISSUETYPE = ISSUE is written to the MATUSETRANS table.

Example

Issue 20 bearings at \$0.50 (issue cost).

Table 1. Source of GL account for issuing an item

Source GL account	Debit	Credit	Source of GL account
1. Inventory GL account (item resource code)	20 x \$0.50 = \$10.00	20 x \$0.50 = \$10.00	Inventory control account
2. If issued to a work order, uses work order GL account			
3. If issued to asset: <ul style="list-style-type: none"> • Asset GL account • GL account of location for the asset 			
4. If issued to a location: <ul style="list-style-type: none"> • If only one asset at location, asset GL account • Location GL account 			

If you capitalize the item, the default credit account is the capital GL account, and the line cost is zero.

Issue an item between sites within the same organization

In the Inventory Usage application, you can issue an item within the same organization by inserting a record, similar to a purchase order. A financial transaction occurs only when the status changes.

The date and time is used in the Actual Date field to determine the financial period for the transaction. The Actual Date field defaults to the system date and time.

When the document status changes to COMPLETE, a transaction of ISSUETYPE = ISSUE is written to the MATUSETRANS table.

Example

Issue 20 bearings at \$0.50 (issue cost) from the storeroom in Site A to the storeroom in Site B

Table 1. Source of GL account for issuing an item between sites in the same organization

Source of GL account	Debit	Credit	Source of GL account
1. Inventory GL account (item resource code)	20 x \$0.50 = \$10.00	20 x \$0.50 = \$10.00	Inventory control account
2. If issued to a work order, uses work order GL account			
3. If issued to asset <ul style="list-style-type: none"> • Asset GL account • GL account of location for the asset 			
4. If issued to a location <ul style="list-style-type: none"> • If only one asset at location, asset GL account • Location GL account 			

If you capitalize the item, the default credit account is the capital GL account, and the line cost is zero.

Return a previously issued item

To return an item, click Select Items for Return.

The date and time in used in the Actual Date field in the table window to determine the financial period for the transaction. The Actual Date field defaults to the system date and time.

To return items in the Inventory Usage application, select the applicable items from a list of previously issued items. The transaction is posted with a negative line cost and the accounts are the same debit and credit as the issue transaction. These accounts are read-only.

When the document status changes to COMPLETE, a transaction of ISSUETYPE = RETURN is written to the MATUSETRANS table.

Example

Return 4 bearings that were issued at \$0.50 each. At issue, the debit account was 1111-111-111 and the credit account was 2224-224-222.

Table 1. Source of GL account for returning a previously issued item

Source GL account	Debit	Credit	Source of GL account
1111-111-111 general ledger debit account used when item was issued (read-only)	4 x \$0.50 = \$2.00	4 x \$0.50 = \$2.00	2224-224-222 general ledger credit used when item was issued (read-only)

Transferring items

To transfer an item, click Select Items for Transfer.

Primary transaction

When the document status changes to COMPLETE, a transaction of ISSUETYPE = TRANSFER is written to the MATRECTRANS table.

Example

Transfer 20 bearings at \$0.50 (issue cost) from the central storeroom to the packaging storeroom.

Table 1. Source of GL account for transferring an item

Source GL account	Debit	Credit	Source of GL account
1. Inventory control account of destination storeroom.	20 x \$0.50 = \$10.00	20 x \$0.50 = \$10.00	Inventory control account of source storeroom.
2. If in response to an internal purchase order, uses purchase order line general ledger debit account.			If in response to an internal purchase order, comes from purchase order line general ledger credit account

If you capitalize the item and it exists in the destination, the default for both the debit and credit accounts is the capital GL account, and the line cost is zero.

If you capitalize the item and your company is stocking it in the destination for the first time, the debit account for the transfer is the inventory control account of the destination. The credit account is the capital GL account.

Transferring a capitalized item to a new inventory location inserts the item as capitalized into the new inventory location. The control account for the item in that new inventory location is the inventory control account, not the capital GL account.

Example

You transfer 20 bearings into the central storeroom at \$0.50 each (primary transaction), but the standard cost of the bearings in the central storeroom is \$0.45 each. Your company uses the standard cost.

If the item is capitalized, the default credit account is the capital GL account. Also, because the standard cost of a capitalized item is zero, the line cost for the standard receipt adjustment transaction equals the receipt price of the item.

Table 2. Source of GL account with different item cost

Source GL account	Debit	Credit	Source of GL account
Inventory control account of supplying storeroom	$(\$0.50 - \$0.45) \times 20 =$ \$1.00	$(\$0.50 - \$0.45) \times 20 =$ \$1.00	Inventory control account for destination storeroom

All cost entries and calculations are performed in the base currency.

Transferring items via shipments

In the Inventory Usage application, you can transfer items using an intermediary, such as a shipper or courier, by creating a shipment records.

You insert an inventory usage record that has one or more transfer lines. By changing the status to shipped, you can fill out the details of the shipment, such as the shipper and waybill number. This creates the financial transaction for the deduction from the supplying storeroom. The transaction set is complete when the shipment is received at the destination storeroom, which occurs in the Shipment Receiving application.

Primary transaction

When the document status changes to SHIPPED, a transaction of ISSUETYPE = SHIPTRANSFER is written to the MATRECTRANS table.

Example

Transfer 20 bearings at \$0.50 (issue cost) from the central storeroom in site A to the packaging storeroom in site B within the same organization using a shipment record.

Table 1. Source of GL account for transferring an item within the same organization using a shipment record

Source GL account	Debit	Credit	Source of GL account
Inventory control account of central storeroom in site B.	$20 \times \$0.50 = \10.00	$20 \times \$0.50 = \10.00	Clearing account of organization B

Using the previous example to complete a transfer of items across organizations, two transactions are required:

- The central storeroom in site A will transfer the items out of the storeroom via the shipment.
- The packaging storeroom in site B will receiving the items against the shipment to the storeroom by using the Shipment Receiving application.

Database transactions

In the Inventory Usage application, you can transfer an item against an internal purchase order. This section explains the general ledger transactions for all materials usage scenarios.

Issuing items

When you issue an item, the default accounts are determined in the following ways:

Issue Type of Issue

GL Debit Account (GLDEBITACCT) ⇐

1. GL Account field (not displayed) in the Inventory application ⇐ Inventory Resource field for the item type on the Inventory Resource Codes window in the Chart of Accounts application (typically only one segment only of the GL Debit Account field);
2. GL Account field in the Work Orders application, if work order number specified; ⇐ GL Account field in the Preventive Maintenance application, if based on preventive maintenance record; or, GL Account field in Asset (not displayed); or, GL Account field in the Locations application;
3. GL Account field in the Asset application (not displayed);
4. GL Account field in the Locations application.

GL Credit Account (GLCREDITACCT) ⇐ GL Control Account field (not displayed) in the Inventory application.

Issue Type of Issue

MATUSETRANS.GLDEBITACCT ⇐

1. INVCOST.GLACCOUNT ⇐ ACCOUNTDEFAULTS.GLDEFAULT (where DFLTGROUP = INVRESCODE)
2. WORKORDER.GLACCOUNT ⇐ PM.GLACCOUNT; or, ASSET.GLACCOUNT; or, LOCATIONS.GLACCOUNT
3. ASSET.GLACCOUNT
4. LOCATIONS.GLACCOUNT

MATUSETRANS.GLCREDITACCT ⇐ INVCOST.CONTROLACC ⇐ LOCATIONS.CONTROLACC

Issue Type of Return

GL Debit Account (GLDEBITACCT) ⇐ GL Credit Account on Select Items for Return window for selected item.

GL Credit Account (GLCREDITACCT) ⇐ GL Debit Account on Select Items for Return window for selected item.

Issue Type of Return

MATUSETRANS.GLDEBITACCT ⇐ MATUSETRANS.GLCREDITACCT for the issue transaction of the item.

MATUSETRANS.GLCREDITACCT ⇐ MATUSETRANS.GLDEBITACCT for the issue transaction of the item.

Transferring out

Displayed fields	<p>GL Debit Account field (GLDEBITACCT) ⇐</p> <p>the Control Account field for the labor or courier in the Locations application, if the item is transferred to a labor or courier location; between two storerooms at the same site.</p> <p>the GL Debit Account field on the PO Lines tab if in response to an internal purchase order; between two storerooms at the same site.</p> <p>the clearing account of the transferring out organization for the site, if in response to an internal purchase order between a transferring out site and a receiving site.</p> <p>GL Control Account field (not displayed) in the Inventory application for the to location ⇐ Inventory Account field on the Inventory-Related Accounts window in the Chart of Accounts application.</p> <p>GL Credit Account field (GLCREDITACCT) ⇐</p> <p>the GL Credit Account field on the PO Lines tab if in response to an internal purchase order, otherwise,</p> <p>GL Control Account field (not displayed) in the Inventory application for from location ⇐ Inventory Account field on the Inventory-Related Accounts window in the Chart of Accounts application.</p>
Database fields	<p>MATRECTRANS.GLDEBITACCT ⇐</p> <p>LOCATIONS.CONTROLACC, if transferred to a labor or courier location, otherwise,</p> <p>POLINE.GLDEBITACCT, if in response to an internal purchase order; between two storerooms at the same site.</p> <p>ORGANIZATION.CLEARING ACCOUNT, clearing account of the organization of the transferring out site, if in response to an internal purchase order between a transferring out site and a receiving site.</p> <p>INVCOST.CONTROLACC for to location ⇐ LOCATIONS.CONTROLACC</p> <p>MATRECTRANS.GLCREDITACCT ⇐</p> <p>POLINE.GLCREDITACCT, if in response to an internal purchase order; otherwise,</p> <p>INVCOST.CONTROLACC for from location ⇐ LOCATIONS.CONTROLACC</p>

Transferring in

Displayed fields	<p>GL Debit Account (GLDEBITACCT) ⇐</p> <p>If in response to an internal purchase order, the GL Debit Account field on the purchase order line otherwise,</p> <p>GL Control Account field (not displayed) in the Inventory application for the to location ⇐ Inventory Control Account field on the Inventory-Related Accounts window in the Chart of Accounts application.</p> <p>GL Credit Account (GLCREDITACCT) ⇐</p> <p>If the item is transferred from a labor our courier location, the Control Account field for the labor or courier in the Locations application, otherwise</p> <p>If in response to an internal purchase order, the GL Credit Account field on the purchase order line otherwise,</p> <p>If in response to an internal purchase order between a receiving site and a transferring out site, the clearing account of the receiving organization for that site.</p> <p>GL Control Account field (not displayed) in the Inventory application for the from location ⇐ GL Control Account field (not displayed) in the Locations application for the from location ⇐ Inventory Control Account field on the Inventory-Related Accounts window in the Chart of Accounts application.</p>
Database fields	<p>MATRECTRANS.GLDEBITACCT ⇐</p> <p>If in response to an internal purchase order, POLINE.GLDEBITACCT; otherwise,</p> <p>INVCOST.CONTROLACC for to location ⇐ LOCATIONS.CONTROLACC</p> <p>MATRECTRANS.GLCREDITACCT ⇐</p> <p>If transferred from a labor or courier location, LOCATIONS.CONTROLACC; otherwise,</p> <p>If in response to an internal purchase order, POLINE.GLCREDITACCT; otherwise,</p> <p>If in response to an internal purchase order between a receiving site and a transferring out site, ORGANIZATION.CLEARING ACCOUNT, the clearing account of the receiving organization for that site.</p> <p>INVCOST.CONTROLACC for from location ⇐ LOCATIONS.CONTROLACC</p>

Financial processes in the Tools application

Both the tools GL accounts (tool resource codes) and the tools control accounts can be divided into two different types: internal and external. For the tools GL account, the tool resource code that you assign to Outside = N becomes the default for the internal tools GL account, whereas the code that you assign to Outside = Y becomes the default for the external tools GL account.

As with the tools GL accounts (tool resource codes), there are internal and external tools control accounts. Thus, the tools control account code that you assign to Outside = N becomes the default for the internal tools control account, whereas the codes that you assign to Outside = Y become the defaults for the external tools control accounts.

Furthermore, for the external tools control accounts, you can assign a unique default code for each vendor.

If Outside Field = N

TOOL.GLACCOUNT \leftarrow ACCOUNTDEFAULTS.GLDEFAULT (where DFLTGROUP = TOOLRESCODE and GROUPVALUE = N) (Tool Resource field for Outside = N on Tool Resource Codes window in the Chart of Accounts application) \leftarrow direct entry (no default)

TOOL.CONTROLACC \leftarrow ACCOUNTDEFAULTS.GLDEFAULT (where DFLTGROUP = INTTOOLREC, and GROUPVALUE = ALL) (Control Account field on Internal Tools Control Accounts window in the Chart of Accounts application) \leftarrow direct entry (no default)

If Outside Field = Y

TOOL.GLACCOUNT \leftarrow ACCOUNTDEFAULTS.GLDEFAULT (where DFLTGROUP = TOOLRESCODE, and GROUPVALUE = Y) (Tool Resource field for Outside = Y on Tool Resource Codes window in the Chart of Accounts application) \leftarrow direct entry (no default)

TOOL.CONTROLACC \leftarrow ACCOUNTDEFAULTS.GLDEFAULT (where DFLTGROUP = EXTTOOLREC, and GROUPVALUE = vendor name) (Control Account field for vendor on External Tools Control Accounts window in the Chart of Accounts application) \leftarrow direct entry (no default)

Financial processes in the Issues and Transfers application

Various financial processes occur in the Issues and Transfers application.

Important: The Issues and Transfers application is replaced by the Inventory Usage application. The following topics are provided for reference only.

- [Issue an item within one site](#)
In Issues and Transfers, you can issue an item from the Issue tab within the same site.
- [Issue an item between sites within the same organization](#)
In the Issues and Transfers application, you can issue an item from the Issue tab between sites within the same organization.
- [Return a previously issued item](#)
To return an item, click Select Items for Return on the Issue tab.
- [Transfer out](#)
To transfer an item out, click Select Items for Transfer on the Transfer Out tab.
- [Transfer in](#)
To transfer an item in, click Select Items for Transfer on the Transfer In tab.
- [Database transactions](#)
In the Issues and Transfers application, you can transfer an item against an internal purchase order. This section explains the general ledger transactions resulting from Transfer In and Transfer Out actions.

Issue an item within one site

In Issues and Transfers, you can issue an item from the Issue tab within the same site.

The date and time in the Actual Date field is used to determine the financial period for the transaction. The Actual Date field defaults to the system date and time.

When you click Save, ISSUETYPE = ISSUE is written to the MATUSETRANS table.

Example

Issue 20 bearings at \$0.50 (issue cost).

Table 1. Source of GL account for issuing an item

Source GL account	Debit	Credit	Source of GL account
1. Inventory GL account (item resource code)	20 x \$0.50 = \$10.00	20 x \$0.50 = \$10.00	Inventory control account
2. If issued to a work order, uses work order GL account			
3. If issued to asset, uses <ul style="list-style-type: none"> • Asset GL account • GL account of location for the asset 			
4. If issued to a location <ul style="list-style-type: none"> • If only one asset at location, asset GL account • Location GL account 			

If you capitalize the item, the default credit account is the capital GL account, and the line cost is zero.

Issue an item between sites within the same organization

In the Issues and Transfers application, you can issue an item from the Issue tab between sites within the same organization.

The date and time in the Actual Date field is used to determine the financial period for the transaction. The Actual Date field defaults to the system date and time.

When you click Save, ISSUETYPE = ISSUE is written to the MATUSETRANS table.

Example

Issue 20 bearings at \$0.50 (issue cost) from the storeroom in site A to the storeroom in site B

Table 1. Source of GL account for issuing an item between sites in the same organization

Source GL account	Debit	Credit	Source of GL account
1. Inventory GL account (item resource code)	20 x \$0.50 = \$10.00	20 x \$0.50 = \$10.00	Inventory control account
2. If issued to a work order, uses work order GL account			
3. If issued to asset, uses:			
• Asset GL account			
• GL account of location for the asset			
4. If issued to a location:			
• If only one asset at location, asset GL account			
• Location GL account			

If you capitalize the item, the default credit account is the capital GL account, and the line cost is zero.

Return a previously issued item

To return an item, click Select Items for Return on the Issue tab.

The date and time in used in the Actual Date field in the table window to determine the financial period for the transaction. The Actual Date field defaults to the system date and time.

To return items in the Issues and Transfers application, select the applicable items from a list of previously issued items. The transaction is posted with a negative line cost and the accounts are the same debit and credit as the issue transaction. These accounts are read-only.

When you click Save, ISSUETYPE = RETURN is written to the MATUSETRANS table.

Example

Return 4 bearings that were issued at \$0.50 each. At issue, the debit account was 1111-111-111 and the credit account was 2224-224-222.

Table 1. Source of GL account for returning a previously issued item

Source GL account	Debit	Credit	Source of GL account
1111-111-111 general ledger debit used when item was issued (read-only)	4 x \$0.50 = \$2.00	4 x \$0.50 = \$2.00	2224-224-222 general ledger credit used when item was issued (read-only)

Transfer out

To transfer an item out, click Select Items for Transfer on the Transfer Out tab.

The date and time are used in the Actual Date field to determine the financial period for the transaction. The Actual Date field defaults to the system date and time.

Primary transaction

When you click Save, ISSUETYPE = TRANSFER is written to the MATUSETRANS table.

Example 1

Transfer 20 bearings at \$0.50 (issue cost) from the central storeroom to the packaging storeroom in the same site.

Table 1. Source of GL account for transferring an item within the same site

Source GL account	Debit	Credit	Source of GL account
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Source GL account	Debit	Credit	Source of GL account
1. Inventory control account of destination storeroom. 2. If in response to an internal purchase order uses purchase order line general ledger debit account	20 x \$0.50 = \$10.00	20 x \$0.50 = \$10.00	Inventory control account of source storeroom. If in response to an internal purchase order, uses purchase order line general ledger credit account

Example 2

Transfer 20 bearings at \$0.50 (issue cost) from the central storeroom in site A to the packaging storeroom in site B within the same organization.

Table 2. Source of GL account for transferring an item within the same organization

Source GL account	Debit	Credit	Source of GL account
Inventory control account of central storeroom in site B.	20 x \$0.50 = \$10.00	20 x \$0.50 = \$10.00	Clearing account of organization B

Using the previous example to complete a transfer of items across organizations, two transactions are required:

- The central storeroom in site A must issue items to a courier.
- The packaging storeroom in site B must transfer items in from the courier to the storeroom.

If you capitalize the item and it exists in the destination, the default for both the debit and credit accounts is the capital GL account, and the line cost is zero.

If you capitalize the item and your company is stocking it in the destination for the first time, the debit account for the transfer is the inventory control account of the destination. The credit account is the capital GL account.

Transferring a capitalized item to a new inventory location inserts the item as capitalized into the new inventory location. The control account for the item in that new inventory location is the inventory control account, not the capital GL account.

Secondary transaction

Transferring against an internal purchase order creates the same transaction as receiving material against an internal purchase order.

Transferring against an internal purchase order produces a secondary transaction under the following conditions:

- Your standard cost is used as your issue cost
- The receipt price varies from the standard price in the destination storeroom

In either scenario, the following record is written to the INVTRANS table:

TRANSTYPE = STDRECADJ

The value of the transaction (line cost) is determined with the following equation:

Receipt quantity x (receipt price - standard price)

Example

You transfer 20 bearings into the central storeroom at \$0.50 each (primary transaction), but the standard cost of the bearings in the central storeroom is \$0.45 each. Your company uses the standard cost.

If the item is capitalized, the default credit account is the capital GL account. Also, because the standard cost of a capitalized item is zero, the line cost for the standard receipt adjustment transaction equals the receipt price of the item.

Table 3. Source of GL account with different item cost

Source GL account	Debit	Credit	Source of GL account
Receipts price variance account	$(\$0.50 - \$0.45) \times 20 = \$1.00$	$(\$0.50 - \$0.45) \times 20 = \$1.00$	Inventory control account

All cost entries and calculations are performed in the base currency.

Transfer in

To transfer an item in, click Select Items for Transfer on the Transfer In tab.

The Actual Date field defaults to the system date and time. The date and time in the Actual Date field determine the financial period for the transaction.

Primary transaction

When you click Save, the following record is written to the MATRECTRANS table:

ISSUETYPE = TRANSFER

Example 1

Transfer 20 bearings at \$0.50 (issue cost) to the packaging storeroom from the central storeroom.

Table 1. Source of GL account for transfer between storerooms

Source GL account	Debit	Credit	Source of GL account
1. Inventory control account of destination storeroom.	20 x \$0.50 = \$10.00	20 x \$0.50 = \$10.00	Inventory control account of source storeroom
2. Inventory control account of destination storeroom.			Inventory control account of source storeroom

Example 2

Transfer 20 bearings at \$0.50 (issue cost) from the central storeroom in site A to the packaging storeroom in site B within the same organization.

Table 2. Source of GL account for transfer between sites in the same organization

Source GL account	Debit	Credit	Source of GL account
1. Inventory control account of destination storeroom in site B.	20 x \$0.50 = \$10.00	20 x \$0.50 = \$10.00	Inventory control account of source storeroom in site A.
2. If in response to an internal purchase order with a courier, uses purchase order line general ledger debit account.			If in response to an internal purchase order with a courier, ← defaults to the clearing account of the organization.

Transfer 20 bearings at \$0.50 (issue cost) from the central storeroom in site A, organization A to the packaging storeroom in site B, organization B.

Table 3. Source of GL account for transfer between sites in the same organization

Source GL account	Debit	Credit	Source of GL account
Inventory control account of central storeroom in site B.	20 x \$0.50 = \$10.00	20 x \$0.50 = \$10.00	Clearing account of organization B.

Using the previous example, to transfer items across organizations, two transactions are required:

- The central storeroom in site B must transfer items from the storeroom to the courier.
- The packaging storeroom in site A must receive items from a courier.

If the item is capitalized and it exists in the destination, the default for both the debit and credit accounts is the capital GL account, and the line cost is zero.

If the item is capitalized and your company is stocking it in the destination for the first time, the debit account for the transfer is the inventory control account of the destination. The credit account is the capital GL account.

Transferring a capitalized item to a new inventory location inserts the item as capitalized into the new inventory location. The control account for the item in that new inventory location is the inventory control account, not the capital GL account.

Secondary transaction

Transferring against an internal purchase order creates the same transaction as receiving material against an internal purchase order.

Transferring against an internal purchase order produces a secondary transaction under the following conditions:

- Standard cost is used as your issue cost.
- The receipt price varies from the standard price in the destination storeroom.

Under these conditions, the following record is written to the INVTRANS table:

TRANSTYPE = STDRECADJ, to the INVTRANS table.

The value of the transaction (line cost) is determined with the following equation:

Receipt quantity x (receipt price - standard price)

Example

You transfer 20 bearings into the central storeroom at \$0.50 each (primary transaction), but the standard cost of the bearings in the central storeroom is \$0.45 each. Your company uses the standard cost.

Table 4. Source of GL account for transfer with different costs

Source GL account	Debit	Credit	Source of GL account
Receipts price variance account	(\$0.50 - \$0.45) x 20 = \$1.00	(\$0.50 - \$0.45) x 20 = \$1.00	Inventory control account

If the item is capitalized, the default credit account is the capital GL account. Also, since the standard cost of a capitalized item is zero, the line cost for the standard receipt adjustment transaction equals the receipt price of the item.

All cost entries and calculations are performed in the base currency.

Database transactions

In the Issues and Transfers application, you can transfer an item against an internal purchase order. This section explains the general ledger transactions resulting from Transfer In and Transfer Out actions.

Issues tab

When you issue an item, the default accounts are determined in the following ways:

Issue Type of Issue

GL Debit Account (GLDEBITACCT) ⇐

1. GL Account field (not displayed) in the Inventory application ⇐ Inventory Resource field for the item type on the Inventory Resource Codes window in the Chart of Accounts application (typically only one segment only of the GL Debit Account field);
2. GL Account field in the Work Orders application, if work order number specified; ⇐ GL Account field in the Preventive Maintenance application, if based on the preventive maintenance record; or, GL Account field in Asset (not displayed); or, GL Account field in the Locations application;
3. GL Account field in the Asset application (not displayed);
4. GL Account field in the Locations application.

GL Credit Account (GLCREDITACCT) ⇐ GL Control Account field (not displayed) in the Inventory application.

Issue Type of Issue

MATUSETRANS.GLDEBITACCT ⇐

1. INVCOST.GLACCOUNT ⇐ ACCOUNTDEFAULTS.GLDEFAULT (where DFLTGROUP = INVRESCODE)
2. WORKORDER.GLACCOUNT ⇐ PM.GLACCOUNT; or, ASSET.GLACCOUNT; or, LOCATIONS.GLACCOUNT
3. ASSET.GLACCOUNT
4. LOCATIONS.GLACCOUNT

MATUSETRANS.GLCREDITACCT ⇐ INVCOST.CONTROLACC ⇐ LOCATIONS.CONTROLACC

Issue Type of Return

GL Debit Account (GLDEBITACCT) ⇐ GL Credit Account field on Select Items for Return window for selected item.

GL Credit Account (GLCREDITACCT) ⇐ GL Debit Account field on Select Items for Return window for selected item.

Issue Type of Return

MATUSETRANS.GLDEBITACCT ⇐ MATUSETRANS.GLCREDITACCT for the issue transaction of the item.

MATUSETRANS.GLCREDITACCT ⇐ MATUSETRANS.GLDEBITACCT for the issue transaction of the item.

Transfer Out tab

This section provides general ledger field information for the Transfer Out tab.

Displayed fields	<p>GL Debit Account (GLDEBITACCT) ⇐</p> <p>the Control Account field for the labor or courier in Locations, if the item is transferred to a labor or courier location; between two storerooms at the same site.</p> <p>the GL Debit Account field on the PO Lines tab if in response to an internal purchase order; between two storerooms at the same site.</p> <p>the clearing account of the transferring out organization for the site, if in response to an internal purchase order between a transferring out site and a receiving site.</p> <p>GL Control Account field (not displayed) in the Inventory application for the to location ⇐ Inventory Account field on the Inventory-Related Accounts window in the Chart of Accounts application.</p> <p>GL Credit Account (GLCREDITACCT) ⇐</p> <p>the GL Credit Account field on the PO Lines tab if in response to an internal purchase order, otherwise,</p> <p>GL Control Account field (not displayed) in the Inventory application for from location ⇐ Inventory Account field on the Inventory-Related Accounts window in the Chart of Accounts application.</p>
Database fields	<p>MATRECTRANS.GLDEBITACCT ⇐</p> <p>LOCATIONS.CONTROLACC, if transferred to a labor or courier location, otherwise,</p> <p>POLINE.GLDEBITACCT, if in response to an internal purchase order; between two storerooms at the same site.</p> <p>ORGANIZATION.CLEARING ACCOUNT, clearing account of the organization of the transferring out site, if in response to an internal purchase order between a transferring out site and a receiving site.</p> <p>INVCOST.CONTROLACC for to location ⇐ LOCATIONS.CONTROLACC</p> <p>MATRECTRANS.GLCREDITACCT ⇐</p> <p>POLINE.GLCREDITACCT, if in response to an internal purchase order; otherwise,</p> <p>INVCOST.CONTROLACC for from location ⇐ LOCATIONS.CONTROLACC</p>

Transfer In tab

This section provides general ledger field information for the Transfer In tab.

Displayed fields	<p>GL Debit Account (GLDEBITACCT) ⇐</p>
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	<p>If in response to an internal purchase order, the GL Debit Account field on the purchase order line otherwise, GL Control Account field (not displayed) in the Inventory application for to location ⇐ Inventory Control Account field on the Inventory-Related Accounts window in the Chart of Accounts application.</p> <p>GL Credit Account (GLCREDITACCT) ⇐</p> <p>If the item is transferred from a labor our courier location, the Control Account field for the labor or courier in the Locations application, otherwise</p> <p>If in response to an internal purchase order, the GL Credit Account field on the purchase order line otherwise,</p> <p>If in response to an internal purchase order between a receiving site and a transferring out site, the clearing account of the receiving organization for that site.</p> <p>GL Control Account field (not displayed) in the Inventory application for the from location ⇐ GL Control Account field (not displayed) in the Locations application for the from location < Inventory Control Account field on the Inventory-Related Accounts window in the Chart of Accounts application.</p>
Database fields	<p>MATRECTRANS.GLDEBITACCT ⇐</p> <p>If in response to an internal purchase order, POLINE.GLDEBITACCT; otherwise, INVCOST.CONTROLACC for to location ⇐ LOCATIONS.CONTROLACC</p> <p>MATRECTRANS.GLCREDITACCT ⇐</p> <p>If transferred from a labor or courier location, LOCATIONS.CONTROLACC; otherwise, If in response to an internal purchase order, POLINE.GLCREDITACCT; otherwise,</p> <p>If in response to an internal purchase order between a receiving site and a transferring out site, ORGANIZATION.CLEARING ACCOUNT, the clearing account of the receiving organization for that site.</p> <p>INVCOST.CONTROLACC for from location ⇐ LOCATIONS.CONTROLACC</p>

Financial processes in the Preventive Maintenance module

Various financial processes occur in the Preventive Maintenance application.

- [Financial processes in the Preventive Maintenance application](#)
Various financial processes occur in the Preventive Maintenance application.

Financial processes in the Preventive Maintenance application

Various financial processes occur in the Preventive Maintenance application.

Any GL account (segment) entered in the Preventive Maintenance application is used on work orders that you generate from the preventive maintenance record.

Displayed field	GL Account field (GLACCOUNT) ⇐ manual entry (no default)
Database field	PM.GLACCOUNT ⇐ manual entry (no default)

Financial processes in the Purchasing module

Various financial processes occur in the Companies, Purchase Requisitions, Purchase Orders, Receiving, and Invoices applications.

- [Financial processes in the Companies application](#)
In the Companies application, the GL account fields, AP Control Account RBNI Account, and, Suspense Account default according to company type that is specified in the Company Type field.
- [Financial processes in the Purchase Requisitions application](#)
You can select several material and service requisition actions from the PR Lines tab in the Purchase Requisitions application, that cause GL account transactions to be written.
- [Financial processes in the Purchase Orders application](#)
The Material Orders from External Vendor action that is selected from the PO Lines tab in the Purchase Orders application, causes GL account transactions to be written.
- [Receiving application](#)
The Receiving application is used to process receipts for materials.
- [Shipment Receiving application](#)
A shipment record is used to transfer a shipment between two storerooms when an intermediary, such as a shipper, is used. Shipment records are created using the Inventory Usage application and receipts are created against these records using the Shipment Receiving application.
- [Financial processes in the Invoices application](#)
Although records might be created to establish GL accounts, no general ledger transactions occur until you approve the invoice. Upon invoice approval, many transactions can occur.

- [Tax transactions](#)
An invoice can include tax. If so, in addition to the transaction of TRANSTYPE = TOTAL, a transaction is written to the INVOICETRANS table with TRANSTYPE = TAX n , where $1 \leq n \leq 27$. The value of n depends on which tax type you selected for the tax in the Chart of Accounts application.
- [Cost variance transactions](#)
If time lapses between receiving the item and approving the invoice, the cost associated with the invoice line might differ from the cost of the item at receipt.

Financial processes in the Companies application

In the Companies application, the GL account fields, AP Control Account RBNI Account, and, Suspense Account default according to company type that is specified in the Company Type field.

Displayed fields

RBNI (RBNIACC) \Leftarrow RBNI field for Company Type on Company-Related Accounts window in the Chart of Accounts applications.

Suspense (APSUSPENSEACC) \Leftarrow AP Suspense field for Company Type on Company-Related Accounts window in the Chart of Accounts application.

AP Control (APCONTROLACC) \Leftarrow AP Control field for Company Type on Company-Related Accounts window in the Chart of Accounts application.

Database Fields

COMPANIES.RBNIACC \Leftarrow COMPANYACCDEF.RBNIACC

COMPANIES.APSUSPENSEACC \Leftarrow COMPANYACCDEF.APSUSPENSEACC

COMPANIES.APCONTROLACC \Leftarrow COMPANYACCDEF.APCONTROLACC

Financial processes in the Purchase Requisitions application

You can select several material and service requisition actions from the PR Lines tab in the Purchase Requisitions application, that cause GL account transactions to be written.

- [Material requisitions for a storeroom](#)
Specific information is held when material requisitions are made for a storeroom by an external vendor.
- [Material requisitions for a direct issue](#)
Specific information is held when material requisitions are made for a direct issue, when Issue on Receipts is set to \checkmark .
- [Material requisitions from an internal vendor](#)
Specific information is held when material requisitions are made from the storeroom of an internal vendor.
- [Material requisitions from an internal vendor in a different organization](#)
Specific information is held when material requisitions are made from the storeroom of an internal vendor from a different organization.
- [Service purchase requisitions](#)
Specific information is held for purchase requisitions when the Line Type is set to *Service*.
- [Standard service purchase requisitions](#)
Specific information is held for purchase requisitions when the Line Type is set to *Standard service*.
- [Rotating asset purchase requisitions](#)
Specific information is held for rotating asset purchase requisitions, when the Issue on Receipts and Charge to Store check boxes are set to \checkmark .

Material requisitions for a storeroom

Specific information is held when material requisitions are made for a storeroom by an external vendor.

Displayed fields

GL Debit Account (GLDEBITACCT) \Leftarrow GL Control Account field (not displayed) for storeroom location in the Inventory application.

GL Credit Account (GLCREDITACCT) \Leftarrow RBNI field for Vendor in Companies \Leftarrow RBNI field for Company Type field (for Vendor on PR line) on Company-Related Accounts window in the Chart of Accounts application.

Database fields

PRLINE.GLDEBITACCT \Leftarrow INVCOST.CONTROLACC

PRLINE.GLCREDITACCT \Leftarrow COMPANIES.RBNIACC \Leftarrow COMPANYACCDEF.RBNIACC (where TYPE = company type of vendor)

Material requisitions for a direct issue

Specific information is held when material requisitions are made for a direct issue, when Issue on Receipts is set to \checkmark .

Displayed fields

Direct issue requisitions and purchase orders can be created for an external vendor.

GL Debit Account (GLDEBITACCT) \Leftarrow GL Account field (not displayed) in the Inventory application \Leftarrow Inventory Resource field for item Type field on Inventory Resource Codes window in the Chart of Accounts:

1. Work Order GL Account field.
2. Asset GL Account field (not displayed).
3. Location GL Account field.

GL Credit Account (GLCREDITACCT) \Leftarrow RBNI field for Vendor in Companies \Leftarrow RBNI field for Company Type field (for Vendor on PR line) on Company-Related Accounts window in the Chart of Accounts application.

Database fields

PRLINE.GLDEBITACCT \Leftarrow

1. INVCOST.GLACCOUNT \Leftarrow ACCOUNTDEFAULTS.GLDEFAULT (where DFLTGROUP = INVRESCODE and GROUPVALUE = item type for item on purchase order line)
2. WORKORDER.GLACCOUNT
3. ASSET.GLACCOUNT
4. LOCATIONS.GLACCOUNT

PRLINE.GLCREDITACCT \Leftarrow COMPANIES.RBNIACC \Leftarrow COMPANYACCDEF.RBNIACC (where TYPE = company type of vendor)

Material requisitions from an internal vendor

Specific information is held when material requisitions are made from the storeroom of an internal vendor.

This transaction involves internal purchase orders within the same site or between two sites within the same organization.

Displayed fields

GL Debit Account (GLDEBITACCT) \Leftarrow GL Control Account field (not displayed) in the Inventory application for requisitioning storeroom location \Leftarrow Inventory Control Account field on the Inventory-Related Accounts window in the Chart of Accounts application.

GL Credit Account (GLCREDITACCT) \Leftarrow GL Control Account field (not displayed) in the Inventory application for vendor storeroom location \Leftarrow Inventory Control Account field on the Inventory-Related Accounts window in the Chart of Accounts application.

Database fields

PRLINE.GLDEBITACCT \Leftarrow INVCOST.CONTROLACC (of requisitioning location) \Leftarrow LOCATIONS.CONTROL.ACC

PRLINE.GLCREDITACCT \Leftarrow INVCOST.CONTROLACC (of vendor location) \Leftarrow LOCATIONS.CONTROL.ACC

You cannot create a service requisition that names an internal vendor.

Material requisitions from an internal vendor in a different organization

Specific information is held when material requisitions are made from the storeroom of an internal vendor from a different organization.

Displayed fields	<p>GL Debit Account (GLDEBITACCT) \Leftarrow GL Control Account field (not displayed) in the Inventory application for requisitioning storeroom location \Leftarrow Inventory Control Account field on the Inventory-Related Accounts window in the Chart of Accounts application.</p> <p>GL Credit Account (GLCREDITACCT) \Leftarrow Organization Clearing Account field in the Organization application for the organization of the receiving site.</p>
Database fields	<p>PRLINE.GLDEBITACCT \Leftarrow INVCOST.CONTROLACC (of requisitioning location) \Leftarrow LOCATIONS.CONTROL.ACC</p> <p>PRLINE.GLCREDITACCT \Leftarrow ORGANIZATION.CLEARINGACCOUNT</p>

Service purchase requisitions

Specific information is held for purchase requisitions when the Line Type is set to *Service*.

Displayed fields	<p>The GL Debit Account and GL Credit Account fields for a service requisition default just as they do for a direct issue material requisition. However, the merger does not involve an item resource code, unless you do the following:</p>
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- Order the service requisition for an asset
- Select the Charge to Store check box

Standard service purchase requisitions

Specific information is held for purchase requisitions when the Line Type is set to `Standard service`.

Displayed fields

GL Debit Account (GLDEBITACCT) ← GL Account field for the Organization and Service item, as defined in the Service Items application using the Service Item / Organization Details action.

GL Credit Account (GLCREDITACCT) ← RBNI field for vendor in Companies ← RBNI field for Company Type field (for vendor on purchase requisition line) on Company-Related Accounts window in the Chart of Accounts application.

Database fields

PRLINE.GLDEBITACCT ← ITEMORGINF0.GLACCOUNT

PRLINE.GLCREDITACCT ← COMPANIES.RBNIACC (of vendor) ← COMPANYACCDEF.RBNIACC, where TYPE = company type of the vendor.

Rotating asset purchase requisitions

Specific information is held for rotating asset purchase requisitions, when the Issue on Receipts and Charge to Store check boxes are set to `Y`.

Displayed fields	<p>GL Debit Account (GLDEBITACCT) ← Rotating Suspense Account field (not displayed) in Asset ← Global Rotating Suspense Account field on the Inventory-Related Accounts window in the Chart of Accounts application.</p> <p>GL Credit Account (GLCREDITACCT) ← RBNI field for vendor in Companies ← RBNI field for Company Type field (for vendor on purchase requisition line) on Company-Related Accounts window in the Chart of Accounts application.</p>
Database fields	<p>PRLINE.GLDEBITACCT ← ASSET.ROTSUSPACCT ← ACCOUNTDEFAULTS.GLDEFAULT (where DFLTGROUP = INVRELACC and GROUPVALUE = ROTUSPACCT)</p> <p>PRLINE.GLCREDITACCT ← COMPANIES.RBNIACC (of vendor) ← COMPANYACCDEF.RBNIACC, where TYPE = company type of the vendor.</p>

Financial processes in the Purchase Orders application

The Material Orders from External Vendor action that is selected from the PO Lines tab in the Purchase Orders application, causes GL account transactions to be written.

You can copy purchase order line items from purchase requisitions line items or you can enter them directly on a purchase order. In the first case, the general ledger fields are copied from the purchase requisition. In the second case, purchase order line general ledger fields default exactly as they do on a purchase requisition.

- **Material orders from an external vendor**

Specific information is held for storeroom items that are ordered from an external vendor. The purchase requisition line shown in parentheses, indicating that the purchase order general ledger information might have been copied from there.

Material orders from an external vendor

Specific information is held for storeroom items that are ordered from an external vendor. The purchase requisition line shown in parentheses, indicating that the purchase order general ledger information might have been copied from there.

Displayed fields	<p>GL Debit Account (GLDEBITACCT) ← GL Debit Account field on purchase requisition line ← GL Control Account field (not displayed) for storeroom location in the Inventory application.</p> <p>GL Credit Account (GLCREDITACCT) ← GL Credit Account field on purchase requisition line ← RBNI field for vendor in Companies ← RBNI field for Company Type field (for vendor on purchase order line) on Company-Related Accounts window in the Chart of Accounts application.</p>
Database fields	<p>POLINE.GLDEBITACCT ← (PRLINE.GLDEBITACCT) ← INVCOST.CONTROLACC</p> <p>POLINE.GLCREDITACCT ← (PRLINE.GLCREDITACCT) ← COMPANIES.RBNIACC ← COMPANYACCDEF.RBNIACC where TYPE = company type of the vendor</p>

Receiving application

The Receiving application is used to process receipts for materials.

- [External material receipts into a storeroom](#)
Specific information is held for processing external receipts through the Materials tab in the Receiving application into a storeroom.
- [External material receipts issue on receipt](#)
Specific information is held for processing external receipts through the Materials tab in the Receiving application.
- [Material receipts with an inspection required](#)
You process a receipt, when an inspection of the item is required, through the Material Receipts tab in the Receiving application. The inspection status is set with the Inspection Required check box on the purchase order Lines in the Purchase Orders application.
- [Void receipts](#)
You use the Select Receipts to Void action to reverse a receipt that is recorded in error. This inserts a transaction of ISSUETYPE=VOIDRECEIPT to the MATRECTRANS table. The related receipt record is reversed and balances and inventory costs are adjusted as necessary.

External material receipts into a storeroom

Specific information is held for processing external receipts through the Materials tab in the Receiving application into a storeroom.

The date and time are used in the Received Date field to determine the financial period for the transaction. The Received Date field defaults to the system date and time.

The Loaded Cost column in the table window represents the cost of material, plus any taxes or standard services that have been added to the line.

Primary transaction

When you save this information, a record is written to the MATRECTRANS table.

An example of receiving 20 bearings at \$0.50 each.

Source of GL account	Debit	Credit	Source of GL account
Purchase order line Debit account	10 x \$0.50 = \$5.00	20 x \$0.50 = \$10.00	Purchase order line Credit account

All cost entries and calculations are made in the base currency.

External material receipts issue on receipt

Specific information is held for processing external receipts through the Materials tab in the Receiving application.

To do this process on the Material Receipts tab click New Row or Select Ordered Items.

The date and time are used in the Received Date field to determine the financial period for the transaction. The Received Date field defaults to the system date and time.

Primary transaction

When you save this information, ISSUETYPE = RECEIPT is written to the MATRECTRANS table.

You use the same debit and credit amounts when inserting a purchase order or purchase requisition line.

Secondary transaction

A record is written to the MATUSETRANS table. This record represents the issue of the item upon receipt. From an accounting perspective, it is the same transaction as in MATRECTRANS.

Material receipts with an inspection required

You process a receipt, when an inspection of the item is required, through the Material Receipts tab in the Receiving application. The inspection status is set with the Inspection Required check box on the purchase order Lines in the Purchase Orders application.

Purchase orders with receipt required

If you selected the Inspection Required check box, the Inspection Status field on the Material Receipts tab defaults to WINSP (Waiting for Inspection) upon receipt.

Use the Change Inspection Status action in the Receiving application to accept or reject these items.

Change inspection status

In the following example, you have transferred eight items to your storeroom and returned two to the vendor. After you complete the transaction, the Material Receipts tab displays updated line item information.

The following table shows what general ledger transactions are written when you receive 10 copper tubings at \$0.50 each. Upon inspection, eight copper tubings are accepted and the remaining two copper tubings are rejected.

Transaction type	GL account source	Debit	Credit	GL account source
Receipt	Holding Location GL account	10 x \$0.50 = \$5.00	10 x \$0.50 = \$5.00	RBNI (Received But Not Invoiced) GL account from company application
Transfer to your Storeroom	The GL account of your Storeroom	8 x \$0.50 = \$4.00	8 x \$0.50 = \$4.00	Holding Location GL account
Return to Holding Location	Holding Location GL account	-2 x \$0.50 = -\$1.00	-\$1.00 -2 x \$0.50 = -\$1.00	RBNI GL account from company application

Void receipts

You use the Select Receipts to Void action to reverse a receipt that is recorded in error. This inserts a transaction of ISSUETYPE=VOIDRECEIPT to the MATRECTRANS table. The related receipt record is reversed and balances and inventory costs are adjusted as necessary.

Voided receipts are used for correction only and cannot be referenced on invoices.

Shipment Receiving application

A shipment record is used to transfer a shipment between two storerooms when an intermediary, such as a shipper, is used. Shipment records are created using the Inventory Usage application and receipts are created against these records using the Shipment Receiving application.

The date and time are used in the Received Date field to determine the financial period for the transaction. The Received Date field defaults to the system date and time.

When you click Save, ISSUETYPE = SHIPRECEIPT is written to the MATRECTRANS table.

If you use standard cost, a potential secondary transaction can occur. For example, if you move the item from storeroom A to storeroom B, and the receipt price of the item differs from the standard price of the item in storeroom B. TRANSTYPE = STDRECADJ is written to the INVTRANS table.

The value of the transaction (that is, the LINECOST) is equal to the following equation:

[Receipt Quantity x (Receipt Price-Standard Price in Storeroom B)].

Example

You create an inventory usage record and add a usage line where the item quantity is five and the unit cost is \$10. You want to transfer the item from the Central Storeroom at your Bedford site to the Central Storeroom at your Nashua site.

You change the status of the inventory record to SHIPPED and record the shipment details; that is, the carrier and so on. At this point, transactions of type SHIPTRANSFER are recorded in the MATRECTRANS table for the supplying storeroom.

At such time as the shipment is to be received at the destination storeroom you will use the Shipment Receiving application to record receipts against the shipment.

If you are receiving...	You enter...
A rotating item	One transaction for each received asset
A non-rotating item	One transaction for all received assets

Each of these transactions appears in the MATRECTRANS table as type SHIPRECEIPT and inspection status WASSET.

Table 1. Source of GL account for rotating item

GL account source	Debit	Credit	GL account source
Clearing account for your Bedford site	1*\$10=\$10	1*\$10=\$10	Inventory Control account for the Central storeroom at your Bedford site.
	1*\$10 = \$10	1*\$10 = \$10	
	1*\$10 = \$10	1*\$10 = \$10	
	1*\$10 = \$10	1*\$10 = \$10	
	1*\$10 = \$10	1*\$10 = \$10	

Table 2. Source of GL account for non-rotating item

GL account source	Debit	Credit	GL account source
Clearing account for your Bedford site	5*\$10 = \$50	5*\$10 = \$50	Inventory Control account for the Central storeroom at your Bedford site.

Financial processes in the Invoices application

Although records might be created to establish GL accounts, no general ledger transactions occur until you approve the invoice. Upon invoice approval, many transactions can occur.

The date and time are used in the Entered Date field in the Invoices application to determine the financial period for transactions in this application. All transactions are in the base currency.

Processes that result in debit or credit transactions use decimal fields and amount (cost) fields. Minimize the effects of rounding in calculations by using the Database Configuration application to set the scale for these fields to six or more places. The scale is the number of places calculated and displayed after the decimal point.

- **[Invoice lines tab](#)**
You can copy invoice line items from purchase order line items or enter them directly. If you copy an invoice line from a purchase order, the GL Debit Account field for that invoice line defaults to the purchase order line debit account. When you directly enter invoice line items, the invoice line GL Debit Account field defaults exactly as if inserting a purchase requisition line.
- **[Not charged to store](#)**
You receive an invoice for two hours of computer repair at \$50 an hour. The invoice has no associated purchase order and it is not charged to store. In addition to the primary transaction, a transaction is written to the SERVRECTRANS table.
- **[Charged to store](#)**
If the Charge to Store check box is selected, the charges are carried through to the rotating asset.
- **[Distribute costs window](#)**
Default information on this window comes from the INVOICECOST table; where data results from inserting invoice line items. The GL Debit Account and GL Credit Account source fields are the same fields used when inserting an invoice line.
- **[Invoice approval](#)**
In the Invoices application, the displayed general ledger fields acquire their values when you insert the invoice lines. When you approve an invoice, the general ledger field values in any application are not affected; however, at least one database transaction is created and possibly others.
- **[Invoice reversal](#)**
You can cancel individual invoices that have an approved or paid status, without doing a return transaction. Reverse invoices can be used to remove erroneously entered invoices, and credit or debit memos.
- **[Invoice total transaction](#)**
When you approve an invoice, during the primary transaction, TRANSTYPE=TOTAL is written to the INVOICETRANS table.
- **[Additional transactions for materials](#)**
If the item is a material to be issued on receipt, any change in the item cost is accounted for by writing entries to both the MATRECTRANS and MATUSETRANS tables. The accounts default as if inserting a purchase requisition line. If the materials are charged to a work order, the actual materials cost is also updated.

Invoice lines tab

You can copy invoice line items from purchase order line items or enter them directly. If you copy an invoice line from a purchase order, the GL Debit Account field for that invoice line defaults to the purchase order line debit account. When you directly enter invoice line items, the invoice line GL Debit Account field defaults exactly as if inserting a purchase requisition line.

The GL Credit field source is always the RBNI account for the vendor that you have specified in the Invoices application.

In the Database section, both the purchase order line and the purchase requisition line are shown in parentheses, indicating that you might have copied the invoice general ledger information from the purchase order.

Inserting invoice lines creates no general ledger transactions until you reach the invoice approval stage.

Displayed fields

GL Debit Account (GLDEBITACCT) ← GL Debit Account field on PO Lines tab ← GL Debit Account field on PR Lines tab ← GL Control Account field (not displayed) for storeroom location in the Inventory application.

GL Credit Account (GLCREDITACCT) ← RBNI field in Companies for vendor ← RBNI field for Company Type field (for vendor in Invoices application) on Company-Related Accounts window in the Chart of Accounts application.

Database fields

INVOICECOST.GLDEBITACCT ← (POLINE.GLDEBITACCT) ← (PRLINE.GLDEBITACCT) ← INVCOST.CONTROLACC

INVOICECOST.GLCREDITACCT ← COMPANIES.RBNIACC ← COMPANYACCDEF.APSUSPENSEACC (where TYPE = type of vendor company)

Not charged to store

You receive an invoice for two hours of computer repair at \$50 an hour. The invoice has no associated purchase order and it is not charged to store. In addition to the primary transaction, a transaction is written to the SERVRECTRANS table.

Table 1. GL account source when invoice not charged to store

	GL account source	Debit	Credit	GL account source
1	If issued to a work order, uses work order GL account	2 x \$50.00 = \$100.00	2 x \$50.00 = \$100.00	Company RBNI (Received But Not Invoiced) account
2	If issued to asset, uses Asset GL account Asset location of GL account			
3	If issued to a location and there is only one asset at location, uses asset GL account Location GL account			

Service for Item With No PO, if Charge to Store? = N.

Database fields	SERVRECTRANS.GLDEBITACCT ← INVOICECOST.GLDEBITACCT ← or, WORKORDER.GLACCOUNT, or, ASSET.GLACCOUNT, or, LOCATIONS.GLACCOUNT SERVRECTRANS.GLCREDITACCT ← COMPANIES.RBNIACC ← COMPANYYACDEF.RBNIACC (where TYPE = type of vendor company)
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Charged to store

If the Charge to Store check box is selected, the charges are carried through to the rotating asset.

You receive an invoice for two hours of computer repair at \$50 an hour. The invoice has no associated purchase order, and it is charged to store. In addition to the primary transaction, a transaction is written to SERVRECTRANS.

GL account source	Debit	Credit	GL account source
Asset rotating suspense account	2 x \$50.00 = \$100.00	2 x \$50.00 = \$100.00	Company RBNI account

Furthermore, when UPDATEINVENTORY = 1, the database inventory cost of the rotating asset (for example, the computer) is updated.

Service for Item With No PO, if Charge to Store? = Y

Database fields

SERVRECTRANS.GLDEBITACCT ←

INVOICECOST.GLDEBITACCT ←

ASSET.ROTSUSPACCT ←

ACCOUNTDEFAULTS.GLDEFAULT (where DFLTGROUP = INVRELACC and GROUPVALUE = ROTSPACCT)

SERVRECTRANS.GLCREDITACCT ←

COMPANIES.RBNIACC ← COMPANYYACDEF.RBNIACC (where TYPE = type of vendor company)

Distribute costs window

Default information on this window comes from the INVOICECOST table; where data results from inserting invoice line items. The GL Debit Account and GL Credit Account source fields are the same fields used when inserting an invoice line.

Using the Distribute Costs window creates no general ledger transactions until you reach the invoice approval stage.

Displayed fields

GL Debit Account (GLDEBITACCT) ← GL Debit Account field on invoices line.

GL Credit Account (GLCREDITACCT) ← GL Credit Account field on invoices line ← RBNI field in Companies for vendor ← RBNI field for Company Type field (for vendor in Invoices) on Company-Related Accounts window in the Chart of Accounts application.

Database fields

INVOICECOST.GLDEBITACCT (← POLINE.GLDEBITACCT)(← PRLINE.GLDEBITACCT)

INVOICECOST.GLCREDITACCT ← COMPANIES.APSUSPENSEACC ← COMPANYYACDEF.RBNIACC (where TYPE = type of vendor company)

Example

Materials are purchased for a storeroom.

The following are the displayed fields:

GL Debit Account (GLDEBITACCT) ← GL Debit Account field on purchase order line ← GL Debit Account field on purchase requisition line ← GL Control Account field (not displayed) for storeroom location in the Inventory application.

GL Credit Account (GLCREDITACCT) ← RBNI field in Companies for vendor ← RBNI field for Company Type field (for vendor in Invoices) in the Company-Related Accounts window in the Chart of Accounts application.

The following are the database fields:

INVOICECOST.GLDEBITACCT (← POLINE.GLDEBITACCT) ← (PRLINE.GLDEBITACCT) ← INVCOST.CONTROLACC

INVOICECOST.GLCREDITACCT ← COMPANIES.RBNIACC ← COMPANYACDEF.RBNIACC (where TYPE = type of vendor company)

Transactions Resulting From Distributing Costs

The actual general ledger transactions occur only at the time of invoice approval.

For Materials

MATRECTRANS.GLDEBITACCT ← INVOICECOST.GLDEBITACCT ← POLINE.GLDEBITACCT

MATRECTRANS.GLCREDITACCT ← INVOICECOST.GLCREDITACCT ← POLINE.GLCREDITACCT

Invoice approval

In the Invoices application, the displayed general ledger fields acquire their values when you insert the invoice lines. When you approve an invoice, the general ledger field values in any application are not affected; however, at least one database transaction is created and possibly others.

The date and time in the Entered Date field is used in the Invoices application to determine the financial period for transactions in this application.

If a purchase order number for the invoiced item exists and the Buy Ahead field (not displayed, by default) in the Purchase Orders application is set to Buy Ahead, the exchange rate at invoice approval is the rate locked in with the vendor when you create the purchase order. Otherwise, if the Vendor Currency field in the Invoices application is populated, the exchange rate is the current active rate from the Exchange Rate table in the Currency Management application.

Invoice reversal

You can cancel individual invoices that have an approved or paid status, without doing a return transaction. Reverse invoices can be used to remove erroneously entered invoices, and credit or debit memos.

You cannot reverse an invoice that was created with the Payment Scheduling or the Labor Reporting application.

The date and time in the G/L Posting Date field is used to determine the financial period for transactions in the Invoices application.

When the reverse invoice is created and its status is set to Pending Reversal (PENDREV); additionally, the invoice, invoice lines, and invoice line costs are copied from the original invoice. The original invoice number is stored in the ORIGINVOICENUM column. The reverse invoice number is stored in the REVINVOICENUM column of the original invoice.

When the reverse invoice is approved, the Invoices application reverses all the related records that were created with the original transaction, by setting opposite values. The status of the original invoice is set to REVERSED.

Primary transaction

When you approve a reverse invoice, the TRANSTYPE = TOTAL is written to the INVOICETRANS table.

Example

In this example, you approve a reverse invoice for the original invoice 20 bearings at \$0.50 each, plus tax of \$0.75.

Table 1. Source of GL account to reverse an invoice

GL account source	Debit	Credit	GL account source
Company RBNI Account	$(-20 \times \$ 0.50) + (- 0.75) = -\10.75	$(-20 \times \$ 0.50) + (- 0.75) = -\10.75	Company AP Suspense account

Invoice total transaction

When you approve an invoice, during the primary transaction, TRANSTYPE=TOTAL is written to the INVOICETRANS table.

For example, an invoice is approved for 20 bearings at \$0.50 each, plus tax of \$0.75:

Table 1. GL account source to approve an invoice

GL account source	Debit	Credit	GL account source
Company RBNI account	$(20 \times \$0.50) + \$0.75 = \$10.75$	$(20 \times \$0.50) + \$0.75 = \$10.75$	Company AP suspense account

A secondary transaction moves the tax portion into a tax account. We include tax in the preceding example to emphasize that the line cost for the TOTAL transaction includes tax.

If the unit cost of the item is in a foreign currency, for example, Canadian dollars, the LINECOST is in the base currency, for example, US dollars. The approval date determines the exchange rate used at invoice approval. The enter date in the INVOICE table determines the financial period.

Database fields	INVOICETRANS.GLDEBITACCT ← COMPANIES.RBNIACC ← COMPANYACCDEF.RBNIACC (where TYPE = type of vendor company)
	INVOICETRANS.GLCREDITACCT ← COMPANIES.APSUSPENSEACC ← COMPANYACCDEF.APSUSPENSEACC (where TYPE = type of vendor company)

Additional transactions

The following additional transactions can occur. These potential transactions are written to the INVOICETRANS, MATRECTRANS, and SERVRECTRANS tables. All transactions are in the base currency.

Service transaction for each invoice line with no associated purchase order line

If the invoice contains a line for a service for which no purchase order line exists, an additional transaction is written to the SERVRECTRANS table. Because no associated purchase order exists, no receipt for that service exists. However, an entry to account is required for the receipt stage. Therefore, the debit account defaults as if you inserted a purchase order line (or a purchase requisition line).

Additional transactions for materials

If the item is a material to be issued on receipt, any change in the item cost is accounted for by writing entries to both the MATRECTRANS and MATUSETRANS tables. The accounts default as if inserting a purchase requisition line. If the materials are charged to a work order, the actual materials cost is also updated.

Example

You approve an invoice for 20 bearings at CAD3.30 each. The base currency is US dollars, and the exchange rate is currently CAD5.00 per USD1.00. At the point of receipt, the item price is only CAD3.00, and the exchange rate is CAD6.00 per USD1.00.

At receipt, the bearings are CAD3.00 = USD0.50 each.

At invoice approval, the bearings are CAD3.30 = USD0.66 each.

The following record, ISSUETYPE = INVOICE, is written to both the MATRECTRANS and MATUSETRANS tables.

Table 1. Source of GL account for MATRECTRANS and MATUSETRANS

GL account source	Debit	Credit	GL account source
Debit account established upon insertion of invoice line = PO line debit Account	$(\$0.66 - \$0.50) \times 20 =$ \$3.20	$(\$0.66 - \$0.50) \times 20 =$ \$3.20	PO line credit account = Company RBNI account

If Issue on Receipt? = Y

MATUSETRANS.GLDEBITACCT ← INVOICECOST.GLDEBITACCT ← POLINE.GLDEBITACCT

MATUSETRANS.GLCREDITACCT ← INVOICECOST.GLCREDITACCT ← POLINE.GLCREDITACCT

For Service

SERVRECTRANS.GLDEBITACCT ← INVOICECOST.GLDEBITACCT ← POLINE.GLDEBITACCT

SERVRECTRANS.GLCREDITACCT ← INVOICECOST.GLCREDITACCT ← POLINE.GLCREDITACCT

Tax transactions

An invoice can include tax. If so, in addition to the transaction of TRANSTYPE = TOTAL, a transaction is written to the INVOICETRANS table with TRANSTYPE = TAXn, where $1 \leq n \leq 27$. The value of n depends on which tax type you selected for the tax in the Chart of Accounts application.

Pay tax to vendor example 1

Approve an invoice for 20 bearings at \$0.50 each, plus tax of \$0.75.

If the tax is of type Tax 1, the following tax transactions are written: TRANSTYPE = TAX1 to INVOICETRANS.

Table 1. Source of GL account for pay tax to vendor

GL account source	Debit	Credit	GL account source
Paid Tax GL account	\$0.75	\$0.75	Company RBNI account

Pay tax to vendor example 2

Additionally, there is an option to add taxes to the cost of the item. When you choose this option and Pay Tax to Vendor is true, a single transaction of TRANSTYPE=TOTAL is written to the INVOICETRANS table. A tax type transaction is not written in this scenario.

If Tax Paid to Vendor (Pay Tax to Vendor? = Y) and if Tax is of Type Tax n , where $1 \leq n \leq 27$

INVOICETRANS.GLDEBITACCT \leftarrow INVOICE.TAXnGL \leftarrow TAXTYPE.INCLUSIVEGL

INVOICETRANS.GLCREDITACCT \leftarrow COMPANIES.RBNIACC \leftarrow COMPANYACCDEF.RBNIACC (where TYPE = type of vendor company)

Do not pay tax to vendor example 1

Approve an invoice for 20 bearings at \$0.50 each, plus tax of \$0.75.

If the tax is of type Tax 1, a tax transaction is written with TRANSTYPE = TAX1 to INVOICETRANS.

Table 2. Source of GL account for do not pay tax to vendor

GL account source	Debit	Credit	GL account source
Paid Tax GL Account	\$0.75	\$0.75	Unpaid Tax GL account

Do not pay tax to vendor example 2

When you can add tax to items and Pay Tax to Vendor is false, two transactions are written to the INVOICETRANS table:

- TRANSTYPE=TAX n , where $1 \leq n \leq 27$
- TRANSTYPE=TOTAL

Approve an invoice for 20 bearings at \$0.50 each, plus tax of \$0.75.

If the tax is of type Tax 1, a tax transaction is written with TRANSTYPE = TAX1 to INVOICETRANS.

Table 3. Source of GL account for do not pay tax to vendor

GL account source	Debit	Credit	GL account source
Company RBNI account	\$0.75	\$0.75	Unpaid Tax GL account

If Tax Paid Directly to Authority (Pay Tax to Vendor? = N) and if Tax is of Type Tax n , where $1 \leq n \leq 27$.

INVOICETRANS.GLDEBITACCT \leftarrow INVOICE.TAXnGL \leftarrow TAXTYPE.EXCLUSIVEGL

INVOICETRANS.GLCREDITACCT \leftarrow TAXTYPE.INCLUSIVEGL

Cost variance transactions

If time lapses between receiving the item and approving the invoice, the cost associated with the invoice line might differ from the cost of the item at receipt.

Both the resulting transactions and the transaction tables to which they are written vary in accordance with several factors. Also, if you purchased the item for a storeroom, the variance based is accounted for on the source of the cost change, including the following potential sources:

- The cost on the invoice is different from the cost at receipt
- The exchange rate changes between the time of receipt and invoice approval

With any cost variance, a transaction is written to either MATRECTRANS or SERVRECTRANS, depending on whether the item is material or service. As with records written to PRLINE and POLINE, the source of the accounts varies, depending on the nature of the item and on the planned use for the item.

In addition, a currency variance and invoice cost variance transactions might be written to INVOICETRANS.

- **Variance for materials**

If the invoice line is for materials, the total exchange rate gain or loss is calculated related to the line. This amount is combined with the total variance due to cost changes related to the same invoice line. One transaction is written for both currency variance and invoice cost variance to the MATRECTRANS table (and to the MATUSETRANS table, if set to Issue on Receipt on the purchase order line). Both the debit and credit accounts default as if you inserted a receipt line for a purchase order. In addition, if variances are tracked separate transactions can be written for each type of variance to the INVOICETRANS table.

- **Cost variance transaction case study 1**

A transaction is written to the MATRECTRANS table or the INVOICETRANS table, or both, for the entire variance. The value of UPDATEINVENTORY in MAXVARS is 1, the default, and the quantity of the item on the invoice is less than or equal to the current balance of the item in the storeroom at the time of invoice approval.

- **Cost variance transaction case study 2**

A transaction is written to the MATRECTRANS table or the INVOICETRANS table, or both, for the entire variance. The value of UPDATEINVENTORY in MAXVARS is 1, the default, and the quantity of the item on the invoice is greater than the current balance of the item in the storeroom at the time of invoice approval.

- **Cost variance transaction case study 3**

A transaction is written to the MATRECTRANS table or the INVOICETRANS table, or both, for the entire variance. The value of UPDATEINVENTORY in MAXVARS is 0 and the average cost is not updated.

- **Variances for services**

If the line item is a service, any changes are tracked to the item cost by writing an entry to the SERVRECTRANS table. The accounts default as if a purchase requisition line was being inserted. Furthermore, if the service is associated with a work order, the actual service cost is updated for the work order.

- **Service not charged to store**

You receive an invoice for a service that required 2 hours at a rate of CAD3.30 per hour. The base currency is US dollars, and the exchange rate is currently CAD5.00 per USD1.00. At the point of receipt, the item price is only CAD3.00, and the exchange rate is CAD6.00 per USD1.00.

- **Service charged to store**

The debit account for the transaction to the SERVRECTRANS table is the rotating suspense account of the asset that was serviced. Otherwise, this

transaction works exactly as if the invoice is for a service where the Charge to Store check box is clear.

Variance for materials

If the invoice line is for materials, the total exchange rate gain or loss is calculated related to the line. This amount is combined with the total variance due to cost changes related to the same invoice line. One transaction is written for both currency variance and invoice cost variance to the MATRECTRANS table (and to the MATUSETRANS table, if set to Issue on Receipt on the purchase order line). Both the debit and credit accounts default as if you inserted a receipt line for a purchase order. In addition, if variances are tracked separate transactions can be written for each type of variance to the INVOICETRANS table.

If you purchased the item for inventory (not for issue on receipt), any cost variances are accounted for based on two determining factors:

- The quantity of an item on the invoice, relative to the current balance of the item in the storeroom at the time of invoice approval
- The value of UPDATEINVENTORY in MAXVARS

If many items are issued or transferred out since receipt, the current balance at invoice approval time might be less than the invoice quantity.

Cost variance transaction case study 1

A transaction is written to the MATRECTRANS table or the INVOICETRANS table, or both, for the entire variance. The value of UPDATEINVENTORY in MAXVARS is 1, the default, and the quantity of the item on the invoice is less than or equal to the current balance of the item in the storeroom at the time of invoice approval.

UPDATEINVENTORY = 1 (the default) and Invoice Quantity \leq Current® Balance

For the items remaining in inventory, the average cost of the item is updated to reflect the per unit variance by writing a transaction of TRANSTYPE = INVOICE to the MATRECTRANS table for the amount in inventory.

In this example, you approve an invoice for 20 bearings at CAD3.30 each. The base currency is US dollars, and the exchange rate is currently CAD5.00 per USD1.00. At the point of receipt, the item price is only CAD3.00, and the exchange rate is CAD6.00 per USD1.00.

At receipt, the bearings are CAD3.00 = USD0.50 each.

At invoice approval, the bearings are CAD3.30 = USD0.66 each.

Average cost change

Originally, 10 items were in the storeroom at \$0.50 each. Upon receipt, there are 30 items at \$0.50 each for a total value of \$15.00. Upon invoice approval, the value increases by \$3.20 to \$18.20. The average cost is \$18.20 divided by 30 = \$0.61.

If you capitalize this item, the average cost in the storeroom changes. If the item you capitalized has a zero cost in the storeroom before you approve the invoice, it has a positive cost after you approve the invoice.

Table 1. Source of GL account for invoice cost variance transaction

GL account source	Debit	Credit	GL account source
Debit account established upon insertion of invoice line = Purchase order line debit account	$(\$0.66 - \$0.50) \times 20$ = \$3.20	$(\$0.66 - \$0.50) \times 20$ = \$3.20	Purchase order line credit account = company RBNI account

Cost variance transaction case study 2

A transaction is written to the MATRECTRANS table or the INVOICETRANS table, or both, for the entire variance. The value of UPDATEINVENTORY in MAXVARS is 1, the default, and the quantity of the item on the invoice is greater than the current balance of the item in the storeroom at the time of invoice approval.

UPDATEINVENTORY = 1 (the default) and Invoice Quantity $>$ Current® Balance

For the items remaining in inventory, the average cost of the item is updated to reflect the per unit variance by writing a transaction of TRANSTYPE = INVOICE to the MATRECTRANS table for the amount in inventory.

A transaction of TRANSTYPE = INVCEVAR is written to the INVOICETRANS table for the items that you issued out of the storeroom. This transaction is written after you received the item, but before you approve the invoice.

If a change in the exchange rate caused any of the remaining variance, a transaction of TRANSTYPE = CURVAR is written to the INVOICETRANS table for the remainder of the currency variance.

For this example, assume that you already have 10 bearings currently in inventory. You receive 20 bearings into your inventory, when the exchange rate is CAD3.00 = USD0.50.

When the exchange rate changes to CAD3.00 = USD0.60, you issue all 10 of the items that were already in inventory plus four of the 20 bearings that you recently received.

When you receive the invoice for the 20 bearings, the exchange rate is CAD3.30 = USD0.66.

Average cost change

Each of the 20 bearings you ordered is now worth \$0.16 more at invoice than at receipt. Of those 20 items, four have already been issued from the storeroom.

Instead of taking the \$3.20 ($20 \times \$0.16 = \3.20) and allocating it among the 16 remaining items, which would create a \$0.20 increase per item, the average cost of the storeroom is maintained correctly by increasing the average cost of each item by \$0.16 to \$0.66.

Upon invoice approval, the 16 bearings remaining in the storeroom are accounted for by debiting the inventory control account and crediting the RBNI account by $16 \times \$0.16 = \2.56 . Also, the invoice cost variance account is debited and the company RBNI account is credited $4 \times \$0.16$ for the already issued four bearings.

Table 1. Source of GL account for average price change

GL account source	Debit	Credit	GL account source
Inventory Control Account	$16 \times \$0.16 = \2.56	$16 \times \$0.16 = \2.56	Company RBNI account

The remaining amount of $\$3.20 - \$2.56 = \$0.64$ is allocated between the currency variance and invoice cost variance accounts through the following transactions that are written to the INVOICETRANS table.

If you capitalize this item, the average cost in the storeroom changes. If the capitalized item has a cost of \$0.00 in the storeroom before you approve the invoice, it has a positive cost after you approve the invoice.

Currency variance transaction

Here, we must control for the cost variable. The cost on receipt was $\text{CAD}3.00 = \text{US}0.50$. If the cost at invoice had been $\text{CAD}3.00$, as opposed to $\text{CAD}3.30$, the cost per bearing at invoice would have been $\text{CAD}3.00 = \$0.60$. Four invoice items are no longer in the storeroom.

Table 2. Source of GL account for currency variance transaction

GL account source	Debit	Credit	GL account source
Currency variance account	$(\$0.60 - \$0.50) \times 4 = \$0.40$	$(\$0.60 - \$0.50) \times 4 = \$0.40$	Company RBNI account

If the item is capitalized, the credit account is the inventory control account and not the capital GL account.

Invoice cost variance transaction

In this transaction, we must control the exchange rate variable. If the exchange rate at receipt is the same as the invoice exchange rate, the cost per bearing at receipt is $\text{CAD}3.00 = \text{USD}0.60$ (not \$0.50). The cost at invoice was $\text{CAD}3.30 = \text{USD}0.66$. Four items are no longer in the storeroom.

Variance accounts track cost variances by storeroom location, not by item.

Table 3. Source of GL account for invoice cost variance transaction

GL account source	Debit	Credit	GL account source
Invoice Cost Variance account of Storeroom	$(\$0.66 - \$0.60) \times 4 = \$0.24$	$(\$0.66 - \$0.60) \times 4 = \$0.24$	Company RBNI account

The \$0.64 variance for the four items in inventory consists of a \$0.40 currency variance and a \$0.24 cost variance.

Even if the item is capitalized, the credit account is the inventory control account, not the capital GL account.

Cost variance transaction case study 3

A transaction is written to the MATRECTRANS table or the INVOICETRANS table, or both, for the entire variance. The value of UPDATEINVENTORY in MAXVARS is 0 and the average cost is not updated.

A change in the exchange rate causes TRANSTYPE = CURVAR to be written to the INVOICETRANS table for that portion of the total variance.

A change in the cost in the foreign currency causes TRANSTYPE = INVCEVAR to be written to the INVOICETRANS table for that portion of the total variance.

Both the preceding overview and the following example apply to both capitalized and non-capitalized items.

In this example, you approve an invoice for 20 bearings at $\text{CAD}3.30$ each. The base currency is US dollars, and the exchange rate is currently $\text{CAD}5.00$ per $\text{USD}1.00$. At the point of receipt, the item price is only $\text{CAD}3.00$, and the exchange rate is $\text{CAD}6.00$ per $\text{USD}1.00$.

At receipt, the bearings are $\text{CAD}3.00 = \text{USD}0.50$ each.

At invoice approval, the bearings are $\text{CAD}3.30 = \text{USD}0.66$ each.

Currency variance transaction

The cost on receipt is $\text{CAD}3.00 = \text{USD}0.50$. If the cost at invoice is $\text{CAD}3.00$, as opposed to $\text{CAD}3.30$, the cost per bearing at invoice is $\text{CAD}3.00 = \text{USD}0.60$. The CURVAR transaction is written to the INVOICETRANS table.

Table 1. Source of GL account for currency variance transaction

GL account source	Debit	Credit	GL account source
Currency variance account	$(\$0.60 - \$0.50) \times 20 = \$2.00$	$(\$0.60 - \$0.50) \times 20 = \$2.00$	Inventory control account

Even if the item is a capitalized item, the credit account is the inventory control account, not the capital GL account.

Invoice cost variance transaction

For this transaction, you control the exchange rate variable. If the exchange rate at receipt is the same as the invoice exchange rate, the cost per bearing at receipt is CAD3.00= USD0.60 (not USD0.50). The cost at invoice was CAD3.30= USD0.66. The INVCEVAR transaction is written to INVOICETRANS.

Variance accounts track cost variances by storeroom location, not by item.

Table 2. Source of GL account for invoice cost variance transaction

GL account source	Debit	Credit	GL account source
Invoice Cost Variance account of Storeroom	$(\$0.66 - \$0.60) \times 20 = \$1.20$	$(\$0.66 - \$0.60) \times 20 = \$1.20$	Inventory Control account

The \$3.20 variance for the 20 items on the invoice is made of a \$2.00 currency variance and a \$1.20 cost variance.

Even if the item is capitalized, the credit account is the inventory control account, not the capital GL account.

Variations for services

If the line item is a service, any changes are tracked to the item cost by writing an entry to the SERVRECTRANS table. The accounts default as if a purchase requisition line was being inserted. Furthermore, if the service is associated with a work order, the actual service cost is updated for the work order.

Service not charged to store

You receive an invoice for a service that required 2 hours at a rate of CAD3.30 per hour. The base currency is US dollars, and the exchange rate is currently CAD5.00 per USD1.00. At the point of receipt, the item price is only CAD3.00, and the exchange rate is CAD6.00 per USD1.00.

At receipt, the hourly rate is CAD3.00 = USD0.50.

If no exchange rate change occurs, the hourly rate at invoice approval is CAD3.30 = USD0.55. However, the exchange rate changed to CAD5.00 per USD1.00. Therefore, at invoice approval, the hourly rate is CAD3.30 = USD0.66.

The following transaction is written to the SERVRECTRANS table:

Table 1. Source of GL account for service not charged to store

GL account source	Debit	Credit	GL account source
1. If issued to a work order, uses work order GL account	$(\$66.00 - \$50.00) \times 2 = \$32.00$	$(\$66.00 - \$50.00) \times 2 = \$32.00$	Company RBNI account
2. If issued to asset, uses asset GL account			
3. If issued to asset, uses GL account of asset location			

Service charged to store

The debit account for the transaction to the SERVRECTRANS table is the rotating suspense account of the asset that was serviced. Otherwise, this transaction works exactly as if the invoice is for a service where the Charge to Store check box is clear.

In addition, if UPDATEINVENTORY = 1, the database inventory cost of the rotating asset is updated.

Transactions resulting from the distribute costs process

Recall the following conditions that determine distribute costs:

- The invoice line has a purchase order line number specified
- You received the line and distributed the costs to another GL account

At invoice approval, the corresponding entries to the GL account are made depending upon the invoice line item:

- If the invoice line item is a material, the transaction is written to the MATRECTRANS table.
- If the invoice line item is a service, the transaction is written to the SERVRECTRANS table.

The costs can be distributed for only material line items when you select the Issue on Receipt check box. At the approve invoices stage, consider any lines that the user inserts on the Distribute Costs window as new invoice lines that need the receipt transaction.

Scenario

Suppose that originally, as a result of your receiving 20 bearings at \$0.50 each, the following transaction is written to the MATRECTRANS table.

Table 1. Source of GL account for service charged to store

GL account source	Debit	Credit	GL account source
1111-111-111 (Purchase order line debit account)	$20 \times \$0.50 = \10.00	$20 \times \$0.50 = \10.00	3333-333-333 (Purchase order line credit account)

Later, you decide that to charge 20% of the cost to account 2224-111-111, as, perhaps, two bearings went to a different location than planned.

Using the distribute costs process, you back out the invoice line corresponding to that receipt. On the Distribute Cost window, you distribute the cost. Upon invoice approval, the following transactions are written to the MATRECTRANS table. The account codes are the codes you entered on the Distribute Costs window.

Table 2. Source of GL account for MATRECTRANS table

GL account source	Debit	Credit	GL account source
1111-111-111 (Purchase order line debit account)	-\$10.00	-\$10.00	3333-333-333 (Purchase order line credit account)
1111-111-111 (Purchase order line debit account)	\$8.00	\$8.00	3333-333-333 (Purchase order line credit account)
2224-111-111 (Defaults as if receiving the item)	\$2.00	\$2.00	(Defaults as if receiving the item)

Financial processes in the Resources module

Various financial processes occur in the Labour application.

- [Financial processes in the Labor application](#)
Various financial processes occur in the Labor application.

Financial processes in the Labor application

Various financial processes occur in the Labor application.

If the rate records associated with a labor are internal labor rates, they typically receive one set of default GL accounts. If they are external labor rates, they receive another set of default GL accounts.

Database Fields	Content
Database fields for internal labor rates	LABORCRAFTRATE.GLACCOUNT ⇐ ACCOUNTDEFAULTS.GLDEFAULT (where DFLTGROUP = LABRESCODE and GROUPVALUE = 0) (Labor Resource field for Outside? = N on Labor Resource Codes window in the Chart of Accounts application) ⇐ direct entry (no default) LABORCRAFTRATE.CONTROLACC ⇐ LOCATIONS.INTLABREC (where the LOCATION = LABOR.WORKLOCATION and SITE=LABOR.WORKSITE)
Database fields for external labor rates	LABORCRAFTRATE.GLACCOUNT ⇐ ACCOUNTDEFAULTS.GLDEFAULT (where DFLTGROUP = LABRESCODE and GROUPVALUE = 1) (Labor Resource field for Outside? = Y on Labor Resource Codes window in the Chart of Accounts application) ⇐ direct entry (no default) LABORCRAFTRATE.CONTROLACC ⇐ ACCOUNTDEFAULTS.GLDEFAULT (where DFLTGROUP = EXLABREC and GROUPVALUE = vendor name) (Control Account field for associated vendor field on External Labor Control Accounts window in the Chart of Accounts application) ⇐ direct entry (no default)

Financial processes in the Service Desk module

Various financial processes occur in the Service Requests, Incidents, and Problems applications.

- [Financial processes in the Service Requests, Incidents, and Problems applications](#)
Various GL account rules are used for starting and stopping the timer in the Service Requests, Incidents, or Problems applications.

Financial processes in the Service Requests, Incidents, and Problems applications

Various GL account rules are used for starting and stopping the timer in the Service Requests, Incidents, or Problems applications.

- [Capturing time spent on a ticket](#)
Start and stop the timer to capture the time spent on a ticket.

Capturing time spent on a ticket

Start and stop the timer to capture the time spent on a ticket.

There are various GL account rules after you start the timer.

Displayed fields	GL Account (GLACCOUNT) ⇐ GL Control Account field (displayed), normal validation rules for GL accounts apply.
	GL Account (GLACCOUNT) ⇐ GL Control Account field (not displayed).

The following table describes which GL account rules apply when the GL Control Account field is not shown on the ticket.

Table 1. GL account rules without general ledger control account field on ticket

If asset or location...	and the site and asset site are...	use the GL account...
not on the ticket	equal or not equal	from the Labor record of the user running the application as the LABTRANS (GL) default. If the GL account does not exist, the global ticket GL account is used as the LABTRANS (general ledger) default.
on ticket	not equal	the asset or location generates the LABTRANS (general ledger) record. If asset or location do not have an associated GL account, the GL account from the labor record of the user running the application is used as the LABTRANS (general ledger) default. If the labor record does not have a valid GL account, the global ticket GL account is used as the LABTRANS (general ledger) default.
both on ticket	equal	as determined by existing asset or location merging rules. If asset and location do not have associated GL accounts, the GL account from the labor record of the user running the application is used as the LABTRANS (general ledger) default. If the labor record does not have a valid GL account, the global ticket GL account is used as the LABTRANS (general ledger) default.

Financial processes in the Work Orders module

Various financial processes occur in the Work Order Tracking, Quick Reporting, and Labor Reporting applications.

- [Financial processes in the Work Order Tracking application](#)
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- [Financial processes in the Quick Reporting application](#)
Various financial processes occur in the Quick Reporting application.
- [Financial process in the Labor Reporting application](#)
Various financial processes occur in the Labor Reporting application.

Financial processes in the Work Order Tracking application

Various financial processes occur in the Work Order Tracking application.

- [Report actual material use](#)
The financial processes used in the tracking of actual quantities, locations, and cost for items used on an approved work order.
- [Report actual labor use](#)
The financial processes used in the tracking of actual labor hours that were required to complete the work order.
- [Report actual tool use](#)
The financial processes used in the tracking of actual quantities, hours, and rates for tools used on an approved work order.

Report actual material use

The financial processes used in the tracking of actual quantities, locations, and cost for items used on an approved work order.

The date and time in the Actual Date field are used to determine the financial period for the transaction. The Actual Date field defaults to the system date and time.

After you enter and save material use information, a record is written, ISSUETYPE = ISSUE, to the MATUSETRANS table. The quantity is posted as a negative value.

Example

Report use of 20 bearings (item type = BEARINGS), that costs \$0.20 per piece, on the Materials subtab on the Actuals tab in Work Order Tracking application.

Table 1. Source of GL account for report actual material use

Source of GL account	Debit	Credit	Source of GL account
1. Inventory GL account (item resource code)	-20 x \$0.20 = \$4.00	-20 x \$0.20 = \$4.00	Inventory control account
2. Work order GL account			

If the item is capitalized, the default credit account is the capital GL account, and the line cost is zero.

If Issue Type field is set to RETURN

After you enter and save material use information, the ISSUETYPE = RETURN record is written to the MATUSETRANS table. The quantity is written as a positive value.

Example

Report return of 20 bearings (item type = BEARINGS), that costs \$0.20 each, on the Materials subtab on the Actuals tab in the Work Order Tracking application.
 Table 2. Source of GL account for report actual material use

Source of GL account	Debit	Credit	Source of GL account
1. Inventory GL account (item resource code)	20 x \$0.20 = - \$4.00	20 x \$0.20 = - \$4.00	Inventory control account
2. Work order GL account			

If the item is capitalized, the default debit account is the capital GL account and the line cost is zero.

The general ledger fields for actual material use that is reported or viewed in Work Orders application default just as they do when the usage is recorded or viewed in the Inventory application or the Issues and Transfers application.

Report actual labor use

The financial processes used in the tracking of actual labor hours that were required to complete the work order.

At the transaction level, reporting actual labor use by labor code or craft works just as it does when using the Labor Reporting application to report labor use.

The date and time in the Actual Date field is used to determine the financial period for the transaction. The Actual Date field defaults to the system date and time.

The general ledger fields for actual labor use that is reported or viewed in the Work Orders application default just as they do when the usage is recorded or viewed in the Labor Reporting application.

Report actual tool use

The financial processes used in the tracking of actual quantities, hours, and rates for tools used on an approved work order.

Internal tools

You can enter a date and time to determine the financial period for the transaction. If you do not enter a date and time, it defaults to system date and time.

Example

Table 1. Source of GL account for report actual tool use (internal tools)

Source of GL account	Debit	Credit	Source of GL account
1. Internal tools GL account (resource code)	2 x \$5.00 = \$10.00	2 x \$5.00 = \$10.00	Internal tools control account
2. Work order GL account			
Displayed field	GL Debit Account (GLDEBITACCT) ⇐ 1. GL Account field in the Tool / Organization Details action of the Tools application ⇐ Internal Tool Resource Code field from the Resource Codes action in the Chart of Accounts application. 2. GL Account field in the Work Orders application. The general ledger fields for actual material use that is reported or viewed in the Work Orders application default just as they do when the usage is recorded or viewed in the Inventory application or the Issues and Transfers application. GL Credit Account (GLCREDITACCT) ⇐ Control Account field in the Tool / Organization Details action of the Tools application ⇐ Control Account field in the Organization Default Accounts action of the Chart of Accounts application		
Database fields	TOOLTRANS.GLDEBITACCT ⇐ 1. ITEMORGINFO.GLACCOUNT ⇐ ACCOUNTDEFAULTS.GLDEFAULT (where DFLTGROUP = TOOLRESCODE and GROUPVALUE = 0) ⇐ direct entry (no default) 2. WORKORDER.GLACCOUNT ⇐ PM.GLACCOUNT or ASSET.GLACCOUNT or LOCATIONS.GLACCOUNT TOOLTRANS.GLCREDITACCT ⇐ ITEMORGINFO.CONTROLACC ⇐ ACCOUNTDEFAULTS.GLDEFAULT (where DFLTGROUP = TOOLREC and GROUPVALUE = TOOLREACCT) ⇐ direct entry (no default)		

External tools

Report external tool use the same as you report internal tool use. If the Outside check box of the tool is selected, the external tool resource code is used on the debit side, and the external tools control account, established by tool vendor, on the credit side.

After entering and saving the tool use information, a record is written to the TOOLTRANS table.

You can enter a date and time to determine the financial period for the transaction. If you do not enter a date and time, it defaults to system date and time.

Example

Report the use of hoist for 2 hours, at \$7.00 an hour, belonging to a contractor, on the Tools subtab in the Actuals tab in the Work Order Tracking application.

Table 2. Source of GL account for report actual tool use (external tools)

Source of GL account	Debit	Credit	Source of GL account
1. External tools GL account (resource code) 2. Work order GL account	2 x \$7.00 = \$14.00	2 x \$7.00 = \$14.00	External tools control account, for tool vendor
Displayed fields	GL Debit Account (GLDEBITACCT) ← 1. GL Account field in the Tool / Organization Details action of the Tools application ← External Tool Resource Code field from the Resource Codes action in the Chart of Accounts application. 2. GL Account field in the Work Orders application. The general ledger fields for actual material use that is reported or viewed in the Work Orders application default just as they do when the usage is recorded or viewed in the Inventory application or the Issues and Transfers application. GL Credit Account (GLCREDITACCT) ← Control Account field in the Tool / Organization Details action of the Tools application ← Tool Control Account field for the vendor in the Companies application.		
	TOOLTRANS.GLDEBITACCT ← 1. ITEMORGINFO.GLACCOUNT ← ACCOUNTDEFAULTS.GLDEFAULT (where DFLTGROUP = TOOLRESCODE and GROUPVALUE = 1 ← direct entry (no default) 2. WORKORDER.GLACCOUNT ← PM.GLACCOUNT or ASSET.GLACCOUNT or LOCATIONS.GLACCOUNT TOOLTRANS.GLCREDITACCT ← ITEMORGINFO.CONTROLACC ← COMPANIES.TOOLCONTROLACCOUNT ← direct entry (no default)		

Financial processes in the Quick Reporting application

Various financial processes occur in the Quick Reporting application.

The GL Account field in this application populates just as it does in Work Order Tracking application.

In the Quick Reporting application, you can perform the following actions:

- Move or modify assets, or both
- Report actual labor use
- Report actual material use
- Report actual tool use

These processes are identical to the processes in the Work Order Tracking application.

Financial process in the Labor Reporting application

Various financial processes occur in the Labor Reporting application.

You can report actual labor usage and see the transaction records of actual labor usage. You can also report this information in the Work Order Tracking application.

You can edit the GL Debit Account field and the GL Credit Account field when reporting labor usage. After you save your edits, the transaction is recorded and all fields become read-only.

- [Work types](#)
The general ledger fields default in the same manner for all work types.
- [Report labor use](#)
Describe the financial transactions in the Labor Reporting application that cause GL account transactions to be written.

Work types

The general ledger fields default in the same manner for all work types.

There are three work types:

- NON-WORK (including Sick (SICK) and Vacation (VAC))
- OT-REF (overtime refused)
- WORK (including Travel (TRAV) and Waiting on Material (WMATL))

Reporting work types

To report WORK, enter any one of the following items in the general ledger fields:

- Asset number
- General ledger debit account
- Operating location

- Work order number

If you enter the work order number, asset number, or operating location, a value defaults to the general ledger debit account field.

To report NON-WORK and OT-REF, you leave the following fields blank:

- General ledger debit account
- Work order
- Asset
- Operating location

If you do not specify a general ledger debit account, that field is remains blank.

Displayed fields

GL Debit Account (GLDEBITACCT) ⇐

1. GL Account field (not displayed) in Labor ⇐ Labor Resource field (for Vendor = Null or for Vendor = Not Null) on Labor Resource Codes window in the Chart of Accounts application
2. GL Account field in the Work Orders application
3. GL Account field (not displayed) in the Asset window
4. GL Account field in the Locations window

GL Credit Account (GLCREDITACCT) ⇐

- Control Account field (not displayed) in Labor ⇐ Control Account field for Work Location on Internal Labor Control Accounts window in the Chart of Accounts application

Or

- GL Debit Account field from purchase order line on PO Lines window in the Purchase Orders application

Database fields

LABTRANS.GLDEBITACCT ⇐

1. LABORCRAFTRATE.GLACCOUNT ⇐ ACCOUNTDEFAULTS.GLDEFAULT (where DFLTGROUP = LABRESCODE and GROUPVALUE = 0 or GROUPVALUE = 1)
2. WORKORDER.GLACCOUNT
3. ASSET.GLACCOUNT
4. LOCATIONS.GLACCOUNT

LABTRANS.GLCREDITACCT ⇐ LABOR.CONTROLACC ⇐ LOCATIONS.INTLABREC

⇐ ACCOUNTDEFAULTS.GLDEFAULT (where DFLTGROUP = EXLABREC and GROUPVALUE = vendor name) or

If LABTRANS.PONUM is not null, LABTRANS.GLCREDITACCT ⇐ POLINE.DEBITGLACCT (where LABTRANS.PONUM = POLINE.PONUM and LABTRANS.POLINENUM = POLINE.POLINENUM)

Report labor use

Describe the financial transactions in the Labor Reporting application that cause GL account transactions to be written.

Report labor use for internal resources

The Labor Reporting application lets you report actual labor use and see the transaction records of previously reported actual labor use. You can also use the Work Order Tracking application. You can edit the GL Debit Account field and the GL Credit Account field when you report labor use before you save the record. After the transaction is recorded, all fields become read-only.

The general ledger fields default in the same manner for all three work types:

- NON-WORK (including SICK and VAC)
- OT-REF
- WORK (including TRAV and WMATL)

In order to report use of type WORK, enter any of the following items:

- A general ledger debit account
- A work order number
- An asset number
- An operating location

In the cases of NON-WORK and OT-REF, you can report usage without entering this data. If you do not enter a work order number, asset number, or location, the GL Debit Account field does not default to anything. In such cases, you enter a code in the GL Credit Account field.

Primary transaction

When you save a record after reporting actual labor use, a record of type WORK is written to the LABTRANS table.

You can enter a date and time to determine the financial period for the transaction. If you do not enter a date and time, it defaults to system date and time.

Example

Joe Jones works for 2 hours at a rate of \$15.00 per hour.

Table 1. Source of general ledger code for report labor use for internal resources

Source of GL account	Debit	Credit	Source of GL account
1. Internal labor GL account (resource code)	\$15.00 x 2 = \$30.00	\$15.00 x 2 = \$30.00	Internal labor control account of work location
2. Work order GL account			
3. Asset GL account			
4. Operating location GL account			

The table lists general ledger sources in order of priority. For example, the labor resource account code overrides any defined segment in the same position of the work order GL account, which, if present, overrides the asset GL account which overrides any segments in the same position from the GL account of the location.

Report labor use for external resources

You report external labor usage similarly to how you report internal labor usage.

When you save a record after reporting actual labor use, a record of type WORK (or a synonym) is written to the LABTRANS table.

The date and time that you enter is used in the Daily Time table to determine the financial period for the transaction. If you do not enter a date and time it defaults to the system date and time.

Example 1

Bill Smith works for 2 hours at a rate of \$15.00 per hour. A vendor provides Bill's services.

Table 2. Source of general ledger code for report labor use for external resources

Source of GL account	Debit	Credit	Source of GL account
1. External labor GL account (resource code)	\$15.00 x 2 = \$30.00	\$15.00 x 2 = \$30.00	External labor control account for the vendor
2. Work order GL account			
3. Asset GL account			
4. Operating location GL account			

Example 2

Bill Smith works for 2 hours at a rate of \$15.00 per hour. A vendor provides Bill's services, but the following example has an outstanding purchase order for those services.

Table 3. Source of general ledger code for report labor use for external resources

Source of GL account	Debit	Credit	Source of GL account
1. External labor GL account (resource code)	\$15.00 x 2 = \$30.00	\$15.00 x 2 = \$30.00	Purchase order lines general ledger debit account.
2. Work order GL account			
3. Asset GL account			
4. Operating location GL account			

The table lists general ledger sources in order of priority. For example, the labor resource account code overrides any defined segment in the same position of the work order GL account, which overrides the asset GL account, if present, which overrides any segments in the same position from the GL account of the operating location.

The general ledger debit account of the purchase order for the external service order is assumed to be a temporary charge account; receiving the service in the Labor Reporting application clears the charge in the temporary account and charges the correct debit account.

General ledger database columns

The table in this appendix lists the GL account columns found in user applications. It shows the application, table, and column name for each column. The table also indicates whether you must fully specify the GL account.

The GL account specification required (fully or partially) column indicates whether the general ledger database column, and its corresponding field on a tab, require a fully specified account, or whether a partially specified account is acceptable.

A fully specified account has an account code in each required component, for example, 6100-350-SAF. A partially specified account has placeholder characters for one or more account components, for example, 6100-???-SAF.

Table 1. General ledger database column definitions

Application	Table	Column name	GL account specification required (fully or partially)
CHRTACCT	TAX	EXCLUSIVEGL	Fully

Application	Table	Column name	GL account specification required (fully or partially)
CHRTACCT	TAX	INCLUSIVEGL	Fully
CHRTACCT	TAXTYPE	EXCLUSIVEGL	Fully
CHRTACCT	TAXTYPE	INCLUSIVEGL	Fully
COMPANY	COMPANIES	APCONTROLACC	Fully
COMPANY	COMPANIES	APSUSPENSEACC	Fully
COMPANY	COMPANIES	RBNIACC	Fully
COMPANY	COMPANIES	APCONTROLACC	Fully
ASSET	ASSETTRANS	GLDEBITACCT	Partially
ASSET	ASSETTRANS	GLCREDITACCT	Partially
ASSET	ASSET	GLACCOUNT	Partially
ASSET	ASSET	ROTSUSPACCT	Fully
INVENTOR	INVCOST	CONTROLACC	Fully
INVENTOR	INVCOST	GLACCOUNT	Partially
INVENTOR	INVCOST	INVCOSTADJACC	Fully
INVENTOR	INVCOST	SHRINKAGEACC	Fully
INVENTOR	INVRESERVE	GLACCOUNT	Fully
INVENTOR	INVTRANS	GLCREDITACCT	Fully
INVENTOR	INVTRANS	GLDEBITACCT	Fully
INVENTOR	REORDER	CONTROLACC	Fully
INVENTOR	REORDER	GLACCOUNT	Fully
INVOICE	APTRANS	GLCREDITACCT	Fully
INVOICE	APTRANS	GLDEBITACCT	Fully
INVOICE	INVOICE	APCONTROLACC	Fully
INVOICE	INVOICE	APSUSPENSEACCT	Fully
INVOICE	INVOICE	TAX1GL	Fully
INVOICE	INVOICE	TAX2GL	Fully
INVOICE	INVOICE	TAX3GL	Fully
INVOICE	INVOICE	TAX4GL	Fully
INVOICE	INVOICE	TAX5GL	Fully
INVOICE	INVOICECOST	GLCREDITACCT	Fully
INVOICE	INVOICECOST	GLDEBITACCT	Fully
INVOICE	INVOICETRANS	GLCREDITACCT	Fully
INVOICE	INVOICETRANS	GLDEBITACCT	Fully
INVOICE	SCHARGES	GLDEBITACCT	Fully
LABOR	LABORCRAFTRATE	CONTROLACC	Fully
LABOR	LABORCRAFTRATE	GLACCOUNT	Partially
LABOR	LABTRANS	GLCREDITACCT	Fully
LABOR	LABTRANS	GLDEBITACCT	Fully
LOCATION	LOCATIONS	CONTROLACC	Fully
LOCATION	LOCATIONS	CURVARACC	Fully
LOCATION	LOCATIONS	GLACCOUNT	Partially
LOCATION	LOCATIONS	INVCOSTADJACC	Fully
LOCATION	LOCATIONS	INVOICEVARACC	Fully
LOCATION	LOCATIONS	PURCHVARACC	Fully
LOCATION	LOCATIONS	INVOICEVARACC	Fully
LOCATION	LOCATIONS	PURCHVARACC	Fully
LOCATION	LOCATIONS	RECEIPTVARACC	Fully
LOCATION	LOCATIONS	SHRINKAGEACC	Fully
PM	PM	GLACCOUNT	Partially
PO	POLINE	GLCREDITACCT	Fully
PO	POLINE	GLDEBITACCT	Before approval: partially On approval: fully
PR	PRLINE	GLCREDITACCT	Fully
PR	PRLINE	GLDEBITACCT	Before approval: partially On approval: fully
RECEIVING	MATRECTRANS	GLCREDITACCT	Fully
RECEIVING	MATRECTRANS	GLDEBITACCT	Fully
RECEIVING	MATRECTRANS	GLCREDITACCT	Fully
RECEIVING	MATRECTRANS	GLDEBITACCT	Fully
RFQ	RFQLINE	GLDEBITACCT	Fully
RFQ	RFQLINE	GLCREDITACCT	Fully
RFQ	RFQLINE	GLCREDITACCT	Fully
SERV	SERVRECTRANS	GLCREDITACCT	Fully

Application	Table	Column name	GL account specification required (fully or partially)
SERV	SERVRECTRANS	GLDEBITACCT	Fully
TOOL	TOOL	CONTROLACC	Fully
TOOL	TOOL	GLACCOUNT	Partially
TOOL	TOOLTRANS	GLCREDITACCT	Fully
TOOL	TOOLTRANS	GLDEBITACCT	Fully
WOTRACK	WORKORDER	GLACCOUNT	Partially
WOTRACK	WOSTATUS	GLACCOUNT	Partially

Implementing workflow processes

Workflow features let you automate repetitive business and record management processes. This provides a means for greater efficiency and accountability throughout your enterprise.

- [Workflow overview](#)
You use the Workflow application to plan, design, build, test, implement, and manage workflow processes. Workflow provides a means of electronically reproducing business processes so that they can be applied to records.
- [Configuring for Workflow](#)
Workflow applications require minimal configuration before you can create workflow processes.

Workflow overview

You use the Workflow application to plan, design, build, test, implement, and manage workflow processes. Workflow provides a means of electronically reproducing business processes so that they can be applied to records.

With workflow, you can manage the movement of a record through a process from start to finish. You can instruct individuals to act on records, specify delegates when workers are unavailable, ensure that individuals act in a timely manner, and ensure that an audit trail exists for each record and process.

Workflow is an integrated part of the software. Workflow processes and their supporting records are at the system level in a multisite implementation. Workflow processes can be used for all organizations and sites. You can design processes or subprocesses that are specific to an organization or specific to a site, by using logical branching.

You can create a workflow process for any business object. Because all the applications are associated with product business objects and can run a customer Java™ class, you can build workflow processes for any application, including cloned and custom applications.

Workflow handles assignments in a flexible manner. You can specify assignee relationships for assignments to create groups of active assignments at run time. Assignees can receive notifications of assignments in their Workflow Inbox or in their email inbox, eliminating the need for users to search for their assignments. Workers or administrators can reassign workflow tasks, stop a process instance, and remove a record from the control of Workflow. You can specify at what point in a process you want email notifications to be generated. Delegates can be specified when workers are unavailable.

A workflow process can run a program, such as a batch file or an .exe file that is stored on a local server in the system directory. A workflow process for one type of record can start a process for another type of record. For example, a service request can launch a process for an incident. A process can contain subprocesses. For example, for different subcategories of records, or records from different sites. When a process requires user interaction, the product can direct a user to a specific application, to a tab, or to an action.

- [Applications that are used with Workflow](#)
Workflow is used with other applications that directly or indirectly support its functionality.
- [Workflow design process](#)
Workflow processes can be designed to incorporate the most effective ways of completing business tasks. You can evaluate your current practices and determine how you can improve or standardize them before you design workflow processes.

Applications that are used with Workflow

Workflow is used with other applications that directly or indirectly support its functionality.

Actions

Create and manage actions and action groups. Actions are associated with connection lines in a workflow process and are triggered by the routing that moves a record from one node to another.

Communication Templates

Create and manage templates that the system uses when generating e-mail messages. Workflow uses communication templates for notifications.

Escalations

Create and manage escalation processes. An *escalation* is a mechanism that can monitor time-sensitive records and key performance indicators, which can take actions or send notifications when a record reaches a defined escalation point. Workflow can use escalations with task assignments.

Inbox/Assignments Setup

Configure the Workflow Inbox on the Start Center of a user.

People

Create and manage records for individuals who are listed on records in any capacity. Workflow uses person records when generating assignments and notifications.

Person Groups

Create and manage records for groups of individuals. Workflow uses person group records when generating assignments and notifications.

Roles

Create and manage records for roles. All roles resolve to a person, a person group, or an e-mail address. All workflow assignments and notifications are made to roles.

Workflow Administration

View and modify assignments and active instances of workflow processes.

Workflow Designer

Create, view, and modify workflow processes.

Workflow Inbox

View and respond to workflow assignments. A workflow process routes assignments to users' inboxes.

Workflow design process

Workflow processes can be designed to incorporate the most effective ways of completing business tasks. You can evaluate your current practices and determine how you can improve or standardize them before you design workflow processes.

When you create a workflow process, the product directs records through paths that you specify. When you design a process, be sure to consider what can happen at each decision point and include all the paths that a record can take. You could begin your workflow implementation with simple processes. You can always build in more complexity in a later revision.

To design optimum workflow processes, consider the following guidelines:

- Generic processes require less maintenance than highly specific ones. For example, you could modify roles that resolve to an individual more frequently than roles that resolve to a person group.
- When designing processes, consider when you want the product to generate notifications. The product can generate notifications when the following events occur in a process:
 - A record reaches a decision point (node)
 - A record follows a specific path (connection line) in a process
 - Task assignments are made
- When designing processes, consider how you want to handle null values. A process could reach a decision point that evaluates data on the record and that data could be missing from the record.
- When a record takes the negative path, you can design the record so that it can be modified to take the positive path. You could also design the record to exit the process permanently.
- If a record can go through a process again after it has been rejected, you can define a limit to the number of times a record can repeat the process.
- Try to avoid having separate groups of nodes and connection lines that perform the same function at different points in a process. It is more efficient to reuse the same code through looping or through creating a subprocess.
- Simple processes involving a limited number of nodes are easier to troubleshoot and maintain. If the number of nodes in your process grows too large, you could break down the process into subprocesses.
- When writing Structured Query Language (SQL) statements, consider how the SQL syntax affects how the product interprets the statements. The following examples demonstrate the use of the colon in SQL statements:
 - ASSETNUM - (without a colon) Instructs the product to go to the database for the asset record
 - ASSETNUM: - (with a colon) Instructs the product to use the asset record in memory (the record currently on the window)
- [Business process analyses](#)
Your business practices encompass how you manage your enterprise. You can start the analyses of your processes by collecting information about your enterprise. This information helps you to determine the types of processes that you could automate.
- [Workflow tool palette buttons](#)
Workflow tool palette buttons provide visual indications of workflow application support and workflow process control. You use these icons to route workflow assignments and to complete workflow assignments.
- [Elements of workflow processes](#)
You use workflow processes to create steps to guide records for your business processes. You use numerous elements when creating your workflow processes to achieve the business goals set out for your enterprise.
- [Examples of workflow processes](#)
You can use the Workflow application to manage records used in various business processes. The examples provided are basic because of the limited number of nodes that can be displayed.

Business process analyses

Your business practices encompass how you manage your enterprise. You can start the analyses of your processes by collecting information about your enterprise. This information helps you to determine the types of processes that you could automate.

Enterprise analysis

Gather the following enterprise information to use when designing your workflow processes:

- If you have an organizational chart, review your organizational chart to see how your enterprise is organized.
- If your enterprise is multinational, list the languages that are required for your workflow processes.
- Collect the business process flows that document the business units of your organization. If there are different process flows for the same organizations at various locations, gather those process flows. Compare the business practices at locations to find out if the differences are significant.
- Review the standard operating procedures, such as the International Organization for Standardization (ISO) 9000 quality management or the ISO 14000 procedures.
- Review the regulatory requirements for your industry and how they affect your business processes.

- Review the policies that define who is responsible for creating budgets.
- Review the policies that define financial approval limits and list the individuals who have the authority to approve spending.
- Research the types of records at your enterprise that require approval.
- Review the policies that define the levels of approval that are required for each type of record.

Implementation analysis

Gather the following implementation information for use when designing your workflow processes:

- Determine the number of organizations and sites that exist for your enterprise. You create workflow processes at the system level. Find out if there are separate processes or subprocesses for different organizations or sites.
- Find out if you use the Integration Framework to integrate with any external systems.
- Determine if any Maximo® product options have been purchased.
- Research the applications that your enterprise has implemented.
- Determine the types of records for which you use the software.
- Find out if the system has been configured to generate records, such as inventory reorder records, preventive maintenance work orders, and scheduled payment invoices.
- Determine if your implementation uses Start Centers that do not include the Workflow Inbox. If users cannot access the Inbox, you can design your workflow processes to send e-mail messages to notify users.
- [Process analysis](#)
Information you collect about your processes can be formatted into a flowchart. A flowchart can help you to identify reusable elements, the beginning and the end of record life cycles, and the parts of the life cycle that can be managed by a workflow process.
- [Workflow processes and user responsibilities](#)
Workflow processes identify the people who create and who manage a record throughout its life cycle. Workflow processes also identify the types of records that are used.

Process analysis

Information you collect about your processes can be formatted into a flowchart. A flowchart can help you to identify reusable elements, the beginning and the end of record life cycles, and the parts of the life cycle that can be managed by a workflow process.

You could diagram your business process on paper, on a blackboard, or using a graphics software program to create a flowchart. Writing or diagramming a business practice helps you to analyze it. It also provides you with a map of your process flows that you can use when you create a workflow process. Your goal is to produce a detailed diagram that shows all of the routes that a record can take through your enterprise during its life cycle.

Your research must include the following information:

- The names of the people who interact with records during a process
- The processes that are used to manage specific records
- The records that enter the process, and where the records go when they exit the process
- The records that are managed during a process
- The length of time it takes for a record to go through a process
- The parts of your current process that are working well and should be kept
- The parts of your current process that are not working well and should be changed or removed

As you document your business process, make note of trouble spots, such as undocumented procedures, or different ways to complete the same task. Address these issues and refine your business processes before you create and implement a workflow process.

Workflow processes and user responsibilities

Workflow processes identify the people who create and who manage a record throughout its life cycle. Workflow processes also identify the types of records that are used.

In workflow processes, assignments are made to roles that represent either a single user or a group of people. As you generate a list of persons associated with each process, consider whether you can create person groups for people with similar job responsibilities, levels of authority, and security clearances.

To help you to identify the people, the roles, and the records that are involved in the workflow processes that you create, compile the following information:

- Decide how people are going to be notified of workflow assignments. Users who are going to be assigned tasks must have user records.
- Generate a list of the people who must be notified of the progress of a record. The product can send e-mail messages to notify specific users. It is more efficient to create person records for all individuals who receive notifications.
- Identify the personnel who work on shifts.
- Identify supervisors on person records for escalations and notifications.
- Identify contract labor personnel if they are required to interact with a record in a workflow process. Identify which contract workers have both person records and labor records.
- Specify the level of security that applies to individuals in different roles in your enterprise. Decide which applications and which actions personnel in each security group are allowed to view. When you design your security groups and workflow processes, you must ensure that users in a particular role have the security permissions they need to perform their assigned tasks.

Workflow tool palette buttons

Workflow tool palette buttons provide visual indications of workflow application support and workflow process control. You use these icons to route workflow assignments and to complete workflow assignments.

When you add workflow support to an application, a Route button is added to the application toolbar. Two icons exist for the Route toolbar button, to indicate whether a record is being used in a workflow process. You can customize the Route buttons. If multiple processes exist for an application, you can create different buttons for each process.

Table 1. Route buttons

Icon	File name	Function
	nav_icon_route.gif	Indicates that the application supports workflow. You can click the icon to route the current record into a process.
	nav_icon_route_active.gif	Indicates that the current record is under the control of one or more workflow processes. You can click this toolbar button to perform one of the following actions: <ul style="list-style-type: none"> • Complete a workflow assignment. • Route the record into another workflow process.

Standards for graphic files

When you create customized images to use as toolbar buttons, create pairs of icons for each process.

The following standards are required for toolbar button images:

- Images must be Graphics Interchange Format (GIF) files. Use the GIF format for a transparent background for the icon image.
- Image resolution must be 72 DPI.
- Image height for toolbar icons is 17 pixels. The width of the icon can vary from 12 to 26 pixels.
- Copy the images for toolbar buttons to the following directory: <product directory>\applications\maximo\maximouiweb\webmodule\weclient\images

Elements of workflow processes

You use workflow processes to create steps to guide records for your business processes. You use numerous elements when creating your workflow processes to achieve the business goals set out for your enterprise.

- **Process nodes**
A node is a graphical element that represents a point in your business process. Nodes are added at specific business process junctures to denote the entry of a record into the business process.
- **Connection lines**
All nodes in a workflow process, except for the start nodes and the stop nodes, must be connected to two other nodes. You can draw positive and negative types of connections between nodes.
- **Person records**
You use the People application to create, to modify, to view, and to delete records for individuals. The People application stores information about individuals, such as users, laborers, asset owners, and supervisors who receive workflow notifications.
- **Person groups and workflow assignments**
You use Person Groups to specify that a group member for a specific organization or site must be used when making workflow assignments. Workflow assignments are made to roles.
- **Roles and role records**
You use the Roles application to create role records. A role is a function within a business. A role can represent a specific job title (such as a department manager), an assigned duty (such as a watch officer), a class file, and a data set.
- **Communication templates**
You use Communication Templates to create and to manage templates that generate email messages about the status of workflow records.
- **Notifications**
You use the Workflow Designer application to create notifications. A notification is an email message that is generated by the progress of a record through a workflow process.
- **Escalations and action groups**
You use Escalations to create escalation records. You can use escalations to escalate workflow assignments before they time out in the Inbox for the recipient.
- **Escalation points**
An escalation point defines the attributes of a record that trigger an action. You can define one or more escalation points for an escalation and specify one or more actions and notifications for each escalation point.
- **Actions and action records**
Workflow processes use actions to move records through a process and to trigger events, such as status changes. You define actions in the Actions application and then you reuse them in other workflow processes that you create.
- **Action types**
When you create an action record, you specify the action type to help determine what kind of action to take when the action is encountered in a process.
- **Record routing**
Activating a workflow process indicates that the process is ready to have records routed through it. Before you activate a record, consider whether you want records to be routed into a process manually or automatically.
- **Domains for status synonyms**
If your business processes for record approvals or for status changes involve multiple steps for each approval or status change, you can create synonym statuses that model those processes.

Process nodes

A node is a graphical element that represents a point in your business process. Nodes are added at specific business process junctures to denote the entry of a record into the business process.

You can drag nodes from the palette onto the canvas. You can add any number of nodes to a process. If a process exceeds 50 - 100 nodes, consider breaking the process into subprocesses to simplify management and maintenance.

As you drag each node onto the canvas, a name and a number are assigned to the node. The node name describes the type of node. The number indicates the order in which the node was added to the canvas. You can modify the name of a node when you configure the node properties.

Whenever possible, give nodes easy to understand labels. You can view node titles in the workflow map.

All nodes have properties, except for the start node and for the stop node. You configure nodes by modifying the properties to match your business requirements. You specify properties for a node in the Properties window for the node. Each node must be configured individually. You can configure nodes at any point while you build a process, but as a best practice, configure nodes as you add them to the canvas.

The Workflow Designer application includes the types of nodes that can represent various points in your business process. A node can be any of the following types:

Table 1. Types of nodes

Node	Description
 Start node	Indicates the point when a record starts a workflow process. When you create a process, a single start node displays on the canvas. Each process can have only one start node. You cannot delete start nodes.
 Condition node	Indicates an evaluation of the record, based on data in the record. Use a condition node to enable a true evaluation or a false evaluation of the record, and then direct the record based on that evaluation. When a condition node is generated, it evaluates the record based on the Structured Query Language (SQL) statement defined in the properties for the node. The record is then routed to either the positive connection line or to the negative connection line exiting the node. You can use the SQL Expression Builder tool, accessed from the Workflow Configuration > Escalations application, to create an SQL statement.
 Interaction node	Provides an option for a user interaction with a record. Use interaction nodes to guide a user through a structured interaction with a record. A process can have one or more interaction nodes. You do not have to include interaction nodes in a process. A manual input node precedes an interaction node. If an interaction node leads to an application not related to the object on the process record, place a stop node after the interaction node. The original process shuts down as the new record displays.
 Manual input node	Indicates a need for user input because there are multiple directions that a record can take in a process. Use a manual input node to have the assignee decide what happens next. When a manual input node is generated, a window displays. The manual input window contains a menu of options for routing the record. When the assignee selects an option, any actions or notifications associated with the option are triggered.
 Subprocess node	Indicates that a separate workflow process is contained within another workflow process. Use a subprocess node to break down a complicated business process into smaller, self-contained units. For example, you could have a subprocess that handles records in different sites, or that handles different classes of work orders. When the record encounters a stop node within a subprocess, the stop node is returned to the main process. The stop node is returned at the same point where it left the process and on the same type of routing line on which it finished.
 Task node	Indicates when a user is to be given an Inbox assignment. The user has two choices. For example, the user can either approve a record or reject a record. Use task nodes when your business process requires that a user evaluate a record. Create a task assignment that routes the record to one or more individuals. Workflow comes to a stop at a task node until the assigned user has routed the record.
 Wait node	Indicates that the progress of a record through a process pauses until a required condition is met. Use a wait node to create a reaction to a database event, such as a status change, or a record update. A process can have one or more wait nodes. You do not need to include wait nodes in a process. A wait node cannot precede a node that requires user interaction, such as an interaction node or a manual input node.
 Stop node	Marks the end of a workflow process. That is, the point where a record leaves control of the process. When you create a process, a single stop node is placed on the canvas. Use the stop node tool in the palette to place additional stop nodes on the canvas.

Connection lines

All nodes in a workflow process, except for the start nodes and the stop nodes, must be connected to two other nodes. You can draw positive and negative types of connections between nodes.

Positive connections

A solid black line on the canvas represents a positive connection. A positive connection indicates a positive outcome. For example, an action was performed, a record was approved, or a record met the condition specified by the node. Use the Connect Nodes tool  to draw a positive line between nodes.

Negative connections

A dashed red line on the canvas represents a negative connection. A negative connection indicates a negative outcome. For example, a record was canceled, a record was rejected, or a record did not meet the condition specified by the node. Use the Negative Connection tool  to draw a negative line between nodes.

Types of nodes and guidelines for connection lines

The following table describes the types of nodes and lists the guidelines for the connection lines that you can draw between one node and another node:

Table 1. Node guidelines

Type of node	Description	Lines permitted entering a node	Lines permitted or required exiting a node
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Type of node	Description	Lines permitted entering a node	Lines permitted or required exiting a node
 Start node	Indicates the point when a record starts a workflow process.	None.	One positive line is required.
 Condition node	Indicates an evaluation of the record, based on data in the record.	One or more positive lines; one or more negative lines.	One positive line and one negative line are required.
 Interaction node	Provides an option for a user interaction with a record.	One or more positive lines; one or more negative lines.	One positive line is permitted.
 Manual input node	Indicates a need for user input because there are multiple directions that a record can take in a process.	One or more positive lines; one or more negative lines.	More than one positive line is required. Negative connections exiting the node are not allowed.
 Subprocess node	Indicates that a separate workflow process is contained within another workflow process.	One or more positive lines; one or more negative lines.	One positive line and one negative line are required.
 Task node	Indicates when a user is to be given an Inbox assignment.	One or more positive lines; one or more negative lines.	One positive line is required; one negative line is allowed.
 Wait node	Indicates that the progress of a record through a process pauses until a required condition is met.	One or more positive lines; one or more negative lines.	One positive line is required.
 Stop node	Marks the end of a workflow process. That is, the point where a record leaves control of the process.	One or more positive lines; one or more negative lines.	None.

Person records

You use the People application to create, to modify, to view, and to delete records for individuals. The People application stores information about individuals, such as users, laborers, asset owners, and supervisors who receive workflow notifications.

A person record is a record for an individual whose name could appear as a text field value. Workflow assignments are made to roles. All roles resolve to a person, to a person group, or to an e-mail address.

The name of a person is used as the text field value in the **Reported By** field or in the **Affected Person** field on a service request, in the **Supervisor** field on a labor record, or in a **Ship To** field or **Bill To Attention** field on a purchasing record.

You must create a person record for any individual who is assigned tasks as part of a workflow process. When you create records in the Labor application and in the Users application, you must create a person record. Person records might have to be created for other individuals who do not have records in the Labor application or in the Users application.

Person records that you create for use as part of workflow processes must contain values in the following fields:

Supervisor

The person who oversees or manages the individual. This information is used for escalations.

Primary Email

The email address where notifications are sent.

Primary Calendar

The work calendar that the individual follows. This information is used when determining assignments and escalations.

Primary Shift

The shift that the individual works. This information is used when determining assignments and escalations.

Workflow Email Notification

The circumstances when the individual must receive email notifications for task assignments. The default value is PROCESS.

Workflow Delegate

The person identifier of the individual designated to receive assignments when the primary individual is unavailable for an extended period (for example, on vacation or on sick leave)

Delegate From and Delegate To

The time period when workflow processes must route assignment to the delegate. If these fields are empty, all workflow assignments are routed to the delegate.

For complete information on People, see the help for [People](#).

Person groups and workflow assignments

You use Person Groups to specify that a group member for a specific organization or site must be used when making workflow assignments. Workflow assignments are made to roles.

Different workers can perform the same role on different shifts. Creating person groups for roles such as "supervisor" or "safety engineer" simplifies a workflow process. Creating person groups also reduces the need for revisions as individuals move in and out of roles.

Workflow assignments are based on entries in the person group role record. If the Broadcast check box is selected on the role record, the task is assigned to all members of the person group. If the check box has not been selected, the product goes through the following steps to determine the appropriate role for the task:

- The product checks for a person record with appropriate entries in the Calendar and Shift fields for the assignment, verifying the group members in the order specified by the Sequence field. If no sequence values are specified, the assignment is made to the first group member with an appropriate entry in the Calendar and Shift fields. The search logic depends on whether the workflow process is for an application at the site, the organization, or the system level.
 - If the application is at the site level, the first check is for person records where the value in the Use for Site field matches the site of the record in the workflow process. The next check is for person records where the value in the Use for Organization field matches the Site of the record in the workflow process. The third check is for person records where there is no value in either the Use for Site field or the Use for Organization field.
 - If the application is at the organization level, the product checks for person records where the value in the Use for Organization field matches the organization of the record in the workflow process. The next check is for person records where there is no value in either the Use for Site field or the Use for Organization field.
 - If the application is at the system level, the product checks for person records where there is no value in either the Use for Site field or the Use for Organization field.
- If there is no person whose Calendar and Shift entries match the assignment, the product checks for a person record who is listed in the Site Default field. (This field is optional; you can specify a single site default per site.)
- If no site default is specified, the product checks for a person record who is checked in the Organization Default field. (This field is optional; you can specify only a single organization default per organization.)
- If no organization default is specified, the Group Default person is assigned. By default, the first person added to a person group becomes the group default, but you can modify this setting.

For complete information on Person Groups, see [Person Groups](#).

Roles and role records

You use the Roles application to create role records. A role is a function within a business. A role can represent a specific job title (such as a department manager), an assigned duty (such as a watch officer), a class file, and a data set.

Workflow Inbox assignments and workflow notifications are always made to roles. All role records point to one or more person identifiers. Role records can also point to a table and column in the database that represent a person. When a role is encountered in a workflow process, it resolves the role to a person group or to an individual person record.

You use roles when you create and configure the following workflow elements:

- Communication templates (recipients)
- Escalations
- Negative connection lines (notifications)
- Positive connection lines (notifications)
- Manual Input nodes (notifications)
- Task nodes (assignments and notifications)
- Wait nodes (notifications)

By using role records instead of person records for assignments and notifications, you can create generic workflow processes that require less maintenance as individuals move in and out of different roles within your company.

For complete information on Roles, see [Roles](#).

Communication templates

You use Communication Templates to create and to manage templates that generate email messages about the status of workflow records.

When you create a communication template, you can specify the following information:

- The business object that the template can be used for
- The applications where the template can be used
- The address that the email must be sent from
- The address that replies must be sent to
- The subject line of the message
- The body of the message
- One or more recipients of the message. You can send messages to roles, persons, person groups, and email addresses. You can specify whether each recipient must also receive a carbon copy (CC) or blind carbon copy (BCC) of the message.
- Documents to include as attachments when the message is generated

You can use substitution variables when you create the subject line and the body of your message. The last memo substitution variable ensures that the last memo saved to the database displays in the list of memos. The current memo substitution variable ensures that the memo is available immediately. When an email is generated by using that template, it replaces the substitution variables from the template with the corresponding values from the record.

For complete information about Communication Templates, see the help for [Communication Templates](#).

Notifications

You use the Workflow Designer application to create notifications. A notification is an email message that is generated by the progress of a record through a workflow process.

The Workflow Designer application uses communication templates for notifications. You use the Communication Templates application to create and to manage the templates.

When you create communication templates for workflow notifications, you specify roles as the recipients rather than persons or person groups. Many individuals come into contact with a record as it moves through its life cycle. Often these individuals need to know about the progress of a record. You can design your workflow process to generate notifications as required by your business process. Notifications can be made through email or through a pager, providing that your paging system supports email.

You can configure the following workflow components to generate notifications:

- Escalations
- Negative connection lines
- Positive connection lines
- Manual input nodes
- Task nodes
- Wait nodes

You cannot modify a communication template in the Workflow Designer application. You must create separate templates for your notification requirements.

Escalations and action groups

You use Escalations to create escalation records. You can use escalations to escalate workflow assignments before they time out in the Inbox for the recipient.

When you assign specific steps in a workflow process to employees, those assignments display in their Inbox. If the assignments are not completed promptly, they time out in the Inboxes for the recipients. When this event happens, you can use escalations to assign the tasks to other people. Escalations help to get tasks completed on time and help to prevent work backlogs.

An action group is a type of action record that includes multiple actions and a sequence to use when performing the actions. Escalations are always associated with action groups.

You can associate an action group with an escalation in either of the following ways:

- You can create action groups using the Actions application and then click Detail Menu next to the Action Group field on the Actions sub tab to associate the action group with the escalation.
- You can create action groups in the Escalations application by clicking New Row on the Actions sub tab. When you create an action group in the Escalations application, the action group receives a generated name. The actions receive assigned sequence numbers. The sequence numbers are based on the order in which you add the actions to the group.

For complete information on Escalations, see the help for [Escalations](#).

Escalation points

An escalation point defines the attributes of a record that trigger an action. You can define one or more escalation points for an escalation and specify one or more actions and notifications for each escalation point.

You can create the following categories of escalation points:

- Elapsed time since a past event - Compares the current date and time to the specified field that represents an event in the past. You can select from a list of DATETIME fields on the record (for example, a Start Date on a workflow assignment, an Actual Start date on a work order, or a Status Date on a record that includes status).
- Time until a future event - Compares the current date and time to the specified field that represents an event in the future (for example, a Renewal Date on a contract, a Due Date on an invoice, or a Target Finish date on a work order).
- Condition - Condition without a time measurement. If you want to trigger the actions and notifications of an escalation based on a condition that does not have a time measurement, you can specify the condition in the Escalation Point Condition field. You also can use the Condition field to specify that the escalation point must be applied to only the subset of records specified by the condition

Actions and action records

Workflow processes use actions to move records through a process and to trigger events, such as status changes. You define actions in the Actions application and then you reuse them in other workflow processes that you create.

You use actions when you create and configure the following Workflow elements:

- Escalations
- Negative connection lines

- Positive connection lines

For complete information on the Actions application, see [Actions associated with escalation points](#).

Action types

When you create an action record, you specify the action type to help determine what kind of action to take when the action is encountered in a process.

An action can be one of the following types:

APPACTION

Used to specify that an application action be initiated. For this type of action, there must be values in the Object and Value fields. When creating an APPACTION type action, you can specify one of the following actions if it is available for the specified object:

- Apply SLA - Apply the specified service level agreement.
- Create Change - Create a change work order.
- Create Incident - Create an incident ticket.
- Create Problem - Create a problem ticket.
- Create Release - Create a release work order.
- Create SR - Create a service request ticket.
- Create WO - Create a work order.
- WF Accept - Workflow auto-accept. Accepts the record and routes it to the positive path in the workflow process.
- WF Escalate - Escalate the record in the workflow process and reassigns the assignment to its escalation role.
- WF Initiate - Initiate® a workflow process. This option requires a value in the Parameter/Attribute field.
- WF Reject - Workflow auto-reject. Rejects the record and routes it to the negative path in the workflow process.

CHANGESTATUS

Used to specify that the status of a record changes. There must be a value in the Object field and a status in the Value field for this type of action.

CUSTOM

Used to specify that a custom class file should run. There must be a value in the Object field and the name and path of a class file in the Value field for this type of action.

EXECUTABLE

Used to specify that a program on the server should run. For this type of action, the name of a program file must be in the Value field.

GROUP

Used to specify that the system should run the sequence of actions that you specify in the Members table window.

SETVALUE

Used to specify that the system should set the value of a specified field. For this type of action, values are required in the Object, Value, and Parameter/Attribute fields.

Record routing

Activating a workflow process indicates that the process is ready to have records routed through it. Before you activate a record, consider whether you want records to be routed into a process manually or automatically.

A record can enter a workflow process by any of the following methods:

- When you click the Route button on the toolbar.
- When you select the Route Workflow action.
- When you create and save a record, the record is routed into the workflow process. You can set one process per object to initiate automatically.
- You can set workflow options in the Organizations application. These options specify that generated records must be routed into a particular workflow process. You can specify a workflow process to manage the following records:
 - Work orders that are generated from a preventive maintenance record
 - Purchase requisitions that are generated through the inventory reorder process
 - Purchase orders that are generated through the inventory reorder process
 - Work orders that are generated when a purchase order for a rotating asset is approved
- A record can be routed from one workflow process to another in any of the following ways:
 - With an interaction node
 - With a subprocess node
 - With a WFINITIAL action specified on a connection line leaving a node
- A record can be automatically routed into a process with an escalation action.

Domains for status synonyms

If your business processes for record approvals or for status changes involve multiple steps for each approval or status change, you can create synonym statuses that model those processes.

For example, your business process requires that three people review a record before it is considered approved. There is a single status for waiting for approval and a single status for approved. You can create synonym statuses of waiting for approval that represent each of the preliminary approvals before the record is considered approved.

You add synonym values to a value list in the Domains application in your nonproduction environment. Import the changes to your production environment.

Examples of workflow processes

You can use the Workflow application to manage records used in various business processes. The examples provided are basic because of the limited number of nodes that can be displayed.

The examples illustrate some of the capabilities of the Workflow application and must not be used in a production environment. The product demonstration database includes workflow processes that display simple processes.

- [Example of a purchase requisition business process](#)
You can create a workflow process to handle a purchase requisition. When you create a purchase requisition, your supervisor must approve it.
- [Example of a service request business process](#)
A workflow process can be created to handle service requests. An enterprise uses the software for service desk functions. The enterprise has designed a workflow process that guides a service desk agent through the initial steps of the record management process.
- [Example of a work order business process](#)
A workflow process can be created to handle a work order. An enterprise has configured the system to route all new preventive maintenance work orders that are generated through the preventive maintenance work order generation cron task into a workflow process.

Example of a purchase requisition business process

You can create a workflow process to handle a purchase requisition. When you create a purchase requisition, your supervisor must approve it.

When an approved purchase requisition reaches the purchasing department, a purchasing agent evaluates the record, and then performs one of the following steps:

- Rejects the requisition
- Creates a request for quotation to receive bids for the purchase
- Creates a purchase order from the requisition

The record then exits the workflow process for the purchase requisition.

For example, you can create a requisition such that if the total is less than \$500, the requisition is routed to the purchasing department. If the requisition total exceeds \$500, the requisition requires the approval of the department manager before it can be routed to the purchasing department. If the requisition total exceeds \$1,000, the requisition requires the approval of a vice president before it can be routed to the purchasing department. If the requisition total exceeds \$5,000, the requisition requires the approval of the chief financial officer before it can be routed to the purchasing department.

The diagram that follows illustrates one way that you might map the preceding scenario. The nodes and the connection lines in this example are arranged so that they are easy to see at a glance, but they can be arranged differently. You could add or remove stop nodes, and the workflow process would still illustrate the same business process.

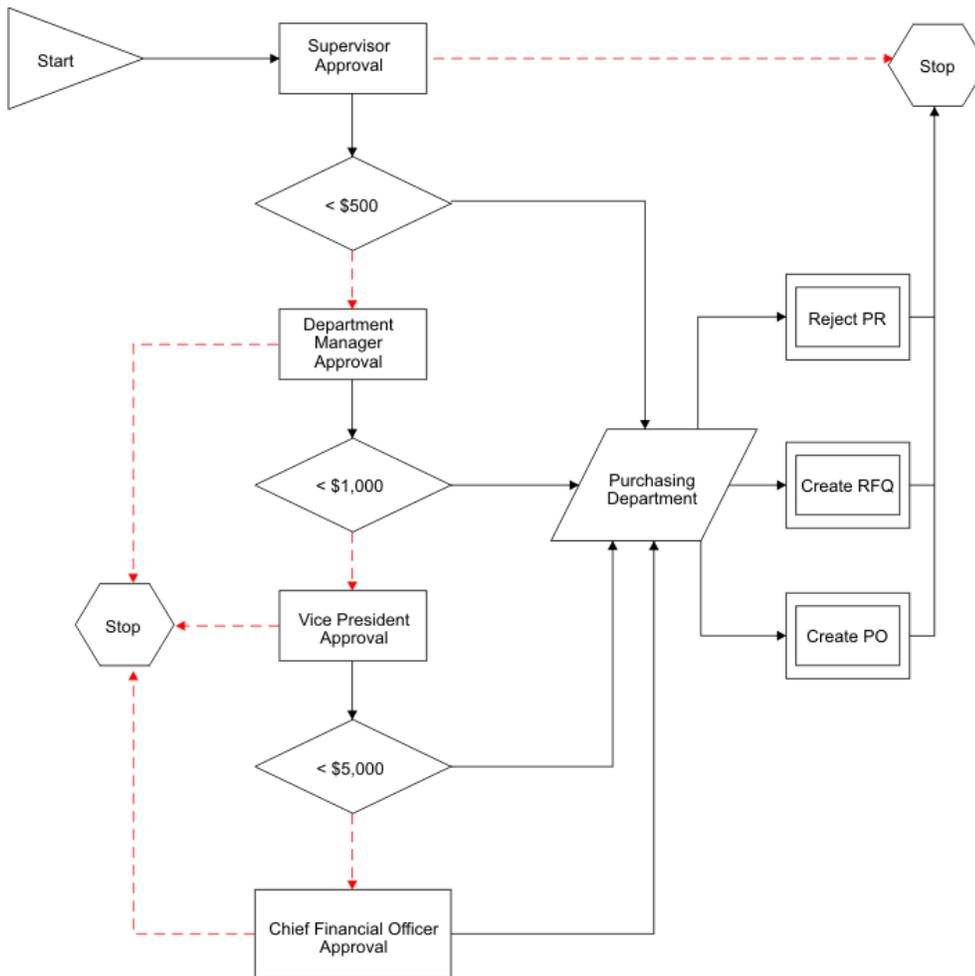


Figure 1. Example of a purchase requisition workflow process

Example of a service request business process

A workflow process can be created to handle service requests. An enterprise uses the software for service desk functions. The enterprise has designed a workflow process that guides a service desk agent through the initial steps of the record management process.

When a service desk agent takes an incoming telephone call, the agent creates a service request ticket to record the interaction. The enterprise requires the agent to record the name of the caller and telephone number. The agent also must type a short description of the service request. For example, a request for information, maintenance, and a classification for the service request. Depending on the type of service request, the agent also might type information about the asset or the location.

When the agent saves the service request ticket, the product starts the service request workflow process. The Manual Input window opens with the following options:

- I must type additional information regarding this service request.
- I must type information about tickets or work orders related to this service request.
- I must make an entry in the Work Log or Communications Log.
- I have completed data entry for this ticket.

If the agent requests to type more information, either the Service Request tab, the Related Records tab, or the Log tab display, depending on which option the agent selected. When the agent indicates the completion of data entry for a service request, the product evaluates the data on the record.

If the agent has not provided asset or location data, the Manual Input window displays the following options:

- Close ticket - informational call
- Close ticket - unauthorized caller
- Close ticket - misdirected call
- Take no action

If an asset or a location is specified on the record, the Manual Input window opens with the following options:

- Take Ownership of ticket (**Take Ownership** action)
- Assign Ownership of ticket (**Assign Ownership** action)
- Create Incident record (**Create Incident** action)
- Create Problem record (**Create Problem** action)

- Create Change work order for an IT asset. (**Create Change** action)
- Create Work Order for a non-IT asset. (**Create Work Order** action)
- Take no action on this ticket.

The following diagram illustrates one way that the preceding scenario might be mapped.

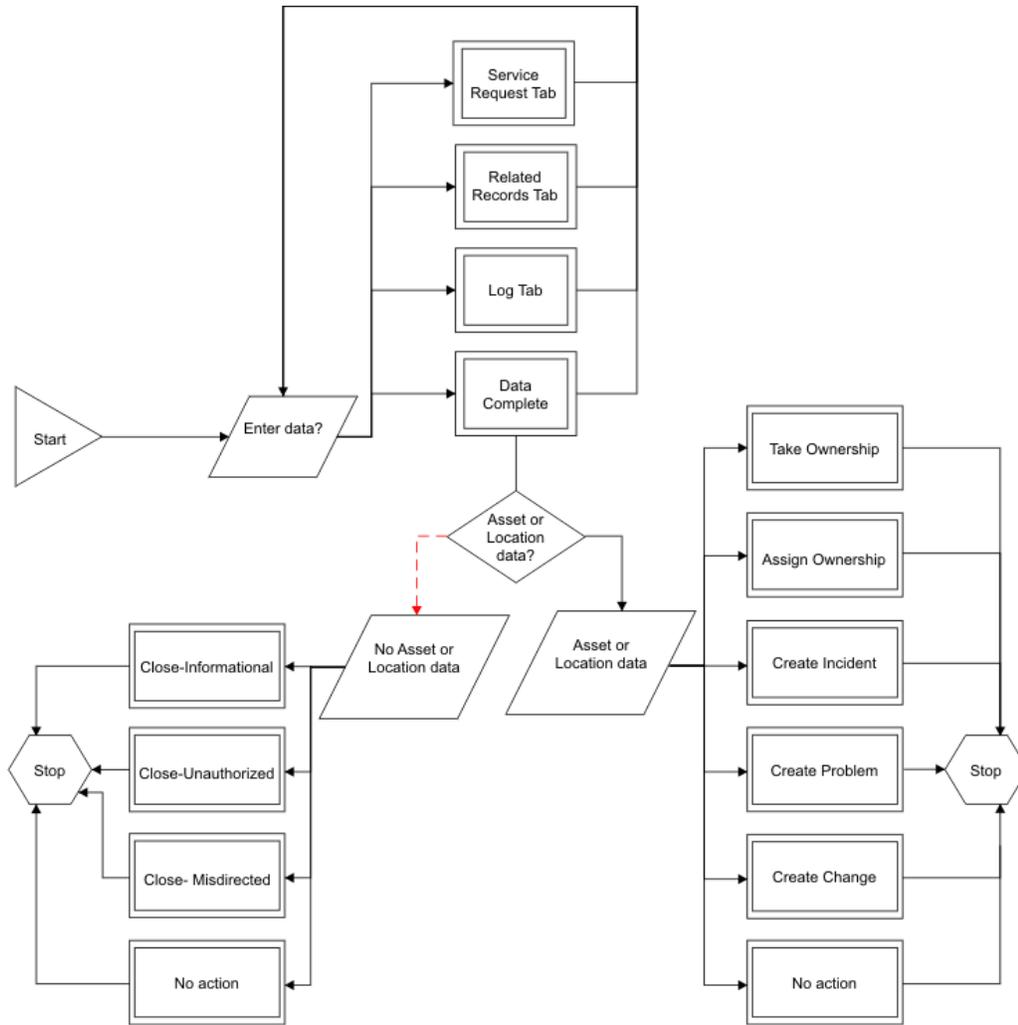


Figure 1. Sample Service Request Workflow

Example of a work order business process

A workflow process can be created to handle a work order. An enterprise has configured the system to route all new preventive maintenance work orders that are generated through the preventive maintenance work order generation cron task into a workflow process.

The first step is to evaluate the priority of the work order, as follows:

- If the preventive maintenance work order is high priority or has a null value in the Priority field, it is routed to a work planner for immediate review and approval.
- If the preventive maintenance work order has a low priority, it is routed to a Stop node and exits the process.

All preventive maintenance work orders then go through a financial approval process. Work orders with an estimated total cost of less than \$500 are automatically approved. The maintenance supervisor must review and approve work orders with an estimated total cost of more than \$500.

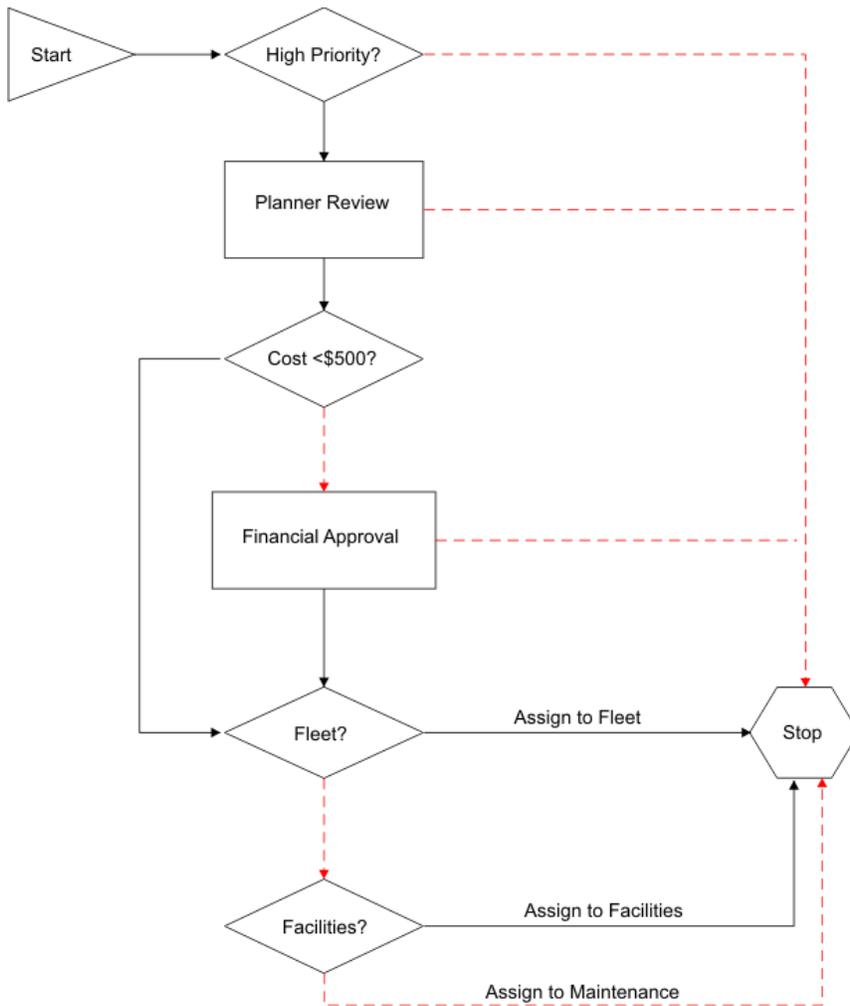
After a work order passes the financial approval process, it must be assigned to a work group, as follows:

- If the preventive maintenance work order is for a vehicle, the system assigns it to the fleet maintenance group.
- If the preventive maintenance work order is for a building or location, the system assigns it to the facilities maintenance group.
- The system assigns all other preventive maintenance work orders to the maintenance group.

After the system assigns the work order to a maintenance group, the work order exits the workflow process.

The following diagram illustrates one way that you might map the preceding scenario.

Figure 1. Example of a preventive maintenance work order workflow



Configuring for Workflow

Workflow applications require minimal configuration before you can create workflow processes.

- **[Configuration prerequisites](#)**
The Workflow Designer application requires a Java™ Virtual Machine (JVM) on the client workstation. If you do not have a JVM installed, the product cannot display the Workflow canvas.
- **[Creating workflow processes](#)**
You can create workflow processes that reflect your business processes. A workflow process defines the actions and notifications that can occur at different points in a business process.
- **[Testing workflow processes](#)**
You test your workflow processes in a test environment by routing a record through each possible path. Perform these tests before you export your processes to your production environment to ensure that each workflow process accurately reflects your business process.
- **[Modifying workflow processes](#)**
Testing your workflow processes might reveal areas for improvement, or over time your processes might evolve due to changes in your business, increased efficiencies, and so on. You can add, modify, or delete process elements at any time until the process has been enabled. Once a process has been enabled, create a revision of the process if you want to modify it.
- **[Integrating workflow processes](#)**
You use workflow processes to perform tasks, to execute actions, and to send notifications. After you create workflow processes, you can test them in an environment other than your working environment to fine-tune their behavior. After you test the processes, you can integrate them into your working environment.
- **[Workflow/Inbox Assignments portlet](#)**
The Workflow Inbox/Assignments is one of the portlets that might appear on your Start Center. If your workplace has implemented the Workflow feature, a list of your task assignments displays in the Inbox.

Configuration prerequisites

The Workflow Designer application requires a Java™ Virtual Machine (JVM) on the client workstation. If you do not have a JVM installed, the product cannot display the Workflow canvas.

To design and create workflow processes, you must be familiar with the following tools, processes, and concepts:

- The business processes for the enterprise
- Product applications
- Object structures and data relationships
- Structured query language (SQL) statements and syntax
- [Workflow administration](#)
You use the Workflow Administration application to view and to manage active instances of workflow processes.
- [Security permissions for workflow processes](#)
If you design workflow processes, you must belong to a security group with security permissions.
- [Synonym statuses](#)
You can create synonym statuses if your business processes for record approvals or for status changes involve multiple steps for each approval or status change.
- [Stopping instances of workflow processes](#)
When you route a record into a workflow process, an active instance of that process is created to manage that individual record. You can view and stop workflow processes for records for any Workflow-enabled application.
- [Test environment design](#)
Workflow processes are automated and can be complex. For this reason, you can create a test environment where you design and test processes without affecting records in your production environment.

Workflow administration

You use the Workflow Administration application to view and to manage active instances of workflow processes.

The Workflow Administration application contains a window that displays a row for each active instance of a workflow process. A record can show up multiple times if it is controlled by multiple workflow instances. You can see which version of a revised process was used to create each instance, the person identifier of the individual who routed each record into Workflow, and the date and time that the process was initiated.

The recordkey (for example, the work order number or the purchase order number) displays with the site identifier in the Owner Description field.

Security permissions for workflow processes

If you design workflow processes, you must belong to a security group with security permissions.

Users are not automatically granted access to workflow actions. An administrator must use the Security Groups application to grant users security permissions to workflow actions. The workflow actions appear in the Security Groups application when you add workflow support to an application. You can grant users access to actions before you activate a process.

Additionally, you require security permissions for the following applications:

- Actions
- Communication Templates
- Escalations
- Inbox/Assignments Setup
- People
- Person Groups
- Roles
- Workflow Administration
- Workflow Designer
- Workflow Inbox (portlet)

If you or your group are responsible for testing workflow processes, you must have security permissions for other applications, depending on the processes that are being tested.

Synonym statuses

You can create synonym statuses if your business processes for record approvals or for status changes involve multiple steps for each approval or status change.

For example, your business process might call for three different people to review a record before it is considered approved. There is a single status for waiting for approval and a single status for approved. You can create synonym statuses of waiting for approval that represent each of the preliminary approvals before the record is considered approved.

You use the Domains application to add synonym values to a value list. For more information about creating synonym statuses, see the Domains Help for this product.

Stopping instances of workflow processes

When you route a record into a workflow process, an active instance of that process is created to manage that individual record. You can view and stop workflow processes for records for any Workflow-enabled application.

Before you begin

The application associated with the workflow process record must be enabled for Workflow.

About this task

When you stop a workflow process, you are only stopping the single instance of the workflow process that controls a particular record. To deactivate a workflow process, use the Workflow Designer application. When you stop a process instance, the following tasks are performed:

- The record is removed from the control of the workflow process.
- A transaction is written to the workflow history of the record. Workflow history remains with a record permanently, even after the record has left the control of Workflow.
- Specified notifications are sent to past assignees, current assignees, or both. You can use a communication template to create a notification, or type the subject, message, and role recipients manually.

Procedure

1. To stop a workflow process, complete one of the following steps:
 - In a Workflow-enabled application, display the record you want to remove from Workflow. From the Select Action menu, choose Stop Workflow.
 - In the Workflow Administration application, select the active process that you want to stop. Click Stop Process on the assignment line.
2. Optional: Create an email notification. The system defaults to the WFSTOP communication template. You can use the WFSTOP communication template to create the notification. You can also manually specify the subject, message, and role recipients.
3. Click OK. The system stops the workflow process. The system also sends any notifications.

Test environment design

Workflow processes are automated and can be complex. For this reason, you can create a test environment where you design and test processes without affecting records in your production environment.

Design your test environment so that it is a copy of your production environment. Your test database must include enough data and users so that you can thoroughly test each workflow process. You use the applications in the Integration module to migrate a workflow process from your test environment to your production environment.

Creating workflow processes

You can create workflow processes that reflect your business processes. A workflow process defines the actions and notifications that can occur at different points in a business process.

About this task

A workflow process consists of the header information for the record, the nodes, the connection lines, and the properties specified for the nodes and the connection lines.

Procedure

1. On the toolbar of the Workflow Designer application, click New Process.
2. In the Process field, type a name for the process.
3. Optional: Type a description.
4. In the Object field, type a value or click Select Value and select an object.
5. Click Save Process.

What to do next

You are now ready to use the canvas to add nodes and connection lines and to configure the properties of each of the elements of the process.

- [Specifying the properties of actions](#)
You can specify the properties of an action. An action is an event that is triggered by the progress of a record through a workflow process.
- [Specifying the properties of condition nodes](#)
A condition node indicates an evaluation of the record, based on data in the record. You use a condition node to have a true or false evaluation made on the record and then direct the progress of the record based on that evaluation.
- [Specifying the properties of interaction nodes](#)
You use interaction nodes to specify the actions that occur in a workflow process between different applications.
- [Specifying the properties of manual input nodes](#)
You use manual input nodes in a workflow process to designate options that users are presented with during a workflow process.

- [Specifying the properties of subprocess nodes](#)
You can specify the properties for subprocess nodes. Subprocess nodes are processes that have been created to be used within a main workflow process.
- [Specifying the properties of task nodes](#)
A task node indicates when a user has two choices, such as approving or to rejecting a record. You use task nodes when your business process requires you to evaluate the record. You also use task nodes when you want to create a task assignment that routes the record to one or more individuals.
- [Specifying the properties of wait nodes](#)
You can specify the properties of wait nodes. Wait nodes specify that the process is halted until a specific event occurs.
- [Adding nodes and connections lines](#)
You create a workflow process by inserting nodes and connection lines on a workflow canvas.
- [Setting a workflow process to automatically initiate](#)
You can specify that when a user creates and saves a new record in an application, the record is automatically routed into a workflow process. Each object can have only a single process that is automatically initiated.
- [Setting processes to not auto-initiate](#)
You can specify that when a record is created and saved in an application, the record is not routed into a workflow process. Each object can have only a single process that is initiated automatically.

Specifying the properties of actions

You can specify the properties of an action. An action is an event that is triggered by the progress of a record through a workflow process.

About this task

To trigger actions, you can configure the following workflow components:

- Negative connection lines
- Positive connection lines

Procedure

1. From the List tab of the Workflow Designer application, select a process with properties to be modified.
2. In the Actions window of the Process tab, click Edit Properties.
3. In the Action field, specify a value.
4. In the Instruction field, type text to describe to the run-time user what specific action occurs for routing and manual inputs.
5. Click Condition Expression Builder.
6. Select the Custom Class check box to specify that a custom class file is used to evaluate the record.
7. In the Communication Template field, specify a value.
8. In the Send To field, specify a value.
9. In the Subject field, type the subject of the notification e-mail.
10. In the Message field, type the message of the notification e-mail.
11. Click OK and click Save Process.

Specifying the properties of condition nodes

A condition node indicates an evaluation of the record, based on data in the record. You use a condition node to have a true or false evaluation made on the record and then direct the progress of the record based on that evaluation.

About this task

When a condition node is encountered, the record is evaluated based on the Structured Query Language (SQL) statement defined in the node properties. The record is then routed to either the positive or the negative connection line exiting the node. Use the Condition Node  tool in the Workflow palette to place a new condition node on the canvas. A workflow process can have one or more condition nodes, but you do not have to include condition nodes in a process.

You can specify the following properties for condition nodes:

Title

Type or modify the node name and description.

Expression

Used to specify the SQL statement that tests one or more field values on the record. The product returns either a true result or a false result. You can define a simple expression or a complex expression, based on the needs of your business process. You can use substitution variables in the SQL expression. When the product encounters the condition node during a condition test, it substitutes values from the current record for the table and column information based upon the specified substitution variables. Use the Expression Builder to create your SQL expression.

Custom Class

Used to specify the custom class file that performs the condition test. Locate custom class files in the product directory.

Procedure

1. From the List tab of the Workflow Designer application, select a process with properties to be modified.

2. From the Canvas tab, right-click the condition node and select Properties.
3. Optional: Type a description.
4. Click Condition Expression Builder.
5. Select the Custom Class check box.
6. Click OK and click Save Process.

Specifying the properties of interaction nodes

You use interaction nodes to specify the actions that occur in a workflow process between different applications.

About this task

Use the Interaction Nodes Properties window to specify the following properties for interaction nodes:

Application

Used to specify the application that displays.

Tab

Used to specify the tab that displays. Use the tab identifier from the application presentation file as the value for the tab name. You can view this information in Application Designer. Tab identifiers are not in the database. You must specify tab names manually.

Action

Used to specify an action that either displays or that is performed by the product. You can select from actions available by means of a toolbar button or from the Select Action menu.

Relation

Used to create an interaction that leads to another application. The information in the Relation field determines which record to display when the application opens.

Process

Used to specify an active workflow process for the specified application. The process starts on the current record upon arrival in the target application.

Direction Title

Used to specify the title of the message window that displays.

Direction Body

Used to specify the text of the instructions that displays in a message window.

The absence of a title or the absence of a body does not create a window.

Procedure

1. From the List tab of the Workflow Designer application, select a process with properties to be modified.
2. From the Canvas tab, right-click the interaction node  and select Properties.
3. Optional: Type a description.
4. In the Application field, specify a value.
5. In the Tab Name field, type the tab identifier from the XML presentation file.
6. In the Action field, specify a value.
7. In the Relation field, specify a value.
8. In the Launch Process field, specify a value.
9. In the Directions Title field, type the title of the message window.
10. In the Directions Body field, type the instructions that the product displays in the message window.
11. Click OK and click Save Process.

Specifying the properties of manual input nodes

You use manual input nodes in a workflow process to designate options that users are presented with during a workflow process.

About this task

Use the Manual Input Properties window to specify the following properties for manual input nodes:

Title

Used to specify or modify the node name and the description.

Display One

Used to specify what the product does if a user has security permissions to only one specified option.

Actions

Displays actions associated with the connection lines that exit from the node. Add rows to the Actions window by drawing connections that exit the node. You can type a number in the Sequence column to specify the order in which options are presented to a user. The Instruction displays for each row in the

Manual Input window.

Notifications

Used to specify any notifications that the product generates if the record travels through a connection line that exits the node. You can use a communication template to create one or more notifications. You can also choose to specify the subject, message, and role recipients manually.

Procedure

1. From the List tab of the Workflow Designer application, select a process with properties to be modified.
2. From the Canvas tab, right-click the manual input node  and select Properties.
3. Optional: Type a description.
4. Select the Display One check box to specify the action that occurs when a user has security permissions to one specified option.
5. In the Action field, specify a value.
6. In the Communication Template field, specify a value.
7. In the Send To field, specify a value.
8. In the Subject field, type the subject of the notification e-mail.
9. In the Message field, type the message of the notification e-mail.
10. Click OK and click Save Process.

Specifying the properties of subprocess nodes

You can specify the properties for subprocess nodes. Subprocess nodes are processes that have been created to be used within a main workflow process.

About this task

Use the Subprocess Properties window to specify the following properties for subprocess nodes:

Title

Used to specify or modify the node name and the description.

Subprocess

Used to type the name and the description of a workflow process record. The subprocess must meet the following criteria:

- The process must exist in the Workflow Designer application.
- The process must be associated with the same object as the main process.
- The process must be enabled, but not activated.

Procedure

1. From the List tab of the Workflow Designer application, select a process with properties to be modified.
2. From the Canvas tab, right-click the subprocess node  and select Properties.
3. Optional: Type a description.
4. In the Subprocess field, specify a value.
5. Click OK and click Save Process.

Specifying the properties of task nodes

A task node indicates when a user has two choices, such as approving or to rejecting a record. You use task nodes when your business process requires you to evaluate the record. You also use task nodes when you want to create a task assignment that routes the record to one or more individuals.

About this task

Use the Task Node Properties window to specify the following properties for task nodes:

Title

Used to specify or modify the node name and the description.

Time Limit

Used to specify the time limit for the assignee to complete the task before it is escalated.

Application

Used to specify which application the product uses to display the assigned record. Typically, the object is associated with a single application. In some cases, such as in Quick Reporting and Work Order Tracking, an object can be associated with more than one application. It might, for example, represent a clone or even a new custom application on that table.

Display One

Used to specify whether a single option is displayed when the user has security permissions to only one option.

- If the check box is selected, the product displays the single option in the Complete Workflow Assignment window.

- If the check box is cleared, the product performs the action.

WF Task Type

Used to add another task to the workflow process.

Assignments

Used to specify one or more roles to receive the task assignment. Specify at least one assignment per task node. A task assignment can be designated to a role or to an assignee relationship.

Notifications

Used to specify the notifications that the system generates as a record leaves the node. You can use a communication template to create one or more notifications. Or, you can specify the subject, message, and role recipients manually.

Perform Accept Action

Used to specify how the system routes the record when the assignment is made to a group.

- When any assignment is accepted - Used to specify that the system needs only one positive action to route the record to the positive connection line.
- When all assignments are accepted - Used to specify that all assignees must select the positive action in order for the system to route the record to the positive connection line. If a single assignee selects the negative option, the system routes the record to the negative connection line.

Procedure

1. From the List tab of the Workflow Designer application, select a process with properties to be modified.
2. From the Canvas tab, right-click the task node  and select Properties.
3. Optional: Type a description.
4. In the Application field, specify a value.
5. In the Time Limit field, specify the time limit for the assignee to complete the task before it is escalated.
6. Select the Display One check box to specify what the system might do if the user has security permissions to only one specified option.
7. In the Assignments section, click New Row, and specify values for each of the fields that display.
8. In the Notifications section, click New Row, and specify values for each of the fields that display.
9. In the Perform Accept Action field, select one of the following options to specify how the record is routed:
 - a. When any assignment is accepted.
 - b. When all assignments are accepted.
10. Click OK, and click Save Process.

Specifying the properties of wait nodes

You can specify the properties of wait nodes. Wait nodes specify that the process is halted until a specific event occurs.

About this task

You can specify the following properties for wait nodes:

Title

Used to specify or modify the node name and the description

Wait List

Used to specify one or more system events. The first event to occur triggers the record to resume its progress through the process. Event names consist of three or four lowercase words, delimited by periods. For example, maximo.workorder.update or maximo.po.statuschange.appr.

- The first word is always `maximo`.
- The second word is the name of the business object (MBO). For example, `po`.
- The third word is one of the following words:
 - `statuschange`. If the event is a change of status, the event name has a fourth part; either the name of a specific status, for example, `appr`, or `*` for any status change.
 - `update`

Notifications

Used to specify the notifications that the system should generate as a record leaves the node. You can use a communication template to create one or more notifications. You can also specify the subject, the message, and the role recipients manually.

Procedure

1. From the List tab of the Workflow Designer application, select a process with properties to be modified.
2. From the Canvas tab, right-click the wait node  and select Properties.
3. Optional: Type a description.
4. In the Event field, type an event name.
5. In the Communication Template field, specify a value.
6. In the Send To field, specify a value.
7. In the Subject field, type the subject of the notification email.
8. In the Message field, type the message of the notification email.
9. Click OK and click Save Process.

Adding nodes and connections lines

You create a workflow process by inserting nodes and connection lines on a workflow canvas.

About this task

Each workflow process includes start nodes and stop nodes. Start nodes and stop nodes do not carry user-defined information. The other types of nodes carry user-defined actions.

Procedure

1. Select one of the following options:

Options	Step
To create a workflow process	Click Create a Workflow Process.
To configure a process that is enabled and activated	Select the process you want to revise and click Create Revision.

2. To add a node, select one of the following options:

To Add a Node	Step
In the Canvas tab	On the Workflow Designer toolbar, select Move/Add Nodes and drag the node onto the canvas.
In the Process tab	Click New Node.

3. To edit the properties of the node, select one of the following options:

Option	Step
In the Canvas tab	Double click the node, and edit the properties in the Condition Node Properties window.
In the Process tab	Click the Edit Properties icon.

4. Repeat step 2 to place other types of nodes onto the canvas.
5. To reposition nodes, in the Canvas tab, drag the node you want to move.
6. On the Workflow designer toolbar, select one of the following connection tools to create connection lines between nodes:
 - a. Click Connect Nodes to add a positive connection line.
 - b. Click Connect Nodes with a Negative Action to add a negative connection line.
7. Click a node and drag the line to another node. Lines must travel from one node to another node. The lines indicate the path for records to follow in the workflow process. The type of lines and the number of lines you can draw from each node varies depending on the type of node.
8. Click Save Process.

What to do next

After adding nodes and connection lines, the next step is to validate the process to ensure its structural integrity.

Setting a workflow process to automatically initiate

You can specify that when a user creates and saves a new record in an application, the record is automatically routed into a workflow process. Each object can have only a single process that is automatically initiated.

Before you begin

A process must be validated, enabled, and activated before you can set it to automatically initiate.

About this task

This action only routes records created by users. Records that the product creates automatically (for example, through a PM cron task or through the inventory reorder function) cannot be automatically routed into a process through this method.

Procedure

1. In the Workflow Designer application, display an activated process record.
2. Select the Set Process to Auto-Initiate action.

Setting processes to not auto-initiate

You can specify that when a record is created and saved in an application, the record is not routed into a workflow process. Each object can have only a single process that is initiated automatically.

Procedure

1. In the Workflow Designer application, select the activated process record that you want to set to not auto-initiate.

2. Select the Set Process to Not Auto-Initiate action.
3. Click Save Process.

Testing workflow processes

You test your workflow processes in a test environment by routing a record through each possible path. Perform these tests before you export your processes to your production environment to ensure that each workflow process accurately reflects your business process.

1. [Workflow process testing](#)
Design your test environment so that it is a copy of your production environment. Your test database must include enough data and users so that you can thoroughly test each workflow process.
2. [Validating workflow processes](#)
You must validate workflow processes to verify the structural integrity of the process.
3. [Enabling workflow processes](#)
Workflow process records are in a draft or a development stage until you enable the record. Enabling a process involves validating the structure of the process.
4. [Activating workflow processes](#)
You activate workflow records before they can be routed into a workflow process.
5. [Disabling workflow processes](#)
Disabling a process prevents new records from being routed into the workflow process. Disabling a process does not affect records that are under the control of the process.
6. [Viewing workflow history](#)
For auditing purposes, a record is maintained of all records that are routed through a workflow process. You can view a list of all user-initiated actions in the workflow process, for example, routing a record into a workflow process, or completing an assignment.
7. [Viewing workflow assignments from a Workflow-enabled application](#)
The Workflow Map shows a graphic of a workflow process, including its nodes and connection lines. The current location of the map in a process is highlighted by a box around the node. You can view the workflow assignments for a record from within a workflow-enabled application. You use the Workflow Map to see where your assignment falls in the context of the workflow process as a whole.
8. [Viewing a Workflow Map](#)
The Workflow Map shows a graphic of a workflow process. You can use the Workflow Map to see where your assignment falls in the context of the process as a whole.

Workflow process testing

Design your test environment so that it is a copy of your production environment. Your test database must include enough data and users so that you can thoroughly test each workflow process.

You use the applications in the Integration module to migrate a workflow process from your test environment to your production environment:

- Validate, enable, and activate each workflow process in a test environment that contains sufficient sample data to test the process. Set up your environment to include test users who can receive assignments and notifications.
- Route records through all possible paths in the process, including all possible paths through any subprocesses. You might create test plans to help you verify that you have tested all possible routes in a process.
- Verify that assignments appear in the Workflow Inbox for users, and that email notifications are being generated.
- Determine whether the process is complete, or whether additional steps must be added.
- Determine that you have configured the process to make the necessary assignments, notifications, and so forth, that are required by your business process. If you have not configured the process, you must modify the process.
- Make any necessary additions, modifications, or deletions and retest the process.
- Use the integration applications to export your tested processes from your test environment to your production environment.

Next topic: [Validating workflow processes](#)

Validating workflow processes

You must validate workflow processes to verify the structural integrity of the process.

Before you begin

If you are validating a process that includes subprocesses, you must validate the subprocess records before you validate the main process.

Procedure

1. From the List tab of the Workflow Designer application, select the process record that you want to validate.
2. Select the Validate Process action. If the process fails validation, a window displays that lists the errors. If the process passes validation, a message displays in the navigation bar.
3. Click Save Process.

What to do next

You are now ready to enable the workflow process. Enabling a process locks the process. To modify a process that has been locked, create a revision and make your changes to it.

Previous topic: [Workflow process testing](#)

Next topic: [Enabling workflow processes](#)

Enabling workflow processes

Workflow process records are in a draft or a development stage until you enable the record. Enabling a process involves validating the structure of the process.

About this task

After you enable a process record, the record is locked, and it is ready for use.

Procedure

1. From the List tab of the Workflow Designer application, select the process record that you want to enable.
2. Select the Enable Process action.
3. Click Close and click Save Process.

What to do next

To make a workflow process record ready to use as a main process, you must activate the process.

Previous topic: [Validating workflow processes](#)

Next topic: [Activating workflow processes](#)

Activating workflow processes

You activate workflow records before they can be routed into a workflow process.

About this task

When you activate a workflow process record, the following actions occur:

- The Workflow actions and buttons are added to the applications associated with the object if those applications do not support workflow yet.
- The Active check box is selected to indicate that the record is currently being used to manage records.
- When you activate a process revision, the previously active revision is deactivated. The product does not disable the revision because active instances of the process might exist.

Procedure

1. From the List tab of the Workflow Designer application, select the process record that you want to activate.
2. Select the Activate Process action. If the applications associated with the object already support workflow, a message displays in the navigation bar stating that the process has been activated.
3. Click OK.

Previous topic: [Enabling workflow processes](#)

Next topic: [Disabling workflow processes](#)

Disabling workflow processes

Disabling a process prevents new records from being routed into the workflow process. Disabling a process does not affect records that are under the control of the process.

Before you begin

You must use the Workflow Designer application to stop any active instances of the process.

About this task

After a record is routed through an enabled process, the process cannot be deleted because other records might be under the control of the process. When you enable a new process revision, the previous revision is automatically disabled.

Procedure

1. From the List tab of the Workflow Designer application, display the record that you want to disable.
2. Select the Disable Process action.

Previous topic: [Activating workflow processes](#)

Next topic: [Viewing workflow history](#)

Viewing workflow history

For auditing purposes, a record is maintained of all records that are routed through a workflow process. You can view a list of all user-initiated actions in the workflow process, for example, routing a record into a workflow process, or completing an assignment.

About this task

When a record routes through more than one workflow process, the workflow history is sorted by process name, then by transaction date. To view workflow assignments, select the Workflow_>..View Workflow History action.

Results

Some transactions are performed automatically. The transactions that are performed automatically do not display even though they are recorded in the workflow history of the record in the database.

Previous topic: [Disabling workflow processes](#)

Next topic: [Viewing workflow assignments from a Workflow-enabled application](#)

Viewing workflow assignments from a Workflow-enabled application

The Workflow Map shows a graphic of a workflow process, including its nodes and connection lines. The current location of the map in a process is highlighted by a box around the node. You can view the workflow assignments for a record from within a workflow-enabled application. You use the Workflow Map to see where your assignment falls in the context of the workflow process as a whole.

About this task

From the View Workflow Assignments window, you can perform the following tasks:

- View a list of the active workflow assignments for the record
- View the workflow history for a record
- View the workflow map for any processes that are currently managing the record.

To view workflow assignments, select the Workflow_>..View Workflow Assignments action.

Previous topic: [Viewing workflow history](#)

Next topic: [Viewing a Workflow Map](#)

Viewing a Workflow Map

The Workflow Map shows a graphic of a workflow process. You can use the Workflow Map to see where your assignment falls in the context of the process as a whole.

About this task

A workflow process consists of decision points, known as nodes, and connecting lines between the decision points. The nodes indicate points in a process where a decision is made, and the connection lines show the path that the record takes after a decision point. The current location of the map in the process is highlighted by a box around the node.

Procedure

1. Select the Workflow_>..Workflow Map action from any workflow-enabled application. You can also access the Workflow Map from the View Assignments window.
2. If multiple workflow processes for the application exist, select the process from the Process Name menu.
3. Click OK to close the workflow map.

Previous topic: [Viewing workflow assignments from a Workflow-enabled application](#)

Modifying workflow processes

Testing your workflow processes might reveal areas for improvement, or over time your processes might evolve due to changes in your business, increased efficiencies, and so on. You can add, modify, or delete process elements at any time until the process has been enabled. Once a process has been enabled, create a revision of the process if you want to modify it.

- [Revising a process](#)
If you want to modify a process after it is enabled and locked, you must create a revision of the process. A revision of the process is required because other records might be under the control of this process.
- [Synchronizing active workflow processes](#)
A workflow process can include one or more subprocesses. When you modify a subprocess, you must update the main process so that it uses the revised subprocess. This process is known as synchronization.
- [Viewing synchronized processes](#)
You can view the name and the revision number of each subprocess associated with a main workflow process.
- [Adding workflow support to applications](#)
Workflow actions or buttons are not included with any of the applications when you install them. You can add the workflow actions and buttons to an application without activating a process. For example, you can make the actions and buttons visible for user training. You can also create customized toolbar buttons before activating a process.
- [Adding toolbar buttons for active workflow processes](#)
If multiple active processes exist for an object, you can use a single toolbar button for all active workflow processes.
- [Modifying toolbar buttons for active workflow processes](#)
You can modify the toolbar buttons that are associated with an application at any time during the design process, or after a process activates.
- [Deleting workflow processes](#)
Depending upon your security permissions and whether records have been marked for deletion, you can delete records from both active and inactive workflow processes.

Revising a process

If you want to modify a process after it is enabled and locked, you must create a revision of the process. A revision of the process is required because other records might be under the control of this process.

About this task

You also can create a revision of a process that is not yet activated or enabled. Creating a revision does not deactivate or disable an activated or enabled process record. However, when you activate a new process revision, the previous revision is deactivated.

Procedure

1. In the Workflow Designer application, display the enabled process record.
2. On the toolbar, click Create Process Revision.
3. Make any necessary modifications to the process.
4. Click Save Process.

What to do next

You must validate, enable, and activate a process revision before it can be used to process records.

Synchronizing active workflow processes

A workflow process can include one or more subprocesses. When you modify a subprocess, you must update the main process so that it uses the revised subprocess. This process is known as synchronization.

Before you begin

You must enable the subprocess revisions before you can synchronize a workflow process.

Procedure

1. In the Workflow Designer application, select the main process record that you want to update.
2. Select the Resynchronize an Active Process action.
3. Click Save Process.

Viewing synchronized processes

You can view the name and the revision number of each subprocess associated with a main workflow process.

Before you begin

The main workflow process record must be activated before you can perform this action.

Procedure

1. From the List tab of the Workflow Designer application, select the process record that you want to view.
2. Select the View Synchronized Processes action.
3. Click OK.

Adding workflow support to applications

Workflow actions or buttons are not included with any of the applications when you install them. You can add the workflow actions and buttons to an application without activating a process. For example, you can make the actions and buttons visible for user training. You can also create customized toolbar buttons before activating a process.

Before you begin

Users are not automatically granted access to workflow actions. An administrator must grant users security permissions to workflow actions in the Security Groups application. The workflow actions appear in the Security Groups application after you add workflow support to an application. You can grant users access to actions before you activate a process.

About this task

When you add workflow support to applications, the product performs the following tasks:

- Adds the Add a Route button to the application toolbar. To customize this button, click Edit Workflow Go Buttons.
- Adds the following workflow-related actions to the Select Action menu for an application:
 - Route Workflow
 - Stop Workflow
 - View Workflow History
 - View Workflow Assignments
 - View Workflow Map
 - Workflow Help
- Supplies the workflow options to all users in security groups with access to the target application.

The Add Workflow to Applications action does not validate, enable, or activate processes.

Procedure

1. From the List tab of the Workflow Designer application, select the process record to which you want to apply workflow.
2. From the Select Action menu, select Add Workflow to Applications.
3. Save your changes.

Results

The Add Workflow Support to Applications window displays. If an application does not support Workflow, the Add Support checkbox displays. You can clear the Add Support checkbox for an application if you do not want to add workflow support to it.

Adding toolbar buttons for active workflow processes

If multiple active processes exist for an object, you can use a single toolbar button for all active workflow processes.

About this task

The Start Workflow window displays a menu of active processes from which to select. You can also add your own toolbar buttons for different active processes. If you exceed the number of icons that can fit on the toolbar, an arrow displays to indicate that a menu of options exists.

Procedure

1. In the Workflow Designer application, select a process record.
2. Select the Edit Workflow GO Buttons action.
3. Insert a row.
4. Specify the application where the workflow process is initiated or routed.

5. Optional: Specify the name of the workflow process.
If no process is specified, the user is prompted to select from active processes for the application or object.
6. Specify a sequence value for the order of the Go Buttons.
7. Add a description that acts as a tooltip for the button.
8. Specify the name of the graphic file to use for the toolbar icon.
For example, specify nav_icon_route.gif.
9. Specify the path and name of the graphic file to use for the toolbar icon when the process is active.
For example, specify nav_icon_route_active.gif.
10. Click OK and then save the process.

Modifying toolbar buttons for active workflow processes

You can modify the toolbar buttons that are associated with an application at any time during the design process, or after a process activates.

Modify toolbar buttons for active processes in the same way that you add buttons for active processes. For more information about modifying buttons, see [Adding toolbar buttons for active workflow processes](#).

Deleting workflow processes

Depending upon your security permissions and whether records have been marked for deletion, you can delete records from both active and inactive workflow processes.

- [Setting security permissions for record deletion](#)
You can give specific groups of users security permissions that allow them to delete records from active workflows.
- [Deleting inactive workflow process records](#)
Process records can be deleted if the process has not been activated or enabled, and no records have been routed through the process.
- [Marking workflow process records for deletion](#)
You can identify records that can be deleted when you create a workflow process. Records that have been marked can be deleted once the workflows they are part of have stopped.

Setting security permissions for record deletion

You can give specific groups of users security permissions that allow them to delete records from active workflows.

Procedure

1. In the Security Groups application, select the security group on the List tab.
2. On the Applications tab, select the Workflow Designer application record.
3. In the Options for Workflow Designer table, select Grant Access for the following options:
 - a. Allow deletion of records
 - b. Disallow deletions
4. Once you have saved the security group, log out and log in to ensure the security settings are applied.

Deleting inactive workflow process records

Process records can be deleted if the process has not been activated or enabled, and no records have been routed through the process.

About this task

Procedure

1. In the Workflow Designer application, display the process record to delete.
2. Select the Delete Process action.
3. Click Yes to confirm the deletion.

Marking workflow process records for deletion

You can identify records that can be deleted when you create a workflow process. Records that have been marked can be deleted once the workflows they are part of have stopped.

About this task

This action can be performed only by users with the appropriate security permissions.

Procedure

1. In the Workflow Designer application, select or create a workflow.
2. Select the Allow deletion of records action.

Integrating workflow processes

You use workflow processes to perform tasks, to execute actions, and to send notifications. After you create workflow processes, you can test them in an environment other than your working environment to fine-tune their behavior. After you test the processes, you can integrate them into your working environment.

Before you begin

The supporting data must be in place before you can integrate the workflow processes.

- **Exporting workflow actions**
When you export workflow actions, you create a query to select records. The export performs the standard outbound processing for the selected interface on the result set of the query.
- **Exporting workflow communication templates**
When you export workflow communication templates, you create a query to select records. The export performs the standard outbound processing for the selected interface on the result set of the query.
- **Exporting workflow roles**
When you export workflow roles, you create a query to select records. The export performs the standard outbound processing for the selected interface on the result set of the query.
- **Manipulating workflow supporting data**
After exporting the workflow supporting data, you must manipulate the data to import it properly. You change the data to ensure that the data is imported from and to the correct places in your system, and to ensure that the commands within the data are set to perform the correct procedures.
- **Importing workflow supporting data**
The Integration Framework can import a workflow process and its supporting data (including actions, roles, and communication templates).
- **Exporting workflow processes**
You can export the workflow processes that you have created.
- **Manipulating workflow processes**
After you export a workflow process, you must manipulate it to import it properly. You manipulate or change the process to ensure that the data is imported from and to the correct places in your system. You also manipulate it to ensure that the commands within the processes are set to perform the correct procedures.
- **Importing workflow processes**
You use the integration framework to import a workflow process and its supporting data, such as actions, roles, and communication templates.

Exporting workflow actions

When you export workflow actions, you create a query to select records. The export performs the standard outbound processing for the selected interface on the result set of the query.

About this task

If the standard processing runs classes or rules that exclude or that modify records or fields, you might need to create and use a new integration point that does not filter or modify records.

To export data, enable the applicable external system and interface. You do not have to enable the outbound event listener.

Procedure

1. From the List tab of the External Systems application, select the system where you want to export a data file. EXTSYS1 is a default system that you can use to export workflow supporting data. You can create as many external systems as you need.
2. Click the Outbound Interfaces tab and select MXACTIONInterface.
3. Click Data Export.
4. In the Integration Point field of the Data Export window, type the name of the corresponding integration point.
5. Optional: In the Export Condition field, type a Structured Query Language (SQL) query statement. The query must be against the primary (top-level) Maximo® business object (MBO) in the integration object.
 - a. To export all workflow-related actions, your query might read: `action in (select action from wfaction)`
 - b. To export actions related to a single workflow process, your query might read: `action in (select action from wfaction where processname = 'name' and processrev = 'rev')` To avoid processing problems due to the size of the XML transaction, use the Export Condition field to filter out unnecessary records.
6. Click OK.

Exporting workflow communication templates

When you export workflow communication templates, you create a query to select records. The export performs the standard outbound processing for the selected interface on the result set of the query.

About this task

If the standard processing runs classes or rules that exclude or that modify records or fields, you might need to create and use a new integration point that does not filter or modify records.

To export data, you enable the applicable external system and interface. You do not have to enable the outbound event listener.

Procedure

1. From the List tab of the External Systems application, select the system where you want to export a data file. EXTSYS1 is a default system to where you can export workflow supporting data. You can create as many external systems as you need.
2. Click the Outbound Interfaces tab and select the MXCTEMPLATEInterface that you want to export.
3. Click Data Export.
4. In the Integration Point field of the Data Export window, type the name of the corresponding integration point.
5. Optional: In the Export Condition field, type a Structured Query Language (SQL) query. The query must be against the primary (top-level) Maximo® business object (MBO) in the integration object.
 - a. To export all workflow-related communication templates, your query might read: `templateid in (select templateid from wfassignment)`
 - b. To export communication templates related to a single workflow process, your query might read: `templateid in (select templateid from wfassignment where processname = 'name' and processrev = 'rev')` To avoid processing problems due to the size of the transaction, use the Export Condition field to filter out unnecessary records.
6. Click OK.

Exporting workflow roles

When you export workflow roles, you create a query to select records. The export performs the standard outbound processing for the selected interface on the result set of the query.

About this task

If the standard processing runs classes or rules that exclude or that modify records or fields, you might need to create and use a new integration point that does not filter or modify records.

To export data, you must enable the applicable external system and interface. You do not have to enable the outbound event listener.

Procedure

1. From the List tab of the External Systems application, select the system where you want to export a data file. EXTSYS1 is a default system to where you can export workflow supporting data. You can create as many external systems as you need.
2. Click the Outbound Interfaces tab and select the MXMAXROLEInterface that you want to export.
3. Click Data Export.
4. In the Integration Point field of the Data Export window, type the name of the corresponding integration point.
5. Optional: In the Export Condition field, type a Structured Query Language (SQL) query. The query must be against the primary (top-level) Maximo® business object (MBO) in the integration object.
 - a. To export all workflow-related roles, your query might read: `maxrole in (select roleid from wfassignment)`
 - b. To export roles related to a single workflow process, your query might read: `maxrole in (select roleid from wfassignment where processname = 'name' and processrev = 'rev')` To avoid processing problems due to the size of the transaction, use the Export Condition field to filter out unnecessary records.
6. Click OK.

Manipulating workflow supporting data

After exporting the workflow supporting data, you must manipulate the data to import it properly. You change the data to ensure that the data is imported from and to the correct places in your system, and to ensure that the commands within the data are set to perform the correct procedures.

Procedure

1. Open the file that you exported from your test environment, such as mxaction. If you have not modified the INTGLOBALDIR, the path for the file is: `<drive_letter>:\<bea_folder>\user_projects\domains\mydomain\xmfiles`
2. Locate the tag `<SenderID>`. Modify the data within the tag to be from EXTSYS1 to read: `<SenderID>EXTSYS1</SenderID>`.
3. Locate the tag `<RecipientID>`. Modify the data within the tag to be from MX, or from the VARVALUE specified in the MAXVARS table for VARNAME MXSYSID by modifying it to read: `<RecipientID>MX</RecipientID>`.

4. Search the document to locate the parent tags, such as `COMMTEMPLATE`, `MAXROLE`, and `ACTION`. Replace these tags with `<COMMTEMPLATE action = "">`, `<ACTION action = "">`, and `<MAXROLE action = "">`. Adding the `action = ""` command tells the system to add or to replace this action.
5. Save the file and place it in the folder of your working environment: `<drive_letter>:\<bea_folder>\user_projects\domains\mydomain\load\xml`

Importing workflow supporting data

The Integration Framework can import a workflow process and its supporting data (including actions, roles, and communication templates).

Before you begin

Your environment must be configured before you can import workflow supporting data. The Data Import feature is available only for interfaces of the Notify operation type within an adapter.

To import data, the data must be in an Extensible Markup Language (XML) file. The format of the data must be the same as the format of the table that corresponds to the interface.

About this task

You can import data to build and test your process in a test environment, then you use the integration framework to export the process to your production environment.

Procedure

1. From the List tab of the External Systems application, select the system where you want to import workflow supporting data. `EXTSYS1` is a default system that you can use to import workflow supporting data.
2. Select the Data Import action.
3. In the Data Import window, select XML File.
4. In the Server Directory field, specify the location of the file. The default location of the file is: `<global directory location>\load\xml`.
5. In the File Name field, specify the name of the file.
6. Click Import.

Exporting workflow processes

You can export the workflow processes that you have created.

Before you begin

You must first create your workflow processes and test them.

Procedure

1. From the List tab of the External Systems application, select the system where you want to export a data file. `EXTSYS1` is a predefined destination where you can export workflow data. The System tab opens with all fields populated. You can create as many external systems as you need.
2. Click the Outbound Interfaces tab and select the interface that you want to export, `MXWFInterface`
3. Click Data Export.
4. In the Data Export window, choose one of the following options:
 - a. To export all workflow processes, click OK. All workflow processes are exported in a single XML file.
 - b. To restrict the output, and export only certain processes, add a Structured Query Language where clause in the Export Condition field. For example, to export only the first revision of the `WOSTATUS` process, type `PROCESSNAME='WOSTATUS' AND PROCESSREV = '1'`.
5. Click OK. The workflow processes are exported to a single XML file.

What to do next

You can now integrate the workflow processes into your working environment.

Manipulating workflow processes

After you export a workflow process, you must manipulate it to import it properly. You manipulate or change the process to ensure that the data is imported from and to the correct places in your system. You also manipulate it to ensure that the commands within the processes are set to perform the correct procedures.

Procedure

1. Open the file that you exported from your test environment. If you have not modified the `INTGLOBALDIR`, the path for the file is: `<global directory>:\xmlfiles`
2. Locate the tag `<SenderID>`. Modify the data within the tag to be from `EXTSYS1` to read: `<SenderID>EXTSYS1</SenderID>`.

3. Locate the tag `<RecipientID>`. Modify the data within the tag to be from MX. You can also modify the data within the tag from the VARVALUE specified in the MAXVARS table for VARNAME MXSYSID, as follows: `<RecipientID>MX</RecipientID>`.
4. Search the XML document to locate the `<WFPROCESS>` and replace with `<WFPROCESS> action = ""` Adding the `action = ""` command tells the product to add or to replace this action.
5. Save the file and place it in the folder of your working environment: `<global directory location>\load\xml`.

Importing workflow processes

You use the integration framework to import a workflow process and its supporting data, such as actions, roles, and communication templates.

Before you begin

Your environment must be configured before you can import workflow processes. The Data Import feature is available only for interfaces of the Notify operation type within an adapter. For more information about configuring your environment, refer to the system administrator guide. For every workflow process that you import, you must add workflow support to the associated applications after you activate the workflow process.

To import data, the data must be in an Extensible Markup Language (XML) file. The format of the data must be the same as the format of the table that corresponds to the interface.

If your workflow process has subprocesses, you must activate the parent and child processes, and then resynchronize the processes. Also, you must import any subprocesses to your workflow process before you import the workflow process.

About this task

When you import a workflow process, you build and test your process in a test environment. After you test your process, you use the integration framework to export the process to your production environment.

Procedure

1. From the List tab of the External Systems application, select the system that you want to import a data file to. EXTSYS1 is a default system to which you can import workflow processes.
2. Select the Data Import action.
3. In the Data Import window, select XML File.
4. In the Server Directory field, specify the location of the file. The default location of the file is: `<global directory location>\load\xml`.
5. In the File Name field, specify the name of the file.
6. Click Import.

Workflow/Inbox Assignments portlet

The Workflow Inbox/Assignments is one of the portlets that might appear on your Start Center. If your workplace has implemented the Workflow feature, a list of your task assignments displays in the Inbox.

A task assignment is a record that is routed to you for action, based on the information contained in a workflow process. The number of records in Inbox/Assignments displays in the top left corner of the portlet.

You use the Workflow Inbox to review assignments, to route assignments, and to complete assignments. You must complete the assignments before a record can move to the next step in a workflow process.

- [Configuring the Workflow Inbox](#)
You use the Workflow Inbox to review, to route, and to complete your task assignments. A task assignment is a record that is routed to you for action, based on the information contained in a workflow process. Records that are listed in your Workflow Inbox are assigned to you.
- [Configuring administrator email notifications](#)
The administrator can receive email notifications about workflow errors to help resolve issues more quickly.
- [Reassigning workflow assignments](#)
You use the Workflow Administration application to reassign workflow task assignments. Sometimes, a workflow task that has been assigned to an individual or to a group must be reassigned to someone else.
- [Sending reassignment notifications](#)
You can notify a person or a group of a workflow task reassignment.
- [Completing workflow assignments](#)
You can complete workflow assignments to complete a task and to route the task to the next assignee. You can view and edit memos that are entered by individuals who have previously reviewed the record or assignment. You can also write memos to task assignees.
- [Deleting assignments](#)
You can delete task assignments if a task node has more than one assignment and you want to make a particular task assignment inactive.

Configuring the Workflow Inbox

You use the Workflow Inbox to review, to route, and to complete your task assignments. A task assignment is a record that is routed to you for action, based on the information contained in a workflow process. Records that are listed in your Workflow Inbox are assigned to you.

Before you begin

You must have security permissions to configure the portlets that display on your Start Center, including configuring the Workflow Inbox.

About this task

The description that displays in the Inbox portlet is the description of the step from the workflow process, not the description of the record. For example, the description for a purchase order task might be "Supervisor approval."

Procedure

1. Click Edit Portlet (pencil icon) in the Inbox/Assignments header to display the Inbox/Assignments Setup application.
2. You can perform the following actions in the Inbox/Assignments Setup application:
 - Change the display name of the portlet
 - Indicate how many rows to display in the portlet
 - Select the columns that are displayed in the portlet and modify their descriptions
 - Indicate the order that the columns are displayed by entering a value in the Order column
3. Click Finished.

What to do next

You must complete the assignment in your Workflow Inbox before the record can move to the next step in the workflow process.

Configuring administrator email notifications

The administrator can receive email notifications about workflow errors to help resolve issues more quickly.

Procedure

1. In the System Properties application, filter to select the mxe.workflow.admin property.
2. In the Global Value field, specify your email address.
3. Save your changes and click Live Refresh.

Reassigning workflow assignments

You use the Workflow Administration application to reassign workflow task assignments. Sometimes, a workflow task that has been assigned to an individual or to a group must be reassigned to someone else.

Procedure

1. From the View Active Assignments window of the Workflow Administration application, click View/Modify Active Assignments.
2. Click Reassign Assignment to reassign assignments.
3. In the Person field of the Reassign window, type a person ID.
4. Click OK to close the Reassign window, then click OK.

Sending reassignment notifications

You can notify a person or a group of a workflow task reassignment.

Procedure

1. In the Reassign window, click New Row.
2. In the Send To field, specify the identifier for a person or click Detail Menu... Select Value and choose a person record from the list.
3. In the Subject field, type a subject for the e-mail message.
4. In the Message field, type the text of the e-mail message.
5. Click OK to close the Reassign window, then click OK.

Completing workflow assignments

You can complete workflow assignments to complete a task and to route the task to the next assignee. You can view and edit memos that are entered by individuals who have previously reviewed the record or assignment. You can also write memos to task assignees.

Procedure

1. Perform one of the following actions:
 - In the workflow inbox, select Route.
 - In a Workflow-enabled application, click Route Workflow.
 - In the Workflow window, click Complete an Assignment.
2. Select an action.
3. In the Memo field, enter a memo value.
4. Click Reassign, to assign the task to another individual.
5. Click OK.

Results

The task is placed in the workflow inbox of the assigned person. The memo that you entered is added to the record workflow history. The next person in the process flow can view your memo in the Earlier Memos table window

Deleting assignments

You can delete task assignments if a task node has more than one assignment and you want to make a particular task assignment inactive.

About this task

All task nodes must have at least one task assignment. You cannot delete the last active assignment for a given task.

Deleting an assignment changes the status of the task assignment record to inactive.

Procedure

1. If necessary, use the table filter to locate a process instance.
2. In the Processes table window, click View/Modify Active Assignments.
3. To delete an assignment, click Delete Assignment. The status of the task assignment is changed to inactive. The assignment record is removed from the View Active Assignments window.
4. Click OK to close the window.

Integrating data with external applications

The integration framework helps you to integrate application data with other applications, either within your enterprise or with external systems. The framework includes predefined content that enables integration with a number of business objects, and a tool kit that you can use to extend predefined integration content and to develop new integration points. Features that allow enablement of message providers are included in the integration framework. The framework provides an abstraction of the message queuing features. In this way, the product is independent of the model for the underlying messages, such as JMS or Apache Kafka.

- [Integration framework overview](#)
As the system administrator for the Maximo® Manage Integration Framework, you can enable the secure sharing of data between Maximo Manage and an external system or application. Integration components, which you can configure to fit your integration needs, are included in your Maximo Manage system.
- [Architecture](#)
The integration framework architecture includes the data, transport, communication, and security components required to exchange information between separate applications and systems.
- [Integration by using Apache Kafka](#)
You can integrate with the Apache Kafka messaging platform to publish and consume messages asynchronously from the Kafka platform. Kafka can be configured as an external message provider that accepts and stores outbound and inbound messages.
- [Enabling data export and import through message queues](#)
Before you use the integration framework to exchange data with an external application, you configure some components that are needed for inbound and outbound communication. You configure system properties, end points, publishing channels and integration controls, external systems, message queues, and cron tasks. You might need to make other configurations to export and import data.
- [Configuring Java Message Service \(JMS\) servers](#)
If you use Java™ Messaging Service (JMS) to integrate data, you can deploy one or more server bundles with a Liberty server that supports JMS messaging.
- [Integration components](#)
Depending on the scope and requirements of your implementation, you can create new components or copy, modify, or extend most of the predefined components.
- [Integration data processing](#)
You can configure integration components in different ways to meet your integration requirements. You can integrate with multiple external applications, and each application requires a different integration approach that is based on the integration support that is provided by that application.
- [Configuring the integration framework](#)
Setting up the integration framework includes configuring related system properties, queues, and security. Implementing integration scenarios requires a knowledge of configuring queues and knowledge of J2EE and product security support.
- [Exporting and importing file-based data](#)
The integration administrator can initiate export and import data from within the External Systems application to support, for example, integrating data using files. The import process includes the ability to preview a data load from a file to validate the data prior to saving it to the database. The import process also includes an option to manage errors that result from file loading in the same file format as the imported file

- **[Federated MBO integration](#)**
Maximo Manage supports the sharing of data between Maximo Manage and external systems in several ways.
- **[Integration APIs](#)**
The integration framework supports the use of REST (Representational State Transfer) application programming interface (API), and the sharing of lifecycle data between applications based on Open Services for Lifecycle Collaboration (OSLC) integration.
- **[Integration queries](#)**
The integration framework supports queries from external systems. You can execute a query for object structures and enterprise services by using HTTP, REST APIs, or a Simple Object Access Protocol (SOAP) request in a web service. Queries can be in the form of XML messages or REST API JSON.
- **[Interface tables](#)**
Interface tables are an option for integration with systems that use database tables to exchange data. This integration option applies only to enterprise services and publish channels and is always processed asynchronously, by using JMS queues.
- **[Integration modules](#)**
An integration module provides a mechanism for a process management product to invoke an external operational management product. You can configure an integration module to automate logical management operations, such as software deployment, by using an operational management product.
- **[Launch in Context feature](#)**
You use the Launch in Context application to create and modify launch entry records which open an external application in the same or a different browser session. You can open applications independently or as part of an application integration scenario.
- **[Integrating with Workday Connector](#)**
You can integrate IBM® Maximo Manage and Workday Human Capital Management (HCM) to synchronize your HCM data and integrate IBM Maximo Manage and Workday Financial to synchronize your financial data. By completing an integration with Workday Connector, you can synchronize data between systems and access more accurate cost and time reporting information.
- **[Envizi ESG Suite and TRIRIGA Application Suite Connectors](#)**
IBM TRIRIGA® Application Suite and IBM Maximo Application Suite customers have access to a collection of predefined integrations between each other and IBM Envizi ESG Suite.
- **[Integration reference information](#)**
Reference information includes a guide to the XML structures and schemas used by the integration framework, the system properties you can set, and predefined collaboration switches provided with applications.

Integration framework overview

As the system administrator for the Maximo® Manage Integration Framework, you can enable the secure sharing of data between Maximo Manage and an external system or application. Integration components, which you can configure to fit your integration needs, are included in your Maximo Manage system.

The integration framework includes the following components and features:

- Predefined integration content
- Applications to create and configure integration components
- Support for multiple communication modes including web services, Java™ Message Service (JMS) messaging, Apache Kafka messaging, and hyper text transfer protocol (HTTP).
- Support for different data formats, including database interface tables, XML and JavaScript Object Notation (JSON) messages, and flat files such as comma-separated text files
- Event-based, batch, program-initiated, and user-initiated processing and context-based launch of external applications
- Support for integration to operational management products (OMPs)
- Support for clustered environments
- Support for interacting with applications that support the Open Services for Lifecycle Collaboration (OSLC) integration specification. The integration framework can enable an application to be an OSLC consumer application that can integrate with an external application that has implemented OSLC provider capabilities.
- REST API support for the standard services of the integration framework. The Maximo Manage business objects form the resources for the REST API.
- Use of API keys for all machine-to-machine integrations. Generate the API key in the Administration Work Center.

The integration framework provides multiple options for sending and receiving data. Evaluate which approach is the most efficient for your requirements when you are planning an integration. Some typical integration scenarios include:

- Load files with legacy data during an implementation.
- Synchronize master data between a product application and an external ERP application.
- Use web services to enable real-time querying of product application data by an external application.
- Call an external application to validate data that is entered in a product application.

If you want to import a large number of records from an external source, import the data in batch files or use interface tables. This approach separates the data so that multiple messages are processed as separate transactions. You can also use REST APIs to import and export data in JSON, XML, or CSV format. With a single transaction that processes synchronously, such as a web service call, limit the number of messages in a single transaction to ensure that the transaction processes in an acceptable length of time. When you are planning an integration, evaluate which integration option is most appropriate for your requirements.

Predefined integration content includes support for a number of business objects and insert, update, and delete functions on these business objects is enabled. When you use predefined content, there are certain limitations that can affect your implementation. If business rules exist within the business object that do not allow a function, for example the delete function, the function is not available for integration. In addition to support for insert, update and delete operations, the product applications support other functions that are available as actions. Predefined integration content does not support all the actions that are available. In most cases, the Change Status action is supported through integration.

Architecture

The integration framework architecture includes the data, transport, communication, and security components required to exchange information between separate applications and systems.

- **Integration framework components**
The framework for data exchange includes components and tools that you can use to implement different types of integration scenarios.
- **Message provider enablement**
The Integration Framework includes features that allow enablement of message providers. The framework provides an abstraction of the message queuing features. In this way, the product is independent of the model for the underlying messages, such as JMS or Apache Kafka.
- **Framework for operational management product integration**
Process management products can integrate with operational management products in an automated mode using integration modules. Process management products can use the launch in context feature to integrate with operational management products in an assisted mode.
- **Framework for user interface integration**
You can configure the integration framework to open a window in an external application and provide data to include in the context of that window.

Integration framework components

The framework for data exchange includes components and tools that you can use to implement different types of integration scenarios.

Components

The framework includes predefined integration components and applications you can use to configure components. The main components are described in the following table.

Table 1. Integration framework data exchange components

Component	Description
Object structures	An object structure is the common data layer that the integration framework components use for outbound and inbound application message processing. An object structure consists of one or more related business objects that define the content of an XML or JSON message (schema). For JSON messages, you can configure message templates to filter which data from the related business objects is included in the message.
Business objects	Application business objects are available as Representational State Transfer (REST) resources for queries and updates by using the REST API component of the integration framework.
Publish channels	A publish channel is used for sending asynchronous messages through a message queue to an external system. Publish channel messages can be initiated via an event or through the Data Export feature.
Invocation channels	Invocation channels are used for sending synchronous messages to an external system and processing the response content. The channel supports the implementation of processing logic and mapping of the request and the response. An invocation channel also allows for response data to be used to update business objects and be displayed to application users.
Enterprise services	An enterprise service is a pipeline for querying and importing data from an external system. An enterprise service can process data synchronously (without a queue) or asynchronously (with a queue). Enterprise services can use multiple protocols, such as web services and HTTP.
External systems	An external system is defined for the external application that you plan to integrate with. The external system identifies the communication protocol to use and which enterprise services, publish channels and message queues to implement for that external system.
Handlers and endpoints	A handler and its associated endpoint routes outbound messages to an external system. The combination of a handler and its endpoint specify the transport protocol, such as HTTP or web service, and provide the communication data required to reach the destination, such as a URL. You configure endpoints for the handler that you use.
Web services	You can deploy integration framework services, such as enterprise or object structure services, as web services that external systems can invoke.
Data import and export	You can load data from either XML files or flat files, such as a comma-separated text file or a CSV file. You can import and export data in the JSON format. You can initiate data import and export from a product application and you can schedule a batch process to perform an import as a background process. You can export one or more records to a file using a Publish Channel, where filter conditions can be applied to control the content of the data that is exported.
Content	The integration framework provides predefined content that includes object structures, corresponding enterprise services and publish channels, an external system, and predefined handlers that support different communication protocols.
API keys	You use API keys to enable a machine-to-machine integration for an external client. When an API key is assigned to the external client, the external client can access and interact with data in the Maximo® Manage system.

Processing

As integration messages flow in and out, the framework provides options, such as Java™ classes, XSL mapping and processing rules, to provide message transformation logic and business rules to meet your integration requirements.

Communication

The integration framework can facilitate asynchronous or synchronous data exchange. Asynchronous messages are processed through the message queues. The queues can process messages in order of priority (sequential processing), or in a multi-threaded manner (continuous processing). Synchronous messages that require a response to the sender are not processed through the JMS queues and require a direct connection between the integration framework and the external application.

When integrating with multiple external applications, you can configure different channels and services to use different communication protocols, including HTTP, web services, and message queue messaging, based on the capabilities of each individual external application.

Security

The integration framework uses the product support for J2EE authentication security so that you can configure for Enterprise Java Beans (EJBs), web services, and HTTP. You can configure authorization security for applications, objects, and standard service methods.

You can specify security that enables only the logged-in user to create an API key. To limit the creation of API keys to the logged-in user, specify 1 for the `mxe.apikeyforloggedinuser` system property.

Message provider enablement

The Integration Framework includes features that allow enablement of message providers. The framework provides an abstraction of the message queuing features. In this way, the product is independent of the model for the underlying messages, such as JMS or Apache Kafka.

The Integration Framework provides a client for JMS and Kafka. A factory implementation for these supported messaging models is registered. Each factory provides a concrete implementation of the clients for the message consumer, producer, and browser.

Updates to the framework provide a higher-level abstraction of the existing JMS features. Existing JMS support and configuration remain unchanged. Any existing JMS configuration in the Integration Framework is the same if the same JMS messaging provider and application server are used.

Framework for operational management product integration

Process management products can integrate with operational management products in an automated mode using integration modules. Process management products can use the launch in context feature to integrate with operational management products in an assisted mode.

The process management product provides an action Java™ class that initiates the call to an integration module, and subsequently the operational management product. The process management product then processes the response from the operational management product.

A logical management operation defines the action that the process management product takes on the operational management product. The logical management operation identifies the following properties:

- The name and description of the action that it supports
- Whether processing is synchronous or asynchronous
- The input (source) and output (target) objects and fields for the transaction

The integration module provides a mechanism for a process management product to call an external operational management product. When it is started by a process management product, the integration module uses data provided by the process management product to assist in calling the operational management product service. The integration module can also return any response data to the process management product.

Operational management products provide services that integration modules can call to initiate operational management product actions.

Framework for user interface integration

You can configure the integration framework to open a window in an external application and provide data to include in the context of that window.

You can configure a console URL for any application with a web-based console, and you can configure URLs for consoles that use Java™ Web Start. You cannot use a launch entry to open applications that are not enabled for the web. You can configure a launch point from any product application. You can provide access to launch points as actions, as hyperlinks, and in application buttons.

You can use the same approach to open a product application window from an external application.

Integration by using Apache Kafka

You can integrate with the Apache Kafka messaging platform to publish and consume messages asynchronously from the Kafka platform. Kafka can be configured as an external message provider that accepts and stores outbound and inbound messages.

Introduction to Kafka integration

The product provides the Kafka messaging client that supports consuming, producing, and browsing Kafka topics. To use Kafka features in the product, you must obtain and configure a Kafka server instance of the provider. You can choose any Kafka provider that is compatible with the Kafka 2.8.x client libraries.

The Kafka provider manages the topics and the corresponding partitions and storage that persist the integration messages. The integration framework provides the Kafka client framework to read, write, and browse messages in Kafka topics.

The integration framework uses the point-to-point delivery of Kafka messages. Thus, all Kafka topics are used by the integration framework as a messaging queue. Only one consumer group per topic is used to consume messages. A separate consumer group is used for browsing. However, one other consumer group per topic is available for browsing topics.

The integration framework uses only messaging features of Kafka and does not use any of the Kafka streaming features.

The integration framework supports asynchronous message processing that uses Kafka providers similarly to the way that the integration framework uses JMS. Kafka topics persist messages to a data store for outbound publish or notification channel messages and inbound enterprise service messages. In both cases,

sequential and continuous message processing is supported.

Maximo Manage components for Kafka message queues

The following Maximo® Manage components support using Kafka as a message queue:

- Maximo Manage cron tasks for consuming messages from the queues.
- The integration framework for file loading, and the interface table cron task and servlet that write, or produce, messages to queues.
- External Systems application configuration to support registration of the Kafka provider and queue processing.
- Maximo Manage REST API for Kafka that enables browsing messages in the queue. Kafka messages cannot be deleted from Maximo Manage. It is better to leverage the Message Reprocessing application to remove Kafka messages, which in effect just skips the message for the next one.

Differences between JMS queue processing and Kafka queue processing

If you are considering changing from using JMS queues to using Kafka queues for message processing, though the processing features in Kafka are similar, be aware of some differences. Many of the following differences are discussed in more detail in other topics in the Kafka content.

- In Maximo Manage, a Kafka message type is always byte and not text. JMS messages can be text or byte.
- A Kafka message is always compressed.
- The Kafka message size limit is configured in the *mxm.kafka.messagesize* system property in Maximo Manage. Set its value in bytes to match the value that is used on the Kafka server for Maximo Manage.
- Kafka messages are not deleted when they are processed. They are removed from the queue after the configured retention time is exceeded.
- Continuous message consumption is managed by Maximo Manage cron tasks and not by message-driven beans (MDBs).
- The Maximo Manage REST API is used for browsing messages in a queue.
- [Specifying Kafka providers for message processing](#)
You can specify Kafka as a messaging provider to asynchronously process outbound and inbound integration framework messages. The integration framework supplies a Kafka client.
- [Registering Kafka topics as Maximo Manage queues](#)
To exchange message data and contents with Kafka, you register Kafka topics as Maximo Manage message queues.
- [Configuration of the Kafka cron task](#)
You configure an instance of the Kafka cron task for each of your Kafka queues. The cron task consumes Kafka messages based on the schedule that you specify. All message consumption is controlled by the Kafka cron task.
- [Message processing by using a Kafka provider](#)
With a Kafka messaging provider, you can process outbound messages sequentially and inbound messages sequentially or continuously. In general, Kafka message processing is similar to JMS message processing.
- [Sample REST API requests for browsing Kafka queues](#)
You can browse message content in a Kafka queue by using a REST API that the product provides. Browse message content to analyze it or to troubleshoot processing.

Specifying Kafka providers for message processing

You can specify Kafka as a messaging provider to asynchronously process outbound and inbound integration framework messages. The integration framework supplies a Kafka client.

Before you begin

Obtain and configure a Kafka provider that is compatible with the Kafka 2.8 libraries.

About this task

Kafka refers to a *topic* as a category or feed name to which records are published. Because of the way that the integration framework works with Kafka, topics are referred to as messaging queues.

Only one Kafka provider instance per deployment is supported.

Procedure

1. In the External Systems application, add or select the external system and then select Add/Modify Message Providers to open the Message Hub Provider dialog box.
2. Insert a row and add a Kafka provider name.
The provider type is specified as KAFKA.
3. Specify values for the following properties. The SASL_MECHANISM and SECURITY_PROTOCOL properties are optional.

Option	Description
SASL_MECHANISM	The mechanism that implements the Simple Authentication and Security Layer (SASL) authentication and security framework. The allowed value is PLAIN. If no value is specified, the value of PLAIN is used.
SECURITY_PROTOCOL	The protocol that ensures secure data sharing. Allowed values are SASL_SSL, SSL, PLAINTEXT, or SASL_PLAINTEXT. If no value is specified, the default value of SASL_SSL is used.
BOOTSTRAPSERVERS	A comma-separated list of server URLs that host your Kafka instance. Include the port specification. For example, specify <i>brokerurl1,brokerurl2</i> . You can use quotation marks if needed.

Option	Description
PASSWORD	If you specify the security protocol as either SASL_SSL or SASL_PLAINTEXT, specify an authentication password.
USERNAME	The username for your password.

4. Save your changes.

What to do next

- Register the Kafka topics as Maximo® Manage queues in the External Systems application.
- For continuous inbound queues, you do not need to set any error queues. The error table acts as the error queue.
- Configure one or more cron tasks to poll your queues and process the queue messages.
- For continuous queues, configure one or more error cron tasks to process the messages from the error table.

Registering Kafka topics as Maximo Manage queues

To exchange message data and contents with Kafka, you register Kafka topics as Maximo® Manage message queues.

Before you begin

Before you can register Kafka topics as product queues, take the following steps:

- Create the topics on the Kafka server.
- Configure a message provider of Kafka type in the External Systems application.

Procedure

1. Select Add/Modify Queues in the External Systems application and add a queue.
2. Specify the Kafka provider and topic name. Specify the message direction and whether the queue is sequential or continuous. All outbound queues are sequential queues. You specify a queue as continuous by leaving the Sequential check box deselected and specify a queue as inbound by leaving the Inbound check box deselected.

Note: No separate error queue is needed for continuous queue processing. Error messages are written to the error tables as it was done in Maximo Manage earlier. There is a new error processing cron task called KAFKAERROR. You should configure an instance of the KAFKAERROR cron task for each continuous queue. It is responsible for processing messages from the error table in a continuous way. The Kafka cron task just moves to the next offset and continues processing remaining messages from the Kafka continuous queue.
3. Specify the email address of the user who receives notices when errors occur in the queue. This value is used instead of the email value that is specified in system properties.
4. In the Maximum Retry Count field, specify the maximum number of reprocessing attempts after an initial error and before a message is put in a Hold status and moved to a configured error queue.
5. Save your changes.

What to do next

For each queue, add an instance of the Kafka cron task to periodically poll the queue for messages and process them.

Configuration of the Kafka cron task

You configure an instance of the Kafka cron task for each of your Kafka queues. The cron task consumes Kafka messages based on the schedule that you specify. All message consumption is controlled by the Kafka cron task.

Kafka cron task setup

The Kafka cron task consumes messages according to whether the queue is sequential or continuous. In the Cron Task Setup application, add one or more instances of the Kafka cron task. Define the cron task schedule, administrative user to notify about problems, whether the cron is active, and whether to keep history. For each instance, specify values for the following properties:

Property	Description	Default
TOPIC	The name of the Kafka topic. This value is required.	None
MESSAGEHUB	The name of the Kafka provider that is registered in the product. This value is required.	None

Property	Description	Default
MESSAGEPROCESSOR	The message processor. The same message processor is used for JMS processing. This value is optional. If no value is specified, the default values are used.	Inbound psdi.iface.jms.QueueToMaximoProcessor Outbound psdi.iface.jms.QueueToDestManagerProcessor Notification com.ibm.tivoli.maximo.notification.NotificationMessageProcessor
PARTITION	A cron task is a specific Kafka consumer instance. The specific numeric partition that is assigned to the cron task creates a Kafka consumer that has that partition. When external systems send messages to the Maximo® Manage application, Kafka partitions can potentially be used for scaling. You can define cron tasks, which are Kafka consumers, by using preassigned partitions during setup time.	None

KAFKAERROR cron task setup

The KAFKAERROR cron task is responsible for processing messages from the error table in a continuous way. It should be set up only for continuous Kafka queues.

Property	Description	Default
TOPIC	The name of the Kafka topic. This value is required.	None
MESSAGEPROCESSOR	The message processor. The same message processor is used for JMS processing. This value is optional. If no value is specified, the default values are used.	Inbound psdi.iface.jms.QueueToMaximoProcessor Outbound psdi.iface.jms.QueueToDestManagerProcessor Notification com.ibm.tivoli.maximo.notification.NotificationMessageProcessor

- [Guidelines for Kafka cron task configuration](#)
For the Kafka cron task, it is important that you configure it using these guidelines.

Guidelines for Kafka cron task configuration

For the Kafka cron task, it is important that you configure it using these guidelines.

- Maximo® Manage does not use Kafka topics for error management of continuous queues. The error table, maxinterror is used for error handling. To enable the process of error message reprocessing for continuous queues, you must setup an instance of the KAFKAERROR cron task for each continuous queue. Error processing for sequential queues remains unchanged.
- It is important to setup partitions for continuous queues to facilitate parallel processing. For each partition, ensure that you have only one Kafka cron task instance.
For example, if a continuous queue has three partitions, you must have three instances of the Kafka cron task. Each of the Kafka cron task instances must be set with a unique partition number set in the PARTITION parameter. Typically, partitions follow a zero-based numeric sequence, that is, a three-partition Kafka task has 0,1, and 2 numbered partitions.

Follow the same method for sequential queues as well. However, for sequential queues, since only one partition exists, you must set the PARTITION parameter to 0.

- If you are using Maximo Application Suite 8.9 or earlier versions, set the mxe.int.kafkapolltimeout property to 5000 for better message consumption performance. The default value is set to 5000 for the mxe.int.kafkapolltimeout property starting from Maximo Application Suite 8.10 onwards.
- If a Kafka cron task stops processing messages for a long period, stop the cron task. Delete and re-create the cron task by using a different name to resolve the issue.
- The Kafka cron task uses Maximo Manage users for message processing. If the user is inaccessible for some reason, the Kafka cron task is unable to create the user information for the Maximo user. In this scenario, the cron task cannot pull messages from Kafka, but it continues to run, that is, the lastruntimeStamp is updated according to the frequency. Look for the following message in the log:
"Default userinfo for integration user is null ... will not attempt to get any message from Kafka topic."

In such cases, check the Maximo Manage User application and the loginlock table to see whether the user is disabled or invalid or blocked. You might have to delete or restart the Kafka cron task.

Message processing by using a Kafka provider

With a Kafka messaging provider, you can process outbound messages sequentially and inbound messages sequentially or continuously. In general, Kafka message processing is similar to JMS message processing.

Kafka message processing

Kafka message processing tracks processed messages by maintaining an *offset* value that represents the sequential order in which messages are received by Kafka topics. The offset value indicates the next message to be processed. After a message is processed in Kafka, the offset is now beyond that processed message, and the message is never processed again.

The processed message is not deleted from the queue. It remains in the queue until the configured expiration time for the message is met.

Maximo® Manage provides an application to help you to reprocess messages that have errors. See [more information about error processing](#).

Message size limits

You configure a message size limit on the Kafka server. When you configure this limit, consider the size of your transactions, including the size of integrated attachments. Large message size can have a negative performance impact on the reading and writing of messages in the queue.

In Maximo Manage, you can add the `mxe.kafka.messagesize` system property for the maximum message size that can be processed. Configure the property to match the message size, in bytes, that you set on the Kafka server. The default setting is 10 MB.

Kafka write timeouts

In Maximo Manage, Kafka write actions wait for acknowledgment from the Kafka brokers. You can control the write timeout for the Kafka producer by using the `mxe.kafka.waittimeforack` property. The measurement unit is in milliseconds.

Outbound sequential message processing

The integration framework uses Kafka topics as outbound, sequential message queues. When a message is sent from the integration framework, it is routed to your Kafka provider, where it is hosted as a JSON message in a predefined topic. Although publish channels can send messages in XML or JSON format, the product wraps them as JSON formatted messages and writes them to the Kafka topic. An outbound message uses the structure that is shown in the following code example:

```
{
  "interfacetype": "MAXIMO",
  "INTERFACE": "MXPRInterface",
  "payload": "<xml/json message>",
  "SENDER": "MX",
  "destination": "<external system name>",
  "destjndiname": "<kafka topic name>",
  "compressed": "1",
  "MEAMessageID": "<providername>~<topic>~<partition>~<offset>",
  "mimetype": "application/xml"
}
```

The payload property contains the payload that is sent to the endpoint. The entire Kafka message is compressed at the time of storage inside the Kafka partitions. In the Kafka partitions, messages are stored in a strict timestamp order. The position of the message in the partition is given a sequential ID number that is known as a message *offset*. Although Kafka topics can be partitioned, sequentially processed topics must be in a single partition.

After the message is written to the Kafka topic, it is processed by the associated Kafka cron task that you configure in the Cron Task Setup application for each topic. Processing occurs according to the external system and endpoint that are configured for the channel.

Inbound sequential processing

Inbound message processing can be sequential or continuous. Inbound sequential processing is similar to outbound sequential processing and requires the same types of configuration, including an instance of the Kafka cron task.

The structure of a sequential inbound message is shown in the following example:

```
{
  "interfacetype": "MAXIMO",
  "SENDER": "testkafka",
  "destination": "testkafka",
  "USER": "wilson",
  "MEAMessageID": "...",
  "INTERFACE": "MXASSETInterface",
  "payload": "{\"assetnum\":\"AZ163\",\"siteid\":\"BEDFORD\"}",
  "mimetype": "application/json",
  "destjndiname": "anamitratestcont"
}
```

Configure sequential queues with a single partition and no more than one cron task instance to consume messages from the queue.

See [more information about error processing](#).

Inbound continuous queue processing and scaling

Inbound continuous message processing with Kafka is similar to JMS message processing, however, there are differences in scaling and in error processing.

In general, and unlike sequential queues, continuous queue processing does not stop processing when a message has an error. Messages with errors are written to the error table and processed from the error table by the KAFKAERROR cron task instance for the respective queue.

A single Kafka queue can be scaled as *multithreaded*, or as having multiple consumers of messages, by defining more partitions for the queue. Each partition represents a separate consumer, and each partition requires its own cron task instance to support message consumption for the partition. To scale processing, configure multiple partitions. The number of cron task instances must match the number of partitions.

See [more information](#) about error processing of messages in continuous inbound queues and configuring a redelivery delay.

- [Error processing with an Apache Kafka provider](#)
When messages have errors during processing in Kafka, you can reprocess them or mark them to be deleted after they expire from Kafka.
- [Expired message cleanup](#)
You can configure a cron task to remove messages that have expired in the Kafka topic from Maximo Manage. Kafka does not provide a way to delete messages from the server.
- [Managing Kafka offset values in Maximo Manage](#)
Offset values are managed by Kafka. Queue processing in Maximo Manage attempts to keep the Maximo Manage offset values synchronized with the corresponding Kafka offset values for a queue.

Error processing with an Apache Kafka provider

When messages have errors during processing in Kafka, you can reprocess them or mark them to be deleted after they expire from Kafka.

Error processing of messages in sequential queues

Sequential queues do not use an error queue because only one message is in error at any time. A message in error prevents the messages behind it in the queue from processing. However, an error does not prevent new messages from being added to the queue. Kafka retains both processed and unprocessed messages in the queue, based on the retention time that is set in Kafka.

In Kafka, pay attention to the Kafka retention time. For example, if you set it to 48 hours, a message goes in error late Friday evening. Other messages stack up behind the error message. If the error message is not managed until Monday morning, the error message and other unprocessed messages might expire before messages resume processing.

Messages that are in error and expired in Kafka can be reprocessed in the Message Reprocessing application.

If messages are in a queue but are not being processed, which happens if the cron task is not active, messages can expire. Because the messages did not process with an error, they are not available in the Message Reprocessing application and are not recoverable.

If you have messages in error that you do not want to reprocess, mark the messages for deletion in the Message Reprocessing application.

Error processing of messages in continuous inbound queues

A message that is in error in a continuous queue is written to the end of the queue so that it reprocesses. The number of times that an errored message can be reprocessed is determined by the value of the Maximum Retry Count field for this external system.

For continuous inbound error processing, you must set up an instance of the KAFKAERROR cron task for that continuous queue. This cron task processes the messages from the maxinterror table in Maximo® Application Suite.

Note: After attempting the "maximum retry count" times, the error message is set on HOLD status. This gets skipped by the KAFKAERROR cron task in favor of the next message in the error table. If you want to fix the message and retry, use the Message Reprocessing application to edit the message and change the message status to "RETRY" for the KAFKAERROR cron task to process it in the next iteration. If you do not want to process the error message anymore, mark the message for deletion in the Message Reprocessing application.

Configuration of a redelivery delay for continuous queues

An administrator can configure a redelivery delay that is in effect when a retry count is specified for a continuous queue. When a redelivery delay is specified in the mx.int.kafkaredeldelay property, the cron task for the queue does not rewrite a message to the end of the Kafka queue until after the delay time.

For example, if the delay is set to 30 seconds, the cron task for the continuous queue pauses for 30 seconds before it rewrites the message with errors to the end of the queue. The delay allows other messages to be processed in the queue, some of which can contain objects that are needed to successfully process the message that had errors. The drawback of using this mechanism is that the delay slows down the processor because it delays the cron task from continued processing.

To implement a redelivery delay, create the mx.int.kafkaredeldelay property in the System Properties application and set a delay time in seconds.

Expired message cleanup

You can configure a cron task to remove messages that have expired in the Kafka topic from Maximo® Manage. Kafka does not provide a way to delete messages from the server.

KafkaErrorsCleanup cron task

When a message is older than the retention time that you configure on the server, Kafka expires the message. Maximo Manage cron tasks cannot process expired message from the queue, and if any of the expired messages didn't process because of errors, they remain in the Message Reprocessing application.

The KafkaErrorsCleanup cron task can be configured to clean up the Kafka expired messages that meet the following conditions:

- The message must be older than the retention time in hours that is specified when you add a message queue for a publish channel, enterprise service, or notification channel. The integration administrator should set this time to match the retention time that is specified when the topic is registered in Kafka.
- The message must be marked for deletion in the product or already processed. Topics that are already processed are no longer visible in the Message Reprocessing application, but they are deleted by the cleanup cron task.

Messages that have a status of Hold or Retry are not deleted by the cron task. The integration administrator can try to reprocess those messages manually from the Message Reprocessing application or mark the message for deletion and run the cron task.

Managing Kafka offset values in Maximo Manage

Offset values are managed by Kafka. Queue processing in Maximo® Manage attempts to keep the Maximo Manage offset values synchronized with the corresponding Kafka offset values for a queue.

Maximo Manage maintains these offset values in the MAXKAFKAOFFSET table, so that for messages with errors, processing of duplicate messages is prevented.

Values might not be synchronized if you delete and re-create Kafka queues, such as while you are working in a development environment. The offset values also might not be synchronized if you use a command line or user interface tool in Kafka to reset the Kafka consumer offset for the Maximo Manage consumer group. You must update Maximo Manage to reflect these types of changes.

Procedure

1. In Maximo Manage, stop the cron task for the consumer.
The name of the cron task instance is the client ID of the Kafka consumer.
2. Delete the Kafka queue.
The queue name is the name of the consumer group.
3. Take one of the following steps:

Condition	Action
A Kafka queue was deleted in Kafka	In the MAXKAFKAOFFSET table of Maximo Manage, delete the row that corresponds to the Kafka offset value for the deleted Kafka queue. You delete the row either in the database or by creating an object structure and deleting the row by using a REST client, such as Postman. Each queue partition is associated with one row.
An offset value was changed in Kafka by using Kafka tooling or scripting	In the MAXKAFKAOFFSET table of Maximo Manage, set the offsets to the same values.

4. Create the Kafka queue.
5. Restart the Kafka server.
6. Restart the cron task for the consumer.

Sample REST API requests for browsing Kafka queues

You can browse message content in a Kafka queue by using a REST API that the product provides. Browse message content to analyze it or to troubleshoot processing.

When you browse a Kafka queue, you see messages that are unprocessed and messages that are processed but not yet expired from Kafka. In a continuous queue, you might see multiple iterations of a message if the message encountered an error during processing.

To make a REST request, you need a browser session or another API tool.

Sample REST API requests

Sample formats of the REST requests are shown in the following examples:

Providing the hostname, port, Kafka provider, and topic name

```
http://localhost:7001/maximo/oslc/browsemsgshub/Kafka Provider Name/Kafka Topic Name?clean=1
```

Showing all records or showing records from the offset point on forward by using the all parameter

```
http://localhost:7001/maximo/oslc/browsemsgshub/Kafka Provider Name/Kafka Topic Name?all=1
```

To show all records and ignore the offset value, set the all parameter to 1, as shown previously.

To show all messages from the offset point on forward, set the all parameter to 0.

Limiting the content in the response by using the pageSize parameter

```
http://localhost:7001/maximo/oslc/browsemsgshub/Kafka Provider Name/Kafka Topic Name?oslc.pageSize=100
```

Limiting the content in the response and identifying the partition by using the pageSize parameter

```
http://localhost:7001/maximo/oslc/browsemsgshub/Kafka Provider Name/Kafka Topic Name?oslc.pageSize=100&partition=0
```

Limiting the content in the response, identifying the partition and requests on the second page of data by using the pageSize parameter

```
http://localhost:7001/maximo/oslc/browsemsgshub/Kafka Provider Name/Kafka Topic Name?oslc.pageSize=100&partition=0&pageno=2
```

Enabling data export and import through message queues

Before you use the integration framework to exchange data with an external application, you configure some components that are needed for inbound and outbound communication. You configure system properties, end points, publishing channels and integration controls, external systems, message queues, and cron tasks. You might need to make other configurations to export and import data.

If you are using JMS message queues, you obtain them from a JMS provider, such as IBM® MQ. If you are using Kafka message queues, you obtain a Kafka provider and configure the connection to it.

If you are using JMS message queues, you can use a JMS version 1.1 compliant provider, such as IBM MQ or the Maximo® Application Suite built-in JMS provider from WebSphere® Application Server Liberty. If you are using Kafka message queues, obtain a Kafka provider and configure the connection to it.

Note: Delete messages for all types of JMS queues through Message Reprocessing. However, if your system admin uses the Delete Selected Messages or Delete All Messages option to delete messages, ensure that the JMS crontask for that queue is shut down before deleting the message. Other tasks include understanding the object structures and child components for message content, setting up optional message templates, and setting up API keys if you use machine-to-machine integration.

Procedure

1. Obtain and configure the messaging queue provider.
 2. Register either the JMS queue or the Kafka topics in Maximo Manage.
 3. Create an external system.
 4. Register the JMS queues or the Kafka topics with the external system.
 5. Configure the external system for sequential or continuous processing.
 6. For JMS processing, register the queues and connection factories in the `server.xml` file for Maximo Manage in WebSphere Application Server Liberty.
If you are already using a supported JMS provider, use the same JNDI name as the JNDI name that you use in Maximo Manage. For more information about configuring the `server.xml` file, see [Enabling JMS messaging for Liberty](#) in the WebSphere Application Server Liberty documentation.
- [Configuring system properties for JMS queues](#)
Before you enable the integration framework, modify the default settings for integration properties to settings that are appropriate to your environment.
 - [Activating the cron task for JMS queues](#)
For asynchronous processing, integration messages are placed in JMS queues. Cron tasks poll the JMS queues at frequent intervals and then process messages that are found in the queues.
 - [Exporting data to a test file](#)
To validate that outbound processing is correctly configured and enabled, run a test export.
 - [Importing data from a test file](#)
To validate that inbound processing is correctly configured and enabled, run a test import.

Configuring system properties for JMS queues

Before you enable the integration framework, modify the default settings for integration properties to settings that are appropriate to your environment.

Procedure

1. In the System Properties application, filter for the integration properties by specifying the filter `mxe.int` in the Property Name field.
2. Select the `mxe.int.dfltuser` property and verify that the user account that is specified is a valid system user account. Modify the property value if necessary.
The property specifies the default login ID that is used for all integration transactions that are processed by an inbound JMS queue.
3. Optional: Configure the `mxe.int.globaldir` property to specify a global directory to hold integration-related files. The product must have access to the global directory.
For example, you use a file-based endpoint that does not specify a file location. The file that is generated by the endpoint is placed in a default directory in the global directory.

Activating the cron task for JMS queues

For asynchronous processing, integration messages are placed in JMS queues. Cron tasks poll the JMS queues at frequent intervals and then process messages that are found in the queues.

Procedure

1. In the Cron Task Setup application, search for the JMSQSEQCONSUMER cron task.
2. Verify that the cron task is configured to poll both the SEQQIN and the SEQQOUT queues.
3. Set the Active check box for each queue.
4. Click Save.
5. Click the Reload Request action.

Exporting data to a test file

To validate that outbound processing is correctly configured and enabled, run a test export.

About this task

To test outbound processing, this task uses the data export feature to export a person record to a file. The task uses the following predefined integration components:

- External system: EXTSYS1
- Publish channel: MXPERSONInterface, which uses the MXPERSON object structure
- Endpoint: MXXMLFILE

Procedure

1. In the Systems tab, ensure that the Enabled check box is selected for the EXTSYS1 external system.
2. In the Publish Channels tab, filter for the MXPERSONInterface publish channel.
3. In the Details section for the MXPERSONInterface publish channel, specify MXXMLFILE in the End Point field.
4. Click Data Export.
5. In the Data Export window, specify 1 in the Count field to limit the export to just one record.

Results

If a location is not specified in the FILEDIR property, the XML file is exported to the location that you specified in the mx.int.globaldir property.

Importing data from a test file

To validate that inbound processing is correctly configured and enabled, run a test import.

Procedure

1. Open the test file that you exported in a text editor and perform the following modifications:
 - a. Change the <PublishMXPERSON> tag to <SyncMXPERSON> to change the operation for inbound processing.
 - b. Add a suffix to the LASTNAME value, such as LASTNAME_TEST, to make it easy to verify the change when you import the test file.
 - c. Save the file.
2. On the System tab of the External Systems application, ensure that the Enabled check box is selected for the EXTSYS1 external system.
3. On the Enterprise Services tab, filter for the MXPERSONInterface enterprise service.
4. Select the MXPERSONInterface row, and clear Use Continuous Queue.
5. Click Save.
6. Select the MXPERSONInterface row and click Data Import.
7. In the Data Import window, specify the following values:
 - a. Select the XML file option.
 - b. In the Specify Import File field, navigate to the modified test file and select it.
8. Click OK.
9. In the People application, filter for the test record and verify that the value in the Last Name field includes the suffix that you added.
10. Delete the suffix to restore the record to its original value and click Save.

Configuring Java Message Service (JMS) servers

If you use Java™ Messaging Service (JMS) to integrate data, you can deploy one or more server bundles with a Liberty server that supports JMS messaging.

- [Configuring JMS servers for Maximo Manage](#)
To add a JMS server bundle, you specify `standalonejms` for the server bundle type when Maximo Manage is deployed.
- [Scaling JMS servers](#)
By default, the server bundle for JMS servers is a single pod or server bundle in Maximo Manage. You can add server bundles if you need them.

Configuring JMS servers for Maximo Manage

To add a JMS server bundle, you specify `standalonejms` for the server bundle type when Maximo® Manage is deployed.

About this task

This configuration creates a single-pod Liberty JMS server.

By default, ephemeral storage for the JMS server uses the `/jmsstore` directory in the container. Generally, users require persistent storage for messaging. To provide persistent storage, provision a persistent storage volume for Maximo Application Suite. Then, configure a persistent volume claim for the JMS bundle when you deploy the application. You can specify a different directory for the JMS storage while setting server configuration through the additional server configuration parameters for the bundle.

Procedure

1. Log in to Maximo Application Suite as a system administrator.
2. From Suite administration, select Workspaces from the side navigation menu and then select the Manage tile.
3. On the Manage workspace details page, click Actions, and select Update configuration.
4. In the Server bundles row, click the edit icon.
5. In the Server bundles section, if the System managed checkbox is selected, clear it. Click Add bundle.
6. In the Name column, enter a name for the bundle, such as `jmsserver`.
7. In the Type column, select `standalonejms`.
8. To configure the queues, complete the following steps:
 - a. In the Additional properties column for your JMS server bundle, click View.
 - b. Optional: Set a different route subdomain.
 - c. In the Additional server config section, use XML to specify both the default queues and the custom queues that you want to add. This step adds the default queues and two custom queues:

```
<?xml version="1.0" encoding="UTF-8"?>
<server description="new server">
  <messagingEngine>
    <fileStore path="/jmsstore"/>
    <queue
      id=" home markdown jenkins workspace Transform in SSLPL8 cd com.ibm.mam.doc.manage.deploy.t.configure.jms.server_2_sqoutbd" maintainStrictOrder="true" maxMessageDepth="100000" failedDeliveryPolicy="KEEP_TRYING"
      maxRedeliveryCount="-1"/>
    <queue
      id=" home markdown jenkins workspace Transform in SSLPL8 cd com.ibm.mam.doc.manage.deploy.t.configure.jms.server_2_sqinbd" maintainStrictOrder="true" maxMessageDepth="200000" failedDeliveryPolicy="KEEP_TRYING"
      maxRedeliveryCount="-1"/>
    <queue
      id=" home markdown jenkins workspace Transform in SSLPL8 cd com.ibm.mam.doc.manage.deploy.t.configure.jms.server_2_cqinerrbd" maxMessageDepth="100000" failedDeliveryPolicy="KEEP_TRYING"/>
    <queue
      id=" home markdown jenkins workspace Transform in SSLPL8 cd com.ibm.mam.doc.manage.deploy.t.configure.jms.server_2_cqinbd" maxMessageDepth="100000" exceptionDestination="cqinerrbd"/>
    <queue
      id=" home markdown jenkins workspace Transform in SSLPL8 cd com.ibm.mam.doc.manage.deploy.t.configure.jms.server_2_notferrbd" maxMessageDepth="100000" failedDeliveryPolicy="KEEP_TRYING"/>
    <queue
      id=" home markdown jenkins workspace Transform in SSLPL8 cd com.ibm.mam.doc.manage.deploy.t.configure.jms.server_2_notfbd" maxMessageDepth="100000" exceptionDestination="notferrbd"/>
    <queue
      id=" home markdown jenkins workspace Transform in SSLPL8 cd com.ibm.mam.doc.manage.deploy.t.configure.jms.server_2_custsqoutbd" maintainStrictOrder="true" maxMessageDepth="100000" failedDeliveryPolicy="KEEP_TRYING"
      maxRedeliveryCount="-1"/>
    <queue
      id=" home markdown jenkins workspace Transform in SSLPL8 cd com.ibm.mam.doc.manage.deploy.t.configure.jms.server_2_custsqinbd" maintainStrictOrder="true" maxMessageDepth="200000" failedDeliveryPolicy="KEEP_TRYING"
      maxRedeliveryCount="-1"/>
  </messagingEngine>
</server>
```

Note: The fileStore path can be modified to use a different directory to store JMS messages. If you are using persistent volumes, make sure that the fileStore path is configured correctly under the persistent volume directory. For example, if your persistent volume is mounted on directory `/nfs`, then the fileStore path might be `/nfs/jmsstore`.

- d. Click Save to save the additional server bundle properties.
9. If you have a single server (all) bundle or for the mea bundle, to prepare the other Maximo Manage server bundles for the JMS queues, complete the following steps:
 - a. In the Additional properties column for the server bundle, click View.
 - b. In the Additional server config section, specify features for both the default queues and the custom queues that you want to add, as shown in the following example:

```
<?xml version='1.0' encoding='UTF-8'?>
<server description="new server">
  <featureManager>
    <feature>jndi-1.0</feature>
    <feature>wasJmsClient-2.0</feature>
    <feature>jmsMdb-3.2</feature>
    <feature>mdb-3.2</feature>
  </featureManager>
  <jmsQueueConnectionFactory jndiName="jms/maximo/int/cf/intcf" connectionManagerRef="mifjmsconfact">
    <properties.wasJms remoteServerAddress="<InstancesId>-<workspaceId>-<serverbundlename>.mas-<instanceId>-manage.svc:7276:BootstrapBasicMessaging"/></jmsQueueConnectionFactory>
  </connectionManager>
  <id=" home markdown jenkins workspace Transform in SSLPL8 cd com.ibm.mam.doc.manage.deploy.t.configure.jms.server_2_mifjmsconfact" maxPoolSize="20"/>
  <jmsQueue jndiName="jms/maximo/int/queues/sqout"><properties.wasJms queueName="sqoutbd"/></jmsQueue>
  <jmsQueue jndiName="jms/maximo/int/queues/sqin"><properties.wasJms queueName="sqinbd"/></jmsQueue>
  <jmsQueue jndiName="jms/maximo/int/queues/cqin"><properties.wasJms queueName="cqinbd"/></jmsQueue>
  <jmsQueue jndiName="jms/maximo/int/queues/cqinerr"><properties.wasJms queueName="cqinerrbd"/></jmsQueue>
  <jmsQueue jndiName="jms/maximo/int/queues/notf"><properties.wasJms queueName="notfbd"/></jmsQueue>
  <jmsQueue jndiName="jms/maximo/int/queues/notferr"><properties.wasJms queueName="notferrbd"/></jmsQueue>
```

```

    <jmsQueue jndiName="jms/maximo/int/queues/custsqout"><properties.wasJms queueName="custsqoutbd"/>
  </jmsQueue>
  <jmsQueue jndiName="jms/maximo/int/queues/custsqin"><properties.wasJms queueName="custsqinbd"/></jmsQueue>
  <jmsActivationSpec
id=" home markdown_jenkins workspace Transform in SSLPL8_cd com.ibm.mam.doc_manage_deploy_t_configure_jms_serve
r_2_maximo-all/mboejb/JMSContQueueProcessor-1" maxEndpoints="5"><properties.wasJms
destinationLookup="jms/maximo/int/queues/cqin" maxConcurrency="5" maxBatchSize="20"
connectionFactoryLookup="jms/maximo/int/cf/intcf"/></jmsActivationSpec>
  <jmsActivationSpec
id=" home markdown_jenkins workspace Transform in SSLPL8_cd com.ibm.mam.doc_manage_deploy_t_configure_jms_serve
r_2_maximo-all/mboejb/JMSContQueueProcessor-2" maxEndpoints="1"><properties.wasJms
destinationLookup="jms/maximo/int/queues/cqinerr" maxConcurrency="1" maxBatchSize="20"
connectionFactoryLookup="jms/maximo/int/cf/intcf"/></jmsActivationSpec>
</server>

```

10. If you have report, cron, or UI bundles, complete the following steps for each of them:

- In the Additional properties column for the server bundle, click View.
- In the Additional server config section, specify features for both the default queues and the custom queues that you want to add, as shown in the following example:

```

<?xml version='1.0' encoding='UTF-8'?>
<server description="new server">
  <featureManager>
  <feature>jndi-1.0</feature>
  <feature>wasJmsClient-2.0</feature>
  <feature>jmsMdb-3.2</feature>
  <feature>mdb-3.2</feature>
  </featureManager>
  <jmsQueueConnectionFactory jndiName="jms/maximo/int/cf/intcf" connectionManagerRef="mifjmsconfact">
  <properties.wasJms remoteServerAddress="<InstancesId>-<workspaceId>-<serverbundlename>.mas-<instanceId>-
manage.svc:7276:BootstrapBasicMessaging"/></jmsQueueConnectionFactory>
  <connectionManager
id=" home markdown_jenkins workspace Transform in SSLPL8_cd com.ibm.mam.doc_manage_deploy_t_configure_jms_serve
r_2_mifjmsconfact" maxPoolSize="20"/>
  <jmsQueue jndiName="jms/maximo/int/queues/sqout"><properties.wasJms queueName="sqoutbd"/></jmsQueue>
  <jmsQueue jndiName="jms/maximo/int/queues/sqin"><properties.wasJms queueName="sqinbd"/></jmsQueue>
  <jmsQueue jndiName="jms/maximo/int/queues/cqin"><properties.wasJms queueName="cqinbd"/></jmsQueue>
  <jmsQueue jndiName="jms/maximo/int/queues/cqinerr"><properties.wasJms queueName="cqinerrbd"/></jmsQueue>
  <jmsQueue jndiName="jms/maximo/int/queues/notf"><properties.wasJms queueName="notfbd"/></jmsQueue>
  <jmsQueue jndiName="jms/maximo/int/queues/notferr"><properties.wasJms queueName="notferrbd"/></jmsQueue>
  <jmsQueue jndiName="jms/maximo/int/queues/custsqout"><properties.wasJms queueName="custsqoutbd"/>
  </jmsQueue>
  <jmsQueue jndiName="jms/maximo/int/queues/custsqin"><properties.wasJms queueName="custsqinbd"/></jmsQueue>
</server>

```

For steps 9 and 10:

The queueName values must match the queue names that you specified in step 8.c. Also, the difference between all bundles or mea bundle XML versus the report, cron, UI bundles XML is that the second category does not have the jmsActivationSpec lines.

When you enter the connection properties, supply the following variables:

```

<InstanceId>
  Name of your Maximo Application Suite instance.
<workspaceId>
  Name of your workspace.
<serverbundlename>
  Name of your JMS server bundle, for example, jmsserver.

```

Note: Your *remoteServerAddress* must be in the following format:

```

remoteServerAddress="<InstancesId>-<workspaceId>-<serverbundlename>.mas-<InstanceId>-
manage.svc:7276:BootstrapBasicMessaging"

```

For example:

```

remoteServerAddress="mngrel84-masdev-jmsserver.mas-mngrel84-manage.svc:7276:BootstrapBasicMessaging"

```

- Click Save again to save the additional server bundle properties.
- After you complete the workspace updates, activate the changes.

What to do next

After you configure the stand-alone JMS servers, you can log in to Maximo Manage and configure your JMS queues. For more information, see [JMS queue configuration](#).

Scaling JMS servers

By default, the server bundle for JMS servers is a single pod or server bundle in Maximo® Manage. You can add server bundles if you need them.

You can select one of the following options to add JMS server bundles:

- Complete the following steps to create more instances of the standalonejms server bundle and the mea server bundle:
 - Create another instance of the standalonejms server bundle.

2. Create the same set of queues that existed in your first server bundle.
3. Create another instance of the mea server bundle that uses the new standalonejms server bundle.

You can then configure an external system to use either of the mea cluster URLs to send the messages, which distributes the processing load across multiple servers.

- You can add more mea server instances for the same standalonejms server. This process effectively creates message-driven beans (MDB) that can consume messages in parallel from the JMS server.

Integration components

Depending on the scope and requirements of your implementation, you can create new components or copy, modify, or extend most of the predefined components.

Duplicating an integration component and modifying the copy has several advantages. The copy of an integration component becomes a user-defined entity, and modification restrictions that apply to the predefined component do not apply to the copy. The original version of the component is unchanged. To avoid modifying a component while it is being used for transaction processing, perform all modifications in administrator mode.

- **[Object structures](#)**
An object structure is the common data layer that the integration framework components use for outbound and inbound application message processing. An object structure consists of one or more related business objects that define the content of an XML or JSON message (schema).
- **[Publishing channels and services](#)**
Channels and services reference an object structure for their message content and enable the synchronous and asynchronous exchange of data with external systems. Outbound messages are processed by publishing channels and invocation channels. Inbound messages are processed by object structure services, enterprise services, and standard services.
- **[Endpoints and handlers](#)**
An endpoint and its associated handler route outbound messages to an external system. The combination of an endpoint and handler specify the transport protocol to use or web service, and provide the communication data required to reach the destination, such as a URL.
- **[Web services](#)**
External systems can use integration framework web services to send messages or queries to the Maximo® database. You can use an integration framework service as the source for a web service and then deploy this service to communicate with external systems.
- **[Configuring an external system](#)**
You can configure the external system that the integration framework communicates with. You can configure external systems for external applications inside or outside your enterprise.
- **[API keys application](#)**
You use API keys to enable an inbound machine-to-machine integration for an external client. API keys can be used by the OSLC and REST APIs and also can be used as part of the Manage integration framework.
- **[Predefined integration content](#)**
The integration framework provides predefined integration content, including object structures, enterprise services, and publish channels that support exporting data to external systems importing data from external system or exporting data to them.

Object structures

An object structure is the common data layer that the integration framework components use for outbound and inbound application message processing. An object structure consists of one or more related business objects that define the content of an XML or JSON message (schema).

An object structure provides the message content for channels and services and enables application-based import and export. In addition, an object structure, on its own, can be called as a service, supporting the Create, Update, Delete, Sync, and Query operations.

Note: Use the object structures that are provided with your Manage system whenever possible, instead of creating a new or duplicate object structure. If the outbound integration messages are in the JSON format, you can modify which data is shared from that object structure by creating a message template for the object structure.

- **[Identification of object structure data](#)**
If you are adding or modifying object structures, identification of the data to include requires some understanding of the applications and their associated objects. Review the data model of an application to determine which objects, database tables, and views contain the data to transfer to and from an external system.
- **[Alternate keys](#)**
Inbound message processing relies on the key field(s) of an object to find an existing record in the system to support updates and deletes. The default processing relies on the primary key to retrieve existing records. Sometimes a primary key is unknown to an external application and an alternate key (known by the external system) is defined to support the updating and deleting of records by the external system.
- **[Object fields](#)**
The integration framework and the external system exchange a subset of the data columns in the objects within the object structure. Subject to certain restrictions, you can control the content of the object fields within the message by including persistent and nonpersistent columns of individual objects.
- **[Interface table and flat file considerations](#)**
If you use an object structure for exchanging data with interface tables or flat files, you must ensure that the object structure does not contain duplicate column names.
- **[Modification of a predefined object structure](#)**
There are certain restrictions if you modify a predefined object structure.
- **[Configuring an object structure](#)**
You can create new object structures and during that process you can generate schema files, include or exclude fields, and resolve alias conflicts. You can also specify inbound setting restrictions, set advanced configuration properties, configure application authorization, and configure message templates for outbound integration messages.
- **[Message templates that specify outbound data](#)**
Message templates are an additional option for editing the structure of an outbound message. You use message templates to limit which data from the

associated object structure is included in the message.

Identification of object structure data

If you are adding or modifying object structures, identification of the data to include requires some understanding of the applications and their associated objects. Review the data model of an application to determine which objects, database tables, and views contain the data to transfer to and from an external system.

You must find out which objects populate the database tables. Generally, a one-to-one relationship exists between an object and a database table. However, in some cases, multiple objects write data to a single table.

When an object structure contains multiple objects, the object structure is arranged as a hierarchy, with a root object (the top or main object) and child objects. An object structure can support any number of levels of objects in its hierarchy. If you create or modify object structures, you must specify a valid parent-child for relationship for all objects under the top level of the hierarchy and you cannot reference the same object more than once in the same branch of the hierarchy. When you create an object structure, start by adding the main (top-level) object. You can then add more objects as child objects of the parent object.

For example, there is a predefined object structure for exchanging data in the person object with an external system. If no predefined object structure existed, to create one, you determine that the data that you require resides in the PERSON, PHONE, EMAIL, and SMS tables. The database tables have the same name as the corresponding objects. Include these objects in the object structure that you create. The name of the object structure must begin with an alphabetic character.

Typically, the objects in an object structure include all the persistent columns of the objects and exclude all nonpersistent columns. A persistent column is a data field that an object uses to write data to a database table as part of its processing. A nonpersistent column is a temporary data field that an object uses for calculations or temporary storage.

Learn more about object structures and their relationships in the Object Structures and Database Configuration applications. To see information about various object structures for Work Centers, open the Object Structures application and filter the object structure names by entering `mxapi` in the Object Structure field. In Work Centers, the queries for the various object structures control the information that is visible in containers such as the columns and tabs.

Alternate keys

Inbound message processing relies on the key field(s) of an object to find an existing record in the system to support updates and deletes. The default processing relies on the primary key to retrieve existing records. Sometimes a primary key is unknown to an external application and an alternate key (known by the external system) is defined to support the updating and deleting of records by the external system.

An inbound message normally uses the primary key of an object to look up and process records that already exist in the system. However, sometimes a primary key is an internally-generated value that is not available to the external system. In such cases, you can define an alternate key for an object and the external system passes the alternate key field(s) that the integration framework uses, instead of the primary key fields, to retrieve the data for that object.

You can specify an alternate key for an object either at object level or at object structure level. If you specify an alternate key at object level, all object structures that include the object use the same alternate key. If you specify an alternate key at the object structure level, you can use different object structures to specify a different alternate key for each external data source that the object uses. You define the index that make up an alternate key for an object in the Database Configuration application. After you create the index, you can select it as an alternate key for the object.

During inbound processing, the integration framework processes the alternate key and primary key in the following order:

- Processes the alternate key of the object structure, if one is configured.
- Processes the alternate key of the object, if one is configured and an alternate key is not configured for the object structure.
- Uses the object primary key if an alternate key is not configured for either the object structure or the object.

After you specify an alternate key, inbound messages can fail if you change or drop the alternate key index.

Object fields

The integration framework and the external system exchange a subset of the data columns in the objects within the object structure. Subject to certain restrictions, you can control the content of the object fields within the message by including persistent and nonpersistent columns of individual objects.

A business object can have many fields, most of which may not be necessary for an integration scenario. When you configure an object structure, you can select which fields to include in integration messages and improve the performance of message transfer between applications. By default, the objects in an object structure include all the persistent columns of the objects. A persistent column is a data field that an object uses to write data to a database table as part of its processing. To control the content size, you can exclude persistent columns that you are not exchanging with external applications. Only the included persistent columns are part of the XML or JSON message for outbound messages. For inbound messages, only the object columns that are included in the object structure are updated. Do not exclude any column that is part of a primary or alternate key.

An object structure excludes most nonpersistent columns in the component objects. A nonpersistent column is a temporary data field that an object uses for calculations or temporary storage. You can include additional nonpersistent columns in the object structure. For example, objects that contain the persistent column DESCRIPTION also contain the nonpersistent column DESCRIPTION_LONGDESCRIPTION. Most predefined object structures include this nonpersistent column because many integration scenarios require long description fields. If this field is not included, it is not part of the integration messages. If you change the message content of an object structure that is being used for an interface table, the interface table must be regenerated to reflect the updated content of the object structure.

Interface table and flat file considerations

If you use an object structure for exchanging data with interface tables or flat files, you must ensure that the object structure does not contain duplicate column names.

You must select the Flat Supported check box for any object structure that you intend to use for interface table or flat file integration scenarios. When this option is set, messages are checked to ensure that every column for every object in the object structure has a unique name. If duplicate column names exist, you can create an alias field name for one of the duplicate names. Modifying the alias ensures that all column names are unique and the system can generate the interface table or flat file without errors. Interface tables require that all columns that are included in the corresponding object have an alias name of 18 or fewer characters.

Modification of a predefined object structure

There are certain restrictions if you modify a predefined object structure.

You can add objects to a predefined object structure, but you cannot delete predefined objects from the object structure. To avoid this restriction, you can copy the predefined object structure to create a user-defined object structure, and delete objects from the copy. You can also use a message template to filter which data from the objects is included in JSON outbound messages. Do not delete or edit an object structure that is for a primary Manage API. These object structures are included in your Manage system.

You can include and exclude persistent and nonpersistent columns, subject to the standard validations that apply during integration processing. Outbound messages include the columns for objects that you add to an object structure. Test inbound messages to ensure that any columns that you added are processed successfully. If the additional object columns are not processed successfully, add an object structure processing class to handle the inbound processing.

If you use the object structure in interface tables or flat files, check for column duplications. If you use interface tables, regenerate the table for every enterprise service or publish channel that uses the modified object structure.

Configuring an object structure

You can create new object structures and during that process you can generate schema files, include or exclude fields, and resolve alias conflicts. You can also specify inbound setting restrictions, set advanced configuration properties, configure application authorization, and configure message templates for outbound integration messages.

- [Creating object structures](#)
When you create an object structure, you define a group of related objects to be part of an integration message that you exchange with external applications. You can identify data fields for each business object that determines the content of integration messages.
- [Configuring an alternate key](#)
To configure an alternate key, create a unique index in the Database Configuration application and reference this index as the alternate key for an object structure or for a specific object.
- [Including nonpersistent fields in the object structure](#)
You can include nonpersistent field data in an integration message. By default, the business object nonpersistent fields are excluded from the object structure definition. Business objects use nonpersistent fields for calculations or for temporary storage of data.
- [Excluding persistent fields from the object structure](#)
You can exclude persistent field data that you do not want to map to an integration message. By default, the business object persistent fields are included in the object structure definition. Business objects use persistent fields to write processing data to a database.
- [Resolving alias conflicts](#)
An object structure that contains multiple objects and supports flat files or interface tables, cannot have duplicate field names for any of the fields in its objects. You must resolve any field name (alias) conflicts before you can generate interface tables and flat file records.
- [Setting restrictions on fields for inbound messages](#)
Standard integration processing sets the values in object fields with the corresponding values from an inbound message. You can set a field as restricted if you do not want the value to be updated by inbound messages, for example for a field with an internal ID or where a processing class provides the logic to set the field.
- [Setting advanced configurations for an object structure](#)
You can set advanced configurations for an object structure to change some default processing behavior for integration messages. Advanced configurations include configuring how key fields are processed for child objects, whether an event on a child object activates a corresponding event on the parent object, and whether auto-generated data is deleted.

Creating object structures

When you create an object structure, you define a group of related objects to be part of an integration message that you exchange with external applications. You can identify data fields for each business object that determines the content of integration messages.

About this task

During the configuration, you can define the Java™ classes, if needed, that process inbound and outbound messages. You also can define an application that provides authorization rules for the integration messages processed through the object structure. If the object structure is intended for querying only and you do not want to use it for updating, select the Query Only option. If the main object in the object structure has a relationship to itself as a child object, set the Self Reference option.

Procedure

1. In the Object Structures application, click New Object Structure.
2. In the Object Structure field, specify an object structure identifier.
3. Optional: If you are using the object structure for query operations, select the Query Only check box.
4. Optional: If you are using interface tables or flat files to exchange data between the integration framework and an external system, select the Support Flat File Structure check box.
5. In the Consumed By field, specify the module that uses the object structure.

Option	Description
INTEGRATION	Integration framework
MIGRATIONMGR	Migration manager
REPORTING	Reporting
OSLC	OSLC

6. In the Source Objects table window, click New Row.
7. Enter values in the following fields to create a business object hierarchy:
 - Object
 - Parent Object
 - Reporting Description
 - Relationship
 - Object Order
8. Click Save Object Structure.

What to do next

If the Alias Conflict check box is selected on the object structure record, you can add or modify an alias to correct the duplicated field names in your source objects. You can also specify the persistent and nonpersistent fields that you want to exclude and include from the object structure.

Configuring an alternate key

To configure an alternate key, create a unique index in the Database Configuration application and reference this index as the alternate key for an object structure or for a specific object.

About this task

If you set the alternate key at the object level, the key applies to all uses of the object in any object structure. If you set the alternate key within the object structure, the key applies to the object only when it is accessed through the selected object structure.

Procedure

1. Identify the field(s) of an object to use as the alternate key.
2. Select the object in the Database Configuration application.
3. Create a unique index for the field(s) in the Indexes tab.
4. Specify this index in the Alternative Key field in one of the following tabs:
 - a. In the Object tab of the Database Configuration application if you want to apply the alternate key to the object for all external data sources.
 - b. In the Object Structures tab of the Database Configuration application if you want to apply the alternate key to this specific usage of the object.

Including nonpersistent fields in the object structure

You can include nonpersistent field data in an integration message. By default, the business object nonpersistent fields are excluded from the object structure definition. Business objects use nonpersistent fields for calculations or for temporary storage of data.

Before you begin

If you want to change a predefined object structure, make a duplicate of that object structure to create a user-defined version that is suitable for modification.

Procedure

1. In the Object Structures application, select the object structure that you want to update.
2. Select the business object that contains the nonpersistent field that you want to include.
3. From the Select Action menu, select Exclude/Include Fields.
4. Click the Non-Persistent Fields tab to display the nonpersistent fields in the business object.
5. Specify whether you want the nonpersistent field to be included or excluded.

Option	Included
Include the field	Selected
Exclude the field	Cleared

6. Click OK.

What to do next

You can generate schema files and view the XML structures of an object structure web service.

Excluding persistent fields from the object structure

You can exclude persistent field data that you do not want to map to an integration message. By default, the business object persistent fields are included in the object structure definition. Business objects use persistent fields to write processing data to a database.

About this task

You cannot exclude a field that is part of a primary key. If you exclude a persistent field from a predefined object structure, the associated object might not function properly during inbound message processing. Test your inbound messages to ensure that an excluded persistent field does not impact the object processing.

Procedure

1. In the Object Structures application, select the object structure that you want to update.
2. Select the business object that contains the persistent field that you want to exclude.
3. From the Select Action menu, select Exclude/Include Fields.
4. Click the Persistent Fields tab to display the persistent fields in the business object.
5. Specify whether you want the persistent field to be excluded or included.

Option	Excluded
Exclude the field	Selected
Include the field	Cleared

6. Click OK.

What to do next

You can generate schema files and view the XML structures of an object structure web service.

Resolving alias conflicts

An object structure that contains multiple objects and supports flat files or interface tables, cannot have duplicate field names for any of the fields in its objects. You must resolve any field name (alias) conflicts before you can generate interface tables and flat file records.

About this task

If an alias conflict exists, the Alias Conflict check box is selected on the object structure record. You can change an alias only if the Support Flat File Structure check box is selected on the record, indicating that the data is processed using interface tables or flat files.

Procedure

1. When an alias conflict exists, select a business object in the Source Objects table.
2. Select the Add/Modify Alias action.
If a duplicate alias exists for a field, the corresponding Duplicate check box is selected.
3. To update a duplicate alias:
 - a. Click View Details for the duplicate alias.
 - b. Specify a new value in the ALIASNAME field.
 - c. Click OK.

What to do next

After you resolve all alias conflicts, you can generate interface tables and flat file records. If you use interface tables, you must regenerate all tables that use the updated object structure. To regenerate interface tables, select the Create Interface Tables action in the External Systems application.

Setting restrictions on fields for inbound messages

Standard integration processing sets the values in object fields with the corresponding values from an inbound message. You can set a field as restricted if you do not want the value to be updated by inbound messages, for example for a field with an internal ID or where a processing class provides the logic to set the field.

Procedure

1. In the Object Structures application, select the Inbound Setting Restrictions action.
2. In the Inbound Setting Restrictions window, select the object that you want to apply setting restrictions to.
The Inbound Setting Restrictions table refreshes with a list of the fields that are configured for the selected object.

3. Select the Restricted check box for any field that you do not want to be updated with values in inbound messages.
4. You can select the Override check box to remove the restrictions set for a field.
You cannot override the restriction set on some fields, for example for a field with a system-generated ID.
5. Click OK to close the dialog box.

Setting advanced configurations for an object structure

You can set advanced configurations for an object structure to change some default processing behavior for integration messages. Advanced configurations include configuring how key fields are processed for child objects, whether an event on a child object activates a corresponding event on the parent object, and whether auto-generated data is deleted.

Procedure

1. Select the Advanced Configuration action.
2. Deselect the Exclude Parent Key Attributes check box for any object where you want these attributes to be included for child objects.
When checked (the default), key fields that exist in a child object are not included in the section of the message for the child object if the same field is part of the key of the parent object. If you deselect this option, key fields for a child object are always included and the field is included in both the child object section of the message and the parent object section.
3. Select the Skip Key Update check box if you want to disable updates of primary keys.
4. Deselect the Delete Auto-generated Data check box for any object where you want to retain this data.
When checked (the default), integration processing always deletes any child-level data that is automatically created by the business object logic when the parent object is created. If you deselect this option, any additional data that is auto-generated is retained.
5. Check the Propagate Event option for any object where you want an event on a child object to trigger an event on the main object.
When you configure a publish channel to send messages based on an object event, the event listener is configured for the main object of the object structure. In some cases, an update to a child object does not trigger an event on the main object and no message is initiated. Check this option if you want an update to the child object to trigger an event to the main object without updating the main object. If a child object includes logic that triggers an event to its parent object, you cannot enable or disable it with this configuration.

Message templates that specify outbound data

Message templates are an additional option for editing the structure of an outbound message. You use message templates to limit which data from the associated object structure is included in the message.

When you create the message template, you associate it with an object structure. A single object structure can have multiple message templates. You configure message templates on the Message Templates subtab on the Integration tab of the Administration Work Center.

After you add a message template, select it and then select the object and data from the object that you want to include in messages. Hover on a field to see information about various properties of the field, such as length and description.

Publishing channels and services

Channels and services reference an object structure for their message content and enable the synchronous and asynchronous exchange of data with external systems. Outbound messages are processed by publishing channels and invocation channels. Inbound messages are processed by object structure services, enterprise services, and standard services.

- **[Publish channels](#)**
A publish channel is used for sending asynchronous messages through a queue to an external system. Publish channel messages can be initiated via an event or through the Data Export feature.
- **[Invocation channels](#)**
Invocation channels define the processing logic and mapping of inbound and outbound data, which enables the integration framework to call external applications and process responses. No predefined invocation channels are provided.
- **[Object structure services](#)**
When you configure an object structure, no additional configuration is necessary to make it available as a service or a REST resource.
- **[Enterprise services](#)**
An enterprise service is a pipeline for querying external data and importing data from an external system. An enterprise service can process data synchronously (without a queue) or asynchronously (with a queue). Enterprise services can use multiple protocols, such as web services and HTTP.
- **[Standard services](#)**
A standard service is based on an annotated method in an application. A standard service is specific to the method annotated for an object and is not reusable for other objects. You can deploy a standard service as a web service. You can access a standard service by using the REST API.

Publish channels

A publish channel is used for sending asynchronous messages through a queue to an external system. Publish channel messages can be initiated via an event or through the Data Export feature.

The integration framework includes predefined publish channels or you can configure new publish channels. When configuring a publish channel, you must associate it with an object structure, and, optionally, enable an event listener.

You must also configure the publish channel with an external system to determine where the message is delivered to and configure an endpoint that routes the message to the specified external system.

You can also configure processing rules, Java™ processing classes, or XSL mapping to customize transaction processing of the publish channel.

- [Creating publish channels](#)

You can create a publish channel record to send integration messages to an external system. Messages are based on an associated object structure.

- [Enabling publish channel listeners](#)

You enable an event listener on a publish channel to monitor for processing activity on the associated publish channel objects. Publish channel processing is initiated when an event occurs on the main object of the associated object structure.

Creating publish channels

You can create a publish channel record to send integration messages to an external system. Messages are based on an associated object structure.

Before you begin

Before you create and configure a publish channel, use the Object Structures application to configure the object structure that you intend to associate with the publish channel.

Procedure

1. In the Publish Channels application, click New Publish Channel.
2. Specify a name for the publish channel.
3. In the Object Structure field, specify the object structure to use with the publish channel.
The Object Structure Sub-Records section refreshes with details of the objects that are contained in this object structure.
4. Optional: To restrict publish channel events to the main object of the object structure, select Skip Different Object Types.
This option can help to avoid publishing errors when there are multiple objects associated with an object structure.
5. Optional: To send messages in JSON format, select the Publish JSON checkbox.
Publish channels send messages in XML format by default.
6. Optional: If you intend to use an interface table as the data source, specify its name in the Interface Table field.
The object structure must be configured to support flat files to be used with interface tables
7. Optional: If you intend to customize outbound processing logic, specify the paths for the Java™ Classes and the XSL style sheet in the following fields:
 - a. Processing Class
 - b. User Exit Class
 - c. XSL Map
 - d. Event Filter ClassAny Java classes you specify must be part of the application EAR file. An XSL file can be within the EAR file or located on an accessible file system.
8. Optional: Configure processing rules for the publish channel. Prevent the publish channel from processing business object-based rules by clearing the Retain Objects checkbox.
9. Save the publish channel.

What to do next

You can enable a publish channel listener to direct the integration framework to build and process the selected publish channel. You can also use the External Systems application to associate the publish channel with an external system and identify an endpoint for delivering messages from the publish channel.

Enabling publish channel listeners

You enable an event listener on a publish channel to monitor for processing activity on the associated publish channel objects. Publish channel processing is initiated when an event occurs on the main object of the associated object structure.

Procedure

1. In the Publish Channels application, select the publish channel that you want to configure with an event listener.
2. Select the Enable Event Listener action.
3. Click OK to enable the publish channel listener.
The details for the publish channel refresh and the Event Listener check box is now selected.

What to do next

Select Disable Event Listener action if you want to disable the event listener at any time..

Invocation channels

Invocation channels define the processing logic and mapping of inbound and outbound data, which enables the integration framework to call external applications and process responses. No predefined invocation channels are provided.

- **Creating invocation channels**
You can create an invocation channel record to send outbound data from an object structure to an external system and to process responses from the external system.
- **Configuring an action to call an invocation channel**
The integration framework provides a default action class that you can configure as a system action. By providing this action class, you can configure a user interface control, an escalation, or a workflow to invoke an external service using an invocation channel.
- **Invoking an external system from an application**
After configuring an action class to invoke an external system (via an invocation channel), you can configure a button in an application to trigger the invocation action. You can also extend the action class to display the results of the transaction in an application dialog box.

Creating invocation channels

You can create an invocation channel record to send outbound data from an object structure to an external system and to process responses from the external system.

Before you begin

You must include the defined processing class, user exit class, and XSL mapping files in the application EAR file. You also must define an XSL mapping filename path that is accessible by the application server.

Procedure

1. In the Invocation Channels application, click New Invocation Channel.
2. In the Invocation Channel field, specify an invocation channel identifier.
3. Enter values in the following fields:
 - Adapter
 - Endpoint
4. Optional: If this invocation channel processes responses from an external application, select the Process Response check box.
5. In the Service Request Configuration table window, enter values in the following fields:

Option	Description
Request Object Structure	The object structure that is used to define the content for outbound data processing.
Request Processing Class	The Java™ class file that is used when the invocation channel requires predefined outbound processing logic.
Request User Exit	The class file that the invocation channel uses to customize the predefined outbound processing logic
Request XSL File	The XSL file that is used to customize predefined outbound invocation channel mapping.

6. Optional: If you selected the Process Response check box, enter values in the following fields in the Service Response Configuration table window:

Option	Description
Response Object Structure	The object structure that is used to define the content for the response.
Response Processing Class	The Java class file that is used when the invocation channel requires predefined inbound processing logic for the response.
Response User Exit Class	The class file that the invocation channel uses to customize the predefined inbound processing logic for the response.
Response XSL File	The XSL file that is used to customize predefined inbound invocation channel mapping for the response.

7. Click Save Invocation Channel.

What to do next

You can view the XML schema of the object structure using a URL with the following format:
`http://localhost:port/meaweb/schema/service/object_structure_name`

Configuring an action to call an invocation channel

The integration framework provides a default action class that you can configure as a system action. By providing this action class, you can configure a user interface control, an escalation, or a workflow to invoke an external service using an invocation channel.

Procedure

1. Create an invocation channel in the Invocation Channels application.
2. Create an action in the Actions application.
3. Specify an object for the action.
This object must be the same as the main object of the request object structure of the invocation channel and the main object of the application, workflow, or escalation that invokes the action.
4. Specify Custom Class in the Type field.

5. Specify the name of the custom class in the Variable field.
You can use the name of the default class provided for this purpose, `psdi.iface.action.InvokeCustomClass`, or an alternative class name if you created your own custom class to invoke an external system.
6. Specify values in the Parameters/Attributes field.
Specify the values in the following order, and separate each value with a comma:
 - a. Required: The name of the invocation channel to use.
The value must be precisely the same as the name of the invocation channel.
 - b. Optional: The name of the relationship to use if the main object of the response object structure is different from the main object of the request object structure in the invocation channel. If the response object is the same as the request object, no relationship is required.
 - c. Optional: If you specified a relationship, specify the action to apply. The default action is Add, which creates records. To update existing records, specify Change as the action. If the request and response object structures are the same, the objects are updated if updated fields are mapped into the response object structure.
7. Specify whether to apply the action to all applications, to workflows, or applications.
8. Save the action.

What to do next

Associate an application, workflow, or escalation with the action. The main object is passed to the action class and then to the object structure of the invocation channel to form the request XML.

Invoking an external system from an application

After configuring an action class to invoke an external system (via an invocation channel), you can configure a button in an application to trigger the invocation action. You can also extend the action class to display the results of the transaction in an application dialog box.

Before you begin

You must create an invocation channel and an action class before you add the invocation action to an application. If you intend to show the results of the invocation, create a Results (dialog) window in advance.

Procedure

1. Open the application in the Application Designer application.
The main object for this application must be same as the main object for the invocation channel and the action that you intend to call from the application.
2. Add a Button Group control to the workspace from the Control Palette.
The Button Group control automatically adds a Pushbutton control to the workspace.
3. Click Properties to open the Pushbutton Properties window.
4. Specify a name for the button in the Value field, for example `Invoke External System`.
5. Specify the Control ID for the Results window in the Target ID field.
6. Specify a method in the Value field that calls the invocation channel and redirects the results to the Results window.
For example:

```
InvokeChannelCache.getInstance().getInvokeChannel(channelName)
.invoke(metadata, mbo, mbo.getMboSet(rel), action, null);
```

Where:

- The `channelName` value is the name of the invocation channel.
- The `mbo` value is the name of the object.
- The `rel` value is the name of the relationship (if applicable).
- The `action` value is Add.

Object structure services

When you configure an object structure, no additional configuration is necessary to make it available as a service or a REST resource.

Enterprise services

An enterprise service is a pipeline for querying external data and importing data from an external system. An enterprise service can process data synchronously (without a queue) or asynchronously (with a queue). Enterprise services can use multiple protocols, such as web services and HTTP.

An enterprise service has data processing layers that transform data and apply business processing rules to data before the it reaches the target objects. When the inbound message reaches the object structure layer, the XML message must be in the format of the object structure schema. The integration framework can then can process the message successfully.

You can configure an enterprise service to implement the following transaction processing:

- Processing rules

- User exit Java™ processing class
- Enterprise service processing class
- XSL mapping

The gateway is the entry point for enterprise service messages, excluding those that are delivered directly from an external queue to the integration queue. For some integration scenarios, it can be useful to configure gateway properties, for example if properties such as system IDs are provided within the XML message rather than in the header information. You can configure an interpreter Java class to change the external system ID, the enterprise service ID, or other JMS message header properties that are provided in an inbound message. Alternatively, you can configure gateway properties in the Enterprise Services application.

- [Configuring an enterprise service](#)

When you create an enterprise service, you associate it with an object structure. You can also configure gateway properties that are added to the header information of inbound messages.

Configuring an enterprise service

When you create an enterprise service, you associate it with an object structure. You can also configure gateway properties that are added to the header information of inbound messages.

- [Creating an enterprise service](#)

You can create an enterprise service record to receive inbound data from an external system. On the enterprise service, you can identify the data transformation and processing rules that the integration framework uses to receive inbound data from an external system.

- [Configuring additional object structures for an enterprise service](#)

An enterprise service must be associated with a primary object structure. You can add additional object structures to an enterprise service to support updating additional data that is not included in the primary object structure of the enterprise service. Based on the defined processing order, the enterprise service processes additional object structures before it processes its primary object structure.

- [Adding gateway properties to an enterprise service](#)

The gateway is the entry point for enterprise service messages, excluding those that are delivered directly from an external queue to the integration queue. An interpreter Java™ class can be implemented that can change the external system (SENDER) or the enterprise service (INTERFACE) and can set other JMS header properties as needed. In the Enterprise Services application, you can set gateway properties either as hard-coded values or by specifying XML tags.

Creating an enterprise service

You can create an enterprise service record to receive inbound data from an external system. On the enterprise service, you can identify the data transformation and processing rules that the integration framework uses to receive inbound data from an external system.

Before you begin

Before you create and configure an enterprise service, use the Object Structures application to configure the object structure that you associate with the enterprise service.

About this task

When the Use External Schema check box is selected, the Split Tag, External Schema File, and External Schema Element fields are editable. The external schema values identify the schema location and external root element name.

Procedure

1. In the Enterprise Services application, click New Enterprise Service.
2. In the Enterprise Service field, specify an enterprise service identifier.
3. Enter a values in the following fields:
 - Object Structure
 - Adapter
4. Optional: Enter values in the following fields:

Option	Description
Operation	Determines how the Enterprise Service processes data. For example, you can synchronize objects or create new objects. You can also update, delete, or query existing objects.
Multiplication Control	Determines the cross-reference control that the enterprise service uses to multiply an inbound message for multiple organizations or sites.
Interface Table	Reflects the content of the enterprise service object structures.
Split Tag	Identifies whether the received message contains multiple instances of a document. For example, a single message can contain ten purchase orders. The split process handles each of these instances individually. The application writes multiple files to the inbound queue. The syntax that you use to identify these node values should have a fully qualified XPATH expression.

5. Optional: To use an external schema, select the Use External Schema check box.
6. Optional: You can customize inbound enterprise service processing logic by completing the following steps:
 - a. In the Processing Class field, enter a class value if the enterprise service requires predefined inbound processing logic.
 - b. In the User Exit Class field, enter a class value the enterprise service uses to customize the predefined inbound processing logic.

- c. In the XSL Map field, enter a value to customize the predefined inbound enterprise service mapping.
7. Click Save Enterprise Service.

What to do next

You can use the External Systems application to associate the enterprise service with an external system.

Configuring additional object structures for an enterprise service

An enterprise service must be associated with a primary object structure. You can add additional object structures to an enterprise service to support updating additional data that is not included in the primary object structure of the enterprise service. Based on the defined processing order, the enterprise service processes additional object structures before it processes its primary object structure.

Procedure

1. In the Enterprise Services application, display the service for which you want to add an object structure.
2. Select the Add/Modify Additional Object Structure action and click New Row.
3. Enter values in the following fields:
 - Object Structure
 - Processing Order
4. Optional: You can customize inbound enterprise service processing logic by completing the following steps:
 - a. In the Processing Class field, enter a class value if the enterprise service requires predefined inbound processing logic.
 - b. In the User Exit Class field, enter a class value the enterprise service uses to customize the predefined inbound processing logic.
 - c. In the XSL Map field, enter a value to customize the predefined inbound enterprise service mapping.
 - d. In the Multiplication Control field, enter a value to define the cross-reference control that the enterprise service uses to multiply an inbound message for multiple organizations or sites.
5. Click OK.

Adding gateway properties to an enterprise service

The gateway is the entry point for enterprise service messages, excluding those that are delivered directly from an external queue to the integration queue. An interpreter Java™ class can be implemented that can change the external system (SENDER) or the enterprise service (INTERFACE) and can set other JMS header properties as needed. In the Enterprise Services application, you can set gateway properties either as hard-coded values or by specifying XML tags.

Before you begin

Review the following points about the settings in the Gateway Properties before you configure the gateway properties:

- If you select the XML Tag check box and leave the Value field null, the gateway uses the name of the root element in the XML message as the value for the corresponding property.
- If you select the XML Tag check box and enter a tag name in the Value field, the gateway uses the value for that tag as the value for the corresponding property.
- If the tag appears multiple times in the XML message, the adapter uses the value of the first occurrence of the tag. If you clear the XML Tag check box and enter a data value in the Value field, the gateway uses that data as the value for the corresponding property.

Procedure

1. In the Enterprise Services application, display the service for which you want to add a gateway property.
2. Select the Gateway Properties action.
3. In the Gateway Properties for Enterprise Service table window, click New Row.
4. In the Property field, specify the name of the property that you want to include in the message.
5. In the Value field, type the data that you want to use as the value of the property.
6. Optional: Specify whether you want to use the XML root element as the value of the corresponding property.

Option	XML Tag
Use the XML root element	Selected
Do not use the XML root element	Cleared

7. Click OK.

Standard services

A standard service is based on an annotated method in an application. A standard service is specific to the method annotated for an object and is not reusable for other objects. You can deploy a standard service as a web service. You can access a standard service by using the REST API.

A standard service is a service that an application provides for performing a specific operation on an object. Standard services are available only for methods that are properly annotated within the service. The service schemas that are generated for standard services are used only by the corresponding actions.

Endpoints and handlers

An endpoint and its associated handler route outbound messages to an external system. The combination of an endpoint and handler specify the transport protocol to use or web service, and provide the communication data required to reach the destination, such as a URL.

For data export using a publish channel, the cron task for the outbound queue invokes the handler. For a data export using an invocation channel, the invocation channel invokes the handler directly. The handler uses the metadata properties of the message to determine the external system for a publish channel transaction and any override values configured for the endpoint properties. The handler then sends the data to the destination that is specified by the endpoint associated with the handler. A single handler can have multiple endpoints, and each endpoint can contain different parameters.

Endpoints and handlers are used for outbound integration only. However, the interface table endpoint and handler also support the creation of interface tables, which are needed for inbound integration.

Endpoints provide the execution parameter values that the handler uses to perform its function. The metadata included with the endpoint definition, together with the outbound integration message, are used by the handler at the time of execution. Some handlers have predefined endpoints. These can be modified or new endpoints configured using the End Points application. The following table lists predefined endpoints.

Endpoint	Handler	Description
MXFLATFILE	FLATFILE	Writes outbound integration messages in a flat file format to a specified directory location.
MXIFACETABLE	IFACETABLE	Writes outbound integration messages to interface tables.
MXXMLFILE	XMLFILE	Writes outbound integration messages in an XML file format to a specified directory location.
MXCMDLINE	CMDLINE	Implements the CMDLINE handler. Takes a command and endpoint as input and uses the SSH protocol to invoke the command on the target system and return the results.

A number of predefined handlers are provided. For several of these handlers, corresponding endpoint definitions have been configured. The endpoint definition provides the metadata values for the handler parameters, such as a directory name for the FLATFILE handler.

- [Configuring an endpoint](#)
In the End Points application, you can create an endpoint that specifies how outbound transactions are delivered and the handler that routes them.
- [Predefined endpoint handlers and properties](#)
Predefined handlers are provided that you can associate with an endpoint. Learn more about the handlers and how to configure their properties. Additionally, you can create and register custom handlers when needed.
- [Configuring OAuth access](#)
If you want to use an OAuth authentication service to provide secure delegated access to Maximo® Manage data, you can configure OAuth access for the HTTP handler and the WEBSERVICE-JAX-WS handler.

Configuring an endpoint

In the End Points application, you can create an endpoint that specifies how outbound transactions are delivered and the handler that routes them.

- [Creating endpoints](#)
You create an endpoint to identify a target location and the transport mechanism that the integration framework uses to publish data or to start a service.
- [Adding a handler to an endpoint](#)
You can add a handler to an endpoint record to specify how to route outbound data to a specific endpoint location. You can also add a handler to define the data format that is used in the data transfers. When you create a handler, you must identify the specific Java™ class file that contains the processing logic that you need for data transfers.
- [Writing custom handlers](#)
You can write a custom handler and associate it with an endpoint, for example to support communication with an FTP server.

Creating endpoints

You create an endpoint to identify a target location and the transport mechanism that the integration framework uses to publish data or to start a service.

Procedure

1. In the End Points application, add an endpoint and specify an identifier for it.
2. In the Handler field, select a value.
The handler's endpoint properties are displayed and the Consumed By field displays the information that is associated with the specified endpoint handler.
3. In the Properties for End Point window, configure values for the endpoint properties that you need.
 - a. If you configure a Password property, add an encrypted value to specify that the endpoint needs more security for storage and display.
 - b. Optional: Select the Allow Override checkbox to identify properties that can be overwritten.
Select this checkbox when you use an invocation channel processing class.
4. Optional: Test the endpoint by selecting Test, selecting a local test file, and selecting Test again.
5. Save the endpoint.

What to do next

You can add a handler to specify how to route outbound data to a specific endpoint location in a specific format. You can use the endpoint in the following integration framework applications:

- External Systems
- Publish Channels
- Invocation Channels
- Integration Modules
- Logical Management Operations

Adding a handler to an endpoint

You can add a handler to an endpoint record to specify how to route outbound data to a specific endpoint location. You can also add a handler to define the data format that is used in the data transfers. When you create a handler, you must identify the specific Java™ class file that contains the processing logic that you need for data transfers.

About this task

You cannot modify or delete a predefined handler.

Procedure

1. In the End Points application, select the endpoint that you want to update with handler information.
2. Select the Add/Modify Handlers action.
3. Click New Row.
4. Enter values in the following fields:
 - Handler
 - Handler Class Name
 - Consumed By
5. Click OK.

Writing custom handlers

You can write a custom handler and associate it with an endpoint, for example to support communication with an FTP server.

Procedure

1. To write a custom handler, implement the RouterHandler interface.
2. Specify the following method to return a list of properties that the handler uses to send data to the endpoint:

```
getParameter ()
```

The method returns a list of RouterPropsInfo objects. The isCrypto attribute in the RouterPropsInfo object indicates whether to encrypt the property value while storing data. For password properties, the value of this attribute is True.

3. Specify the following method to send data to the specified endpoint:

```
sendData (Map metaData, byte[] data, Map destinationMap)
```

The method returns the following information:

- Metadata provides information about the external system and the interface.
- Data is the XML data.
- DestinationMap specifies the endpoint.

Predefined endpoint handlers and properties

Predefined handlers are provided that you can associate with an endpoint. Learn more about the handlers and how to configure their properties. Additionally, you can create and register custom handlers when needed.

- [Enterprise bean handler](#)
The Enterprise Java™ Bean (EJB) handler is a Java component that consists of enterprise bean clients. The handler publishes a set of properties that a client uses to communicate with and deliver an integration message to a target client. The target client can run on the local application server or on a remote application server.
- [Flat file handler](#)
The FLATFILE handler converts an outbound integration message into a flat file and writes it to a directory that has a configurable location. Flat files contain ASCII data in the form of rows and columns. Each line of text constitutes one row, and a separator character separates each column in the row. The FLATFILE handler encodes outbound flat files in the standard UTF-8 format.
- [Kafka handler and properties](#)
You can configure an endpoint to use the Kafka handler to send exchange inbound or outbound messages to with the object storage for your Kafka provider.
- [HTTP handler](#)
The HTTP handler is a Java component that consists of properties. The handler delivers an outbound integration message to a URL by using HTTP or HTTPS protocols. The HTTP handler also evaluates the response code received from the external system.

- [S3 handler and properties](#)
You can configure an endpoint to use a Simple Storage Service (S3) handler to exchange inbound or outbound messages with an S3 object storage provider.
- [IFACETABLE handler](#)
The IFACETABLE handler consists of several properties. This handler writes an outbound integration message to an interface table in a local or remote database. There are no Java exit classes for this handler.
- [JMS handler](#)
The JMS handler delivers outbound integration messages to a JMS-compliant messaging system that supports a JMS queue or topic.
- [Web service handler](#)
The web service handler is a Java client that can invoke any document-literal web service that is WS-I BP 1.1 compliant. The outbound integration message forms the payload (SOAP body) and the handler provides the SOAP headers and envelope. This handler operates independent of the container.
- [Web service handler \(JAX-WS\)](#)
The WEBSERVICE-JAX-WS handler is a Java client that can invoke any document-literal web service that is WS-I BP 1.1 compliant. The outbound integration message forms the payload (SOAP body) and the handler provides the SOAP headers and envelope.
- [XML file handler](#)
The XML file handler is a Java component that writes an outbound integration message into a file in XML format.
- [Command line handler](#)
The CMDLINE handler takes a command and an endpoint as input. The CMDLINE handler uses the SSH protocol to run the command on the target system and return the results.

Enterprise bean handler

The Enterprise Java™ Bean (EJB) handler is a Java component that consists of enterprise bean clients. The handler publishes a set of properties that a client uses to communicate with and deliver an integration message to a target client. The target client can run on the local application server or on a remote application server.

To establish a connection, the remote Java class and the home Java class must be available in the class path of the handler. If the client is on a remote application server that is different from the handler application server, the client jar file reference must be in the class path of the handler. The handler picks up the context factory class name from the local application server when the enterprise bean client is on a remote application server that is the same as the handler application server.

CONTEXTFACTORY property

This required property specifies a J2EE context factory class name. The documentation for your application server contains the name of the default context factory to use.

EJBEXIT property

This optional property is used for customization and specifies the fully qualified name of a custom Java class that implements the EJBExit interface.

If you do not specify a value for this property, the DefaultEJBExit interface is executed and attempts to resolve the enterprise bean method signature and parameters.

If the enterprise bean client has its own method signature and parameters, create a Java class that contains your version of the EJBExit interface and implementations of the following methods:

```
public Class[] getClassParams ()
```

The getClassParams() method returns the method signature in the form of an array of Java classes.

```
public Object[] getObjectParams(byte[] data, String interfaceName, Map String, ? metaData) throws MXException
```

The getObjectParams() method returns the parameters of the enterprise bean business method in the form of an array of Java objects.

```
public void responseOk(Object response) throws MXException
```

The responseOk() method is called after a successful enterprise bean invocation.

```
public void responseError(Exception e) throws MXException
```

The responseError() method is called with the originating exception as a parameter if an error is encountered during enterprise bean invocation.

The following code illustrates what your implementation of getClassParams() looks like when the enterprise bean client has a business method with a byte array and a string:

```
Class[] classParams = {byte[].class, String.class};  
return classParams;
```

The following code illustrates what your implementation of getObjectParams () looks like when the enterprise bean client has a business method with a byte array and a string:

```
byte[] data = ...;  
String ifaceType = ...;  
  
Object[] objParams = {data,ifaceType};  
return objParams;
```

Complete one of the following actions to identify the location of the package structure for the EJBExit class file:

- Place the class in the Java package structure in the applications/maximo/businessobjects/classes directory.

- Modify the mboweb\webmodule\META-INF\MANIFEST.MF class path to include the package structure.
- Rebuild the application EAR file and include the EJBExit class file.

JNDIName property

This required property specifies the name by which the enterprise bean client is registered in the Java Naming and Directory Interface (JNDI) tree on the application server. The filename is ibm-ejb-jar-bnd.xml and the property is set to

```
<ejbBindings
xmi:id="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mif.doc_gp_intfrmwk_r_ejb_handler_Session_enterpr
iseservice_Bnd"
  jndiName="ejb/maximo/remote/enterpriseservice">
  <enterpriseBean xmi:type="ejb:Session"
    href="#_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mif.doc_gp_intfrmwk_META-INF_ejb-
jar.xml_Session_enterpriseservice"/>
</ejbBindings>
```

METHODNAME property

This required property specifies the public business method that is exposed by the enterprise bean client that is invoked by this handler.

PROVIDERURL property

This required property specifies the URL of the target application server on which the enterprise bean is running. The system then maps to the java.naming.provider.url property and creates the InitialContext object.

If the handler and the target enterprise bean are running on the same application server instance, do not specify this property because it defaults to the local server URL.

USERNAME and PASSWORD properties

The user name and password properties correspond to the java.naming.security.principal (USERNAME) and java.naming.security.credentials (PASSWORD) properties that are used to create the InitialContext object.

Flat file handler

The FLATFILE handler converts an outbound integration message into a flat file and writes it to a directory that has a configurable location. Flat files contain ASCII data in the form of rows and columns. Each line of text constitutes one row, and a separator character separates each column in the row. The FLATFILE handler encodes outbound flat files in the standard UTF-8 format.

The FLATFILE handler can be used only with publish channels, not invocation channels. The object structure associated with the publish channel must be configured to support flat files. You must resolve all alias conflicts for the object structure and format the XML message according to the object structure schema before writing the message to a flat file.

Naming conventions

File names require the following format.

externalsystemname_publishchannelname_uniqueidentifier.dat

- externalsystemname is the identifier of the system (the value of MAXVARS.MXSYSID).
- publishchannelname is the name of the publish channel.
- uniqueidentifier is a number based on current system time.

The following example file name indicates that the file goes to the external system EXTSYS1 and was published through the MXASSETInterface publish channel:

EXTSYS1_MXASSETInterface_10971102668641498.dat

The first two lines of the file contain header information. The first line has the following format:

```
externalsystemname <separator>
publish channel name <separator> [action] <separator> langcode
```

The second line of the file contains the names of the columns, separated by the separator character. The column names are the same as the names in the corresponding interface table.

Flat file format

If the data in the flat file contains the flat file delimiter character, the data adds the text qualifier, which is " (quotation marks). If the data contains quotation marks, the handler escapes the quotation marks. You cannot use quotation marks as the delimiter character.

The following example data uses a comma (,) as a delimiter. The INVOICEDESC value, (Rotating Custom Item, No 71), contains a comma. When the flat file is written, the INVOICEDESC value is enclosed in quotation marks.

```
EXTSYS1,MXINVOICEInterface,Add
INVOICENUM,INVOICEDESC,PONUM,VENDOR,CONTACT,PAYMENTTERMS
1071,"Rotating Custom Item, No 71",1000,A0001,,
```

The following example data uses a comma (,) as a delimiter. The INVOICEDESC value (Rotating "Custom" Item No 71) contains double quotation marks. When the flat file is written, double quotation marks in INVOICEDESC data ends with quotation marks, and the entire string is wrapped in quotation marks.

```
EXTSYS1,MXINVOICEInterface,Add
INVOICENUM,INVOICEDESC,PONUM,VENDOR,CONTACT,PAYMENTTERMS
1071,"Rotating ""Custom"" Item No 71",1000,A0001,,
```

The following example data uses a comma (,) as a delimiter. The INVOICEDESC data (Rotating "Custom" Item, No. 71) contains the delimiter character and double quotation marks. When the flat file is written, the INVOICEDESC value appears in the code.

```
EXTSYS1,MXINVOICEInterface,Add
INVOICENUM,INVOICEDESC,PONUM,VENDOR,CONTACT,PAYMENTTERMS
1071,"Rotating ""Custom"" Item, No. 71",1000,A0001,,
```

Flat file properties

The FLATFILEDIR property is an optional property that specifies the location of flat files on a server. The location must exist on the server where the JMS CRON task for the outbound queue is running, or on an accessible shared network drive. The default value points to the global directory. To specify a location for the global directory, configure the mx.int.globaldir property in the System Properties application.

In a multitenancy environment, the FLATFILEDIR property is required and is made available by the system provider.

The FLATFILESEP property is a required property that specifies the character that separates the columns in each row.

Kafka handler and properties

You can configure an endpoint to use the Kafka handler to send exchange inbound or outbound messages to with the object storage for your Kafka provider.

Configure these Kafka handler properties for an endpoint in the End Points application:

- Topic
The identifier of the inbound or outbound queue.
- Boostrapservers
The comma-separated list of servers that host your Kafka instance. Include the port specification.
- Password
The password for authenticating to your Kafka instance. You can specify whether the value is encrypted.
- Username
The User ID for authenticating to your Kafka instance.

HTTP handler

The HTTP handler is a Java™ component that consists of properties. The handler delivers an outbound integration message to a URL by using HTTP or HTTPS protocols. The HTTP handler also evaluates the response code received from the external system.

HTTPEXIT property

This optional property is used for customization and specifies the fully qualified name of a Java class that interprets the HTTP response. This property also helps implement the code that is required for an external system to interpret the HTTP response.

Tip: You also can configure HTTP handler exits by using automation scripts. For more information about configuring with a script, see [Defining an HTTP handler using a script](#).

The Java class must be available in the application EAR file and must be in the class path of the handler.

Table 1. Property values

Property	Value
Java class	DefaultHTTPExit.java
Package	psdi.iface.router
HTTPEXIT property	psdi.iface.router.DefaultHTTPExit

If you do not specify a value for this property, the DefaultHTTPExit exit class is executed and implements the psdi.iface.router.HTTPExit interface. The Java class has the following key methods:

Table 2. Key methods for the Java class

Method	Signature	Description
--------	-----------	-------------

Method	Signature	Description
processResponseData()	<pre>public void processResponseData(int responseCode, String responseMsg, byte[] msgBodyData) throws MXException</pre>	<p>The default implementation compares the response code from the external system to a range of valid codes (values 200 through 299). If the response code falls outside that range, the system assumes that the message was not delivered to the external system. An exception occurs and the message remains in the queue.</p> <p>If you need additional processing for a specific implementation, extend the default implementation and override the processResponseData () method. As an alternative, you can implement the psdi.iface.router.HTTPExit interface. If the response that is received from the external system does not pass the validation in this class, the overriding method must issue an exception.</p> <p>If you do not define a value for this property, the default implementation of HTTPExit is run.</p>
getURLProperties()	<pre>public Map String, String getURLProperties(Map String, ? metaData, byte[] data, Map String, MaxEndPointProp Info httpInfo)</pre>	Returns the map of URL properties that are added to the URL in the form <code>url?prop1=value1&...</code> . The default implementation returns a null value.
getHeaderProperties()	<pre>public Map String, String getHeaderProperties(Map String, ? metaData, byte[] data, Map String, MaxEndPointProp Info httpInfo)</pre>	Returns a map of the HTTP header properties for the request. The default implementation returns a null value unless a header property map is associated with the metadata map that has the HEADERPROPS key.
transformPayloadToFormData()	<pre>public Map String, String transformPayloadToFormData(Map String, ? metaData, byte[] data, Map String, MaxEndPointProp Info destinationMap)</pre>	Converts the XML payload to data. The default implementation returns a null value.

You can use the following methods to control the exception if an error occurs. If you create a script that includes one of these methods, select the Allow invoking methods check box so that the script processor can invoke the script functions that map to these methods.

Table 3. Methods for exception customization

Method	Description
urlProps()	Adds query parameters to a configured URL. The psdi.iface.router.ScriptHTTPReq interface implements the request object.
getUrl()	Sets the URL for the HTTP call.
headerProps()	Sets the request headers for the HTTP call.
processResponse()	Processes the HTTP response. The psdi.iface.router.ScriptHTTPResp interface implements the response object.

CONNECTTIMEOUT property

This optional property specifies the connection timeout value in milliseconds.

READTIMEOUT property

This optional property specifies the read timeout value in milliseconds.

HTTPMETHOD property

This required property specifies a valid HTTP method that is executed by the endpoint. Valid HTTP methods are GET, POST, PUT, PATCH, and DELETE.

HTTPHEADER property

This optional property can add a comma-separated list of names and values to the header section of HTTP messages. The list includes name and value information in the format of Headername1:Headervalue1, Headername2:Headervalue2. If no value is provided in the property, custom code can inject the values into the transaction context during invocation channel processing.

URL property

This optional property specifies a valid URL to which XML data can be posted or where an HTTP GET operation can be performed.

USERNAME and PASSWORD properties

If the URL requests basic authentication, these properties specify the required values. Both values are MIME encoded and are passed to the URL.

OAUTHCLIENT property

This optional property specifies the primary key for the MAXOAUTHCLIENT object, which is used to configure OAuth for access to external services.

S3 handler and properties

You can configure an endpoint to use a Simple Storage Service (S3) handler to exchange inbound or outbound messages with an S3 object storage provider.

IBM Cloud® Object Storage is one provider of Cloud Object Storage.

Configure the following S3 handler properties for an endpoint in the End Points application:

URL

The URL of the S3 provider.

Bucketname

The name of the container for objects that you store in S3 storage.

Secretkey

The secret access key that you use to sign the HTTP requests that you make to S3. You must authenticate your request with both the access key ID and the secret access key.

Accesskey

The access key ID that you use to sign the HTTP requests that you make to S3. You must authenticate your request with both the access key ID and the secret access key.

Datareader

The property that specifies the class that is used to read files from S3. The default that is set for this property implements the data reader feature that is included in the application, which applies to most cases.

Related information

- [Documentation for IBM Cloud Object Storage](#)

IFACETABLE handler

The IFACETABLE handler consists of several properties. This handler writes an outbound integration message to an interface table in a local or remote database. There are no Java™ exit classes for this handler.

Only publish channels can use the IFACETABLE handler. Invocation channels cannot use this handler.

ISREMOTE property

This required property is a Boolean value that specifies whether interface tables are available in the local database or in a remote database. A value of 0 (false) indicates that the interface tables are available in the local database in the system schema. You do not have to enter any other handler properties. In the predefined MAXIFACETABLE handler, the value of this property is 0. A value of 1 (true) indicates the interface tables are in a remote database. If necessary, specify values for all the handler properties.

DRIVER property

This property specifies the JDBC driver to connect to a remote database that contains the interface tables. This property applies only when the value of the ISREMOTE property is 1.

URL property

This property specifies the JDBC URL and applies only when the value of the ISREMOTE property is 1. The following example contains the location, port number, and database name:

```
jdbc:db2://hostname:port/maximodb
```

USERNAME and PASSWORD properties

If access to the remote database requires a user name and password, these properties specify those values. These properties apply only when the value of the ISREMOTE property is 1.

JMS handler

The JMS handler delivers outbound integration messages to a JMS-compliant messaging system that supports a JMS queue or topic.

The messaging models have the following characteristics:

- Point-to-point messaging (one to one): A sender generates messages and places them in a queue. Only one receiver can obtain the message from the queue.
- Publish-subscribe (one to many): A publisher generates messages and places them in a topic. Multiple subscribers can retrieve messages from the topic.

The messaging system represents a queue or topic that is available on the local application server, on a remote application server, or on a remote dedicated queuing system such as IBM® WebSphere® MQ. To use this handler, enable the messaging systems by using JMS. The messaging system is distinct from the

standard internal queues that reside on the local application server.

CONFACTORYJNDINAME property

This required property specifies a Java™ object that is used to create connections to a JMS provider. Before the system can connect to a queue or topic, it must obtain a reference to a connection factory.

DESTINATIONTYPE property

This optional property specifies the JMS destination type; queue or topic. The following table lists the DESTINATIONTYPE options and their associated values.

Destination	Value
Topic	javax.jms.Topic
Queue	javax.jms.Queue

DESTJNDINAME property

This required property specifies the name by which the JMS queue or topic is registered in the application server Java Naming and Directory Interface (JNDI) tree.

CONTEXTFACTORY property

This property specifies the initial context factory class name. The property is not required when the JMS handler is communicating with a JMS provider that shares the same initial context factory as the application server of the handler. When the handler and the JMS provider share an application server, they share the initial context factory class. The context property value is required when the handler and the JMS provider do not share an application server.

ISCOMPRESS property

This required property specifies whether the message is compressed before it is placed into a queue or topic. Compression is an optimization technique that delivers smaller messages to a queue or topic. The following table lists the ISCOMPRESS options and their associated values.

Option	Value
Do not compress data	0
Compress data	1

Compressed messages must be extracted after they are received. Extract the messages by creating the appropriate JMS receiver or subscriber component and placing Java decompression logic within the receiver or subscriber. Use the standard Java Inflater() class that is part of the java.util.zip package. The default compression uses the standard Java Deflater() class.

ISTEXT property

This optional property specifies whether the JMS handler will deliver messages to another queue in text format.

Option	Value
Deliver messages in default (bytes) format	0
Deliver messages in text format	1

JMSEXIT property

In a multitenancy environment, customization by using Java classes can be implemented only by the system provider and may not be supported in your environment.

This optional property is used for customization and specifies the fully qualified name of a Java class that runs the JMSExit interface. The Java class must implement the getMessageProperties() method that is defined in the JMSExit interface. The Java class must be in the class path for the application server or in the application EAR file.

You can use this option change or add properties in the JMS message. If this property does not contain a value, the header attributes for the message are not changed when the message is delivered to the external queue or topic.

PROVIDERURL property

This required property specifies a local or remote URL where the JMS provider can be accessed. If the target JMS provider is local to the application server of the handler, the property is not required.

PROVIDERUSER and PROVIDERPASSWORD properties

These properties are used for the JMS provider authentication. The properties map to the connectionFactory.createConnection(provideruser,providerpassword) API in JMS.

USERNAME and PASSWORD properties

These properties correspond to the `java.naming.security.principal` (USERNAME) and `java.naming.security.credentials` (PASSWORD) properties used for creating the `InitialContext` object.

Web service handler

The web service handler is a Java™ client that can invoke any document-literal web service that is WS-I BP 1.1 compliant. The outbound integration message forms the payload (SOAP body) and the handler provides the SOAP headers and envelope. This handler operates independent of the container.

This web service handler supports an early implementation of web services and is provided to maintain backwards compatibility with existing web services. If you are implementing new web services, configure them to use the web service handler for JAX-WS.

MEP property

This optional property specifies the message exchange pattern for the web service. The property supports the following values. If you do not provide a value, the default value, the `sendreceive` value is used.

Value	Web Service Operation Type
<code>sendreceive</code>	Request and response
<code>sendrobust</code>	Request with void or fault response
<code>fireandforget</code>	Request only, no response, or fault

ENDPOINTURL property

This required property specifies a valid web service URL on which to invoke a web service. You can use the `WSEXIT` class to override the value specified via the user interface just before the web service is invoked.

SERVICENAME property

This required property specifies the name of the web service deployed in the URL.

SOAPACTION property

This optional property specifies the value of the `SOAPAction` HTTP header to be used when invoking the web service. The default value is an empty string. To set a value for the property, view the WSDL file for a web service to determine the action and specify this value. You can use the `WSEXIT` class to override the value specified in the user interface before you invoke the web service.

SOAPVERSION property

This optional property specifies the version of the SOAP specification used during web service call. Valid values are `SOAP11` and `SOAP12`.

HTTPVERSION property

This optional property specifies the version of the HTTP protocol for web service invocations. The valid values are `HTTP/1.0` and `HTTP/1.1`. If you do not provide a value, the system uses the default value, `HTTP/1.1`.

HTTPCONNTIMEOUT property

This optional property specifies the connection timeout value in milliseconds. The default value for this property is 60000 milliseconds.

HTTPREADTIMEOUT property

This optional property specifies the read timeout value in milliseconds. The default value for this property is 60000 milliseconds.

USERNAME and PASSWORD properties

If the specified web service is secured (if HTTP basic authentication is enabled), specify a user name and password.

WSEXIT property

In a multitenancy environment, customization by using Java classes can be implemented only by the system provider and may not be supported in your environment.

This optional property is used for customization. It specifies the fully qualified name of a custom Java class that implements the `psdi.iface.router.WSExit` interface. The property defines the following methods:

The `responseOk()` method is called after a successful invocation of the external web service.

```
public void responseError(Exception e) throws MXException
```

If an error occurs when the web service is called, the `responseError()` method is called with the originating exception as a parameter.

The default implementation of the WSExit interface is `psdi.iface.router.DefaultWSExit`.

Web service handler (JAX-WS)

The WEBSERVICE-JAX-WS handler is a Java™ client that can invoke any document-literal web service that is WS-I BP 1.1 compliant. The outbound integration message forms the payload (SOAP body) and the handler provides the SOAP headers and envelope.

This web service handler supports the implementation of web services for Maximo® Manage 8.3 and later. If you are implementing new web services, configure them to use this web service handler.

MEP property

This optional property specifies the message exchange pattern for the web service. The property supports the following values. If you do not provide a value, the default sendreceive value is used.

Value	Web Service Operation Type
sendreceive	Request and response
sendrobust	Request with void or fault response
fireandforget	Request only, no response, or fault

ENABLEAPPCONTEXT property

Set this property to 1 (true) when implementing support for WS-* policies.

ENDPOINTURL property

This required property specifies a valid web service URL on which to invoke a web service. You can use the WSEXIT class to override the value specified via the user interface just before the web service is invoked.

SERVICENAME property

This required property specifies the name of the target web service that the handler invokes.

SOAPACTION property

This optional property specifies the value of the SOAPAction HTTP header to be used when invoking the web service. The default value is an empty string. To set a value for the property, view the WSDL file for a web service to determine the action and specify this value. You can use the WSEXIT class to override the value specified in the user interface before you invoke the web service.

SOAPVERSION property

This optional property specifies the version of the SOAP specification used during web service call. Valid values are SOAP11 and SOAP12.

HTTPCONNTIMEOUT property

This optional property specifies the connection timeout value in milliseconds. The default value for this property is 60000 milliseconds.

HTTPREADTIMEOUT property

This optional property specifies the read timeout value in milliseconds. The default value for this property is 60000 milliseconds.

HTTPHEADER property

This optional property can add a comma-separated list of names and values to the header section of HTTP messages. The list includes name and value information in the format of `Headervalue1:Headervalue1, Headervalue2:Headervalue2`. If no value is provided in the property, custom code can inject the values into the transaction context during invocation channel processing.

USERNAME and PASSWORD properties

If the specified web service is secured (if HTTP basic authentication is enabled), specify a user name and password.

WSEXIT property

Tip: You also can configure SOAP endpoint exits by using automation scripts.

This optional property is used for customization. It specifies the fully qualified name of a custom Java class that implements the `psdi.iface.router.WSExit` interface. The property defines the following methods:

The `responseOk()` method is called after a successful invocation of the external web service.

```
public void responseError(Exception e) throws MXException
```

If an error occurs when the web service is called, the `responseError()` method is called with the originating exception as a parameter.

The default implementation of the `WSExit` interface is `psdi.iface.router.DefaultWSExit`.

CFGXMLPATH property

This property is obsolete. Do not use it.

OAUTHCLIENT property

This optional property specifies the primary key for the `MAXOAUTHCLIENT` object, which is used to configure OAuth for access to external services.

XML file handler

The XML file handler is a Java™ component that writes an outbound integration message into a file in XML format.

FILEDIR property

This optional property specifies where the handler creates the XML files. The default value is `mxe.int.globaldir/xmlfiles`. The file location must be accessible by the JMS CRON task for the outbound queue for publish channel messages. For Invocation Channel messages, the file location must be accessible by any Maximo® Manage servers where an invocation channel can be initiated.

PRETTYPRINT property

This required property specifies whether the handler formats the XML file. The valid values are 0 and 1. A value of 1 prompts the handler to pretty print format the xml file. Publish channel, invocation channel, and invocation API file names have the following formats:

```
externalsystemname_publishchannelname_uniqueidentifier.xml
```

```
invocationchannelname_uniqueidentifier.xml
```

- `externalsystemname` is the identifier of the system (the value of `MAXEXTSYSTEM.EXTSYSNAME`).
- `publishchannelname` is the name of the publish channel.
- `uniqueidentifier` is a number based on current system time.

For example, the file name `MX_MXASSETInterface_10971102668641398.xml` indicates that the file was generated to send data to the external system `EXTSYS1`. The file name also indicates that the file contains the `MXASSETInterface` publish channel.

Command line handler

The `CMDLINE` handler takes a command and an endpoint as input. The `CMDLINE` handler uses the SSH protocol to run the command on the target system and return the results.

A metadata parameter is passed during a system invocation when the handler is called. The parameter is a map that contains the name of the endpoint that represents the target system. The caller can target any system at run time and pass the endpoint to the command handler. The caller uses whatever configuration the endpoint has at the time of the invocation.

CMDLINE handler properties

The `CMDLINE` handler has the following properties:

- `CMDTIMEOUT` – The timeout value for command execution
- `CONNTIMEOUT` – The timeout value for the connection
- `USERNAME` – The user name for the connection
- `PASSWORD` – The password for corresponding user name
- `HOST` – The host name of target where command is run
- `PORTNO` – The port number of target where the command is run
- `IGNORESETUPERR` – A boolean value that indicates whether to ignore an error running the setup command
- `RETRYINTERVAL` – The time to wait between retrying a command
- `MAXRETRY` – The number of attempts to run a command before returning an exception
- `SSHEXIT` – The Java™ exit class that can be implemented to customize processing of the handler

Command data parameters

The data parameter is a byte array representation of an XML document. The data parameter contains the following information:

- The tags that correspond to the setup command
- The working directory
- The command to run
- Any substitution parameters

Available tags

The following tags are available:

- CLWORKINGDIR – A directory to change (`cd`) to on the remote system before the command is run.
- CLSSETUPCMD – A setup command to be run before the main command. Use this tag for any environmental setup that must occur on the remote system before the main command is issued.
- CLCMDPATTERN - A string that defines the pattern of the command to be run. The format of this pattern is similar to the `java.text.MessageFormat` class. An example is `ls -l {0}`, where `{0}` represents a parameter that is substituted.
- CLSUB0 - The value to substitute into positions that are marked by `{0}` in the CLCMDPATTERN.
- CLSUB1- The value to substitute into positions that are marked by `{1}` in the CLCMDPATTERN.
- CLSUBn - The value to substitute into positions that are marked by `{n}` in the CLCMDPATTERN. A CLSUBn tag must correspond to each substitution position in the CLCMDPATTERN tag.

Command results

The return byte array representation of an XML document contains the results of the command. The XML document contains tags that correspond to the return value, STDOUT and STDERR.

The following tags are available:

- CLRETURNCODE – The return code from the remote command.
- CLRESPONSEOUT – The data that is returned by the remote command in STDOUT tag.
- CLRESPONSEERR – The data that is returned by the remote command in STDERR tag.

Configuring OAuth access

If you want to use an OAuth authentication service to provide secure delegated access to Maximo® Manage data, you can configure OAuth access for the HTTP handler and the WEBSERVICE-JAX-WS handler.

Before you begin

Details for the OAuth client access are stored in the MAXOAUTHCLIENT object.

Administrators must grant the appropriate authorizations to the MAXOAUTHCLIENT object structure by using the Security Groups application.

Because most OAuth handshakes are done over TLS, the Manage truststore must also be updated with the CA trust chain of the OAuth provider.

About this task

Maximo Manage supports the OAuth 2.0 client credentials grant type. Using this flow, Maximo Manage sends a client ID and client secret to the URL of the OAuth provider for authentication and receives an access token.

The date and time that the access token is created are stored in the MAXOAUTHCLIENT object. The OAuth provider specifies an expiration interval for the access token, and the token expires at the end of that interval. After expiration, a new token is generated when a new authentication request occurs.

There are two options for adding or modifying OAuth clients:

- You can add or modify clients in the End Points application.
- You can add or modify clients by using a REST API call.

Adding or modifying OAuth clients in the End Points application

In the End Points application, you can add OAuth clients or update existing clients.

Procedure

1. In the End Points application, from the More Actions menu, select Add/Modify OAuth Clients.
2. In the Add/Modify OAuth Clients window, click New Row.
3. In the Details section on the Add/Modify OAuth Clients window, enter the details for the OAuth connection, as shown in the following table.

Option	Description
Client Name	Unique identifier of the OAuth client.
Client ID	Maximo Manage client ID that is registered with the OAuth provider.
Grant Type	Grant type for exchange. The default is <code>client_credentials</code> .
Token URL	URL of the OAuth provider, which is used to exchange the client ID with the access token.

Option	Description
Client Secret	Maximo Manage client secret that is registered with the OAuth provider. The clientsecret is encrypted in the Manage database. Because the table is backed up in cache, do not perform offline updates to the table.
Scope	Scope that specifies the permissions that are granted for the access token request. This field is optional.
Refresh Token	Token to support grant types that use a refresh token. Maximo Manage 8.3 does not support this attribute.

The following fields on the Add/Modify OAuth Clients window are read-only fields:

- The Expiry field displays the expiration interval in seconds for the access token.
- The Creation date field displays the date and time that the access token was created.

4. Click OK.

Adding or modifying OAuth clients by using a REST API

The HTTP handler and the WEBSERVICE-JAX-WS handler include an oauthclient property. To add a client by using a REST API call, you must specify the value for the clientname attribute in the oauthclient property.

Procedure

To configure the OAuth client for token exchange, you can send a REST API call that specifies values from the MXAPIOAUTHCLIENT object structure, as shown in the following example:

```
POST /oslc/os/mxapioauthclient?lean=1&ctx=ccrypto=1
{
  "clientname": "{user-defined name for the client}",
  "clientid": "{ID that is provided by the OAuth provider}",
  "clientsecret": "{secret that is provided by the OAuth provider}",
  "scope": "{optional scope}",
  "tokenurl": "{token URL that is provided by the OAuth provider}"
}
```

Web services

External systems can use integration framework web services to send messages or queries to the Maximo® database. You can use an integration framework service as the source for a web service and then deploy this service to communicate with external systems.

The web services are based on the Java™ API for XML Web Services (JAX-WS). In earlier releases, the integration framework also supported AXIS2 web services but these web services are no longer supported. During an upgrade, any existing AXIS2 web services are automatically converted to JAX-WS web services.

In the WebSphere® Application Server Liberty environment, you can use Simple Object Access Protocol (SOAP) 1.1 and SOAP 1.2 with the JAX-WS as a transport protocol in the same web service instance.

- [Web service sources](#)
The source of a web service can be an object structure service, a standard service, or an enterprise service.
- [Implementing SOAP 1.1 and 1.2 with JAX-WS web services](#)
You can use SOAP (SOAP) 1.1 and SOAP 1.2 with the JAX-WS (Java API for XML Web Services) endpoint handler to exchange messages in a WebSphere Application Server Liberty environment.
- [Web service deployment options](#)
After you create a web service, you have a choice of deployment options. If you deploy a web service to the product web service container, the deployment is automatic. If you deploy a web service to an application server web service container, the deployment is manual.
- [Web service deployment actions](#)
When you deploy a web service, a number of events occur, including the generation of the XML schema and the web services description language (WSDL) file for the web service.
- [Schema generation](#)
You can generate the schema and view the XML for any web service in the Web Services Library application. You can also regenerate the schema to ensure that the schema is updated to reflect any changes that you make to the service.
- [Generation of a Web Services Description Language file](#)
A WSDL file is generated during the deployment of a web service. The WSDL file describes the web service, provides its location, and specifies the operations that the service makes available.
- [UDDI registration](#)
You can register deployed web services in a UDDI registry. UDDI is an XML-based registry for publishing and locating WSDL files that describe web service applications.
- [Creating and deploying web services](#)
You can create a web service based on any object structure service, standard service, or enterprise service that is defined for the system. You then deploy the web service to the product web service container or to the application web service container.
- [Web service interactions overview](#)
An interaction can start a web service and send data to it from an application. The interaction can then display data returned from the web service and save this data to the application database.

Web service sources

The source of a web service can be an object structure service, a standard service, or an enterprise service.

Object structure services

You can create an object structure web service from a predefined or a user-defined object structure service. Object structure web services support create, update, delete, sync, and query operations. Create and query operations also support responses. The response to the create operation can be based on the primary or alternate key of the primary object that is defined in the object structure. The response to the query operation is provided in the XML schema format of the object structure.

Standard services

You can create a standard web service from methods that are annotated in application services. To use methods as web services, annotated methods, such as the `ChangeStatus` method, must exist within an application. A single standard web service is created for each application service and all annotated methods within the service are the web service operations. The input and output parameters of the methods are associated with the input and output parameters for the standard web service.

Enterprise services

You can create an enterprise web service from a predefined or a user-defined enterprise service. Enterprise web services support additional exit processing, business rules, and transformations. A service exists for each operation that is contained in an enterprise service record (one service per operation). With the exit processing layer, you can map an external schema XML to the object structure XML for both the invocation and the response. Enterprise web services provide response content for the create and query operations that are processed in the queue. The enterprise service definition has a `ProcessResponse` flag that indicates whether the service supports a response.

- [JMS queue settings for enterprise web services](#)
Enterprise web services can use the Java™ Message Service (JMS) queue to process XML messages, or you can specify that the service bypasses the JMS queue.

JMS queue settings for enterprise web services

Enterprise web services can use the Java™ Message Service (JMS) queue to process XML messages, or you can specify that the service bypasses the JMS queue.

JMS queue-based processing provides asynchronous message processing. For enterprise services that support synchronous processes, you must specify non-queue-based message processing. The integration framework processes XML messages from external applications based on the queue settings that are defined for the enterprise web service:

Queue-based message processing

A queue-based enterprise web service processes XML messages and writes these messages into the configured, inbound JMS queue. When the message is moved into the JMS queue, the external application is released from the invocation. The integration framework processes the messages and saves them in the Maximo® database.

An enterprise web service cannot use the JMS queue if the service includes create or query operations that require a response to the external application.

Non-queue-based message processing

A non-queue-based enterprise web service processes messages from the integration framework to the object processing layer and saves information, when applicable, to the Maximo database. After the enterprise web service completes message processing, the integration framework sends a response to the external application. You must specify non-queue-based processing if the enterprise web service supports query or create operations that require a response to the external application.

Implementing SOAP 1.1 and 1.2 with JAX-WS web services

You can use SOAP (SOAP) 1.1 and SOAP 1.2 with the JAX-WS (Java™ API for XML Web Services) endpoint handler to exchange messages in a WebSphere® Application Server Liberty environment.

About this task

In the Liberty environment, you can use one or both versions of SOAP as a transport protocol in the same web service instance.

To implement SOAP with JAX-WS web services, you must modify the XML files for `mea` server bundles and for server bundles with the type `a11` since the `a11` bundle also includes `mea`. The following files must be configured:

- `web_oidc.xml`
- `web.xml`
- `webservices.xml`

To customize the XML files, create a file set that replicates the Manage file structure and configure the replicated XML files. Then, add the updated file set to a compressed archive file, copy the archive to a location that is accessible to Maximo® Manage, and configure the application to include the customization archive when it is redeployed. For more information, see [Customizing the application](#).

Procedure

1. In Liberty, in the `servers.xml` file, locate the `<featureManager>` element and ensure that its `<feature>` element is `webProfile-8.0`.
2. To modify the XML files for server bundles of type `mea`, complete the following steps:

- a. Navigate to the following location in the file system for your customization archive and open the web.xml file in a text editor:

```
deployment\was-liberty-default\config-deployment-descriptors\maximo-mea\meaweb\webmodule\WEB-INF\web.xml
```

- b. Review the root element and ensure the version attribute that is used is 3.1 or later, but earlier than 4.x.
 c. Ensure that the servlet class is `psdi.iface.webservices.JAXWSWebServiceProvider` and that the `psdi.iface.webservices.WASJAXWSWebServiceProvider` servlet class is commented out because it is not used with Liberty. Ensure that all references to the WASJAXWSWebServiceProvider class in the file are replaced with JAXWSWebServiceProvider class. Save any changes.
 d. Navigate to the following location in the file system for your customization archive and open the web_oidc.xml file in a text editor:

```
deployment\was-liberty-default\config-deployment-descriptors\maximo-mea\meaweb\webmodule\WEB-INF\web_oidc.xml
```

- e. Review the root element and ensure the version attribute that is used is 3.1 or later, but earlier than 4.x.
 f. Ensure that the servlet class is `psdi.iface.webservices.JAXWSWebServiceProvider` and that the `psdi.iface.webservices.WASJAXWSWebServiceProvider` servlet class is commented out because it is not used with Liberty. Ensure that all references to the WASJAXWSWebServiceProvider class in the file are replaced with JAXWSWebServiceProvider class. Save any changes.
 g. Navigate to the following location and open the webservices.xml file in a text editor:

```
deployment\was-liberty-default\config-deployment-descriptors\maximo-mea\meaweb\webmodule\WEB-INF\webservices.xml
```

- h. Select from the following options to update the webservices.xml file:

Option	Description
To use SOAP 1.1	In the <wsdl-file> element, specify <code>wsprovider11.wsdl</code> as the value and save the file.
To use SOAP 1.2	In the <wsdl-file> element, specify <code>wsprovider12.wsdl</code> as the value and save the file.
To use both protocols in the same endpoint	In the <wsdl-file> element, specify <code>wsprovider12.wsdl</code> as the value and save the file. Then, in the System Properties application, set the global value of the <code>mxe.int.supportsbothsoapversion</code> system property to 1.

Save any changes.

3. To modify the XML files for server bundles of type **all**, complete the following steps:

- a. Navigate to the following location in the file system for your customization archive and open the web.xml file in a text editor:

```
deployment\was-liberty-default\config-deployment-descriptors\maximo-all\meaweb\webmodule\WEB-INF\web.xml
```

- b. Review the root element and ensure the version attribute that is used is 3.1 or later, but earlier than 4.x.
 c. Ensure that the servlet class is `psdi.iface.webservices.JAXWSWebServiceProvider` and that the `psdi.iface.webservices.WASJAXWSWebServiceProvider` servlet class is commented out because it is not used with Liberty. Ensure that all references to the WASJAXWSWebServiceProvider class in the file are replaced with JAXWSWebServiceProvider class. Save any changes.
 d. Navigate to the following location in the file system for your customization archive and open the web_oidc.xml file in a text editor:

```
deployment\was-liberty-default\config-deployment-descriptors\maximo-all\meaweb\webmodule\WEB-INF\web_oidc.xml
```

- e. Review the root element and ensure the version attribute that is used is 3.1 or later, but earlier than 4.x.
 f. Ensure that the servlet class is `psdi.iface.webservices.JAXWSWebServiceProvider` and that the `psdi.iface.webservices.WASJAXWSWebServiceProvider` servlet class is commented out because it is not used with Liberty. Ensure that all references to the WASJAXWSWebServiceProvider class in the file are replaced with JAXWSWebServiceProvider class. Save any changes.
 g. Navigate to the following location and open the webservices.xml file in a text editor:

```
deployment\was-liberty-default\config-deployment-descriptors\maximo-all\meaweb\webmodule\WEB-INF\webservices.xml
```

- h. Select from the following options to update the webservices.xml file:

Option	Description
To use SOAP 1.1	In the <wsdl-file> element, specify <code>wsprovider11.wsdl</code> as the value and save the file.
To use SOAP 1.2	In the <wsdl-file> element, specify <code>wsprovider12.wsdl</code> as the value and save the file.
To use both protocols in the same endpoint	In the <wsdl-file> element, specify <code>wsprovider12.wsdl</code> as the value and save the file. Then, in the System Properties application, set the global value of the <code>mxe.int.supportsbothsoapversion</code> system property to 1.

Save any changes.

What to do next

After you configure the XML files, add them to a compressed archive file, copy the archive to a location that is accessible to Maximo Manage, and configure the application to include the customization archive when it is redeployed.

Web service deployment options

After you create a web service, you have a choice of deployment options. If you deploy a web service to the product web service container, the deployment is automatic. If you deploy a web service to an application server web service container, the deployment is manual.

You can deploy web services to one container type only. You cannot deploy some web services to a product web service container and deploy other web services to an application server web service container. Deployment to the web service container for the product is the quicker option, because the deployment is automatic. This type of deployment does not require redeployment of the Maximo® EAR files or a restart of the application server.

To invoke a web service on the application server, you must deploy the service to the application server web service container. Integration with an application server can provide a web service with access to additional services, such as enhanced security policies. If you choose this type of deployment, the information is added to the `deplmodule.dar` file. You must then add this file to the application server deployment directory, rebuild the EAR files, and restart the application server.

You can convert existing web services that are deployed to the product web service container to redeploy them to the application server web service container.

Web service deployment actions

When you deploy a web service, a number of events occur, including the generation of the XML schema and the web services description language (WSDL) file for the web service.

When you deploy a web service, the following events occur:

- The XML schema is made available for a new web service or the schema is regenerated for an existing web service.
- The WSDL file is made available for the service interface.
- The web service is deployed for the selected service.
- If Universal Description Discovery and Integration (UDDI) registry properties are configured, the web service is registered in the UDDI registry.

The deployed web service is available at the following URL:

`http://hostname:port/meaweb/services/web service name`

- `host:port/meaweb` is the value of the integration web application URL property.
- `web service name` is the name of the service for which the web service is deployed.

The list of deployed web services is available in the Web Services Library application.

Schema generation

You can generate the schema and view the XML for any web service in the Web Services Library application. You can also regenerate the schema to ensure that the schema is updated to reflect any changes that you make to the service.

A web service data structure is based on its associated object structure (for object structure services and enterprise services) or method signature (for standard web services). The web service data structure is provided in a standard XML representation, as a schema. This schema is used to create the WSDL file for the service.

If you change the data structure that is associated with a web service, regenerate the schema to update its schema and the WSDL file. The following changes to the data dictionary change the object structure:

- Adding new fields to a table
- Changing the type of a field
- Dropping fields from a table
- Changing a field from optional to required

The XML does not contain fields that are marked for exclusion in the object structure.

Before you deploy a web service, you must generate the schema to provide updated schema information to the WSDL file. When you generate a schema, input elements are displayed in the XML Data window and output elements are displayed in the Response XML window.

To access a generated schema, you can use a URL.

Enterprise service and object structure schemas

Use a URL that is similar to the following example in which MXSR is the object structure name that is associated with the service:

`http://localhost:port/meaweb/schema/service/MXSR`

For compatibility with version 7.5, URLs that are similar to the following example are still supported:

`http://localhost:port/meaweb/schema/service/MXSRSERVICE.xsd`

Standard service schemas

Use a URL that is similar to the following example in which ITEM is the name of the service.

`http://localhost:port/meaweb/schema/service/ss/ITEM`

For compatibility with version 7.5, URLs that are similar to the following example are still supported:

`http://localhost:port/meaweb/schema/service/ss/ITEMSERVICE.xsd`

If you set the `mxe.int.resolveschema` global property to true in the System Properties application, all include files are resolved. The entire schema content resides in a single file.

Generation of a Web Services Description Language file

A WSDL file is generated during the deployment of a web service. The WSDL file describes the web service, provides its location, and specifies the operations that the service makes available.

The WSDL file specifies the XML structure of the input and output messages for the operation, based on the XML schema. The file also specifies the URL for the web service, and the operations that the web service makes available.

A client program needs the schema definitions and WSDL file to generate client stubs. The client program uses a programming language, such as Java™ or C#, to call the web service.

You can view a generated WSDL file in a browser at http://localhost:port/meaweb/wsdl/service_name?wsdl, where *service_name* is the name of the service, such as MXASSET.

UDDI registration

You can register deployed web services in a UDDI registry. UDDI is an XML-based registry for publishing and locating WSDL files that describe web service applications.

You can register deployed web services in a UDDI registry by configuring the following global properties in the System Properties application:

System property	Description
mxe.int.uddipuburl	UDDI registry publish URL
mxe.int.uddiinurl	UDDI registry inquiry URL
mxe.int.uddiname	UDDI registry user ID
mxe.int.uddipassword	UDDI registry password

If you specify values for the publish URL property and the inquiry URL property, the web service is registered in the UDDI registry. To bypass UDDI registration, do not specify any values for these properties. Only the model for the WSDL file is registered in the UDDI registry. The *businessEntity*, *businessService*, and *bindingTemplate* values are not registered. The UDDI registration entry contains the URL to the WSDL file.

Creating and deploying web services

You can create a web service based on any object structure service, standard service, or enterprise service that is defined for the system. You then deploy the web service to the product web service container or to the application web service container.

- **[Creating a web service](#)**
When you create a web service, an external system can send web-based messages and queries to the associated service without configuring additional communication protocols or services.
- **[Deploying a web service to the product web service container](#)**
After you create a web service, you must deploy it before it can start processing XML messages. When you deploy a web service to the product web service container, the deployment process occurs automatically and does not require a server restart.
- **[Deploying a web service to the application server web service container](#)**
A deployment file is generated when you deploy a web service to the application server web service container. You must rebuild the Maximo EAR file to include the deployment file and restart the application server to activate the web service.
- **[Updating schema information](#)**
If you change the data structure of an integration service, update the schema information to the WSDL file to update the web service. If you do not regenerate the schema, the schema used by the web service can differ from the structure defined for the associated integration service.

Creating a web service

When you create a web service, an external system can send web-based messages and queries to the associated service without configuring additional communication protocols or services.

Before you begin

Perform the following checks to ensure that the service you want to use is available to create a web service:

- For an object structure service, verify that the Consumed By field is set to `INTEGRATION` in the Object Structures application.
- For a standard service, ensure that a method is annotated in the application service for each operation that you want to use in the web service. Only those methods that are properly annotated are accessible in the Web Services Library application.
- For an enterprise service, ensure that the service is associated with an external application in the External Systems application.

Procedure

1. In the Web Services Library application, select the appropriate Create Web Service action.
2. Choose the service to use by selecting the corresponding Source Name check box.
3. Optional: In the Name field, specify an identifier for the web service.
4. For a web service that is based on an enterprise service, specify whether you want the web service to be queue-based or to bypass the JMS queue.
5. Click Create.

What to do next

You must deploy the web service before you can use it to process inbound messages and queries. You can also generate the schema and view the XML structures of any selected web service.

Deploying a web service to the product web service container

After you create a web service, you must deploy it before it can start processing XML messages. When you deploy a web service to the product web service container, the deployment process occurs automatically and does not require a server restart.

Procedure

1. In the Web Services Library application, select the web service that you want to deploy.
2. Select the Deploy to Product Web Service Container...Deploy Web Service action.
3. Click OK.

Deploying a web service to the application server web service container

A deployment file is generated when you deploy a web service to the application server web service container. You must rebuild the Maximo® EAR file to include the deployment file and restart the application server to activate the web service.

About this task

The deplmodule.dar deployment file is in the directory that is specified by the mx.e.int.globaldir system property.

Procedure

1. In the Web Services Library application, select the web service that you want to deploy.
2. Select the Deploy to Application Server Web Service Container...Generate Deployment File Entries action.
This action generates an entry in the deployment file, deplmodule.dar.
3. Click OK.
4. Copy the deplmodule.dar file from the integration framework global directory to the product deployment directory.
5. In the deployment directory, build the maximo.ear file.
6. In the administrative console for the application server, deploy all web services in the deplmodule.dar file:
 - a. Stop the application server.
 - b. Redeploy the maximo.ear file.
 - c. Restart the application server.

Updating schema information

If you change the data structure of an integration service, update the schema information to the WSDL file to update the web service. If you do not regenerate the schema, the schema used by the web service can differ from the structure defined for the associated integration service.

Procedure

1. After modifying the data structure of a web service, click Generate Schema, WSDL, and View XML.
If you do not regenerate the schema, the web service is not aware of changes that you make.
2. For web services that are deployed to the application server web service container, you can automate schema updates in the System Properties application.
 - a. Set the value of the mx.e.int.containerdeploy property to 1 to deploy web services to the application server web service container.
 - b. Set the value of the mx.e.int.wsdlincludeschema property to 1 to ensure that schema information is included as part of WSDL files.
 - c. Set the value of the mx.e.int.resolveschema property to 1 to ensure that the system resolves all included fields into a single file.
 - d. Set the value of the mx.e.int.wsdlcurrentschema property to 1 to provide up-to-date schema content as part of a WSDL file.

Web service interactions overview

An interaction can start a web service and send data to it from an application. The interaction can then display data returned from the web service and save this data to the application database.

To implement interactions requires knowledge of:

- XML schemas
- Web services
- The integration framework
- Customizing applications and application user interfaces

An interaction can manage the following processes:

- Prepare a request for a web service.
- Invoke a web service from an application.
- Retrieve results from the web service in the form of a response.

- Display the results in an application.
- Optionally, apply the response data into the system database.
- Report any errors that occur during the request or response processes.

Two applications are provided to help you create and manage interactions:

- Create and configure interactions in the Create Interaction application.
- Review, modify, and delete interactions in the Interactions application.

After you create an interaction, users can perform the following tasks from the application user interface:

- Start the interaction.
- View and, if configured, change the parameters of the request to the web service.
- Invoke the web service by sending the request.
- Optionally, view data received from the web service and commit this data to the database.
- **[Creating interactions](#)**
The Create Interactions wizard application guides you through all the steps required to create and configure an interaction. After you complete the wizard process and test the interaction, users can start working with it immediately with no requirement for additional configuration or deployment.

Creating interactions

The Create Interactions wizard application guides you through all the steps required to create and configure an interaction. After you complete the wizard process and test the interaction, users can start working with it immediately with no requirement for additional configuration or deployment.

Before you begin

Before you run the Create Interactions application, ensure that you have all the information required for the configuration. During the process, you must specify the web service, define the structure of messages, and map the data between the application and the web service.

A logging tool is provided to log configuration activity and maintain a log file of the items that are configured. To generate a detailed log of the configuration, in the Logging application, set the interaction logger to DEBUG mode.

Procedure

1. To configure the web service for the interaction, in step 1 of the process:
 - a. Specify the URL for the WSDL file for the web service.
 - b. When the screen refreshes with information from the WSDL file, specify one port for the interaction.
 - c. Specify one operation for the interaction and check Process Response if you want the web service to return data to the application during the interaction.
2. Review the contents of the request to the web service in step 2, and modify the request object structure by removing any unnecessary elements.
3. Optional: Review the contents of the response from the web service in step 3, and modify the response object structure by removing any unnecessary elements.
This step is included only if you checked the Process Response option in step 1.
4. To configure the application for the interactions, in step 4 of the process:
 - a. Specify the application that uses the interaction.
 - b. Configure the application binding for the interaction, including the main object, the signature option, the interaction mode, and the user interface components.
 - c. Specify the security groups that are authorized to initiate the interaction.
5. Configure the Request tab of the Interactions window in step 5, including specifying the fields that users can see and whether they can edit them.
6. Optional: Configure the Response tab of the Interactions window in step 6, including specifying the fields that users can see and whether they can edit them.
This step is included only if you checked the Process Response option in step 1.
7. You can map information from the application to the web service in step 7. Mapped information is entered automatically into the request when users start the interaction.
8. Optional: You can map information from the web service to the application in step 8. If you check the Commit Response option, the mapped information is saved automatically to the database.
9. Review the configurations in the final step of the process.

What to do next

To monitor the time it takes to execute the interaction, in the Logging application, set the integration logger to either INFO mode or DEBUG mode.

You can view the interaction and modify mapping information in the Interactions application. If you intend to modify an interaction, select the Deactivate Interaction action before you make any changes and reactivate it after you complete the modification.

Configuring an external system

You can configure the external system that the integration framework communicates with. You can configure external systems for external applications inside or outside your enterprise.

You can configure an external system to use new or existing JMS queues and you can configure integration controls to support customization with processing rules.

If you copy a predefined external system, it copies the channels and services that are configured for it.

- **[Creating an external system](#)**
You create an external system to exchange data with external applications. When you create an external system, the application copies the integration controls that are defined for the corresponding publish channels and enterprise services. You then can specify default control values that apply to a particular external system.
- **[Enabling a publish channel](#)**
You must enable a publish channel that is associated to an external system before it can be used to publish event-based messages to an external system. By default, the publish channel records that are associated with an external system are disabled. A disabled publish channel prevents the external system from processing outbound integration framework messages.
- **[Enabling an enterprise service](#)**
You must enable an enterprise service that is associated to an external system before it can be used to receive inbound external application data. By default, the enterprise service records that are associated with an external system are disabled. A disabled enterprise service prevents the external system from processing inbound external application messages.
- **[Exporting data](#)**
To export a batch of message data to an external system, you can use the data export feature in the External Systems application. You can initiate the export process for each publish channel that is associated with an external system.
- **[Exporting data in sequential batches](#)**
To export multiple batches of message data to an external system, you can use the Bulk Data Exports action in the External Systems application. When you use this feature, exports are processed in order based on the sequence that you specify for the publish channels.
- **[Importing file-based data](#)**
You can use the data import feature to load data from either XML, JSON, or flat, delimited files to update the database. You can preview and validate the data prior to loading it and committing it to the database. You can choose to manage errors with the Message Reprocessing application or by extracting errors to a file format that is the same as the imported file format.
- **[Importing data by using a REST API call](#)**
You can use the Get External Data option on the Enterprise Services tab in the External Systems application to import data from external sources using a REST API call.
- **[Registering Kafka topics as Maximo Manage queues](#)**
To exchange message data and contents with Kafka, you register Kafka topics as Maximo® Manage message queues.
- **[Adding JMS queues to an external system](#)**
You can use Java™ Message Service (JMS) or other queues to exchange enterprise service and publish channel data with an external application. When messages are received or sent, they are written to the queue. These messages remain in the queues until they are successfully processed or deleted.
- **[Creating interface tables](#)**
You can create an interface table to integrate with external systems that use database tables for data exchange. Interface tables reflect the content of publish channel or enterprise service object structures. You must recreate existing tables when you change the definition of the corresponding object structure.
- **[Working with integration controls](#)**
If integration channels or services contain processing rules or exit classes that are based on integration controls, the values of the integration controls can be configured for the external system. You can configure boolean, list, and value integration controls that you can incorporate in processing rules.

Creating an external system

You create an external system to exchange data with external applications. When you create an external system, the application copies the integration controls that are defined for the corresponding publish channels and enterprise services. You then can specify default control values that apply to a particular external system.

Before you begin

Before you create an external system, define the queues and endpoint that the external system uses.

Procedure

1. In the External Systems application, click New External System.
2. In the System field, specify an external system identifier.
3. To send outbound messages, complete the following steps:
 - a. Select a value for the Outbound Sequential Queue field.
 - b. Select a value for the End Point field.The configured properties for the endpoint are displayed.
4. To receive inbound messages, complete the following steps:
 - a. Select a value for the Inbound Sequential Queue field.
 - b. Select a value for the Inbound Continuous Queue field.
5. Enable and save the external system.

What to do next

Configure a message provider and a message queue. Enable at least one publish channel or enterprise service for message processing.

- **[Specifying Kafka providers for message processing](#)**
You specify Kafka as a messaging provider to asynchronously process outbound integration framework messages. The integration framework supplies a Kafka client.
- **[Enabling an external system](#)**
You can enable an external system after you configure the external system record and when you are ready to begin integration framework message processing.

Specifying Kafka providers for message processing

You specify Kafka as a messaging provider to asynchronously process outbound integration framework messages. The integration framework supplies a Kafka client.

Before you begin

Obtain and configure a Kafka provider that is compatible with the Kafka 1.1.1 libraries.

About this task

Kafka refers to a *topic* as a category or feed name to which records are published. Because of the way that the integration framework works with Kafka, topics are referred to as messaging queues.

Procedure

1. In the External Systems application, add or select the external system and then select Add/Modify Message Providers to open the Message Hub Provider dialog box.
2. Insert a row and add a Kafka provider name.
The provider type is specified as KAFKA.
3. Specify values for the following properties. The SASL_MECHANISM and SECURITY_PROTOCOL properties are optional.

Option	Description
SASL_MECHANISM	The mechanism that implements the Simple Authentication and Security Layer (SASL) authentication and security framework. Allowed values are PLAIN, GSSAPI, SCRAM-SHA-256, and SCRAM-SHA-512. If no value is specified, the default value of PLAIN is used.
SECURITY_PROTOCOL	The protocol that ensures secure data sharing. Allowed values are SASL_SSL, SSL, PLAINTEXT, or SASL_PLAINTEXT. If no value is specified, the default value of SASL_SSL is used.
BOOTSTRAPSERVERS	A comma-separated list of server URLs that host your Kafka instance. Include the port specification. For example, specify <i>brokerurl1,brokerurl2</i> . You can use quotation marks if needed.
PASSWORD	If you specify the security protocol as either SASL_SSL or SASL_PLAINTEXT, specify an authentication password.
USERNAME	The username for your password.

4. Save your changes.

What to do next

Register the Kafka topics as Maximo® queues in the External Systems application. Configure one or more cron tasks to poll your queues and process the queue messages.

Enabling an external system

You can enable an external system after you configure the external system record and when you are ready to begin integration framework message processing.

Before you begin

You must enable at least one publish channel or enterprise service before any message processing can occur.

About this task

You also can disable an external system to stop all inbound and outbound message processing. If you disable an external system, only messages that are in the queues are processed. The integration framework does not accept inbound messages or send outbound messages. Additionally, you cannot use the external system data export and data import features.

Procedure

1. In the External Systems application, select the system that you want to update.
2. Select the option to enable or disable the external system.
3. Save the external system.

Enabling a publish channel

You must enable a publish channel that is associated to an external system before it can be used to publish event-based messages to an external system. By default, the publish channel records that are associated with an external system are disabled. A disabled publish channel prevents the external system from processing outbound integration framework messages.

Procedure

1. In the External Systems application, select the system that you want to update.
2. On the Publish Channels tab, specify whether you want the publish channel to be enabled or disabled.

Option	Enabled
Enabled	Selected
Disabled	Cleared

3. Click Save External System.

- [Associating a publish channel with an external system](#)

You can associate a publish channel with an external system to send asset management object data to the external system. The channels that you create and associate to the external system contain the outbound message processing logic.

- [Selecting publish channels for the external system](#)

You can associate multiple publish channels with an external system to synchronize the asset management object data with the external application data. The channels that you create and associate to the external system contain the outbound message processing logic.

- [Adding an endpoint to a publish channel](#)

You can define the endpoint that a publish channel uses to determine where the outbound data is published. Endpoints identify a target location and the transport mechanism for outbound data publication. If you do not define an endpoint at the publish channel level, data is moved to the endpoint location that is defined at the external system level.

- [Importing file-based data](#)

You can use the data import feature to load data from either XML, JSON, or flat, delimited files to update the database. You can preview and validate the data prior to loading it and committing it to the database. You can choose to manage errors with the Message Reprocessing application or by extracting errors to a file format that is the same as the imported file format.

Associating a publish channel with an external system

You can associate a publish channel with an external system to send asset management object data to the external system. The channels that you create and associate to the external system contain the outbound message processing logic.

About this task

You can define the endpoint that the channel uses. If you do not define an endpoint at the publish channel level, data is moved to the endpoint location that is defined at the external system level. You also can enable the associated publish channel when you are ready to perform outbound integration framework message processing.

Procedure

1. In the External Systems application, select the external system that you want to update.
2. On the Publish Channels tab, insert a row.
3. In the Publish Channel field, specify an identifier for the outbound interface of the external system.
4. Optional: In the Adapter field, specify an interface type.
5. Optional: In the End Point field, specify the end point that is used by the external system for outbound transactions.
6. Optional: Enable the publish channel to make it active.
7. Save your changes.

Selecting publish channels for the external system

You can associate multiple publish channels with an external system to synchronize the asset management object data with the external application data. The channels that you create and associate to the external system contain the outbound message processing logic.

Procedure

1. In the External Systems application, select the system that you want to update.
2. On the Publish Channels tab, click Select Channel.
3. Choose one or more publish channels by selecting the corresponding Publish Channel check boxes.
4. Click OK.
5. Click Save External System.

What to do next

You can define the endpoints that the channels use. If you do not define an endpoint at the publish channel level, data is moved to the endpoint location that is defined at the external system level. You must enable the associated publish channels before you can perform integration framework message processing.

Adding an endpoint to a publish channel

You can define the endpoint that a publish channel uses to determine where the outbound data is published. Endpoints identify a target location and the transport mechanism for outbound data publication. If you do not define an endpoint at the publish channel level, data is moved to the endpoint location that is defined at the external system level.

Before you begin

You must associate a publish channel to an external system.

Procedure

1. In the External Systems application, select the external system that you want to update.
2. On the Publish Channels tab, select the publish channel for which you want to add an endpoint.
3. In the End Point field, specify a value.
4. Click Save External System.

What to do next

You can enable the associated publish channel when you are ready to perform outbound integration framework message processing.

Importing file-based data

You can use the data import feature to load data from either XML, JSON, or flat, delimited files to update the database. You can preview and validate the data prior to loading it and committing it to the database. You can choose to manage errors with the Message Reprocessing application or by extracting errors to a file format that is the same as the imported file format.

Before you begin

Before data can be imported, if you plan to import data from a flat file, such as a .csv file, the enterprise service object structure must support flat file structures. Ensure that the Support Flat File Structure check box is selected on the associated object structure record in the Object Structures application. You also must enable both the external system and the enterprise service before you can import data.

About this task

The data import process can use a predefined or user-defined enterprise service.

Procedure

1. In the External Systems application, display the external system that contains the enterprise service from which you want to import data.
2. On the Enterprise Services tab, select the enterprise service from which you want to import data.
3. Click Data Import.
4. Optional: Select the Import Preview check box to examine the data before importing and committing the data to the database.
Use the preview option to sample data records. This feature is not intended to support a large file containing hundreds of records. Processing synchronously processes the file to the business objects and returns any error messages encountered, without committing any updates to the database.
5. Specify the type of file that you want to use for the file import.

Option	Description
XML file	Imported data is in XML format.
Flat file	Imported data is in a delimited flat file. If necessary, modify the Delimiter and Text Qualifier values.
JSON file	Imported data is in JSON format.

6. In the Specify Import File field, enter the file name path the imported file uses for identification and storage.
7. Select the File-based Error Management check box if you want to manage any errors you encounter through a file in the same format as the file being imported. This option is an alternative to managing errors with the Message Reprocessing application
8. Click OK to begin the import data process.

What to do next

When the data import is executed, the file that is selected for import is formed into multiple messages and dropped into the inbound queue that is configured for the enterprise service and its corresponding external system. The messages are then processed from the inbound queue to the application objects for updating. The processing of messages from an inbound queue requires the enablement of the related cron task when the sequential queue is used or the enablement of Message Driven Beans for the continuous queue. If errors occur when processing a file, you can manage and view the data import messages that are flagged with an error in the Message Reprocessing application.

Enabling an enterprise service

You must enable an enterprise service that is associated to an external system before it can be used to receive inbound external application data. By default, the enterprise service records that are associated with an external system are disabled. A disabled enterprise service prevents the external system from processing inbound external application messages.

Procedure

1. In the External Systems application, display the system that you want to update.
2. On the Enterprise Services tab, specify whether you want the enterprise service to be enabled or disabled.
3. Save your changes.

- **[Associating an enterprise service with an external system](#)**

You can associate an enterprise service with an external system to synchronize inbound external application data with asset management objects. The services that you create and associate to the external system contain the inbound message processing logic.

- **[Selecting enterprise services for the external system](#)**

You can associate multiple enterprise services with an external system to synchronize inbound external application data with asset management objects. The services that you create and associate to the external system contain the inbound message processing logic.

- **[Selecting an enterprise service queue type](#)**

You can specify whether the enterprise service that you associate to the external system receives data from the continuous or sequential queue. The queue selection you make for the enterprise service determines how the Java™ Message Service (JMS) queue processes inbound messages.

Associating an enterprise service with an external system

You can associate an enterprise service with an external system to synchronize inbound external application data with asset management objects. The services that you create and associate to the external system contain the inbound message processing logic.

About this task

You can specify whether the associated enterprise services receive data from the sequential or continuous queue. You also can enable the associated enterprise service when you are ready to perform inbound integration framework message processing.

Procedure

1. In the Enterprise Systems application, display the system that you want to update.
2. On the Enterprise Services tab, click New Row.
3. In the Enterprise Service field, enter a value.
4. Specify whether you want the enterprise service to be enabled or disabled.
5. Specify whether you want the service messages to receive data from the continuous or sequential queue.
6. Save your changes.

Selecting enterprise services for the external system

You can associate multiple enterprise services with an external system to synchronize inbound external application data with asset management objects. The services that you create and associate to the external system contain the inbound message processing logic.

Procedure

1. In the External Systems application, display the system that you want to update.
2. On the Enterprise Services tab, click Select Service.
3. Choose one or more enterprise services by selecting the corresponding Enterprise Service check boxes.
4. Click OK.
5. Save your changes.

What to do next

You must enable the associated enterprise services before you can perform integration framework message processing. You also can specify whether the associated enterprise services receive data from the sequential or continuous queues.

Selecting an enterprise service queue type

You can specify whether the enterprise service that you associate to the external system receives data from the continuous or sequential queue. The queue selection you make for the enterprise service determines how the Java™ Message Service (JMS) queue processes inbound messages.

Before you begin

You must associate an enterprise service to an external system.

About this task

The continuous queue continues to process messages that are in the queue even when message processing results in an error. Conversely, the sequential queue stops processing messages that are in the queue until the processing error is cleared. A sequential queue also processes messages on a strict first-in-first-out basis.

Procedure

1. In the External Systems application, select the external system that you want to update.
2. On the Enterprise Services tab, select the enterprise service for which you want to select a queue.
3. Specify whether you want the service messages to receive data from the continuous or sequential queue.
4. Save your changes.

What to do next

You can enable the associated enterprise service when you are ready to perform inbound integration framework message processing.

Exporting data

To export a batch of message data to an external system, you can use the data export feature in the External Systems application. You can initiate the export process for each publish channel that is associated with an external system.

Before you begin

You must configure an endpoint to the data destination.

In addition to configuring an endpoint, you must enable both the external system and the publish channel before you can export data. The data for export must either be in an XML, JSON, or delimited flat file format that conforms to the object structure schema. A delimited flat file, such as comma separated, is a flattened version of the object structure schema format.

Procedure

1. In the External Systems application, click the Publish Channels tab and select the publish channel that you want to export.
2. In the End Point field, specify the destination for the outbound data.
3. Click Data Export to specify more criteria for the data export. Enter selections in one or more of the following fields.
 - a. In the Export Condition field, specify a SQL query to select records for export.

For example, specify `assetnum like '11%' and siteid='BEDFORD'` to export all asset records that start with 11 and are in the Bedford site. The query must be specified on the primary or top-level object in the publish channel object structure.

The query can affect the size of the exported message. The export process performs the standard outbound processing on the result set of the query for the selected publish channel.
 - b. In the Export Order By field, specify one or more fields by which records are sorted on export. You can specify ASC or DESC order.

For example, specify `assetnum DESC` to order the exported data by descending asset ID. The ORDER BY statement must apply to the primary, or top-level, object in the integration object.
 - c. In the Export Count field, specify a value to limit the number of records in the export file.

If the result of the query contains more records than the number you specify, those records are not included in the exported data.
4. To break up the data and store it in the queue as separate files, specify a value in the Batch Size field.

If the number of records is larger than the batch size that you specify, the export data is split into a transaction with multiple files and stored separately.
5. Click OK to begin exporting the data.

Results

When the data is exported, it is formed into a message and dropped into the outbound queue that is configured for the publish channel and its corresponding external system. Then, the message is processed from the outbound queue to the configured endpoint. If an error occurs when delivering a message to the endpoint, you can manage and view the data export messages that are flagged with an error in the Message Reprocessing application.

Exporting data in sequential batches

To export multiple batches of message data to an external system, you can use the Bulk Data Exports action in the External Systems application. When you use this feature, exports are processed in order based on the sequence that you specify for the publish channels.

Before you begin

Before you set up bulk data exports, complete the following tasks:

- Configure an endpoint to the data destination.
- Configure and enable the external system.
- Configure the publish channels for the export.

About this task

Data is exported sequentially based on the order of the publish channels that you specify in the Bulk Data Exports window.

Data is processed using a cron task instance in the BULKEXPORT cron task. If no cron task instance exists for the external system, a cron task instance that matches the name of the external system for exporting the data is automatically generated. If the cron task instance already exists for the external system, it is activated when you click Process.

When a cron task is active, the In Process check box is selected. No other process for this external system can be started when the cron task is active. Only one export can occur at a time.

When all data in a publish channel is processed, the data is committed. If you have multiple batches in a publish channel, data is committed only after all batches are processed.

If an error occurs for any publish channel, processing is stopped, and an error message is displayed. No data for that channel is committed until the error is corrected. You can correct the error and click Process to restart the process. When you click Process, the publish channel that has the error is reprocessed, and processing continues with the next channel in the sequence. Data is not reprocessed for the publish channels that were successfully committed before the error occurred.

When the cron task is completed, it is automatically deactivated.

Table 1. Buttons in the Bulk Data Export window

Button	Function
Save	Saves any changes that you made in the Bulk Data Exports window.
Cancel	Closes the Bulk Data Exports window but does not save your changes. To save changes, click Save before you click Cancel.
Refresh	Reloads the Bulk Data Exports window and updates the fields to display the status of the data export process.
Reset	Restarts the bulk data export process for all the publish channels that are included in this external system.
Process	Starts the bulk data export process.

Procedure

1. In the External Systems application, locate and open the external system that you want to use.
2. On the System tab, in the Outbound Sequential Queue field, specify a destination for the outbound data.
3. From the More Actions menu, select Bulk Data Exports.
4. For the publish channels that you want to export, add rows sequentially in the order that you want to process the data and enter details for the export in the following fields:

Option	Description
Sequence	Enter a number to specify the order in which to process the publish channel data. If you add sequence numbers in increments of ten, it is easy to insert additional publish channels if the need arises at a later date. For example, if you have sequence numbers 10 and 20, and later you want to export a publish channel between those two rows, you can add a sequence number of 15.
Publish Channel	Specify the publish channel to use for the export.
Batch Size	Optional. Specify the number of records to include in each JMS message for the selected publish channel. For example, if you have 100 messages and specify a batch size of 50, the result is 2 JMS messages. If the number of records is larger than the batch size that you specify, the export data is split into a transaction that has multiple files that are stored separately. Even though the records are processed in multiple batches, only one commit occurs for the entire publish channel.
Export Condition	Optional. Specify an SQL query to select records for export. For example, specify <code>assetnum like '11%' and siteid='BEDFORD'</code> to export all asset records that start with 11 and are in the Bedford site. The query must be specified on the primary or top-level object in the publish channel object structure.
Export Order By	Optional. Specify one or more fields by which to sort records that you export. You can specify <code>ASC</code> for ascending order or <code>DESC</code> for descending order. For example, specify <code>assetnum DESC</code> to order the exported data by descending asset ID. The <code>ORDER BY</code> statement must apply to the primary or top-level object in the integration object.
Error Message	If an error occurs during the export process, this field displays an error message.
Enabled	Select this field in the table row to enable the publish channel.
Processed	If this publish channel was processed, this field displays a check mark.
User Defined	Indicates whether you created the publish channel or it was predefined in the application.

5. Click Save.
6. Click Cancel to close the window.
7. From the More Actions menu, select Bulk Data Export.
8. To export the data, click Process.

Importing file-based data

You can use the data import feature to load data from either XML, JSON, or flat, delimited files to update the database. You can preview and validate the data prior to loading it and committing it to the database. You can choose to manage errors with the Message Reprocessing application or by extracting errors to a file format that is the same as the imported file format.

Before you begin

Before data can be imported, if you plan to import data from a flat file, such as a .csv file, the enterprise service object structure must support flat file structures. Ensure that the Support Flat File Structure check box is selected on the associated object structure record in the Object Structures application. You also must enable both the external system and the enterprise service before you can import data.

About this task

The data import process can use a predefined or user-defined enterprise service.

Procedure

1. In the External Systems application, display the external system that contains the enterprise service from which you want to import data.
2. On the Enterprise Services tab, select the enterprise service from which you want to import data.
3. Click Data Import.
4. Optional: Select the Import Preview check box to examine the data before importing and committing the data to the database. Use the preview option to sample data records. This feature is not intended to support a large file containing hundreds of records. Processing synchronously processes the file to the business objects and returns any error messages encountered, without committing any updates to the database.
5. Specify the type of file that you want to use for the file import.

Option	Description
XML file	Imported data is in XML format.
Flat file	Imported data is in a delimited flat file. If necessary, modify the Delimiter and Text Qualifier values.
JSON file	Imported data is in JSON format.

6. In the Specify Import File field, enter the file name path the imported file uses for identification and storage.
7. Select the File-based Error Management check box if you want to manage any errors you encounter through a file in the same format as the file being imported. This option is an alternative to managing errors with the Message Reprocessing application.
8. Click OK to begin the import data process.

What to do next

When the data import is executed, the file that is selected for import is formed into multiple messages and dropped into the inbound queue that is configured for the enterprise service and its corresponding external system. The messages are then processed from the inbound queue to the application objects for updating. The processing of messages from an inbound queue requires the enablement of the related cron task when the sequential queue is used or the enablement of Message Driven Beans for the continuous queue. If errors occur when processing a file, you can manage and view the data import messages that are flagged with an error in the Message Reprocessing application.

Importing data by using a REST API call

You can use the Get External Data option on the Enterprise Services tab in the External Systems application to import data from external sources using a REST API call.

Before you begin

Before you import external data, you must complete the following tasks:

- Configure and enable the external system.
- Configure an inbound queue for the external system.
- Configure an endpoint for the import.
- Configure the enterprise services for the import.

About this task

When you complete the following procedure, the REST API that you specify is called, and data is imported into Maximo® Manage. The process runs in the background as a cron task that uses the endpoint that you specify. When the response is received, data is split into individual transactions and stored in the queue. Data is processed based on either the JMS or Kafka queue that you specify for the external system.

Procedure

1. In the External Systems application, select the external system to use for importing data.
2. On the Enterprise Services tab, select the enterprise service to use for importing data.
3. Click Get External Data.
4. In the Get External Data window, enter the following information for importing your data:

Option	Description
Select Data Type	Select either JSON or XML.
End Point	Select the endpoint for your REST API call.
Queue based	If your import is queue-based, select the checkbox.

5. Click OK.

Registering Kafka topics as Maximo Manage queues

To exchange message data and contents with Kafka, you register Kafka topics as Maximo® Manage message queues.

Before you begin

Before you can register Kafka topics as product queues, take the following steps:

- Create the topics on the Kafka server.
- Configure a message provider of Kafka type in the External Systems application.

Procedure

1. Select Add/Modify Queues in the External Systems application and add a queue.
2. Specify the Kafka provider and topic name. Specify the message direction and whether the queue is sequential or continuous.
All outbound queues are sequential queues. You specify a queue as continuous by leaving the Sequential check box deselected and specify a queue as inbound by leaving the Inbound check box deselected.
Note: No separate error queue is needed for continuous queue processing. Error messages are written to the error tables as it was done in Maximo Manage earlier. There is a new error processing cron task called KAFKAERROR. You should configure an instance of the KAFKAERROR cron task for each continuous queue. It is responsible for processing messages from the error table in a continuous way. The Kafka cron task just moves to the next offset and continues processing remaining messages from the Kafka continuous queue.
3. Specify the email address of the user who receives notices when errors occur in the queue. This value is used instead of the email value that is specified in system properties.
4. In the Maximum Retry Count field, specify the maximum number of reprocessing attempts after an initial error and before a message is put in a Hold status and moved to a configured error queue.
5. Save your changes.

What to do next

For each queue, add an instance of the Kafka cron task to periodically poll the queue for messages and process them.

Adding JMS queues to an external system

You can use Java™ Message Service (JMS) or other queues to exchange enterprise service and publish channel data with an external application. When messages are received or sent, they are written to the queue. These messages remain in the queues until they are successfully processed or deleted.

Before you begin

Before you can add a queue to an external system, you must create the queue on the application server. If you add a sequential queue, you must set up a cron task to periodically poll the queue for messages.

About this task

Each external system can have its own inbound and outbound queues, or you can configure multiple systems to share queues. You can either add your own user-defined message queues, or modify the existing queues when the predefined inbound and outbound message queues do not meet your needs.

Procedure

1. In the External Systems application, select the system for which you want to add a JMS queue.
2. Select the Add/Modify Queues action and add a row.
3. Enter values in the following fields:

Option	Description
Queue JNDI Name	The name of the JMS queue.
Queue Connection Factory	The connection factory that is used for accessing the queue. For a JMS queue, the default value is jms/mro/int/queues/sqin.
Maximum Try Count	The number of times a message is reprocessed after an initial error and before it is written to the error log and an e-mail notification is sent to the system administrator.

4. Optional: Enter values in the following fields:

Option	Description
Initial Context Factory	The class used to connect to the JMS queue server.
Provider URL	The URL of the JMS queue server.
User ID	The user ID that is used to access the new queue.
Password	The password that is use to access the queue.
E-mail Address	The e-mail address of a user who receives notices when transaction errors occur in the queue. This value is typically the e-mail address of a system administrator.

5. Optional: If the queue delivers inbound messages and functions as a continuous queue, clear the Sequential check box.
6. Optional: If the queue delivers outbound messages, clear the Inbound check box.
7. Click OK.
8. On the System tab, enter values in the following fields as required:

- Outbound Sequential Queue for the sequential queue for outbound messages.
 - Inbound Sequential Queue for the sequential queue for inbound messages.
 - Inbound Continuous Queue for the continuous queue for inbound messages.
9. Save your changes.

Creating interface tables

You can create an interface table to integrate with external systems that use database tables for data exchange. Interface tables reflect the content of publish channel or enterprise service object structures. You must recreate existing tables when you change the definition of the corresponding object structure.

Before you begin

You cannot recreate an interface table when unprocessed messages for that interface table exist in the MXIN_INTER_TRANS queue table. If you do not back up data before you recreate an interface table, the system loses the data. Ensure that alias conflicts are resolved and the Support Flat File Structure check boxes are selected on the associated object structure records in the Object Structures application.

About this task

The Create Interface Table dialog box displays the interface tables that are associated with publish channels and enterprise services that have the following characteristics:

- Registered to the selected external system.
- Interface table name is not null.
- Corresponding object structure supports a flat file representation.

Procedure

1. In the External Systems application, select the Create Interface Tables action.
2. In the Create Interface Tables dialog box, select the interface table that you want update and create.
3. Enter a value in the End Point field.
4. Optional: Select the Rename Existing check box to create a copy of the selected interface table.
The asset management system stores copy of the interface table and adds a BAK suffix to its name.
5. Click Create.
6. Click OK to create the table or Cancel to stop the process.
Depending on the number of interface tables you are creating, this process can take some time.
7. Click OK to close the Create Interface Tables dialog box.

Working with integration controls

If integration channels or services contain processing rules or exit classes that are based on integration controls, the values of the integration controls can be configured for the external system. You can configure boolean, list, and value integration controls that you can incorporate in processing rules.

- **[Setting up a Boolean control](#)**
You can set up a Boolean control on an external system when you need a control that specifies a value of true or false. You also can add specific organization-level and site-level values to a Boolean control. A publish channel or an enterprise service can use this Boolean control in its processing rule evaluations. The true or false value that you assign to the control in the external system determines whether an enterprise service or a publish channel applies a processing rule.
- **[Setting up a cross-reference control](#)**
You can set up a cross-reference control when you need a control that replaces one value with another. A cross-reference control can map a value in the asset management system to a value in the external system.
- **[Setting up a list control](#)**
You create a list type integration control when you need a control that contains a list of values. You also can add specific organization-level and site-level values to a list control. A publish channel or an enterprise service can use this list control in its processing rule evaluations. The value that you assign to the control in the external system determines whether an enterprise service or a publish channel applies a processing rule.
- **[Setting up a value control](#)**
You can set a value type integration control on an external system when you need a control that contains a single value. You also can add specific organization-level and site-level values to a value control. A publish channel or an enterprise service can use this value control in its processing rule evaluations. The value that you assign to the control in the external system determines whether the processing rule is applied.
- **[Overriding values for a cross-reference control](#)**
You can set up a cross-reference control to override values for sites and organizations. You can choose to override the cross-reference values that were previously defined at the enterprise service or publish channel level. The value override can be configured according to each external system to maintain valid asset management system and external system mappings.
- **[Overriding values for a list control](#)**
You can set up a list control to override values for sites and organizations. You can choose to override the list control values that were previously defined in the enterprise service or publish channel level. The rule could skip the processing of the transaction when the data field value does not match any of the overwritten list control values.

Setting up a Boolean control

You can set up a Boolean control on an external system when you need a control that specifies a value of true or false. You also can add specific organization-level and site-level values to a Boolean control. A publish channel or an enterprise service can use this Boolean control in its processing rule evaluations. The true or false value that you assign to the control in the external system determines whether an enterprise service or a publish channel applies a processing rule.

Before you begin

The boolean value that you assign to a control must already exist in the control definition in the Publish Channels or Enterprise Services application. If that definition points to a domain, any organization-level or site-level values that you assign must exist in that domain.

Procedure

1. In the External Systems application, display the system that you want to update.
2. Select the Set Up Integration Controls action.
3. Select the boolean control that you want to update.
4. Click New Row.
5. Perform one of the following actions:
 - Enter a value in the Organization field.
 - Enter a value in the Site field.
6. Specify whether you want the Boolean control to have a default value of true or false.

Option	Default True
True value	Selected
False value	Cleared

7. Click OK to close the Boolean Control dialog box.
8. Click OK to close the Set Up Integration Controls dialog box.

Setting up a cross-reference control

You can set up a cross-reference control when you need a control that replaces one value with another. A cross-reference control can map a value in the asset management system to a value in the external system.

Before you begin

The value that you assign for translation must first exist in the control definition in the Publish Channels or Enterprise Services application. If that definition points to a domain, the organization-level or site-level values that you assign must exist in that domain.

Procedure

1. In the External Systems application, display the system that you want to update.
2. Select the Setup Integration Controls action.
3. Select the cross-reference control that you want to update.
4. Click New Row.
5. In the Maximo Value field, enter the application value that the asset management system converts to or from an external system value.
6. In the External Value field, enter the external system value the asset management system converts to or from the Maximo value.
7. Click OK to close the Cross-Reference Control dialog box.
8. Click OK to close the Setup Integration Controls dialog box.

Setting up a list control

You create a list type integration control when you need a control that contains a list of values. You also can add specific organization-level and site-level values to a list control. A publish channel or an enterprise service can use this list control in its processing rule evaluations. The value that you assign to the control in the external system determines whether an enterprise service or a publish channel applies a processing rule.

Before you begin

The values that you add to a list control must already exist in the control definition in the Publish Channels or Enterprise Services application. If that definition points to a domain, the organization-level or site-level values that you assign must exist in that domain.

Procedure

1. In the External Systems application, display the system that you want to update.
2. Select the Set Up Integration Controls action.
3. Select the list control that you want to update.
4. Click New Row.
5. In the Value field, enter a value that exists in the domain.
6. Click OK to close the List Control dialog box.
7. Click OK to close the Set Up Integration Controls dialog box.

Setting up a value control

You can set a value type integration control on an external system when you need a control that contains a single value. You also can add specific organization-level and site-level values to a value control. A publish channel or an enterprise service can use this value control in its processing rule evaluations. The value that you assign to the control in the external system determines whether the processing rule is applied.

Before you begin

The value that you assign first must exist in the control definition in the Publish Channels or Enterprise Services application. If that definition points to a domain, the organization-level or site-level values that you assign must exist in that domain.

Procedure

1. In the External Systems application, display the system that you want to update.
2. Select the Set Up Integration Controls action.
3. Select the value control that you want to update.
4. Click New Row.
5. Perform one of the following actions:
 - Enter a value in the Organization field.
 - Enter a value in the Site field.
6. In the Value field, enter a value that exists in the domain.
7. Click OK to close the Value Control dialog box.
8. Click OK to close the Set Up Integration Controls dialog box.

Overriding values for a cross-reference control

You can set up a cross-reference control to override values for sites and organizations. You can choose to override the cross-reference values that were previously defined at the enterprise service or publish channel level. The value override can be configured according to each external system to maintain valid asset management system and external system mappings.

Before you begin

The value that you use for translation must first exist in the cross-reference control definition in the Publish Channels or Enterprise Services application. If that definition points to a domain, the organization-level or site-level values that you assign must exist in that domain.

About this task

If you use synonyms, enter the external value as the control value, not the internal application value.

Procedure

1. In the External Systems application, display the system that you want to update.
2. Select the Setup Integration Controls action.
3. Select the cross-reference control that you want to update.
4. Click Override.
The Override Values for Cross-Reference Control dialog box displays any organization-level and site-level values that exist for the control.
5. Click New Row.
6. Perform one of the following actions:
 - Enter a value in the Organization field.
 - Enter a value in the Site field.
7. In the Values for Organization/Site table window, click New Row.
8. Enter the values in the Default Value and External Value fields.
To use the control as a multiplication control, enter multiple records that have the same external value and different organization or site values.
9. Click OK to close the Override Values for Cross-Reference Control dialog box.
10. Click OK to close the Cross-Reference Control dialog box .
11. Click OK to close the Set Up Integration Controls dialog box .

Example

Five external systems are configured to exchange data with the integration framework. Four of these external systems use the same site values, but one site value differs. A cross-reference control that performs the translation between the four mismatched values and the asset management system value can be overwritten at an external system level. The value override can be configured to translate the remaining mismatched external system site value to an asset management system storeroom value.

A cross-reference control in an enterprise service can translate the external system site value EX001 to an asset management system site MX001. An override cross-reference control in external system can override the predefined EX001 value and use an EX002 value in its value translation.

Overriding values for a list control

You can set up a list control to override values for sites and organizations. You can choose to override the list control values that were previously defined in the enterprise service or publish channel level. The rule could skip the processing of the transaction when the data field value does not match any of the overwritten list control values.

Before you begin

The value that you assign first must exist in the control definition in the Publish Channels or Enterprise Services application. If that definition points to a domain, the organization-level or site-level values that you assign must exist in that domain.

About this task

You must use a period (.) as the decimal placeholder when you enter decimals as a control value, regardless of the locale settings of the application server or database. Numbers to the left of the placeholder are not formatted. This format applies to inbound and outbound data. For example, \$1,738,593.64 must be specified as 1738593.64.

Procedure

1. In the External Systems application, display the system that you want to update.
2. Select the Set Up Integration Controls action.
3. Select the list control that you want to update.
4. Click Override.
The Override Values for List Control dialog box displays any organization-level and site-level values that exist for the control.
5. Click New Row.
6. Perform one of the following actions:
 - Enter a value in the Organization field.
 - Enter a value in the Site field.
7. In the Values for Organization/Site table window, click New Row.
8. Enter a value in the Value field.
If you use synonyms, enter an external value, not the internal application value.
9. Click OK to close the Override Values for List Control dialog box.
10. Click OK to close the Cross-Reference Control dialog box .
11. Click OK to close the Set Up Integration Controls dialog box .

Example

Work orders are sent to an external system based on their statuses. The processing rule that is defined on the enterprise service or publish channel can check the status of a work order against a list control that contains two status values: `APPR` (approved) or `COMPLETE`. This list override can be configured to evaluate two different work order status values: `WAPPR` (waiting on approval) or `WSCH` (waiting to be scheduled). If the status of a work order does not match the overwritten list control values, the work order transaction is not sent to the external system.

API keys application

You use API keys to enable an inbound machine-to-machine integration for an external client. API keys can be used by the OSLC and REST APIs and also can be used as part of the Manage integration framework.

In a machine-to-machine integration, an external machine interacts with Manage data in the Manage system without the use of a browser. API keys are a native form of authentication that do not require an external repository for password storage.

By default, all API keys are encrypted at storage. This setting is controlled by the `mxe.secureapikey` property.

Adding API keys for REST APIs

When an API key is assigned to the external client, the external client can access and interact with data in the Manage system by using the API key as an `apikey` query parameter or an `apikey` request header in REST API calls. REST API calls that use an API key do not create a persistent server connection, and the API key must be part of all REST API requests that the external client makes.

For more information and to use an API key, on the API Keys subtab of the Integration tab of the Administration Work Center, from the Action menu, select API documentation. Select Authorize to use your API key.

To use an API key, go to Integration > API Keys application from the menu.

Using externally created API keys

You can use externally created API keys as an API key in Maximo® Manage. Create this type of API key by using the `MXAPIAPIKEY` REST API and providing your generated API key by using the "apikey" json property, as shown in the following code:

```
POST /oslc/os/mxapiapikey
{
  "apikey": "<outside generated apikey>",
  "expiration": -1
}
```

Security access

As the system administrator, you must synchronize Manage users for the external clients before API keys are created for those clients. The permissions that are associated with the API key are determined by the permissions for the associated user. You can create and configure API keys on the API Keys subtab of the Integration tab of the Administration Work Center. You can create and configure API keys from the API Keys application under Integration.

You also can specify security that enables only the logged-in user to create an API key. To limit the creation of API keys to the logged-in user, go to the System Properties application and filter for the `mxe.apikeyforloggedinuser` property. In the Global Value field, specify 1 and save the record. Select Live Refresh to apply the value immediately.

To disable access to the Manage system for an external client, you can delete the associated API key, but the external client might still access the Manage system by using another configured authentication system. If an API key is compromised, delete the key and create another key for that user.

- [Searching for API keys](#)
You can search for API keys in the API Keys application.
- [Sorting API keys](#)
You can sort API keys in the API Keys application.
- [Adding API keys](#)
When an API key is assigned to the external client, the external client can access and interact with data in the Manage system. The interaction happens by using the API key as an `apikey` query parameter or an `apikey` request header in REST API calls. REST API calls that use an API key do not create a persistent server connection, and the API key must be part of all REST API requests that the external client makes.
- [Copying API keys](#)
It is possible to copy an API key value for your use.
- [Deleting API keys](#)
You can delete an API key if necessary.
- [Changing the layout](#)
You can switch between a tile and a tabular layout for the APIs you create.

Searching for API keys

You can search for API keys in the API Keys application.

Procedure

In the API Keys application, specify a string in the Search field.
The search results are displayed based on your search string.

Sorting API keys

You can sort API keys in the API Keys application.

Procedure

In the API Keys application, select a sort criteria from the list.
The API keys are sorted according to the criteria you select.
Tip: Use the up or down arrow to sort in ascending or descending order.

Adding API keys

When an API key is assigned to the external client, the external client can access and interact with data in the Manage system. The interaction happens by using the API key as an `apikey` query parameter or an `apikey` request header in REST API calls. REST API calls that use an API key do not create a persistent server connection, and the API key must be part of all REST API requests that the external client makes.

Procedure

1. In the API Keys application, click Add API key +.
2. In the Add API key dialog, select the user the API key is for, in the User field.
3. Specify the token expiry in minutes period using the + and - controls.
4. Click Create.
You can see the API key that you created in the API Keys page.

Copying API keys

It is possible to copy an API key value for your use.

Procedure

In the API Keys application, click Copy key for the API key whose value you want to copy. A notification is displayed stating that the key is copied to the clipboard.

Deleting API keys

You can delete an API key if necessary.

Procedure

In the API Keys application, click the Delete icon to delete the API you want to remove.

Changing the layout

You can switch between a tile and a tabular layout for the APIs you create.

Procedure

Select the list or the grid icon to toggle between APIs displayed in a table or APIs displayed as tiles.

- [Managing columns](#)
You can add or remove columns to the tabular layout of the existing API keys.
- [Viewing APIs with filters](#)
In the tabular layout of the API Keys page, you can use filters to customize the list displayed and hover over a row to view the copy and delete options.

Managing columns

You can add or remove columns to the tabular layout of the existing API keys.

Procedure

1. In the tabular view of the API Keys page, click the Column Selection icon.
2. Click Manage columns and in the Select value dialog, select the columns that you want to see from the list.
3. Click OK to see the table updated with your column selection.

Viewing APIs with filters

In the tabular layout of the API Keys page, you can use filters to customize the list displayed and hover over a row to view the copy and delete options.

Procedure

Click the Filters icon to see the available filters.

Note: If you add columns using Manage columns, you can see those column headings as filters. The list of API keys in the table is displayed according to the filters that you select.

Predefined integration content

The integration framework provides predefined integration content, including object structures, enterprise services, and publish channels that support exporting data to external systems importing data from external system or exporting data to them.

In some cases, only the object structure is provided without a related publish channel or enterprise service. The integration framework, by design, provides support for inserting, updating, deleting and querying data according the business rules defined in the business objects within the object structure. It does not provide all

the functionality that is available through the applications, including those that are available from actions or the processing button on the screen. Some object structures may provide support for some actions or the processing button on the screen.

Some object structures that are provided with your product are the definition of REST APIs that are also provided with your product. For a module-based list of the product REST APIs and related object structures, log in to your product system, and then go to the following URL: *Your product URL*/maximo/maximomodules.jsp

- **[Master data objects](#)**
The integration framework provides a selection of predefined integration content for master data, which generally consists of accounting, people, storeroom, labor, classification, and vendor data.
- **[Item and inventory objects](#)**
The integration framework provides a selection of predefined integration content for item and inventory objects, such as service items, tool items, inventory vendors, and issues.
- **[Documents objects](#)**
The integration framework provides a selection of predefined integration content for documents, such as purchasing records, invoices, and work order records.
- **[Transaction interface objects](#)**
The integration framework provides a selection of predefined integration content for transaction interface objects, such as receipts, general ledger transactions, labor time reporting, and meter readings.
- **[System objects](#)**
System objects are MBOs that are generally used for application or metadata configuration. Updating data using system objects may require specific post-processing activities, for example, reconfiguring the database.
- **[Data loading order](#)**
When you use the integration framework to load multiple sets of data into the application database, you must maintain the dependencies so that the data is loaded correctly. Use the following sequence of predefined object structures as a guide to determine the order in which you load the data.

Master data objects

The integration framework provides a selection of predefined integration content for master data, which generally consists of accounting, people, storeroom, labor, classification, and vendor data.

- **[Asset object](#)**
The MXASSET object structure allows for bidirectional synchronization of asset information, including attributes that define meters.
- **[Chart of Account object](#)**
The MXCOA object structure allows for bidirectional synchronization of chart of accounts data.
- **[Classification item object](#)**
The MXCLASSIFICATION object structure allows for bidirectional synchronization of classifications, including Class Use With, Class Specs, and Class Spec Use With.
- **[Craft object](#)**
The MXCRAFT object structure allows for bidirectional synchronization of craft information. Craft information includes crafts, craft skills and craft rates.
- **[Financial project object](#)**
The MXPROJ object structure allows for bidirectional synchronization of financial project information. This object structure synchronizes individual tasks and projects as separate messages. It does not synchronize a project and all its child tasks in a single message.
- **[General ledger \(GL\) component object](#)**
The MXGLCOMP object structure allows for inbound synchronization of GL components.
- **[Labor object](#)**
The MXLABOR object structure allows for bidirectional synchronization of labor information, including person and labor craft rates.
- **[Person object](#)**
The MXPERSON object structure allows for bidirectional synchronization of person information, including phone, email, and SMS data.
- **[Person/user object](#)**
The MXPERUSER object structure allows for bidirectional synchronization of person/user information. This object structure supports status changes.
- **[Storeroom location object](#)**
The MXSTORELOC object structure allows for bidirectional synchronization of storeroom, labor, and courier locations.
- **[Vendor \(Companies\) master object Structure object](#)**
The MXVENDORMSTR object structure allows for bidirectional synchronization of vendor master data.
- **[Vendor \(Companies\) object](#)**
The MXVENDOR object structure allows bidirectional synchronization of organization-level vendor data, including contacts.

Asset object

The MXASSET object structure allows for bidirectional synchronization of asset information, including attributes that define meters.

Purpose

The MXASSET object structure synchronizes individual assets, but not the asset hierarchy as a whole. It supports the addition and update of meters tied to an asset, but not the update of meter reading values. Inbound processing of ASSETMETER is restricted to attributes that define the meter, not meter reading values or other information pertaining to meter readings.

Prerequisite

You must synchronize applicable operating locations, storerooms, meters, and items before loading assets.

The MBO relationship used to retrieve the ASSETMETER MBO is different from the MBO relationship used in the Assets application. Therefore, the changed attribute in the XML (outbound processing) is not set for any values from this MBO.

This object structure does not support status changes or asset movement. A standard service for assets is provided to support moving assets that reside in operating locations. The standard service, Asset, provides an operation, assetmoveSingleAsset, to support this functionality.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	MoutAssetProcess - Populates the Hierarchypath field if a classification is associated with the asset.
Publish Channel	MXASSETInterface
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	MaxAssetProcess - If the Hierarchypath is provided, the processing class populates the corresponding classtructureid field of the asset, which creates the association of the classification with the asset.
Enterprise Service	MXASSETInterface
Processing Rules	None
Integration Controls	None

Chart of Account object

The MXCOA object structure allows for bidirectional synchronization of chart of accounts data.

Prerequisite

You must load general ledger components before loading the chart of accounts. There is no predefined publish channel for this object structure.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	None
Publish Channel	None
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	MaxCOAProcess - Can process as a combination of delimited segments or as individual components that are part of the GLACCOUNT datatype definition.
Enterprise Service	MXCOAInterface
Processing Rules	None
Integration Controls	None

Examples of inbound processing

Processing as a combination of delimited segment is available for XML and interface tables. You can specify the general ledger account this way in all object structures.

```
<GLACCOUNT>  
<VALUE>6400-2-10</VALUE>  
</GLACCOUNT>
```

The object structure validates each segment, then creates the chart of account record in database with the following values:

- GLACCOUNT=6400-2-10

- GLCOMP01=6400
- GLCOMP02=2
- GLCOMP03=10

You can also process the object as individual components that are part of the GLACCOUNT datatype definition.

```
<GLACCOUNT>
<GLCOMP glorder="0">6400</GLCOMP>
<GLCOMP glorder="1">2</GLCOMP>
<GLCOMP glorder="2">10</GLCOMP>
</GLACCOUNT>
```

The object structure validates the components and creates the account, using the delimiter defined in the GLCONFIGURE table for each segment. This option is available for XML only.

Classification item object

The MXCLASSIFICATION object structure allows for bidirectional synchronization of classifications, including Class Use With, Class Specs, and Class Spec Use With.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	None
Publish Channel	MXCLASSInterface
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	MaxClassificationProcess - Processing logic to find classification and parent using Hierarchypath. Because the system allows duplicate classifications (hierarchypaths), an exception is generated when attempting to update a classification if duplicates exist.
Enterprise Service	MXCLASSInterface
Processing Rules	None
Integration Controls	None

Craft object

The MXCRAFT object structure allows for bidirectional synchronization of craft information. Craft information includes crafts, craft skills and craft rates.

Prerequisite

If the craft references a skill or contracts, that information must exist prior to loading crafts.

A craft can have a standard rate, a rate for each skill level for the craft, or different rates for each contract that provides the craft, with an optional skill-level rate for each contract.

The CRAFT and CRAFTSKILL records have a STANDARDRATE field for the hourly rate for each craft or skill associated with the craft.

The CRAFTRATE record specifies rates for vendors that supply the craft and, optionally, different rates for each combination of skill, craft, and vendor.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	None
Publish Channel	MXCRAFTInterface
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	None
Enterprise Service	MXCRAFTInterface
Processing Rules	None
Integration Controls	None

Financial project object

The MXPROJ object structure allows for bidirectional synchronization of financial project information. This object structure synchronizes individual tasks and projects as separate messages. It does not synchronize a project and all its child tasks in a single message.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	None
Publish Channel	MXPROJInterface
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	None
Enterprise Service	MXPROJInterface
Processing Rules	None
Integration Controls	None

General ledger (GL) component object

The MXGLCOMP object structure allows for inbound synchronization of GL components.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	None
Publish Channel	None
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	None
Enterprise Service	MXGLCOMPIInterface
Processing Rules	None
Integration Controls	None

Labor object

The MXLABOR object structure allows for bidirectional synchronization of labor information, including person and labor craft rates.

Prerequisite

You must synchronize any associated craft, work location, or storeroom location before loading labor. Each person record can have only one labor record.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	MoutLaborProcess - Processing logic disabled.
Publish Channel	MXLABORInterface
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	MaxLaborProcess - Supports status changes. Sets the ORGID for LaborCraftRate MBO from the parent MBO. Also sets the PERSONID on the PERSON record, based on the PERSONID in the LABOR record
Enterprise Service	MXLABORInterface
Processing Rules	None
Integration Controls	None

Person object

The MXPERSON object structure allows for bidirectional synchronization of person information, including phone, email, and SMS data.

Purpose

This object structure supports synchronizing individual person data. It does not support updating availability information for a person record. The object structure also supports status changes.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	None
Publish Channel	MXPERSONInterface
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	MaxPersonProcess - Requires that data for all child objects (PHONE, EMAIL, SMS) must be provided with every person update. Due to a lack of a unique key on these objects, the logic always deletes all of the child objects and adds them again. If a person has three email records in the system and a person message is received with two email records, the email record not included in the person message will be deleted. The object structure supports status changes.
Enterprise Service	MXPERSONInterface
Processing Rules	None
Integration Controls	None

Person/user object

The MXPERUSER object structure allows for bidirectional synchronization of person/user information. This object structure supports status changes.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	None
Publish Channel	MXPERUSERInterface
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	MaxPersonUserProcess - Processing is required to save the person data prior to saving of the user data. This object structure supports status changes.
Enterprise Service	MXPERSUSERnterface
Processing Rules	None
Integration Controls	None

Storeroom location object

The MXSTORELOC object structure allows for bidirectional synchronization of storeroom, labor, and courier locations.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	MoutLocProcess - provides filtering to send only storeroom, courier, or labor locations.
Publish Channel	MXSTORELOCInterface
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	MaxLocProcess - provides filtering to accept only storeroom, courier, or labor locations.
Enterprise Service	MXSTORELOCInterface
Processing Rules	None
Integration Controls	None

Vendor (Companies) master object Structure object

The MXVENDORMSTR object structure allows for bidirectional synchronization of vendor master data.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	None
Publish Channel	MXVENDORMSTRInterface
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	None
Enterprise Service	MXVENDORMSTRInterface
Processing Rules	None
Integration Controls	None

Vendor (Companies) object

The MXVENDOR object structure allows bidirectional synchronization of organization-level vendor data, including contacts.

Prerequisite

To enable this object structure to create the company master record, select the Automatically Add Companies to Company Master option for the set associated with the organization to which the vendor record is being added. The MXVENDOR object structure supports status changes.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	None
Publish Channel	MXVENDORInterface
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	MaxComProcess - Provides logic to support creating the company master record.
Enterprise Service	MXVENDORInterface
Processing Rules	None
Integration Controls	None

Item and inventory objects

The integration framework provides a selection of predefined integration content for item and inventory objects, such as service items, tool items, inventory vendors, and issues.

- [Item object](#)**
 The MXITEM object structure allows for bidirectional synchronization of item data, including conversions, item specs and conditions. This object structure supports status changes.
- [Service item object](#)**
 The MXSERVITEM object structure allows for bidirectional synchronization of service item data. The main object of the object structure, SERVICEITEMS, is a nonpersistent object.
- [Tool item object](#)**
 The MXTOOLITEM object structure allows for bidirectional synchronization of tool item data, including tool item specs.
- [Inventory object](#)**
 The MXINVENTORY object structure allows for bidirectional synchronization of inventory (item-storeroom) data, including inventory costs.
- [Inventory balance object](#)**
 The MXINVBAL object structure allows for bidirectional synchronization of inventory balance data. The balance change information in this object structure is for the lowest level (BIN or LOT) within the application.
- [Item vendor object](#)**
 The MXINVVENDOR object structure allows for bidirectional synchronization of vendor-item data.
- [Inventory reservations object](#)**
 The MXINVRES object structure provides for the bidirectional synchronization of inventory (storeroom) reservations. This object structure does not process direct issue reservation records created by the system.
- [Inventory issues object](#)**
 The MXINVISSUE object structure provides for the bidirectional synchronization of inventory (storeroom) issues and returns.

Item object

The MXITEM object structure allows for bidirectional synchronization of item data, including conversions, item specs and conditions. This object structure supports status changes.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	MoutItemProcess - Filter to not set tool or service items. Supports retrieval of the hierarchy path for the class structure id of the item.
Publish Channel	MXITEMInterface
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	MaxItemProcess - If the inbound transaction is an item update and the capitalized flag of the item has changed, a method is called to change the capitalized status of the item. If the item type is not ITEM or a valid synonym. Supports status changes.
Enterprise Service	MXITEMInterface
Processing Rules	None
Integration Controls	None

Service item object

The MXSERVITEM object structure allows for bidirectional synchronization of service item data. The main object of the object structure, SERVICEITEMS, is a nonpersistent object.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	None
Publish Channel	MXSERVITEMInterface
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	None
Enterprise Service	MXSERVITEMInterface
Processing Rules	None
Integration Controls	None

Tool item object

The MXTOOLITEM object structure allows for bidirectional synchronization of tool item data, including tool item specs.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	MoutToolItemProcess - Supports retrieval of the hierarchy path for the class structure id of the item.
Publish Channel	MXTOOLITEMInterface
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	MaxToolItemProcess - If the inbound transaction is an item update and the capitalized flag of the item has changed, a method is called to change the capitalized status of the item.
Enterprise Service	MXTOOLITEMInterface
Processing Rules	None
Integration Controls	None

Inventory object

The MXINVENTORY object structure allows for bidirectional synchronization of inventory (item-storeroom) data, including inventory costs.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	MoutInvProcess - Sets the value of the ITEMTYPE field from the ITEM object.
Publish Channel	MXINVENTORYInterface
Processing Rules	SKIPINVENTORY - Skips the record if its ITEMTYPE is in the SKIPITEMTYPE integration control.
Integration Controls	SKIPITEMTYPE

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	MaxInvProcess - Supports status changes.
Enterprise Service	MXINVENTORYInterface
Processing Rules	None
Integration Controls	None

Inventory balance object

The MXINVBAL object structure allows for bidirectional synchronization of inventory balance data. The balance change information in this object structure is for the lowest level (BIN or LOT) within the application.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	MoutInvBalancesProcess - Sets the value of the ITEMTYPE field from the ITEM object.
Publish Channel	MXINVBALInterface
Processing Rules	SKIPINVBALITM - Skips the record if its ITEMTYPE is in the SKIPITEMTYPE integration control.
Integration Controls	SKIPITEMTYPE

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	MaxInvBalancesProcess - The inbound inventory balance object structure internally calls the current balance adjustment method, and this creates a CURBALADJ financial transaction in INVTRANS.
Enterprise Service	MXINVBALInterface MXINVBALQInterface - A second enterprise service that is configured for operation query.
Processing Rules	None
Integration Controls	None

Item vendor object

The MXINVVENDOR object structure allows for bidirectional synchronization of vendor-item data.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	MoutInvVendorProcess -Sets the value of the ITEMTYPE field from the ITEM object and set the value of the CURRENCYCODE from the vendor (companies) object.
Publish Channel	MXINVVENDORInterface
Processing Rules	INVVITEMTYPE - Skips the record if its ITEMTYPE is in the ITEMTYPEFORINV integration control.
Integration Controls	ITEMTYPEFORINV

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	MaxInvVendorProcess - If the inbound message contains a currency code and that code differs from the vendor's currency code, an error is reported.
Enterprise Service	MXINVENDORInterface
Processing Rules	None
Integration Controls	None

Inventory reservations object

The MXINVRES object structure provides for thebidirectional synchronization of inventory (storeroom) reservations. This object structure does not process direct issue reservation records created by the system.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	MoutRSVProcess - Skips reservations that are for direct issues.
Publish Channel	MXINVRESInterface
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	None
Enterprise Service	MXINVRESInterface
Processing Rules	None
Integration Controls	None

Inventory issues object

The MXINVISSUE object structure provides for the bidirectional synchronization of inventory (storeroom) issues and returns.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	MoutISUPProcess - Skips reservations that are for direct issues.

Predefined integration components	Value and description
Publish Channel	MXINVISSUEInterface - Filters out direct issues from MATUSETRANS (PONUM is not null and ISSUETYPE is ISSUE or RETURN) because they are handled by the receipts (MXRECEIPTInterface) object structure. Filters out variance transactions that are written to MATUSETRANS by the invoice approval process.
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	MaxISUPProcess - If the action provided is not an Add action, then an exception is generated. Validates ISSUETYPE to ensure that it is ISSUE, RETURN, or null. If it is any other value, an error is reported. If it is null, the value is set to ISSUE by default.
Enterprise Service	MXINVISSUEInterface
Processing Rules	None
Integration Controls	None

Documents objects

The integration framework provides a selection of predefined integration content for documents, such as purchasing records, invoices, and work order records.

- [The STATUSIFACE field and processing](#)
All purchasing and work order documents have a status. The STATUSIFACE field identifies whether related transactions contain new or updated records, or status changes only.
- [Purchase contracts object](#)
The MXPC object structure allows for bidirectional synchronization of exporting purchase contract information. This object structure currently only supports the purchase contracts types of blanket and price.
- [Purchase requisitions object](#)
The MXPR object structure allows for bidirectional synchronization of exporting purchase requisition information and supports status changes.
- [Purchase order object](#)
The MXPO object structure allows for bidirectional synchronization of exporting purchase order information and supports status changes.
- [Invoice object](#)
The MXINVOICE object structure allows for bidirectional synchronization of exporting invoice information and supports status changes.
- [Outbound processing rules for work order interfaces](#)
Unlike purchasing document interfaces, work order document interfaces do not have a STATUSIFACE field and do not send status change notifications. A work order document interface is first sent out when the status of a work order changes to WOSTART and on every subsequent update, regardless of the status of the work order.
- [Work order object](#)
The MXWO object structure allows for bidirectional synchronization of exporting work order information and supports status changes.
- [Work order detail object](#)
The MXWODETAIL object structure allows for bidirectional synchronization of exporting work order information, including planned material, labor, service, and tools.
- [Work order hierarchy object](#)
The MXWOHIER object structure allows for bidirectional synchronization of exporting work order information, including child work orders, and also supports status changes. The system first sends out a work order when it reaches the status in the WOSTART control, then on all updates thereafter. The entire work order document is always sent.

The STATUSIFACE field and processing

All purchasing and work order documents have a status. The STATUSIFACE field identifies whether related transactions contain new or updated records, or status changes only.

In general, the field STATUSIFACE applies to all object structure subrecords that are created from stateful MBOs, which are MBOs that have a STATUS field and support status change actions. The STATUSIFACE field is provided as a nonpersistent field to those objects where integration supports a status change.

The STATUSIFACE field and outbound processing

While processing an object structure subrecord that has been created from a stateful MBO, the outbound integration processing looks for a STATUS field in the MBO and a STATUSIFACE field in the corresponding object structure subrecord. If both fields exist, the processing sets the value of the STATUSIFACE field to the value of the changed attribute for the corresponding STATUS field. A value of 0 indicates that the status was not changed. A value of 1 indicates that the status was changed.

This processing applies only to event-generated outbound messages, not to messages exported via the data export feature or through a programmatic invocation.

The STATUSIFACE field and inbound processing

When processing an object structure where the primary (top) MBO is stateful, the inbound processing looks for a STATUSIFACE field on the corresponding object structure subrecord to determine if the inbound message is to be processed as both a document update and a status change, or as a status change only.

The following table describes inbound processing using object structures with a stateful primary (top) MBO. It does not apply to any stateful MBO that is included as a child object in an object structure.

Table 1. Actions taken during inbound processing of the STATUSIFACE field

Value of STATUSIFACE	Document exists in the database	Document does not exist in the database
Not provided, or 0	<ul style="list-style-type: none">Updates the document in the databaseIf the status of the inbound document is different from the status in the database, updates the status in the database	<ul style="list-style-type: none">Adds the document to the databaseSets the status in the database to the status of the inbound message
1	Updates the status in the database	Error

Purchase contracts object

The MXPC object structure allows for bidirectional synchronization of exporting purchase contract information. This object structure currently only supports the purchase contracts types of blanket and price.

Outbound integration processing

The following table shows the predefined values used in outbound integration processing.

Table 1. Purchase contracts object predefined components for outbound integration processing

Predefined integration components	Value and description
Object structure processing class functionality	MoutPCProcess - Skips reservations that are for direct issues.
Publish channel	MXPCInterface - Uses processing rules so that the complete purchase contract document is sent only for a status change.
Processing rules	<ol style="list-style-type: none">SKIPPC - Skips the sending of the document if both of the following conditions are true:<ul style="list-style-type: none">The document has not been sent out before.The new status is not listed in the PCSEND control.SKIPPCUPDATE - Skips the sending of the document when updated but no status change.SETSTATUSIFACE - Sets the value of the STATUSIFACE field to 0 (false) for all status values except those listed in the PCSEND control.CHECKSTATUS - Sends only the purchase contract header data if status changes and the new status is not in the PCSEND control. (In this case, the full document was previously sent and this is sending only the status change notification).
Integration controls	PCSEND

Inbound integration processing

The following table shows the preconfigured values used in inbound integration processing.

Table 2. Purchase contracts object predefined components for inbound integration processing

Predefined integration components	Value and description
Object structure processing class functionality	MaxPCProcess - Supports status changes. Creates a new revision when the purchase contract already exists and the revision does not. Only supports contract types of blanket and price.
Publish channel	MXPCInterface
Processing rules	None
Integration controls	None

Purchase requisitions object

The MXPR object structure allows for bidirectional synchronization of exporting purchase requisition information and supports status changes.

Outbound integration processing

The following table shows the predefined values used in outbound integration processing.

Table 1. Purchase requisitions object predefined components for outbound integration processing

Predefined integration components	Value and description
Object structure definition class functionality	None
Publish channel	MXPRInterface – Uses the processing rules. The complete purchase request document is sent only for status changes.
Processing rRules	<ol style="list-style-type: none"> SKIPPR - Skips the sending of the document if both of the following conditions are true: <ul style="list-style-type: none"> The document has not been sent out before. The new status is not listed in the PRSEND control. SKIPPRUPDATE - Skips the sending of the document when updated but the status is not changed. SETSTATUSIFACE - Sets the value of the STATUSIFACE field to 0 (false) for all status values except those listed in the PRSEND control. CHECKSTATUS - Sends only the purchase requisition header data if status changes and the new status is not in the PRSEND control. (In this case, the full document was previously sent and this is sending only the status change notification).
Integration controls	PRSEND

Inbound integration processing

The following table shows the preconfigured values used in inbound integration processing.

Table 2. Purchase requisitions object predefined components for inbound integration processing

Predefined integration components	Value and description
Object structure processing class functionality	MaxPRProcess – Supports status changes. If the current status of the purchase requisition is approved, to support updates the processing class will change the status back to waiting for approval, perform updates and then return the status to what is identified in the XML message.
Publish channel	MXPRInterface
Processing rules	None
Integration controls	None

Purchase order object

The MXPO object structure allows for bidirectional synchronization of exporting purchase order information and supports status changes.

Outbound integration processing

The following table shows the predefined values used in outbound integration processing.

Table 1. Purchase order object predefined components for outbound integration processing

Predefined integration components	Value and description
Object structure definition class functionality	None
Publish channel	MXPOInterface - Uses processing rules, the complete purchase order document is only sent only for status changes.
Processing rules	<ol style="list-style-type: none"> SKIPPO - Skips the sending of the document if both of the following conditions are true: <ul style="list-style-type: none"> The document has not been sent out before. The new status is not listed in the POSEND control. SKIPPOUPDATE - Skips the sending of the document when updated but the status is not changed. SETSTATUSIFACE - Sets the value of the STATUSIFACE field to 0 (false) for all status values except those listed in the POSEND control. CHECKSTATUS - Sends only the purchase order header data if status changes and the new status is not in the POSEND control. (In this case the full document was previously sent and this is sending only the status change notification).
Integration controls	POSEND

Inbound integration processing

The following table shows the preconfigured values used in inbound integration processing.

Table 2. Purchase order object predefined components for inbound integration processing

Predefined integration components	Value and description
Object structure processing class functionality	MaxPOProcess - supports status changes. If the current status of the purchase order is approved, to support updates, the processing class changes the status back to waiting for approval, performs the updates, and then returns the status to what is identified in the XML message.

Predefined integration components	Value and description
Publish channel	MXPOInterface
Processing rules	None
Integration controls	None

Invoice object

The MXINVOICE object structure allows for bidirectional synchronization of exporting invoice information and supports status changes.

Outbound integration processing

The following table shows the predefined values used in outbound integration processing.

Table 1. Invoice object predefined components for outbound integration processing

Predefined integration components	Value and description
Object structure definition class functionality	None
Publish channel	MXINVOICEInterface - Uses processing rules, the complete invoice document is sent only for status changes.
Processing rules	<ol style="list-style-type: none"> 1. SKIPINVOICE - Skips the sending of the document if both of the following conditions are true: <ul style="list-style-type: none"> • The document has not been sent out before. • The new status is not listed in the IVSEND control. 2. SKIPINVIOCEUPDATE - Skips the sending of the document when updated but the status is not changed. 3. SETSTATUSIFACE - Sets the value of the STATUSIFACE field to 0 (false) for all status values except those listed in the IVSEND control. 4. CHECKSTATUS – Sends only the invoice header data if the status changes and the new status is not in the IVSEND control. (In this case the full document was previously sent and this is sending only the status change notification).
Integration controls	IVSEND

Inbound integration processing

The following table shows the preconfigured values used in inbound integration processing.

Table 2. Invoice object predefined components for inbound integration processing

Predefined integration components	Value and description
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Predefined integration components	Value and description
Object structure processing class functionality	<p>The inbound processing creates and updates INVOICECOST lines only if one of the following conditions is met:</p> <ul style="list-style-type: none"> The invoice line does not reference a purchase order line. The corresponding purchase order line does not have a distribution. The purchase order line does not reference a storeroom. <p>In all other cases, the inbound processing ignores INVOICECOST information when creating or updating the invoice.</p> <p>If the inbound message provides INVOICETERMS, the inbound processing deletes the old terms and adds the new ones.</p> <p>Users can optionally specify a price variance in the PRICEVAR field on each invoice line, if invoice matching is done in the external system and price variances determined in the external system are sent to create variance transactions to update work orders and storerooms. In order to process these variances, a value must exist for OWNERSYSID in the inbound invoice, and it cannot be the same as the value of MAXVARS.MXSYSID.</p> <p>Users can optionally specify a price variance in the PRICEVAR field on each invoice line, if invoice matching is done in the external system and price variances determined in the external system are sent to create variance transactions to update work orders and storerooms. In order to process these variances, a value must exist for OWNERSYSID in the inbound invoice, and it cannot be the same as the value of MAXVARS.MXSYSID.</p> <p>The IVMATCH collaboration switch requires the following values:</p> <ul style="list-style-type: none"> OWNER1SYSID value is always "THISMX". OWNER2SYSID value is the value of INVOICE.OWNERSYSID. <p>If the evaluation is false, line level invoice variances are ignored in the invoice processing.</p> <p>The following are the typical scenarios for using the invoice interface:</p> <ul style="list-style-type: none"> Invoice Matching in the system (AP Outbound): Invoices received from third parties, either electronically or manually, are processed by the system; that is, they are matched against receipts, if applicable, and then approved. Alternately, payment schedules created in the system will result in approved invoices being created based on the schedule. These approved invoices result in a payment advice being sent to an external AP system. The process of matching also results in accounting entries being posted to the general ledger. Invoice Matching in external system (Variances Inbound): The system does not do the invoicing, but accepts matched invoices from external systems and applies any variances back to the respective work orders, storerooms, and so on. The accounting entries related to the accounts payable and/or variances must be recorded in the external system; they will not be sent out. <p>The primary intent of this interface is to provide the system with any variance information necessary for updating the work order costs.</p>
Publish channel	MXINVOICEInterface
Processing rules	None
Integration controls	None

The following table shows an example of possible INVOICE.OWNERSYSID values, the evaluation that is generated, and the default result of the evaluation.

Table 3. Evaluation example

Value of INVOICE.OWNERSYSID	Evaluation	Result (default)
Null	OWNER1SYSID="THISMX" and OWNER2SYSID="THISMX"	False
MXSYSID	OWNER1SYSID="THISMX" and OWNER2SYSID="THISMX"	False
EXTSYSID	OWNER1SYSID="THISMX" and OWNER2SYSID="EXT"	True
Any other value	OWNER1SYSID="THISMX" and OWNER2SYSID="EXT"	True

Outbound processing rules for work order interfaces

Unlike purchasing document interfaces, work order document interfaces do not have a STATUSIFACE field and do not send status change notifications. A work order document interface is first sent out when the status of a work order changes to WOSTART and on every subsequent update, regardless of the status of the work order.

Users can configure the start value in the WOSTART control. Any status that you specify in the control is the value, not the MAXVALUE. If multiple synonym values exist for a status, list all applicable synonyms.

Work order object

The MXWO object structure allows for bidirectional synchronization of exporting work order information and supports status changes.

Purpose

The system first sends out a work order when it reaches the status in the WOSTART control, then on all updates thereafter. The entire work order document is always sent.

The work order interface contains all the information defined by system on the work order, but it does not provide additional information about projects or financial control data, equipment, and locations that is not part of the standard work order. If necessary, you can add the additional information via user fields.

The system treats work order tasks as work orders. Both have similar properties and they are stored in the same table. If a user creates a work order, adds tasks/child work orders to the work order, and then approves the work order, the Inherit Status Changes flag on the work order indicates whether approval of the work order also results in approval of all the tasks/child work orders of that particular work order. The default is Y, so when a work order is approved, any child tasks or work orders that inherit the parent's approval based on this flag are also approved.

The outbound event listener on the work order MBO receives multiple independent events, one for each work order, and they are processed and sent out independently. Therefore, a work order with three tasks and two child work orders results in six independent outbound work orders.

Outbound integration processing

The following table shows the predefined values used in outbound integration processing.

Table 1. Work order object predefined components for outbound integration processing

Predefined integration components	Value and description
Object structure definition class functionality	None
Publish channel	MXWOInterface - Uses processing rules, the complete work order document is sent only for status changes.
Processing rules	SKIPWO – Skips the sending of the document if both of the following conditions are true: <ul style="list-style-type: none"> The document has not been sent out before. The new status is not listed in the WOSTART control.
Integration controls	WOSTART

Inbound integration processing

The following table shows the preconfigured values used in inbound integration processing.

Table 2. Work order object predefined components for inbound integration processing

Predefined integration components	Value and description
Object structure processing class functionality	StatefulMicSetIn - Generic class that supports status changes.
Publish channel	MXWOInterface
Processing rules	None
Integration controls	None

Work order detail object

The MXWODETAIL object structure allows for bidirectional synchronization of exporting work order information, including planned material, labor, service, and tools.

Purpose

The system first sends out a work order when it reaches the status in the WOSTART control, then on all updates thereafter. The entire work order document is always sent.

The MBO relationship that is used to retrieve the reservation MBO (INVRESERVE) is different from the relationship that is used in the Work Order Tracking application. Therefore, the changed attribute in the XML is not set for any values from this MBO

Outbound integration processing

The following table shows the predefined values used in outbound integration processing.

Table 1. Work order detail object predefined components for outbound integration processing

Predefined integration components	Value and description
Object structure definition class functionality	MoutWORsvProcess - Provides the code required to update the sendersysid column on the invreserve MBO.
Publish channel	MXWODETAILInterface - Uses processing rules, the complete work order document with plan information is sent only for status changes.
Processing rules	SKIPWO - Skips the sending of the document if both of the following conditions are true: <ul style="list-style-type: none"> The document has not been sent out before. The new status is not listed in the WOSTART control.
Integration controls	WOSTART

Inbound integration processing

The following table shows the preconfigured values used in inbound integration processing.

Table 2. Work order detail object predefined components for inbound integration processing

Predefined integration components	Value and description
Object structure processing class functionality	None
Publish channel	None
Processing rules	None
Integration controls	None

Work order hierarchy object

The MXWOHIER object structure allows for bidirectional synchronization of exporting work order information, including child work orders, and also supports status changes. The system first sends out a work order when it reaches the status in the WOSTART control, then on all updates thereafter. The entire work order document is always sent.

Outbound integration processing

The following table shows the predefined values used in outbound integration processing.

Table 1. Work order hierarchy object predefined components for outbound integration processing

Predefined integration components	Value and description
Object structure definition class functionality	None
Publish channel	MXWOHierInterface - Contains an event filter class, WOHierarchyEventFilter, that prevents the child MBOs from being sent out when they are being sent out via a parent MBO (where both parent and child MBOs are initiated by the same event action).
Processing rules	SKIPWO - Skips the sending of the document if both of the following conditions are true: <ul style="list-style-type: none"> The document has not been sent out before. The new status is not listed in the WOSTART control.
Integration controls	WOSTART

Inbound integration processing

The following table shows the preconfigured values used in inbound integration processing.

Table 2. Work order hierarchy object predefined components for inbound integration processing

Predefined integration components	Value and description
Object structure processing class functionality	MaxWOHierarchyProcess - Supports status changes and commit processing to support loading multiple related work orders in a single message.
Publish channel	MXWOHierInterface
Processing rules	None
Integration controls	None

Transaction interface objects

The integration framework provides a selection of predefined integration content for transaction interface objects, such as receipts, general ledger transactions, labor time reporting, and meter readings.

- [Receipts object for materials and services](#)**
 The MXRECEIPT object structure allows for bidirectional synchronization of purchase order receipt information for material and service receipts and it also supports status change when receipts require inspections. The object structure uses a nonpersistent object to support both material (MATRECTRANS) and service (SERVRECTRANS) receipts. For material line items, this object structure supports nonrotating items, and a separate object structure, MXRCVROTITM supports rotating items.
- [Material and rotating item receipt object](#)**
 The MXRCVROTITM object structure allows for inbound synchronization of receipt information for rotating items.
- [General ledger \(GL\) object](#)**
 The MXGLTXN object structure allows for outbound synchronization of GL transactions. This interface allows for the posting of site-level transactions to an external general ledger application for accounting reconciliation.
- [Labor time reporting object](#)**
 The MXEMPACT object structure allows for posting site-level actual time reported in the system to external applications. The approved labor actuals are sent out and all inbound labor actuals are accepted regardless of status. The status of existing records are not updated when processing inbound transactions.
- [Meter reading object](#)**
 The MXMETERDATA object structure allows inbound synchronization of meter reading data. This object structure supports only inbound processing. This

interface does not support the processing of meter readings for work order tasks.

Receipts object for materials and services

The MXRECEIPT object structure allows for bidirectional synchronization of purchase order receipt information for material and service receipts and it also supports status change when receipts require inspections. The object structure uses a nonpersistent object to support both material (MATRECTRANS) and service (SERVRECTRANS) receipts. For material line items, this object structure supports nonrotating items, and a separate object structure, MXRCVROTITM supports rotating items.

Purpose

In the outbound direction, this object structure processes purchase order receipts, transfers (movements against receipts or receipts against internal PO). It also processes returns (returns to vendors after receipt inspection, or returns to vendor after acceptance and goods movement from the location that holds the inspections).

For inbound receipts, the MXRECEIPT object structure supports Receipts, Inspections, Returns, and Voiding of a receipt. You do not have to specify whether an inbound receipt is a material receipt or a service receipt. The integration processing uses the POLINE to make the determination.

Sending a transaction for an Inspection or Void, requires that the processing can identify the previously receipted line item to apply the Inspection or Void against. Inbound transactions identify a prior receipt transaction already in Maximo® in two ways:

- In the payload, provide the RECEIPTREF property with the value of the MATRECTRANSID of the previous receipt transaction. The external application must obtain the MATRECTRANSID of that initial receipt transaction.
- In the payload, provide the ORGRCVEXTERNALREFID property with the value of the EXTERNALREFID of the previous receipt transaction. The external application must provide a unique EXTERNALREFID value on all receipt-related transactions. The Inspection or Void transaction must also provide the EXTERNALREFID of the initial receipt transaction in the ORGRCVEXTERNALREFID field of the payload. Using this approach gives the external application complete control of the ID values that are used on transactions, with a requirement that each EXTERNALREFID must be unique. When you provide EXTERNALREFID on your payload, you also need to provide a SOURCESYSID that represents the external application that is sending the transaction.

Note: Do not specify a RECEIPTREF or ORGRCVEXTERNALREFID value for Returns. Returns are processed independently of the corresponding receipt.

Sample transactions

```
{
  "issuetype": "RECEIPT",
  "orgid": "EAGLENA",
  "siteid": "BEDFORD",
  "positeid": "BEDFORD",
  "ponum": "1126",
  "porevisionnum": 0,
  "polinum": 1,
  "itemnum": "6I-2499",
  "itemsetid": "SET1",
  "tostoreloc": "CENTRAL",
  "receiptquantity": 5,
  "externalrefid": "1126r5",
  "sourcesysid": "xyz"
}
```

If the PO line for the receipt requires an inspection, the following transaction would be the inspection (qty 5 accepted). This example uses the EXTERNALREFID to find the original Receipt record.

```
{
  "issuetype": "RECEIPT",
  "orgid": "EAGLENA",
  "siteid": "BEDFORD",
  "positeid": "BEDFORD",
  "ponum": "1126",
  "porevisionnum": 0,
  "polinum": 1,
  "itemnum": "6I-2499",
  "itemsetid": "SET1",
  "tostoreloc": "CENTRAL",
  "receiptquantity": 5,
  "externalrefid": "1126i5",
  "sourcesysid": "xyz",
  "acceptedqty": 5,
  "rejectqty": 0,
  "inspected": true,
  "orgrcvexternalrefid": "1126r5"
}
```

The following inspection is the same but uses the MATRECTRANSID in the RECEIPTREF field to find the original Receipt record.

```
{
  "issuetype": "RECEIPT",
  "orgid": "EAGLENA",
  "siteid": "BEDFORD",
  "positeid": "BEDFORD",
  "ponum": "1126",
  "receiptref": "1126r5"
}
```

```

"porevisionnum": 0,
"polinum": 1,
"itemnum": "6I-2499",
"itemsetid": "SET1",
"tostoreloc": "CENTRAL",
"receiptquantity": 5,
"externalrefid": "1126i5",
"sourcesysid": "xyz",
    "acceptedqty": 5,
    "rejectqty": 0,
"inspected": true,
"receiptref": 13428573 *
}

```

* 13428573 is the generated by Maximo MATRECTRANSID on the MATRECTRANS row for the initial receipt transaction.

Other data-mapping information:

All quantities must be positive and the sum of the accepted qty and reject qty must equal the receiptquantity.

For a Void transaction, it requires:

- issuetype of VOIDRECEIPT
- receiptquantity (must be negative)

Outbound integration processing

The following table shows the predefined values that are used in outbound integration processing.

Table 1. Receipts object predefined components for outbound integration processing

Predefined integration components	Value and description
Object structure definition class functions	<p>MoutProcess - Processes receipts with issue type of RECEIPT or RETURN. If no issue type is specified, it is treated as RECEIPT.</p> <p>Processing for RECEIPT issue type and Inspection Required = N:</p> <p>Material and service receipts:</p> <ul style="list-style-type: none"> • Uses inbound RECEIPTQUANTITY (for material receipts) or QTYTORECEIVE (for service receipts) to create the receipt. • Maps inbound REJECTEDQTY to the REJECTEDQTY field in the receipt. • Ignores any other quantities. • Does not look at the inbound INSPECTED field. <p>Material receipts (MATRECTRANS records):</p> <ul style="list-style-type: none"> • Sends out only RECEIPT and RETURN type records and TRANSFER type records containing a PONUM (not a storeroom transfer). Sends out new receipts only, not updates to existing receipts. <p>Service receipts (SERVRECTRANS records):</p> <ul style="list-style-type: none"> • Sends out RECEIPT and RETURN type records. Sends out new receipts and updates to existing receipts.
Publish channel	MXRECEIPTInterface
Processing rules	<p>Service receipts:</p> <p>Sends out records when the status is equal to a value in the SERVRECSTAT control (default COMP). It occurs under the following conditions:</p> <ul style="list-style-type: none"> • A record that does not require inspection is inserted. • An existing record is updated in database and the status field is changed to COMP.
Integration controls	SERVRECSTAT control identifies all statuses at which the system sends out service receipt transactions. It can have multiple values. By default, the value is COMP.

Inbound integration processing

The following table shows the preconfigured values that are used in inbound integration processing.

Table 2. Receipts object predefined components for inbound integration processing

Predefined integration components	Value and description
-----------------------------------	-----------------------

Predefined integration components	Value and description
Object structure processing class functions	<p>MaxRCVProcess -</p> <p>Processing for RECEIPT issue type and Inspection Required = Y:</p> <p>Material receipts:</p> <p>INSPECTED = N:</p> <ul style="list-style-type: none"> • Uses only the inbound RECEIPTQUANTITY field to create the receipt; ignores accepted and rejected quantity values. • Creates a receipt with STATUS = WINSP (waiting inspection) and quantity that is derived from RECEIPTQUANTITY. <p>INSPECTED = Y:</p> <ul style="list-style-type: none"> • Uses the inbound RECEIPTQUANTITY, ACCEPTEDQTY, and REJECTEDQTY fields to create the receipt. • Does not allow partial inspections or acceptances. RECEIPTQUANTITY must equal ACCEPTEDQTY + REJECTEDQTY. • Creates a receipt with STATUS = WASSET (if it is a rotating item) or COMP (all other items). • Depending on quantities specified, can create up to three transactions—one RECEIPT, one TRANSFER, and one RETURN. <p>Service receipts:</p> <p>INSPECTED = N:</p> <ul style="list-style-type: none"> • Uses the inbound AMTTORECEIVE (if POLINE order quantity is null) or QTYTORECEIVE (in other cases) to create a receipt; ignores all other quantity values. • Creates a receipt with STATUS = WINSP (waiting inspection) and quantity that is derived from QTYTORECEIVE. <p>INSPECTED = Y:</p> <ul style="list-style-type: none"> • Uses the inbound QTYTORECEIVE, ACCEPTEDQTY, and REJECTEDQTY fields to create a receipt. • Does not allow partial inspections or acceptances. QTYTORECEIVE must equal ACCEPTEDQTY + REJECTEDQTY. • Creates a single transaction of type RECEIPT, with STATUS = COMP. <p>Processing for RETURN issue type:</p> <p>Material and service receipts:</p> <ul style="list-style-type: none"> • Accepts return transactions for a POLINE only if an earlier receipt exists for the same line; if Inspection Required = Y for the POLINE, the receipt was approved. Otherwise, it reports an error. • Uses only the inbound RECEIPTQUANTITY (for material receipts) or QTYTORECEIVE (for service receipts) field to create the receipt; ignores all other quantity values. • Creates a single transaction with issue type RETURN and the credit GL account as the RBNI account.
Publish channel	MXRECEIPTInterface
Processing rules	None
Integration controls	None

Material and rotating item receipt object

The MXRCVROTITM object structure allows for inbound synchronization of receipt information for rotating items.

Purpose

This object structure supports inbound processing only.

You cannot specify a status for the receipt in the interface. The status is set by the business processing.

This interface differs from the MXRECEIPTInterface in that it processes material receipts exclusively and you can identify serialized rotating assets to be created for rotating item receipts.

You can receive rotating items with or without asset numbers. If you receive them without asset numbers, you must manually specify the asset numbers by using the Receive Rotating Items dialog box in the Purchasing Receiving application.

For rotating items, the number of inbound transactions is one more than the number of rotating items. One transaction exists for the total receipt quantity, and one transaction exists for each rotating item that is associated with the receipt. For example, for a receipt of 10 rotating items produces 11 transactions.

For inbound receipts, the MXRCVROTITM object structure supports Receipts, Inspections, Returns, and Voiding of a receipt.

When a transaction is sent for an Inspection or Void, it requires that the processing can identify the previously received line item to apply the Inspection or Void against. Inbound transactions identify a prior receipt transaction already in Maximo® in two ways:

- In the payload, provide the RECEIPTREF property with the value of the MATRECTRANSID of the previous receipt transaction. It requires the internal application to obtain the MATRECTRANSID of that initial receipt transaction.

- In the payload, provide the ORGRCVEXTERNALREFID property with the value of the EXTERNALREFID of the previous receipt transaction. It requires the external application to provide a unique EXTERNALREFID value on all receipt-related transactions. It also requires the Inspection or Void transaction to provide the EXTERNALREFID of the initial receipt transaction in the ORGRCVEXTERNALREFID field of the payload. Using this approach gives the external application complete control of the ID values that are used in transactions, with a requirement that each EXTERNALREFID must be unique. When you provide an EXTERNALREFID on your payload, you also need to provide a SOURCESYSID that represents the external application that is sending the transaction.

Note: Do not specify a RECEIPTREF or ORGRCVEXTERNALREFID value for Returns. Returns are processed independently of the corresponding receipt.

Sample transactions

Receipt for a PO line (No inspection required)

```
{
  "issuetype": "RECEIPT",
  "orgid": "EAGLENA",
  "siteid": "BEDFORD",
  "positeid": "BEDFORD",
  "ponum": "1126",
  "porevisionnum": 0,
  "polinum": 1,
  "itemnum": "D600",
  "itemsetid": "SET1",
  "tostoreloc": "CENTRAL",
  "receiptquantity": 2,
  "externalrefid": "1126r5",
  "sourcesysid": "xyz",
  "asset": [
    {
      "siteid": "BEDFORD",
      "assetnum": "DS1134-1"
    },
    {
      "siteid": "BEDFORD",
      "assetnum": "DS1134-2"
    }
  ]
}
```

Receipt for a PO line (inspection required)

```
{
  "issuetype": "RECEIPT",
  "orgid": "EAGLENA",
  "siteid": "BEDFORD",
  "positeid": "BEDFORD",
  "ponum": "1127",
  "porevisionnum": 0,
  "polinum": 1,
  "itemnum": "D600",
  "itemsetid": "SET1",
  "tostoreloc": "CENTRAL",
  "receiptquantity": 2,
  "externalrefid": "1127r2",
  "sourcesysid": "xyz"
}
```

The PO line for the receipt requires an inspection and the following transaction is the inspection (qty 2 accepted). This example uses the EXTERNALREFID to find the original Receipt record.

```
{
  "issuetype": "RECEIPT",
  "orgid": "EAGLENA",
  "siteid": "BEDFORD",
  "positeid": "BEDFORD",
  "ponum": "1127",
  "porevisionnum": 0,
  "polinum": 1,
  "itemnum": "D600",
  "itemsetid": "SET1",
  "tostoreloc": "CENTRAL",
  "receiptquantity": 2,
  "externalrefid": "1127i2",
  "sourcesysid": "xyz",
  "acceptedqty": 2,
  "rejectqty": 0,
  "inspected": true,
  "orgrcvexternalrefid": "1127r2",
  "asset": [
    {
      "siteid": "BEDFORD",
      "assetnum": "DS1134-1"
    },
    {
      "siteid": "BEDFORD",
      "assetnum": "DS1134-2"
    }
  ]
}
```

```
]
  }
```

The following inspection is the same but uses the MATRECTRANSID in the RECEIPTREF field to find the original Receipt record.

```
{
  "issuetype": "RECEIPT",
  "orgid": "EAGLENA",
  "siteid": "BEDFORD",
  "positeid": "BEDFORD",
  "ponum": "1127",
  "porevisionnum": 0,
  "polinum": 1,
  "itemnum": "D600",
  "itemsetid": "SET1",
  "tostoreloc": "CENTRAL",
  "receiptquantity": 2,
  "externalrefid": "1127i2",
  "sourcesysid": "xyz",
  "acceptedqty": 2,
  "rejectqty": 0,
  "inspected": true,
  "receiptref": 13428573 *
  "asset": [
    {
      "siteid": "BEDFORD",
      "assetnum": "DS1134-1"
    },
    {
      "siteid": "BEDFORD",
      "assetnum": "DS1134-2"
    }
  ]
}
```

* 13428573 is the MATRECTRANSID generated by Maximo on the MATRECTRANS row for the initial receipt transaction.

Other data-mapping information:

All quantities must be positive and the sum of the acceptedqty and rejectqty must equal the receiptquantity.

For a Void transaction, it requires:

- issuetype of VOIDRECEIPT
- receiptquantity (must be negative)

Outbound integration processing

The following table shows the predefined values that are used in outbound integration processing.

Table 1. Material and rotating item receipt object predefined components for outbound integration processing

Predefined integration components	Value and description
Object structure definition class functions	None
Publish channel	None
Processing rules	None
Integration controls	None

Inbound integration processing

The following table shows the preconfigured values that are used in inbound integration processing.

Table 2. Material and rotating item receipt object predefined components for inbound integration processing

Predefined integration components	Value and description
Object structure processing class functions	<p>MaxRcvRotItmMProcess - Reports an error if the purchase order line being processed has LINETYPE = SERVICE or STDSERVICE.</p> <p>Processing is the same as the inbound integration point processing class functionality for material receipts that use the MXRECEIPTInterface, with the following more processing:</p> <ul style="list-style-type: none"> • Receipts: If the line item is a rotating item and Inspection Required = N, or INSPECTED = Y, the processing checks for asset information that corresponds to the item provided in the interface. If the information is available, the processing validates the number of asset records to ensure it equals the RECEIPTQTY or ACCEPTEDEQTY (whichever applies). If it does, invokes the receiving functionality and creates asset as required. • Returns: If the item being returned is a rotating item, ignores any asset information. <p>In the system, the return of a rotating type item does not affect the assets that are created by the original receipt. The asset records remain unchanged; only the item balances are updated (if applicable).</p>
Publish channel	MXRCVROTITMInterface
Processing rules	None

Predefined integration components	Value and description
Integration controls	None

General ledger (GL) object

The MXGLTXN object structure allows for outbound synchronization of GL transactions. This interface allows for the posting of site-level transactions to an external general ledger application for accounting reconciliation.

Purpose

This interface uses a nonpersistent MBO with data from the following subrecords:

- SERVRECTRANS
- MATRECTRANS
- INVTRANS
- INVOICETRANS
- MATUSETRANS
- LABTRANS
- TOOLSTRANS

The event filter class, GLEventFilter, is used to set the events to the applicable persistent objects listed.

The SOURECEMBO field identifies the database table in which the transaction originated. Its value is derived from the GLSOURCEMBO synonym domain.

Outbound integration processing

The following table shows the predefined values used in outbound integration processing.

Table 1. General ledger object predefined components for outbound integration processing

Predefined integration components	Value	Description
Object structure definition class functionality	MoutGLProcess - Service receipts	<p>Service receipts include the following entries:</p> <ul style="list-style-type: none"> • Accounting entries for non-distributed service receipts created by the receiving application for services ordered on purchase orders (ISSUETYPE = RECEIPT, COSTINFO=1) • Accounting entries for distributed service receipts created by the receiving application for services ordered on purchase orders (ISSUETYPE = POCOST) • Accounting entries for purchase order services with Receipt Required = N that are directly invoiced instead of being received (ISSUETYPE = INVOICE) • Accounting entries for services that are not against purchase orders and are invoiced directly (ISSUETYPE = INVOICE) • Invoice variance transactions recorded against service receipts (ISSUETYPE = INVOICE) <p>Service receipts (SERVRECTRANS) processing:</p> <ul style="list-style-type: none"> • Sets SOURCEMBO to SERVRECTRANS and ISSUETYPE to the value listed. • INVOICE type transactions: sends out on insert. • POCOST and RECEIPT type transactions: if Inspection Required = N for the corresponding POLINE, sends out on insert. If inspection required = Y, sends out when status is changed to COMP.

Predefined integration components	Value	Description
	MoutGLProcess - Material receipts	<p>Material receipts include the following:</p> <ul style="list-style-type: none"> • Accounting entries for non-distributed material receipts created by the receiving application for items/ tools ordered on purchase orders (ISSUETYPE = RECEIPT, COSTINFO = 1) • Accounting entries for distributed material receipts created by the receiving application for items/ tools ordered on purchase orders (ISSUETYPE = POCOST) • Accounting entries for Item transfers between storerooms (ISSUETYPE = TRANSFER and PONUM=NULL) • Accounting entries for receipt inspection transfers of items between the receipt inspection storeroom and the purchase order line storeroom (ISSUETYPE = TRANSFER and RECEIPTREF!=NULL and PONUM!=NULL) • Accounting entries for receipts against internal purchase orders (ISSUETYPE = TRANSFER and RECEIPTREF=NULL and PONUM!=NULL) • Accounting entries for receipt inspection goods return of items and materials (ISSUETYPE = RETURN) • Accounting entries for return to vendor from a storeroom or direct issue purchase order lines (ISSUETYPE = RETURN) • Invoice variance transactions recorded against material receipts (ISSUETYPE = INVOICE) • Accounting transaction for increasing the kit item's INVENTORY control account value when kits are made (ISSUETYPE = KITMAKE). transactions for increasing the INVENTORY control account for each constituent item of a kit when a kit is disassembled (ISSUETYPE = KITBREAK) <p>Material receipts (MATRECTRANS) processing:</p> <ul style="list-style-type: none"> • Sets SOURCEMBO to MATRECTRANS and ISSUETYPE to value listed. • Sends out INVOICE, RECEIPT, TRANSFER, RETURN, KITMAKE and KITBREAK type transactions on insert. • For POCOST type transactions on insert if status is COMP (that is, on insert if Inspection Required = N, and when status changed to COMP if Inspection Required = Y).
	MoutGLProcess - Inventory adjustment transactions	<p>Inventory adjustment transactions include the following:</p> <ul style="list-style-type: none"> • Inventory current balance adjustments (ITTYPE = CURBALADJ) • Inventory standard/ average cost adjustments (ITTYPE = STDCOSTADJ/ AVGCOSTADJ) • Cost difference when a kit is disassembled and there is a difference between the value of the kit and the sum of the kit component values (ITTYPE = KITCOSTVAR) • Physical count reconciliation (ITTYPE = RECBALADJ) • Capitalized cost adjustment (ITTYPE = CAPCSTADJ) • Standard cost receipt adjustment (ITTYPE = STDRECADJ) <p>Inventory adjustment (INVTRANS) processing:</p> <ul style="list-style-type: none"> • Sets SOURCEMBO to INVTRANS and ITTYPE to value listed. • Does not send out transactions with ITTYPE = INSERTITEM, CREATEASSET and PHYSCNT, as they are considered audit records rather than accounting transactions. • Sends out all other transactions on insert.
	MoutGLProcess - Invoice transactions	<p>Invoice transactions include the following transactions created by invoice approval:</p> <ul style="list-style-type: none"> • Invoice TOTAL transaction (amount payable to invoice vendor, TRANSTYPE = TOTAL) • Invoice line tax transactions (tax accounting for each TAX code for an invoice line, TRANSTYPE = TAX1:TAX5) • Invoice currency variance transaction (TRANSTYPE = CURVAR) • Invoice price variance transactions (TRANSTYPE = INVCEVAR) <p>Invoice transaction (INVTRANS) processing:</p> <ul style="list-style-type: none"> • Sets SOURCEMBO to INVOICETRANS and TRANSTYPE to the value listed. • Sends out all transactions when they are created.
	MoutGLProcess - Material issue and return transactions	<p>Material issue and return transactions include the following:</p> <ul style="list-style-type: none"> • Accounting entries for items issued from a storeroom in the system (ISSUETYPE = ISSUE) • Accounting entries for items returned to a storeroom (ISSUETYPE = RETURN) <p>Material issue and return (MATUSETRANS) processing:</p> <ul style="list-style-type: none"> • Sets SOURCEMBO to MATUSETRANS and ISSUETYPE to value listed. • Does not send out direct issue transactions that are created by PO receiving/ invoice variances in MATUSETRANS, as they are accounted for in MATRECTRANS. Identifies such transactions by their PONUM, so all MATUSETRANS transactions that have a PO reference are not sent out by this interface. • Sends out all other transaction at time of creation.

Predefined integration components	Value	Description
	MoutGLProcess - Labor transactions	Labor Transaction (LABRTRANS) processing: <ul style="list-style-type: none"> • Sets SOURCEMBO to LABTRANS. • If approval not required, send out labor actuals against work orders on insert. • If approval required, sends out transaction after it is approved (when GENAPPSERVRECEIPT is Y).
	MoutGLProcess - Tool transactions	Tool Transaction (TOOLTRANS) processing: <ul style="list-style-type: none"> • Sets SOURCEMBO to TOOLTRANS. • Sends out usage of tools on work orders on creation of TOOLTRANS
Publish channel	MXGLTXNInterface	
Processing rules	SKIPGL	Skips the sending of the general ledger transaction based on the value in SOURCEMBO existing in the GLSOURCE control.
Integration controls	GLSOURCE	

Inbound integration processing

The following table shows the preconfigured values used in inbound integration processing.

Table 2. General ledger object predefined components for inbound integration processing

Predefined integration components	Value and description
Object structure processing class functionality	None
Publish channel	None
Processing rules	None
Integration controls	None

Labor time reporting object

The MXEMPACT object structure allows for posting site-level actual time reported in the system to external applications. The approved labor actuals are sent out and all inbound labor actuals are accepted regardless of status. The status of existing records are not updated when processing inbound transactions.

Outbound integration processing

The following table shows the predefined values used in outbound integration processing.

Table 1. Labor time reporting object predefined components for outbound integration processing

Predefined integration components	Value and description
Object structure definition class functionality	None
Publish channel	MXEMPACTInterface
Processing rules	SKIPEMPACT - Skips the sending of the labor pay (LABTRANS) if the transaction is not approved (GENAPPSERVRECEIPT = 0).
Integration controls	

Inbound integration processing

The following table shows the preconfigured values used in inbound integration processing.

Table 2. Labor time reporting object predefined components for inbound integration processing

Predefined integration components	Value and description
Object structure processing class functionality	MaxEmpactProcess - Allows add actions only. A null action is processed as an add action. LABTRANSID is not allowed to be passed with a value because the LABTRANSID is program-generated during the add action.
Publish channel	MXEMPACTInterface
Processing rules	None
Integration controls	None

Meter reading object

The MXMETERDATA object structure allows inbound synchronization of meter reading data. This object structure supports only inbound processing. This interface does not support the processing of meter readings for work order tasks.

Outbound integration processing

The following table shows the predefined values used in outbound integration processing.

Table 1. Meter reading object predefined components for outbound integration processing

Predefined integration components	Value and description
Object structure definition class functionality	None
Publish channel	None
Processing rules	None
Integration controls	None

Inbound integration processing

The following table shows the preconfigured values used in inbound integration processing.

Table 2. Meter reading object predefined components for inbound integration processing

Predefined integration components	Value and description
Object structure processing class functionality	<p>MaxMeterDataProcess - The processing class verifies that the following attributes are provided:</p> <ul style="list-style-type: none"> • Site ID • Asset or location • Meter ID or condition monitoring point • Meter reading value, reading date time, inspector <p>When a work order is specified, the following processing occurs:</p> <ul style="list-style-type: none"> • If a measurement point is specified, the processing class identifies the asset or location meter corresponding to the site and measurement point, and creates a meter reading for that asset or location meter. • If a meter is specified, then either asset or location must be specified. If both are specified, the processing class assumes the meter belongs to the asset, and processes the meter accordingly. If only the asset or location is specified, then the meter on the corresponding entity is updated. <p>If no work order is specified, the following processing occurs:</p> <ul style="list-style-type: none"> • If a measurement point is specified, the reading is recorded for the measurement point. • If a meter is specified, then either asset or location must be specified. If both are specified, the processing class assumes the meter belongs to the asset, and processes the meter accordingly. If only asset or location is specified, then the meter on the corresponding entity is updated.
Publish channel	MXMETERInterface
Processing rules	None
Integration controls	None

System objects

System objects are MBOs that are generally used for application or metadata configuration. Updating data using system objects may require specific post-processing activities, for example, reconfiguring the database.

The following restrictions apply to the use of enterprise services, publish channels and object structures:

- You cannot enable listeners for publish channels.
- You cannot process system interfaces via interface tables or flat files.
- You must specify an action code on inbound system interfaces.
- **Object structures object**
The MXINTOBJECT object structure allows for inbound synchronization of the definition of object structures, including column aliases. System validations that apply to users adding, deleting and modifying predefined object structures apply to the modification of object structures via the Object Structure object structure service.
- **Enterprise service object**
The MXENTSRV object structure allows for inbound synchronization of the definition of enterprise services and their corresponding processing rules and control values.
- **Publish channel object**
The MXIFACEOUT object structure allows for inbound synchronization of the definition of publish channels their corresponding processing rules and control values. Before publish channel creation, make sure all controls used by the publish channel exist.
- **End point object**
The MXENDPOINT object structure allows for inbound synchronization of the definition of end points.

- **External system object**
The MXEXTSYSTEM object structure allows for inbound synchronization of the definition of an external system, the enterprise services and publish channels used by the external system, and their corresponding control values.
- **Integration control object**
The MXIFACECONTROL object structure allows for inbound synchronization of Integration Controls and their system level default values.
- **Invocation channel object**
The MXIFACEINVOKE object structure allows for inbound synchronization of an invocation channel definition.
- **Integration queue object**
The MXQUEUE object structure allows for inbound synchronization of integration queue definitions.
- **Message definition object**
The MXMESSAGE object structure allows for inbound synchronization of system error and warning messages.
- **MBO configuration object**
The MXOBJECTCFG object structure allows for inbound synchronization of MBO definition information.
- **Domain object**
The MXDOMAIN object structure allows for inbound synchronization of domain information.
- **Communication template object**
The MXCTEMPLATE object structure allows for bidirectional synchronization of communication templates that users can leverage to standardize frequently used e-mail communications and notifications.
- **Action definition object**
The MXACTION object structure allows for inbound synchronization of workflow action definitions that can be used with escalation, service level agreement (SLA), and workflow processes.
- **System properties object**
The MXPROP object structure allows for inbound synchronization of system properties and values.
- **Integration module object**
The MXIM object structure allows for inbound synchronization of an integration module definition including properties and LMO relationships.
- **Logical management operations (LMO) object**
The MXLMO2 object structure allows for inbound synchronization of LMOs including attributes.
- **Operational management product (OMP) object**
The MXOMP object structure allows for inbound synchronization of OMPs, including relationships to CIs and configurations with IM and LMOs.
- **Launch entry object**
The MXLAUNCH object structure allows for inbound synchronization of Launch Entries and context information.

Object structures object

The MXINTOBJECT object structure allows for inbound synchronization of the definition of object structures, including column aliases. System validations that apply to users adding, deleting and modifying predefined object structures apply to the modification of object structures via the Object Structure object structure service.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	N/A
Publish Channel	N/A
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	N/A
Enterprise Service	N/A
Processing Rules	None
Integration Controls	None

Enterprise service object

The MXENTSRV object structure allows for inbound synchronization of the definition of enterprise services and their corresponding processing rules and control values.

Prerequisite

Before enterprise service creation, make sure all controls used by the enterprise service exist.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	N/A
Publish Channel	N/A
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	N/A
Enterprise Service	N/A
Processing Rules	None
Integration Controls	None

Publish channel object

The MXIFACEOUT object structure allows for inbound synchronization of the definition of publish channels their corresponding processing rules and control values. Before publish channel creation, make sure all controls used by the publish channel exist.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	N/A
Publish Channel	N/A
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	N/A
Enterprise Service	N/A
Processing Rules	None
Integration Controls	None

End point object

The MXENDPOINT object structure allows for inbound synchronization of the definition of end points.

Prerequisite

Before end point creation, make sure handlers used by end points exist.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	N/A
Publish Channel	N/A
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	N/A
Enterprise Service	N/A
Processing Rules	None
Integration Controls	None

External system object

The MXEXTSYSTEM object structure allows for inbound synchronization of the definition of an external system, the enterprise services and publish channels used by the external system, and their corresponding control values.

Prerequisite

Before external system creation, make sure all enterprise services and publish channels, end points, and controls used by the external system exist.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	N/A
Publish Channel	N/A
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	N/A
Enterprise Service	N/A
Processing Rules	None
Integration Controls	None

Integration control object

The MXIFACECONTROL object structure allows for inbound synchronization of Integration Controls and their system level default values.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	N/A
Publish Channel	N/A
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	N/A
Enterprise Service	N/A
Processing Rules	None
Integration Controls	None

Invocation channel object

The MXIFACEINVOKE object structure allows for inbound synchronization of an invocation channel definition.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	N/A
Publish Channel	N/A
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	N/A
Enterprise Service	N/A
Processing Rules	None
Integration Controls	None

Integration queue object

The MXQUEUE object structure allows for inbound synchronization of integration queue definitions.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	N/A
Publish Channel	N/A
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	N/A
Enterprise Service	N/A
Processing Rules	None
Integration Controls	None

Message definition object

The MXMESSAGE object structure allows for inbound synchronization of system error and warning messages.

Prerequisite

In addition to the new messages added via this object structure, the messages.xml file must be updated with the corresponding message text.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	N/A

Predefined integration components	Value and description
Publish Channel	N/A
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	N/A
Enterprise Service	N/A
Processing Rules	None
Integration Controls	None

MBO configuration object

The MXOBJECTCFG object structure allows for inbound synchronization of MBO definition information.

Prerequisite

Use this object structure with caution.

Use only add, addchange, or change action codes when synchronizing inbound data through this object structure. Do not use the replace action unless you completely replace the MAXOBJECTCFG and MAXATTRIBUTECFG data.

The delete action presents the risk of deleting predefined records in the database tables associated with MAXOBJECTCFG and MAXATTRIBUTECFG MBOs.

An inbound setting restriction exists on the CHANGED, EAUDITENABLED, EAUDITFILTER, EAUDITTBNAME, IMPORTED, STORAGEPARTITION, MAXOBJECTID column, so the XML value is not set to the MBO.

After synchronizing inbound data with this interface, for your changes to take effect, use the Database Configuration application and select the Apply Configuration Changes action.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	N/A
Publish Channel	N/A
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	psdi.iface.app.configure.MaxObjcfgProcess - If the event that MAXOBJECTCFG is creating a view (MAXOBJECTCFG.VIEW=1), the processing class skips any MAXATTRIBUTECFG MBOs associated with the referred MAXOBJECTCFG. This class also delays the SAVE validation on MAXOBJECTCFG until all its associated attributes are successfully added into the database.
Enterprise Service	N/A
Processing Rules	None
Integration Controls	None

Domain object

The MXDOMAIN object structure allows for inbound synchronization of domain information.

Purpose

Some fields in the database are associated with select value lists. These lists of defined values are known as domains (sometimes referred to as value lists).

This object structure synchronizes ALN, numeric, numeric range, table, and crossover domains definitions.

Prerequisite

Update and delete operations require external systems to provide valid DOMAINID values.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	N/A
Publish Channel	N/A
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	N/A
Enterprise Service	N/A
Processing Rules	None
Integration Controls	None

Communication template object

The MXTEMPLATE object structure allows for bidirectional synchronization of communication templates that users can leverage to standardize frequently used e-mail communications and notifications.

Purpose

A communication template is a definition of a mail message with subject, message, and recipient information that is processed when certain nodes become current, or along specified workflow routing paths between nodes.

This object structure synchronizes application, change status, custom class, command line, and set value actions, but not action group.

Prerequisite

Update and delete operations require external systems to provide a valid ACTIONID value.

This object structure does not support the creation of action groups.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	N/A
Publish Channel	MXTEMPLATEInterface
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	N/A
Enterprise Service	N/A
Processing Rules	None
Integration Controls	None

Action definition object

The MXACTION object structure allows for inbound synchronization of workflow action definitions that can be used with escalation, service level agreement (SLA), and workflow processes.

Purpose

An action is an event that you want the system to trigger when it encounters records that meet the conditions defined by an escalation point, service level agreement, or workflow process.

This object structure synchronizes application, change status, custom class, command line, and set value actions, but not action group.

Prerequisite

Update and delete operations require that external systems provide a valid ACTIONID value.

This object structure does not support the creation of action groups.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	N/A
Publish Channel	N/A
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	N/A
Enterprise Service	N/A
Processing Rules	None
Integration Controls	None

System properties object

The MXPROP object structure allows for inbound synchronization of system properties and values.

Purpose

Prerequisite

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	N/A
Publish Channel	N/A
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	N/A
Enterprise Service	N/A
Processing Rules	None

Predefined integration components	Value and description
Integration Controls	None

Integration module object

The MXIM object structure allows for inbound synchronization of an integration module definition including properties and LMO relationships.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	N/A
Publish Channel	N/A
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	N/A
Enterprise Service	N/A
Processing Rules	None
Integration Controls	None

Logical management operations (LMO) object

The MXLMO2 object structure allows for inbound synchronization of LMOs including attributes.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	N/A
Publish Channel	N/A
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	N/A
Enterprise Service	N/A
Processing Rules	None
Integration Controls	None

Operational management product (OMP) object

The MXOMP object structure allows for inbound synchronization of OMPs, including relationships to CIs and configurations with IM and LMOs.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	N/A
Publish Channel	N/A

Predefined integration components	Value and description
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	N/A
Enterprise Service	N/A
Processing Rules	None
Integration Controls	None

Launch entry object

The MXLAUNCH object structure allows for inbound synchronization of Launch Entries and context information.

Outbound Integration Processing

The following table shows the predefined values used in outbound integration processing.

Predefined integration components	Value and description
Object Structure definition class functionality	N/A
Publish Channel	N/A
Processing Rules	None
Integration Controls	None

Inbound Integration Processing

The following table shows the preconfigured values used in inbound integration processing.

Predefined integration components	Value and description
Object Structure processing class functionality	N/A
Enterprise Service	N/A
Processing Rules	None
Integration Controls	None

Data loading order

When you use the integration framework to load multiple sets of data into the application database, you must maintain the dependencies so that the data is loaded correctly. Use the following sequence of predefined object structures as a guide to determine the order in which you load the data.

Object structures

- MXGLCOMP
- MXCOA
- MXVENDORMSTR
- MXVENDOR
- MXPERSON
- MXPERUSER
- MXCRAFT
- MXLABOR
- MXSTORELOC
- MXCLASSIFICATION
- MXITEM
- MXINVENTORY
- MXINVBAL
- MXINVVENDOR
- MXSERVITEM
- MXPROJ
- MXASSET
- MXWO
- MXWODETAIL
- MXWOHIER
- MXINVRES

- MXEMPACT
- MXINVISSUE
- MXGLTXN
- MXTOOLITEM
- MXPC
- MXMETERDATA
- MXPR
- MXPO
- MXRECEIPT
- MXRCVROTITM
- MXINVOICE

System object structures

- MXINTOBJECT
- MXIFACECONTROL
- MXENTSRV
- MXIFACEOUT
- MXENDPOINT
- MXQUEUE
- MXEXTSYSTEM
- MXIFACEINVOKE
- MXIM
- MXLMO2
- MXOMP
- MXLAUNCH
- MXMESSAGE
- MXOBJECTCFG
- MXDOMAIN
- MXCTEMPLATE
- MXACTION
- MXPROP

Integration data processing

You can configure integration components in different ways to meet your integration requirements. You can integrate with multiple external applications, and each application requires a different integration approach that is based on the integration support that is provided by that application.

- **[Planning to process data for integration](#)**
Before you initiate an integration transaction, you must decide which integration components to use. You must also plan how to implement these components so that you can achieve a successful integration with the external destination for your integration.
- **[Inbound data processing](#)**
The integration framework supports asynchronous and synchronous processing of inbound integration messages with object structures, enterprise services, and standard services.
- **[Outbound data processing](#)**
Publish channels provide asynchronous processing of outbound messages that do not require a response from the external system. This processing can be initiated by an object event or you can publish on demand with the data export feature. Invocation channels provide synchronous processing of outbound messages that require a response or confirmation from the external system.
- **[Configuring integration processing](#)**
Processing of integration messages occurs at several points during the movement of integration messages for inbound and outbound transactions. When you configure integration processing, you must ensure that source data and destination data are in compatible data structures and formats.
- **[Rule-based customization](#)**
You can use processing rules to change the behavior of predefined integration processing without writing Java™ classes, automation scripts, or XSL maps. You can implement processing rules only on publish channels or on enterprise services.
- **[Code-based customization](#)**
The integration framework provides placeholders in transaction flows where you can insert your own code to provide logic that customizes transaction processing. You can insert Java classes or automation scripts at selected points in the processing of object structures, publish channels, enterprise services, and invocation channels. You can also use XSL maps to transform messages.

Planning to process data for integration

Before you initiate an integration transaction, you must decide which integration components to use. You must also plan how to implement these components so that you can achieve a successful integration with the external destination for your integration.

The choice of the components that you use and how you implement them is often determined by the external application that you are integrating with. These choices include the following considerations:

Data type

Define the data, for example work orders and person data. When defined, determine whether there are predefined object structures to support each set of data or must you create more object structures.

Direction

For each set of data, which direction will the integration scenario implement, sending outbound transactions, receiving inbound transactions, or both? The direction of the integration can vary for each set of data.

Message exchange

This factor depends on the capabilities of the external application and options can include integrating data by using files (XML, JSON, or flat, such as CSV), calling web services, and posting XML or JSON over HTTP. The method of exchanging data and how often that occurs can vary for each set of data.

Customization

As data is exchanged, is customization within the application needed to transform message content or to apply integration business rules? If customization is required, does it use integration framework capabilities such as Java™ exit classes, automation scripts, XSL maps, or processing rules, or is customization implemented in the external application?

Depending upon the answers to these questions, you need different types of component and API configurations, which can include:

- Object structures
- Message templates, if the outbound integration messages are in the JSON or XML format
- API keys
- Publish channels and invocation channels
- Enterprise services
- Object structure services, enterprise services, and standard services
- Web services
- REST and OSLC APIs
- External systems
- Endpoints

Inbound data processing

The integration framework supports asynchronous and synchronous processing of inbound integration messages with object structures, enterprise services, and standard services.

For asynchronous processing, the external system establishes and maintains a connection until the message is passed into a JMS queue. For synchronous processing, the external system establishes maintains a connection until message processing is complete.

- [Asynchronous processing of inbound messages](#)
During asynchronous processing of inbound messages, an external application calls an enterprise service and maintains a connection until the message is saved to a JMS queue and the connection ends. If an error occurs during the save of the message to the queue, the external application is responsible for reprocessing the message.
- [Synchronous processing of inbound messages](#)
You can implement synchronous inbound integration with an object structure, enterprise, or standard service. These transactions require the establishment and maintenance of a direct connection from the external application to the integration framework for the duration of the transaction.
- [Initiation of asynchronous processing of inbound data](#)
To initiate integration processing, the external system uses one of the supported methods to establish a connection. After the external system and enterprise service are validated, messages are placed in the JMS queue that is specified for the enterprise service.
- [Initiation of synchronous processing of inbound data](#)
To initiate synchronous processing, the external system uses one of the supported methods to establish a connection. During the connection process, the integration framework checks that the external system and the referenced enterprise service are valid and enabled.
- [Processing sequences](#)
The same processing sequence is applied to asynchronous and synchronous messages that use an enterprise service. The processing sequences are different for synchronous messages, depending on whether they use object structures or standard services.
- [Enterprise service processing sequences](#)
An enterprise service message processes through a number of layers to query and update business object data. You can use these processing layers to customize and control processing to satisfy the integration requirements with the external application.
- [Synchronous integration with an object structure service](#)
An object structure service is accessible by using the HTTP Post, EJB, and web service invocation methods to receive synchronous object structure service messages. The operations Create, Update, Delete, Sync, and Query are supported.
- [Synchronous integration with a standard service](#)
A standard service is accessible by using the HTTP Post, EJB, and web service invocation methods to receive synchronous standard service messages.

Asynchronous processing of inbound messages

During asynchronous processing of inbound messages, an external application calls an enterprise service and maintains a connection until the message is saved to a JMS queue and the connection ends. If an error occurs during the save of the message to the queue, the external application is responsible for reprocessing the message.

Asynchronous processing is managed by sequential or continuous JMS queues. Processing in a sequential queue guarantees the order of delivery of messages, based on a first in, first out order. Processing in a continuous queue delivers messages in any order.

You can use enterprise services to support the following transactions:

- Importing data from a flat file or an XML file
- Loading data from interface tables
- Receiving an XML message from an HTTP POST request

- Calling a web service that is configured to use a JMS queue
- Calling an EJB
- Using a direct JMS connection

All of these options support the use of an enterprise service, when the integration message is passed into a JMS queue. When the message is in the queue, a separate process that uses a cron task or a message-driven bean (MDB) picks up the message from the queue. The message is then processed through the enterprise service layer, the related object structure layer, and the business objects are updated. Because messages are processed through a JMS queue, no response is sent to the application that called the service and the Query operation is not supported in this processing model.

Synchronous processing of inbound messages

You can implement synchronous inbound integration with an object structure, enterprise, or standard service. These transactions require the establishment and maintenance of a direct connection from the external application to the integration framework for the duration of the transaction.

The external application maintains the connection to the service until business objects are updated in the Maximo® database or until business objects are returned in response to a Query operation. The integration framework returns a response to the external application to confirm the success or failure of message processing.

The following options are available for sending synchronous integration messages to services:

- Posting of an XML or JSON message by using HTTP or REST API
- Starting a web service that is configured to bypass the JMS queue
- Starting an EJB

Object structure and enterprise services can use any of these options to support Create, Update, Delete, Sync, and Query operations.

Initiation of asynchronous processing of inbound data

To initiate integration processing, the external system uses one of the supported methods to establish a connection. After the external system and enterprise service are validated, messages are placed in the JMS queue that is specified for the enterprise service.

The procedure for establishing the initial connection varies depending on the integration method that is used for the transaction. The following table describes the available methods and the connections that these methods use.

Method	Connection procedure
HTTP or HTTPS Post method	Use the following URL: <i>hostname:port/meaweb/esqueue/extsysname/entservname</i> where: <ul style="list-style-type: none"> • <i>extsysname</i> is the name of the external system • <i>entservname</i> is the name of the enterprise service
EJB	Start an EJB from a Java™ Platform, Enterprise Edition client by using the following code: <pre>public byte() processExternalDataAsync(byte[] extData, String serviceName, String sender)</pre> On the client, specify the JNDI name of the Enterprise JavaBean, <i>ejb/maximo/remote/enterpriseservice</i> , to look up the Enterprise JavaBean reference and to start the method. The following configurations are required on the Java Platform, Enterprise Edition client: <ul style="list-style-type: none"> • Access to the Home and Remote class files • Access to the Java Platform, Enterprise Edition JAR files for the server • The URL of the server that hosts the Enterprise JavaBeans • The class name of the context factory The client code must instantiate the default InitialContext object. The context derives the provider URL and the context factory from the environment.
Data import feature that uses XML or flat files	The user clicks Data Import in an application.
Data import cron task	The XMLFILECONSUMER cron task or the FLATFILECONSUMER cron task polls the source directory that is configured for data import.
Interface tables	The external system writes message data to the appropriate interface tables and updates the MXIN_INTER_TRANS queue table with information about the sequence for processing the records in the interface table. A cron task polls the MXIN_INTER_TRANS queue table for records to be processed.
Web services	The external system starts an enterprise service that is deployed as a web service that is configured not to bypass the JMS queue.
JMS direct	The external system passes an XML message directly into the JMS queue from another queuing system, such as WebSphere® MQ.

When a connection is established, or when a cron task runs and identifies that data is ready for import, the following steps occur:

1. The integration framework checks that the external system and the enterprise service are valid and enabled.
2. If the messages are in flat file format, the integration framework checks that the object structure supports flat structures.
3. If verification fails, the integration framework notifies the sender of the error and does not process the data.
4. If the verification is successful, the integration framework identifies the inbound JMS queue that is assigned to the enterprise service and writes the message to the queue.

5. The integration framework updates the JMS message header with the names of the external system and the enterprise service.

If a transaction that contains multiple instances of a record encounters errors, error-handling varies depending on the exchange method used. The following error-handling occurs, depending on the exchange type:

- For HTTP or EJB transactions only: If a transaction contains multiple instances of a document, for example, if it contains 10 person records, a single message is written to the JMS queue, not 10 individual messages. If one of the records has a processing error, a total message processing exception occurs and none of the records is committed to the database.
- For data import transactions only: If a transaction contains multiple instances of a document, for example, if it contains 10 person records, the application writes 10 individual messages to the JMS queue. If one of the messages has a processing error, an error transaction is logged for that message and the remaining 9 messages continue to process in the application.

Initiation of synchronous processing of inbound data

To initiate synchronous processing, the external system uses one of the supported methods to establish a connection. During the connection process, the integration framework checks that the external system and the referenced enterprise service are valid and enabled.

The procedure for establishing the initial connection varies, depending on the service that is used for the transaction. The following table describes the available methods and the connections that these methods use.

Method	Connection procedure
HTTP or HTTPS Post method	<ul style="list-style-type: none"> • Use the following URL for transactions that use an enterprise service: hostname:port/meaweb/es/extsysname/entservname <p>Where:</p> <ul style="list-style-type: none"> ◦ <i>extsysname</i> is the name of the external system ◦ <i>entservname</i> is the name of the enterprise service <ul style="list-style-type: none"> • Use the following URL for transactions that use an object structure service: hostname:port/meaweb/os/osname <p>Where <i>osname</i> is the name of the object structure service.</p> <ul style="list-style-type: none"> • Use the following URL for transactions that use a standard service: hostname:port/meaweb/ss/application service name <p>Where <i>application service name</i> is the name of the standard service.</p>
EJB	<ul style="list-style-type: none"> • For enterprise service transactions, start an EJB from a Java™ Platform, Enterprise Edition client by using the following code: public byte[] processExternalDataSync(byte[] extData, String serviceName, String sender) <p>The client can use the JNDI name of the Enterprise JavaBean, <i>ejb/maximo/remote/enterpriseservice</i>, to look up the Enterprise JavaBean reference and to start the method. The following configurations are required on the Java Platform, Enterprise Edition client:</p> <ul style="list-style-type: none"> • For object structure service transactions, start an EJB from a Java Platform, Enterprise Edition client by using the following code: public byte[] processMOS(byte[] reqmosData, String mosName) <p>The client can use the JNDI name of the Enterprise JavaBean, <i>ejb/maximo/remote/mosservice</i>, to look up the Enterprise JavaBeans reference and to start the method. The following configurations are required on the Java Platform, Enterprise Edition client:</p> <ul style="list-style-type: none"> • For object structure service transactions, start an EJB from a Java Platform, Enterprise Edition client by using the following code: public byte[] action(byte[] actionData, String maxServiceName) <p>The client can use the JNDI name of the Enterprise JavaBean, <i>ejb/maximo/remote/actionservice</i>, to look up the Enterprise JavaBean reference and to start the method. The following configurations are required on the Java Platform, Enterprise Edition client:</p> <p>The following configurations are required on the Java Platform, Enterprise Edition client:</p> <ul style="list-style-type: none"> • Access to the Home and Remote class files • Access to the Java Platform, Enterprise Edition JAR files for the server • The URL of the server that hosts the Enterprise JavaBeans • The class name of the context factory <p>The client code must instantiate the default InitialContext object. The context derives the provider URL and the context factory from the environment.</p>
Web service	<p>Use the following URL for transactions that start a web service:</p> <p>http://hostname:port/meaweb/services/web service name</p> <p>where <i>web service name</i> is the name of a deployed web service.</p>

Processing sequences

The same processing sequence is applied to asynchronous and synchronous messages that use an enterprise service. The processing sequences are different for synchronous messages, depending on whether they use object structures or standard services.

- [Enterprise service processing sequences](#)
An enterprise service message processes through a number of layers to query and update business object data. You can use these processing layers to customize and control processing to satisfy the integration requirements with the external application.
- [Synchronous integration with an object structure service](#)
An object structure service is accessible by using the HTTP Post, EJB, and web service invocation methods to receive synchronous object structure service messages. The operations Create, Update, Delete, Sync, and Query are supported.
- [Synchronous integration with a standard service](#)
A standard service is accessible by using the HTTP Post, EJB, and web service invocation methods to receive synchronous standard service messages.

Enterprise service processing sequences

An enterprise service message processes through a number of layers to query and update business object data. You can use these processing layers to customize and control processing to satisfy the integration requirements with the external application.

For asynchronous processing, the data can originate from the following exchange methods:

- Interface tables
- HTTP Post of an XML or JSON message
- Starting a web service that is configured to use a JMS queue
- Starting an EJB
- Direct JMS connection
- Data import of a flat file, JSON or XML file

For synchronous processing, the data can originate from the following exchange methods:

- HTTP Post of an XML or JSON message
- Starting a web service that is configured to use a message queue
- Starting an EJB

The same processing sequence applies for asynchronous and synchronous processing.

Enterprise service processing occurs in the following sequence:

1. The external system calls the enterprise service.
2. Custom processing can occur at several points during the processing of enterprise services. You can run custom Java™ classes or automation scripts to manipulate the message data or you can apply an XSL map. Custom processing occurs in the following order:
 - a. If a preprocessing method is defined in a user exit class, this method is applied first.
 - b. If an external exit class is specified, this processing is applied.
 - c. If a postprocessing method is defined in a user exit class, this method is applied.
 - d. If an XSL map is specified for the enterprise service, the map is applied to convert enterprise service format to object structure format.At this point in the processing, the message must match the format of the object structure that is associated with the enterprise service.
3. Object structure processing occurs in the following order:
 - a. You can run custom Java classes or automation scripts to manipulate data during object structure processing.
 - b. If processing rules are configured for the object structure, these rules are run next.
 - c. If processing rules result in the multiplication of data for sites or organizations, the object structure message is duplicated for the additional sites or organizations.
 - d. Objects are created and object processing starts.
4. Object processing occurs in the following order:
 - a. If a preprocessing method is defined in a user exit class, this method is applied.
 - b. If an external exit class is specified, this processing is applied.
 - c. If a postprocessing method is defined in a user exit class, this method is applied.
 - d. The business objects are processed, and data is saved to the database.
5. For synchronous transactions only, for Create, Update, Delete, and Sync operations, the enterprise service provides a response to the starting application that includes the following information:
 - Indicates whether the message was processed successfully.
 - The value of the internal ID column of the main object, regardless of whether the column is part of the primary key of the main object.
 - The values of the primary key fields of the main object.
 - The values of any alternate key fields for the main object, which is configured for the object or for the object structure.
6. For synchronous transactions only, for Query operations, the entire object structure is returned. You can run custom Java classes or automation scripts to manipulate the response data, or you can apply an XSL map. You can manipulate the response data by applying an XSL map.

Synchronous integration with an object structure service

An object structure service is accessible by using the HTTP Post, EJB, and web service invocation methods to receive synchronous object structure service messages. The operations Create, Update, Delete, Sync, and Query are supported.

Integration processing that is based on an object structure service occurs in the following sequence:

1. The external system uses one of the following invocation methods to initiate communication with the integration framework:
 - HTTP invocation
 - EJB invocation
 - Web service invocation
2. The integration framework receives the inbound message that identifies the object structure that is associated with the message
3. The integration framework builds the objects, based on the object structure and the content of the inbound message.

4. The integration framework applies any predefined logic to the object structure.
5. Objects are processed and data is committed to the database if the message contains an update operation, or the data is returned to the requester if the message contains a query operation.
6. If a processing error occurs, the response with an error message is returned to the caller of the service.

Synchronous integration with a standard service

A standard service is accessible by using the HTTP Post, EJB, and web service invocation methods to receive synchronous standard service messages.

Integration processing that is based on a standard service occurs in the following sequence:

1. The external system uses one of the following invocation methods to initiate communication with the integration framework:
 - HTTP invocation
 - EJB invocation
 - Web service invocation
2. The objects are passed to the system, and standard system processing is applied.

Enterprise service processing sequences

An enterprise service message processes through a number of layers to query and update business object data. You can use these processing layers to customize and control processing to satisfy the integration requirements with the external application.

For asynchronous processing, the data can originate from the following exchange methods:

- Interface tables
- HTTP Post of an XML or JSON message
- Starting a web service that is configured to use a JMS queue
- Starting an EJB
- Direct JMS connection
- Data import of a flat file, JSON or XML file

For synchronous processing, the data can originate from the following exchange methods:

- HTTP Post of an XML or JSON message
- Starting a web service that is configured to use a message queue
- Starting an EJB

The same processing sequence applies for asynchronous and synchronous processing.

Enterprise service processing occurs in the following sequence:

1. The external system calls the enterprise service.
2. Custom processing can occur at several points during the processing of enterprise services. You can run custom Java™ classes or automation scripts to manipulate the message data or you can apply an XSL map. Custom processing occurs in the following order:
 - a. If a preprocessing method is defined in a user exit class, this method is applied first.
 - b. If an external exit class is specified, this processing is applied.
 - c. If a postprocessing method is defined in a user exit class, this method is applied.
 - d. If an XSL map is specified for the enterprise service, the map is applied to convert enterprise service format to object structure format.At this point in the processing, the message must match the format of the object structure that is associated with the enterprise service.
3. Object structure processing occurs in the following order:
 - a. You can run custom Java classes or automation scripts to manipulate data during object structure processing.
 - b. If processing rules are configured for the object structure, these rules are run next.
 - c. If processing rules result in the multiplication of data for sites or organizations, the object structure message is duplicated for the additional sites or organizations.
 - d. Objects are created and object processing starts.
4. Object processing occurs in the following order:
 - a. If a preprocessing method is defined in a user exit class, this method is applied.
 - b. If an external exit class is specified, this processing is applied.
 - c. If a postprocessing method is defined in a user exit class, this method is applied.
 - d. The business objects are processed, and data is saved to the database.
5. For synchronous transactions only, for Create, Update, Delete, and Sync operations, the enterprise service provides a response to the starting application that includes the following information:
 - Indicates whether the message was processed successfully.
 - The value of the internal ID column of the main object, regardless of whether the column is part of the primary key of the main object.
 - The values of the primary key fields of the main object.
 - The values of any alternate key fields for the main object, which is configured for the object or for the object structure.
6. For synchronous transactions only, for Query operations, the entire object structure is returned. You can run custom Java classes or automation scripts to manipulate the response data, or you can apply an XSL map. You can manipulate the response data by applying an XSL map.

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3. The integration framework builds the objects, based on the object structure and the content of the inbound message.
4. The integration framework applies any predefined logic to the object structure.
5. Objects are processed and data is committed to the database if the message contains an update operation, or the data is returned to the requester if the message contains a query operation.
6. If a processing error occurs, the response with an error message is returned to the caller of the service.

Synchronous integration with a standard service

A standard service is accessible by using the HTTP Post, EJB, and web service invocation methods to receive synchronous standard service messages.

Integration processing that is based on a standard service occurs in the following sequence:

1. The external system uses one of the following invocation methods to initiate communication with the integration framework:
 - HTTP invocation
 - EJB invocation
 - Web service invocation
2. The objects are passed to the system, and standard system processing is applied.

Outbound data processing

Publish channels provide asynchronous processing of outbound messages that do not require a response from the external system. This processing can be initiated by an object event or you can publish on demand with the data export feature. Invocation channels provide synchronous processing of outbound messages that require a response or confirmation from the external system,.

- [Asynchronous integration with a publish channel](#)
The integration framework uses publish channels to process asynchronous outbound messages. The sending of a publish channel message can be initiated by an object event, or you can use the data export feature to send publish channel messages on demand.
- [Synchronous integration with an invocation channel](#)
The integration framework uses invocation channels to process synchronous outbound messages that require a confirmation or response content from the external application. The export is started by an action class that calls the invocation channel.

Asynchronous integration with a publish channel

The integration framework uses publish channels to process asynchronous outbound messages. The sending of a publish channel message can be initiated by an object event, or you can use the data export feature to send publish channel messages on demand.

Publish channels are configured for an object structure and can enable event-based integration when the main object of the object structure is updated. An update occurs, for example, when a user saves a record in an application or completes a stage in a workflow process. When the main object of an object structure is updated, an event is initiated to all publish channels that are associated with the object structure and are configured to listen for events. Users can use the data export feature in the External Systems application to initiate publish channel messages at any time.

When a publish channel message is initiated by an event or by data export, the integration framework performs a sequence of tasks:

1. Identifies the object structure and the component objects that are associated with the publish channel.
 2. Constructs the object structure for the transaction and forms an XML or JSON message that is based on the content of the objects.
 3. Applies any processing rules that are defined in the Publish Channels application.
 4. If the publish channel is associated with multiple external systems, creates copies of the object structure, one for each publish channel and external system combination.
 5. If any custom processing Java™ classes, automation scripts, or an XSL map are associated with the publish channel, processes them in the following order:
 - a. Runs the event filter class, if one is provided.
 - b. Runs the preprocessing method in the user exit processing class, if one is provided.
 - c. Runs a publish channel processing class, if one is provided.
 - d. ,
 - e. Runs the postprocessing method in the user exit class, if one is provided.
 - f. Applies an XSL map, if one is provided.
 6. Writes the XML or JSON message to the outbound queue specified for the external system.
 7. A cron task picks up the publish channel message and delivers it to the external system, which is based on the endpoint that is configured.
- [Data export feature](#)
The publish channel supports batch processing of integration data by using the data export feature.

- [Event-based integration](#)

A publish channel can initiate an integration message in response to the processing of a system transaction, such as the update of an object.

Data export feature

The publish channel supports batch processing of integration data by using the data export feature.

You initiate the data export feature by running a SQL query on the primary object of an object structure, and the number of records to send. If the query is successful, the export starts.

You initiate the data export feature by providing a SQL WHERE clause on the primary object of an object structure in the Data Export window. You can also configure the number of records to send. If the query is successful, the export starts and delivers the data based on the endpoint that is configured for the publish channel.

Event-based integration

A publish channel can initiate an integration message in response to the processing of a system transaction, such as the update of an object.

You can configure publish channels to listen to events that occur on the primary object of the related object structure by selecting the Enable Listener check box in the Publish Channels application. When the main object of an object structure is updated, a publish channel message sends the updated information to the external system.

When an update to a child object initiates an update to the main object, this information is also sent to the external system. However, some updates to a child object do not initiate an update to the main object and, as a result, the updated information is not sent to the external system. For example, if an object structure is configured to support an attachment as a child object, when the user adds an attachment, the external system is not notified of this event.

To propagate an event from a child object to the primary object of the object structure, in the Object Structures application, you use the Advanced Configurations action to configure event propagation. When you configure an object structure to propagate events on child objects to the main object, the main object then sends the updated information to the external system.

If you configure event propagation for an object structure, you must monitor message activity carefully, because the configuration can initiate more messages than the external system is designed to process. For child objects that have embedded logic to update the parent object, this configuration has no impact in terms of enabling or disabling the event propagation from the child to the parent object.

Synchronous integration with an invocation channel

The integration framework uses invocation channels to process synchronous outbound messages that require a confirmation or response content from the external application. The export is started by an action class that calls the invocation channel.

Sending an invocation channel message is initiated by an action Java™ class that is coded to start the channel. Invocation channels are used, for example, to call an external application to validate data, to start a process on an external application, or to retrieve data. An invocation channel can be triggered by a user interface control that is configured to call the action class that starts the channel.

When an invocation channel message is started by an action class, the integration framework performs a sequence of tasks:

1. Identifies the object structure that is associated with each invocation channel and identifies the component objects.
2. Constructs the object structure for the transaction and forms an XML message that is based on the content of the objects.
3. If any custom processing Java classes, automation scripts, or an XSL map are associated with the invocation channel request, processes them in the following order:
 - a. Runs the preprocessing method in the request user exit processing class, if one is provided.
 - b. Runs an invocation channel request processing class, if one is provided.
 - c. Runs the postprocessing method in the request user exit class, if one is provided.
 - d. Applies an XSL map, if one is provided.
4. Writes the XML message to the destination that is specified by the endpoint.
5. The endpoint handler specifies the transport mechanism to use.
6. When the response is received from the end point, if any custom Java classes, automation scripts, or XSL maps are associated with the response, processes them in the following order:
 - a. Runs the preprocessing method in the response user exit processing class, if one is provided.
 - b. Runs an invocation channel response processing class, if one is provided.
 - c. Runs the postprocessing method in the response user exit class, if one is provided.
 - d. Applies an XSL map, if one is provided.
7. Objects are built from the data in the response object structure and are passed to the system where standard processing is applied.
8. If all the objects that are created from the response object structure process successfully, they are committed to the database.

The response content can be managed by the invoker based on integration requirements, for example to update business object data or display the response to a user. A default action class is provided that you can use or extend to implement an invocation channel integration.

- [Customization of metadata properties in an invocation channel](#)

Within the external exit classes or the user exit classes of the invocation channel, you can update additional data, such as the override values for the parameters that are configured for an endpoint.

Customization of metadata properties in an invocation channel

Within the external exit classes or the user exit classes of the invocation channel, you can update additional data, such as the override values for the parameters that are configured for an endpoint.

You can use this type of customization, for example, to derive an endpoint parameter, such as the URL, from the data in the object structure of the invocation channel. You can override the values for a number of metadata properties.

Value	Description
ENDPOINT	You can override this value to use a provided endpoint in place of the endpoint that is configured through the External System.
ENDPOINTPROPS	This value points to a hash map that can contain one or more endpoint parameters with a corresponding override value. If the endpoint configuration defines that you cannot override a property any override value in the integration context is ignored.
TARGETOBJECT	This value is the target object structure of the invocation channel.
SOURCEOBJECT	This value is the source object structure of the invocation channel.

Configuring integration processing

Processing of integration messages occurs at several points during the movement of integration messages for inbound and outbound transactions. When you configure integration processing, you must ensure that source data and destination data are in compatible data structures and formats.

- [Configuring asynchronous processing of inbound messages by using enterprise services](#)
Enterprise services use asynchronous processing for inbound messages that do not require a response from Maximo® Manage. To enable enterprise service processing, you configure several integration components, including an object structure, enterprise service, external system, and JMS cron task.
- [Configuring asynchronous processing of outbound messages by using publish channels](#)
Publish channels process outbound integration messages that do not require a response from the message destination. To enable publish channel processing, you configure several integration components, including an object structure, publish channel, external system, and cron task.

Configuring asynchronous processing of inbound messages by using enterprise services

Enterprise services use asynchronous processing for inbound messages that do not require a response from Maximo® Manage. To enable enterprise service processing, you configure several integration components, including an object structure, enterprise service, external system, and JMS cron task.

About this task

An external system initiates a connection and sends a message that includes the names of the external system and the enterprise service. The external system maintains the connection while the integration framework checks that the enterprise service is enabled for this transaction. Valid transactions are placed into the inbound sequential JMS queue, and the connection with the external system ends. A cron task polls the JMS queue, forwards the message for enterprise service processing, and sends the message onwards for object structure processing before it is committed to the database.

Procedure

1. In the Object Structures application, identify a predefined object structure to use or create one.
2. In the Enterprise Services application, identify a predefined enterprise service to use or create one.
3. Configure the enterprise service to use your object structure and specify a valid operation.
The Query operation is not valid for asynchronous processing with enterprise services.
4. In the External Systems application, identify an external system to use or create one and configure it for your enterprise service:
 - a. Configure the external system to use inbound JMS queues and enable the external system.
 - b. Configure the external system to use your enterprise service and enable the service.
5. Optional: Configure the source for the integration message.

Message source	Configurations
Messages from files by using a cron task	In the Cron Task Setup application, set the data import cron task to active.
Messages from a web service call	In the Web Services Library application, create a web service that is based on your enterprise service.
Messages from interface tables	In the Cron Task Setup application, set the interface table cron task to active.

6. Configure a queue to receive the integration messages.

Queue type	Description
Continuous	On the application server, configure message-driven beans to consume queue messages.
Sequential	In the Cron Task Setup application, set the JMS cron task to active so that it can consume messages from the queue.

Configuring asynchronous processing of outbound messages by using publish channels

Publish channels process outbound integration messages that do not require a response from the message destination. To enable publish channel processing, you configure several integration components, including an object structure, publish channel, external system, and cron task.

About this task

An object structure provides the message content to the publish channel. Publish channel processing transforms the message, and the external system then forwards it to its destination queue. A cron task polls the queue on a regular schedule and delivers the message to its destination. Publish channel transactions can be initiated by an event, such as a change to the status of an object, or by starting a data export transaction in the External Systems application.

Procedure

1. In the Object Structures application, identify a predefined object structure to use or create one.
2. In the Publish Channels application, identify a predefined publish channel to use or create one.
3. Optional: To enable event-based integration, configure a listener for the event:
 - a. In the Publish Channels application, select the Enable Publish Channel Listener action.
If the listener is enabled, when the primary object of the object structure is updated, publish channel transactions are initiated.
 - b. If you want events on child objects to start publish channel transactions, in the Object Structures application, select the Advanced Configurations action and configure event propagation.
4. Optional: In the Publish Channels application, review the processing rules and add or change rules as necessary.
Processing rules are run in the order indicated in the Sequence field. If you change the sequence values, rules run in a different order, which can have unintended results.
5. Optional: Specify any automation scripts, custom Java™ class files, or XSL maps to provide custom logic during the transformation process.
6. In the External Systems application, add the publish channel to the external system and specify the file path to the outbound sequential queue.
7. If you are using JMS queues, in the Cron Task Setup application, enable the SEQOUT instance of the JMSQSEQCONSUMER cron task. For Kafka queues, configure the Kafka cron task to periodically poll the queues and deliver messages.
The cron task delivers messages from the JMS queue to their destinations in the same order as the messages are received into the queue.

Rule-based customization

You can use processing rules to change the behavior of predefined integration processing without writing Java™ classes, automation scripts, or XSL maps. You can implement processing rules only on publish channels or on enterprise services.

Processing rules can access and evaluate the values in XML and object fields, object sets, and integration and system controls. Processing rules also can change the values in XML and object fields, or stop or skip processing all or part of a message.

- [Rule definitions for objects and records](#)
An object structure consists of one or more object records. When an object is created, the object fields are populated from the corresponding record fields before standard application processing is applied.
- [Processing rule definitions](#)
A processing rule performs an action on a field in a record or object, or on the record or object itself. To define a processing rule, in the service or channel used for the transaction, you can specify the record or object to which the rule applies.
- [Conditions and evaluations](#)
Processing rules are applied conditionally. Any conditions must be met before the processing or action that is specified in the rule can be performed.
- [Integration controls](#)
Integration controls give you the ability to configure the behavior of any enterprise service or publish channel according to the requirements of individual organizations and sites. Processing rules and Java classes can access integration controls for evaluation purposes.
- [Configuring processing rules](#)
You can configure processing rules for an object structure in the Publish Channels application or in the Enterprise Services application.

Rule definitions for objects and records

An object structure consists of one or more object records. When an object is created, the object fields are populated from the corresponding record fields before standard application processing is applied.

During outbound processing, the original object is populated with the record fields from the corresponding fields. Except for certain generic integration fields, system objects are not updated in outbound messages.

For outbound processing, you can apply processing rules to object structure records only.

Use the following guidelines to apply a rule to an object structure record or to an object:

- For outbound processing, you can apply processing rules to object structure records only.
- For inbound processing, you can apply processing rules to object structure records or to objects.
 - If an inbound rule changes the key field value of an object, apply rules to the object structure record.
 - If an inbound rule does not evaluate or manipulate an object or object set, apply rules to the object structure record.
 - If an inbound rule evaluates or manipulates a user-defined field, apply rules to the object structure record.
 - If an inbound rule evaluates or manipulates an object or object field, apply rules to the object.

Apply all rules for enterprise services to either objects or to object structure records. Avoid applying rules to both objects and object structure records. If you apply processing rules to both object structures and objects, the processing time for inbound transactions increases.

Processing rule definitions

A processing rule performs an action on a field in a record or object, or on the record or object itself. To define a processing rule, in the service or channel used for the transaction, you can specify the record or object to which the rule applies.

- [Processing rule initiation](#)
For an outbound transaction, a business object event on the primary object of an object structure initiates a processing rule. For an inbound transaction, the event that initiates a processing rule is identified by the value of the Action attribute on the primary object of the inbound XML or JSON message.
- [Processing rule actions](#)
A processing rule can act on an enterprise service or a publish channel as a whole. For example, a rule can bypass a message, or it can manipulate the value in a data field within the message.
- [Processing sequence](#)
Processing rules are applied sequentially for each record or object within an object structure, starting with the primary object and moving down to the child objects.

Processing rule initiation

For an outbound transaction, a business object event on the primary object of an object structure initiates a processing rule. For an inbound transaction, the event that initiates a processing rule is identified by the value of the Action attribute on the primary object of the inbound XML or JSON message.

When you configure publish channels and enterprise services, you specify which events to use to initiate each processing rule. You can apply a processing rule to the primary record, a child record, or an object, but the event that initiates the rule must be initiated on the primary object.

You can, for example, implement a Stop rule on the PERSON object that prevents users from changing any attribute on the person record by identifying that the rule applies on update. With this configuration, users can create or delete person records but users cannot update person records.

For outbound transactions, in the Publish Channels application you can configure one or more of the following actions on the primary object to initiate the rule:

- Insert
- Delete
- Update

When an outbound message is generated using the Data Export feature or by a programmatic call to the publish channel, all enabled processing rules are run, regardless of the event settings.

For inbound transactions, in the Enterprise Services application you can configure one or more of the following actions on the primary object to initiate the rule:

- Add
- Change or Replace (equivalent of Update)
- Delete

You can set one of these values as the Action attribute of the primary object for the inbound transaction.

Processing rule actions

A processing rule can act on an enterprise service or a publish channel as a whole. For example, a rule can bypass a message, or it can manipulate the value in a data field within the message.

Three processing rule actions act on a service or channel message: stop, skip, and skip children. Four processing rule actions transform the value in a field within a service or channel message: combine, split, set, and replace.

- [Message processing actions](#)
Message processing actions stop or skip an entire enterprise service or publish channel message, or skip entire records within the message.
- [Field transformation actions](#)
Apply the field transformation rule to a record or object that contains the field to be transformed. A field transformation rule can be applied to a single field or multiple fields in the selected record.

Message processing actions

Message processing actions stop or skip an entire enterprise service or publish channel message, or skip entire records within the message.

Skip action

The skip action bypasses a message that meets specified criteria. When a skip action is applied to an inbound message, the message is not processed and is cleared from the inbound queue. When a skip action is applied to an outbound message, nothing is written to the queue and the message is not sent to an external system. Skip processing does not generate an error, but the system log file is updated with the rule that caused the skip action.

A skip action has some predefined rules. These rules look up integration control values to ensure that outbound messages have a valid status before being sent to the external system.

Stop action

The stop action halts the processing of a message that meets specified criteria. An outbound message is rolled back and an error message is displayed. For inbound transactions, the message remains in the inbound queue. If the error was the result of a synchronous invocation of the enterprise service, the calling program is notified about the error.

Predefined rules are not provided with a stop action. This option is a utility for users to customize the behavior of a service or channel.

When possible, use the skip action rather than the stop action for inbound enterprise services. The stop action results in a processing error and the message remains in the inbound queue or the initiator receives an error response. These results do not occur when you use the skip action.

If a processing rule with a stop action is applied to a publish channel that is generated by the Data Export feature, the stop action is treated as a skip action. If the stop action evaluates as true, the message is skipped.

Skip children action

You can apply the skip children action only to outbound messages in a publish channel. Apply the processing rule on the record or object whose child level records are skipped.

If the person structure has the person object and child objects of phone and email, you can use the skip children action on a person to strip the phone and email data from the message. Use the skip children action when a status change occurs and the external system does not need the accompanying phone and email information.

Skip record action

You can apply the skip record action only to outbound messages in a publish channel. The skip record action deletes a record or object that contains your applied rule. Apply the processing rule on the record or object, and all of child records and objects, that you want to skip.

If the person object structure has a person object and a child object of phone, you can use the skip record action to strip a specific phone record from the message. Use the skip record action, for example, when you want to send the work phone number but not the home phone number for a person. The skip record rule needs a condition that identifies a home phone record to ensure that the record is skipped.

Field transformation actions

Apply the field transformation rule to a record or object that contains the field to be transformed. A field transformation rule can be applied to a single field or multiple fields in the selected record.

Set action

The set action writes a value to a specified data field. When you define the rule, you specify the data to be set and the source of the new value. Indicate whether the rule always writes the new value to the target field or writes the new value only when the field is null (the default action). You can use this action to initialize the value in a data field. If the rule always writes the new value to the target field, any existing value in the field is overwritten.

The source can be one of the following values:

- A value integration control
- A hard-coded value
- A system control (in the MAXVARS database table)
- Another field in the specified record or object
- A field in a related object

Replace action

The replace action replaces a value in a data field with another value. When you define the rule, specify the data field that you want to update. The control that you use must be a cross-reference control. You specify the name of a cross-reference control that contains the original and replacement values for the data field.

Use this action when the database and the external system use different identifiers for the same entity. You can, for example, replace the SITEID value in a publish channel with an external PLANTID value, and replace the external PLANTID value in an enterprise service with the SITEID value.

Combine action

The combine action concatenates values from multiple source fields into a single target field. When you define the rule, identify the target field and the source fields and the sequence in which the source data is to be written. The source data can be a data field or an integration control that contains a data value. You can also specify an integration control that contains the delimiter to separate the segments in the target field.

Use this action in an enterprise service processing rule when a mismatch exists between the system definition and the external system definition of an entity. An enterprise service processing rule can, for example, combine a vendor ID and a vendor location field from an external system into the COMPANY field. A publish channel processing rule can then use the split action to separate the combined field into separate values when data is sent to the external system.

The source and target fields must be in the same object. This action always overwrites the existing value in the target field. Ensure that the source and target fields are alphanumeric fields, or processing errors may occur.

Split action

The split action is the reverse of the combine action. The split action separates the value in one field into multiple fields. When you define the rule, you identify one source field, one or more target fields, and how the rule processor identifies segments of the source field.

The fields can have the following sources:

- A field in the selected record or object
- An integration control that contains the delimiter that separates the segments in the source field

The source and target fields must exist in the same object. This action always overwrites the existing value in the target fields. Ensure that the source and target fields are alphanumeric fields, or processing errors might occur.

If you combined multiple fields in an inbound message, split the combined field into individual fields in the outbound direction. There are two ways to identify how to split the field. You can specify the length of each segment of the source field, or you can identify a delimiter that separates the segments.

If the field length of each segment of source data is constant, the rule processor breaks up the source field from left to right, based on the field length, sequence, and values that you specify. For example, target field A with a character length of 6 holds positions 1-6 of the source field. Target field B with a character length of 3 holds positions 7-9 of the source field.

If the length of the source field segments is variable, but the source field contains a distinct delimiter that identifies the segments, use the separator option. The separator option identifies an integration control that defines the separator. The same separator must delimit all the segments. The rule processor parses the source field from left to right. The processor looks for the delimiter, breaks up the string into multiple values, and moves each value into the designated target field.

Processing sequence

Processing rules are applied sequentially for each record or object within an object structure, starting with the primary object and moving down to the child objects.

If you define multiple processing rules for a single record or object, you can modify the default processing sequence. Your modification is especially important if a rule depends on the successful result of an earlier rule. If a rule with a stop or skip action is successfully applied, no further checking occurs.

Conditions and evaluations

Processing rules are applied conditionally. Any conditions must be met before the processing or action that is specified in the rule can be performed.

Conditions can involve evaluating or comparing XML field data, an object field, an object set, or an integration or system control.

- [Condition specifications](#)
A condition is a grouping of one or more evaluations. Multiple conditions can be specified, and their sequence is identified by the condition number.
- [Evaluation category specifications](#)
Before you define the specifics of an evaluation, select the type of data that must be evaluated.
- [Field to evaluate](#)
For XML field and object field evaluations, you specify the field that you evaluate.
- [Type of evaluation](#)
Evaluations generally involve the comparison of two values or a check for the existence of an object set or a null value.
- [When to evaluate a field](#)
For XML field and object field evaluations, the processing rule first determines whether to evaluate the specified data.
- [Comparison field specifications](#)
The user interface displays subsets depending on the type of evaluation (XML field, object field, object set, or control). If a processing rule uses one of the first eight evaluation types, it must specify the field (comparison field) with which it is making the comparison.

Condition specifications

A condition is a grouping of one or more evaluations. Multiple conditions can be specified, and their sequence is identified by the condition number.

Each evaluation returns a value of true or false. If an evaluation checks whether the values of two fields are equal, for example, it returns a value of true if the fields are equal and a value of false if they are not equal. Conditions also return a value of true or false. If every evaluation within a condition is true, the condition is true. If any evaluation within the condition is false, the condition is false. If a processing rule contains multiple conditions, only one condition must be true for the action that is associated with the processing rule.

Evaluation category specifications

Before you define the specifics of an evaluation, select the type of data that must be evaluated.

The following table describes the categories that you can use in your evaluations.

Category	Use
XML field	Evaluate a value in an integration object record field, or compare the values in two record fields.

Category	Use
Object field	Evaluate the value in an object field, or compare the values in two fields in the related objects. The object field can be part of the object structure definition. The object field can also be part of an object that is accessed in a relationship with an object in the object structure definition.
Object set	Check for the existence of records in a related object.
Control	Evaluate a value or boolean integration control or a system control.

Because enterprise service processing rules are applied before objects are built, the processing rules cannot evaluate object fields or object sets. You can use the following combinations of categories, processing direction (outbound or inbound), and record types (record or object) in your evaluations.

Direction of processing rule	XML field evaluation	Object field evaluation	Object set evaluation	Control evaluation
Outbound	Available	Available	Available	Available
Inbound (record)	Available	Not available	Not available	Available
Inbound (Object)	Available	Available	Available	Available

Field to evaluate

For XML field and object field evaluations, you specify the field that you evaluate.

For an object evaluation, you specify the object and the relationship to access the field. If the field value is a derivative of the object, which matches the record, no relationship is required.

Type of evaluation

Evaluations generally involve the comparison of two values or a check for the existence of an object set or a null value.

The user interface displays a subset of the types depending on the category of evaluation (XML field, object field, object set, or control). The following table lists the possible types of evaluations that you can use.

Type of evaluation	Description
EQUALS	The value in the specified field is equal to the value of a second field (the comparison field).
NOTEQUALS	The value in the specified field is not equal to the value of a second field (the comparison field).
GREATER	The value in the specified field is greater than the value of a second field (the comparison field).
GREATEROREQUAL	The value in the specified field is greater than or equal to the value of a second field (the comparison field).
LESS	The value in the specified field is less than the value of a second field (the comparison field).
LESSOREQUAL	The value in the specified field is less than or equal to the value of a second field (the comparison field).
LIKE	The value contains the expected value.
NOTLIKE	The value does not contain the expected value.
ISNULL	The specified field contains no value or a null value.
ISNOTNULL	The specified field contains a value.
NONE	This option is available only if the When to Evaluate field is configured as Changed or Not Changed. If NONE is selected, no further evaluation is necessary.
EXISTS	Records exist in the specified object set.
NOTEXISTS	No records exist in the specified object set.

When to evaluate a field

For XML field and object field evaluations, the processing rule first determines whether to evaluate the specified data.

The system evaluates the data by checking the Evaluate When field, which can have one of the following values:

Value	Action
CHANGED	The evaluation continues only if the activity that generated the message changes the specified field.
NOT CHANGED	The evaluation continues only if the activity that generated the message does not change the specified field.
ALWAYS	The evaluation continues whether or not the value of the activity that generated the message (default) changes the specified field. If you specify this option, you cannot specify a comparison type of None.

When a record is updated, a changed attribute (changed="1") appears on the corresponding field in the outbound message. This attribute determines whether the field meets the criteria in the Evaluate When field.

This attribute does not appear in messages generated by the Data Export feature. Evaluations that are applied when a value has changed, might not provide the right output in a data export scenario.

The changed attribute does not apply to inbound messages.

Comparison field specifications

The user interface displays subsets depending on the type of evaluation (XML field, object field, object set, or control). If a processing rule uses one of the first eight evaluation types, it must specify the field (comparison field) with which it is making the comparison.

The following table lists the possible types of comparison fields that you can use in the field comparisons. Comparison of an alphanumeric source field is case sensitive.

Field	Use
Integration control	Compare the value in the specified field with the values in a list or value integration control. If a list control has multiple matching values, the evaluation is true. The true evaluation occurs only if the field value matches any one of the values in the list control. Example: Validate the STATUS of a purchase order. The current value in a STATUS field is WAPPR and the possible acceptable values that satisfy the condition are in a list control called POSEND. The values in POSEND are WAPPR, APPR, and CLOSE. If the evaluation type is EQUALS, the evaluation returns a true value.
Value	Compare the value in the specified field with a predefined value. This option is available for user-defined conditions. Regardless of the locale setting of the application server or the database, all decimal fields must use a period (.) as the decimal placeholder. Numbers to the left of the placeholder are not formatted. This format applies to inbound and outbound data. For example, \$1,738,593.64 must be in the following format: 1738593.64. Example: A processing rule compares the value of the POLIN1 field with the value SPARE. If the evaluation type is EQUALS and the two values are the same, the evaluation returns a true value.
MAXVAR	Compare the value in the specified field with the value in a system control (a value in the MAXVARS database table). Example: Evaluate the OWNERSYSID on any enterprise service or a publish channel to determine if it is the same as MAXVARS.MXSYSID.
Boolean	Compare the value in the specified field with a Boolean value (true or false).
Comparison field	Compare the value in the specified field with another field in the same object. Example: Compare the GLDEBITACCT value and GLCREDITACCT value on a PO line or a journal entry to determine if they are equal.
Object, relationship, and field	Compare the value in the specified field with a field in a different object. Example: Check the OWNERSYSID of inventory in the system for the item-storeroom values on a receipt line or a PO Line.

Integration controls

Integration controls give you the ability to configure the behavior of any enterprise service or publish channel according to the requirements of individual organizations and sites. Processing rules and Java™ classes can access integration controls for evaluation purposes.

Integration controls are defined at the system level. You can assign controls to one or more enterprise services or publish channels. The control values can be configured at the external system level. Two external systems that process the same enterprise service can share the same processing logic, class files, and processing rules, yet they process the data differently because they use different control settings.

- [Control levels](#)
All master data and documents are stored at the system level, organization level, or site level. Item data is stored at the system level, accounting information at the organization level, and work orders at the site level. An implied hierarchy exists among these levels.
- [Control types](#)
You can create four types of integration controls to meet your business needs.
- [New controls](#)
Modifying control values at the external system level is generally sufficient to customize predefined enterprise service or publish channel processing. If new business rules are implemented or a new publish channel and enterprise service is implemented, a new control might be needed.

Control levels

All master data and documents are stored at the system level, organization level, or site level. Item data is stored at the system level, accounting information at the organization level, and work orders at the site level. An implied hierarchy exists among these levels.

An integration control can be configured to override values at any of the following levels:

Control value	Description
System-level	A system-level value applies to all system organizations and sites. If the control is not configured for organization-level or site-level values, system processing uses the system default. If the control is configured for organization-level values, or site-level values but none exists for a particular organization or site, system processing uses the system-level value.
Organization-level	An organization-level value applies to all system sites within an organization. If a control is configured for organization-level values but none exists for a particular organization, system processing uses the system-level value.
Site-level	A site-level value applies to a specific site within a system organization. If a control is configured for site-level values but none exists for a particular site, system processing uses the organization value (if one exists) or the system-level value.

Data that is processed by enterprise services or publish channels that use a control with an organization or site override must be at the organization or site level.

Control types

You can create four types of integration controls to meet your business needs.

Boolean controls

A boolean integration control specifies a value of 0 (false) or 1 (true).

List controls

A list integration control contains a list of values. You can enter multiple values for the control and optionally assign a system domain to the control. Assigning a domain ensures the validation of any value that is entered for that control, at any level. If a domain is not assigned, there is no validation of the values that are entered.

For example, work orders are sent to an external system only if the status of the work order is APPR (approved) or COMPLETE. To determine whether to send the work order, the Java™ code or the processing rule can check the status of a work order against a list control that contains these two values.

Value controls

A value integration control contains a single value. You can enter a single value for the control and optionally assign a system domain to the control.

Cross-reference controls

A cross-reference control replaces one value with another. In a publish channel, a system value is converted to an external system value. In an enterprise service, an external system value is converted to a system value. You can optionally assign a system domain to a cross-reference control. If a domain is specified, any system value that is specified for the control is validated against that domain. If a domain is not assigned, there is no validation of the values that are entered.

Cross-reference controls must have a one-to-one mapping between the system value and the external system value. If two system values are associated with an external system value, or two external system values with a system value, a processing error occurs.

If you create the cross-reference control to function as a multiplication control on an enterprise service, one-to-many mappings can exist. A multiplication control is a cross-reference control that copies, or multiples, an inbound message for multiple organizations or sites. A multiplication control has one external value and multiple system values.

Multiplication controls are always specific to the external system. You identify the control as a multiplication control on the Enterprise Service tab in the Enterprise Services application.

For example, the system sites correspond to external system business units, but the two systems use different values for these entities. A cross-reference control can perform the translation between the two values. A cross-reference control in an enterprise service can translate business unit EX001 to system site MX001. In a publish channel, the same control can translate MX001 to EX001.

Multiplication controls

A multiplication control can update the company in every organization in the system database. For example, use a multiplication control to update the company in every organization within the system. Value updates occur when the system receives company data using an enterprise service.

New controls

Modifying control values at the external system level is generally sufficient to customize predefined enterprise service or publish channel processing. If new business rules are implemented or a new publish channel and enterprise service is implemented, a new control might be needed.

Use the following guidelines when you create new controls:

- Control names must be unique.
- To use the controls as part of a processing rule, and to set a value at the external system level, associate controls with a publish channel or enterprise service.
- When you associate a publish channel or enterprise service with an external system, all associated controls are copied to the external system level. You can assign values at the external system level.

Configuring processing rules

You can configure processing rules for an object structure in the Publish Channels application or in the Enterprise Services application.

- [Defining integration control or system control evaluations](#)
You can use a control evaluation to compare a value in a specified field with the value in an integration control. You can also use a control evaluation to compare the value in a specified field with a system control value (a MAXVARS value).
- [Defining processing rules](#)
You can define a processing rule to perform custom enterprise service and publish channel processing. When you use a processing rule, you can perform custom inbound and outbound processing without using a Java class.
- [Adding controls](#)
Integration controls are used to configure the behavior of any enterprise service or publish channel according to the requirements of individual organizations and sites. Control types include Boolean controls, cross-reference controls, list controls, and value controls.

- [Associating integration controls with enterprise services or publish channels](#)

You can associate integration controls with a publish channel or an enterprise service to make the control available for inbound and outbound message processing. A publish channel or an enterprise service can have an association with one or more integration controls.

- [Managing data in sub-record fields](#)

As part of an integration, you can work with the values in a single source data field to set the value, combine the value, split the value, or replace the value.

Defining integration control or system control evaluations

You can use a control evaluation to compare a value in a specified field with the value in an integration control. You can also use a control evaluation to compare the value in a specified field with a system control value (a MAXVARS value).

About this task

If you evaluate an integration control, it must be a Boolean or Value type control.

Procedure

1. In the Enterprise Services or Publish Channels application, display the service or channel record to which the evaluation applies.
2. On the Object Structure Sub-Records table window, select the object structure to which the evaluation applies.
3. Perform one of the following actions:
 - For an enterprise service, click Add/Modify Conditions on the Object Structure Processing Rules tab or the Object Processing Rules tab.
 - For a publish channel, click Add/Modify Conditions on the Processing Rules for Sub-Record table window.
4. On the Conditions table window, click New Row.
5. In the Conditions field, enter a value.
The condition value determines the order in which the integration framework evaluates the conditions.
6. To compare the control value with a field value, select a one of the following radio buttons and enter values in the appropriate fields.
 - Integration Control
 - MAXVAR
7. Enter values in the following fields:

Option	Description
Evaluation Type	Defines the type of evaluation that is carried out on the XML field.
Value	The value that is used in the control evaluation.

8. Click OK.

- [Defining object field evaluations](#)

You can use an object field evaluation to evaluate the value of a field in any object that is included in the definition of an object structure. You can also evaluate other business objects that can be accessed by using a WHERE clause.

- [Defining object set evaluations](#)

You use an object set evaluation to determine whether records exist in a relationship between two business objects. If the relationship returns a business object set, the evaluation returns a true result.

- [Defining XML field evaluations](#)

You can use an XML field evaluation to evaluate a value in an object structure sub-record. When you use an XML field evaluation, you can check whether a field is null, and compare values in a business object field with an integration control, a system value, or a predefined value.

Defining object field evaluations

You can use an object field evaluation to evaluate the value of a field in any object that is included in the definition of an object structure. You can also evaluate other business objects that can be accessed by using a WHERE clause.

About this task

Regardless of the locale setting of the application server or the database, all decimal fields must use a period (.) as the decimal placeholder. There is no formatting of numbers to the left of the placeholder. This format applies to inbound and outbound data. For example, \$1,738,593.64 must be 1738593.64.

You can use an object field evaluation to perform the following evaluations:

- Check if the field is null or not null
- Compare the value in the object field with the value of an integration control or a system control
- Compare the value in the object field with predefined value

If the data does not satisfy the comparison, the evaluation returns a false result. If the data satisfies the comparison, the evaluation returns a true result.

Procedure

1. In the Publish Channels application, display the channel record to which the evaluation applies.
2. In the Object Structure Sub-Records table window, select the object structure to which the evaluation applies.
3. In the Processing Rules for Sub-Record table window, click Add/Modify Conditions.
4. On the Conditions table window, click New Row.
5. In the Conditions field, enter a value.

The condition value determines the order in which the integration framework evaluates the conditions.

6. On the Object Field tab, click New Row.
7. Enter values in the following fields:

Option	Description
Object	The business object that contains the field that is evaluated.
Object Relationship	The relationship between the defined business object and the rule business object.
Field	The business object field that is evaluated.
Evaluation Type	The type of evaluation that is carried out on the business object field.
Evaluate When	How often the evaluation is performed.

Enter a business object value only if it is not the in the business object on which the rule is created.

8. To compare the value of the business object field with another value, select a one of the following radio buttons and enter values in the appropriate field.
 - Integration Control
 - Value
 - MAXVAR
9. Click OK.
10. Click Save Publish Channel.

Defining object set evaluations

You use an object set evaluation to determine whether records exist in a relationship between two business objects. If the relationship returns an business object set, the evaluation returns a true result.

Procedure

1. In the Publish Channels application, display the channel record to which the evaluation applies.
2. In the Object Structure Sub-Records table window, select the object structure to which the evaluation applies.
3. In the Processing Rules for Sub-Record table window, click Add/Modify Conditions.
4. On the Conditions table window, click New Row.
5. In the Conditions field, enter a value.

The condition value determines the order in which the integration framework evaluates the conditions.

6. On the Object Set tab, click New Row.
7. Enter values in the following fields:

Option	Description
Object	The business object that contains the field that is evaluated.
Object Relationship	The relationship between the defined business object and the rule business object.
Evaluation Type	The type of evaluation that is carried out on the business object field.

8. Click OK.
9. Click Save Publish Channel.

Defining XML field evaluations

You can use an XML field evaluation to evaluate a value in an object structure sub-record. When you use an XML field evaluation, you can check whether a field is null, and compare values in a business object field with an integration control, a system value, or a predefined value.

Procedure

1. In the Enterprise Services or Publish Channels application, display the service or channel record to which the evaluation applies.
2. In the Object Structure Sub-Records table window, select the object structure to which the evaluation applies.
3. Perform one of the following actions:
 - For an enterprise service, click Add/Modify Conditions on the Object Structure Processing Rules tab or the Object Processing Rules tab.
 - For a publish channel, click Add/Modify Conditions on the Processing Rules for Sub-Record table window.
4. In the Conditions table window, insert a row.
5. Optional: In the Conditions field, enter a value.

The condition value determines the order in which the integration framework evaluates the conditions.

6. In the XML Field tab, insert a row.
7. Enter values in the following fields:

Option	Description
Field	The XML field that is evaluated.
Evaluation Type	The type of evaluation that is carried out on the XML field.
Evaluate When	How often the evaluation is performed.

8. To compare the value of the XML field with another value, select a one of the following radio buttons and enter values in the appropriate field.
 - Integration Control
 - Value
 - MAXVAR
 - Comparison Field
9. Click OK.

Defining processing rules

You can define a processing rule to perform custom enterprise service and publish channel processing. When you use a processing rule, you can perform custom inbound and outbound processing without using a Java™ class.

Before you begin

Before you create a processing rule, you must consider defining:

- Whether an enterprise service or a publish channel rule evaluates an XML field or a business object field.
- The sub-record or business object on which the rule is defined.
- The actions that trigger the rule.

Procedure

1. In the Enterprise Services or Publish Channels application, display the service or channel to which the rule applies.
 2. In the Object Structure Sub-Records table window, select the object structure sub-record to which the rule applies.
 3. For an enterprise service, perform one of the following actions:
 - On the Object Structure Processing Rules tab, click New Row to define an inbound processing rule on an object structure.
 - On the Object Processing Rules tab, click New Row to define an inbound processing rule on a business object.
 4. For a publish channel, click New Row to define an outbound processing rule on a business object.
 5. In the Rule field, enter a rule identifier.
 6. In the Action field, enter a value.
 7. To change the order in which the application applies the processing rules for an object, change the value in the Sequence field.
The integration framework applies the rules sequentially starting with the primary-level object.
 8. To specify when the processing rule is applied, select one or more of the following options:
 - Select or clear the Apply on Primary Object Insert check box.
 - Select or clear the Apply on Primary Object Update check box.
 - Select or clear the Apply on Primary Object Delete check box.
 9. Save your changes.
- [Enabling processing rules](#)
You must enable a processing rule before the rule can be applied to enterprise service or publish channel objects. An enabled processing rule indicates that it is ready to perform custom inbound and outbound processing.

Enabling processing rules

You must enable a processing rule before the rule can be applied to enterprise service or publish channel objects. An enabled processing rule indicates that it is ready to perform custom inbound and outbound processing.

About this task

If you disable a predefined processing rule, it can cause integration framework processing errors.

Procedure

1. In the Enterprise Services or Publish Channel application, display the service or channel that contains the processing rule that you want to enable.
2. In the Object Structure Sub-Records table window, select the object to which the rule applies.
3. Specify whether you want the processing rule to be enabled or disabled.
For the enterprise service, you can enable or disable the processing rule on the Object Structure Processing Rules or Object Processing Rules tab. For the publish channel, you can enable or disable the processing rule on the Processing Rules for Sub-Record tab.
4. Save your changes.

Adding controls

Integration controls are used to configure the behavior of any enterprise service or publish channel according to the requirements of individual organizations and sites. Control types include Boolean controls, cross-reference controls, list controls, and value controls.

- [Adding Boolean controls](#)
You can add a Boolean type control when you need an integration control that specifies a value of true or false. An enterprise service or a publish channel can use this Boolean control in its processing rule evaluations. The true or false value that you assign to the control determines whether an enterprise service or a publish channel applies a processing rule on a transaction.
- [Adding cross-reference controls](#)
You add a cross-reference type control when you need an integration control to replace one value with another. You can replace a value in inbound or outbound messages and across multiple organizations or sites. A cross-reference control can perform the translation between a value in the asset management system and a value in the external system.

- [Adding list controls](#)

You create a list type integration control when you need a control that contains a list of values. A publish channel or an enterprise service can use this list control in its processing rule evaluations. The rule could skip the processing of the transaction when the data field value does not match any of the defined list control values.

- [Adding value controls](#)

You can create a value type integration control when you need a control that contains a single value. A publish channel or an enterprise service can use this value control in its processing rule evaluations. The rule could skip the processing of the transaction when the data field value does not match the defined control value.

Adding Boolean controls

You can add a Boolean type control when you need an integration control that specifies a value of true or false. An enterprise service or a publish channel can use this Boolean control in its processing rule evaluations. The true or false value that you assign to the control determines whether an enterprise service or a publish channel applies a processing rule on a transaction.

Procedure

1. In the Enterprise Services or the Publish Channels application, select the Create Integration Controls action.
2. Click Add New Control > Add New Boolean Control.
3. Specify an identifier and description for the Boolean control.
4. Specify whether you want the Boolean control to have a default value of true or false.

Option	Default True
True value	Selected
False value	Cleared

5. Click OK to close the Boolean Control dialog box.
6. Click OK to close the Create Integration Controls dialog box.

Example

You can use a Boolean control to indicate whether enterprise services or publish channels receive or send purchase order transactions. You can set a processing rule action on the enterprise services or publish channel to skip a transaction. If the default value that you assign to the Boolean control is true, and the processing rule evaluation is true, the enterprise services or publish channel receives and sends purchase order transaction updates.

What to do next

You can associate an integration control with an enterprise service or a publish channel in the Enterprise Services or Publish Channels application. This association makes the integration control available for inbound and outbound message processing. You can also associate an integration control to an external system in the External Systems application. The value that you define on the control at the external level overwrites the control value that is defined at the enterprise service or publish channel level.

Adding cross-reference controls

You add a cross-reference type control when you need an integration control to replace one value with another. You can replace a value in inbound or outbound messages and across multiple organizations or sites. A cross-reference control can perform the translation between a value in the asset management system and a value in the external system.

About this task

A publish channel uses a cross-reference control to convert an outbound asset management system value to an external system value. An enterprise service uses a cross-reference control to convert an inbound external system value to an asset management system value. If you use synonyms, enter the external value as the control value, not the internal application value. You must use a period (.) as the decimal placeholder when you enter decimals as a control value. The numbers to the left of the placeholder are not converted. For example, \$1,738,593.64 must be 1738593.64.

Procedure

1. In the Enterprise Services or Publish Channels application, select the Create Integration Controls action.
2. Click Add New Control > Add New XRef Control.
3. Enter values in the following fields:

Option	Description
Integration Control	The identifier for the cross-reference control.
Domain	The domain that is used to check the values that are entered for the integration control.

4. In the Values table window, insert a row.
5. Enter values in the following fields:

Option	Description
Default Value	The value that is converted to or from an external system value.
Default External Value	The external system value that is converted to or from the default value.

6. Click **OK** to close the Cross-Reference Control dialog box.
7. Click **OK** to close the Create Integration Controls dialog box.

Example

The asset management system sites correspond to external system business units, but two external systems use different values for these entities. A cross-reference control can perform the translation between the two mismatched values and the asset management system value.

A cross-reference control in an enterprise service can translate the external system site value `EX001` to an asset management system site value `MX001`.

What to do next

You can associate an integration control with an enterprise service or a publish channel in the Enterprise Services or Publish Channels application. This association makes the integration control available for inbound and outbound message processing. You can also associate an integration control with an external system in the External Systems application. The value that you define on the control at the external level overwrites the control value that is defined at the enterprise service or publish channel level.

Adding list controls

You create a list type integration control when you need a control that contains a list of values. A publish channel or an enterprise service can use this list control in its processing rule evaluations. The rule could skip the processing of the transaction when the data field value does not match any of the defined list control values.

About this task

You must use a period (.) as the decimal placeholder when you enter decimals as a control value. The numbers to the left of the placeholder are not converted. For example, \$1,738,593.64 must be 1738593.64.

Procedure

1. In the Enterprise Services or the Publish Channels application, on the Select Action menu, select Create Integration Controls.
2. Click Add New Control > Add New List Control.
3. Enter values in the following fields:

Option	Description
Integration Control	The identifier for the list control.
Domain	The domain that is used to check the values that are entered for the integration control.

4. In the Values table window, click New Row.
5. In the Default Value field, enter a value for evaluation.
6. Click OK to close the List Control dialog box.
7. Click OK to close the Create Integration Controls dialog box.

Example

Work orders are sent to an external system only if the status of the work order is `APPR` (approved) or `COMPLETE`. The processing rule can check the status of a work order against a list control that contains these two status values. If the status of a work order does not match the two list control values, the work order transaction is not sent to the external system.

What to do next

You can associate an integration control with an enterprise service or a publish channel in the Enterprise Services or Publish Channels application. These associations make the integration controls available for inbound and outbound message processing. You can also associate an integration control to an external system in the External Systems application. The value that you define on the control at the external level overwrites the control value that is defined at the enterprise service or publish channel level.

Adding value controls

You can create a value type integration control when you need a control that contains a single value. A publish channel or an enterprise service can use this value control in its processing rule evaluations. The rule could skip the processing of the transaction when the data field value does not match the defined control value.

About this task

You can provide a default control value and assign a domain to the control to ensure the validation of any value that you enter for that control.

Procedure

1. From the Select Action menu in the Enterprise Services or the Publish Channels application, select Create Integration Controls.
2. Click Add New Control > Add New Value Control.

- Enter values in the following fields:

Option	Description
Integration Control	The identifier for the value control.
Domain	The domain that is used to check the values that are entered for the integration control.
Default Value	The default value for the integration control.

- Click OK to close the Value Control dialog box.
- Click OK to close the Create Integration Controls dialog box.

Example

Purchase orders are received by the asset management system only if the company type value is EX. To determine whether the purchase order is received, the processing rule can check the value of the company type against the value that is defined in the control. If the EX company value does not match the value contained in the control, the purchase order transaction is not sent to the asset management system.

What to do next

You can associate an integration control with an enterprise service or a publish channel in the Enterprise Services or Publish Channels application. These associations make the integration controls available for inbound and outbound message processing. You can also set an integration control on an external system in the External Systems application. The value that you define on the control at the external system level overwrites the control value that is defined at the enterprise service or publish channel level.

Associating integration controls with enterprise services or publish channels

You can associate integration controls with a publish channel or an enterprise service to make the control available for inbound and outbound message processing. A publish channel or an enterprise service can have an association with one or more integration controls.

About this task

When you associate an integration control with a publish channel or an enterprise service, you can override the predefined values of the controls that are set at the service or channel level. You can define integration controls globally and configure the controls for each external system, according to the requirements of individual organizations and sites.

Procedure

- In the Enterprise Services or Publish Channels application, display the service or channel for which you want to associate an integration control.
- Select the Associate Integration Controls action.
- Perform one of the following actions:

Option	Description
Select integration controls individually	<ol style="list-style-type: none"> Click New Row. In the Integration Control field, enter a control value.
Select multiple integration controls	<ol style="list-style-type: none"> Click Select Controls. Select the appropriate controls. Click OK.

- Click OK to close the Associate Integration Controls dialog box.

Managing data in sub-record fields

As part of an integration, you can work with the values in a single source data field to set the value, combine the value, split the value, or replace the value.

- Setting sub-record field values**
You can assign a value to a specified data field to overwrite the existing value in the data field. You can indicate whether a value is always assigned or only assigned when the target data field is null.
- Combining sub-record field values**
You can combine the values in two or more source data fields or integration controls into a single target data field. You can combine values when mismatches occur between an asset management system value and the external system value. For example, a two-part external system key can map to a single part key in the asset management system.
- Splitting sub-record field values**
You can split the value in a single source data field into multiple target fields. You can split values when mismatches occur between an asset management system value and the external system value. For example, a single part asset management system key can map to a two-part key in the external system.
- Replacing sub-record field values**
You can replace a value in a data field with another value. You can replace a value when the external system and the asset management system have different identifiers for the same entity. For example, a plant identifier of an external system can be translated to an asset management system site identifier.

Setting sub-record field values

You can assign a value to a specified data field to overwrite the existing value in the data field. You can indicate whether a value is always assigned or only assigned when the target data field is null.

Before you begin

You must create a processing rule that contains a set action before you can set sub-record field values.

Procedure

1. In the Enterprise Services or Publish Channels application, display the service or channel record to which the sub-record field set action applies.
2. On the Enterprise Services or Publish Channels tab, select the processing rule to which the sub-record field set action applies.
3. Perform one of the following actions:
 - For an enterprise service, click Sub-Record Fields on the Object Structure Processing Rules tab or the Object Processing Rules tab.
 - For a publish channel, click Sub-Record Fields on the Processing Rules for Sub-Record table window.
4. Click New Row.
5. In the Field field, enter the name of the target data field.
This value defines the field that you want to replace.
6. Specify whether a value is always assigned or only assigned when the target data field is null.

Option	Replace When Null
Assign when data field is null	Selected
Always assign	Cleared

7. To specify the source field, select a one of the following radio buttons and enter values in the appropriate fields:
 - Integration Control
 - MAXVAR
 - Field
 - Object
8. Click OK.

Combining sub-record field values

You can combine the values in two or more source data fields or integration controls into a single target data field. You can combine values when mismatches occur between an asset management system value and the external system value. For example, a two-part external system key can map to a single part key in the asset management system.

Before you begin

You must create a processing rule that contains a combine action before you can combine sub-record field values.

About this task

The source and target fields must be in the same object. This action always overwrites the existing value in the target field. Ensure that the source and target fields are alphanumeric fields, or processing errors may occur.

Procedure

1. In the Enterprise Services or Publish Channels application, display the service or channel record to which the sub-record field combine action applies.
2. On the Enterprise Services or Publish Channels tab, select the processing rule to which the sub-record field combine action applies.
3. Perform one of the following actions:
 - For an enterprise service, click Sub-Record Fields on the Object Structure Processing Rules tab or the Object Processing Rules tab.
 - For a publish channel, click Sub-Record Fields on the Processing Rules for Sub-Record table window.
4. In the Target Sub-Record Fields table window, perform one of the following actions:

Option	Description
Select target fields individually	<ol style="list-style-type: none"> a. Click New Row. b. In the Field field, enter a target data field. c. In the Separator Integration Control field, enter a delimiter value that separates the segments in the target field.
Select multiple target fields at one time	<ol style="list-style-type: none"> a. Click Select Field. b. Select the appropriate fields. c. Click OK. d. In the Separator Integration Control field, enter a delimiter value that separates the segments in the target field.

5. In the Source Sub-Record Fields for Target table window, perform one of the following actions:

Option	Description
Select source fields individually	<ol style="list-style-type: none"> a. Click New Row. b. Select a one of the following radio buttons and enter values in the appropriate fields: <ul style="list-style-type: none"> • Field • Integration Control c. Enter a value in the Sequence field to define the order in which the application move segments of the source field to the target fields.

Option	Description
Select multiple source fields at one time	a. Click Select Field. b. Select the appropriate fields. c. Click OK. d. Enter a value in the Sequence field to define the order in which the application move segments of the source field to the target fields.

6. Click OK.

Splitting sub-record field values

You can split the value in a single source data field into multiple target fields. You can split values when mismatches occur between an asset management system value and the external system value. For example, a single part asset management system key can map to a two-part key in the external system.

Before you begin

You must create a processing rule that contains a spit action before you can split sub-record field values.

Procedure

1. In the Enterprise Services or Publish Channels application, display the service orchannel record to which the sub-record field split action applies.
2. On the Enterprise Services or Publish Channels tab, select the processing rule to which the sub-record field split action applies.
3. Perform one of the following actions:
 - For an enterprise service, click Sub-Record Fields on the Object Structure Processing Rules tab or the Object Processing Rules tab.
 - For a publish channel, click Sub-Record Fields on the Processing Rules for Sub-Record table window.
4. In the Target Sub-Record Fields table window, perform one of the following actions:

Option	Description
Select target fields individually	a. Click New Row. b. In the Field field, enter a target data field. c. In the Separator Integration Control field, enter a delimiter value that separates the segments in the target field.
Select multiple target fields at one time	a. Click Select Field. b. Select the appropriate fields. c. Click OK. d. In the Separator Integration Control field, enter a delimiter value that separates the segments in the target field.

5. In the Target Sub-Record Fields for Source table window, perform one of the following actions:

Option	Description
Select source fields individually	a. Click New Row. b. In the Field field, enter the name of the target field that receives the first or next segment of the source data. c. If you did not specify a value in the Separator Integration Controlfield, enter a number in the Field Lengthfield. d. Enter a value in the Sequence field to define the order in which the application move segments of the source field to the target fields.
Select multiple source fields at one time	a. Click Select Field. b. Select the appropriate fields. c. Click OK. d. If you did not specify a value in the Separator Integration Controlfield, enter a number in the Field Lengthfield. e. Enter a value in the Sequence field to define the order in which the application move segments of the source field to the target fields.

6. Click OK.

Replacing sub-record field values

You can replace a value in a data field with another value. You can replace a value when the external system and the asset management system have different identifiers for the same entity. For example, a plant identifier of an external system can be translated to an asset management system site identifier.

Before you begin

You must create a processing rule that contains a replace action before you can replace sub-record field values. You must also create a cross-reference control that contains the original and new values for the data field.

Procedure

1. In the Enterprise Services or Publish Channels application, display the service or channel record to which the sub-record field replace action applies.
2. On the Enterprise Services or Publish Channels tab, select the processing rule to which the sub-record field replace action applies.
3. Perform one of the following actions:
 - For an enterprise service, click Sub-Record Fields on the Object Structure Processing Rules tab or the Object Processing Rules tab.
 - For a publish channel, click Sub-Record Fields on the Processing Rules for Sub-Record table window.

4. Click New Row.
5. In the Field field, enter the name of the target data field.
This value defines the field that you want to replace. The target field must be in the sub-record object shown at the top of the dialog box.
6. In the Integration Control field, enter the name of the cross-reference type control that contains the original and new values for the target field.
7. Click OK.

Code-based customization

The integration framework provides placeholders in transaction flows where you can insert your own code to provide logic that customizes transaction processing. You can insert Java™ classes or automation scripts at selected points in the processing of object structures, publish channels, enterprise services, and invocation channels. You can also use XSL maps to transform messages.

When you create or update a Java class file, you must rebuild and redeploy the application EAR file before integration components can use it. You can write a script in one of the supported scripting languages in the Automation Scripts application, or you can import a script that you created externally, and you can activate it for immediate use. When you create or update an XSL map, you can either store it in the application EAR file or in a directory on your file system.

When the customization code is configured for use, the integration framework calls the code at the appropriate point during transaction processing.

You can download sample Java classes or XSL files from the IBM® Tivoli® Open Process Automation Library (OPAL).

- [Customization Java classes and methods](#)
You can extend the standard processing of outbound and inbound messages by using Java classes. Multiple placeholders exist in message processing flows where you can insert custom Java code to affect message content or processing or both.
- [Customization with automation scripts](#)
You can use automation scripts in place of Java classes to extend the main Java processing classes for predefined integration components. You can use automation scripts to apply custom logic at various points during the processing of object structures, publish channels, enterprise services, and invocation channels.
- [XSL mapping](#)
For outbound transactions, you can implement an XSL file to manipulate the data that is sent to the external system after Java exit processing is completed. For inbound transactions, you can implement an XSL file to manipulate the data to be set to the object structure after Java exit processing is completed.
- [Interface table user exit class](#)
When you use interface tables to receive messages from an external system, you can perform customization in the polling program that retrieves the data from the interface table and sends data to the system.

Customization Java classes and methods

You can extend the standard processing of outbound and inbound messages by using Java™ classes. Multiple placeholders exist in message processing flows where you can insert custom Java code to affect message content or processing or both.

- [External exit classes](#)
External exit classes provide a base class, ExternalExit, that you can extend to customize publish channel, enterprise service, and invocation channel processing.
- [User exit classes](#)
For inbound and outbound transactions on a publish channel, an enterprise service, or an invocation channel, a user exit class can have a preprocessor method and a postprocessor method. For inbound transactions, the user exit class can have an extra method that processes business objects just before they are committed to the database.
- [Event filter classes](#)
For outbound asynchronous transactions that use publish channels, you can run a custom Java class or an automation script by using an event filter class. The processing for an event filter class occurs before the serialization of data in the object structure layer for an outbound message. The event filter class can insert logic that affects the creation of the integration message at this processing point.
- [Handler exit classes](#)
Multiple predefined methods, or handlers, are provided so that you can send data to an external system, including HTTP, an enterprise Java bean call, and interface tables. Some of these methods have user exit placeholders that are available for customization.

External exit classes

External exit classes provide a base class, ExternalExit, that you can extend to customize publish channel, enterprise service, and invocation channel processing.

For outbound messages, the input to the external exit class is the irData element of the XML message. The output of the class processing is the erData element of the XML message that is delivered to the target destination. For inbound messages, the input to the external exit class is the erData element of the inbound message. The output is the irData element that is delivered to the related object structure for processing into Maximo® Manage.

To use an external exit class for customization, specify your Java™ class in the Processing Class field in the Publish Channels application or in the Invocation Channels application.

An alternative approach to integration customization is to implement a user exit class. If an adapter for Oracle or SAP is installed, predefined processing classes are provided, and customizations must be done by using the user exit class. When no predefined processing classes exist, you can choose whether to implement custom code in the external exit class or the user exit class.

User exit classes

For inbound and outbound transactions on a publish channel, an enterprise service, or an invocation channel, a user exit class can have a preprocessor method and a postprocessor method. For inbound transactions, the user exit class can have an extra method that processes business objects just before they are committed to the database.

- [Preprocessing method for outbound transactions](#)
The input to the first outbound user exit point is the XML that is generated by the object structure. If you have an ERP adapter processing class, you can use either the preprocessing method or postprocessing method to implement your custom logic, depending upon your requirement.
- [Postprocessing method for outbound transactions](#)
In the postprocessing method of the user exit, the IR element from the object structure and the ER element from the XML output of the processing class are both available for processing.
- [Preprocessing method for inbound transactions](#)
In the preprocessing method for inbound transactions, the input is the XML message that is delivered from the external system. If necessary, you can change data in the message to affect the processing logic in the processing class.
- [Postprocessing method for inbound transactions](#)
In the postprocessing method for inbound transactions, both the IR records and ER records are available for processing.
- [Business object processing on inbound transactions](#)
The user exit class on an enterprise service has an additional method, setUserMboIn, that enables custom processing at the point when the business objects are created from object structure XML, but are not yet saved to the database.

Preprocessing method for outbound transactions

The input to the first outbound user exit point is the XML that is generated by the object structure. If you have an ERP adapter processing class, you can use either the preprocessing method or postprocessing method to implement your custom logic, depending upon your requirement.

By using the preprocessing exit point, you can change data in the message which later alters the processing logic of a processing class when it is implemented.

Outbound message customization can be done in the preprocessor method, by using the following method:

```
public StructureData setUserValueOut(StructureData irData)
```

This method can perform the following processing:

- Validate data.
- Change system data by changing the IR record that is sent to the external system.
- Stop the message from being sent out of Maximo® Manage by throwing a system exception. The entire message is rolled back. If the message is initiated by an event, the entire message is also rolled back, including any changes that you make in an application.
- Stop the message from being sent to the external system by throwing a SKIP_TRANSACTION exception.
- Log the transaction.

Postprocessing method for outbound transactions

In the postprocessing method of the user exit, the IR element from the object structure and the ER element from the XML output of the processing class are both available for processing.

Use the following method to customize outbound messages.

```
public StructureData setUserValueOut(StructureData irData, StructureData erData)
```

The method can perform the following processes:

- Validate data.
- Change data by changing the ER record that is sent to the external system.
- Map additional data from the irData element to the erData element.
- Stop the transaction from being sent out of Maximo® Manage by throwing a system exception. The entire message is rolled back. If the message is initiated by an event, the entire message is also rolled back, including any changes that you make in an application.
- Stop the message from being sent to the external system by throwing a SKIP_TRANSACTION exception.
- Log the transaction.

You identify the publish channel user exit class in the Publish Channels application.

Preprocessing method for inbound transactions

In the preprocessing method for inbound transactions, the input is the XML message that is delivered from the external system. If necessary, you can change data in the message to affect the processing logic in the processing class.

Inbound transaction customization can be done in the first exit by using the following method:

```
public StructureData setUserValueIn(StructureData erData)
```

This method can perform the following processing:

- Validate data.
- Change external data by changing the ER record before it is mapped to the IR record and saved in the system.
- Stop further processing of the transaction by throwing an exception. For queue-based messages, the transaction remains in the queue to be reprocessed. For messages that are not queue-based, the messages are returned to the client that started the enterprise service.
- Stop the message from being processed into Maximo® Manage by throwing a SKIP_TRANSACTION exception. In this case, the message is not saved in the system. For queue-based messages, the message is removed from the queue.
- Log the transaction.

Postprocessing method for inbound transactions

In the postprocessing method for inbound transactions, both the IR records and ER records are available for processing.

Inbound transaction customization can be done in the postprocessing flow by using the following method:

```
public StructureData setUserValueIn(StructureData irData, StructureData erData)
```

The method can perform the following processes:

- Validate data.
- Change external data by changing IR record to be saved in the system.
- Map additional data from the ER record to the IR record.
- Stop further processing of the transaction by throwing an exception. For queue-based messages, the transaction remains in the queue for reprocessing. For messages that are not queue-based, the messages are returned to the client that started the enterprise service.
- Stop the message from being processed into Maximo® Manage by throwing a skip_transaction exception. In this case, the message is not saved in the system. For queue-based messages, the message is removed from the queue.
- Log the transaction.

You identify the enterprise service user exit class in the Enterprise Services application.

Business object processing on inbound transactions

The user exit class on an enterprise service has an additional method, setUserMboIn, that enables custom processing at the point when the business objects are created from object structure XML, but are not yet saved to the database.

This user exit is called after the system processing and can run on the objects that are created in the system by using the following method:

```
public void setUserMboIn(MboRemote mbo)
```

The object parameter is a reference to a primary object in the object structure.

This method is called once for the primary object. For an XML transaction with multiple nouns, the object exit is called once for each noun.

The method can perform the following processes:

- Validate data.
- Stop the transaction from being saved in the system by throwing a system exception. For queue-based messages, the transaction remains in the queue and is retried.
- Log the transaction.

You identify the user exit class in the Enterprise Services application.

Event filter classes

For outbound asynchronous transactions that use publish channels, you can run a custom Java™ class or an automation script by using an event filter class. The processing for an event filter class occurs before the serialization of data in the object structure layer for an outbound message. The event filter class can insert logic that affects the creation of the integration message at this processing point.

Configure any of the following features in the Event Filter Class field of a publish channel:

- Add logic that removes unwanted fields or objects from a message to reduce the amount of data in the serialization process.
- Override default recursion logic that prevents an event from an inbound integration from sending an outbound integration message. Overriding the default behavior in this scenario can allow an outbound message to be initiated from an event that is triggered by an inbound message.
- Filter events in or out by specifying the identifier of a conditional expression. If the filter evaluates to be true, the event is filtered out. If the filter evaluates to false, the event is not filtered out.

Handler exit classes

Multiple predefined methods, or handlers, are provided so that you can send data to an external system, including HTTP, an enterprise Java™ bean call, and interface tables. Some of these methods have user exit placeholders that are available for customization.

- **[Enterprise bean processing user exit class](#)**
You can use an exit placeholder for class customization when transactions are sent to an external system by an enterprise bean. This exit class is optional and is called before the enterprise bean is called.
- **[HTTP processing user exit class](#)**
When you send outbound transactions to an external system by using HTTP, you can use an HTTP exit placeholder for customization. This exit class is optional and is called as part of the response from the HTTP call.
- **[JMS processing user exit class](#)**
When you send transactions from the system to an external system by using JMS, you can use an exit placeholder for customization. This exit class is optional and is called before the JMS is called.
- **[Web service processing user exit class](#)**
You can use an exit placeholder for customization when you send transactions from the system to an external system by using a web service. This exit class is optional and is called before the web service is started.

Enterprise bean processing user exit class

You can use an exit placeholder for class customization when transactions are sent to an external system by an enterprise bean. This exit class is optional and is called before the enterprise bean is called.

The implementation of this Java™ class must resolve the method signature of the enterprise bean that is started by this handler and the parameters that the method requires. If no value is specified for this property, the system applies a default exit called DefaultEJBExit. This default exit attempts to resolve the enterprise bean method signature and parameters.

This class must implement the `psdi.interface.router.EJBExit` interface and the following methods:

- The `getClassParams()` method returns the method signature in the form of an array of Java classes:

```
public Class[] getClassParams()
```
- The `getObjectParams` method returns an array of the parameters of the enterprise beans as an array of Java objects:

```
public Object[] getObjectParams(byte[] data, String interfaceName, String destinationName)
```
- After the successful invocation of the enterprise bean, the `responseOk()` method is called with an object as the response of the invocation:

```
public void responseOk(Object response) throws MXException
```
- If an error is encountered during the enterprise bean invocation, the `responseError()` method is called with the originating exception as a parameter:

```
public void responseError(Exception e) throws MXException
```

You enter the fully qualified name of the Java class in the EJBEXIT property of the endpoint that implements the enterprise bean handler.

HTTP processing user exit class

When you send outbound transactions to an external system by using HTTP, you can use an HTTP exit placeholder for customization. This exit class is optional and is called as part of the response from the HTTP call.

The HTTP processing exit class runs when a response is returned to an HTTP Post from an external system. In the default implementation of the `psdi.interface.router.DefaultHTTPExit` class, the response code that is received from the external system is compared to a range of response codes. The range that is used by the default implementation is 200 - 299. If the code is outside that range, then the transaction was not delivered to the external system, and an exception is raised.

With some external systems, the response from an HTTP call is interpreted to see whether the external system accepted the message. The interpretation logic can be implemented in the HTTP exit class.

If the publish channel message is not accepted, the code must raise an exception. The message in the outbound queue is marked as an error and is not removed from the queue. If the message is accepted, the message is removed from the outbound queue. If the invocation channel message fails, the exception is returned to the invoker of the channel, and the invoker handles the exception according to the design requirements.

The HTTP processing exit class must implement the `psdi.interface.router.HTTPExit` interface and implement the following method:

```
public void processResponseData(int responseCode, String responseMsg, byte[] msgBodyData)
```

If necessary, this class can interpret the response code and throw an exception. The class can perform the following actions:

- Check the response code from the HTTP post.
- If the response code is in the error range, the exception is logged on the ERROR level, and a system exception is thrown.
- If the response code is valid, the transaction is logged on the DEBUG level.

You must specify the fully qualified name of the Java™ class in the HTTPEXIT property of the endpoint that implements the HTTP handler.

JMS processing user exit class

When you send transactions from the system to an external system by using JMS, you can use an exit placeholder for customization. This exit class is optional and is called before the JMS is called.

This class must implement the `psdi.iface.router.JMSExit` class and the following method:

```
public Map getMessageProperties(Map metaData, (byte[] data,
Map origProps) throws MXException
```

This method can perform the following processes:

- Change the properties of the JMS message
- Split the data to multiple properties, to match the JMS message

You enter the fully qualified name of the Java™ class in the JMSEXIT property of the endpoint that implements the JMS handler.

Web service processing user exit class

You can use an exit placeholder for customization when you send transactions from the system to an external system by using a web service. This exit class is optional and is called before the web service is started.

This class must implement the `psdi.iface.router.WSExit` interface and the following methods:

getServiceName () method

The `getServiceName ()` method returns the service name of the web service to start:

```
public String getServiceName(Map metaData, String endpointURL, String serviceName, String interfaceName, String
targetNamespace) throws MXException
```

getEndpointURL () method

The `getEndpointURL ()` method returns the endpoint URL of the web service to start:

```
public String getEndpointURL(Map metaData, String endpointURL, String serviceName, String interfaceName, String
targetNamespace) throws MXException
```

responseOk () method

The `responseOk ()` method is called after a successful invocation of the external web service.

```
public void responseOk(org.w3c.dom.Document response) throws MXException
```

responseError () method

If an error is encountered during the web service invocation, the `responseError ()` method is called with the originating exception as a parameter:

```
public void responseError(Exception e) throws MXException
```

getOneWayWsInfo () method

The `getOneWayWsInfo ()` method returns a Boolean value that specifies whether the web service to start is one way:

```
public boolean getOneWayWsInfo(Map metaData, String endpointURL, String serviceName, String interfaceName, String
targetNamespace, boolean oneWayWs) throws MXException
```

getSoapAction () method

The `getSoapAction ()` method returns the SOAPAction HTTP header to use to start the web service:

```
public String getSoapAction(Map metaData, String endpointURL, String serviceName, String interfaceName, String
targetNamespace, String soapAction) throws MXException
```

You must specify the fully qualified name of the Java™ class in the WSEXIT property of the endpoint that implements the web service handler.

The `psdi.iface.router.DefaultWSExit` class is a default implementation of the `WSExit` interface. This class overrides the `getEndpointURL ()` method to concatenate the service name at the end of endpoint URL to form the new endpoint URL.

Customization with automation scripts

You can use automation scripts in place of Java™ classes to extend the main Java processing classes for predefined integration components. You can use automation scripts to apply custom logic at various points during the processing of object structures, publish channels, enterprise services, and invocation channels.

You define automation scripts for integration by using the Automation Scripts application. Defining a script for integration identifies which integration component the script is associated with and at what point in the processing flow that the script runs. To test scripts, you can set the log level to debug, activate the script, and use the data import or data export feature to initiate an integration transaction.

- [Creating automation scripts for integration](#)
An automation script can customize the processing of integration messages for inbound and outbound transactions. You associate an automation script with an integration component, and you configure when to insert it into integration processing.
- [Customization of object structure processing with automation scripts](#)
Object structure processing supports the simultaneous use of automation scripts and Java classes for customization. Automation scripts that are defined for an object structure can affect the processing of data that is directly processed through the object structure, such as the REST API, or through other integration components such as publish channels and enterprise services.

- [Customization of channel and service processing by using automation scripts](#)

When you create an automation script, you identify the channel or service that the script runs on. You also specify where to insert the script during the processing flow.

Creating automation scripts for integration

An automation script can customize the processing of integration messages for inbound and outbound transactions. You associate an automation script with an integration component, and you configure when to insert it into integration processing.

Procedure

1. In the Automation Scripts application, select the Create \geq Script for Integration action.
2. Specify an integration component to associate with the automation script and then specify the insertion point for the script.
3. Optional: Select the Activate check box if you want the script to be immediately active.
4. Optional: Specify the logging level to apply when the script executes.
For testing purposes, if you set the logging level to debug, the logs contain useful information that helps you troubleshoot any issues.
5. Specify the scripting language of the script.
6. Either enter the script directly into the Source Code field or browse to the location where the script is stored and click Import.
7. Click Create.

Customization of object structure processing with automation scripts

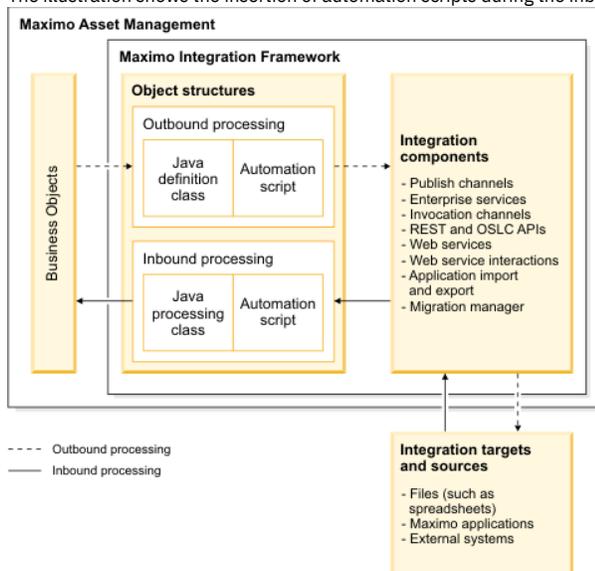
Object structure processing supports the simultaneous use of automation scripts and Java™ classes for customization. Automation scripts that are defined for an object structure can affect the processing of data that is directly processed through the object structure, such as the REST API, or through other integration components such as publish channels and enterprise services.

- [Insertion points for customization of object structure processing with automation scripts](#)
You can insert script-based processing into the Java definition classes and Java processing classes that transform object structures during integration processing.
- [Outbound processing of object structures](#)
Outbound object structure processing performs the serialization of business object (mbo) data into an XML message. During this processing, an automation script can insert custom processing logic to change the default processing behavior of the object structure. The script can be used instead of the Java definition class or can be used with it.
- [Inbound processing of object structures](#)
The processing of inbound messages by the integration framework supports the use of automation scripts on the object structure to support custom logic. This use of automation scripts allows customization for any inbound integration message that uses an object structure and for customization of processing Migration Manager data.

Insertion points for customization of object structure processing with automation scripts

You can insert script-based processing into the Java™ definition classes and Java processing classes that transform object structures during integration processing.

The illustration shows the insertion of automation scripts during the inbound and outbound processing of object structures.



Outbound object structure processing implements a Java definition class that allows for the insertion of custom processing during the serialization of business object data into an XML message. You can also implement an automation script to customize the processing of the object structure. The integration framework supports the customization of an object structure to be a Java class, an automation script, or both simultaneously.

Inbound object structure processing implements a Java processing class that allows for insertion of custom processing of data from the inbound XML message before it is mapped to the business object data. In addition to the Java processing class, you can implement an automation script to customize the processing in the object structure.

Outbound processing of object structures

Outbound object structure processing performs the serialization of business object (mbo) data into an XML message. During this processing, an automation script can insert custom processing logic to change the default processing behavior of the object structure. The script can be used instead of the Java™ definition class or can be used with it.

Functions, such as `skipMbo(ctx)`, are used in serialization. In the function name, `ctx` is the object in the function that is prepared by the integration framework and communicates data between the integration framework and the automation script. An automation script can affect the processing of the data and communicate those changes back to the integration framework.

Serialization includes the following functions that can be used by automation scripts to insert customized logic into the processing of the data:

`skipMbo(ctx)`

Filters object data from the XML message. APIs are available to filter data from the XML message, continue processing for data that you want in the XML message, and complete processing of the object structure after data is filtered out. For example, if the object structure is constructing an XML message for a purchase order, an automation script can insert logic that filters out purchase order line data where the line type is for service lines.

`skipCols(ctx)`

Filters a column or multiple columns from the object structure. For example, if the object structure is constructing an XML message for an asset, an automation script can insert logic that filters out a number of columns that are not needed by the system that will receive the XML message.

`overrideValues(ctx)`

Sets the value of an object structure field in the XML message. For example, if the object structure is constructing an XML message for an asset, an automation script CAN insert logic that might filter out a number of columns that are not needed by the system that will receive the XML message that is created.

- [Functions for outbound processing of object structures](#)

The `skipMBO(c)`, `skipCols(ctx)`, and `overrideValues(ctx)` functions are used in automation scripts for outbound processing of object structures. Each function has its own APIs that are available to process the data in the object structure. All example scripts are written in Jython.

- [Java definition classes and automation scripts](#)

You can use a Java definition class and an automation script at the same time on an object structure. The Java definition class is executed before the automation script for each function.

Functions for outbound processing of object structures

The `skipMBO(c)`, `skipCols(ctx)`, and `overrideValues(ctx)` functions are used in automation scripts for outbound processing of object structures. Each function has its own APIs that are available to process the data in the object structure. All example scripts are written in Jython.

- [Skip processing of business objects by using the skipMbo\(ctx\) function](#)

The `skipMbo(ctx)` function filters data from the XML message that is built during the serialization process. The `skipMbo(ctx)` function can filter a Maximo® business object, continue processing the message after a business object is skipped, or terminate the processing of the message at the point of execution.

- [Skip processing of columns in business objects by using the skipCols\(ctx\) function](#)

The `skipCols(ctx)` function filters the columns of a Maximo business object from the processing of the XML message. The `ctx.skipCol(String)` API can accept one string argument to filter a single column or multiple comma-separated string arguments to filter multiple columns.

- [Set values in fields by using the overrideValues\(ctx\) function](#)

The `overrideValues(ctx)` function sets the value of a field in the XML message.

Skip processing of business objects by using the skipMbo(ctx) function

The `skipMbo(ctx)` function filters data from the XML message that is built during the serialization process. The `skipMbo(ctx)` function can filter a Maximo® business object, continue processing the message after a business object is skipped, or terminate the processing of the message at the point of execution.

ctx.skipMbo() API

The `ctx.skipMbo()` API filters out the processing of any Maximo business objects in the XML message.

For example, the following script executes on the `ctx.skipMbo()` API, and filters out all purchase order lines and their related purchase order cost data for the 1234 purchase order line.

```
def skipMbo (ctx) :
    if ctx.getMboName ()=='POLINE' and ctx.getMbo ().getString ("itemnum")=="1234" :
        ctx.skipMbo ()
```

If you use the `ctx.skipMbo()` API on the root or primary object in the object structure, any business object that meets the criteria in the IF statement is filtered from the XML message.

ctx.process() API

The ctx.process() API continues processing lines that are not filtered out by the ctx.skipMbo() API, for example:

```
def skipMbo (ctx) :
    if ctx.getMboName ()=='POLINE' and ctx.getMbo () .getString ("itemnum")=="1234" :
        ctx.skipMbo ()
    else
        ctx.process ()
```

Executing the ctx.process() API on a row of data enables that data to be serialized. If the Java™ definition class skips that row of data, the ctx.process() API overrides the Java definition class and allows the data to be serialized.

ctx.complete() API

When the ctx.complete() API is invoked, the outbound processing of the object structure is stopped for the current instance of the business object, for instances of the child business objects, and for instances of its peer-level business objects.

For example, the PO object consists of the child objects POLINE and POTERM. The POLINE object consists of a child object POCOST. When the ctx.complete() API is invoked on the PO object, the POLINE, POTERM, and POCOST objects that are related to that PO are not processed.

In the following example script, any purchase order that has a status of complete is processed without the serialization of its purchase order line data.

```
def skipMbo (ctx) :
    if ctx.getMboName ()=='PO' and ctx.getMbo () .getString ("status")=="COMPLETE" :
        ctx.complete ()
    else
        ctx.process ()
```

Skip processing of columns in business objects by using the skipCols(ctx) function

The skipCols(ctx) function filters the columns of a Maximo® business object from the processing of the XML message. The ctx.skipCol(String) API can accept one string argument to filter a single column or multiple comma-separated string arguments to filter multiple columns.

The ctx.skipCol(String) API can filter a single column of a Maximo business object. The following example script filters out the description column of the ASSET object:

```
def skipCols (ctx) :
    if ctx.getMboName ()=='ASSET' :
        ctx.skipCol ("description")
```

You can also use the ctx.skipCol(String) API to filter multiple columns. The following example script filters out the description and the asset number columns of the ASSET object:

```
def skipCols (ctx) :
    if ctx.getMboName ()=='ASSET' :
        ctx.skipCol ("description","assetnum")
```

The ctx.skipCol(String) API can filter the column of a child object in an object structure. For example, the following script filters out the METERNAME column of the ASSETMETER object:

```
def skipCols (ctx) :
    if ctx.getMboName ()=='ASSETMETER' :
        ctx.skipCol ("metername")
```

You can also use the ctx.skipCol(String) API to filter columns based on a specified value. For example, the following script filters out the description column when the assettag attribute has a value of 12593:

```
def skipCols (ctx) :
    if ctx.getMboName ()=='ASSET' and ctx.getMbo () .getString ("assettag")=="12593" :
        ctx.skipCol ("description")
```

Set values in fields by using the overrideValues(ctx) function

The overrideValues(ctx) function sets the value of a field in the XML message.

The ctx.overrideCol() API sets the value of the field in the XML message. For example, the following script sets the value of the site ID to ABC:

```
def overrideValues (ctx) :
    if ctx.getMboName ()=='ASSET' :
        ctx.overrideCol ("SITEID","ABC")
```

In the following example script, if the description field of a purchase order is empty, the description field is set to the purchase order number:

```
def overrideValues (ctx) :
    if ctx.getMboName ()=='PO' :
```

```
mbo = ctx.getMbo()
if mbo.isNull("description"):
    ctx.overrideCol("DESCRIPTION",mbo.getString("ponum"))
```

Java definition classes and automation scripts

You can use a Java™ definition class and an automation script at the same time on an object structure. The Java definition class is executed before the automation script for each function.

Some of the object structures that are included in the integration framework and Migration Manager provide Java definition classes that filter data. For example, the item object structure filters items that are of the type TOOL. When an automation script is implemented with a Java definition class, the automation script can override the filtering of the Java definition class and remove the filtering of the Java class or change the filtering criteria to exclude more data from or include more data in the XML message.

For example, the Java definition class of the MXOPERLOC object structure filters out the locations of the type LABOR while allowing locations of the type OPERATING to be included in the message. You can change the filtering, add more filtering, or replace the default filtering. The following example script changes the processing to filter the locations of the type OPERATING and continues to process locations of the type LABOR:

```
def skipMbo (ctx):
    if ctx.getMboName()=='LOCATIONS':
        if ctx.getMbo().getString("type")=="LABOR":
            ctx.process()
        if ctx.getMbo().getString("type")=="OPERATING":
            ctx.skipMbo()
```

The following example script adds more filtering for the MXOPERLOC object structure by filtering out type COURIER:

```
if ctx.getMboName()=='LOCATIONS':
    if ctx.getMbo().getString("type")=="COURIER":
        ctx.skipMbo()
```

The following example script replaces the definition class filtering so that only locations of type COURIER are filtered out:

```
def skipMbo (ctx):
    if ctx.getMboName()=='LOCATIONS':
        if ctx.getMbo().getString("type")=="COURIER":
            ctx.skipMbo()
        else:
            ctx.process()
```

Inbound processing of object structures

The processing of inbound messages by the integration framework supports the use of automation scripts on the object structure to support custom logic. This use of automation scripts allows customization for any inbound integration message that uses an object structure and for customization of processing Migration Manager data.

For integration processing, a script that is implemented on the object structure applies to messages from the following sources:

- Data import
- REST
- Application import
- Web service
- OSLC
- Integration servlet
- Integration tables

The object structure supports a Java™ processing class or an automation script. You can use a Java processing class, an automation script, or both on the same object structure. The processing supports functions that are in either the class file or the automation script.

A *context* (ctx) is passed between the processing class of the inbound object structure and the automation script, which implements the custom code. The context is supported bidirectionally. Predefined APIs are available for the context. The script framework provides a built-in Java class that prepares a context.

All of the following code examples and fragments use JavaScript. You can implement the logic at the following points in the processing:

- Before the processing of a Maximo® business object. For example, the beforeProcess(ctx) function is processed once for each noun in the inbound message before business objects that are related to the message are created.
- During the processing of a Maximo business object. For example, the beforeCreateMboSet(ctx) function is processed sequentially for each object within every noun in the inbound message. Other functions that are processed sequentially include afterCreateMboSet(ctx), mboRules(ctx), beforeMboData(ctx), and afterMboData(ctx).
- After Maximo business object processing completes. For example, the preSaveRules(ctx) and changeStatus(ctx) functions are processed once for each noun in the inbound message after the business objects are created.

In the Automation Scripts application, you can create a script for integration to include in the object structure processing.

- [Functions for inbound processing of object structures](#)
Each function provides APIs that you can use to customize the processing of the data in the object structure.
- [Context APIs for the inbound processing of object structures](#)
A *context* (ctx) is an object that provides convenience methods for automation scripts to pass data or trigger actions. The context is supported bidirectionally.

Predefined APIs are available for the context, and each function can use different contexts.

Functions for inbound processing of object structures

Each function provides APIs that you can use to customize the processing of the data in the object structure.

- [Skip or change message processing by using the beforeProcess\(ctx\) function](#)
The beforeProcess(ctx) function provides an injection point to run the logic in the automation script before business objects are created.
- [Create business object sets by using the beforeCreateMboSet\(ctx\) function](#)
The beforeCreateMBOSet(ctx) function processes inbound data before the framework creates the Maximo® business objects or business object sets and can operate on all business objects in the object structure.
- [Change business objects or business object sets by using the afterCreateMboSet\(ctx\) function](#)
The afterCreateMboSet(ctx) function processes the inbound object structure after the framework creates the Maximo business object or business object set.
- [Change processing of rules by using the mboRules\(ctx\) function](#)
The mboRules(ctx) function can skip the processing of a business object, skip a transaction, continue processing, or create a business object. This function operates before the creation of each Maximo business object.
- [Set values in fields by using the beforeMboData\(ctx\) function](#)
The beforeMboData(ctx) function is available when the Maximo business object is created but before the values in the business object are set by the integration framework. Processing of the object structure can change the setting of business object data. Processing can also set flags on the fields, such as the samevaluevalidation flag, which triggers field validations even when the field value is set with the current value of the field.
- [Add business objects and change values in fields by using the afterMboData\(ctx\) function](#)
The afterMboData(ctx) function implements custom logic to create an extra related Maximo business object for inclusion in the transaction or change data in a Maximo business object. The function is available after the business object is created and the values are set in the Maximo business object by the integration framework.
- [Change the transaction before saving to the database by using the preSaveRules\(ctx\) function](#)
The preSaveRules(ctx) function allows for extra processing that is related to the transaction as a whole. You can use the preSaveRules(ctx) function to create a related object and add it to the transaction. The function is called before the Save action and is called for each noun in the message.
- [Change status or status date by using the changeStatus\(ctx\) function](#)
The changeStatus(ctx) function implements a status change outside the statefulMicSetIn class that is available in the integration framework. You can also use this function to set the status date with a value instead of using the system date.

Skip or change message processing by using the beforeProcess(ctx) function

The beforeProcess(ctx) function provides an injection point to run the logic in the automation script before business objects are created.

For example, you can skip the processing of a message that is based on the evaluation of the data in the XML message. Another example is to change the action attribute for the message from Sync to Create.

The following JavaScript example sets the message action to Sync:

```
function beforeProcess (ctx)
{
    ctx.setMsgType ("Sync" );
}
```

Create business object sets by using the beforeCreateMboSet(ctx) function

The beforeCreateMBOSet(ctx) function processes inbound data before the framework creates the Maximo® business objects or business object sets and can operate on all business objects in the object structure.

If an automation script that is processing an object structure creates a business object set, then the createMboSet() function in the base class is skipped. Processing of a child business object supports access to the parent object by using the getParentMbo() function.

You can also use the beforeCreateMboSet(ctx) function to conditionally create the business object that is based on the data that is included in the XML message.

You cannot create a child business object that is independent of its parent business object.

The following example shows how to create a child business object from a parent business object.

```
importPackage (Packages.psdi.server);
function beforeCreateMboSet (ctx)
{
    var struc=ctx.getData ();
    var ponum=struc.getCurrentData ("PO", ctx.getUserInfo ());
    var siteid=struc.getCurrentData ("SITEID");
    var poSet = MXServer.getMXServer ().getMboSet ("PO", ctx.getUserInfo ());
    poSet.setQbeExactMatch (true);
    poSet.setQbe ("ponum", ponum);
    poSet.setQbe ("siteid", siteid);
    var poMbo = poSet.moveFirst ();
    var polineSet = poMbo.getMboSet ("POLINE");
    ctx.setMboSet (polineSet);
}
```

Change business objects or business object sets by using the afterCreateMboSet(ctx) function

The afterCreateMboSet(ctx) function processes the inbound object structure after the framework creates the Maximo® business object or business object set.

The afterCreateMboSet(ctx) function is available to operate on all business objects in the object structure. This function can change the business object or business object set that the framework created or can inject more business objects into the business object set.

The following example sets an MboSet property to note that the created location has a type of Storeroom. This logic replaces the default logic that is in the MXSTORELOC processing class.

```
importPackage(Packages.psd.server);
function afterCreateMboSet(ctx)
{
    var loc type = MXServer.getMXServer().getMaximoDD().getTranslator()
        .toInternalString("LOCTYPE", ctx.getData().getCurrentData("TYPE"));

    if (loc Type=="STOREROOM")
    {
        ctx.getPrimaryMboSet().setStoreroom();
    }
    else
    {
        ctx.getPrimaryMboSet().setNonStoreroom();
    }
}
```

Change processing of rules by using the mboRules(ctx) function

The mboRules(ctx) function can skip the processing of a business object, skip a transaction, continue processing, or create a business object. This function operates before the creation of each Maximo® business object.

The following example shows how to skip a transaction:

```
function mboRules(ctx)
{
    ctx.skipTxn();
}
```

Set values in fields by using the beforeMboData(ctx) function

The beforeMboData(ctx) function is available when the Maximo® business object is created but before the values in the business object are set by the integration framework. Processing of the object structure can change the setting of business object data. Processing can also set flags on the fields, such as the samevaluevalidation flag, which triggers field validations even when the field value is set with the current value of the field.

Add business objects and change values in fields by using the afterMboData(ctx) function

The afterMboData(ctx) function implements custom logic to create an extra related Maximo® business object for inclusion in the transaction or change data in a Maximo business object. The function is available after the business object is created and the values are set in the Maximo business object by the integration framework.

When columns in the object structure are restricted, you can use the afterMboData(ctx) function to provide the logic to set those columns instead of having the integration framework set the values.

In the following example, an asset is created with the description field set to a concatenation of the EXTERNALREFID field and the description field that is passed from the object structure:

```
importPackage(Packages.psd.server);
importPackage(Packages.psd.mbo);
function afterMboData(ctx)
{
    var mbo = ctx.getMbo();
    var struc = ctx.getData();
    mbo.setValue("description", "FROM: "+struc.getCurrentData("EXTERNALREFID") + " DESC: "+struc.getCurrentData("DESCRIPTION"));
}
```

Change the transaction before saving to the database by using the preSaveRules(ctx) function

The preSaveRules(ctx) function allows for extra processing that is related to the transaction as a whole. You can use the preSaveRules(ctx) function to create a related object and add it to the transaction. The function is called before the Save action and is called for each noun in the message.

Change status or status date by using the changeStatus(ctx) function

The changeStatus(ctx) function implements a status change outside the statefulMicSetIn class that is available in the integration framework. You can also use this function to set the status date with a value instead of using the system date.

For the automation script to use the changeStatus(ctx) function, the statefulMicSetIn class or the class that extends the statefulMicSetIn class must be registered as the processing class in the object structure. You can use this function to support a status change for five parameters. The base class supports only three parameters.

The following example sets the memo field that is related to the change status action to a string value if the NP_STATUSEMEMO field does not contain a value:

```
importPackage (Packages.psdI.server);
importPackage (Packages.psdI.mbo);

function changeStatus (ctx)
{
    var mbo = ctx.getMbo();
    var struc = ctx.getData();
    var stat = struc.getCurrentData("STATUS");
    var memo = struc.getCurrentData("NP_STATUSEMEMO");
    if (struc.isCurrentDataNull("NP_STATUSEMEMO"))
    {
        memo = "Status change via Integration";
    }
    mbo.changeStatus (stat, MXServer.getMXServer().getDate(), memo, MboConstants.NOACCESSCHECK);
}
```

Context APIs for the inbound processing of object structures

A context (ctx) is an object that provides convenience methods for automation scripts to pass data or trigger actions. The context is supported bidirectionally. Predefined APIs are available for the context, and each function can use different contexts.

An automation script requires context methods to implement processing logic. A context is passed between the processing of the object structure and the automation script, which implements the custom code. The following table shows the context APIs and the common usage of the APIs for each of the functions:

Table 1. Context APIs as used by the functions

Context APIs	beforeProcess (ctx)	beforeCreateMboSet (ctx)	afterCreateMboSet (ctx)	mboRules (ctx)	beforeMboData (ctx)	afterMboData (ctx)	preSaveRules (ctx)	changeStatus (ctx)
ctx.setMsgType()	✓							
ctx.getProcessTable()		✓	✓	✓	✓	✓		
ctx.setProcessTable(String ProcessTable)	✓							
ctx.setMboSet(MboSet mboSet)		✓						
ctx.setMbo(Mbo mbo)		✓						
ctx.getData()	✓	✓	✓	✓	✓	✓	✓	✓
ctx.getMosDetailInfo()		✓	✓	✓	✓	✓	✓	✓
ctx.setSkipBaseAdditionalRules()							✓	
ctx.skipMbo()			✓					
ctx.skipTxn()	✓	✓	✓	✓	✓	✓	✓	✓
ctx.complete()			✓					
ctx.process()			✓					
ctx.getUserInfo()	✓	✓	✓	✓	✓	✓	✓	✓

Context APIs	beforeProcess (ctx)	beforeCreateMboSet (ctx)	afterCreateMboSet (ctx)	mboRules (ctx)	beforeMboData (ctx)	afterMboData (ctx)	preSaveRules (ctx)	changeStatus (ctx)
ctx.getParentMbo()		✓	✓	✓	✓	✓		
ctx.isPrimary()		✓	✓	✓	✓	✓	✓	✓
ctx.bypassMbo()					✓			
ctx.getMsgType()	✓	✓	✓	✓	✓	✓	✓	✓
ctx.getPrimaryMboSet()			✓	✓	✓	✓	✓	✓
ctx.getPrimaryMbo()					✓	✓	✓	✓
ctx.processAsUpdate()				✓				
ctx.processAsAdd()				✓				
ctx.processAsAddAtEnd()				✓				
ctx.log ()	✓	✓	✓	✓	✓	✓	✓	✓

The following APIs are available for inbound data processing:

ctx.getMosDetailInfo()

Provides information about the data dictionary cache for the integration framework for the object structure that is being processed.

ctx.skipMbo()

Skips the processing of a Maximo® business object.

ctx.skipTxn()

Skips the processing of an entire transaction, such as a message.

ctx.complete()

Ends the processing of the object structure at the point of execution, which means that child data is not processed.

ctx.process()

Continues the processing at the point of execution. This API is typically used as part of conditional logic.

ctx.getParentMbo()

Retrieves the parent business object. This API can be used from a child object whose business object is not yet created.

ctx.isPrimary()

Identifies whether the current business object is the root-level business object of the object structure.

ctx.getUserInfo()

Retrieves user information, which is needed if a script is creating a new business object.

ctx.bypassMbo()

Bypasses the creation of the business object and continues to the next business object that is being processed.

ctx.getMsgType()

Provides access to the message type, such as Sync or Create.

ctx.setMsgType()

Sets the message type, such as Sync or Create. This API can be used before processing begins.

ctx.getData()

Provides access to the StructureData, which is the XML message.

ctx.setMboSet(MboSet mboSet)

Sets values in a business object set.

ctx.setMbo(Mbo mbo)

Sets values in a business object.

ctx.getPrimaryMboSet()

Retrieves the root business object of an object structure during the processing of a child business object.

ctx.setProcessTable(String processTable)

Sets the table for a process. The method is used if you have a nonpersistent business object, such as MXRECEIPT, that has processing logic to determine whether the MATRECTRANS table or the SERVRECTRANS table is updated. The ctx.setProcessTable(String processTable) API is used in the beforeProcess(ctx) function.

ctx.getProcessTable()

Retrieves the table name that is set by the ctx.setProcessTable(String processTable) API.

ctx.setSkipBaseAdditionalRules()

Adds custom logic to in the preSaveRules(ctx) function to operate on a completed object structure that is now prepared in the processing.

ctx.processAsUpdate()

Sets the processing action of a business object to the Update action instead of the Add or Delete action.

ctx.processAsAdd()

Sets the processing action of a business object to the Add action instead of the Update or Delete action.

ctx.processAsAddAtEnd()

Sets the processing action of a business object to the Add action instead of the Update or Delete action and creates the business object at the end of the collection instead of at the top of the collection.

ctx.log ()

Runs a log statement from an object structure processing context.

Customization of channel and service processing by using automation scripts

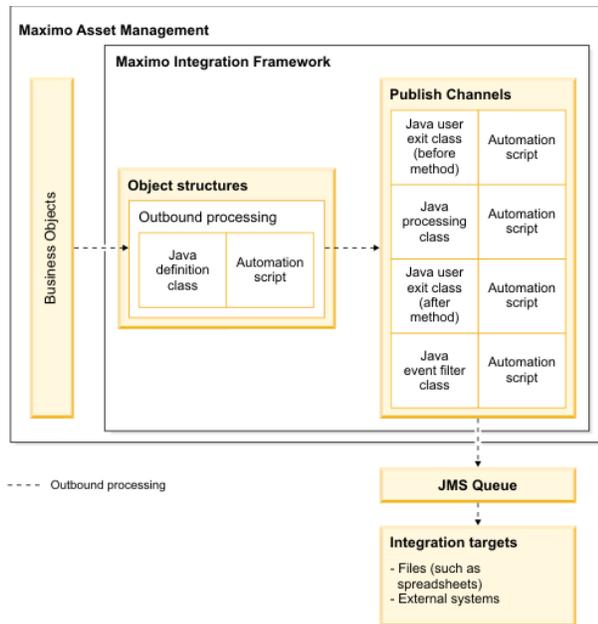
When you create an automation script, you identify the channel or service that the script runs on. You also specify where to insert the script during the processing flow.

- [Customization points during publish channel processing](#)
Publish channels process outbound integration messages that do not require a response. The Java processing class that is associated with a publish channel includes several hooks where you can insert code to provide custom logic.
- [Customization points during enterprise service processing](#)
Enterprise services provide asynchronous and synchronous processing of inbound integration messages. You can insert code to provide custom logic to the Java request processing class for inbound processing and to the Java response processing class for outbound processing.
- [Customization points during invocation channel processing](#)
Invocation channels process outbound integration messages that require a response. The invocation channel request class and the invocation channel response class include several hooks where you can insert code to provide custom logic.
- [Examples of using automation scripts during processing by channels and services](#)
Channel and service processing takes a data record from the source system as an input value, manipulates the data as required, and constructs a data record for the target system. The example python scripts query input data and provide logic to manipulate the data before the output data is constructed.

Customization points during publish channel processing

Publish channels process outbound integration messages that do not require a response. The Java™ processing class that is associated with a publish channel includes several hooks where you can insert code to provide custom logic.

The illustration shows the customization points during outbound processing of integration messages by using publish channels.



After object structure processing constructs the integration message, it is forwarded to the associated publish channel. You can add custom logic at the following points during publish channel processing:

- External exit class
- User exit class that runs before the external exit class
- User exit class that runs after the external exit class
- Event filter class

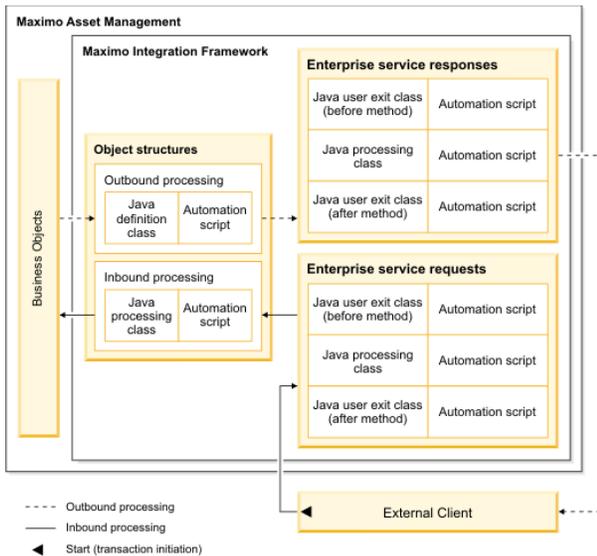
The message is then sent to the JMS queue for delivery to the target destination.

When you configure an external exit or user exit script for a publish channel, a predefined Java class is inserted on the channel that is used to run the script. The predefined classes are the `com.ibm.tivoli.maximo.script.ScriptExternalExit` class and the `com.ibm.tivoli.maximo.script.ScriptUserExit` class. You cannot implement a script and a Java class at the same processing point. If you attempt to create a script on a processing point where a Java class is configured, you cannot save the script.

Customization points during enterprise service processing

Enterprise services provide asynchronous and synchronous processing of inbound integration messages. You can insert code to provide custom logic to the Java™ request processing class for inbound processing and to the Java response processing class for outbound processing.

The illustration shows the customization points during the inbound and outbound processing of integration messages by using enterprise services.



For asynchronous messages that do not require a response, an external service opens a connection to send an enterprise service request. When the request is validated, the message is dropped into a JMS queue for enterprise services processing. For synchronous messages that require a response, the external service maintains a continuous connection during the transaction until the response is received.

In the Automation Scripts application, when you configure an automation script for an enterprise service, you specify one of the following insertion points for the script:

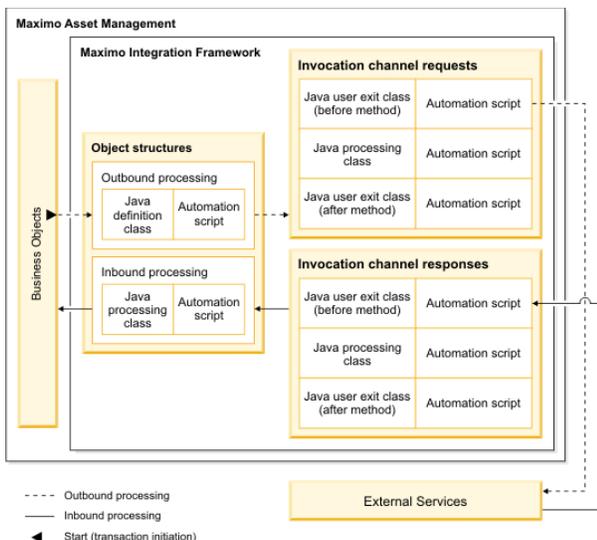
- Insertion points for inbound asynchronous processing:
 - Request, inbound: User exit class that runs before the external exit class
 - Request, inbound: External exit class
 - Request, inbound: User exit class that runs after the external class
- Insertion points for inbound synchronous processing, where a response is required:
 - Request, inbound: User exit class that runs before the external exit class
 - Request, inbound: External exit class
 - Request, inbound: User exit class that runs after the external class
 - Response, outbound: User exit class that runs before the external exit class
 - Response, outbound: External exit class
 - Response, outbound: User exit class that runs after the external class

When you configure an external exit or user exit script for the request or the response of an external service, a predefined Java class is inserted that runs the script. The predefined classes are the `com.ibm.tivoli.maximo.script.ScriptExternalExit` class and the `com.ibm.tivoli.maximo.script.ScriptUserExit` class. You cannot implement a script and a Java class at the same processing point. If you attempt to create a script on a processing point where a Java class is configured, you cannot save the script.

Customization points during invocation channel processing

Invocation channels process outbound integration messages that require a response. The invocation channel request class and the invocation channel response class include several hooks where you can insert code to provide custom logic.

The illustration shows the customization points during inbound and outbound processing of integration messages by using invocation channels.



When a user action in Maximo® Manage starts an outbound integration transaction that requires a response, an invocation channel provides integration processing of requests and responses.

In the Automation Scripts application, when you configure an automation script for an invocation channel, you specify one of the following insertion points for the script:

- Request, outbound: User exit class that runs before the external exit class
- Request, outbound: External exit class
- Request, outbound: User exit class that runs after the external exit class
- Response, inbound: User exit class that runs before the external exit class
- Response, inbound: External exit class
- Response, inbound: User exit class that runs after the external exit class

When you configure an external exit or user exit script for the request or the response of an invocation channel, a predefined Java™ class is inserted that runs the script. The predefined classes are the `com.ibm.tivoli.maximo.script.ScriptExternalExit` class and the `com.ibm.tivoli.maximo.script.ScriptUserExit` class. You cannot implement a script and a Java class at the same processing point. If you attempt to create a script on a processing point where a Java class is configured, you cannot save the script.

Examples of using automation scripts during processing by channels and services

Channel and service processing takes a data record from the source system as an input value, manipulates the data as required, and constructs a data record for the target system. The example python scripts query input data and provide logic to manipulate the data before the output data is constructed.

When Maximo® Manage starts an integration transaction, the object structure provides an internal record data (`irData`) element to a publish channel or an invocation channel. Processing manipulates the `irData` element and constructs an external record data (`erData`) element before the message is forwarded to its destination. Invocation channel transactions can require a response from the external system. Response processing passes the `erData` element to the invocation channel, which manipulates the response data and constructs the `irData` element.

When an external system starts an integration transaction, the message provides an `erData` element to an enterprise service. Processing manipulates the `erData` element and constructs an `irData` element before the message is forwarded to the associated object structure. For messages that require a response, the object structure provides the `irData` element to the enterprise service. Processing manipulates the data and constructs the `erData` element that is forwarded to its destination.

The examples consist of simple scripts that can be used for test purposes. You can use the data import and data export features in the External Systems application to start transactions to test scripts.

Example: Script that changes the description of operating assets on outbound transactions

In this scenario, the `MXASSET` object structure provides `irData` to the `MYASSET` publish channel for processing. An automation script is configured to run on the external exit class of the publish channel. The script checks the status of the asset in the `irData` element. If the asset is in operating status, the script inserts a value in the description field and prints a message to the log file. The `erData` element is then constructed and is forwarded to the external system.

```
if irData.getCurrentData("STATUS") == 'OPERATING' :
    irData.setCurrentData("DESCRIPTION","hello")
    print "MYASSET description change"
```

Example: Script that changes the description of operating assets on inbound transactions

In this example, the `MYASSET` enterprise service processes an inbound message for the `MXASSET` object structure. An automation script inserts a script on the external exit class of the enterprise service. The script checks the status of the asset in the `erData` element. If the asset is in operating status, the script inserts a value in the description field and prints a message to the log file. The `irData` element is then constructed and is forwarded to the associated object structure for processing.

```
if erData.getCurrentData("STATUS") == 'OPERATING' :
    erData.setCurrentData("DESCRIPTION","hello inbound")
    print "MYASSET inbound description has changed"
```

Example: Script that changes the description of lines on a purchase order by using an automation script variable

In this example, the `MXPO` object structure provides the `irData` element to the `MYPO` publish channel for processing. An automation script is configured to run on the external exit class of the publish channel. A literal value, `world`, is defined as an input variable on the automation script. The script queries the `irData` element for purchase orders that contain purchase order lines. The script numbers each purchase order line in a sequence that starts at 1, sets `hello` as the value in the description field, and adds the input variable from the automation script. The script updates the parent purchase order before the `erData` element is constructed and forwarded to the external system.

```
lines = irData.getChildrenData("POLINE")
i = 0
if lines is not None:
    for value in lines:
        ++i
        irData.setAsCurrent(lines,i);
        irData.setCurrentData("DESCRIPTION","hello"+world)
    irData.setParentAsCurrent()
```

Example: Script that skips transactions based on the status of records

In this example, the MXPO object structure is sent to the MYPO2 publish channel for processing. An automation script is configured to run on the user exit class before the external exit class runs. The script queries the irData element for purchase orders with a status of WAPPR and skips the processing of these purchase orders.

```
if irData.getCurrentData("STATUS") == 'WAPPR' :
    errorgroup = "iface"
    errorkey = "SKIP_TRANSACTION"
```

Example: Script that prints transaction information to a log file to assist with troubleshooting

In this example, the MXASSET object structure provides irData to the MYASSET2 publish channel for processing. An automation script is configured to run on the external exit class. The script queries the irData element for assets with a status of operating, prints transaction information to a log file, and constructs the erData element without making any changes. To print information about the transaction, you must set logging to debug. In the Logging application, the logger is set to automation scripts and the logging level is set to DEBUG. In the Automation Scripts application, the logging level for the script is set to DEBUG.

```
if irData.getCurrentData("STATUS") == 'OPERATING' :
    print "Test script"
    variable VAR_EXIT_IFACETYPE " + ifaceTypeprint "Test script
    variable VAR_EXIT_IFACENAME " + ifaceNameprint "Test script
    variable VAR_EXIT_EXTSYSTEM " + extSystemprint "Test script
    variable VAR_EXIT_MESSAGETYPE " + messageTypeprint "Test script
    variable VAR_EXIT_EXTSYSTEM " + extSystemprint "Test script
    variable VAR_EXIT_OSNAME " + osNameprint "Test script"
```

When an asset is exported, the following debugging information is printed to a log file:

```
18 Mar 2014 11:35:06:877 [DEBUG] [MXServer] [CID-MXSCRIPT-2022] execution completed
for cached compiled script PUBLISH.MYASSET.EXTEXIT.OUT for launch point null
Test script variable VAR_EXIT_IFACETYPE MAXIMO
Test script variable VAR_EXIT_IFACENAME MYASSET2
Test script variable VAR_EXIT_EXTSYSTEM MYEXTSYS
Test script variable VAR_EXIT_MESSAGETYPE Publish
Test script variable VAR_EXIT_OSNAME MXASSET
```

XSL mapping

For outbound transactions, you can implement an XSL file to manipulate the data that is sent to the external system after Java™ exit processing is completed. For inbound transactions, you can implement an XSL file to manipulate the data to be set to the object structure after Java exit processing is completed.

The XSL file is always called with the XML message that is output from the Java exit processing. You can register the XSL file in the application EAR file under the businessobjects/classes/ directory or you can reference it using a directory filepath that is not part of the application EAR file.

Omit the .xsl file extension to register the file in the businessobjects/classes/psd/iface/xsl directory, for example:

```
psdi.iface.xsl.mapping
```

Include the .xsl file extension to register the file in a file directory that is accessible by the application server, for example:

```
c:/psdi/iface/xsl/mapping.xsl
```

Interface table user exit class

When you use interface tables to receive messages from an external system, you can perform customization in the polling program that retrieves the data from the interface table and sends data to the system.

The cron task manager runs the interface table polling program. The IFACETABLECONSUMER cron task, has an optional EXITCLASS property where you can specify the fully qualified name of a Java™ exit class.

The Java data structure list represents the record from the interface tables, where the first element is always the action of the message. The remaining elements of the list are the mapped data structures and each map represents a row in the interface table for each message. The keys in the map are the column names and the values are the corresponding column values. All the column values are converted to their translated string format before they are set in the map.

The EXITCLASS class must implement the psdi.iface.intertables.IfacedbExit interface and the following methods:

- `public void beforeQueue(long transid, String extSys, String ifaceName, List data, Connection conn)`
This method is called after the data is received from the interface table and before the data is inserted into one of the inbound queues.
- `public void afterCommit(long transid, String extSys, String ifaceName, Connection conn)`
This method is called after the data is inserted to an inbound queue and deleted from the interface queue table, and the database commit is done.
- `public void afterRollback(long transid, String extSys, String ifaceName, Connection conn)`
This method is similar to the `afterCommit` method but is called if the transaction is rolled back.

This class can perform the following processes:

- Validate data.
- Change external data by changing the IR record to be saved in the system.
- Stop the transaction from being saved in the queue by throwing an exception. In this case, the transaction remains in the MXIN_INTER_TRANS table with the error message and is reprocessed.
- Stop the message from being sent to external system by throwing a skip_transaction exception. In this case, message the system does not save the message; the message is removed from the queue.
- Log the transaction

The user exit that uses the `afterCommit` or `afterRollback` method can perform the following processes:

- Perform custom processing and cleanup.
- Log the transaction.

You identify this class in the Cron Task Setup application.

Configuring the integration framework

Setting up the integration framework includes configuring related system properties, queues, and security. Implementing integration scenarios requires a knowledge of configuring queues and knowledge of J2EE and product security support.

- **JMS queue configuration**
Asynchronous transactions that are exchanged using either publish channels or enterprise services, use Java™ Messaging Service (JMS) queues to exchange data with an external system.
- **Error management**
The integration framework supports several message formats, protocols for exchanging messages, and both synchronous and asynchronous message processing. The management of errors requires multiple options to meet the varied implementation configurations that you can choose.
- **Cluster configuration**
The integration framework can provide integration services across a cluster of application servers. If the continuous queue on a single server is inadequate for your message volume, you can add central processing units, hardware, and a cluster configuration to improve message processing performance.
- **Integration security**
The integration framework includes support for J2EE authentication and for component-level authorization.
- **Language support**
Your database can contain some elements, such as descriptions and long descriptions, in multiple languages. Publish channels and enterprise services can include these translated columns. The integration framework also supports the use of bidirectional language formats.

Related information

- [Integration system properties](#)

JMS queue configuration

Asynchronous transactions that are exchanged using either publish channels or enterprise services, use Java™ Messaging Service (JMS) queues to exchange data with an external system.

For inbound processing, when an enterprise service message is received, the message is immediately written to a JMS queue and the caller of the service is released from the transaction. The message is processed from the inbound JMS queue, through the application business objects, and saved to the database. Messages remain in an inbound queue until they are successfully processed or until they are deleted from the queue. A common strategy for inbound queue implementation is to isolate the queues and the queue consumers to a separate server, or server cluster. This strategy ensures that inbound message-processing does not have a performance impact on application users.

For outbound processing, messages sent out using a publish channel are written to a JMS queue and the user who initiated the message is released from the transaction. The message is processed from the outbound JMS queue using the configured endpoint, and is delivered to the external application. Messages remain in the outbound queue until they are successfully delivered to the external application or are deleted from the queue.

There are three default message queues:

- One outbound sequential queue
- One inbound sequential queue
- One inbound continuous queue

A JMS queue implementation can operate on a single application server or across a cluster of application servers.

- **Creating and configuring a queue**
You can choose to use a single JMS queue for multiple external systems or create a separate queue for each external system that you use. Queue creation and configuration involves multiple steps. You can use the default queues or create additional queues, depending on your integration requirements.
- **Sequential queues**
The sequential queue is a JMS queue that uses a predefined system cron task to consume messages. Messages in sequential queues are processed on a strict first-in-first-out basis, ensuring that messages are processed in the order that they are generated and received.
- **Continuous queues**
A continuous queue is a JMS queue with a message-driven bean (MDB) as a consumer. A continuous queue is predefined for enterprise services only and

uses multi-threaded processing to provide better system performance. A continuous queue does not guarantee the processing order of the messages as is the case with a sequential queue.

- [Queue message format](#)

Messages that are loaded into the JMS queues by the integration framework have defined components and formats. The message body contains the XML or JSON message that is processed into the system or sent to the external system.

- [Queue selectors](#)

Selectors act as WHERE clauses in the JMS queue consumer. Selectors can be applied to message headers and properties in either a continuous or a sequential queue.

- [Viewing and deleting messages in a JMS queue](#)

You can view a list of the messages in a JMS queue, download these messages to view their content, and you can delete messages from configured queues. When viewing or deleting messages, you can apply a selector to limit the messages returned for processing.

- [Configuring queues with WebSphere MQ](#)

You can use IBM® WebSphere® MQ to configure and manage queuing activities. Maximo® Manage supports any JMS 1.1 compliant JMS provider.

Creating and configuring a queue

You can choose to use a single JMS queue for multiple external systems or create a separate queue for each external system that you use. Queue creation and configuration involves multiple steps. You can use the default queues or create additional queues, depending on your integration requirements.

About this task

Separate queues are used to support outbound transactions and inbound transactions. Configure a queue to support either inbound or outbound transactions, not both. Configure outbound queues for use with publish channels and configure inbound queues for use with enterprise services.

Procedure

1. Create and configure the message queue on the application server.
2. In the External Systems application, add properties to the queue.
You can create additional queues to meet system needs. If you do not use the default queues, use an application server provider for your queue configuration.
3. In the External Systems application, configure the external system and enterprise services to use the queues.

- [Queue properties](#)

In the External Systems application, you can configure several properties for each JMS queue.

Queue properties

In the External Systems application, you can configure several properties for each JMS queue.

Property	Description
Queue JNDI Name	References the Java™ Naming and Directory Interface (JNDI) name that is configured on the application server. A default value is provided.
Queue Connection Factory Name	References the Connection Factory name that is configured on the application server. A default value is provided.
Initial Context Factory	A value that you must configure when you do not use the default queues and do not use a provided application server.
Provider URL	A value that you must configure when you do not use the default queues and do not use a provided application server.
User ID	The user ID that you configure when the queue is secured on the application server.
Password	The password that is configured when the queue is secured in the application server for the user ID.
Inbound	Identifies whether the queue is used for inbound processing. If the inbound value is null, the system uses the queue for outbound processing.
Sequential	Identifies whether the queue is a sequential queue. If the sequential value is null, the system uses the queue for continuous queue processing.
Compress	Identifies whether the messages are compressed when they are written to the queue and decompressed when they are pulled from the queue. Compression provides significantly reduced message sizes. The standard Java Inflater and Deflater APIs (java.util.zip) are used for compression.
Maximum Try Count	Identifies how many times the integration framework attempts to retry processing a message after the first time the message does not process because of errors. The system continues to retry the message until the count value is met. The value of this property must be set to one when an error queue is implemented.

Sequential queues

The sequential queue is a JMS queue that uses a predefined system cron task to consume messages. Messages in sequential queues are processed on a strict first-in-first-out basis, ensuring that messages are processed in the order that they are generated and received.

When a message results in an error, the system generates an error that can be managed in the Message Reprocessing application, and does not process subsequent messages in the queue until the error is cleared.

You can configure two system sequential queues for inbound and outbound message processing. A predefined cron task, JMSQSEQCONSUMER, polls the queues. There are two instances of the task, one that polls the inbound queue and one that polls the outbound queue. If you create additional sequential queues, you can configure additional instances of the cron task to point to the additional queues.

The following table lists the cron task parameters that you can configure.

Parameter	Description
MESSAGEPROCESSOR	Java™ class that processes the messages from the queue. The system provides this class.
QUEUENAME	Queue JNDI name, when the queue is created on the application server.
SELECTOR	The WHERE clause for configuring an instance of the cron task to process a subset of messages in the queue. This parameter is optional.
TARGETENABLED	Ensure that the value is at the default of 0 (false). The functionality of this flag is superseded by the donotrun parameter in the cron task framework to control which servers the cron task runs on.

Continuous queues

A continuous queue is a JMS queue with a message-driven bean (MDB) as a consumer. A continuous queue is predefined for enterprise services only and uses multi-threaded processing to provide better system performance. A continuous queue does not guarantee the processing order of the messages as is the case with a sequential queue.

When message processing results in an error that can be managed in the message reprocessing application, the system generates an error message and then continues processing subsequent messages in the queue. There is one default continuous queue to process inbound messages. You can choose to implement additional continuous queues, depending on your integration requirements.

- [Continuous queue performance](#)
To improve queue performance, you can increase the number of message-driven beans for a queue and introduce additional application servers in a cluster. Because message processing is multi-threaded, errors can occur because of the random order of processing.
- [Configuring message beans](#)
Server-specific extensions control the maximum number of beans that you can create.
- [Message caching](#)
Continuous queue processing uses the Maximum Batch Size property, under the Activation Specification definition, to control the number of messages received from the messaging engine in a single batch.
- [Configuring an error queue for the continuous queue](#)
You can implement an error queue on the application server that moves a message out of the main queue to a secondary queue when a message goes in error. Unless your integration scenario supports a very low volume of messages, configure an error queue to support message processing through the continuous queue.

Continuous queue performance

To improve queue performance, you can increase the number of message-driven beans for a queue and introduce additional application servers in a cluster. Because message processing is multi-threaded, errors can occur because of the random order of processing.

The following examples describe errors that can occur. In both scenarios, the integration error management processing can successfully reprocess the error before the system administrator can review it.

For example, you are batch loading a large volume of item and inventory messages in the continuous queue, and multiple inventory records exist for the same item number. If an inventory message for Item A is processed before the item message that adds Item A to the system is processed, the inventory message produces an error because Item A does not exist. Processing continues with the next message.

Eventually, the item message for Item A is processed and Item A is added to the system. The failed message can then be successfully processed. In this case, the error is corrected without manual intervention.

This type of situation can occur when you load related messages in the continuous queue at the same time. Such a situation is more likely to occur when the volume of transactions is high but also can occur whenever two messages process related data concurrently.

For example, two messages try to update the same system record at the same time. One message succeeds and the other fails. However, the error management processing of the system must process the second message after the first update is completed.

Configuring message beans

Server-specific extensions control the maximum number of beans that you can create.

Message caching

Continuous queue processing uses the Maximum Batch Size property, under the Activation Specification definition, to control the number of messages received from the messaging engine in a single batch.

If three message-driven beans are enabled, and the batch size is 10, up to 30 messages can be cached. Test with different values to ensure that the value that you set does not impact application users or server processes.

Configuring an error queue for the continuous queue

You can implement an error queue on the application server that moves a message out of the main queue to a secondary queue when a message goes in error. Unless your integration scenario supports a very low volume of messages, configure an error queue to support message processing through the continuous queue.

A continuous queue uses MDBs to consume messages. When a message goes in error, the MDBs continue to consume the messages in error, even after the messages reach the maximum try count that is configured for reprocessing after an initial error. The continuous selection of these messages consumes system resources and can slow down, or even prevent, other messages from being processed. Configuring an error queue for the continuous queue helps to avoid performance delays or transaction bottlenecks by passing messages in error to a secondary queue.

Queue message format

Messages that are loaded into the JMS queues by the integration framework have defined components and formats. The message body contains the XML or JSON message that is processed into the system or sent to the external system.

Message header

The message header can contain the JMS message ID and standard JMS header values.

Header	Description
JMSMessageID	A message ID that is generated by the system.
JMSRedelivered	Identifies whether the message was reprocessed.

Message properties

The properties contain the following properties from the JMS provider and the integration framework. The integration framework properties are of the string data type.

Property	Description
MEAMessageID	The message ID that is generated by the integration framework.
destjndiname	The name of the queue or topic that the message is written to.
INTERFACE	The name of the publish channel (outbound queue) and the enterprise service (inbound queue).
destination	The external system name for outbound messages.
SENDER	The external system name for the inbound messages.
USER	The name of the user that is associated with the inbound integration message. This value can be used for authorization security if required.
compressed	Indicates whether the message is compressed. Values can be true or false; the default value is false. The standard Java™ Inflater and Deflater APIs (java.util.zip) are used for compression.
uncompressed_length	Stores the original message payload size before compression. This value must comply with the int [xsd:int] schema type and is present only when the compressed property is set to true.
MSG_TRK_ENABLED	Internal value.
MSG_OP_MODE	The endpoint name for the outbound messages. Fixed string MXJMS for inbound messages.
MSG_TRK_STORE_MSG	Internal value.
MSG_TRK_EXTSYS	The external system name for outbound and inbound messages.
Msgkeyval	A field name message key.
searchfieldval	A comma-separated search field value.
msgoperation	Indicates whether the publish channel or enterprise service contains a sync, create, update, or delete operation.
msgstatus	Indicates whether the message has a RECEIVED, ERROR, DELETED, or a PROCESSED status value.
msgerrmsg	Contains the exception message text.

- **Messages in text format**

Messages that are written to a queue by the integration framework are in byte format by default. You can use the External Systems application to ensure that messages in text format are also supported.

Messages in text format

Messages that are written to a queue by the integration framework are in byte format by default. You can use the External Systems application to ensure that messages in text format are also supported.

To support messages in text format, select the Text check box in the Add/Modify queue window in the External Systems application. When a queue is configured to support messages in text format, all subsequent messages that are written to the queue by an integration component are in the *javax.jms.TextMessage* format instead of the default *javax.jms.BytesMessage* format.

When the queue is configured for messages in text format, the Text Message Encoding field in the External Systems application identifies the encoding of text-formatted messages in any of the inbound queues configured for the external system. When no value is provided, messages are assumed to be encoded in UTF-8. Messages that are written to the outbound queue are always encoded with UTF-8.

Queue selectors

Selectors act as WHERE clauses in the JMS queue consumer. Selectors can be applied to message headers and properties in either a continuous or a sequential queue.

The following table lists how you can use continuous selectors in the JMS queue consumer.

Type of queue	Where to identify selector
Sequential queue	Specified as a property of the cron task.
Continuous queue	Specified in the <i>ejb-jar.xml</i> code of the message-driven bean.

Applying selectors splits a queue into smaller queues, each of which contains a subset of data that each cron task or message-driven bean uses. An error in one subset of the data does not stop processing in the others in a sequential queue.

While selectors provide flexibility in separating the processing of transactions, they impair the performance of poll processing. Depending on the volume of transactions, you can prefer to implement multiple queues instead of one queue with multiple selectors. Multiple queues typically provide better performance.

You can add the following statement to the SELECTOR property of the SEQQIN instance of the JMSQSEQCONSUMER to instruct the cron task to process the MXPOInterface and MXPRInterface transactions from the corresponding external system:

```
SENDER='EXTSYS1' and INTERFACE in ('MXPOInterface', 'MXPRInterface')
```

Add the following content to the message bean configuration in the *ejb-jar.xml* file to instruct the message-driven bean to process the MXPOInterface and MXPRInterface transactions from the corresponding external system:

```
<message-selector>
  SENDER='EXTSYS1' AND INTERFACE IN ('MXPOInterface', 'MXPRInterface')
</message-selector>
```

If two external systems send data to an inbound sequential queue, an error in any record stops the processing of all transactions in that queue to maintain a first-in-first-out processing order. Create multiple instances of a cron task, each with a selector that processes a different external system, to prevent an error in one system from stopping transactions from the second system.

Ensure that the where clauses in the selectors identify the mutually exclusive sets of transactions in a sequential queue. Include all the transactions that are inserted into the queues to ensure that all messages are processed in a first-in-first-out order.

Viewing and deleting messages in a JMS queue

You can view a list of the messages in a JMS queues, download these messages to view their content, and you can delete messages from configured queues. When viewing or deleting messages, you can apply a selector to limit the messages returned for processing.

About this task

Messages that are currently being processed to a continuous queue by a message-driven bean or to a sequential queue by a JMS cron task are not available to view or delete. You can deactivate the cron task to stop the processing of messages to a sequential queue. Message-driven beans continually process messages and the number of messages being processed can vary. Unless you disable message-driven beans, it is likely that not all messages can be viewed or deleted. If you view or delete messages while message-driven beans are enabled, it is possible that not all messages are available for processing.

Procedure

1. In the External Systems application, select the Add/Modify Queues action .
2. Select a queue, and click either the View Queue Data button or the Delete Queue Data button.
3. Optional: If you select the View Queue Data option, you can specify a number in the Count field to limit the number of records to view and you can check the Count Only field if you only want to see how many messages are currently in the queue.
4. Optional: Specify one of the following selectors if you want to filter the records returned in either the View Queue Data window or in the Delete Queue Data window:

Option	Description
MEAMessageID	ID of the message (applies to inbound and outbound messages).
INTERFACE	The name of the enterprise service for inbound messages or the name of the publish channel for outbound messages.
destination	The name of the external system for outbound queues only.
SENDER	The name of the external system for inbound messages only.
USER	The user provided with the message. This value is optional, and applies to inbound messages only.

Selector values are case sensitive and you must enclose the value of the selector in single quotes, for example `INTERFACE='MXPERSOnInterface'`.

Configuring queues with WebSphere MQ

You can use IBM® WebSphere® MQ to configure and manage queuing activities. Maximo® Manage supports any JMS 1.1 compliant JMS provider.

- [Configuring JMS endpoints and handlers](#)
Outbound messages in a publish channel are placed into the default queue and you must configure the JMS endpoint and handler to send the message to WebSphere MQ.
- [Configuring integration queues and WebSphere MQ provider](#)
To replace integration framework queues with WebSphere MQ queues, configure the queues on WebSphere Application Server and add these queue definitions in the External Systems application.

Configuring JMS endpoints and handlers

Outbound messages in a publish channel are placed into the default queue and you must configure the JMS endpoint and handler to send the message to WebSphere® MQ.

Procedure

1. Create an WebSphere MQ provider on the WebSphere Application Server and configure an integration endpoint to point to the message queue (MQ) provider by using:
 - a. The destination JNDI name (DESTJNDINAME)
 - b. The connection factory JNDI name (CONFACTORYJNDINAME)
2. Configure the endpoint to point to the WebSphere MQ by using:
 - a. The destination JNDI name (DESTJNDINAME)
 - b. The connection factory JNDI name (CONFACTORYJNDINAME)
 - c. The provider URL (PROVIDERURL)
 - d. The initial context factory (CONTEXTFACTORY)

Configuring integration queues and WebSphere MQ provider

To replace integration framework queues with WebSphere® MQ queues, configure the queues on WebSphere Application Server and add these queue definitions in the External Systems application.

Procedure

1. Create the JMS queue by defining an alternate provider to replace the default provider.
2. Create a proxy queue on the WebSphere Application Server by using the WebSphere MQ provider that points to your message queue (MQ) server queue.
3. In the Add/Modify Queues dialog window in the External Systems application, add values to the Queue JNDI Name and Connection Factory fields to point to the proxy queue and connection factory.

Results

Outbound messages that are destined for the default queue are delivered to the message queue (MQ), and inbound messages are retrieved from the message queue (MQ).

Error management

The integration framework supports several message formats, protocols for exchanging messages, and both synchronous and asynchronous message processing. The management of errors requires multiple options to meet the varied implementation configurations that you can choose.

Queues are used by the integration framework as a staging mechanism for inbound and outbound messages. Queue error management is initiated when an error condition is identified and you can view, correct, cancel, and reprocess problematic messages.

- [Non-queue error management](#)
When you start the synchronous processing of inbound or outbound integration messages, you are notified of any errors at the time of execution.
- [Queue-based error management](#)
You can use the Message Reprocessing application to manage erroneous inbound and outbound asynchronous integration messages that use queues.
- [Configuring error management](#)
To configure error management, you must configure system properties and configure the external system.
- [Error notification](#)
When an inbound or outbound transaction results in an error in a queue, an email notification is sent to the system administrator only if no other unresolved errors are waiting in the same queue. If multiple errors exist in the queue, the system administrator must resolve all of them before notification of new errors is sent.
- [Message reprocessing](#)
In the Message Reprocessing application, you can manage messages that are flagged with an error, including changing the message status, correcting the

message, or deleting it from the database.

- [Error management with file-based data import](#)
The integration framework supports error management with the Message Reprocessing application which allows you to review, correct, reprocess, and delete messages that go in error when processed from an inbound queue. When data is imported from an XML file or a flat file, a second option is available that manages errors using a downloaded file instead of the Message Reprocessing application.
- [Interface table error management](#)
Interface tables can be used for inbound and outbound data exchange. Errors can occur when writing inbound data from an interface table to a queue or outbound data from a queue to an interface table.
- [Common causes of errors](#)
Errors when processing messages in the outbound queue occur because there is a problem delivering a message to the endpoint that is specified for the external system. Errors when processing messages in an inbound queue are typically related to a business rule validation or in the inbound processing of the enterprise service.
- [Error research](#)
When you receive an error notification, look at the message in the Message Reprocessing application.
- [Message tracking](#)
The Message Tracking application tracks and displays the processing history of publish channel messages and queue-based enterprise service messages.

Non-queue error management

When you start the synchronous processing of inbound or outbound integration messages, you are notified of any errors at the time of execution.

Non-queue error management is necessary if an error occurs when a synchronous message is being processed. For inbound messages, instead of relying on an error queue, the integration framework responds synchronously to the caller of the process with an error message. The calling application must receive the response, correct the error, and retry the transaction.

Use the system log to troubleshoot synchronous transaction errors. The system log contains the processing exception that the integration framework issues to the caller of the process.

Queue-based error management

You can use the Message Reprocessing application to manage erroneous inbound and outbound asynchronous integration messages that use queues.

Errors that occur when a message is sent from a queue to an external system are typically caused by a communication failure or a problem with database configuration when writing to interface tables or files. Errors that occur during inbound processing are typically a result of business rule validations or the inbound processing logic of the integration framework.

The sequential queue processes messages one at a time, in a first-in-first-out sequence. As a result, only a single error can exist in a sequential queue. When the integration framework encounters an error in processing a message in a sequential queue, inbound or outbound, the error management mechanism is initiated and the message is flagged as having an error. Subsequent messages in the queue are not processed until the message in error is resolved or deleted.

The continuous queue handles inbound processing only and processes messages in a multi-threaded mode. When an error occurs in the continuous queue, error management is initiated and the message is flagged as having an error. The integration framework continues to process subsequent messages in the queue. As a result, multiple errors can exist in a continuous queue.

Depending on your queue configuration, the integration framework makes several attempts to reprocess the message before determining that an error requires intervention. The system also performs the following activities when encountering an error:

- Sends a notification to one or more email accounts, informing the recipients that an error occurred. The address either is specified with the `mxe.int.admintoemail` system property or on the message queue. An address on the message queue takes precedence over the address on the system property.
- Creates a record that can be viewed and managed in the Message Reprocessing application. This record includes the message that was placed in the queue.

Configuring error management

To configure error management, you must configure system properties and configure the external system.

- [Configure notification properties](#)
Before you use the integration framework, configure notification properties in the System Properties application. The email address properties can be superseded by email addresses that are specified for a message queue in the External Systems application.
- [Error processing with an Apache Kafka provider](#)
When messages have errors during processing in Kafka, you can reprocess them or mark them to be deleted after they expire from Kafka.

Configure notification properties

Before you use the integration framework, configure notification properties in the System Properties application. The email address properties can be superseded by email addresses that are specified for a message queue in the External Systems application.

Procedure

1. Filter for the `mxe.int.adminfromemail` property and specify an email address, such as `mxintadm@example.com`.
This address appears in error notifications that are submitted by the integration framework. Some SMTP servers require this address to be a valid email address format; some servers accept any value.
2. Filter for the `mxe.int.adminmailtoemail` property and specify one or more email addresses to receive notification of message processing errors. Use commas to delimit several email addresses.
You can optionally use the email address property at the queue level to override the administrator address. Use this option if you want to specify different email addresses for each queue. If you do not configure an email address, no email notification is sent when queue processing errors occur.
3. Filter for the `mail.smtp.host` property and specify an SMTP server if none has been configured.
This property is not unique to the integration framework, and can be configured for other applications.

Error processing with an Apache Kafka provider

When messages have errors during processing in Kafka, you can reprocess them or mark them to be deleted after they expire from Kafka.

Error processing of messages in sequential queues

Sequential queues do not use an error queue because only one message is in error at any time. A message in error prevents the messages behind it in the queue from processing. However, an error does not prevent new messages from being added to the queue. Kafka retains both processed and unprocessed messages in the queue, based on the retention time that is set in Kafka.

In Kafka, pay attention to the Kafka retention time. For example, if you set it to 48 hours, a message goes in error late Friday evening. Other messages stack up behind the error message. If the error message is not managed until Monday morning, the error message and other unprocessed messages might expire before messages resume processing.

Messages that are in error and expired in Kafka can be reprocessed in the Message Reprocessing application.

If messages are in a queue but are not being processed, which happens if the cron task is not active, messages can expire. Because the messages did not process with an error, they are not available in the Message Reprocessing application and are not recoverable.

If you have messages in error that you do not want to reprocess, mark the messages for deletion in the Message Reprocessing application.

Error processing of messages in continuous inbound queues

A message that is in error in a continuous queue is written to the end of the queue so that it reprocesses. The number of times that an errored message can be reprocessed is determined by the value of the Maximum Retry Count field for this external system.

For continuous inbound error processing, you must set up an instance of the KAFKAERROR cron task for that continuous queue. This cron task processes the messages from the `maxinterror` table in Maximo® Application Suite.

Note: After attempting the "maximum retry count" times, the error message is set on HOLD status. This gets skipped by the KAFKAERROR cron task in favor of the next message in the error table. If you want to fix the message and retry, use the Message Reprocessing application to edit the message and change the message status to "RETRY" for the KAFKAERROR cron task to process it in the next iteration. If you do not want to process the error message anymore, mark the message for deletion in the Message Reprocessing application.

Configuration of a redelivery delay for continuous queues

An administrator can configure a redelivery delay that is in effect when a retry count is specified for a continuous queue. When a redelivery delay is specified in the `mxe.int.kafkaredeldelay` property, the cron task for the queue does not rewrite a message to the end of the Kafka queue until after the delay time.

For example, if the delay is set to 30 seconds, the cron task for the continuous queue pauses for 30 seconds before it rewrites the message with errors to the end of the queue. The delay allows other messages to be processed in the queue, some of which can contain objects that are needed to successfully process the message that had errors. The drawback of using this mechanism is that the delay slows down the processor because it delays the cron task from continued processing.

To implement a redelivery delay, create the `mxe.int.kafkaredeldelay` property in the System Properties application and set a delay time in seconds.

Error notification

When an inbound or outbound transaction results in an error in a queue, an email notification is sent to the system administrator only if no other unresolved errors are waiting in the same queue. If multiple errors exist in the queue, the system administrator must resolve all of them before notification of new errors is sent.

An email error message includes a Java™ error stack trace.

The same notification process is used for all errors, queues, and messages, regardless of whether the system is running in a clustered or non-clustered environment.

The following example describes error notification for a continuous inbound JMS queue that contains ten messages. The first four messages are processed successfully and an error occurs on the fifth message. Depending on the value you set for the Maximum Try Count property for the external system, the message can be retried one or more times. If the message does not process successfully, it is moved to either an error queue if one is configured, or to be manually reviewed in the Message Reprocessing application. A notification email is sent to the system administrator and subsequent messages in the queue are processed. If another

error occurs in the seventh message, email notification is not sent unless the system administrator resolved the original error. If the system administrator resolved the original error and no errors are pending, a new email notification is sent.

Multiple errors can exist only in the continuous inbound JMS queue. In a clustered environment, the system administrator can receive one email error notification per application server, depending upon the timing of the transactions in error.

The following example describes error notification for a sequential outbound or inbound queue that contains ten messages. The first four messages are processed successfully and an error occurs on the fifth message. Depending on the value you set for the Maximum Try Count property for the queue, the message can be retried one or more times. If the message continues to cause an error, an email notification is sent to the system administrator and subsequent messages in the queue are not processed until the message with the original error is resolved or, if you are using a Kafka provider, the message expires and is deleted from the Kafka queue. The administrator is notified about the first error.

An uncommon exception condition can occur with outbound JMS messages when a message is saved to the queue but the commit of the transaction to the queue fails. This exception can occur because a database connection to the JMS data store is not available. If this exception occurs, a notification is sent and the message in error is visible in the Message Reprocessing application with a status of either JMSERROR or SAVED. Because the message was not saved successfully in the queue, you cannot set the message status to RETRY, but you can process the message from the application.

Message reprocessing

In the Message Reprocessing application, you can manage messages that are flagged with an error, including changing the message status, correcting the message, or deleting it from the database.

If message tracking is enabled, use the Message Tracking application to determine which tracked messages are flagged with an error. If message tracking is not enabled, you can check for transaction errors in the Message Reprocessing application.

- **Message status values**
To change the status of a message, select the Change Status action in the Message Reprocessing application. The system designates a status to each message to indicate whether it is ready for processing.
- **Error messages**
You can review the XML or JSON message that is generated when an error occurs and you can modify the content of the message.
- **Critical errors**
Critical errors are processing exceptions that the integration framework error correction process cannot retry.
- **Correcting errors**
In the Message Reprocessing application, you can either reprocess a message that is in error, or you can delete the message from the database.

Message status values

To change the status of a message, select the Change Status action in the Message Reprocessing application. The system designates a status to each message to indicate whether it is ready for processing.

A message can have a status of RETRY or HOLD:

Status	Description
RETRY	The message is ready to be reprocessed by the system.
HOLD	The message is not ready to be reprocessed by the system.

The RETRY status is the default status for messages that are flagged with an error. Until you correct the processing problem, the system continues to reprocess the message according to the configured queue retry count. When the retry count condition is met, the system changes the messages status to HOLD.

You can halt message reprocessing by changing the message status to HOLD. A hold status prevents the system from reprocessing the flagged message and from updating the system database tables.

Error messages

You can review the XML or JSON message that is generated when an error occurs and you can modify the content of the message.

When you manage an error in the Message Reprocessing application, you can see the following information:

- The Error Data field contains the error message.
- The message content contains the original message that was placed in the queue and is causing an error. You can edit this element.
- If available, the internal record contains the XML or JSON representation of the message at the time that the error occurred. You cannot edit the internal record but you can use it to view if integration processing changed the original message before the error occurred.

The internal record represents the object structure that was created during enterprise service and user exit processing. An internal record is available only for inbound transactions, and only when enterprise service and user exit processing complete successfully. If an internal record is available, it is provided for information only and you cannot change it.

The following example shows an error XML message:

```
<?xml version="1.0" encoding="UTF-8"?>
  <SyncMXPERSO...
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  creationDateTime="2014-04-22T14:04:03-04:00"
```

```

transLanguage="EN" baseLanguage="EN" messageID="11798570432187483"
maximoVersion="7 6" event="1"
messageid="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mif.doc_gp_intfrmwk_c_error_xml_11798570432652
428">
    <MXPERSONSet>
        <PERSON action="Update">
            .
            .
        </PERSON>
    </MXPERSONSet>
</SyncMXPERSON>

```

The following example shows an internal record XML message:

```

<?xml version="1.0" encoding="UTF-8"?>
    <SyncMXPERSON xmlns="http://www.ibm.com/maximo"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    creationDateTime="2014-04-22T14:04:03-04:00"
    transLanguage="EN" baseLanguage="EN" messageID="11798570432187483"
    maximoVersion="7 6" event="1"
    messageid="_home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mif.doc_gp_intfrmwk_c_error_xml_11798570432652
428">
        <MXPERSONSet>
            <PERSON action="Update">
                .
                .
            </PERSON>
        </MXPERSONSet>
    </SyncMXPERSON>
</IR>
</ERROR>

```

Critical errors

Critical errors are processing exceptions that the integration framework error correction process cannot retry.

Transaction processing exceptions can occur when incorrect data, such as a special character, is present in the XML or JSON file. To correct a critical error, you remove the incorrect data from the error XML or JSON message. You can see incorrect data that is associated with a critical error in the main tab of the Message Reprocessing application.

Correcting errors

In the Message Reprocessing application, you can either reprocess a message that is in error, or you can delete the message from the database.

- [Reprocessing an edited message](#)
You can view, modify, and reprocess messages in the Message Reprocessing application. After you edit the error XML or JSON message, you can save or cancel the changes without reprocessing the message.
- [Deleting messages](#)
You can delete messages from the error message queue. After you delete a message, it cannot be reprocessed.
- [Refresh messages](#)
You can use the Refresh icon in the Message Reprocessing application to update the message list. When you refresh the message list, you can check on the status of a specific message listings.

Reprocessing an edited message

You can view, modify, and reprocess messages in the Message Reprocessing application. After you edit the error XML or JSON message, you can save or cancel the changes without reprocessing the message.

About this task

You can edit only those messages that have a HOLD status. If the message has a RETRY status, the content of the message is read-only.

Procedure

1. In the Message Reprocessing application, select the message that you want to modify and click the Message Details icon.
2. In the Error Data window, make any necessary changes to the message.
3. Click Process if you want to reprocess the message.
You can click Save to save the changes without reprocessing the message or you can click Cancel to discard any changes you made.

Results

If the processing is successful, the Message Reprocessing application performs the following tasks:

- Deletes the record in the error message table.
- Updates the DELETEFLAG, CHANGE BY, and CHANGE DATE attributes in the error status table

What to do next

In the Message Details window, refresh the list of messages that are flagged with an error. If the message was successfully reprocessed, it is dropped from the list.

Deleting messages

You can delete messages from the error message queue. After you delete a message, it cannot be reprocessed.

Procedure

1. In the Message Reprocessing application, select the message records that you want to delete.
2. Select the Delete Message action.
3. Click OK.

Results

When a message is deleted, the record is deleted from the MAXINTERRORMSG and MAXINTERROR tables. The application refreshes the result set and omits the deleted message listing on the main tab of the Message Reprocessing application.

Refresh messages

You can use the Refresh icon in the Message Reprocessing application to update the message list. When you refresh the message list, you can check on the status of a specific message listings.

If the message reprocessing was successful, the application omits the applicable message listings. If you delete a message, the application omits the deleted message listing.

Error management with file-based data import

The integration framework supports error management with the Message Reprocessing application which allows you to review, correct, reprocess, and delete messages that go in error when processed from an inbound queue. When data is imported from an XML file or a flat file, a second option is available that manages errors using a downloaded file instead of the Message Reprocessing application.

File-based error management is beneficial when you import a large number of messages that can cause a large number of errors. Managing a large number of errors in a file format can be easier and quicker than managing them individually in the Message Reprocessing application.

- [File-based error management](#)
You can use file-based error management with the data import feature. File-based error management provides the ability to identify all integration messages flagged with an error and download a complete file that contains all errors. The downloaded file is in a format that is consistent with the file that was used for the import.
 - [Configuring error management in data import cron tasks](#)
You can set the ISFILEEXTRACT parameter in the XMLFILECONSUMER and FLATFILECONSUMER cron tasks to identify the error management mechanism that you want to use.
 - [Information extracted by file-based error management](#)
File-based error management provides the ability to download a reprocessable file that contains all of the error messages that originated from a single input file.
-

File-based error management

You can use file-based error management with the data import feature. File-based error management provides the ability to identify all integration messages flagged with an error and download a complete file that contains all errors. The downloaded file is in a format that is consistent with the file that was used for the import.

To configure file-based error management, in the Data Import window, select the File-based Error Management check box.

When you select the File-based Error Management check box and leave the Import Preview check box cleared, you receive a system message after the inbound messages are processed successfully to the queue.

Inbound processing logic identifies processing errors on any of the messages in the source file and makes these failed messages available for download in a reprocessable file. The Message Reprocessing application provides a facility to download the reprocessable file.

Selecting the File-based Error Management check box means that any integration messages flagged with an error are available only in the reprocessable file and are not displayed in the messages section of the Message Reprocessing application.

Configuring error management in data import cron tasks

You can set the ISFILEEXTRACT parameter in the XMLFILECONSUMER and FLATFILECONSUMER cron tasks to identify the error management mechanism that you want to use.

The following table contains the possible values for the ISFILEEXTRACT parameter:

Value	Error management mechanism
0	Error management is handled in the Message Reprocessing application.
1	File-based error management is handled in the Data Import window and in the reprocessable file.

File-based error management means that any integration messages flagged with an error are available only in the reprocessable file and are not displayed in the messages section of the Message Reprocessing application.

Information extracted by file-based error management

File-based error management provides the ability to download a reprocessable file that contains all of the error messages that originated from a single input file.

The following table contains the information available in the Error Extract section of the Message Reprocessing application.

Field	Description
Import file	Name of the source file that generated the reprocessable file.
Enterprise service	Name of the enterprise service that was used to import the source file.
External system	Name of the external system that was used to import the source file.
Import date	Date and time when the data import process initiated processing of the source file.
Imported count	Total number of messages imported from the original source file.
Processed count	Number of messages processed successfully.
Error count	Number of messages that have errors.
File format	Format of the source file.
Available to extract	Identifies whether the inbound processing of the source file has completed.
Extract icon	Action button that initiates the file download process. To assure that the source file has been completely processed by the import mechanism, files are only available for download when the sum of error count and processed count is equal to the imported count.
Delete icon	Action button that deletes the selected record from the Error Extract table. You can only delete table records if the sum of the error count and processed count is equal to the imported count.

- [Downloading reprocessable files](#)

You can download a reprocessable file and fix the processing errors identified in the file. You can then attempt to reload the reprocessable files without removing any of the error message description information that is contained in the file.

- [Reprocessable file format](#)

When you download the reprocessable file, it is provided in the same format as the original input file. If you use the flat file format, the file uses the same delimiter and text qualifier. The default file name for the reprocessable file is `<UniqueFileIdentifier>_<OriginalFileName>.<OriginalFileExtension>`

- [Deleting reprocessable files](#)

You can permanently delete data that is available to reprocess as a file.

Downloading reprocessable files

You can download a reprocessable file and fix the processing errors identified in the file. You can then attempt to reload the reprocessable files without removing any of the error message description information that is contained in the file.

Procedure

1. In the Message Reprocessing application, identify the source file from which you will be downloading its corresponding errors.
2. Verify that the source file has been fully processed by the data import process.
The sum of the error count field and the processed count field must equal the imported count field.
3. Click the Download icon.
4. Save the reprocessable file to your client or to an accessible file server location.

Reprocessable file format

When you download the reprocessable file, it is provided in the same format as the original input file. If you use the flat file format, the file uses the same delimiter and text qualifier. The default file name for the reprocessable file is `<UniqueFileIdentifier>_<OriginalFileName>.<OriginalFileExtension>`

Example of an XML reprocessable file

A reprocessable file based on an XML file, includes an additional element in the main MBO of the original object structure. For example, a reprocessable file generated based on MXASSET information includes the MAXINTERRORMSG element as part of the asset elements.

```
<?xml version="1.0" encoding="UTF-8"?>
  <SyncMXASSET xmlns="http://www.ibm.com/maximo" transLanguage="EN">
    <MXASSETSet>
      <ASSET>
        <ANCESTOR />
        <ASSETID>94</ASSETID>
        <ASSETNUM>THREE_T2002</ASSETNUM>
        <ASSETTAG />
        <ASSETTYPE />
        ...
        ...
        <WARRANTYEXPDATE>2020-12-24T00:00:00-05:00</WARRANTYEXPDATE>
        <YTD COST>0.0</YTD COST>
        <MAXINTERRORMSG>
          The following error occurred while processing ASSET.BMXAA4147E -
          Item set error1 does not exist.
        </MAXINTERRORMSG>
      </ASSET>
      ...
      ...
    </MXASSETSet>
  </SyncMXASSET>
```

Example of flat format reprocessable file

Reprocessable files that follow a flat file structure include an additional column. For example, a reprocessable file generated based on MXASSET information includes the MAXINTERROR column at the end of the original record structure:

```
EXTSYS1,MXASSETInterface,,EN
ASSETNUM,AS_DESCRIPTION,AS_DESCRIPTION_LD,HIERARCHYPATH,AS_SITEID,MAXINTERRORMSG
T-SP500_error,autospray,,,TEXAS,
The following error occurred while processing ASSET.BMXAA4049E -
The value specified T-SP500_error exceeds the maximum field length.
```

Deleting reprocessable files

You can permanently delete data that is available to reprocess as a file.

Procedure

1. In the Message Reprocessing application, identify the row of reprocessable data that you want to delete.
2. Click the Delete icon.

Interface table error management

Interface tables can be used for inbound and outbound data exchange. Errors can occur when writing inbound data from an interface table to a queue or outbound data from a queue to an interface table.

If an error is encountered by the cron task that pulls an outbound message from a queue, the message remains in the queue until the error condition is addressed. Errors may occur for the following reasons:

- The interface table does not exist.
- There is database error due to lack of space.
- The message content, as defined by the object structure, was altered but the interface table was not recreated to reflect the new message format.

When an outbound message reaches an interface table, it is the responsibility of the external application to retrieve that data and manage errors based on their integration implementation.

The cron task that writes inbound messages to a queue can encounter errors for the following reasons:

- The JMS queue is deactivated or free space is not available.
- The enterprise service or external system name is not valid.
- The enterprise service is not enabled for the external system.
- The external system is not enabled.

When an error occurs during inbound interface table processing, the polling program writes the exception trace in the IMPORTMESSAGE column of the MXIN_INTER_TRANS queue table. For the first error in the MXIN_INTER_TRANS queue table, the system sends an email notification to the administrator. You can resolve the error condition by updating the row of data in MXIN_INTER_TRANS, for example, correcting the value of the external system name, or by updating the configuration data in the application, for example, marking the enterprise service as enabled.

After the cron task processes subsequent records in the MXIN_INTER_TRANS queue table, it switches to an idle state that is based on the defined cron task processing intervals. When processing resumes, the cron task tries to process the records in error, as well as new records added to the MAX_INTER_TRANS queue table.

After sending an error notification, the cron task does not send notification of additional errors if the queue table contains one transaction that is marked in error. It is assumed that the person who was notified of the initial error sees and corrects additional errors when the queue table is examined. After all current errors are corrected, the cron task sends a notification when it encounters a new error.

Any errors that occur after the cron task successfully writes an interface table message to an inbound queue are managed by the error handling process for the queues.

Common causes of errors

Errors when processing messages in the outbound queue occur because there is a problem delivering a message to the endpoint that is specified for the external system. Errors when processing messages in an inbound queue are typically related to a business rule validation or in the inbound processing of the enterprise service.

For outbound processing, typical problems are disruptions of the communication link to the external application, issues with the database table space, or file space issues in the external application. To resolve an outbound error, you typically do not need to modify the XML or JSON message.

The following table describes the most common message errors that you can encounter and provides suggestions for correcting them. Correcting an error in the message can create a mismatch in data between the sending and receiving systems.

Error type	Description	Actions
Sequence error	Caused by sequencing problems between messages. The system stops message processing when a record references another record that is in a pending state.	This error is applied to ensure that records process in the correct order. Depending on the direction of the message transaction and the processing logic that applies, the processing can self-correct the error when the record that was in the pending state has processed.
Data error	Occurs because the data or record does not exist in the system database, and is not part of the inbound messages in the queue.	Add the missing data to the system database.
Communication error	Caused by communication problems with the external system from system failures or network issues.	Restore communication with the external system.
Message error	Caused by erroneous message data values.	<ul style="list-style-type: none">• Change the transaction status to HOLD.• Correct the error message.• Change the transaction status to RETRY to reprocess the transaction.

Error research

When you receive an error notification, look at the message in the Message Reprocessing application.

No messages in error exist

If no message in error exists in the Message Reprocessing application, the message was retried and the error was not encountered again. The error message was deleted when the message was successfully processed.

For example, an error occurs in an inbound receipt message due to an incorrect general ledger (GL) account. After the error occurs, an online user enters that GL account in the system. The message is reprocessed successfully and the data is saved.

In another example, an outbound transaction encounters a communication error. When the communication problem is resolved, the message is sent to the external system and the message in error is deleted.

One or more messages in error exist

When an error occurs in a sequential JMSqueue (inbound or outbound), processing of the queue stops until the error is resolved.

Messages are available to review and resolve in the Message Reprocessing application.

When an error occurs in a continuous queue, processing of the queue continues and additional errors can occur before the initial error is resolved. Multiple messages in error can exist in the Message Reprocessing application.

Message tracking

The Message Tracking application tracks and displays the processing history of publish channel messages and queue-based enterprise service messages.

The Message Tracking application works with the Message Reprocessing application. When you use the Message Tracking application, you can determine which messages are flagged with an error. You then can select a failed message and go to the Message Reprocessing application to take appropriate action to correct erroneous data.

- [Message details](#)
When you enable message tracking, the integration framework writes all processed messages to the MAXINTMSGTRK table. A status is assigned to each message which represents its current position in the queue-based processing cycle. Individual message events are displayed in the Message Details window.
- [Message status values](#)
Every inbound and outbound queue-based message that is registered in the Message Tracking application has a status value that indicates its position in the transaction processing cycle.
- [Message events](#)
The Message Tracking application tracks and displays inbound and outbound queue-based transaction processing events. Transaction processing events trigger the system to update the MAXINTMSGTRK table.
- [Message tracking configuration](#)
You can track messages that are sent through publish channels or that are received from enterprise services.
- [Enabling message tracking](#)
Enable message tracking for outbound transactions in the Publish Channels application and for inbound transactions in the Enterprise Services application.

Message details

When you enable message tracking, the integration framework writes all processed messages to the MAXINTMSGTRK table. A status is assigned to each message which represents its current position in the queue-based processing cycle. Individual message events are displayed in the Message Details window.

When you enable message tracking, queue messages that existed before the function was enabled are not identified by the message tracking logic. When you disable message tracking, pre-existing queue messages that existed before the function was disabled are identified but new messages are not identified.

Messages have the following attributes, and values are assigned based on the originating enterprise service or publish channel data:

- Integration mode: The name of the integration mode used in processing the message. For inbound messages, the system assigns an MXJMS default value. For outbound messages, the system assigns the name of the endpoint that is used in message processing.
- Operation: The processing operation the system applies to the tracked message, which can be any of SYNC, UPDATE, QUERY, DELETE, CREATE, and PUBLISH.
- System: The name of the external system that is associated with either the enterprise service or publish channel.
- Integration component: The name of the enterprise service or publish channel.
- Adapter: The name of the adapter that is associated with either the enterprise service or publish channel.
- Queue name: The name of the queue used by the integration framework to process the message.

The following attributes are assigned values at the time the transaction record is created.

Attribute	Value
Received Datetime	The date and time the message was received in the queue.
Message ID	Unique message identifier that is assigned by the integration framework.
Search ID	Message identifier that is assigned by an external application and that is used in the message searches.
External Message ID	Unique message identifier that is assigned by an external application.

The following attributes have dynamic values that change based on the transaction events.

Attribute	Value
Current® Status	The most current processing status for the tracked message.
Status	The status that is associated with the individual message event in the transaction history.
Status Date	The status date for the individual message event in the transaction history.
Error	The error message for the individual error message event in the transaction history.

Message status values

Every inbound and outbound queue-based message that is registered in the Message Tracking application has a status value that indicates its position in the transaction processing cycle.

The message tracking status indicates whether the message was successfully received or processed. The message tracking status also indicates whether the message was deleted, or flagged with errors.

Inbound message status

Inbound messages can have the following status values:

Status	Description
ERROR	Message processing failed due to validation problems.
DELETED	Message was deleted from the queue.
PROCESSED	Message was successfully processed.

Status	Description
RECEIVED	Message was successfully written to the inbound queue.

Outbound message status

Outbound messages can have the following status values:

Status	Description
ERROR	Message processing failed due to validation problems.
DELETED	Message was deleted from the queue.
PROCESSED	Message was successfully processed.
RECEIVED	Message was successfully written to the outbound queue.

Message events

The Message Tracking application tracks and displays inbound and outbound queue-based transaction processing events. Transaction processing events trigger the system to update the MAXINTMSGTRK table.

The following message table attributes are updated according to event type:

- STATUS
- STATUSDATETIME
- ERRORMSGR

The following inbound and outbound events update the MAXINTMSGTRK table:

Table 1. Tracked inbound and outbound events

Event	Details
Message is written to queue	A record is created in the message tracking table when the integration framework first writes the message to the queue. When the message is successfully written to the queue, the message record status is set to RECEIVED. If the integration framework encounters an error when it is writing an inbound message to the queue, it sends a message to the process caller detailing the cause of failure.
Error in message processing	The existing record in the message tracking table. When the asset management system encounters a processing error, it updates the message record status to ERROR. If you resend your message and a processing error occurs again, the asset management system maintains the ERROR message status.
End-of-queue processing	The following transaction processing events update the existing record: <ul style="list-style-type: none"> • The asset management system successfully completes the message processing and updates the message record status to PROCESSED. Because the processing cycle is complete, no further updates are made to the message tracking table. • If you delete the message from the queue, the asset management system sets the message record status to DELETED. The message tracking table is no longer updated.

Message tracking configuration

You can track messages that are sent through publish channels or that are received from enterprise services.

In the Publish Channels and Enterprise Services applications, you can configure the following message tracking functions:

- Enable or disable message tracking.
- Store transaction messages in the database along with the tracking details.
- Specify the message data that the Message Tracking application search function uses by using an XPATH expression.
- Uniquely identify messages with a single ID value by using an XPATH expression.
- Identify messages with a search ID value by using an XPATH expression.

The XPATH expressions that are associated with the external message ID values and the search ID values can identify multiple nodes in an XML file. In this case, the message ID and search ID values are registered as a comma-separated list of values. Database field lengths are applicable to external ID and search ID fields. If necessary, you can adjust the length of these fields in the Database Configuration application.

Stored messages

When you configure message tracking, messages and message tracking details are saved in the database and can be viewed in the Message Reprocessing application.

External message tracking ID

Each inbound message has an external message identifier that is stored in the MAXINTMSGTRK table. With the Message Tracking application, you can use this external message ID to locate specific messages. The syntax that you use to identify a message node must be a fully qualified XPATH expression.

To find all messages for the MXPERSONInterface enterprise service, specify the following fully qualified XPATH expression in the External Message ID field:

```
/{http://www.ibm.com/maximo}SyncMXPERSO@messageID
```

When a multi-noun inbound message is received, the integration framework uses the XPATH expression for the external message ID to identify the message. If the XPATH expression points to an element included in each one of the nouns in the inbound message, the integration framework creates a multi-noun, comma-separated list of external identifiers.

Search ID

By specifying an XPATH expression to identify nodes, the integration framework can perform efficient multi-noun searches. The system stores the search identifier in the MAXINTMSGTRK table.

To find all messages for the MXPERSOInterface enterprise service, create the following fully qualified XPATH expression as the search ID:

```
/{http://www.ibm.com/maximo}SyncMXPERSO/{http://www.ibm.com/maximo}MXPERSOSet/{http://www.ibm.com/maximo}PERSON/{http://www.ibm.com/maximo}PERSONID
```

When a multi-noun inbound message is received, the integration framework uses the XPATH expression for the search ID to identify the message. If the XPATH expression points to an element included in each one of the nouns in the inbound message, the integration framework creates a multi-noun, comma-separated list of search identifiers.

Enabling message tracking

Enable message tracking for outbound transactions in the Publish Channels application and for inbound transactions in the Enterprise Services application.

Procedure

1. In the Publish Channels application or the Enterprise Services application, select the channel or service that processes integration messages.
2. Select the Message Tracking action.
3. In the Message Tracking Setting window, select the Enable Message Tracking check box.
4. Optional: Select the Store Message check box to store transaction messages.
5. Optional: In the External Message ID field, specify one or more XPATH expressions to locate specific messages.
6. Optional: In the Search ID field, specify one or more XPATH expressions to search for messages.

Cluster configuration

The integration framework can provide integration services across a cluster of application servers. If the continuous queue on a single server is inadequate for your message volume, you can add central processing units, hardware, and a cluster configuration to improve message processing performance.

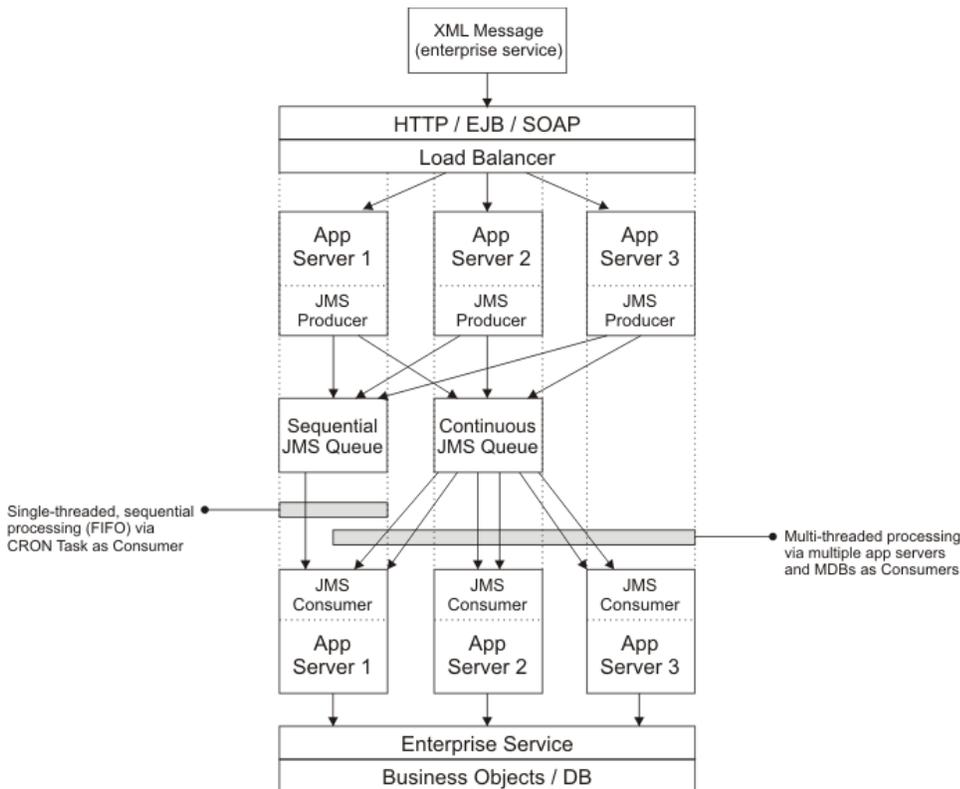
When you implement a server cluster, you can use multiple servers simultaneously to process inbound messages. These messages are processed in the continuous queues by using message-driven beans (MDBs). Cluster configurations facilitate the processing of messages in large volumes.

- [JMS queues in a server cluster](#)
In a cluster configuration, JMS queues are associated with one member of the server cluster and access to the queues is provided by the Java™ Naming and Directory Interface (JNDI) service.
- [Configuring the cron task](#)
The interface table cron task, the data import cron task, and the JMS queue cron task are cluster-aware functions. By default, the cron task framework runs a task on a randomly chosen server. You can configure a cron task to run on a specific application server within a server cluster. Use the donotrun parameter in the cron task framework to control which servers the cron task runs on.
- [Configuring a message processing server](#)
For high volumes of inbound messages, you can improve server efficiency by moving inbound message processing to a separate application server or server cluster.
- [Global directory configuration](#)
In a cluster environment, if you configure a global directory for management of integration files, the directory must be accessible to all members of the cluster.
- [Access to services by inbound messages](#)
Enterprise services, object structure services, and standard services can all function in a server cluster.

JMS queues in a server cluster

In a cluster configuration, JMS queues are associated with one member of the server cluster and access to the queues is provided by the Java™ Naming and Directory Interface (JNDI) service.

The JNDI service is available across all the members on the cluster.



All cluster members can produce messages into the sequential queue. A single-threaded cron task reads the messages in the sequential queue to support first-in-first-out processing.

The continuous queue is multi-threaded on the consumer side to support message processing in high volumes. In this queue, the message processing order is not considered.

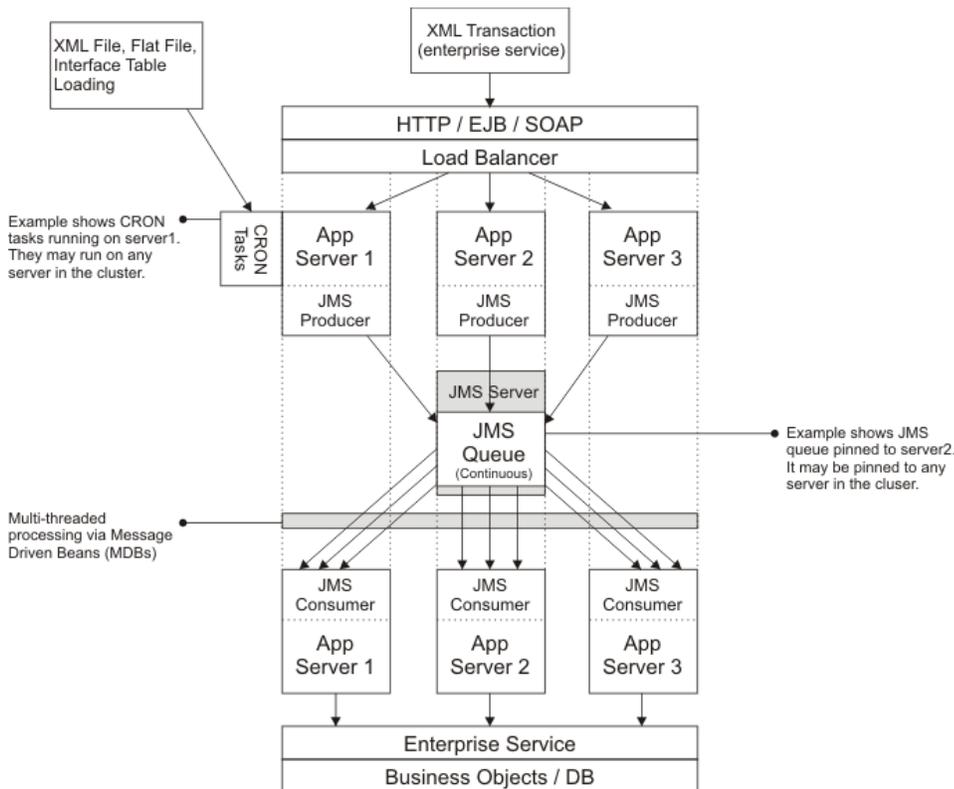
Enterprise service messages that use the sequential queue are processed in a strict sequential order. Message processing is single-threaded. Clustering does not significantly impact the processing performance of messages through the sequential queue.

- [Continuous queue on an application server cluster](#)
In a clustered environment, you can pin the continuous JMS queue to one member of the cluster.
- [Sequential queue on an application server cluster](#)
The sequential queue receives JMS producer messages and processes the JMS consumer messages.

Continuous queue on an application server cluster

In a clustered environment, you can pin the continuous JMS queue to one member of the cluster.

The following diagram shows an example of a cluster configuration on an application server. The continuous queue receives JMS producer messages and processes the JMS consumer messages.



In the example, three application servers exist in the clustered environment. The continuous JMS queue is pinned to one member of the cluster.

The processing occurs when the integration framework receives enterprise service messages by using HTTP, enterprise beans, and SOAP actions. The load balancer directs the application server to drop enterprise service messages into the continuous queue. Each member of the cluster places messages into the queue, which exists on one member of the cluster.

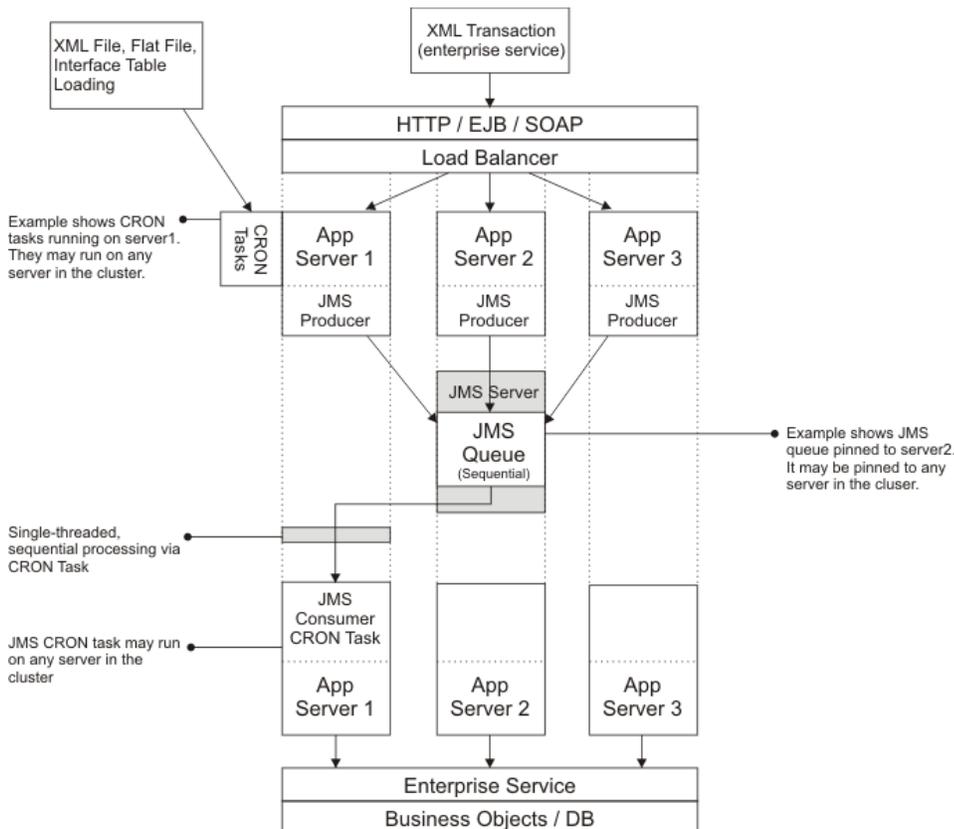
An integration cron task delivers enterprise service messages from flat or XML files and interface tables. The cron tasks that place messages into the queue can run on any server in the cluster.

After messages are in the queue, all application servers can simultaneously pull messages from the queue and process them into the system. Message-driven beans must be enabled on each application server in the cluster.

Sequential queue on an application server cluster

The sequential queue receives JMS producer messages and processes the JMS consumer messages.

The following diagram shows one example of a cluster configuration on application servers.



In the example, three application servers exist in the clustered environment. The sequential JMS queue is pinned to one member of the cluster.

The processing occurs when the integration framework receives enterprise service messages by using HTTP, enterprise beans, and SOAP actions. The load balancer directs the application server to drop enterprise service messages into the sequential queue. Each member of the cluster places messages into the queue, which exists on one member of the cluster.

An integration cron task delivers enterprise service messages from flat or XML files and interface tables. The cron tasks that place messages into the queue can run on any server in the cluster. Once messages are in the queue, the application server that is running the JMS consumer cron task processes messages in a sequential order.

Unlike the continuous queue, there is no multi-threading of messages by design. A cluster implementation does not significantly impact the processing performance of messages that process through the sequential queue.

Configuring the cron task

The interface table cron task, the data import cron task, and the JMS queue cron task are cluster-aware functions. By default, the cron task framework runs a task on a randomly chosen server. You can configure a cron task to run on a specific application server within a server cluster. Use the `donotrun` parameter in the cron task framework to control which servers the cron task runs on.

Configuring a message processing server

For high volumes of inbound messages, you can improve server efficiency by moving inbound message processing to a separate application server or server cluster.

Procedure

1. Deploy a separate application EAR file on the message processing server or server cluster.
2. On the message processing application server or server cluster, use the `donotrun` parameter in the cron task framework to control which servers the cron task runs on.
3. Optional: Configure message-driven beans to pull data from the inbound continuous queue.
Do not enable message-driven beans for inbound processing within the server or server cluster that is dedicated for online users. You can run other background processing cron tasks on this server or server cluster.
4. Optional: Grant user interface access to users who use of the data import feature.

Global directory configuration

In a cluster environment, if you configure a global directory for management of integration files, the directory must be accessible to all members of the cluster.

Depending upon your use of the integration framework components, files may or may not be written to the global directory. In a multitenancy environment, a global directory is required. One of the main reasons for configuring a global directory is to support the use of file-based endpoints. If you intend to use file-based endpoints for invocation channels and messages are initiated by application users that are configured in a UI cluster, all members of the cluster must have visibility to the global directory.

To define the global directory, update the `mxe.int.globaldir` system property in the System Properties application.

Access to services by inbound messages

Enterprise services, object structure services, and standard services can all function in a server cluster.

An inbound transaction can access the relevant service with any of the following communication methods:

- REST API, Internet Inter-ORB Protocol (IIOP), and enterprise beans
- HTTP and HTTPS servlet
- SOAP, HTTP, and HTTPS servlet

Enterprise beans

With a single server, the provider URL for accessing the JNDI tree is the single server URL. With a server cluster, the provider URL can be the URL of any of the servers that has the enterprise beans deployed. All members of the cluster share the JNDI tree and any member of the cluster can look for and retrieve a cluster.

Following a cluster look up, the client retrieves a cluster-aware proxy of the enterprise beans which load balances all the subsequent calls that use that proxy. Load balancing happens transparently to the client code. There is no difference between the code for a single server and for a cluster setup. A separate enterprise bean is deployed for each type of service: object structure service, enterprise service, and standard service.

HTTP servlet

The integration servlet is deployed across all members of the cluster. With a single server configuration, the URL is the HTTP and HTTPS URL of that server. With a cluster server configuration, the URL is the HTTP and HTTPS URL of the load balancer for the cluster. A separate servlet is deployed for each type of service: object structure, enterprise, and standard service.

The URL formats for each service are shown in the following table. The `meaweb` variable in the URL represents the value you specify for the `mxe.int.webappurl` in the System Properties application.

Service	URL
Object structure service	<code>http://hostname:port/meaweb/os/object structure name</code>
Enterprise service (bypassing queue)	<code>http://hostname:port/meaweb/es/extsysname/enterprise service name</code>
Enterprise service (through the queue)	<code>http://hostname:port/meaweb/esqueue/extsysname/enterprise service name</code>
Standard service	<code>http://hostname:port/meaweb/ss/standard service name</code>

Web services

Integration web services are homogeneously deployed across all the server members in the cluster. Web service access for a cluster is the same as for a single server, except that the web service URL and Web Service Definition Language (WSDL) URL point to the cluster instead of to a specific server in the cluster.

The following properties must point to the cluster URL:

- Web application URL `mxe.int.webappurl`
- UDDI registry inquiry URL `mxe.int.uddiinurl`
- UDDI registry publish URL `mxe.int.uddipuburl`

The URL to access a web service is `http://hostname:port/meaweb/services/web service name`. The `meaweb` variable in the URL represents the value you specify for the `mxe.int.webappurl` in the System Properties application.

Integration security

The integration framework includes support for J2EE authentication and for component-level authorization.

- **Authentication security**
You can configure J2EE authentication security for JMS queues, EJB, HTTP, and web services. You can also configure authentication security for remote integration APIs and for the Java™ handler classes for outbound routing.
- **Authorization security**
You can configure authorization security at application level, object level, object structure level, or at the level of a method defined in a standard service. After user authentication completes, the integration framework checks that the user has been granted the authority to send messages to the target application, object, object structure, or method.

Authentication security

You can configure J2EE authentication security for JMS queues, EJB, HTTP, and web services. You can also configure authentication security for remote integration APIs and for the Java™ handler classes for outbound routing.

- [Configuring J2EE security](#)
The integration framework supports basic J2EE security to restrict access based on authentication and authorization.
- [Interface table security](#)
Interface tables use the default database authentication and authorization. If authentication and authorization are in effect, external programs that read or write to the interface tables must provide proper authorization. To read from and write to the interface tables, the USERNAME and PASSWORD values are configured for the endpoint that implements the interface table handler.
- [Securing remote integration APIs](#)
Some MicService remote APIs secure access by forcing the user of those methods to provide the UserInfo object. If a valid UserInfo object is not provided, an error occurs and the call is not completed.
- [Outbound router handler security](#)
The outbound router handlers have support for authorization and confidentiality. The enterprise bean, HTTP, JMS, web service, and interface table handlers have support for security.

Configuring J2EE security

The integration framework supports basic J2EE security to restrict access based on authentication and authorization.

- [Configuring J2EE restrictions for JMS queues](#)
The JMS queues that are used by integration processing support J2EE security, based on user ID and password-based authentication and authorization. You can prevent unauthorized access to the queue by assigning a user ID and password to the Java Naming and Directory Interface (JNDI) name, even if the JNDI name of the queue is known.
- [Securing enterprise bean access](#)
If J2EE Authentication on the system is enabled, you must enable the security for each enterprise bean in the deployment descriptors.
- [Securing the HTTP servlet](#)
The HTTP servlet is a J2EE component that handles inbound HTTP posts. To secure the HTTP servlet, you must first secure the enterprise bean. You can use HTTP basic authentication to secure the HTTP servlet. Authorized users, with a valid user name and password can post an XML transaction to the system.
- [Securing web services](#)
You can secure integration web services by using HTTP basic authentication in standard J2EE security. These security settings provide access to web services to authorized users with a valid user name and password.

Configuring J2EE restrictions for JMS queues

The JMS queues that are used by integration processing support J2EE security, based on user ID and password-based authentication and authorization. You can prevent unauthorized access to the queue by assigning a user ID and password to the Java™ Naming and Directory Interface (JNDI) name, even if the JNDI name of the queue is known.

About this task

Multiple queues can use the same or different user identifications.

Procedure

1. On the administrator console for the server, specify user ID and password values for the following properties, to enable J2EE restrictions:
 - java.naming.security.principal (user ID)
 - java.naming.security.credentials (password)
2. In the External Systems application, select the Add/Modify Queues action and specify the same user ID and password that you provided in Step 1. This step provides access to the queue to the integration producer and consumer programs.
3. To provide access to the continuous queue, under the <enterprise-beans> section in the ejb-jar.xml file, add the <security identify> elements shown in bold text:

```
<enterprise-beans>
  <message-driven
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mif.doc_gp_intfrmwk_t_security_j2ee_restriction
s_MessageDriven_JMSContQueueProcessor_1">
    <ejb-name>JMSContQueueProcessor-1</ejb-name>
    <ejb-class>psdi.iface.jms.JMSContQueueProcessor</ejb-class>
    <transaction-type>Container</transaction-type>
    <message-driven-destination>
      <destination-type>javax.jms.Queue</destination-type>
    </message-driven-destination>
    <env-entry>
      <env-entry-name>MESSAGEPROCESSOR</env-entry-name>
      <env-entry-type>java.lang.String </env-entry-type>
      <env-entry-value>
        psdi.iface.jms.QueueToMaximoProcessor
      </env-entry-value>
    </env-entry>
  </message-driven>
</enterprise-beans>
```

```

</env-entry>
  <security-identity>
    <run-as>
      <role-name>maximouser</role-name>
    </run-as>
  </security-identity>
</message-driven>

```

4. Under the <assembly-descriptor> section in the ejb-jar.xml file, add the <security-role> elements shown in bold text:

```

<assembly-descriptor>
  <security-role>
    <role-name>maximouser</role-name>
  </security-role>
  <container-transaction>
    <method>
      <ejb-name>JMSSContQueueProcessor-1</ejb-name>
      <method-name>*</method-name>
    </method>
    <trans-attribute>Required</trans-attribute>
  </container-transaction>
</assembly-descriptor>

```

Securing enterprise bean access

If J2EE Authentication on the system is enabled, you must enable the security for each enterprise bean in the deployment descriptors.

About this task

Under the <enterprise-beans> section of the ejb-jar.xml file, three integration EJBs are deployed with a default value of 1, which indicates that no authentication is required.

The <ejb-name> to service mapping is:

<ejb-name>	Service
enterpriseservice	Enterprise Service
mosservice	Object Structure Service
actionservice	Standard Service

Procedure

1. To force authentication, change the ALLOWDFLTLOGIN value to 0 (false), for each of three services, indicated in bold in the following code example:

```

<enterprise-beans>
<session
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mif.doc_gp_intfrmwk_t_security_enterprise_bean_S
ession_enterpriseservice">
  <ejb-name>enterpriseservice</ejb-name>
  <home>psdi.iface.gateway.MEAGatewayHome</home>
  <remote>psdi.iface.gateway.MEAGateway</remote>
  <local-home>psdi.iface.gateway.MEAGatewayHomeLocal</local-home>
  <local>psdi.iface.gateway.MEAGatewayLocal</local>
  <ejb-class>psdi.iface.gateway.MEAGatewayBean</ejb-class>
  <session-type>Stateless</session-type>
  <transaction-type>Container</transaction-type>
  <env-entry>
    <env-entry-name>ALLOWDFLTLOGIN</env-entry-name>
    <env-entry-type>java.lang.String</env-entry-type>
    <env-entry-value>0</env-entry-value>
  </env-entry>
  <security-role-ref>
    <description>
      Application Users
    </description>
    <role-name>maximouser</role-name>
    <role-link>maximouser</role-link>
  </security-role-ref>
</session>
<session
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mif.doc_gp_intfrmwk_t_security_enterprise_bean_S
ession_mosservice">
  <ejb-name>mosservice</ejb-name>
  <home>psdi.iface.mos.MOSServiceHome</home>
  <remote>psdi.iface.mos.MOSServiceRemote</remote>
  <local-home>psdi.iface.mos.MOSServiceHomeLocal</local-home>
  <local>psdi.iface.mos.MOSServiceLocal</local>
  <ejb-class>psdi.iface.mos.MOSServiceBean</ejb-class>
  <session-type>Stateless</session-type>
  <transaction-type>Container</transaction-type>
  <env-entry>
    <env-entry-name>ALLOWDFLTLOGIN</env-entry-name>
    <env-entry-type>java.lang.String</env-entry-type>
    <env-entry-value>0</env-entry-value>

```

```

</env-entry>
<security-role-ref>
  <description>
    Application Users
  </description>
  <role-name>maximouser</role-name>
  <role-link>maximouser</role-link>
</security-role-ref>
</session>
<session
id=" _home_markdown_jenkins_workspace_Transform_in_SSLPL8_cd_com.ibm.mif.doc_gp_intfrmwk_t_security_enterprise_bean_S
ession_actionservice">
  <ejb-name>actionservice</ejb-name>
  <home>psdi.iface.action.MAXActionServiceHome</home>
  <remote>psdi.iface.action.MAXActionServiceRemote</remote>
  <local-home>psdi.iface.action.MAXActionServiceHomeLocal</local-home>
  <local>psdi.iface.action.MAXActionServiceLocal</local>
  <ejb-class>psdi.iface.action.MAXActionServiceBean</ejb-class>
  <session-type>Stateless</session-type>
  <transaction-type>Container</transaction-type>
  <env-entry>
    <env-entry-name>ALLOWDFLTLOGIN</env-entry-name>
    <env-entry-type>java.lang.String</env-entry-type>
    <env-entry-value>0</env-entry-value>
  </env-entry>
  <security-role-ref>
    <description>
      Application Users
    </description>
    <role-name>maximouser</role-name>
    <role-link>maximouser</role-link>
  </security-role-ref>
</session>

```

Client programs call the secure version of the enterprise bean methods for each service type:

- Enterprise service: `secureProcessExtneralDataAsync(..)`, `secureProcessExtneralDataSync(..)`
 - Object structure service: `secureProcessMOS(..)`
 - Standard service: `secureAction(..)`
2. To create a secure context for calling the enterprise bean, perform either one of the following tasks:
- Add the following code to to the client code:

```

Properties env = new Properties();
.
.
if (userid != null && password != null)
{
  env.put(Context.SECURITY_CREDENTIALS, password);
  env.put(Context.SECURITY_PRINCIPAL, userid);
}

Context ctx = new IntialContext(env);
//instead of using the default IntialContext() constructor

```

- Use the default InitalContext constructor to pass the security information through `-D` parameters in the `.bat/.sh` script that launches the client:

```

-Djava.naming.security.principal=<username>
-Djava.naming.security.credentials=<password>

```

The SSL version of the Internet Inter-ORB protocol performs data encryption in the provider URL, while the system communicates with the enterprise bean.

Securing the HTTP servlet

The HTTP servlet is a J2EE component that handles inbound HTTP posts. To secure the HTTP servlet, you must first secure the enterprise bean. You can use HTTP basic authentication to secure the HTTP servlet. Authorized users, with a valid user name and password can post an XML transaction to the system.

About this task

To enable HTTP basic authentication, modify the `web.xml` file of the Web application:

- Remove the comments from the `<security-constraint>` section of the integration servlets. There are three `<security-constraint>` sections, one for each type of service: enterprise service, object structure service, and standard service.

The `<web-resource-name>` to service mapping is:

<code><web-resource-name></code>	Service
Enterprise Service Servlet	Enterprise Service
App Service Servlet	Standard Service
Object Structure Service Servlet	Object Structure Service

Procedure

1. In the web.xml file, uncomment the security constraint sections for each service type, as in the following code example:

```
<!--
<security-constraint>
<web-resource-collection>
<web-resource-name>Enterprise Service Servlet</web-resource-name>
<description>
  Enterprise Service Servlet (HTTP POST) accessible by authorized users
</description>
<url-pattern>/es/*</url-pattern>
<url-pattern>/esqueue/*</url-pattern>
<http-method>GET</http-method>
<http-method>POST</http-method>
</web-resource-collection>
<auth-constraint>
<description>
  Roles that have access to Enterprise Service Servlet (HTTP POST)
</description>
<role-name>maximouser</role-name>
</auth-constraint>
<user-data-constraint>
<description>data transmission gaurantee</description>
<transport-guarantee>NONE</transport-guarantee>
</user-data-constraint>
</security-constraint>

<security-constraint>
<web-resource-collection>
<web-resource-name>App Service Servlet</web-resource-name>
<description>
  App Service Servlet (HTTP POST) accessible by authorized users
</description>
<url-pattern>/ss/*</url-pattern>
<http-method>GET</http-method>
<http-method>POST</http-method>
</web-resource-collection>
<auth-constraint>
<description>
  Roles that have access to App Service Servlet (HTTP POST)
</description>
<role-name>maximouser</role-name>
</auth-constraint>
<user-data-constraint>
<description>data transmission gaurantee</description>
<transport-guarantee>NONE</transport-guarantee>
</user-data-constraint>
</security-constraint>

<security-constraint>
<web-resource-collection>
<web-resource-name>Object Structure Service Servlet</web-resource-name>
<description>
  Object Structure Service Servlet (HTTP POST) accessible by authorized users
</description>
<url-pattern>/os/*</url-pattern>
<http-method>GET</http-method>
<http-method>POST</http-method>
</web-resource-collection>
<auth-constraint>
<description>
  Roles that have access to Object Structure Service Servlet (HTTP POST)
</description>
<role-name>maximouser</role-name>
</auth-constraint>
<user-data-constraint>
<description>data transmission gaurantee</description>
<transport-guarantee>NONE</transport-guarantee>
</user-data-constraint>
  </security-constraint>

-->
```

2. Verify that the <security-role> section in the web.xml file is not commented out, as in the following example code:

```
<security-role>
  <description>An Integration User</description>
  <role-name>maximouser</role-name>
</security-role>
```

3. Change the value from 0 to 1 in the useAppServerSecurity <env-entry-name> section, as in the following example:

```
<description>
  Indicates whether to use Application Server security or not
</description>
<env-entry-name>useAppServerSecurity</env-entry-name>
<env-entry-type>java.lang.String</env-entry-type>
<env-entry-value>1</env-entry-value>
</env-entry>
```

What to do next

You can securely deploy a web service by using a Secure Socket Layer (SSL) for HTTPS posts. Configure the SSL on the application server with the appropriate digital certificates.

Securing web services

You can secure integration web services by using HTTP basic authentication in standard J2EE security. These security settings provide access to web services to authorized users with a valid user name and password.

Procedure

1. Similar to the procedure for securing the HTTP servlet, in the web.xml file, uncomment the <security-constraint> section for the web service invocation, as in the following example

```
<security-constraint>
  <web-resource-collection>
    <web-resource-name>Integration Web Services</web-resource-name>
    <description>
      Integration Web Services accessible by authorized users
    </description>
    <url-pattern>/services/*</url-pattern>
    <http-method>GET</http-method>
    <http-method>POST</http-method>
  </web-resource-collection>
  <auth-constraint>
    <description>
      Roles that have access to Integration Web Services
    </description>
    <role-name>maximouser</role-name>
  </auth-constraint>
  <user-data-constraint>
    <description>data transmission gaurantee</description>
    <transport-guarantee>NONE</transport-guarantee>
  </user-data-constraint>
</security-constraint>
```

2. Verify that the <security-role> section in the web.xml file is not commented out, as in the following example code:

```
<security-role>
  <description>An Integration User</description>
  <role-name>maximouser</role-name>
</security-role>
```

3. Change the value from 0 to I in the useAppServerSecurity <env-entry-name> section, as in the following example:

```
<description>
  Indicates whether to use Application Server security or not
</description>
<env-entry-name>useAppServerSecurity</env-entry-name>
<env-entry-type>java.lang.String</env-entry-type>
<env-entry-value>I</env-entry-value>
</env-entry>
```

4. For web service invocation, ensure that the client program uses the following user name and password calls in the JAX-RPC Call object:

```
call.setProperty(Call.USERNAME_PROPERTY, username);
call.setProperty(Call.PASSWORD_PROPERTY, password);
```

What to do next

You can securely deploy a web service by using a Secure Socket Layer (SSL) for HTTPS posts. Configure the SSL on the application server with the appropriate digital certificates.

Interface table security

Interface tables use the default database authentication and authorization. If authentication and authorization are in effect, external programs that read or write to the interface tables must provide proper authorization. To read from and write to the interface tables, the USERNAME and PASSWORD values are configured for the endpoint that implements the interface table handler.

Securing remote integration APIs

Some MicService remote APIs secure access by forcing the user of those methods to provide the UserInfo object. If a valid UserInfo object is not provided, an error occurs and the call is not completed.

The following remote methods are protected because they either provide sensitive information or perform sensitive data transaction processing:

- `exportData(..)`
- `deleteQueueData(..)`
- `processExternalData(..)` (both versions)
- `query(..)`
- `viewQueueData(..)`
- `loadData(..)`
- `loadSystemData(..)`
- `processObjectStructure(..)`
- `routeData(..)`

To run these methods, the caller must retrieve a valid `UserInfo` object and pass it to the method to gain access to the secure layer.

A `UserInfo` object is a serialized object that contains user details including user, password, locale, language, and time zone information, that is used for security purposes.

The system uses REST API and Java™ Remote Method Protocol (JRMP). You can communicate to the system services by using a secure version of JRMP protocol using SSL.

Outbound router handler security

The outbound router handlers have support for authorization and confidentiality. The enterprise bean, HTTP, JMS, web service, and interface table handlers have support for security.

Authorization security

You can configure authorization security at application level, object level, object structure level, or at the level of a method defined in a standard service. After user authentication completes, the integration framework checks that the user has been granted the authority to send messages to the target application, object, object structure, or method.

Manage provides configurable user-based and group-based authorization for its applications by using security signature options (sigoptions). A Manage application is the resource unit that is protected by the access control list (ACL) and sigoptions are the unit permissions for that resource. To secure an integration resource, such as an object structure, you can associate that resource with a Manage application and the object structure then inherits its permissions from the application.

However, this tightly coupled configuration may not be ideal for some users. For example, users who are authorized to use the Asset application may not want authorization to use the `MXAPIASSET` object structure for integration purposes. In this case, you can configure the object structure to have its own authorization.

A security administrator can configure the sigoptions for an object structure independent of the configuration for an application. These sigoptions are the unit permissions for the object structure.

To provide the most flexible security configuration, it is recommended that all object structures have their own authorization independent of applications.

Object-level authorization

Object-level authorization is based on the security configuration that is set in the Data Restrictions tab of the Security Groups application. This security configuration applies to data that is accessed by both Manage applications and integration processing. For integration processing, if an object or attribute is marked as read-only or hidden, inbound message data processing is limited to queries. You cannot insert, update, or delete data in an object or attribute that is marked as read-only or hidden.

Object structure-level authorization

If the `mxe.int.enableosauth` system property is set to 1, you must configure the authorization of the object structure before external users or applications can access and update data by using that object structure. When the system property is set to 0, authorization configuration is not required.

You configure object structure-level authorization by using the Configure Object Structure Security action in the Object Structures application. You can configure authorization for the object structure in the following two ways:

1. You configure the object structure to inherit its authorization from a related application.
 - To configure the authorization in this way, in the Authorization Name field, specify the application name. The signature options of the application are used by default for the object structure. You can add additional signature options to apply to both the object structure and the application.
2. You configure the object structure to have its own authorization by using signature options.
 - To configure the authorization in this way, check the Use Object Structure for Authorization Name check box. The authorization name is set to the object structure name, and the default insert, delete, save, and read options are assigned. For some object structures, you can then create signature options for any supported services that are available by using the object structures. Click Select Service Option to view and create signature options for these services.

After authorization for the object structures is defined, a security administrator can configure the authorization for a security group by using the Security Groups application.

Application-level authorization

You configure application-level authorization in the Object Structures application. In the Authorized Application field, specify the application to authorize. The specified application and the user group of the integration message user together provide authorization for inbound integration messages for object structures and enterprise services. The combination of application and user group also provide authorization for the export of data related to this object structure.

If you use the REST API, you might need to configure application-level authorization to access business object resources.

Standard service authorization

Standard service authorization does not support the use of a condition that you associate with the signature option. Any condition that you assign is ignored.

You can configure a standard service transaction to take on the same security profile for the integration user as if that user entered the transaction through an application. This level of authorization requires manual configuration. The application service must have a properly annotated method and the service must be registered in the Database Configuration application. Assign a signature option to a standard service to limit access to the users or groups that are authorized for the selected option.

Run a SQL script that updates the MAXSERVSECURITY table with the details of the standard service to authorize. The insert statement for the MAXSERVSECURITY must include the fields listed in the following table.

Field	Description
MAXSERVSECURITY ID	A unique ID that is numeric. You can, for example, query the max(MAXSERVSECURITYID) from MAXSERVSECURITY and use the next sequential value.
ROWSTAMP	A unique ID that is numeric. You can, for example, query the max(ROWSTAMP) from MAXSERVSECURITY and use the next sequential value.
SERVICENAME	The service name registered in the Database Configuration application (MAXSERVICE.SERVICENAME).
APP	The application name where the signature option is configured to (MAXAPPS.APP).
METHODNAME	The name of the annotated method in the application service.
OPTIONNAME	This value is a combination of the signature option table for the application and the signature option (SIGOPTION.OPTIONNAME).

Language support

Your database can contain some elements, such as descriptions and long descriptions, in multiple languages. Publish channels and enterprise services can include these translated columns. The integration framework also supports the use of bidirectional language formats.

A single database can contain data in multiple languages. You specify the base language when you install the application. If your system uses a language that differs from the base language, you can enable the integration framework to send and receive data that is not in the base language data.

- [Default processing of multiple languages](#)

When you log in, you can choose a language code other than the base language for the system. In any application, you can then enter language-specific values for columns that are designated as translatable.

- [Multilanguage attributes](#)

The root element of the XML structure for services and channels includes language attributes that specify the language attributes for the record.

- [Bidirectional language support](#)

The integration framework supports bidirectional languages such as Arabic and Hebrew and enables data exchange with external systems that use different bidirectional language formats. Bidirectional languages combine characters that you read from right to left with some characters, such as numbers or dates, that read from left to right.

- [Bidirectional language formats](#)

The default bidirectional formats used by the integration framework are based on Unicode standards. These formats can differ from the formats used by external systems.

- [Configuring bidirectional language support for external systems](#)

Specify the bidirectional language format used by an external system to enable the correct transformation of data to (and from) the default format.

Default processing of multiple languages

When you log in, you can choose a language code other than the base language for the system. In any application, you can then enter language-specific values for columns that are designated as translatable.

By default, outbound transactions contain the applicable column values in the language that is associated with the login session. The language values display whether the transaction is initiated by an application or the data export feature. For example, if the base language of your system is English, you can log in as a French user and update an item record with a French description. The outbound message contains the item description in French, even when the description also exists in English, or a third language.

If a database table contains translatable columns, the database contains a corresponding table called L_tablename, for example, ITEM and L_ITEM. The L_tablename table stores the non-base language values for every translated column except the long description. Long descriptions in all languages are in the LONGDESCRIPTION table.

To include translated values in the outbound message, include the L_tablename and LONGDESCRIPTION objects in the applicable object structures. Provide the base language values as a service input to object structures that have the L_tablename as part of their object definition. Your service input must be in the core object, and all other languages must be in the additional language enabled object.

For example, when English is the base language, the ITEM table contains the English description of an item and the L_ITEM table contains the French and German descriptions of that item. The LONGDESCRIPTION table contains the English, French, and German long descriptions.

When you add the `L_tablename` object to an object structure, assign the same value to the `transLanguage` and `baseLanguage` attributes. Otherwise, the base language values are not available and are processed for the multilanguage-enabled fields.

Multilanguage attributes

The root element of the XML structure for services and channels includes language attributes that specify the language attributes for the record.

The following language attributes are used:

- The `baseLanguage` attribute identifies the base language of the system or application that generates outbound message. For inbound transactions, this attribute is not validated.
- Output XML or JSON includes the `langenabled` attribute on every translatable column, as shown in the following example:

```
<DESCRIPTION langenabled="1">Item 1 description</DESCRIPTION>
```

- The `transLanguage` attribute identifies the language in which the values for applicable multilanguage fields are specified. If this attribute is missing or does not contain a value, all data is assumed to be in the base language. If the `transLanguage` value cannot be interpreted, or if the value does not identify a valid language, an error is returned to the service requester.

Bidirectional language support

The integration framework supports bidirectional languages such as Arabic and Hebrew and enables data exchange with external systems that use different bidirectional language formats. Bidirectional languages combine characters that you read from right to left with some characters, such as numbers or dates, that read from left to right.

The integration framework can transform the bidirectional formats of all inbound and outbound data to and from the bidirectional format specified for the external system. The transformations apply to synchronous and asynchronous communications for enterprise services, object structure services, and standard services. You can also transform the bidirectional formats of files you import with a cron task or when you use the data import feature.

Bidirectional language formats

The default bidirectional formats used by the integration framework are based on Unicode standards. These formats can differ from the formats used by external systems.

Bidirectional formats have five parameters.

Parameter	Value	Flags	Default	Details
Text Type	<ul style="list-style-type: none">ImplicitVisual	<ul style="list-style-type: none">IV	I: Implicit (logical)	
Text Orientation	<ul style="list-style-type: none">LeftToRightRightToRightContextualLeftToRightContextualRightToLeft	<ul style="list-style-type: none">LRCD	L: LeftToRight	
Text Symmetric Swapping	<ul style="list-style-type: none">OnOff	<ul style="list-style-type: none">YN	Y: On	
Text Shaping	<ul style="list-style-type: none">Not ShapedShapedIsolated	<ul style="list-style-type: none">NSB	N: Not Shaped	Arabic only
Numerals Shaping	<ul style="list-style-type: none">NationalNominalContextualNationalContextualNominal	<ul style="list-style-type: none">HNCT	N: Nominal	Arabic only

Configuring bidirectional language support for external systems

Specify the bidirectional language format used by an external system to enable the correct transformation of data to (and from) the default format.

Procedure

- Optional: Select the Bidirectional Format action in the External Systems application for enterprise services or in the Invocation Channels application for object structure services.
- Select the bidirectional language format used by the external system from the list of options and click OK.

Results

After setting the bidirectional language format used by an external system, transformation to the appropriate format occurs automatically during integration processing.

Exporting and importing file-based data

The integration administrator can initiate export and import data from within the External Systems application to support, for example, integrating data using files. The import process includes the ability to preview a data load from a file to validate the data prior to saving it to the database. The import process also includes an option to manage errors that result from file loading in the same file format as the imported file

You can use file-based error management as an alternative to managing errors through the Message Reprocessing application. Importing data from files, in flat file, JSON, or XML format, can be done on a scheduled basis using a predefined cron task. Additionally, administrators can enable an application for export and import, and users can then export and import data directly from within the enabled application.

- [Exporting and importing data in the External Systems application](#)
You can initiate a data export in the Publish Channels tab of the External Systems application. You can initiate a data import in the Enterprise Services tab of the External Systems application.
- [Importing S3 data by using cron tasks](#)
To import data from Cloud Object Storage, you can use a cron task to import data that is read by the Simple Storage Service (S3) handler.
- [Cron tasks for processing inbound data](#)
If you want to schedule file loads rather than using the data import window, you must create, configure, and enable the XMLFILECONSUMER cron task and the FLATFILECONSUMER cron task before cron task message processing can occur.
- [Configuring applications for data export and import](#)
To enable application-based data import and export you must define the content of an object structure and enable this object structure for import and export.

Exporting and importing data in the External Systems application

You can initiate a data export in the Publish Channels tab of the External Systems application. You can initiate a data import in the Enterprise Services tab of the External Systems application.

- [Exporting data](#)
To export a batch of message data to an external system, you can use the data export feature in the External Systems application. You can initiate the export process for each publish channel that is associated with an external system.
- [Exporting data in sequential batches](#)
To export multiple batches of message data to an external system, you can use the Bulk Data Exports action in the External Systems application. When you use this feature, exports are processed in order based on the sequence that you specify for the publish channels.
- [Importing file-based data](#)
You can use the data import feature to load data from either XML, JSON, or flat, delimited files to update the database. You can preview and validate the data prior to loading it and committing it to the database. You can choose to manage errors with the Message Reprocessing application or by extracting errors to a file format that is the same as the imported file format.
- [Importing data by using a REST API call](#)
You can use the Get External Data option on the Enterprise Services tab in the External Systems application to import data from external sources using a REST API call.

Exporting data

To export a batch of message data to an external system, you can use the data export feature in the External Systems application. You can initiate the export process for each publish channel that is associated with an external system.

Before you begin

You must configure an endpoint to the data destination.

In addition to configuring an endpoint, you must enable both the external system and the publish channel before you can export data. The data for export must either be in an XML, JSON, or delimited flat file format that conforms to the object structure schema. A delimited flat file, such as comma separated, is a flattened version of the object structure schema format.

Procedure

1. In the External Systems application, click the Publish Channels tab and select the publish channel that you want to export.
2. In the End Point field, specify the destination for the outbound data.
3. Click Data Export to specify more criteria for the data export. Enter selections in one or more of the following fields.
 - a. In the Export Condition field, specify a SQL query to select records for export.
For example, specify `assetnum like '11%' and siteid='BEDFORD'` to export all asset records that start with 11 and are in the Bedford site. The query must be specified on the primary or top-level object in the publish channel object structure.

The query can affect the size of the exported message. The export process performs the standard outbound processing on the result set of the query for the selected publish channel.

- b. In the Export Order By field, specify one or more fields by which records are sorted on export. You can specify ASC or DESC order. For example, specify `assetnum DESC` to order the exported data by descending asset ID. The ORDER BY statement must apply to the primary, or top-level, object in the integration object.
 - c. In the Export Count field, specify a value to limit the number of records in the export file. If the result of the query contains more records than the number you specify, those records are not included in the exported data.
4. To break up the data and store it in the queue as separate files, specify a value in the Batch Size field. If the number of records is larger than the batch size that you specify, the export data is split into a transaction with multiple files and stored separately.
 5. Click OK to begin exporting the data.

Results

When the data is exported, it is formed into a message and dropped into the outbound queue that is configured for the publish channel and its corresponding external system. Then, the message is processed from the outbound queue to the configured endpoint. If an error occurs when delivering a message to the endpoint, you can manage and view the data export messages that are flagged with an error in the Message Reprocessing application.

Exporting data in sequential batches

To export multiple batches of message data to an external system, you can use the Bulk Data Exports action in the External Systems application. When you use this feature, exports are processed in order based on the sequence that you specify for the publish channels.

Before you begin

Before you set up bulk data exports, complete the following tasks:

- Configure an endpoint to the data destination.
- Configure and enable the external system.
- Configure the publish channels for the export.

About this task

Data is exported sequentially based on the order of the publish channels that you specify in the Bulk Data Exports window.

Data is processed using a cron task instance in the BULKEXPORT cron task. If no cron task instance exists for the external system, a cron task instance that matches the name of the external system for exporting the data is automatically generated. If the cron task instance already exists for the external system, it is activated when you click Process.

When a cron task is active, the In Process check box is selected. No other process for this external system can be started when the cron task is active. Only one export can occur at a time.

When all data in a publish channel is processed, the data is committed. If you have multiple batches in a publish channel, data is committed only after all batches are processed.

If an error occurs for any publish channel, processing is stopped, and an error message is displayed. No data for that channel is committed until the error is corrected. You can correct the error and click Process to restart the process. When you click Process, the publish channel that has the error is reprocessed, and processing continues with the next channel in the sequence. Data is not reprocessed for the publish channels that were successfully committed before the error occurred.

When the cron task is completed, it is automatically deactivated.

Table 1. Buttons in the Bulk Data Export window

Button	Function
Save	Saves any changes that you made in the Bulk Data Exports window.
Cancel	Closes the Bulk Data Exports window but does not save your changes. To save changes, click Save before you click Cancel.
Refresh	Reloads the Bulk Data Exports window and updates the fields to display the status of the data export process.
Reset	Restarts the bulk data export process for all the publish channels that are included in this external system.
Process	Starts the bulk data export process.

Procedure

1. In the External Systems application, locate and open the external system that you want to use.
2. On the System tab, in the Outbound Sequential Queue field, specify a destination for the outbound data.
3. From the More Actions menu, select Bulk Data Exports.
4. For the publish channels that you want to export, add rows sequentially in the order that you want to process the data and enter details for the export in the following fields:

Option	Description
--------	-------------

Option	Description
Sequence	Enter a number to specify the order in which to process the publish channel data. If you add sequence numbers in increments of ten, it is easy to insert additional publish channels if the need arises at a later date. For example, if you have sequence numbers 10 and 20, and later you want to export a publish channel between those two rows, you can add a sequence number of 15.
Publish Channel	Specify the publish channel to use for the export.
Batch Size	Optional. Specify the number of records to include in each JMS message for the selected publish channel. For example, if you have 100 messages and specify a batch size of 50, the result is 2 JMS messages. If the number of records is larger than the batch size that you specify, the export data is split into a transaction that has multiple files that are stored separately. Even though the records are processed in multiple batches, only one commit occurs for the entire publish channel.
Export Condition	Optional. Specify an SQL query to select records for export. For example, specify <code>assetnum like '11%' and siteid='BEDFORD'</code> to export all asset records that start with 11 and are in the Bedford site. The query must be specified on the primary or top-level object in the publish channel object structure.
Export Order By	Optional. Specify one or more fields by which to sort records that you export. You can specify <code>ASC</code> for ascending order or <code>DESC</code> for descending order. For example, specify <code>assetnum DESC</code> to order the exported data by descending asset ID. The <code>ORDER BY</code> statement must apply to the primary or top-level object in the integration object.
Error Message	If an error occurs during the export process, this field displays an error message.
Enabled	Select this field in the table row to enable the publish channel.
Processed	If this publish channel was processed, this field displays a check mark.
User Defined	Indicates whether you created the publish channel or it was predefined in the application.

5. Click Save.
6. Click Cancel to close the window.
7. From the More Actions menu, select Bulk Data Export.
8. To export the data, click Process.

Importing file-based data

You can use the data import feature to load data from either XML, JSON, or flat, delimited files to update the database. You can preview and validate the data prior to loading it and committing it to the database. You can choose to manage errors with the Message Reprocessing application or by extracting errors to a file format that is the same as the imported file format.

Before you begin

Before data can be imported, if you plan to import data from a flat file, such as a .csv file, the enterprise service object structure must support flat file structures. Ensure that the Support Flat File Structure check box is selected on the associated object structure record in the Object Structures application. You also must enable both the external system and the enterprise service before you can import data.

About this task

The data import process can use a predefined or user-defined enterprise service.

Procedure

1. In the External Systems application, display the external system that contains the enterprise service from which you want to import data.
2. On the Enterprise Services tab, select the enterprise service from which you want to import data.
3. Click Data Import.
4. Optional: Select the Import Preview check box to examine the data before importing and committing the data to the database. Use the preview option to sample data records. This feature is not intended to support a large file containing hundreds of records. Processing synchronously processes the file to the business objects and returns any error messages encountered, without committing any updates to the database.
5. Specify the type of file that you want to use for the file import.

Option	Description
XML file	Imported data is in XML format.
Flat file	Imported data is in a delimited flat file. If necessary, modify the Delimiter and Text Qualifier values.
JSON file	Imported data is in JSON format.

6. In the Specify Import File field, enter the file name path the imported file uses for identification and storage.
7. Select the File-based Error Management check box if you want to manage any errors you encounter through a file in the same format as the file being imported. This option is an alternative to managing errors with the Message Reprocessing application.
8. Click OK to begin the import data process.

What to do next

When the data import is executed, the file that is selected for import is formed into multiple messages and dropped into the inbound queue that is configured for the enterprise service and its corresponding external system. The messages are then processed from the inbound queue to the application objects for updating. The processing of messages from an inbound queue requires the enablement of the related cron task when the sequential queue is used or the enablement of Message Driven Beans for the continuous queue. If errors occur when processing a file, you can manage and view the data import messages that are flagged with an error in the Message Reprocessing application.

Importing data by using a REST API call

You can use the Get External Data option on the Enterprise Services tab in the External Systems application to import data from external sources using a REST API call.

Before you begin

Before you import external data, you must complete the following tasks:

- Configure and enable the external system.
- Configure an inbound queue for the external system.
- Configure an endpoint for the import.
- Configure the enterprise services for the import.

About this task

When you complete the following procedure, the REST API that you specify is called, and data is imported into Maximo® Manage. The process runs in the background as a cron task that uses the endpoint that you specify. When the response is received, data is split into individual transactions and stored in the queue. Data is processed based on either the JMS or Kafka queue that you specify for the external system.

Procedure

1. In the External Systems application, select the external system to use for importing data.
2. On the Enterprise Services tab, select the enterprise service to use for importing data.
3. Click Get External Data.
4. In the Get External Data window, enter the following information for importing your data:

Option	Description
Select Data Type	Select either JSON or XML.
End Point	Select the endpoint for your REST API call.
Queue based	If your import is queue-based, select the checkbox.

5. Click OK.

Importing S3 data by using cron tasks

To import data from Cloud Object Storage, you can use a cron task to import data that is read by the Simple Storage Service (S3) handler.

About this task

To import data, configure an endpoint that uses the S3 handler to read the data. Then, import the data by using one of the following cron tasks:

LOADXMLJSONOBJECT

Loads XML and JSON files from cloud storage.

LOADFLATOBJECT

Loads flat files, such as CSV files, from cloud storage.

Procedure

1. Provision Cloud Object Storage and create the following three buckets in any S3 volume for the data that you want to load:

<load bucket name>

Stores the files that you import.

<load bucket name>recovery

Used to recover files that you import.

<load bucket name>backup

Contains the backup for files that you import.

2. In the End Points application, create an endpoint that specifies the S3 handler.
For more information, see [Configuring an endpoint](#).
3. In the Cron Task Setup application, create and activate the cron task instance to import the files:
 - a. Create a cron task instance for the cron task that you want to use to import files. You can select one of the following cron tasks:

Table 1. Cron tasks for loading S3 files

Cron task	Description
LOADXMLJSONOBJECT	Loads XML and JSON files from cloud storage.
LOADFLATOBJECT	Loads flat files, such as CSV files, from cloud storage.

When you configure the ENDPOINTNAME parameter for the cron task instance, ensure that you specify the end point that you created in step 2. The endpoint name must be in uppercase.

- b. Provide any other instance details and enter a schedule for running the cron task instance.
- c. Activate the cron task.

Cron tasks for processing inbound data

If you want to schedule file loads rather than using the data import window, you must create, configure, and enable the XMLFILECONSUMER cron task and the FLATFILECONSUMER cron task before cron task message processing can occur.

- [XMLFILECONSUMER cron task](#)
The XMLFILECONSUMER cron task is the mechanism that you use to load XML files without any application user intervention.
- [FLATFILECONSUMER cron task](#)
The FLATFILECONSUMER cron task is the mechanism that you use to load flat files without any application user intervention.
- [LOADFLATOBJECT cron tasks](#)
To import flat files, such as CSV files, from Simple Storage Service (S3) cloud object storage, add a cron task instance to the LOADFLATOBJECT cron task and specify the appropriate parameters for importing flat files.
- [LOADXMLJSONOBJECT cron task](#)
To import data in XML and JSON formats from Simple Storage Service (S3) cloud object storage, add a cron task instance to the LOADXMLJSONOBJECT cron task and specify the appropriate parameters for importing the files.

XMLFILECONSUMER cron task

The XMLFILECONSUMER cron task is the mechanism that you use to load XML files without any application user intervention.

The XMLFILECONSUMER cron task has the following predefined parameters:

Parameter	Description
EXTERNALSYSTEM	A required parameter value that identifies the external system value that the cron task data load process uses.
SOURCEDIRECTORY	A required parameter value that defines the directory where source files are loaded. This directory must exist on the application server.
ENTERPRISESERVICE	A required parameter value that identifies the enterprise service name that the cron task uses to process all files that are located in the source directory.
FILENAME	An optional parameter value that determines whether the cron task data load process selects source files based on its file name.
USEREXITCLASS	An optional custom processing class value that defines additional cron task capability (for example, file load order).
TARGETENABLED	Ensure that the value is at the default of 0 (false). The functionality of this flag is superseded by the donotrun functionality. Use the donotrun parameter in the cron task framework to control which servers the cron task runs on.
ISFILEEXTRACT	When set to 1 (true), this parameter indicates that file-based error management is used for inbound message processing.

All XML files that are available in the source directory are associated with a specific external system – enterprise service when you add a value to the EXTERNALSYSTEM, SOURCEDIRECTORY, and the ENTERPRISESERVICE parameters. These XML files also are loaded into the integration framework.

The files that match the cron task file name property are associated with a specific external system – enterprise service and are loaded into the system when you add a value to the EXTERNALSYSTEM, SOURCEDIRECTORY, ENTERPRISESERVICE, and FILENAME parameters

FLATFILECONSUMER cron task

The FLATFILECONSUMER cron task is the mechanism that you use to load flat files without any application user intervention.

Cron task parameters

The FLATFILECONSUMER cron task has the following predefined parameters:

Table 1. FLATFILECONSUMER cron task parameters

Parameter	Description
SOURCEDIRECTORY	A required parameter value that defines the directory where source files are loaded. This directory must exist on the application server.
DELIMITER	A required parameter that indicates the character that is used as field delimiter in the flat file. The default value is , (comma).
USEREXITCLASS	A custom processing class value to enable additional cron task capability (for example file load order).
TEXTQUALIFIER	A required parameter value that defines the character that is used as text qualifier in the flat file. The default value is " (double quotation marks).
TARGETENABLED	Ensure that the value is at the default of 0 (false). The functionality of this flag is superseded by the donotrun functionality. Use the donotrun parameter in the cron task framework to control which servers the cron task runs on.
ISFILEEXTRACT	When set to 1 (true), this parameter indicates that file-based error management is used for inbound message processing.

All files available at the source directory are processed by the FLATFILECONSUMER cron task when you add a value to the SOURCEDIRECTORY parameter. The external system and the enterprise service are identified from the first record in the flat file that is imported, which is part of flat file definition.

Cron task processing properties

The FLATFILECONSUMER cron task uses the following processing properties for inbound messages:

- File processing order - The order in which files are loaded on to the server that is determined by the XML file time stamp. The cron task user exit class can be used to overwrite the inbound message processing logic.
- File split - Multi-noun files that are processed by the FLATFILECONSUMER cron task are split before they are written to the queue. The cron task identifies if the file that is loaded is a multi-noun XML file. If the XML file is a multi-noun file, the integration framework uses the enterprise service key columns to identify where the file split occurs. For example, PONUM and SITE in the MXPOInterface enterprise service.
- Queue processing - The FLATFILECONSUMER cron task identifies the queue in which the flat file is loaded. The location is based on the queue (continuous or sequential) specified at the external system and enterprise service level.

The cron task creates an index file (recovery_filename.txt) that contains a reference to the last successfully processed noun when you process a multi-noun file. The entry in the index file is updated when the noun is successfully committed to the queue. Index files are available in the RECOVERY folder which is created in the cron task source directory.

The FLATFILECONSUMER cron task uses the index file name to identify the file that was processed before the server or queue problem was encountered. The cron task continues to process the XML file starting at the last successfully committed noun in the index file. Errors that are identified after a message is successfully written to an inbound queue must be resolved in the Message Reprocessing application.

LOADFLATOBJECT cron tasks

To import flat files, such as CSV files, from Simple Storage Service (S3) cloud object storage, add a cron task instance to the LOADFLATOBJECT cron task and specify the appropriate parameters for importing flat files.

Table 1. LOADFLATOBJECT cron task parameters

Parameter	Description
DELIMITER	Parameter that specifies the character that is used to separate text strings in the flat file that you import.
ENDPOINTNAME	Parameter that specifies the name of the endpoint to use for loading files. The endpoint name must be in upper case.
ISFILEEXTRACT	When set to 1 (true), this parameter indicates that file-based error management is used for inbound message processing.
TEXTQUALIFIER	Parameter that is used to enclose a value that you want to handle as a single text string. All text that follows the text qualifier character and precedes the next occurrence of the character is added as a single value. For example, if you use a comma as your delimiter but you want a city and state to remain as one entry, you can use the % sign as a text qualifier, as shown in the following example: %Dallas, Texas% Then, "Dallas, Texas" will be handled as a single text string and the comma is not treated as a delimiter for your text.
USEREXITCLASS	An optional custom processing class value that defines additional cron task capability (for example, file load order).

LOADXMLJSONOBJECT cron task

To import data in XML and JSON formats from Simple Storage Service (S3) cloud object storage, add a cron task instance to the LOADXMLJSONOBJECT cron task and specify the appropriate parameters for importing the files.

Table 1. LOADXMLJSONOBJECT cron task parameters

Parameter	Description
FILETYPE	Parameter that specifies whether the files to process are in XML or JSON format.
ENDPOINTNAME	Parameter that specifies the name of the endpoint to use for loading files. The endpoint name must be in upper case.
ENTERPRISESERVICE	A required parameter value that identifies the enterprise service name that the cron task uses to process all files that are located in the source bucket.
ISFILEEXTRACT	When set to 1 (true), this parameter indicates that file-based error management is used for inbound message processing.
USEREXITCLASS	An optional custom processing class value that defines additional cron task capability (for example, file load order).
EXTERNALSYSTEM	A required parameter value that identifies the external system value that the cron task data load process uses.

Configuring applications for data export and import

To enable application-based data import and export you must define the content of an object structure and enable this object structure for import and export.

- [Defining the object structure content](#)
Application users can be granted access to export or import data directly from an application. An administrator can identify an appropriate object structure for an application and grant export and import capabilities to manage application data in a file, such as a CSV file that can be maintained in spreadsheet.
- [Enabling data import and export in an application](#)
After you define the content of the object structure, you must enable an application for data import and export. Data import and data export are separate features. You can set up security access to limit access to each of these features.
- [Initiating data export and import in an application](#)
After enabling data export and import in an application, icons are added to the toolbar of the application for starting the transactions.

Defining the object structure content

Application users can be granted access to export or import data directly from an application. An administrator can identify an appropriate object structure for an application and grant export and import capabilities to manage application data in a file, such as a CSV file that can be maintained in spreadsheet.

About this task

Determine the object structure to use for the integration transactions and then modify the content of the object structure to limit data exchange to the content that is required.

Procedure

1. In Application Designer, open the workspace for the application that you want to enable and note the value in the Main Object field in the header area. This value must be the main object in the object structure that you modify for application data import and export.
2. In the Object Structures application, specify the name of the main object in the Object Structure field to filter for object structures based on this object. If the search does not return any object structures based on the main object, you must create an object structure and the following steps do not apply.
3. If the search returns multiple object structures, select an object structure where the value in the Consumed By field is set to Integration.
4. Review the content of the object structure to answer the following questions:
 - a. Is the main object of the object structure the same as the main object of the application that you want to enable for data export and import?
 - b. Does the object structure include child objects that contain data that users do not need to import or export?
For example, the MXPERSO object includes the PHONE, EMAIL, and SMS child objects. Your users may want to import and export data for the PERSON and PHONE objects only.
5. After you review the content of the object structure, you can choose to use the predefined object structure with all of its existing content or to duplicate this object structure and modify its content.
If you make changes to a predefined object structure, it can affect any other integration scenarios that use this object structure. Duplicating the object structure and using this as a template does not cause unexpected behavior for other integration users.
6. Assuming that you duplicate the object structure to provide a new object structure for this scenario, delete any child objects that are not necessary for your integration users.
7. For each object that remains in the object structure, select the Include/Exclude Fields option in the Select Action menu, and deselect all fields that users do not require to import or export.
This step limits the data fields to only those needed by the application users.
8. If delimited flat files are required (for use in a spreadsheet), select the Support Flat Structure check box.
This step activates a validation to ensure that every column for every object in the object structure has a unique name. If the validation fails, an Alias Conflict indicator is set.
9. If the object structure contains an alias conflict, select the Add/Modify Alias option in the Select Action menu to assign a unique alias for any field name where a duplicate exists.
Alias conflicts do not exist in any of the predefined object structures.
10. Save the object structure.

What to do next

The content of the object structure is now configured and you can grant application access to it in the Object Structures application.

Enabling data import and export in an application

After you define the content of the object structure, you must enable an application for data import and export. Data import and data export are separate features. You can set up security access to limit access to each of these features.

Procedure

1. In the Object Structures application, select the object structure that you want to enable for data import and export.
The object structure must specify Integration in the Consumed By field.
2. Select the Add/Modify Application Export Support action.
3. In the Add/Modify Application Export Support window, insert a row.
In the Details section, the value in the Application field defaults to the application that has the same main object as the main object of the object structure.
4. Specify either XML File or Flat File as the format for data export files.
5. In the Maximum Count field, specify the maximum number of rows that can be exported during a single execution. Leave the field empty or specify 0 to allow export of an unlimited number of rows.
6. If you enable multiple object structures for the application export and you want this object structure to be the default, select the Is Default checkbox.
7. Save the export configuration.
8. Select the Add/Modify Application Import Support action and repeat the same procedures to configure data import for the application. Save your changes.

Results

After you enable data export and import, actions are added to the Actions menu of the application.

What to do next

Enable security group access to one or both of these actions.

Initiating data export and import in an application

After enabling data export and import in an application, icons are added to the toolbar of the application for starting the transactions.

- **Exporting application data**
You can export data from an application if the application and security are configured for this action.
- **Importing application data**
After you enable data import for an application and security access, users can import new and updated application data. For example, you can import a bulk load of asset records.

Exporting application data

You can export data from an application if the application and security are configured for this action.

Procedure

1. In the List tab of the application, select one or more records, and then select the Application Export action.
2. In the Application Export window, review the export settings and make any necessary adjustments:
 - a. Optional: Specify a different value in the Object Structure field if you do not want to use the default object structure for the export.
You can specify an alternate object structure only if another object structure has been enabled for this application.
If you specify an alternate object structure, the window refreshes to include the Export Configuration section where you can configure additional settings.
 - b. Optional: If the value in the Selected to Export field exceeds the value in the Export limit field, you can cancel the export and use a different filter to reduce the number of records to export.
The value in the Export limit field is set by the administrator, and cannot be exceeded, regardless of the number of records selected.
3. Optional: In the Export Configuration section, specify the data format.
 - a. If you select XML format, specify the operation for the export, for example Sync.
 - b. If you select Flat File format, specify values in the Delimiter and Text Qualifier fields.
4. Click OK to start the export. Save the export file locally.
If the Save dialog box does not open, change the security settings of your browser to enable automatic prompting for downloads.

Importing application data

After you enable data import for an application and security access, users can import new and updated application data. For example, you can import a bulk load of asset records.

Procedure

1. In the application, select the Data Import action.
2. Review the information in the Data Import window.
if you do not want to use the default object structure for the import, you can specify a different value in the Object Structure field.
3. Optional: If you specified an alternate object structure, in the expanded Import Configuration section, specify the following values:
 - a. If you specify the Flat File format, you can specify values in the Delimiter, Text Qualifier, Action, and Language Code fields, or accept the default values.
 - b. If you specify the XML or JSON format, no additional settings are required because the incoming XML file specifies the operation, language code and action code.
4. Review the value in the Import limit field.
You cannot change this value. If the limit is set, for example, to 100 records, and the import file contains 200 records, only the first 100 records are imported.
5. Select the import file.
6. Optional: Select Import Preview to process the file but not save data to the database.
Use this option to test the data load and validate that there are no errors prior to loading. Any errors are displayed and you can apply corrections to the input file and attempt the import again.
7. Click OK to start the import.
Because data import is a synchronous process, you must wait in the application until the import is complete and a confirmation message appears. If the import encounters errors, no data is loaded, as the file is processed as a single transaction with a single commit.

Federated MBO integration

Maximo® Manage supports the sharing of data between Maximo Manage and external systems in several ways.

The most common way to share information using the Maximo Manage is to replicate data between the systems. A federated resource can share system data without replicating external system data in Maximo Manage.

MBOs are a set of Java™ classes that implement the data persistence layer and business rules in Maximo Manage. With [Federated MBO Integration](#), you can associate Maximo Manage objects with data from an external system, and persist the data outside of the Maximo Manage database. The external data must be exposed through a JSON REST API in order for the data to be available as an MBO.

External data can be registered using the Maximo Manage JSON Resources application. External systems can share data with Maximo Manage when needed rather than replicating the information into the Maximo Manage environment. The federated MBO retrieves the most up to date version of the data from an external application.

Integration APIs

The integration framework supports the use of REST (Representational State Transfer) application programming interface (API), and the sharing of lifecycle data between applications based on Open Services for Lifecycle Collaboration (OSLC) integration.

You can see complete content about REST APIs in the [Maximo® REST API community](#).

- [REST JSON API enhancements](#)
The REST APIs provide enhanced support for querying Maximo Manage data. The REST APIs are also referred to as the JSON APIs.
- [Data import and export with REST API](#)
You can use REST APIs to export data from your C system into an external system or application and to import data from an external system or application into your Manage system. You can export and import JSON, XML, or CSV files.
- [REST API as an RMI batch file replacement](#)
You use REST APIs instead of using Remote Method Invocation (RMI) batch files to work with the product. RMI is not supported in Maximo Manage.
- [Communication with external applications through REST API](#)
You use REST API with your client-based tools to interact with the product from any custom extensions or external applications.

REST JSON API enhancements

The REST APIs provide enhanced support for querying Maximo® Manage data. The REST APIs are also referred to as the JSON APIs.

The new REST API resources evolved from the legacy REST API and provide similar capabilities but remove the requirement to use OSLC namespaces. The new REST API is sometimes referred to as the REST/JSON API because of the end-to-end support of the JSON data format. Legacy APIs were used before version 7.1 of Maximo Manage.

You use API keys to enable an inbound machine-to-machine integration for an external client. API keys can be used by the REST and OSLC APIs and also can be used as part of the Manage integration framework.

The following enhanced support and capabilities are available with the new REST APIs:

- Related object queries, multi-attribute text search, and custom queries
- Bookmarking, notifications, and image association
- Metadata support that uses the JSON schema
- Dynamic query views
- GROUP BY queries
- Custom JSON elements that are appended to the object structure JSON
- Access to Swagger documentation for APIs
- Integration with the Manage cache framework
- API keys for native authentication in inbound machine-to-machine integrations
- Support for importing and exporting data as XML, JSON and CSV files.

The new REST APIs can be used when a Manage package that is not customized is installed and set up with users and groups.

You can see complete content about REST APIs in the [Maximo REST API community](#).

Related concepts

- [API keys application](#)

Data import and export with REST API

You can use REST APIs to export data from your C system into an external system or application and to import data from an external system or application into your Manage system. You can export and import JSON, XML, or CSV files.

Importing data

To import data, you must choose a Manage object structure that references the Manage business objects that consume the data. If you use a CSV file, you must select an object structure that is enabled for flat files. All object structures that are for a primary API are flat-file enabled.

The syntax is validated for the data before the data is stored in an internal Manage repository.

The following table contains examples of importing data by using REST APIs:

RMI is a Java™ protocol that allows external applications to communicate with the product. You use REST APIs and configured API keys to communicate with the product through its REST client. The REST APIs offer similar features to those features that are available with RMI.

The following code sample shows a GET call to the viewQueueDataApi WebMethod in the MIC AppService service. The URI for the AppService is `http://host:port/maximo/api/sevice/MIC`.

```
Map<String,String> qp = new HashMap<String,String>();
qp.put("action", "wsmethod:viewQueueDataApi");
qp.put("count", ""+count);
if(selector != null)
{
qp.put("selector", ""+selector);
}
qp.put("queueName", ""+queueName);
byte[] data = new RestClient(serviceurl)
                .withApiKey(System.getProperty("apikey"))
                .withQueryParams(qp)
                .invoke();
```

Similarly, you can make a POST call, as shown in the following code sample:

```
new RestClient(serviceurl)
                .withApiKey(System.getProperty("apikey"))
                .withQueryParams(qp)
                .withMethod(RestClient.HTTPMETHOD_POST)
                .invoke(data); //data is a byte[] - request payload
```

This type of call can be made with methods that are marked as WebMethods and are thus enabled for REST API. You also can use similar code to call an object structure or combination of object structures to get the correct placement for your job.

Communication with external applications through REST API

You use REST API with your client-based tools to interact with the product from any custom extensions or external applications.

In Maximo® Asset Management, Remote Method Invocation (RMI) can be used to interact with the product from custom extensions or external applications. However, RMI is not supported outside of the Maximo server process in the fully containerized environment of Maximo Manage. You use REST API instead of RMI for interactions with the product from custom extensions or external applications.

To help with using REST API, the product provides a sample HTTP client, which is the `com.ibm.tivoli.maximo.oslc.provider.RestClient` class. This sample HTTP client is a library of many useful methods and other libraries.

REST API benefits for integrating with the product

REST API in the product offers the following key benefits to integration administrators:

- A REST API client can be written in the language of your choice, while with RMI, you can write only in the Java™ language.
- REST API promotes ease of customization and integration with your client applications by using object structures.
- REST API can use API keys for authentication and authorization. All communication with the product can be done with any basic HTTP client, such as the sample `RestClient` HTTP client that is included with the product.
- Well-designed REST API calls provide high scalability with less network traffic. Several ways to design and code the REST API calls are explained in the following sections.

REST API coding options

REST API coding is generally at a fairly high level, but the product offers options to make the code granular if you require granularity. You can code your API calls as multiple REST calls, bulk REST calls, or REST calls that use automation scripts.

The amount of generated network traffic can vary, depending on the way that you code the REST API interaction for your client. If REST API interactions are not coded correctly, client and product performance might be negatively impacted.

Multiple individual REST calls

If you are moving from using RMI in earlier product versions, you can convert your RMI calls to REST calls on a one-to-one basis. However, RMI allows granular API use in the Java SDK that is provided with Maximo Manage, while the REST APIs are higher level. Additionally, it is possible that not every RMI call has an equivalent REST API call because REST APIs are not available for all of the Java SDK of the product.

Network traffic can be high if you code with multiple REST calls because of the number of network calls.

Bulk REST calls

With bulk REST calls, you write code for one call that acts on a set of records that meet your criteria. Bulk REST calls offer better network performance than multiple individual REST calls. However, you might have issues with lack of equivalency of REST APIs with granular RMI calls.

REST calls that use automation scripts

REST calls that use automation scripts offer the best granularity and network performance. With this approach, you can access the full Java SDK, which is not possible with the other approaches.

You write an automation script in the Automation Scripts application and call that script using the REST client. The scripting framework carries forward the API query parameters to the script. The automation script can be written in many languages.

Coding REST API using automation scripts also gives you a way to organically create REST APIs that suit your environment and that can be used elsewhere.

Integration queries

The integration framework supports queries from external systems. You can execute a query for object structures and enterprise services by using HTTP, REST APIs, or a Simple Object Access Protocol (SOAP) request in a web service. Queries can be in the form of XML messages or REST API JSON.

Support for XML queries is based on the system Query By Example (QBE) capability that is available from the List tab of most applications. XML-based queries provide the same query support that is provided in the applications except for attribute searches that are available in some system applications. Integration query time outs are controlled by the `mxe.db.Query.Timeout` system property.

- [Query services](#)
Object structure services and enterprise services support query operations. An external source can use a service to run a query and to retrieve data from a system. In both cases, the object structure schema defines the XML content for the query request and the query response.
- [Creating an enterprise service query](#)
An external source can use an enterprise service to run a query and to retrieve data from a system.
- [Web service queries](#)
Query services that are created in the Enterprise Services application and the Object Structures applications can be deployed as web services. To support querying, you must configure enterprise web services to bypass the JMS queues.
- [Query XML structure](#)
The name of the root element of a query is the concatenation of the operation (Query) and the name of the associated object structure. For example, QueryMXPERSO, where MXPERSO is the object structure.
- [Query selection criteria](#)

Query services

Object structure services and enterprise services support query operations. An external source can use a service to run a query and to retrieve data from a system. In both cases, the object structure schema defines the XML content for the query request and the query response.

For an object structure that has more than two levels of business objects, the query framework supports the use of business object attributes in the top two levels of the request XML. The query response XML contains all the objects in the object structure.

All system-provided object structures with a Consumed By value of INTEGRATION, support the query operation by default. You can configure an object structure to support the query operation only and no other operations that support updating objects. You can use the Object Structures application to create additional object structures which provide support for the query operation.

Creating an enterprise service query

An external source can use an enterprise service to run a query and to retrieve data from a system.

About this task

A sample enterprise service query, `MXINVBALQInterface`, is provided. You can use this sample as a reference when you create query enterprise services.

Procedure

1. If one does not exist, create an object structure containing the objects that the query needs to access.
2. Define an enterprise service that implements the object structure you intend to use for the query.
3. Specify Query as the operation on the enterprise service.
4. Associate the enterprise service with an external system, and enable the external system and its enterprise service.

Web service queries

Query services that are created in the Enterprise Services application and the Object Structures applications can be deployed as web services. To support querying, you must configure enterprise web services to bypass the JMS queues.

A successful response to a query that is run in a web service returns the query result set. If the result set is empty (it contains no records), the XML that is returned in the SOAP body contains the following empty MXPERSOSet tag:

```
<max:QueryMXPERSOResponse xmlns:max="http://www.ibm.com/maximo"
creationDateTime="2011-04-28T21:49:45"
baseLanguage="EN" transLanguage="EN" messageID="12345"
maximoVersion="7.5" rsStart="1" rsCount="10" rsTotal="10">
```

```
</max:MXPERSONSet>
</max:QueryMXPERSONResponse>
```

If an error occurs, an HTTP response code of 500 is returned, along with a SOAP fault detailing the error message.

Use the following URL for the query web service:

```
http://hostname:port/meaweb/services/web_service_name
```

- The host:port/meaweb is the value of the integration web application URL property.
- The web service name is the name of the web service.

You deploy query enterprise and object structure services as web services using the Web Services Library application.

Query XML structure

The name of the root element of a query is the concatenation of the operation (Query) and the name of the associated object structure. For example, QueryMXPERSON, where MXPERSON is the object structure.

Root element

The name of the root element of a query is the concatenation of the operation and the name of the object structure, for example, QueryMXPERSON, where MXPERSON is the object structure. The following table lists the attributes that can apply specifically to the root element of a query, a response to a query, or both. All attributes in this table are optional.

Attribute	Description	Type	Applicable to
uniqueResult	Specifies whether the query expects one record or multiple records in a response. Value 0 (default): The query can return multiple records. Value 1: The query can return a single record; otherwise, an error occurs.	Boolean	Query
maxItems	If the query can return multiple records, this attribute limits the number of records to be returned at one time. If this attribute is not specified, the response contains the entire result set.	PositiveInteger	Query
rsStart	In the query request: Use with maxItems to specify the first record to be returned in a response. If maxItems equals 10 and rsStart is not specified, the response returns results 0 through 9. To receive results 10 through 19, resend the query with rsStart equals 10. If rsStart is not specified, the response starts with the first record in the result set. If the number of records in the query result set is lower than the value of rsStart, the response returns no records.	Integer	Query
rsStart	In the query response: This value matches the rsStart value in the corresponding request. If the corresponding request contains a maxItems value, the rsStart value in requests for additional records is rsStart + rsCount + 1. If this attribute is not specified, the response starts with the first record in the result set and includes the number of records specified by the rsCount attribute.	Integer	Response
rsCount	The number of records that are returned in the message. rsCount does not reflect any rows that may be skipped as part of the response processing layer.	Integer	Response
rsTotal	The total number of records in the result set. If the query does not specify a maxItems value, the rsTotal value is the same as the rsCount value.	Integer	Responses (output)

For example, the response to this query request returns records 11 through 20 of the query result set by virtue of setting the rsStart value to 11 and the maxItems value to 10.

```
<max:QueryMXINVBAL xmlns:max="http://www.ibm.com/maximo"
creationDateTime="2011-04-28T21:49:45"
baseLanguage="EN" transLanguage="EN" messageID="12345"
maximoVersion="7.5" uniqueResult="0" maxItems="10" rsStart="11">
<max:MXINVBALQuery orderBy="string" operandMode="OR">
```

The following query result set contains a total of 35 rows, as noted by rsTotal, but only rows 11 through 20 are returned.

```
<max:QueryMXINVBALResponse xmlns:max="http://www.ibm.com/maximo"
creationDateTime="2011-04-28T21:49:45"
baseLanguage="EN" transLanguage="EN" messageID="12345"
maximoVersion="7.5" rsStart="11" rsCount="10" rsTotal="35">
<max:MXINVBALSet>
.
.
.
</max:MXINVBALSet>
```

Query operator

The QueryOperatorType data type supports the use of different operators. Your query request XML can use the different operators to filter the data that is returned to the querying external source.

QueryMXPERSON element

The QueryMXPERSON element has the following types:

- The QueryMXPERSON element is type QueryMXPERSONType.
- QueryMXPERSONType has element MXPERSONQuery, which is type MXPERSONQueryType.
- MXPERSONQueryType has elements for all the configured attributes of the PERSON object and all of its child objects (EMAIL, PHONE, and SMS).

The QueryMXPERSON operation element uses the following attributes:

- **uniqueResults** – Is a Boolean value that when set to 1 (True), directs the query to return a single and unique record when the value is set to 1 (True). If more than one record is found, an error is returned. When the attribute is not provided, the default value is 0 (false).
- **maxItems** – When this value is set to 10 on the query, it limits the number of records that are returned in the query to 10, even when the result set of the query may be greater than 10. When the attribute is not defined, all rows in the result set of the query are returned.
- **rsStart** – When this value is set to 11 on the query, all the records in the result set are returned starting with record 11. The query result skips records 1 - 10. When the attribute is not defined, the records are returned starting with record 1 in the result set.

The MXPERSONQuery content element uses the following additional attributes:

- **orderby** – Using this value is equivalent to using an Order By in a SQL statement. The attribute can contain a list of comma-separated field names that also include ASC and DESC options. When the attribute is not defined, the query returns records in the order that it was retrieved by the database.
- **operandMode** – This value has two valid values, AND and OR. The system uses this value when one or more fields is used for evaluation in a query execution. When you use the AND value, all field evaluations must be true. When you use the OR value, only one of the field evaluations must be true. When the attribute is not defined, the default value is AND.

QueryMXPERSONResponse element

The QueryMXPERSONResponse element has the following types:

- Element QueryMXPERSONResponse is type QueryMXPERSONResponseType.
- The QueryMXPERSONResponseType has element MXPERSONSet, which is type MXPERSONSetType.
- MXPERSONSetType has elements for all the configured attributes of the PERSON object and elements for child objects defined in the object structure (PHONE, EMAIL, XYZ, and SMS).

The QueryMXPERSONResponse element has the following attributes:

- **rsStart** – This value contains the value set on the query request. If the value is not defined on the request, the default response value is 1.
- **rsCount** – This value contains the number of records that are returned in the query response.
- **total** – This value contains the number of records in the final query result set. The total value can be more than the number of records that are returned when the maxItems attribute is used in the query request.

Query selection criteria

The object structure element of a query request contains the selection criteria for the query. A query can select records based on a single value, a range of values, or a provided 'where' clause. The integration framework supports the use of query operators such as = or >.

Selection criteria apply only to attributes of objects in the top two levels of the object structure; that is, the primary object and its immediate child objects. However, the response includes data from all the objects in the object structure.

- **Field selection**
A field-based query compares the value in a database field with the value in the XML field of the query request.
- **Field evaluation**
The operator attribute compares the value of a database field with one or more values and has the format **operator = value**.
- **Range selection**
A query can search for records with a value that falls within a range of values. The format depends on whether the selection criterion is open-ended or it contains an upper and lower range.
- **Where clause selection**
A query can search for records based on a SQL 'Where' clause that can be provided as part of the integration query XML. The Where clause offers support for more complex queries and the querying of classification-related data.

Field selection

A field-based query compares the value in a database field with the value in the XML field of the query request.

The following sample query searches for employees:

```
<QueryMXPERSON>
  <MXPERSONQuery>
    <PERSON>
    </PERSON>
  </MXPERSONQuery>
</QueryMXPERSON>
```

The following sample query searches for employees where the PERSONID is equal to ATI and STATUS is equal to ACTIVE.

```

<QueryMXPERSO
  <MXPERSOQuery
    <PERSON
      <PERSONID operator ="=">ATI</PERSONID>
      <STATUS operator ="=">ACTIVE</STATUS>
    </PERSON
  </MXPERSOQuery
</QueryMXPERSO

```

The **operandMode** attribute of the MXPERSOQuery element defines the statement that is run with an AND or an OR condition between the field evaluations. The default condition that is used by the system is the AND condition. Additionally, the **operandMode** attribute can be provided at a field level. In this case, a field element can have multiple occurrences and can be evaluated for different conditions, such as a quantity field being evaluated as less than 2 or greater than 10.

The following sample query searches for employees where PERSONID is like %ATI%. The operand represents the default behavior and requires no operator value.

```

<QueryMXPERSO
  <MXPERSOQuery
    <PERSON
      <PERSONID>ATI</PERSONID>
    </PERSON
  </MXPERSOQuery
</QueryMXPERSO

```

The following sample query searches for inventory balances where the bin number is not null.

```

<QueryMXINVBAL
  <MXINVBALQuery
    <INVBALANCES
      <BINNUM operator ="!="></BINNUM>
    </INVBALANCES >
  </MXINVBALQuery
</QueryMXINVBAL

```

The following sample query searches for the inventory balances where the bin number is null.

```

<MXINVBAL>
<INVBALANCES>
<BINNUM>NULL</BINNUM>
</INVBALANCES >
</MXINVBAL>

```

The following sample query uses the equivalent of a SQL IN clause to search for the employees whose status is ACTIVE or INACTIVE.

```

<QueryMXPERSO
  <MXPERSOQuery
    <PERSON
      <STATUS>ACTIVE, INACTIVE</STATUS>
    </PERSON
  </MXPERSOQuery
</QueryMXPERSO

```

The following sample query searches for employees where the PERSONID starts with the letter A.

```

<QueryMXPERSO
  <MXPERSOQuery
    <PERSON
      <PERSONID operator ="SW">A</PERSONID>
    </PERSON
  </MXPERSOQuery
</QueryMXPERSO

```

The following sample query searches for employees where the PERSONID ends with the letter Z.

```

<QueryMXPERSO
  <MXPERSOQuery
    <PERSON
      <PERSONID operator ="EW">Z</PERSONID>
    </PERSON
  </MXPERSOQuery
</QueryMXPERSO

```

Field evaluation

The operator attribute compares the value of a database field with one or more values and has the format **operator = value**.

The value attribute can have the following values.

Value	Description
=	equal
!=	not equal
<	less than
<=	less than or equal
>	greater than

Value	Description
>=	greater than or equal
EW	Ends With
SW	Starts With

Use the less than and greater than attributes with numeric values and date fields only.

For example, to find all employees that have an ACTIVE status, format the query as follows:

```
<QueryMXPERSO
<MXPERSOQuery
<PERSON
<STATUS operator = "=">ACTIVE</STATUS>
</PERSON
</MXPERSOQuery
</QueryMXPERSO
```

Range selection

A query can search for records with a value that falls within a range of values. The format depends on whether the selection criterion is open-ended or it contains an upper and lower range.

The following sample query searches for purchase orders where the DEPARTMENT is greater than 1000.

```
<QueryMXPERSO
<MXPERSOQuery
<PERSON
< DEPARTMENT operator="&gt;=">1000</DEPARTMENT>
</PERSON
</MXPERSOQuery
</QueryMXPERSO
```

The following sample query searches for person records where the PERSONID is greater than 1000 and less than 20000. The query uses two instances of a single field element, the first with the From selection criteria, and the second with the To selection criteria:

```
<QueryMXPERSO
<MXPERSOQuery
<PERSON
< PERSONID operator="&gt;=">1000</PERSONID >
< PERSONID operator="&lt;=">20000</PERSONID >
</PERSON
</MXPERSOQuery
</QueryMXPERSO
```

Where clause selection

A query can search for records based on a SQL 'Where' clause that can be provided as part of the integration query XML. The Where clause offers support for more complex queries and the querying of classification-related data.

The use of the 'Where' clause is mutually exclusive from the use of individual elements. If a query request provides data for the Where element and other elements in the XML, only the WHERE element is used in the query execution.

The WHERE element is located on the same level as the top-level object in an object structure (purchase order), as in the following example:

```
<QueryMXPO xmlns="http://www.ibm.com/maximo">
  <MXPOQuery>
    <PO> </PO>
    <WHERE> </WHERE>
  </MXPOQUERY>
</QueryMXPO>
```

The WHERE element is available in the schema only when the operation is Query and can exist only once. To join multiple tables in the query, use 'exists' within the Where clause, in the same manner as the WHERE clause from the List tab of an application. The following sample query, using the MXPO object structure, retrieves purchase orders that have a PO Line for Item number 1002:

```
<QueryMXPO xmlns="http://www.ibm.com/maximo">
  <MXPOQuery>
    <WHERE>(siteid = 'BEDFORD') and (exists (select 1 from maximo.poline where
      (i temnum='1002') and (ponum=po.ponum and revisionnum=po.revisionnum and
      siteid=po.siteid))</WHERE>
  </MXPOQUERY>
</QueryMXPO>
```

The result of this query retrieved two purchase orders (not all elements are included in the example):

```
<?xml version="1.0" encoding="UTF-8"?>
<QueryMXPOResponse xmlns="http://www.ibm.com/maximo" xmlns:xsi="http://www.w3.org/
2001/XMLSchema-instance" creationDateTime="2012-03-21T11:20:13-04:00"
transLanguage="EN" baseLanguage="EN" messageID="1332343214013260273" maximoVersion=
"7 5 20110413-2230 V7500-721" rsStart="0" rsTotal="2" rsCount="2">
  <MXPOSet>
```

```

<PO>
  <DESCRIPTION>Window and installation for office building</DESCRIPTION>
  <ORDERDATE>2000-04-20T14:00:00-04:00</ORDERDATE>
  <ORGID>EAGLENA</ORGID>
  <PONUM>1013</PONUM>
  <POTYPE>STD</POTYPE>
  <VENDOR>JK</VENDOR>
  .
  .
  .
  <POLINE>
    <DESCRIPTION>5 ft. X 6 ft. window pane</DESCRIPTION>
    <ITEMNUM>1002</ITEMNUM>
    <ITEMSETID>SET1</ITEMSETID>
    <ORDERQTY>1.0</ORDERQTY>
    <POLINENUM>1</POLINENUM>
    .
    .
    .
    <POCOST>
      <COSTLINENUM>1</COSTLINENUM>
      .
      .
      .
    </POCOST>
  </POLINE>
  <POLINE>
    <DESCRIPTION>Installation of window pane</DESCRIPTION>
    <ITEMNUM />
    <ITEMSETID>SET1</ITEMSETID>
    <ORDERQTY>6.0</ORDERQTY>
    <POLINENUM>2</POLINENUM>
    .
    .
    .
    <POCOST>
      <COSTLINENUM>1</COSTLINENUM>
      .
      .
      .
    </POCOST>
  </POLINE>
</PO>
<PO>
  <DESCRIPTION>Window and installation for Office Building</DESCRIPTION>
  <ORDERDATE>2003-02-27T10:07:24-05:00</ORDERDATE>
  <ORGID>EAGLENA</ORGID>
  <PONUM>1029</PONUM>
  <POTYPE>STD</POTYPE>
  <VENDOR>JK</VENDOR>
  .
  .
  .
  <POLINE>
    <DESCRIPTION>5 ft. X 6 ft. window pane</DESCRIPTION>
    <ITEMNUM>1002</ITEMNUM>
    <ITEMSETID>SET1</ITEMSETID>
    <ORDERQTY>1.0</ORDERQTY>
    <POLINENUM>1</POLINENUM>
    .
    .
    .
    <POCOST>
      <COSTLINENUM>1</COSTLINENUM>
      .
      .
      .
    </POCOST>
  </POLINE>
  <POLINE>
    <DESCRIPTION>Installation of window pane</DESCRIPTION>
    <ITEMNUM />
    <ITEMSETID>SET1</ITEMSETID>
    <ORDERQTY>6.0</ORDERQTY>
    <POLINENUM>2</POLINENUM>
    .
    .
    .
    <POCOST>
      <COSTLINENUM>1</COSTLINENUM>
      .
      .
      .
    </POCOST>
  </POLINE>
</PO>
</MXPOSet>
</QueryMXPOResponse>

```

Interface tables

Interface tables are an option for integration with systems that use database tables to exchange data. This integration option applies only to enterprise services and publish channels and is always processed asynchronously, by using JMS queues.

Within an external system, there can be one or more publish channels and enterprise services that are being used for integration with interface tables. Any channel or service that is using an interface table must be associated with an object structure that is configured to support flat files and all alias conflicts must be resolved.

Location of interface tables

The endpoint definition for an external system or a publish channel points to the database where its interface tables are stored. The database can be the local application database or a remote database. The predefined content includes the **MXIFACETABLE** interface table endpoint which points to the application database. You can add additional endpoints for remote databases.

Names of interface tables

The integration framework registers interface table names to an enterprise service or a publish channel. Default names for interface tables are not provided. Apply the following guidelines when naming interface tables:

- Publish channels and enterprise services that use the same object structure can use the same interface table name or different interface table names.
- Publish channels and enterprise services that use a different object structure must use different interface table names.

Interface queue tables

The interface queue tables identify the sequence in which a receiving system processes the records in the respective interface tables. Two queue tables exist, one for inbound transactions and the other for outbound transactions. Some transactions depend on the successful processing of a previous transaction, for example you must create a user before you can add that user to a security group. The receiving system must process the records in the same sequence in which the sending system created the records.

Table 1. Interface queue table

Interface queue table	Direction
MXOUT_INTER_TRANS	Outbound
MXIN_INTER_TRANS	Inbound

External applications that pull data for outbound messages can use the outbound interface queue table (mxout_inter_trans). However, the external applications can also choose to use other methods of consuming outbound messages that meet their integration requirements.

All inbound and outbound transactions must have a record that is inserted into the corresponding inbound or outbound queue table. This record contains a TRANSID value, a unique identifier that identifies the interface table to which the transaction data is written. The corresponding interface table uses the TRANSID value to identify the record or records that are associated with the transaction. You can identify the contents of a transaction by looking up all the records with a given TRANSID value in the corresponding interface table.

The sequence of TRANSID identifies the sequence in which records are processed by the integration framework. For example, when users and security groups are entered into the system, the TRANSID values for the user record must be lower than the TRANSID values for the security group records that reference that user.

The difference between the MXIN_INTER_TRANS and MXOUT_INTER_TRANS queue tables is the direction of the interface table records that they track. The external system must write to the MXIN_INTER_TRANS queue table, and the integration framework must read from it. The integration framework writes to the MXOUT_INTER_TRANS queue table, and the external system reads from it.

The external system can use the MXOUT_INTER_TRANS table or retrieve outbound records from interface tables. The interface queue tables are generated the first time that you create interface tables for an endpoint. Each endpoint has its own interface queue tables and a counter for maintaining the outbound TRANSID value.

- [Creation of interface tables](#)
When an enterprise service and a publish channel use the same interface table, the Create Interface Tables window displays a list of interface tables based on the uniqueness of the interface table name and its corresponding endpoint.
- [Regeneration of interface tables](#)
When columns are added or deleted from the system database tables, you must regenerate all local and remote interface tables that are associated with those object structures.
- [Deletion of interface tables and records](#)
When related inbound transaction records are successfully processed in an interface table, the corresponding record is deleted from the MXIN_INTER_TRANS queue table. The deletion indicates that the transaction was delivered successfully to the inbound JMS queue.
- [Format of interface tables](#)
An interface table has the same format as its corresponding object structure, including persistent and nonpersistent columns and excluding any columns that are excluded from the object structure.
- [Interface table polling](#)
A predefined cron task polls the interface queue table and uses the IFACENAME, EXTSYSNAME, and TRANSID values to place the corresponding records into the appropriate inbound JMS queue for processing. The interface polling process checks that the names of the external system and enterprise service are valid and enabled.
- [Processing interface tables on an external system](#)
To enable an external system to use interface tables, you must create interface tables, define backup procedures for restoring interface tables, and configure the archiving of interface tables.

Creation of interface tables

When an enterprise service and a publish channel use the same interface table, the Create Interface Tables window displays a list of interface tables based on the uniqueness of the interface table name and its corresponding endpoint.

You can create interface tables for enterprise services and publish channels when the associated object structures are marked as flat supported. The Support Flat Structure check box must be selected on the object structure. All alias conflicts must also be resolved for the object structure before you can create an interface table.

You can create interface tables for data synchronization on enterprise services and on publish channels. Interface tables do not support Query and Invoke operations. You can create interface tables for a specific endpoint. You must identify where the tables are created.

The database location that is referenced by the endpoint can be a local database or a remote database. When you create interface tables on a local database, the columns are registered in the system data dictionary. Local interface tables that use a database table and a database column show all updates (except insertions and deletions) to a base column attribute (such as data type) when you run the database configuration operation. When columns are added to or deleted from the base table, you must regenerate the corresponding enterprise service and the publish channel interface tables to apply the column changes. No changes are applied in the remote databases. You must regenerate remote interface tables to apply the column changes.

Regeneration of interface tables

When columns are added or deleted from the system database tables, you must regenerate all local and remote interface tables that are associated with those object structures.

You regenerate interface tables by using the Create Interface Tables action in the External Systems application. If you select the Rename Existing check box, the application backs up existing data in the corresponding interface table to the INTERFACETABLENAME_BAK table.

If necessary, you can restore the data to the new table. Depending on the configuration of a multitenancy environment, you may need to request the assistance of the system provider to access the data that you want to restore. If you do not back up the table, the table is dropped and the data is lost when you regenerate the table. You cannot regenerate an interface table when the MXIN_INTER_TRANS queue table contains a record that points to that interface table. When a row exists in that queue table, the corresponding inbound transaction is ready to process, or the inbound transaction is in error.

The interface table creation process does not check for records in the MXOUT_INTER_TRANS queue table.

You can set the `mxe.int.usedbinforifacetsb` property so that the processing of interface tables does not require an exact match between the object structure and the interface table. When the property is set to 1 (true), the interface process refers to the existing table to determine what to insert into the table rather than the object structure definition. This process avoids invalid column name errors when the endpoint is writing to the interface table.

If you add a new attribute to an interface table, the table must be regenerated to align with the object structure definition.

A utility is available on the Maximo® Manage Content Library that can check an interface table and its related object structure to identify when they are not synchronized. This utility can also update the object structure to exclude columns when those columns do not exist in the interface. See this link for more information: <https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/IBM%20Maximo%20Asset%20Management/page/Maximo%207.5%20Interface%20Table%20Utility>.

Deletion of interface tables and records

When related inbound transaction records are successfully processed in an interface table, the corresponding record is deleted from the MXIN_INTER_TRANS queue table. The deletion indicates that the transaction was delivered successfully to the inbound JMS queue.

Records are deleted from the MXIN_INTER_TRANS queue table and not from the individual interface tables. The system administrator determines when and how to delete records from the interface tables.

For outbound transactions, the external system must manage the deletion and archiving of data in the queue table and interface tables. You cannot delete interface tables in the user interface or by deleting the corresponding object structure. An administrator must manage the archiving of data in the interface tables and can drop the table, if necessary.

Format of interface tables

An interface table has the same format as its corresponding object structure, including persistent and nonpersistent columns and excluding any columns that are excluded from the object structure.

The interface table includes additional columns that identify the sequence in which the sending system writes, and the receiving system processes the records in the various interface tables.

Key columns

If the interface table represents a hierarchical object structure with parent-child object relationships, the table does not include any part of the child object key columns that are included in the parent object key columns. For example, PERSONID is a key column in the PERSON, PHONE, EMAIL, and SMS records. The PERSONID column appears only at the parent (PERSON) level in the MXPERSON_IFACE interface table.

Duplicate columns and aliases

The XML representation of a hierarchical object structure contains duplicate column names, but interface table and flat file representation do not. If an object structure has duplicate non-key column names in both a parent object and a child object, a duplicate column name error occurs when the interface table or a flat file record is generated.

To resolve this issue, change the alias name for one of the duplicate column names. Every system database column can have an alias alternate name. When an alias exists, the system uses the alias when interface tables and flat files are generated. Change the alias to eliminate the duplicate column name error.

Most columns do not have an alias, but some columns have aliases that support the predefined enterprise services or publish channels.

A column within an object structure can have a single alias. If the object structure is used by multiple publish channels and enterprise services, a change to an alias affects every interface table that is associated with the object structure.

The columns in the predefined object structures have system-assigned aliases. Check for duplicates when you create a hierarchical object structure or when you add an object to a predefined object structure. The Add/Modify Alias window shows the fields and aliases for the objects in a selected object structure, and identifies any duplicate alias names with a check in the duplicate column. If a duplicate alias exists, overwrite its value in the ALIASNAME column.

Restricted columns

The HASLD field is an internal system column that is excluded from all object structures. Do not include this column in any object structure that is associated with an interface table. The LANGCODE field is also excluded from the predefined object structures.

Integration processing columns

The following table shows the columns that are used in the interface table sequencing, retrieval, and processing. Some columns are in either the interface queue tables or the interface tables; some are in both places.

Table 1. Integration processing columns

Column name	Interface queue table	Interface table	Description
IFACENAME	Yes	No	The IFACENAME column contains the name of the enterprise service or the publish channel that is used in a transaction. The column is populated in outbound transactions. For inbound transactions, the external system must populate the column with the name of the enterprise service or the publish channel that corresponds to the row that is inserted into an interface table.
TRANSID	Yes	Yes	<p>The TRANSID column in an interface queue table is a sequential number that uniquely identifies an integration transaction. The TRANSID and the interface table name, identifies a unique transaction. The interface queue table can contain one record with a TRANSID value. The corresponding interface table can have one or more records with the TRANSID, depending on the number of records that are written to that interface table as part of that enterprise service or the publish channel.</p> <p>If a transaction writes to multiple interface tables, the interface queue table contains a separate record with a unique TRANSID value for each interface table.</p> <p>Each interface queue table maintains its own TRANSID counter. The outbound TRANSID value is initialized when the interface queue table records are generated. You must create and maintain the TRANSID counters that populate the inbound queue tables and the interface table records.</p> <p>If the external systems do not correctly manage the inbound TRANSID counters, sequential processing is not guaranteed. Ensure that the TRANSID values that the external system generates does not duplicate the TRANSID value that is generated. Errors occur if duplicate TRANSID values exist and when you process the same object structure in both an inbound and an outbound direction by using a single interface table.</p> <p>Each endpoint has its own set of interface queue tables and its own outbound TRANSID counter.</p>
TRANSSEQ	No	Yes	When multiple records in an interface table share the same TRANSID value, the TRANSSEQ column provides a secondary sequence number that indicates the sequence in which those records should be processed.
EXTSYSNAME	Yes	No	The EXTSYSNAME column in the interface queue tables can contain inbound or outbound data. For inbound transactions, the column contains the name of a valid and enabled external system that is defined in the integration framework. For outbound transactions, the column contains the name of the external system that is the destination of the transaction.
ACTION	Yes	No	<p>The ACTION column contains the action to perform on the external system (outbound) or on the integration framework (inbound). The following actions can be used:</p> <ul style="list-style-type: none"> • Add: Inserts the data that is provided in the message. • Delete: Deletes the parent data, and any related child data, from the database. • Change: Updates parent and child data contents of the message, but does not delete existing child data that is not explicitly specified in the message. • Replace: Replaces the existing records with the contents of the message and deletes existing child data that is not referenced in the message. • AddChange: If the primary record does not exist, processes as an add action and, otherwise, processes as a change action. • Null: If the primary record does not exist, processes as an add action and, otherwise, process as a replace action.
IMPORTMESSAGE	Yes (used inbound only)	No	The IMPORTMESSAGE column holds any error message that was produced when the interface table row was moved to the inbound queue.

Column name	Interface queue table	Interface table	Description
TRANSLANGU GE	Yes	No	The TRANSLANGUAGE column identifies the language of the transaction. For an outbound transaction, this value indicates the language of the user who initiated the transaction. For an inbound transaction, this value indicates the language of the transaction. Any attributes that support a multilanguage environment are expected to be in the language that the TRANSLANGUAGE value defines.
MESSAGEID	Yes (used outbound only)	No	The MESSAGEID column is a unique identifier that the system assigns to every outbound transaction.
IFACETBNAME	Yes (used outbound only)	No	The IFACETBNAME column is the name of the interface table that corresponds to the IFACENAME column. This column applies to outbound transactions only.

Long description columns in an Oracle Database

Long description columns are stored in a CLOB (character large object) column in an Oracle Database. Interface tables contain two versions of each CLOB column, one with data type CLOB, and one with data type ALN with a character length of 4000. In the following example, the name of the CLOB column is the column alias. The name of the alphanumeric column is the column alias with the suffix 2.

Table 2. Long description columns in an Oracle Database

Data type	Name of description column
CLOB	PERSON_DESCRIPTION_LD
ALN	PERSON_DESCRIPTION_LD2

The system populates both columns in outbound transactions. For inbound transactions, the integration framework uses the value in the ALN column if it is not null; otherwise, the value in the CLOB column is used.

Interface table polling

A predefined cron task polls the interface queue table and uses the IFACENAME, EXTSYSNAME, and TRANSID values to place the corresponding records into the appropriate inbound JMS queue for processing. The interface polling process checks that the names of the external system and enterprise service are valid and enabled.

You must configure the cron task to initiate interface table polling. You can also perform additional tasks to enhance performance during interface polling.

- [Interface table polling cron task](#)
The IFACETABLECONSUMER cron task is a predefined cron task that polls the inbound interface queue table for new records to process.
- [Advanced interface table polling](#)
You can perform advanced configuration of the interface table polling process to improve its performance when reading data from interface tables.

Interface table polling cron task

The IFACETABLECONSUMER cron task is a predefined cron task that polls the inbound interface queue table for new records to process.

The interface table polling process checks that the external system and enterprise service names are valid and currently enabled. If they are not, the record is marked in error and remains in the interface table.

If you disable interface table polling, new records remain in the interface tables. The messages that were sent to the inbound JMS queue are processed.

You must set up a mechanism to retrieve outbound transactions from the interface tables. You can use a polling program, as the system does for inbound transactions, triggers, or any other mechanism.

The cron task has the following parameters that you can configure. All parameters are optional.

Table 1. Interface table polling cron task parameters

Parameter	Description
EXITCLASS	Java™ exit class that enables the manipulation of data before it is written to an inbound queue.
ENDPOINT	Endpoint that is associated with the interface table. The default value is the predefined endpoint value that points to the local database.
ENTERPRISE SERVICE	Enterprise service to be polled. The default (null value) is all enterprise services. If you specify a value for this parameter, you also must specify a value for the EXTSYSNAME parameter. The values limit the polling thread to a specific enterprise service instead of the default behavior, which polls for all enterprise services.
TARGETENAB LE	Ensure that the value is at the default of 0 (false). The functionality of this flag is superseded by the donotrun functionality. Use the donotrun parameter in the cron task framework to control which servers the cron task runs on.
EXTSYSNAME	External system to be polled.
QUEUETABLE	Enterprise service queue table. The default value is MXIN_INTER_TRANS.

Advanced interface table polling

You can perform advanced configuration of the interface table polling process to improve its performance when reading data from interface tables.

If you send inbound messages through the continuous JMS queue and do not require messages to be maintained in first-in-first-out sequence, you can improve the performance of interface table polling.

Multiple cron tasks

The interface table polling process uses instances of the IFACETABLECONSUMER cron task to read all messages from all interface tables for all external systems that write to the tables. To improve performance, you can introduce multithreaded polling by configuring multiple instances of the IFACETABLECONSUMER cron task in the Cron Task Setup application.

For each instance, you define selectors by assigning values to the EXTSYSNAME and ENTERPRISESERVICE parameters, for example, EXTSYSNAME=EXTSYSNAME1 and ENTERPRISESERVICE=MXPERSONInterface. All selectors must be mutually exclusive among the multiple instances to avoid processing a message more than once.

The performance benefit of multithreaded polling can be further realized in a clustered configuration. The IFACETABLECONSUMER instances can run on different servers to balance the load. To designate an instance of the IFACETABLECONSUMER cron task to run on a specific application server, set the TARGETENABLED parameter to 1 and, on the application server, set `-DIFACETBCONSUMER.<instance name>=1`.

If you configure multiple instances of a cron task the selectors must be mutually exclusive, so that messages are not processed multiple times. Selectors must retrieve all the enterprise service transactions that you use, so that no messages are left unprocessed.

Multiple queues

You can improve performance by setting up multiple interface queue tables. For example, you can write each interface to a separate queue table and define separate cron tasks to process the queue tables independently of one another. You also can set up separate queue tables for each external system and, within each queue table, define selectors for each interface. Depending upon the complexity of your integration, you can use multiple queue tables instead of multiple selectors. To set up multiple queue tables, create the queue tables in the same database as the interface tables, and include all the columns that are in the MXIN_INTER_TRANS queue table. You must design the external system to write to the appropriate queue tables. Ensure that the external system does not insert an interface table message into more than one queue table so that the message is not processed multiple times.

Processing interface tables on an external system

To enable an external system to use interface tables, you must create interface tables, define backup procedures for restoring interface tables, and configure the archiving of interface tables.

- **Enabling inbound processing**
To configure inbound processing of interface table data from an external system, you must create a TRANSID counter and create records for the interface table and queue.
- **Enabling outbound processing**
To configure outbound processing, you must set up and configure a process, such as a polling program or a trigger, to retrieve transactions from the MXOUT_INTER_TRANS queue table.

Enabling inbound processing

To configure inbound processing of interface table data from an external system, you must create a TRANSID counter and create records for the interface table and queue.

Before you begin

To use interface tables, you must create the tables and configure the IFACETABLECONSUMER cron task.

Procedure

1. Create and initialize the outbound TRANSID counter.
2. Create records for each interface table that an inbound transaction writes to, populating each record with the following information:
 - a. The transaction data
 - b. The incremented TRANSID value
 - c. If multiple records exist for the same interface table, the incremented TRANSSEQ value
3. Create an MXIN_INTER_TRANS queue record with the following information:
 - a. The same TRANSID value that is contained the interface table record
 - b. The name of the enterprise service that corresponds to the interface table, in the IFACENAME column
 - c. Optional: The ACTION value
 - d. The identifier of the external system, in the EXTSYSNAME column
4. Perform a single commit, to commit all records for a transaction at one time.

Enabling outbound processing

To configure outbound processing, you must set up and configure a process, such as a polling program or a trigger, to retrieve transactions from the MXOUT_INTER_TRANS queue table.

Before you begin

To use interface tables, you must create the tables.

Procedure

1. Set up a process to retrieve interface table transactions by using the MXOUT_INTER_TRANS queue table. You can use a polling program, a trigger, or any other mechanism.
2. For the polling program to process transactions sequentially configure it to read the records in the MXOUT_INTER_TRANS queue table in the TRANSID sequence.
3. Enable each record in the MXOUT_INTER_TRANS queue table:
 - a. Access the interface table that you just identified, and retrieve the first record in which the TRANSID value matches the TRANSID value in the current MXOUT_INTER_TRANS queue record. If the interface table contains multiple records with the same TRANSID value, retrieve and process them in TRANSSEQ sequence.
 - b. Process data according to the value in the ACTION column of the interface queue table.
4. Commit all records for a single database transaction.
5. Delete the current record from the MXOUT_INTER_TRANS queue table.

What to do next

Implement error management, based on your external system requirements.

Integration modules

An integration module provides a mechanism for a process management product to invoke an external operational management product. You can configure an integration module to automate logical management operations, such as software deployment, by using an operational management product.

A process management product can invoke an integration module from an application, a workflow process, or an escalation process. The integration module then invokes an operational management product. The operational management product automates a service management process, such as a software deployment. The implementation returns the results to the process management product.

If predefined modules are provided with your operational management product, use the process solution installer to load them into the integration framework. If you are familiar with the programming interface for the operational management product, you can create integration modules when one does not exist.

- [Integration module components](#)
An integration module is composed of defined integration framework components. You can configure the integration module to be implemented as a Java™ class or as an invocation channel.
- [Implementation prerequisites](#)
Before any integration module implementations occur, you must ensure the logical management operation is associated to one or more integration modules. The integration module then must have an association with an operational management product. Finally, the logical management operations on each operational management product must be enabled.
- [Implementation properties](#)
The integration framework can automatically process integration data when you implement an integration module. You can customize the implementation if you want to bypass parts of the automatic process.
- [Invocation channel or Java class implementation](#)
You can implement an integration module either as a Java class or as an invocation channel. Before developing an integration module, review the advantages and disadvantages to invocation channel or Java class usage.
- [Integration module processing](#)
Process management products use a system action to initiate an integration module. The action can be associated with an escalation or a workflow, or can be initiated from a menu or a button. The process management product provides an action class that invokes the integration module and processes the response that the integration module returns.
- [Configuring integration modules](#)
Integration modules receive data requests from process management products and return the response data from operational management products.
- [Configuring logical management operations](#)
You can create a logical management operation to define an action that a process management product executes from the integration framework. You also can define what specific object field attributes that they logical management operation uses.

Integration module components

An integration module is composed of defined integration framework components. You can configure the integration module to be implemented as a Java™ class or as an invocation channel.

When you install a predefined integration module, integration module artifacts with the Java class and XSL files are provided. An integration module also provides logical management operation definitions.

- [Integration module definitions](#)
When you install an integration module, the options that you select are used to form the module definitions.

- **Operational management products**

An operational management product automates system processes, such as software deployment. Operational management product services are run on assets, such as servers. The assets are referred to as configuration items.

- **Logical management operations**

Logical management operations identify the actions that integration modules support, such as Get Status and Deploy Software. A logical management operation consists of a data source, target, and specific object field attributes that the source and target use during a process invocation.

Integration module definitions

When you install an integration module, the options that you select are used to form the module definitions.

The integration module definition includes the following information:

- The name, version, and description of the integration.
- Operational management product and version.
- Handler that identifies the protocol that the integration module uses to invoke an operational management product.
- Integration module implementation choice, either a Java™ class or invocation channel.

The following components are contained in the integration module definition:

- The logical management operations that the integration module supports.
- The integration module properties that are unique to the integration module. Use the properties to configure the behavior of the integration module.

Operational management products

An operational management product automates system processes, such as software deployment. Operational management product services are run on assets, such as servers. The assets are referred to as configuration items.

Multiple instances of operational management products can exist in a production environment. More than one operational management product can manage a single configuration item. Each operational management product has its own unique identifier, a source token, for each configuration item.

The database includes a repository of operational management product and configuration item information. This information includes relationships between the operational management products and configuration items, and the source tokens that drive the integration between process management products and operational management products.

Logical management operations

Logical management operations identify the actions that integration modules support, such as Get Status and Deploy Software. A logical management operation consists of a data source, target, and specific object field attributes that the source and target use during a process invocation.

Logical management operations act as interfaces between the process management product and the integration module. You can design and develop integration modules and process management products independently. You can install logical management operation definitions with a product and you can also create logical management operations in the Logical Management Operations application.

The definition of a logical management operation contains the following properties:

Property	Description
Name	The name of the action, such as Get Status or Deploy Software.
Namespace	A unique qualifier, such as com.ibm.tivoli.deployment.
Invocation pattern	<ul style="list-style-type: none"> • Synchronous: The process management product issues a request and the integration module returns the results of the operation immediately. • Asynchronous one-way: The process management product issues a request, and no response is returned. • Asynchronous deferred response: The process management product issues a request, and a token identifies the instance of the request. The process management product passes the token as input to another logical management operation, which then obtains the status of the original request. • Asynchronous callback: The process management product issues a request, and a token identifies the instance of the request. The operational management product uses a token to perform a call-back to identify and to report the status of the original request. The call-back, which is provided by the integration module, inserts or updates a business object.
Source business object	The input object for the logical management operation.
Response business object	The output of the object for the logical management operation.
Business object attributes	The specific attributes of the objects that are needed either for input or output and their data types.

Input objects and input object attributes identify the data that the process management product passes to the integration module. If the logical management operation is configured with input attributes and does not contain an input object, the process management product can pass any business object that has the required input attributes. If an input object is specified, the process management product must pass the business object to the integration module. The response object and attributes identify the data that the integration module returns.

Implementation prerequisites

Before any integration module implementations occur, you must ensure the logical management operation is associated to one or more integration modules. The integration module then must have an association with an operational management product. Finally, the logical management operations on each operational management product must be enabled.

Logical management operation associations

Typically, there is a one-to-one communication between a logical management operation and an operational management product function. However, a single logical management operation invocation can cause the integration module to invoke an operational management product multiple times.

An integration module that uses an invocation channel can run logical management operations only in the following circumstances:

- The source object that is defined on the logical management operation must match the main object of the request object structure that you define on the invocation channel.
- If the invocation channel is not configured to process a response, you cannot associate a response object with the logical management operation.
- The response object that you define on the logical management operation must match the main object of the response object structure that you define on the invocation channel. The match must occur when you configure the invocation channel to process a response.

Operational management product associations

The integration module can support multiple logical management operations for an operational management product. When you run the integration module, the name and namespace values of the logical management operation specify the action to perform.

Operational management product and integration module associations are created when the `OMPPRODUCTNAME` and `OMPVERSION` values are added to the integration module. If multiple versions of the operational management product are used with the integration module, use a null value for the `OMPVERSION`.

Logical operation management enablement

More than one integration module can implement the same logical management operation on an operational management product. Use the `ISPRIMARY` attribute to identify the preferred integration module for the logical management operation on the operational management product. Only one integration module can have the `ISPRIMARY` value set to a true for any given logical management operation - operational management product combination.

Implementation properties

The integration framework can automatically process integration data when you implement an integration module. You can customize the implementation if you want to bypass parts of the automatic process.

- [Integration module parameters](#)
The integration framework provides integration module input parameters, including source and response objects and object sets, and endpoint names. These parameters are passed when you run an integration module as a Java™ class or as an invocation channel.
- [Integration module process flow](#)
Java-based integration modules populate the logical management operation response object or response object set with the results of the operation. For invocation channels, you can specify a mapping from the operational management product response to the response object or set. The integration framework copies the data into the response object or set.
- [Endpoints](#)
An integration module that contains an invocation channel must use an endpoint. A Java class integration module can use an endpoint or use a custom approach to external service invocations.

Integration module parameters

The integration framework provides integration module input parameters, including source and response objects and object sets, and endpoint names. These parameters are passed when you run an integration module as a Java™ class or as an invocation channel.

The following table lists the `psdi.iface.omp.IMConstants` interface parameters and their names.

Name	Description
IM	The instantiated ServiceInvoker object which can be a Java integration module or an invocation channel.
IMNAME	The name of the integration module.
IMVERSION	The version of the integration module.
LMONAME	The name of the logical management operation that is invoked.
LMONAMESPACE	The name space of the logical management operation that is invoked.
OMPGUID	The globally unique identifier (GUID) of the operational management product that the integration module uses.
ENDPOINTNAME	The name of the endpoint that the integration module uses to communicate with the operational management product.
ENDPOINTPROP	A map of <code>String.psdiface.mic.MaxEndPointPropInfo</code> properties that override the endpoint properties.
USERNAME	The user name that the integration framework uses to communicate with the endpoint.
PASSWORD	The password for USERNAME.

Integration module process flow

Java™-based integration modules populate the logical management operation response object or response object set with the results of the operation. For invocation channels, you can specify a mapping from the operational management product response to the response object or set. The integration framework copies the data into the response object or set.

Integration modules must quickly return to their callers. If the external service is a long-running service, the integration module must create another thread. The new thread makes the call to the operational management product, while the original thread returns to the caller.

Integration modules perform the following processing tasks:

1. Retrieve input from the source object or source object set.
2. If applicable, retrieve the integration module-specific properties.
3. Perform all processing logic that the logical management operation requires before it calls the operational management product.
4. Call the operational management product.
5. If applicable, handle the operational management product response.
6. If applicable, populate the response object or response object set with the return data.
7. Return processing information back to the caller.

Endpoints

An integration module that contains an invocation channel must use an endpoint. A Java™ class integration module can use an endpoint or use a custom approach to external service invocations.

Endpoints contain URL properties and handler properties that specify the transport mechanism to use. An endpoint with a web service handler has different properties than an endpoint with a command-line handler. Integration module endpoints and endpoint properties can be overwritten at run time when the process management product passes endpoint properties as input to the integration module. The USERNAME and PASSWORD properties that are returned from the credential mapper can also override the endpoint properties.

Java integration modules can communicate directly with an operational management product or external integration module, without the use of an endpoint. If you do not use an endpoint, you eliminate the need for the Java integration module to convert source objects into the required XML format. When you exclude endpoint use, you can use any communication protocol that is supported by the operational management product. Integration modules are not required to use endpoints. You can configure the integration module to communicate with an operational management product by using integration module properties.

The integration framework provides predefined handlers that support communication protocols such as HTTP and web services. If a predefined handler is not available to support the operational management product service protocol, implement an external integration module. The external integration module acts as an interface to the operational management product service that can use one of the available handler protocols. An alternative solution is to write a custom handler that supports the operational management product service protocol.

Configure a different endpoint for each operational management product to establish individual protocols for each product. The handler that you define for the endpoint must match the handler that you configure for the integration module.

Integration modules based on invocation channels require an endpoint. The endpoint name is one of the parameters the integration framework passes as input to the invocation channel. The caller of the integration module can override the endpoint name.

Regardless of whether you use an endpoint handler to communicate with the operational management product, the integration module must handle scenarios that require multiple invocations of the operational management product for a single logical management operation execution.

Invocation channel or Java class implementation

You can implement an integration module either as a Java™ class or as an invocation channel. Before developing an integration module, review the advantages and disadvantages to invocation channel or Java class usage.

- [Invocation channel and Java class comparison](#)
Before you develop an integration module, consider the advantages and disadvantages of using a Java class or an invocation channel.
- [Invocation channel implementation](#)
Invocation channels use object structures in its implementations to expand the message data content. The object structure uses the object that the process management product passes as the source object to build an entire record that can consist of multiple related objects.
- [Java class implementation](#)
Integration modules can be implemented to use Java class files. Using a Java class file eliminates the need for integration component registration and configuration. Additionally, all the underlying integration module implementations are transparent to the process management product.

Invocation channel and Java class comparison

Before you develop an integration module, consider the advantages and disadvantages of using a Java™ class or an invocation channel.

Advantages and disadvantages of using an invocation channel

Implementing an integration module by using an invocation channel has the following advantages:

- An invocation channel is useful when you pass complex data to the endpoint. It is also useful when you can define a clear mapping between the fields in the source object and the input the endpoint requires.
- Can support hierarchical object structures on input and output transactions.
- The integration framework handles the conversion of objects to XML, and XML to objects.
- Can be configured to use processing classes, user exits, and XSL mapping for inbound and outbound transactions.
- The integration framework performs endpoint invocation.
- Can be invoked directly without an association to an integration module or a logical management operation.
- A simple integration can be implemented using system configuration that does not require you to restart the application server.

Implementing an integration module by using an invocation channel has the following disadvantages:

- Requires more registration and configuration of system artifacts, even when the invocation is simple.
- Multiple applications cannot use the integration module with different business objects.
- Requires additional knowledge of the integration framework.
- Supports only a single invocation of the configured endpoint. It requires additional coding to support multiple invocations.
- Requires additional coding to support a long-running service. By default, the invocation channel waits for a response from the endpoint.

Advantages and disadvantages of using a Java class

Implementing an integration module by using a Java class has the following advantages:

- Requires less registration and configuration of system artifacts.
- Can be used by different applications while using different business objects.
- Can be designed to make multiple external invocations.
- Can use different communication protocols for different logical management operations and operational management products.
- Supports the use of another thread to accommodate a long-running service.
- Can implement multiple logical management operations, even when the input configuration and the output configuration is different.
- Is less likely to require the use of an external integration module.

Implementing an integration module by using a Java class has the following disadvantages:

- Requires you to perform more Java coding.
- Does not support an object structure with a parent and child relationship as input or output. Only the parent object can be used as input, and the Java code must find the child relationship.
- Conversions of objects to XML and XML to objects must be coded when you use an endpoint handler.
- Customization must be built into the design of the integration module. Customization cannot be added later without redeploying the code.
- Use of any integration framework components, such as an endpoint handler, must be coded in the Java class.

Invocation channel implementation

Invocation channels use object structures in its implementations to expand the message data content. The object structure uses the object that the process management product passes as the source object to build an entire record that can consist of multiple related objects.

The objects that are identified in the object structures are used in the XML message creation. When you use an invocation channel, the data must conform to the XML schemas specified for the associated object structures, and you must define an endpoint for the invocation channel.

Invocation channels support optional inbound and outbound processing exit classes. The integration framework uses processing exit classes to implement additional logic. The inbound and outbound processing exit classes must be instances of the Java™ class `psdi.iface.migexits.ExternalExit`.

For outbound transactions, the integration framework calls the following method:

```
public StructureData setDataOut(StructureData irData)
```

For inbound transactions, the integration framework calls the following method:

```
public StructureData setDataIn(StructureData erData)
```

When you override these methods, you can perform additional integration module processing. The properties that are passed to the invocation channel are available to the processing classes.

The following outbound processing class code shows you how to retrieve the operational management product globally unique identifier when you run an invocation channel:

```
import psdi.server.MXServer;
import psdi.iface.omp.IMConstants;
import psdi.iface.omp.OmpServiceRemote;
import psdi.iface.mic.*;
import psdi.iface.migexits.*;
.
.
.
public class OutboundCIEExit extends ExternalExit implements IMConstants
{
    public StructureData setDataOut(StructureData irData)
    throws MXException, RemoteException
    {
        IntegrationContext cntx = IntegrationContext.getCurrentContext();
        String ompGUID = cntx.getStringProperty(OMPGUID);
```

```
.  
. }  
}
```

Additional features of the invocation channel include user exit Java classes and an XSL mapping layer. You can configure the XSL mapping layer to do XML mapping or data transformation.

If the object structure that you need for your integration module invocation does not exist, you can create an object structure in the Object Structures application. You also can use XML with the MXINTOBJECT object structure to create object structures as part of the installation process.

Java class implementation

Integration modules can be implemented to use Java™ class files. Using a Java class file eliminates the need for integration component registration and configuration. Additionally, all the underlying integration module implementations are transparent to the process management product.

Java class integration modules must implement the `psdi.iface.mic.ServiceInvoker` Java interface. The service invoker Java interface is included in the `businessobjects.jar` file. Include the integration module Java class in the system class path at run time.

The service invoker Java interface has variations of the following method signature:

```
public byte[] invoke(Map String, Object metaData,  
MboRemote sourceMbo, MboRemote targetMbo, String endPointName)  
throws MXException, RemoteException;
```

- `metaData` is a map of the name and value properties that includes:
 - The integration module name and version.
 - The logical management operation name and name space.
 - The operational management product globally unique identifier.
 - The endpoint name and any endpoint properties that are being overwritten.
- `sourceMbo` is the source object that you defined on the logical management operation.
- `targetMbo` is the response object that you defined on the logical management operation
- `endPointName` is the name of the endpoint that you use for communication with the operational management product.

If you configure the integration module to implement multiple logical management operations, the integration module must determine which logical management operation is being called. At run time, the integration module retrieves the `LMONAME` and `LMONAMESPACE` properties from the `metaData` input map:

```
import psdi.iface.omp.IMConstants;  
. }  
. }  
String lmoName = metaData.get(IMConstants.LMONAME);  
String lmoNamespace = metaData.get(IMConstants.LMONAMESPACE);
```

The integration module can retrieve logical management operation data from the source object. The following example code retrieves logical management operation values from the source object:

```
String guid = sourceMbo.getString("GUID");  
int packID = sourceMbo.getInt("PACKID");  
boolean hasSubs = sourceMbo.getBoolean("HASSUBS");
```

In the example, the logical management operation has an alphanumeric input attribute called globally unique identifier, an integer attribute called `PACKID`, and a Boolean attribute called `HASSUBS`.

Service invoker methods can take a `MboSetRemote` set of values as a source input, instead of a single `MboRemote` value. In some cases, the integration module passes all of the objects in the object set to the operational management product. In other cases, the integration module passes only the first object in the set. There are no set rules that apply to the integration module behavior, but you must clearly define the expected behavior in the logical management operation description.

Integration module processing

Process management products use a system action to initiate an integration module. The action can be associated with an escalation or a workflow, or can be initiated from a menu or a button. The process management product provides an action class that invokes the integration module and processes the response that the integration module returns.

- [Identification of integration components](#)
The initiation action class identifies the components required for the integration, including the logical management operation, the operational management product, and the integration module.
- [Integration module invocation](#)
Integration modules can be implemented either as Java™ classes or as invocation channels. Integration module instances are called service invokers because they implement the Java interface `psdi.iface.mic.ServiceInvoker`.
- [Integration module response processing](#)
If a logical management operation has a response object, the integration module updates the response object with the results from its invocation. The action class determines whether to save the results to the database. If the action class does not save the results, you can save the data when you view the response results in the user interface.

Identification of integration components

The initiation action class identifies the components required for the integration, including the logical management operation, the operational management product, and the integration module.

The logical management operation runs a process, such as software deployment, on a configuration item by using an operational management product. The process management product provides the necessary input to the integration module, based on the input business objects and attributes that are defined on the logical management operation.

The Java™ action class identifies an operational management product that runs the logical management operation on the selected configuration item. When you install configuration items and operational management products, the component relationships are also installed.

An integration module record identifies which logical management operations are supported on an operational management product. When the integration modules, configuration items, and operational management products are registered, the process management product Java class performs a lookup. The Java class determines which integration modules that it invokes based on the configuration items that it uses.

The integration framework includes a service that provides the following utility methods to assist the class with integration module lookups.

Utility method	Function
<code>psdi.iface.app.omp.OmpSetRemote</code> <code>getOMListForIM</code> (<i>String imName, String imVersion</i>)	Retrieves a list of the operational management products that are associated with the integration module.
<code>psdi.iface.app.im.MaxIMSetRemote</code> <code>getIMListForLMO</code> (<i>String lmoName, String lmoNamespace</i>)	Retrieves a list of the integration modules that implement the specified logical management operation.
<code>psdi.iface.app.im.MaxIMSetRemote</code> <code>getIMListForLMOWithOMP</code> (<i>String lmoName, String lmoNamespace</i>)	Retrieves a list of the integration modules that implement the specified logical management operation on any operational management products.
<code>psdi.iface.app.im.MaxIMSetRemote</code> <code>getIMListForOMP</code> (<i>String ompGuid</i>)	Retrieves the list of the integration modules that implement at least one logical management operation on the operational management product.
Collection <code>getIMListForOMPAndLMO</code> (<i>String ompGUID, String lmoName, String lmoNamespace</i>)	Retrieves the list of integration modules that implement the logical management operation on the specified operational management product. Returns a collection of <code>psdi.iface.omp.OmpImLmoRelInfo</code> objects.
Collection <code>getIMListForOMPAndLMO</code> (<i>String ompHostname, String ompProductname, String ompManufacturer, String lmoName, String lmoNamespace</i>)	Retrieves the list of integration modules that implement the logical management operation on the specified operational management products. Returns a collection of <code>psdi.iface.omp.OmpImLmoRelInfo</code> objects.
<code>psdi.iface.omp.OmpImLmoRelInfo</code> <code>getPreferredIM</code> (<i>String ompGUID, String lmoName, String lmoNamespace</i>)	Retrieves the preferred integration module that implements the logical management operation on the specified operational management product.
<code>psdi.iface.omp.OmpImLmoRelInfo</code> <code>getPreferredIM</code> (<i>String ompHostname, String ompProductname, String ompManufacturer, String lmoName, String lmoNamespace</i>)	Retrieves the preferred integration module that implements the logical management operation on the specified operational management product.

Integration module invocation

Integration modules can be implemented either as Java™ classes or as invocation channels. Integration module instances are called service invokers because they implement the Java interface `psdi.iface.mic.ServiceInvoker`.

The service invoker interface hides the underlying implementation from the caller. The invocation of the integration module by the caller is the same, regardless of the underlying implementation.

- [Service invoker property map](#)
The `getServiceInvoker` utility methods return a map of name and value pairs.
- [Invoke methods](#)
The integration framework provides some invoke methods that the caller uses to invoke an integration module. Invoke methods use properties to determine what object data is returned to the caller. The properties also determine what action is taken on the returned data and how the integration framework communicates with the caller.
- [Operational management product service method](#)
Use the operational management product service method when the action class has a relationship to a configuration item, or when it has a configuration item globally unique identifier (CIGUID) attribute.
- [Service invoker utility methods](#)
The `getServiceInvoker` utility includes methods that retrieve an instance of an integration module for a logical management operation and an operational management product.

Service invoker property map

The `getServiceInvoker` utility methods return a map of name and value pairs.

The `psdi.iface.omp.IMConstants` Java™ interface defines the names of the properties that are returned in the map. The property `IMConstants.IM` contains the instance of the integration module that the process management product invokes.

The property `IMConstants.ENDPOINTNAME` contains the name of the endpoint that is associated with in the operational management product, integration module, and logical management operation relationship. In most cases, the endpoint property is the value that the process management product passes to the integration module. However, in unusual cases, the action class overwrites the configured endpoint.

If a credential mapper is configured, the `getServiceInvoker` utility methods call the credential mapper to retrieve the `USERNAME` and `PASSWORD` that is used for endpoint communication. These properties are returned by the utility methods in a map that is identified by the property `IMConstants.ENDPOINTPROPS`. The caller can overwrite any endpoint properties by adding them to this map.

Before the action class calls the integration module, it must populate the source object with the logical management operation input fields. The action class then passes the source object data to the integration module with the mapping that is returned by the `getServiceInvoker` utility method. The action class provides the logical management operation response object to the integration module when necessary.

The logical management operation response object requires attributes. The action class must ensure that the response object has the logical management operation attributes. The attributes can be persistent or nonpersistent. The response object typically contains the source object data.

Invoke methods

The integration framework provides some invoke methods that the caller uses to invoke an integration module. Invoke methods use properties to determine what object data is returned to the caller. The properties also determine what action is taken on the returned data and how the integration framework communicates with the caller.

The service invoker interface has four invoke method signatures:

- `public byte[] invoke(Map <String, Object> metaData, MboRemote sourceMbo, MboRemote targetMbo, String endPointName)`
- `public byte[] invoke(Map <String, Object> metaData, MboRemote sourceMbo, MboSetRemote targetMboSet, int action, String endPointName)`
- `public byte[] invoke(Map <String, Object> metaData, MboSetRemote sourceMboSet, MboRemote targetMbo, String endPointName)`
- `public byte[] invoke(Map <String, Object> metaData, MboSetRemote sourceMboSet, MboSetRemote targetMboSet, int action, String endPointName)`

The action class passes the following properties when it calls one of the invoke methods on the instantiated service invoker.

Property	Description
metaData	The property map that the <code>getServiceInvoker</code> utility method returns.
Source object and object set	The object with the input attributes that are defined on the logical management operation. This property can contain a null value.
Target object and object set	The object and object set that contains the return data. This property can contain a null value.
Action	This parameter indicates whether existing objects in the <code>targetMboSet</code> are updated, or new objects are added. The possible values for action are: <ul style="list-style-type: none"> • <code>psdi.mbo.MboSetRemote.INSERTONLY</code> • <code>psdi.mbo.MboSetRemote.UPDATEONLY</code>
Endpoint name	The name of the endpoint that the integration module uses for communication.

Operational management product service method

Use the operational management product service method when the action class has a relationship to a configuration item, or when it has a configuration item globally unique identifier (CIGUID) attribute.

When the action class has an authorized configuration item, instead of an actual configuration item, you can use the configuration item globally unique identifier attribute of the authorized configuration item.

The following service method retrieves a list of the preferred integration modules (service invokers). The integration modules implement the specified logical management operation on the operational management products that manage the specified actual configuration item.

```
public Collection Map getServiceInvokerListForCIAndLMO(String actCIGUID, String lmoName, String lmoNamespace, UserInfo userInfo)
```

Each operational management product that has a relationship with the specified actual configuration item, returns the preferred integration module for the logical management operation.

Service invoker utility methods

The `getServiceInvoker` utility includes methods that retrieve an instance of an integration module for a logical management operation and an operational management product.

The following table lists the utility methods provided with the `getServiceInvoker` utility.

Utility method	Function
----------------	----------

Utility method	Function
Map<String, Object> <code>getServiceInvoker (psdi.iface.omp.OmpImLmoRelInfo ompImLmoRelInfo, psdi.security.UserInfo userInfo)</code>	Retrieves the service invoker for the specified integration module, logical management operation, and operational management product.
Map<String, Object> <code>getServiceInvoker (psdi.iface.app.im.OmpImLmoRelRemote ompImLmoRelRemote, psdi.security.UserInfo userInfo)</code>	Retrieves the service invoker for the specified integration module, logical management operation, and operational management product.
Map<String, Object> <code>getServiceInvoker (String ompGUID, String imName, String imVersion, String lmoName, String lmoNamespace, psdi.security.UserInfo userInfo)</code>	Retrieves the service invoker for the specified integration module, logical management operation, and operational management product.
Map<String, Object> <code>getServiceInvoker (String ompGUID, String lmoName, String lmoNamespace, psdi.security.UserInfo userInfo)</code>	Retrieves the service invoker for the preferred integration module for the specified operational management product and logical management operation.
Collection<Map> <code>getServiceInvokerListForCIAndLMO (String actCIGUID, String lmoName, String lmoNamespace, psdi.security.UserInfo userInfo)</code>	Retrieves a list of the service invokers for the preferred integration modules that implement the specified logical management operation on the operational management products. The operational management products have a relationship with the configuration item.

Integration module response processing

If a logical management operation has a response object, the integration module updates the response object with the results from its invocation. The action class determines whether to save the results to the database. If the action class does not save the results, you can save the data when you view the response results in the user interface.

If the response object is the primary object from the application, or if the updated object is based on a relationship with the primary object of the application, the action class does not save the object. Instead, the user interface prompts you to save the object. However, if the updated object is unrelated to the primary application object, the action class saves and commits the changes.

Configuring integration modules

Integration modules receive data requests from process management products and return the response data from operational management products.

- [Creating integration modules](#)
You can create an integration module to pass data between local and external applications. Depending on your needs, you can implement an integration module as an invocation channel or Java™ class. Both the invocation channel and Java class have access to the database and all the objects in memory at the time a process management product invokes an integration module.
- [Selecting logical management operations for integration modules](#)
You can use the Select Operations dialog box to associate one or more logical management operations with an integration module record. Logical management operations define an action that a process manager product runs from an application.
- [Associating a logical management operation with an integration module](#)
You can associate a logical management operation with an integration module to define the actions that are taken on an operational management product. Process management products, such as Change or Deploy, call upon an integration module to run an operational management product. The operational management product then runs the logical management product, such as deploy software, and notifies the process management product of the action status.

Creating integration modules

You can create an integration module to pass data between local and external applications. Depending on your needs, you can implement an integration module as an invocation channel or Java™ class. Both the invocation channel and Java class have access to the database and all the objects in memory at the time a process management product invokes an integration module.

Procedure

1. In the Integration Modules application, click New Integration Module.
2. In the Name and Version fields, enter a unique integration module name and version number combination.
The version field must start with a v and be followed by an integer between 0 to 9, inclusive. The integer can then be followed by a decimal point (.) and up to 17 additional integers. For example, v2.99. or v9.123456.
3. Optional: Enter values in the following fields:

Option	Description
Operational Management Product Name	The operational management product that the integration module invokes. If an integration module works with multiple products, you do not specify a product name.
Operational Management Product Version	The version value of the product that the integration module invokes. If an integration module works with multiple versions of an operational management product, you do not specify a version value.

Option	Description
Handler Name	The protocol that the integration module uses to invoke an operational management product. If the invocation channel has an associated end point, you cannot configure a handler for the integration module.
Invocation Channel Name	The name of the invocation channel that the integration module runs. The integration module uses either an invocation channel or a Java class. Specify only one of them.
Class Name	The name of the Java class that the integration module runs. The integration module uses either an invocation channel or a Java class. Specify only one of them.

4. Click Save Integration Module.

What to do next

You can associate a logical management operation to an integration module to define the actions that process managers run. You also can associate an operational management product to an integration module to define the external applications that you can invoke from a process management product.

Selecting logical management operations for integration modules

You can use the Select Operations dialog box to associate one or more logical management operations with an integration module record. Logical management operations define an action that a process manager product runs from an application.

Before you begin

You first must associate the logical management operation with an operational management product before a process management product can run a logical management operation. The logical management operation records that you associate with an integration module that uses an invocation channel must have a source object name value. This value must be the same as the top source object that is registered to the invocation channel. Additionally, the logical management operation records must have a response object name value when the invocation channel that processes responses. This value must be the same as the top object registered to the invocation channel. You can define the logical management operation source and response object values in the Logical Management Operations application.

Procedure

1. In the Integration Modules application, select the integration module that you want to associate to the logical management operations.
2. On the Logical Management Operations tab, click Select Operations.
3. Select the logical management operations that you want to associate to the integration module record.
4. Click OK.
5. Click Save Integration Module.

What to do next

You can associate an operational management product to an integration module to define the external applications that you can invoke from a process management product.

- [Selecting logical management operations for operational management products](#)
You can use the Select Operations dialog box to associate one or more logical management operations to an operational management product. The association that you make to the operational management product enables the logical management operation. The enablement indicates that the logical management operation is ready for use.

Selecting logical management operations for operational management products

You can use the Select Operations dialog box to associate one or more logical management operations to an operational management product. The association that you make to the operational management product enables the logical management operation. The enablement indicates that the logical management operation is ready for use.

Before you begin

A logical management operation must be associated with an integration module before it can be enabled on an operational management product.

Procedure

1. In the Integration Modules application, select the integration module that you want to associate to the logical management operations.
2. On the Operational Management Products subtab, select the operational management product that you want to associate to the logical management operations.
3. In the Logical Management Operations for Operational Management Product table window, click Select Operations.
4. Select the logical management products that you want to enable for the operational management product.
5. Click OK.
6. Click Save Integration Module.

Associating a logical management operation with an integration module

You can associate a logical management operation with an integration module to define the actions that are taken on an operational management product. Process management products, such as Change or Deploy, call upon an integration module to run an operational management product. The operational management product then runs the logical management product, such as deploy software, and notifies the process management product of the action status.

Before you begin

You first must associate the logical management operation with an operational management product before a process management product can run a logical management operation. The logical management operation records that you associate with an integration module that uses an invocation channel must have a source object name value. This value must be the same as the top source object that is registered to the invocation channel. Additionally, the logical management operation records must have a response object name value when the invocation channel that processes responses. This value must be the same as the top object registered to the invocation channel. You can define the logical management operation source and response object values in the Logical Management Operations application.

About this task

The invocation pattern value determines whether the logical management operation is long-running. It also determines how the process management product expects a response from the operational management product.

Procedure

1. In the Integration Modules application, select the integration module that you want to associate with a logical management operation.
2. On the Logical Management Operations subtab, click New Row.
3. Enter values in the following fields:

Option	Description
Logical Management Operation Name	Identifies the actions that integration modules support, and the actions that the process management products request.
Namespace	Identifies the domain for the logical management operation name. An example is <code>com.ibm.mss</code> .

4. Click Save Integration Module.

What to do next

You can associate an operational management product to an integration module to define the external applications that you can invoke from a process management product.

- [Associating an operational management product with an integration module](#)

You can associate an operational management product to an integration module to define the external applications that you can invoke from a process management product. Process management products, such as Change or Deploy, call upon an integration module to run an operational management product. The operational management product then runs the logical management product, such as deploy software, and notifies the process management product of the action status.

Associating an operational management product with an integration module

You can associate an operational management product to an integration module to define the external applications that you can invoke from a process management product. Process management products, such as Change or Deploy, call upon an integration module to run an operational management product. The operational management product then runs the logical management product, such as deploy software, and notifies the process management product of the action status.

Before you begin

Before a process management product can call an integration module to run a logical management operation on an operational management product, configure the following components:

- Define and configure a logical management operation
- Associate the integration module with the logical management operation and operational management product
- Enable the logical management operation for the integration module on the operational management product

About this task

You can build and configure relationships between integration modules, operational management products, and logical management operations. You can also perform the following actions:

- Associate multiple operational management products with an integration module
- Enable logical management operations on the operational management product for the integration module
- Specify a default integration module to use for a particular logical management operation on an operational management product
- Configure the end point for an integration module and operational management product combination when the invocation channel has no associated end point

Procedure

1. In the Integration Modules application, select the integration module that you want to associate with an operational management product.
2. On the Operational Management Products subtab, click New Row.
3. Enter a values in the following fields:
 - Operational Management Product
 - End Point
4. In the Logical Management Operations table window, click New Row.
5. Enter a value in the Logical Operation Management Name field.
Default values display in the Namespace and Description fields.
6. Optional: Select the Is Primary check box to make the integration module the default integration module for the selected logical management operation.
Select the Is Primary check box when you enable the selected logical management operation on more than one integration module record.
7. Click Save Integration Module.

What to do next

You can associate a logical management operation with an integration module to define the actions that are taken on an operational management product.

Configuring logical management operations

You can create a logical management operation to define an action that a process management product executes from the integration framework. You also can define what specific object field attributes that they logical management operation uses.

- [Creating logical management operations](#)
You can define the invocation pattern on a logical management operation. The pattern value determines whether the logical management operation is long-running and how the process management product expects a response from the operational management product.
- [Adding attributes to logical management operations](#)
You can add attributes to a logical management operation to identify the specific object field attributes the logical management operation data source and target use. You can define the individual attribute entries for both input and output logical management operation invocations.

Creating logical management operations

You can define the invocation pattern on a logical management operation. The pattern value determines whether the logical management operation is long-running and how the process management product expects a response from the operational management product.

Before you begin

You must define a logical management operation relationship to an operational management product and integration module before you can invoke any processes.

Procedure

1. In the Logical Management Applications application, click New Logical Management Operation.
2. In the Name field, specify a logical management operation identifier.
3. Enter values in the following fields:

Option	Description
Source Object Name	The input object for the logical management operation.
Invocation Pattern	The pattern of a logical management operation invocation.
Name Space	The secondary identifier for the logical management operation record.
Response Object Name	The output of the object for the logical management operation.

4. Click Save Logical Management Operation.

Adding attributes to logical management operations

You can add attributes to a logical management operation to identify the specific object field attributes the logical management operation data source and target use. You can define the individual attribute entries for both input and output logical management operation invocations.

About this task

Input object attributes identify the data that the process management product passes to the integration module. Output object attributes identify the data that the integration module returns. Only the respective attributes of the selected source and response objects are available for field selections. If you have not defined either a source or response object, all object attributes are available for selection.

Procedure

1. In the Logical Management Applications application, select the logical management operation for which you want to add an attribute.
2. In the Attributes for LMO window, click New Row.
3. Enter a value in the Name field.
4. Optional: Clear the Input check box to indicate that the attribute is for the output of a logical management operation invocation.
5. Optional: Clear the Required check box to indicate the field attribute is not required in the logical management operation invocation.

Launch in Context feature

You use the Launch in Context application to create and modify launch entry records which open an external application in the same or a different browser session. You can open applications independently or as part of an application integration scenario.

The launch entry record can utilize the following options in the Application Designer to open an external application:

- Action menu items
- Hyperlinks
- Buttons

You use the Launch in Context application to create and update launch entries. A launch entry defines a URL that opens a console for an external application. The launch entry can pass data, referred to as context, from the application to the external console. You can configure a console URL for any application with a web-based console. Additionally, you can configure console URLs for consoles that use Java™ Web Start. You cannot use a launch entry to open applications that are not enabled for the web. You can configure a launch point from any application.

- [Preparation of the external application](#)
Most external applications have a web-based console that you can open from a URL in a web browser. The launch-in-context feature supports the web application (servlet or JSP), portal, and Java Web Start console types.
- [Launch entry URL into an external application](#)
A launch entry URL value can contain substitution variables that use data from the related business objects that you are viewing in the application.
- [Launch entry URL into a product application](#)
A launch entry URL value can contain attribute variables and a SQL Where clause variable.
- [Enabling launch-in-context](#)
To open a browser window in an external application that can contain contextual data, a user must be able to activate the launch in the source application. The user must also have security rights to view the menu item or toolbar button. The target application must be configured to accept the window request from a remote application, and arrangements must be in place to secure the transaction.

Preparation of the external application

Most external applications have a web-based console that you can open from a URL in a web browser. The launch-in-context feature supports the web application (servlet or JSP), portal, and Java™ Web Start console types.

To perform a navigation, the external application console must support the land-in-context capability that accepts data that is passed to it in a URL. The external console uses the URL to open a window with the data that was passed in the URL.

If the external application does not have a land-in-context capability, the launch-in-context feature can open a standard start page within the console, without the contextual data. If the application supports single sign-on authentication, application users are authenticated and directed to the external console. If single-sign on authentication is not implemented, the external console opens a login panel to authenticate the application user.

Launch entry URL into an external application

A launch entry URL value can contain substitution variables that use data from the related business objects that you are viewing in the application.

For example, for a launch entry that is implemented in the Person application, you can substitute the name value into the URL string by using the attribute name, `{attributename}`. The following URL is a URL for the Person application that uses the PERSONNAME attribute:

```
https://extsyshost:9045/tcWebUI/interactionhandler?actionId=viewPerson&Person={PERSONNAME}
```

You can also provide an attribute from an object that is related to the main business object by specifying the relationship name and the attribute name `{relationshipname.attributename}`. The following URL includes a city attribute from an address. Use this URL in the People application when the ADDRESS object is related to a PERSON object with a relationship named ADDRESS:

```
https://extsyshost:9045/WebUI/interactionhandler?actionId=viewCity&cityname={ADDRESS.CITY}
```

Use the `{sourcetoken}` and the `{reportinghostname}` values in a URL when you want to launch to an operational management product console.

Launch entry URL into a product application

A launch entry URL value can contain attribute variables and a SQL Where clause variable.

An external application can launch into the product, open a specific product application, and search for specific business objects to display.

When launching into the product, the product sign on screen is presented. After the user signs on, the specified application opens. Optionally, you can include the username and password in the URL to bypass the sign on screen but only if a Secure Socket Layer (SSL) is configured to secure HTTP access.

The URL to launch into the product has the following format:

```
http://<server>:<port>/<maximo>/ui/<product.jsp?event=loadapp&value=<appID>
```

The following example URL opens the Work Order Tracking application and displays the work order with an ID of 1000

```
http://<server>:<port>/<maximo>/ui/<maximo.jsp?event=loadapp&value=<wotrack>&attrname1=<WONUM>&attrvalue1=<1000>:
```

The search for a record has similar behavior to the List tab in an application, where the filter row has multiple values filled in across the columns. The names of the attributes are the database names of the primary MBO for the application being launched.

If advanced searching is required, you can add a SQL WHERE clause to the URL, in the format used in the following example:

```
http://<server>:<port>/maximo/ui/maximo.jsp?event=loadapp&value=wotrack&sqlwhere=WONUM%3D1000
```

The sender must provide valid URLs. In the previous example, an invalid "=" value was converted to "%3D".

If a URL includes both attribute-type parameters and a SQL Where clause parameter, the SQL Where clause parameter is used and the attribute-type parameters are ignored.

Enabling launch-in-context

To open a browser window in an external application that can contain contextual data, a user must be able to activate the launch in the source application. The user must also have security rights to view the menu item or toolbar button. The target application must be configured to accept the window request from a remote application, and arrangements must be in place to secure the transaction.

- [Creating a launch entry](#)
You can create a launch entry to open an external application in the same or in a new browser session. Launch entry records create website-based links between applications and external operational management products or websites.
- [Configuring a signature option for a launch point](#)
When you create a signature option for a launch point, it becomes available to use within the user interface controls.
- [Adding a launch point to an application menu](#)
After you configure a signature option for a launch point, you can add the option to an application menu. The procedure is similar for adding the launch point to an action or to a toolbar menu.
- [Adding a button as a launch point](#)
To add a button to an application that acts as a launch point, configure a button to use the signature option for the launch point.
- [Adding a condition to a launch point](#)
You can create a condition and then associate the condition with the signature option for the launch point. When you associate a condition with a signature option, the user interface behavior is changed based on the condition and the data that is being viewed.

Creating a launch entry

You can create a launch entry to open an external application in the same or in a new browser session. Launch entry records create website-based links between applications and external operational management products or websites.

Procedure

1. In the Launch in Context application, click New Launch Entry.
2. In the Launch Entry Name field, specify a launch entry identifier.
3. In the console URL field, specify the URL for a website or the console for an operational management product that you want to open in a browser session.
4. In the Target Browser Window field, specify one of the following values:
 - The `_usecurrent` value (default) opens an application or website in the current browser session.
 - The `_blank` value open an application or website in a new browser session.
5. Optional: If the target of the launch entry is a console for an operational management product, specify its name and version in the OMP Product Name and the OMP Version fields.
6. In the Launch Contexts table, click New Row.
7. In the Resource Object Name field, you can specify a business object that restricts use of the launch entry record to applications that support this object. A launch entry can support single or multiple business objects. No restrictions apply to the use of the launch entry if you do not select any business objects. Launch entry classification value attributes. The classification value can restrict the displayed launch entries. Multiple business objects support the classification attribute. The classification restriction is implemented at run time when you use system conditions. Out of box conditions are available to control your launch entry behavior. You also can create your own conditions. For example, if you specify `PERSON` in this field, you can use the launch entry only in the People application. You can use the launch entry record in any application when the field value is null.
8. In the Resource Classification field, if classification attributes are defined for the specified resource object, you can select attributes that restrict the display of launch entries. Many business objects support classification attributes. The classification restriction is implemented at run-time when you use system conditions. Predefined conditions are available to control launch entry behavior. You also can create your own conditions.
9. Select the Include Child Classifications check box to include resource classifications for child objects in the launch entry record.
10. Click Save Launch Entry.

What to do next

You can associate launch entry records with signature options in the Application Designer application. These associations define and control the menu actions for launch entry use.

- **Properties specific to operational management products**

When you create a launch entry record, some properties are specifically for use with operational management products.

Properties specific to operational management products

When you create a launch entry record, some properties are specifically for use with operational management products.

When you associate an operational management product to a launch entry, the framework searches for the product name on the operational management product servers in the database that manages the configuration item. If you provide the operational management product version, the framework searches for the specified version. The server data populates the `{sourcetoken}` and `{reportinghostname}` variables in the launch URL.

To determine what configuration item you are working with, the integration framework looks for a configuration item globally unique identifier (CIGUID) attribute in the business object that you are viewing. If you are viewing the configuration item business object, the globally unique identifier (GUID) attribute is used instead.

The source token is an attribute of the configuration item and operational management product server relationship. The operational management product console accepts the source token as the configuration item identifier. When you include a `{sourcetoken}` in the launch URL, the framework replaces it with the corresponding source token for the selected operational management product server.

The reporting host name is the host name of the selected operational management product server. When the `{reportinghostname}` value is in the URL for the launch entry, the framework replaces it with the host name of the selected operational management product. The source token and host name information is loaded from the discovery engine. If the host name information is not loaded from the discovery engine, you must add the operational management product server information to your database.

Configuring a signature option for a launch point

When you create a signature option for a launch point, it becomes available to use within the user interface controls.

Procedure

1. In the Application Designer, select the application where you want to configure a launch point.
2. Select the Add/Modify Signature Options action.
3. In the Add/Modify Signature Options window, click New Row.
4. Specify values in the Option and Description fields.
5. In the Advanced Signature Options table, select the Associate to Launch Entry To Enable The Launch in Context option.
To access the Advanced Signature Options table, scroll to the end of the Add/Modify Signature Options window, and click Maximize to show the available options.
6. In the Launch Entry Name field, specify the name for the launch entry.
7. Click OK to return to the Application Designer.
8. Click Save Application Definition to commit the modifications to the application to the database.

Adding a launch point to an application menu

After you configure a signature option for a launch point, you can add the option to an application menu. The procedure is similar for adding the launch point to an action or to a toolbar menu.

Procedure

1. In the Application Designer, choose one of the following actions:
 - Add/Modify Select Action Menu
 - Add/Modify Toolbar Menu
2. Click New Row.
3. In the Element Type field, specify the OPTION value.
4. In the Key Value field, specify the name of the signature option that you configured for the launch point.
5. In the Position field, specify a number to indicate the relative position of the item in the menu.
6. In the Tabs field, select one of the following values:
 - Select the MAIN value if the launch URL contains substitution variables.
 - Select the ALL value if the launch URL does not contain substitution variables.
7. Specify values in other, optional fields as appropriate.
8. Click OK to return to the Application Designer.
9. Click Save Application Definition to commit the modifications to the application to the database.

What to do next

Before users can see the new menu item or toolbar button, you must grant user and group access privileges to it. Grant the privileges in the Options section of the Applications tab in the Security Groups application.

Adding a button as a launch point

To add a button to an application that acts as a launch point, configure a button to use the signature option for the launch point.

Procedure

1. In the Application Designer, click Control Palette.
2. Drag a push button control to the application workspace.
3. Open the Properties window for the push button control.
4. In the Label field, specify the name that you want to appear on the button.
5. In the Event field, specify the name of the signature option.
6. Click OK to return to the Application Designer.
7. Click Save Application Definition to commit the modifications to the application to the database.

Adding a condition to a launch point

You can create a condition and then associate the condition with the signature option for the launch point. When you associate a condition with a signature option, the user interface behavior is changed based on the condition and the data that is being viewed.

Procedure

1. In the Security Groups application, select the group for which you want to apply a condition.
 2. In the Application tab, select the application for which you want to apply the condition.
 3. In the Options table, select the condition value that you created.
 4. Click Save Group.
- [Signature option conditions](#)
You can apply conditions to control the user interface behavior based on the data that is being viewed.

Signature option conditions

You can apply conditions to control the user interface behavior based on the data that is being viewed.

The integration framework provides a predefined condition class, `psdi.iface.app.launch.LaunchCICCondition`, to hide launch entry menu items when the current object classification does not match the launch entry classification value. This condition applies to any object that has a classification attribute.

Launch entry menu items can also be hidden when the operational management product that is configured on the launch entry does not manage the configuration item. This condition applies to launch entries that you associate with a configuration item object or actual configuration item object.

You can configure a condition to use the predefined condition class. You also can configure a condition to implement a custom condition using the Conditional Expression Manager application.

The launch point is available from the application, regardless of the data that is being viewed, when you do not use a condition. The data you view is restricted to the signature option security settings for a user group. You also can configure your security settings to hide a launch point, based on set group access privileges.

If you use a Java™ condition class, you must change the condition EXPRESSION attribute to the name of the launch entry. The Java class can identify which launch entry is executed. The expression attribute value must be an exact match to the name of the launch entry and values are case-sensitive.

Integrating with Workday Connector

You can integrate IBM® Maximo® Manage and Workday Human Capital Management (HCM) to synchronize your HCM data and integrate IBM Maximo Manage and Workday Financial to synchronize your financial data. By completing an integration with Workday Connector, you can synchronize data between systems and access more accurate cost and time reporting information.

Workday Connector facilitates the sharing of financial and HCM data between Maximo and Workday Financial and Workday HCM. The connector eliminates the need for double data entry in both systems and results in accurate costing and time reporting information that is collected in Workday.

System requirements

The integration uses existing integration components of each application to complete the integration.

- IBM Maximo Application Suite.
- IBM App Connect Enterprise version 12.0 or later.

- Workday Web Service version 35.1.
- [Workday Human Capital Management \(HCM\) overview](#)
You can configure an integration between IBM Maximo Manage and Workday Human Capital Management (HCM).
- [Workday Financials overview](#)
You can integrate IBM Maximo Manage and Workday Financials.

Workday Human Capital Management (HCM) overview

You can configure an integration between IBM® Maximo® Manage and Workday Human Capital Management (HCM).

The HCM integration facilitates the HR master data from Workday to be populated in Maximo automatically. Once in Maximo, this data can be leveraged to perform accurate time reporting for maintenance-related activities which are then sent back to Time Reporting in Workday, eliminating the need for technicians to enter their maintenance time in both systems.

Integration overview

Integration between Maximo Manage and Workday HCM supports the following HCM use cases:

- The integration creates Maximo Person, Labor, Craft, and Skill data from Workday HCM Worker data.
- The integration creates Workday Time reporting data from Maximo Labor reporting data.

For more information, see [Workday HCM](#).

Data flow

The first integration imports the following Workday HCM Worker data into Maximo Manage data:

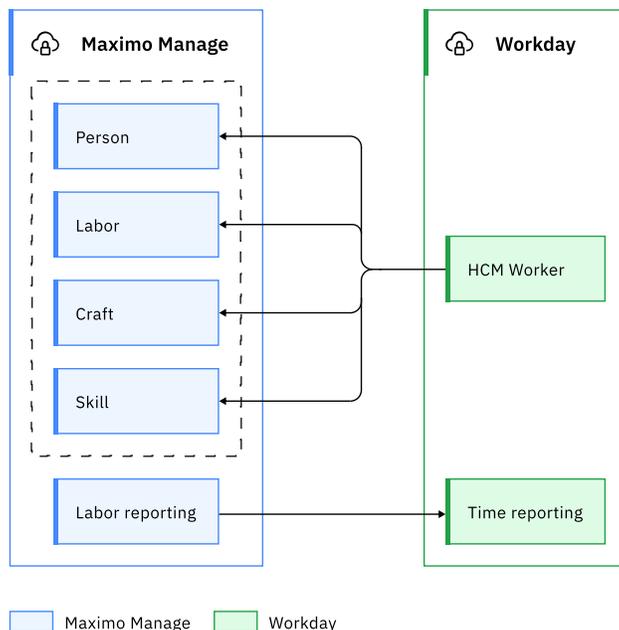
- Person records
- Skill records
- Craft records
- Labor records

When the integration is created, the Labor records can be assigned to Maximo work orders to complete maintenance activities.

When a person who is associated with a labor record reports their time in Maximo Manage, a second integration sends the work order labor reporting data to Workday time reporting data.

The following diagram shows how Workday HCM worker data is integrated by using Maximo Manage. This approach is done by a Maximo cron task.

Figure 1. Integration overview of Maximo Manage and Workday HCM



- [Workday worker integration](#)
Workday Worker data is used to create Maximo Person, Labor, Crafts, and Skills data.

- [Workday Time Tracking integration](#)

The Time Tracking integration creates Workday Time Reporting data from Maximo Labor Reporting data. This integration can optionally be implemented based on the business requirements.

Related information

- [Working with cron tasks](#)

Workday worker integration

Workday Worker data is used to create Maximo Person, Labor, Crafts, and Skills data.

Data flow

A new Maximo cron task is provided to get HCM Worker data from Workday. A cron task is an existing Maximo® Manage component that facilitates processes that run in the background, supports flexible scheduling features, and uses parameters that administrators can configure based on their business requirements. Customers can set a preferred frequency for the cron task. For example, it might be hourly, daily, or weekly.

The Maximo cron task initiates an App Connect Flow service that uses the parameters that are provided by the administrator and then calls the Workday APIs for HCM Worker by using the Workday Connector. When the Workday HCM data is retrieved from Workday, the Connector Flow calls three Maximo enterprise services to load the Maximo skill, craft code, person, and labor records.

Workday HCM data can be filtered based on the configurable parameters, organization, and job family. The configurable parameters are set in the cron task by the administrator.

Related information

- [Working with cron tasks](#)

Workday Time Tracking integration

The Time Tracking integration creates Workday Time Reporting data from Maximo® Labor Reporting data. This integration can optionally be implemented based on the business requirements.

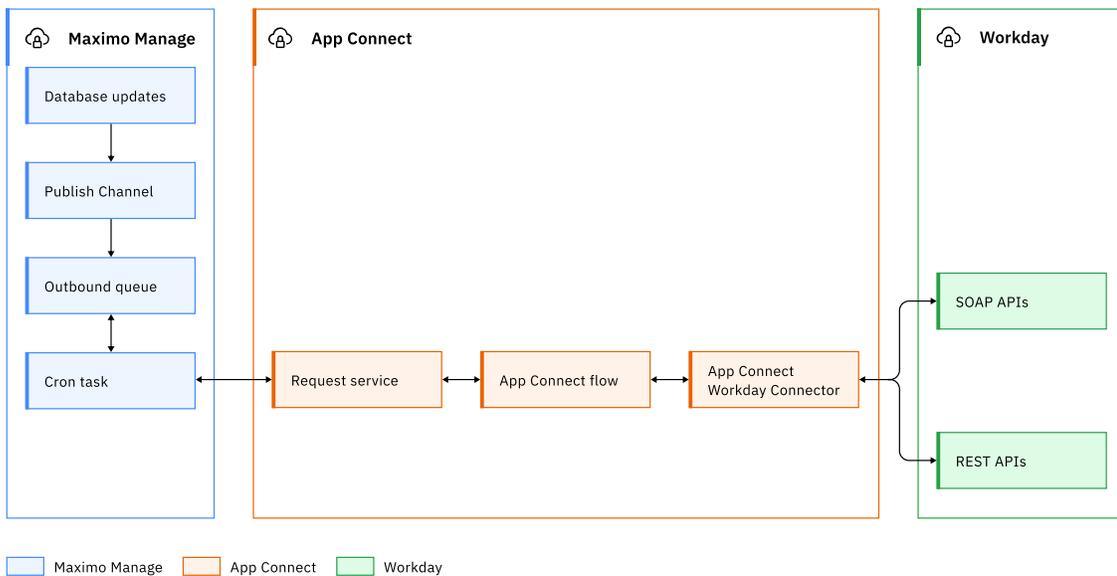
Data flow

Maximo Manage provides Employee Actuals Publish Channel to send labor transaction data to external applications. This solution provides a duplicate of this publish channel to send labor transactions to Workday.

Transactions are triggered by events that capture the saving of a new approved labor transaction in Maximo. The publish channel listens for object events. When the publish channel is triggered, these transactions are saved in an outbound queue and delivered to an App Connect service. The App Connect service maps the transaction to the Workday Time Reporting API to create time reporting transactions in Workday.

The following diagram shows how Maximo labor transactions are sent to Workday:

Figure 1. Sending Maximo Manage data to Workday



Workday Financials overview

You can integrate IBM® Maximo® Manage and Workday Financials.

Integration overview

Integration between Maximo Manage and Workday Financials is to support the following use cases:

- The integration creates Maximo General Ledger components and Charts of Accounts from Workday Financials account data.
- The integration creates Workday General Ledger data from Maximo journal transactions.

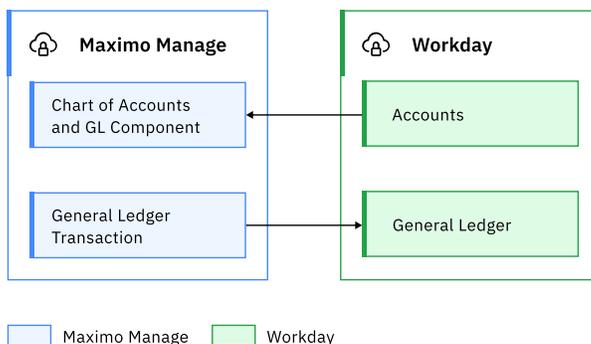
For more information, see [Workday Financials](#).

Data flow

The first integration imports Workday Financials account data into Maximo General Ledger components and charts of accounts. When the integration is created, the Maximo General Ledger components and Charts of Accounts data can be used in Maximo journal transactions.

When a journal transaction is created in Maximo Manage, a second integration sends the data to the Workday General Ledger.

Figure 1. Maximo Manage and Workday Financials overview



- [Workday Account integration](#)
The Workday Account integration creates Maximo General Ledger components and charts of accounts from Workday Account data.
- [Workday Journal transaction integration](#)
Maximo General Ledger integration creates a Workday Journal transaction data from Maximo Manage.

Workday Account integration

The Workday Account integration creates Maximo® General Ledger components and charts of accounts from Workday Account data.

Data flow

A new Maximo cron task is provided to support pulling Workday Account data. A cron task is an existing Maximo Manage component that facilitates processes that in run the background, supports flexible scheduling features, and uses parameters that administrators can configure based on their business requirements. Customers can set a preferred frequency for the cron task. For example, it might be hourly, daily, or weekly.

The Maximo Manage cron task initiates an App Connect flow service that uses the parameters that are provided by the administrator and then calls the Workday APIs for Financial Accounts by using the Workday Connector. When the Workday Financials data is retrieved from Workday, the Connector Flow calls two Maximo enterprise services to load the Maximo General Ledger components and Maximo chart of accounts.

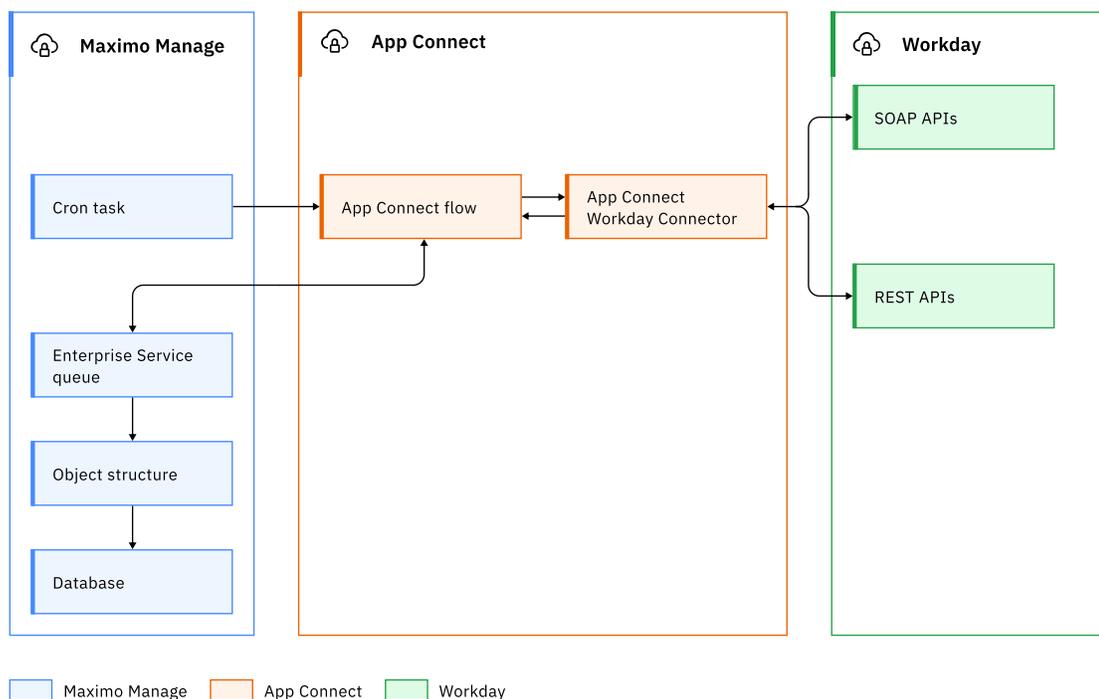
Processing the Workday Account data populates the entire set of accounts for a specific account set.

Process flow

The following diagram shows how Workday Financials data is integrated with Maximo Manage. This approach is driven by a Maximo cron task.

1. The Maximo cron task initiates a pull of data.
2. The App Connect flow uses Workday Connector to pull data.
3. The App Connect flow uses Maximo enterprise services to update the Maximo data. Enterprise services provide error management.

Figure 1. Workday Account data into General Ledger components and charts of accounts in Maximo Manage



Workday Journal transaction integration

Maximo® General Ledger integration creates a Workday Journal transaction data from Maximo Manage.

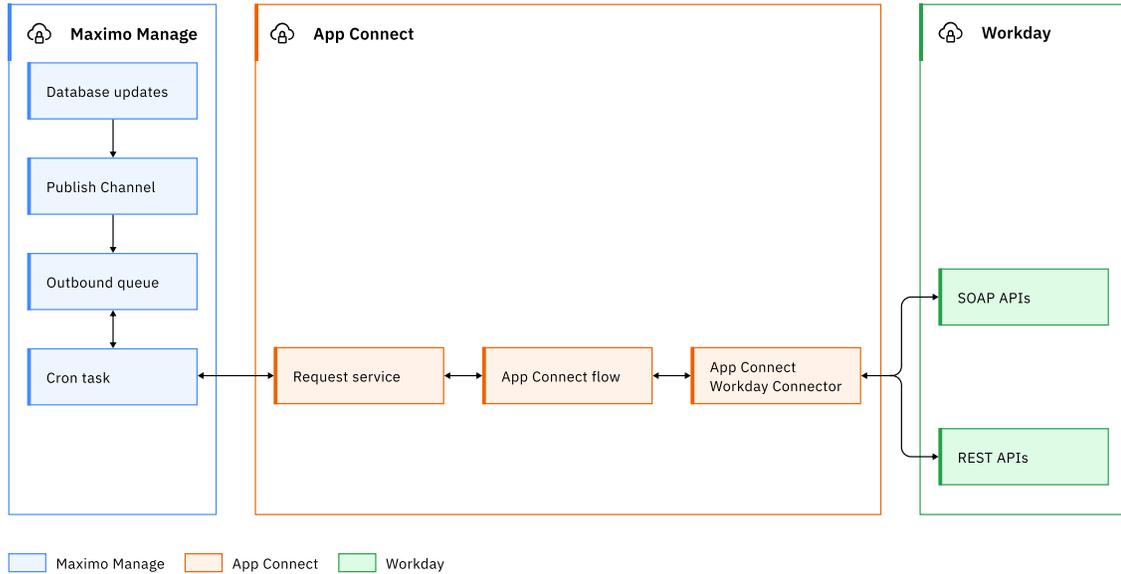
Maximo Manage provides a Journal Transaction Publish Channel to send Maximo journals to external applications. This solution provides a duplicate of this channel to send journals to Workday. Transactions are triggered by events that capture the saving of a new journal transaction in Maximo. The publish channel listens for object events, such as inserts, updates, and deletes. When the publish channel is triggered, these transactions are then saved in an outbound queue and delivered by an App Connect service. The App Connect service maps the transaction to the Workday Journal API to create journal transactions in Workday.

Data flow

The following diagram shows how Maximo journal transactions are sent to Workday.

1. A Maximo publish channel is registered for events.
2. Events trigger message through the publish channel to an outbound queue.
3. An external system endpoint delivers message to App Connect flow.
4. App Connect flow uses Workday Connector to update Workday.

Figure 1. General Ledger Journal data from Maximo Manage into Workday data



Envizi ESG Suite and TRIRIGA Application Suite Connectors

IBM® TRIRIGA® Application Suite and IBM Maximo® Application Suite customers have access to a collection of predefined integrations between each other and IBM Envizi ESG Suite.

These integrations can be used in various combinations to enable many use-cases and they can each be configured for more flexibility.

- Maximo Connector for TRIRIGA supports the following use cases:
 - Bidirectional loading, and continuous synchronization of portfolio data such as people, locations, and assets.
 - Bidirectional routing of service requests between TRIRIGA Application Suite and Maximo Application Suite.
 - Automatic shadowing of work tasks in TRIRIGA Application Suite with work orders in Maximo Application Suite to enable facility teams to plan, budget, and project manage in TRIRIGA Application Suite while work tasks are reflected in Maximo Application Suite as work orders.
- Maximo Connector for Envizi automatically synchronizing asset location and meter readings from Maximo Application Suite to Envizi ESG Suite to automate tracking of energy usage and calculating related scope 1 and 2 emissions of electricity, natural gas, and water.
- [Integrating with Maximo Connector for Envizi](#)
The connector to integrate Maximo Application Suite and Envizi ESG Suite is released with the name IBM Maximo Connector for Envizi. This connector supports the following capability through App Connect flows.
- [Integrating with Maximo Connector for TRIRIGA](#)
Maximo Connector for TRIRIGA integrates Maximo Application Suite and TRIRIGA Application Suite.

Integrating with Maximo Connector for Envizi

The connector to integrate Maximo® Application Suite and Envizi ESG Suite is released with the name IBM® Maximo Connector for Envizi. This connector supports the following capability through App Connect flows.

- Automatically synchronize asset location and meter readings from Maximo Application Suite to Envizi ESG Suite to automate tracking of energy usage and calculating its related scope 1 and 2 emissions of Electricity, Natural Gas, and Water.
- [Overview](#)
You can use Maximo Connector for Envizi to share data between Maximo Application Suite and Envizi ESG Suite.
- [App Connect](#)
IBM App Connect is middleware that provides a flexible environment for integration solutions to transform, enrich, route, and process business messages and data. It is a prerequisite for all the portfolio connectors, and it is made available as a supporting program through TRIRIGA Application Suite 11.3 and Maximo Application Suite 8.9.

- [Installing Maximo Connector for Envizi](#)
The Maximo Connector for Envizi must be installed by using Maximo Application Suite to create an integration with Envizi ESG Suite.
- [Configuring Maximo Connector for Envizi](#)
Configuring the Maximo Connector for Envizi is a three-step process that begins with configuring the App Connect followed by configuring the Envizi ESG Suite and then Maximo Application Suite.
- [Troubleshooting connection errors](#)
You can troubleshoot the common errors that occur, their causes, and their resolutions.

Overview

You can use Maximo® Connector for Envizi to share data between Maximo Application Suite and Envizi ESG Suite.

Use case example

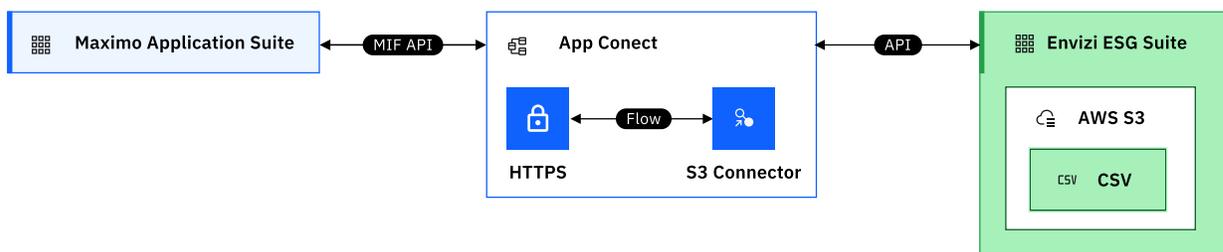
Corporate sustainability managers can gather and maintain accurate sustainability data for their portfolio of assets directly from Maximo Application Suite where those assets are managed. Location data from Maximo Application Suite serves as a baseline for all other sustainability reports in Envizi ESG Suite. Continuously updated meter readings data captured in Maximo Application Suite Electricity, Gas, Water enables accurate greenhouse gas accounting and performance reporting in Envizi ESG Suite.

Connector architecture

IBM App Connect provides a flexible environment for integration solutions to transform, enrich, route, and process business messages and data.

App Connect flows enable specific integration use cases by connecting to predefined APIs to route and map data. Mappings are predefined and can be customized.

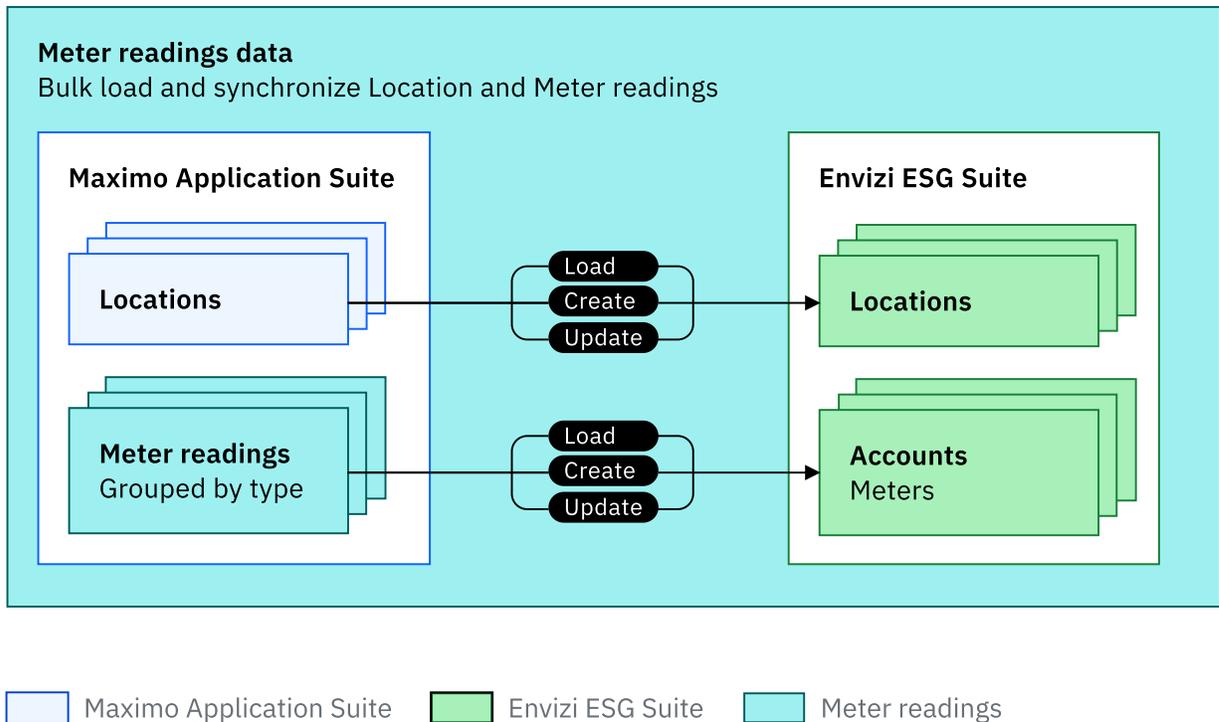
The Maximo Integration Framework for Maximo Application Suite and Envizi API framework for Envizi ESG Suite is used and enabled through provided packages that can be imported.



Maximo Application Suite
 App Connect
 Envizi ESG Suite

Data mapping diagram

The data mapping diagram illustrates the record types that are available by the APIs and App Connect flows.



App Connect

IBM® App Connect is middleware that provides a flexible environment for integration solutions to transform, enrich, route, and process business messages and data. It is a prerequisite for all the portfolio connectors, and it is made available as a supporting program through TRIRIGA® Application Suite 11.3 and Maximo® Application Suite 8.9.

App Connect flows enable specific integration use cases by connecting to predefined APIs to route and transform data. Flows can be applied in different combinations to support various use cases. Flows handle the data mapping and data validation, and they can be modified for individual requirements. These flows are run based on events or on a schedule.

- [Installing App Connect](#)
Installing App Connect provides you its flows by using which you can integrate two systems to share data.
- [App Connect flows](#)

A flow is included with the connector to map records between Envizi ESG Suite and Maximo Application Suite that exports locations and meter readings along with all the necessary mapping fields.

Installing App Connect

Installing App Connect provides you its flows by using which you can integrate two systems to share data.

Procedure

- App Connect Pro SaaS is available in the IBM Cloud® catalog.
- App Connect Enterprise on-premises can also be provisioned within your Red Hat® OpenShift® cluster directly from the Red Hat OpenShift operator. For more information about installing the operator, see [Deploying IBM® App Connect](#).

App Connect flows

A flow is included with the connector to map records between Envizi ESG Suite and Maximo® Application Suite that exports locations and meter readings along with all the necessary mapping fields.

Table 1. Files naming convention for flow.

File	Flow	Destination	Operation
------	------	-------------	-----------

File	Flow	Destination	Operation
PLUSZMXTOS3_v1_1_0.yaml	Locations and Meter Reading	Maximo Application Suite to Envizi ESG Suite	Bulk Load or Load Changes

Installing Maximo Connector for Envizi

The Maximo® Connector for Envizi must be installed by using Maximo Application Suite to create an integration with Envizi ESG Suite.

The installation procedure depends on the version of Maximo Application Suite that is installed.

- [Installing Maximo Connector for Envizi in Maximo Application Suite 8.10](#)
The Maximo Connector for Envizi can be installed by using the Catalog page in Maximo Application Suite 8.10.
- [Installing Maximo Connector for Envizi in Maximo Application Suite 8.9](#)
The Maximo Connector for Envizi can be installed by using the customized .zip file that is provided from Passport Advantage. This .zip file contains all of the configurations that are necessary to complete the installation process.

Installing Maximo Connector for Envizi in Maximo Application Suite 8.10

The Maximo® Connector for Envizi can be installed by using the Catalog page in Maximo Application Suite 8.10.

Procedure

1. In Maximo Application Suite, click the Administration icon, and from the side navigation menu, click Catalog.
2. Click the Add-ons tab, search for the Envizi Connector, and click its tile.
3. On the Envizi Connector page, review the information and then click Configure.
4. On the Update Manage workspace configuration page, in the Components section, in the New version column, select latest.
5. Click Apply Changes and then click Confirm to begin the installation. The process can take between 20 minutes to a couple of hours based on the cluster resources.
6. Optional: In the Red Hat® OpenShift® cluster, monitor the logs that are created in the build pods of the Manage namespace.

Installing Maximo Connector for Envizi in Maximo Application Suite 8.9

The Maximo® Connector for Envizi can be installed by using the customized .zip file that is provided from Passport Advantage. This .zip file contains all of the configurations that are necessary to complete the installation process.

Procedure

1. In Maximo Application Suite, click Administration icon.
2. On the Suite administration page, click the Applications tile.
3. On the Applications page, click Manage.
4. On the Manage page, click Actions, then click Update configuration.
5. In the Configurations list, click the edit icon for Customization.
6. In the Customization section, set System managed to off and then click Add customization archive.
7. In the File address field, enter the path of the .zip file that contains the configurations.
8. Scroll up the page, click Apply changes, and then click Confirm to update the instance. The process can take between 20 minutes to 1-2 hours depending on the cluster resources.
9. Optional: In the Red Hat® OpenShift® cluster, monitor the logs that are created in the build pods of the Manage namespace.

Configuring Maximo Connector for Envizi

Configuring the Maximo® Connector for Envizi is a three-step process that begins with configuring the App Connect followed by configuring the Envizi ESG Suite and then Maximo Application Suite.

Before you begin

- Ensure that you have an instance of App Connect Enterprise or App Connect Pro with the Designer component.
- Ensure that you have administrative access to your Maximo Application Suite instance with an API key that is generated for this integration.
- Ensure that you have an Amazon Simple Storage Service (Amazon S3) bucket for your Envizi ESG Suite instance.
- Import the App Connect certificate to Maximo Application Suite to enable encrypted communication.
- Ensuring that location meter data supports the units of measurement.
- [Configuring App Connect](#)
You configure App Connect by creating accounts and importing flows in App Connect. After configuration, the connection need to be authenticated by creating an API key.

- [Check data and add App Connect certificate](#)
Before you can use Maximo Connector for Envizi, you must add necessary certificates and ensure the correct configuration of data, such as the unit of measure and service address in Maximo Application Suite.
- [Configuring Maximo Application Suite for integration](#)
To configure Maximo Application Suite for integration, you deploy the build and configure artifacts, such as endpoints and cron tasks.
- [Using the connector](#)
You can use the Maximo Connector for Envizi by controlling cron tasks and flows. You can start or stop the cron tasks or flows based on the activity you want to complete.
- [Testing the configuration](#)
To test that the configuration is complete and sending a test payload to test connectivity.

Configuring App Connect

You configure App Connect by creating accounts and importing flows in App Connect. After configuration, the connection need to be authenticated by creating an API key.

- [Adding account for S3 server and HTTP connectors](#)
Before you can import App Connect, you must create accounts for the S3 server and HTTP connectors.
- [Importing and configuring App Connect flows](#)
The flows can be imported by using App Connect and then need to be configured for the HTTP account that was created for the connector.
- [Authenticating on-premises and cloud basedApp Connect](#)
Authenticate the App Connect connection by creating an API key.

Adding account for S3 server and HTTP connectors

Before you can import App Connect, you must create accounts for the S3 server and HTTP connectors.

Procedure

1. In App Connect, open the Catalog page.
2. In the Search application field, type the name of the connector for the account.
3. If the App Connect instance does not have an account for the connector, click Connect to create a new account. Else, open the account selection drop down, and click Add a new account.
4. Enter the necessary details for the connector.
 - For S3, specify the S3 server and user account.
 - For HTTP, specify an authentication key or username and password that is needed for Maximo® Application Suite.
5. Click Connect and in the Account, select newly created account.
Note: App Connect creates an account with a generic name in sequential order. For example, if Account 1 and Account 2 are present, the new account is named as Account 3.
6. Click options icon (three dots) and then click Rename Account.
7. Enter an account name and click Rename Account. This name can now be used by the connector in the flow.

Importing and configuring App Connect flows

The flows can be imported by using App Connect and then need to be configured for the HTTP account that was created for the connector.

Procedure

1. In App Connect, open the Dashboard.
2. Click New and select Import Flow.
3. Browse the flow's .yaml file and click Import. The flow is now be imported and opened.

Configuring the flow to use the right accounts

It is important to check whether the imported flow is using the right accounts for the connectors.

Procedure

1. On the recently imported flow, click Edit Flow and check if the connectors are using the right accounts.
2. To change the account for any connector, select the connector and open the account's name list.
3. Select the account name that you want to use from the list.

Authenticating on-premises and cloud basedApp Connect

Authenticate the App Connect connection by creating an API key.

About this task

For on-premises App Connect, basic authentication is used.

Procedure

1. In App Connect, open your flow and on the Manage tab, click Test.
2. From the side menu, click POST and then open the Try It tab.
3. Use the authentication in the End Point section when you configure Maximo® Application Suite.

Authenticating cloud-based App Connect

Procedure

1. In App Connect, open your flow and on the Manage tab, click Create API key and documentation link.
2. Enter name for the API key and click Create.
Note: Make a note of this key. The Maximo Application Suite end point is configured to send this API key as the value for the X-IBM-Client-Id header when the App Connect flow API is called.
3. Open the API Documentation Link in another tab.
4. Click Route to see the URL.
5. In the Details tab, copy POST link that starts with HTTP.
Note: Test this API by using a tool such as Postman before you use the API in Maximo Application Suite.

Check data and add App Connect certificate

Before you can use Maximo® Connector for Envizi, you must add necessary certificates and ensure the correct configuration of data, such as the unit of measure and service address in Maximo Application Suite.

- [Check the data correctness](#)
Certain data, such as unit of measurements or service address, needs to be correctly maintained in the Maximo Application Suite to make integration with Envizi ESG Suite work as expected.
- [Adding the App Connect certificate in Maximo Application Suite 8.9 and later](#)
You must import the App Connect certificate in Maximo Application Suite to enable encrypted communication for Maximo Connector for Envizi.
- [Adding the App Connect certificate in Maximo Asset Management 7.6.1.2 and later](#)
You must import the App Connect in Maximo Asset Management to enable encrypted communication for Maximo Connector for Envizi. Configuring the WebSphere® certificate tests the connection to a Secure Sockets Layer (SSL) port and retrieves the signer from the server during the connection establishment.

Check the data correctness

Certain data, such as unit of measurements or service address, needs to be correctly maintained in the Maximo® Application Suite to make integration with Envizi ESG Suite work as expected.

- Data for location meters can be exported to Envizi ESG Suite only if the units of measurement are configured. To add or modify units of measurement, see [Adding unit of measurement](#).
- A service address must be configured in the location for proper functioning of Envizi ESG Suite's features. To add a service address, see [Adding service address](#).
- [Adding unit of measurement](#)
In the Maximo Application Suite, you must add the units of measurement that are used to export the data for location meters to Envizi ESG Suite.
- [Adding service address](#)
A service address must be configured for the location in Maximo Manage to ensure proper functioning of features in Envizi ESG Suite.

Adding unit of measurement

In the Maximo® Application Suite, you must add the units of measurement that are used to export the data for location meters to Envizi ESG Suite.

About this task

Data for location meter can be exported to Envizi ESG Suite only if the unit of measurement is configured in Maximo Application Suite.

The current integration with Envizi ESG Suite supports only the following units of measurement for the location meter data.

Table 1. Units of measurement that are supported for Maximo Connector for Envizi.

Meter Type	Supported Unit of Measure
Electric	GJ, kWh, MWh
Natural Gas	GJ, MJ, kWh, m3, mmbtu, therm
Water	litre, klitre, m3, gallon

Procedure

1. In Maximo Manage, from the side navigation menu, click Inventory > Item Master.
2. On the left pane, click Unit of Measure and Conversion > Add/Modify Units of Measure.
3. Add the missing units and then click OK.

Adding service address

A service address must be configured for the location in Maximo® Manage to ensure proper functioning of features in Envizi ESG Suite.

About this task

A service address must be configured with the following fields.

- Street Address
- City
- State
- Post Code
- Country
- Latitude
- Longitude

Procedure

1. In Maximo Manage, from the side navigation menu, click Administration > Service Address.
2. Form the Common Actions menu, click New Service Address and add field details.
3. From the side navigation menu, click Assets > Location and search for the location to associate the service address.
4. In the Service Address field, click the Detail Menu icon and then click Select Value.
5. Search and select the service address that you created.

Adding the App Connect certificate in Maximo Application Suite 8.9 and later

You must import the App Connect certificate in Maximo® Application Suite to enable encrypted communication for Maximo Connector for Envizi.

Procedure

1. Extract the App Connect certificate from an imported flow URL.
2. In App Connect, go to the flow's page, click Test and then click Try It to get the URL.
3. In Maximo Application Suite, click the AppSwitcher icon, click the Workspaces card, and then open the workspace where Maximo Manage is deployed.
4. Click Actions, click Update configuration, and then click the pencil icon for Imported Certificates.
5. Disable System managed, click Add, enter the extracted certificate in the fields, and then click Confirm.
6. Click Apply Changes to update the truststore with the new certificate.

Adding the App Connect certificate in Maximo Asset Management 7.6.1.2 and later

You must import the App Connect in Maximo® Asset Management to enable encrypted communication for Maximo Connector for Envizi. Configuring the WebSphere® certificate tests the connection to a Secure Sockets Layer (SSL) port and retrieves the signer from the server during the connection establishment.

Procedure

1. Log in to the WebSphere console that is hosting the Maximo Application Suite server.
2. Go to Security > SSL certificate & key management. Under Related Items, click Key stores and certificates.
3. Click CellDefaultTrustStore and go to the next page.
4. In the Additional Properties section, click Signer certificates.
5. From this page, click Retrieve from Port and enter the fields details using the following table.

Table 1. Adding details for retrieving fields from the port .

Field	Value
Host	The host from the imported flow URL
Port	443
Alias	appconnect

- After all three are entered, click Retrieve signer information, and the information from the URL gets populated.
- Click Save and then repeat the process for NodeDefaultTrustStore.

Configuring Maximo Application Suite for integration

To configure Maximo® Application Suite for integration, you deploy the build and configure artifacts, such as endpoints and cron tasks.

- **Deploying the Maximo Application Suite build**
Within Maximo Application Suite, the integration provides integration components in .dbc script files and Java™ classes as part of the solution. These components must be installed in the Maximo Application Suite environment. Components and other content that is created for this integration solution is identified by names that begin with PLUSZ.
- **Configuring artifacts**
You must configure meter groups, endpoints, and cron tasks in Maximo Application Suite so that data is shared as expected.

Deploying the Maximo Application Suite build

Within Maximo® Application Suite, the integration provides integration components in .dbc script files and Java™ classes as part of the solution. These components must be installed in the Maximo Application Suite environment. Components and other content that is created for this integration solution is identified by names that begin with PLUSZ.

Deploying Maximo Application Suite 8.8 and later

Procedure

- In Maximo Manage, go to Admin dashboard.
- Select the workspace in which the instance is deployed and update the configuration.
- Go to Customization section and link to the location of the .zip file in the field. For more information, see [setting customizations](#).
- Click Apply Changes to update the instance with the customization.

Deploying IBM® Maximo Asset Management 7.6.1.2 and later

Procedure

- On the Maximo Asset Management administrative workstation, overwrite the SMP directory, which is /opt/IBM/SMP/maximo, with the contents from the .zip file that is provided. The .zip file contains the Java classes and .dbc files.
- Shutdown the Maximo server.
- To install the components, open the /opt/IBM/SMP/maximo/tools/maximo directory, run the **UpdateDB** command.
- To build the Maximo EAR file, open the /opt/IBM/SMP/maximo/deployment directory and run the **./buildmaximoea.sh** command.
- Deploy the new Maximo EAR file on all Maximo servers.
 - In the WebSphere® console, go to Applications, > Application types, > Websphere enterprise applications.
 - Select MAXIMO and then click Update button.
 - Select Browse and select the EAR file from Step 4.
 - Click Next and accept defaults from all pages.
 - After deployment, click Save.
- Start the applications and MXServer.

Configuring artifacts

You must configure meter groups, endpoints, and cron tasks in Maximo® Application Suite so that data is shared as expected.

- **Meter groups configuration**
All the meters that need to sync with Envizi ESG Suite must be in the right meter groups.
- **Configuring endpoints**
Configuring endpoint is needed so that API key can be sent for calling the App Connect flow API.
- **Cron tasks**
The integration can export locations and location meter readings from Maximo Application Suite. Two cron tasks for locations and two for meter readings are configured to fetch data from the integrated system.
- **Configuring Cron Task**
Cron tasks must be configured with proper parameters to fetch the locations and meter readings based on the type of cron task. Running the cron task pulls the data based on configured parameters.

Meter groups configuration

All the meters that need to sync with Envizi ESG Suite must be in the right meter groups.

Following table depicts the expected meter groups for each type of meter.

Table 1. Meter and Meter groups

Meter Group	Meters
PLUSZ_ELEC	Electric Meters
PLUSZ_GAS	Natural Gas Meters
PLUSZ_WTR	Water Meters

To assign or change meter group for a meter, see [Assigning meter groups to assets](#).

Configuring endpoints

Configuring endpoint is needed so that API key can be sent for calling the App Connect flow API.

Procedure

1. In the Maximo® Manage, go to Integration in side pane and then click End Points.
2. Under the End Point column, search PLUSZ.
3. Click on the PLUSZEXPORT endpoint and configure the parameters needed to execute the App Connect flow.

Table 1. Adding endpoint parameter details.

Field	Value
URL	The full URL to the flow's API, which is shown in the API Documentation Link in App Connect.
HEADERS	Replace the YourAPIKeyHere with the API key for the App Connect flow. Note: Do not remove ,Content-Type:application/json.
HTTPMETHOD	Do not change the default value POST.

Cron tasks

The integration can export locations and location meter readings from Maximo® Application Suite. Two cron tasks for locations and two for meter readings are configured to fetch data from the integrated system.

- Always-on Cron Task - For pulling the live or recent data from locations and meter readings, and is supposed to be run frequently. It pulls the data that comes into the system after the last time it ran. Based on its running frequency, the system automatically decides the window of dates or timestamps to pull the data from. These Cron Task Instances uses the suffix as always_on.
 - On-demand Cron Task - Even though it is a cron task, it is supposed to run one time on-demand, when the user wants to pull data between fixed dates or timestamps. After the first cron event runs, it must be stopped to avoid pulling the same data again. It might be needed during initial setup of the system, as starting the Always-on Cron pulls data as and when it arrives. It can also be used anytime in the future to pull any historical data on-demand. The start date OVERRIDESTARTDATE and end date OVERRIDEENDDATE must be configured before starting the cron task. These Cron Task Instances uses the suffix on_demand.
 - [Basic cron task parameters](#)
Basic parameters are used to fetch the data such as base URL for Maximo Application Suite, name, and timestamp.
 - [Advance cron task parameters](#)
Advance parameters are used to fetch more detailed data in an organized format. You can fetch data from specific object structure, apply conditions, and sort the data.
-

Basic cron task parameters

Basic parameters are used to fetch the data such as base URL for Maximo® Application Suite, name, and timestamp.

MXURL

The base URL of the Maximo Application Suite instance. It includes the protocol, domain name, and the port number, for example, `http://example.maximo.com:9080`. Do not enter a / at the end. In the absence of port number, the default port for the protocol is used, which is 80 for http and 443 for https.

For Maximo Application Suite deployments, you must use the route to the Maximo Manage instance domain. You can find this route in Red Hat® OpenShift® under Networking. Routes within the Maximo Manage namespace. The route must be of the format `workspace.manage.instanceid`.

CUSTOMER

The name of the customer. It is used to name the CSV files that are supplied by Envizi ESG Suite.

OVERRIDESTARTDATE

Used only for on-demand cron tasks. The start timestamp for getting data. The date must be specified in ISO 8601 format, for example, 2022-06-26T23:09:30-07:00, where -07:00 represents time zone offset of UTC-07:00 hours.

OVERRIDEENDDATE

Used only for on-demand cron tasks. The end timestamp for getting data. Similar to the OVERRIDESTARTDATE, the date must be specified in ISO 8601 format.

Advance cron task parameters

Advance parameters are used to fetch more detailed data in an organized format. You can fetch data from specific object structure, apply conditions, and sort the data.

SELECT

Names of the fields from the object structure.

FROM

The name of the object structure.

WHERE

The OSLC condition for data selection.

ORDERBY

The sequence in which the data is obtained.

TARGETDATECOLUMN

Name of the DateTime column in the object structure that is used to filter records between a date-time window.

ENDPOINTNAME

The name of the Maximo® Application Suite endpoint that is configured to connect to the App Connect flow.

PAGESIZE

The maximum number of records that are obtained from Maximo Application Suite in one API call. It is also the maximum number of records in the CSV file.

Configuring Cron Task

Cron tasks must be configured with proper parameters to fetch the locations and meter readings based on the type of cron task. Running the cron task pulls the data based on configured parameters.

Procedure

1. In Maximo® Manage, from the side navigation menu, click System Configuration > Platform Configuration > Cron Task Setup.
2. In the Cron Task column, search for *PLUSZ*.
3. Click the PLUSZEXPORT cron task.
4. In the Cron Task Instances, click Calendar icon to set the schedule.
5. After it is configured, click OK.
6. Select the Cron Task Instance to configure Parameters.
7. Go to the Cron Task Parameters section and configure the Value column as needed. Ideally, only the CUSTOMER and MXURL parameters need to be edited for all instances. For the on-demand cron tasks, the OVERRIDESTARTDATE and OVERRIDEENDDATE parameters need to be edited.
8. Click Save.

Using the connector

You can use the Maximo® Connector for Envizi by controlling cron tasks and flows. You can start or stop the cron tasks or flows based on the activity you want to complete.

- [Starting or stopping cron task instance](#)
You can start or stop the cron tasks in Maximo Manage.
- [Starting or stopping App Connect flows](#)
You can start or stop the App Connect flows.

Starting or stopping cron task instance

You can start or stop the cron tasks in Maximo® Manage.

Procedure

1. In Maximo Manage, from the side navigation menu, click System Configuration > Platform Configuration > Cron Task Setup.
2. Search the cron task to be stopped or started in the Cron Task column.
3. In the Active? column, set the switch to on or off to start or stop the cron task respectively.
4. Click Save.

Starting or stopping App Connect flows

You can start or stop the App Connect flows.

Procedure

1. Whether you are on the Dashboard or inside the flow, click the menu icon on the flow's tile.
2. Click Start API to start or click Stop API to stop the flow.

Testing the configuration

To test that the configuration is complete and sending a test payload to test connectivity.

Procedure

1. In Maximo® Manage, from the side navigation menu, click Integration, > End Points.
2. In the End Point column, search for PLUSZExport.
3. Click Test to start the test.
4. Send a test payload that is a valid object. For example, {"Hello": "World"}.
5. If the response is anything other than Bad Request, troubleshoot the issue. For more information, see [troubleshooting](#).

Troubleshooting connection errors

You can troubleshoot the common errors that occur, their causes, and their resolutions.

Table 1. Troubleshooting common errors for Maximo Connector for Envizi.

Error	Cause	Resolution
Response code received from the HTTP request from the endpoint is not successful	Invalid URL in the integration object.	Ensure that the URL for all of the components are entered correctly. Make sure that no accidental spaces are at the beginning or the end.
404: Not Found	Flow is not running.	Make sure that the flow is running before you start the cron tasks.
PKSync error	Certificate error.	Confirm that the certificate is configured correctly.

Integrating with Maximo Connector for TRIRIGA

Maximo® Connector for TRIRIGA® integrates Maximo Application Suite and TRIRIGA Application Suite.

This connector supports the following capabilities through a collection of App Connect flows:

- Bidirectional loading and continuous synchronization of portfolio data, such as people, locations, and assets.
- Bidirectional routing of service requests between TRIRIGA Application Suite and Maximo Application Suite.
- Automatic shadowing of work tasks in TRIRIGA Application Suite with work orders in Maximo Application Suite, which enables facility teams in planning, budgeting, and project management in TRIRIGA Application Suite while work tasks are reflected in Maximo Application Suite.
- [Overview](#)
You can use Maximo Connector for TRIRIGA to share data between Maximo Application Suite and TRIRIGA Application Suite.
- [App Connect](#)
IBM App Connect is middleware that provides a flexible environment for integration solutions to transform, enrich, route, and process business messages and data. It is a prerequisite for all the portfolio connectors, and it is made available as a supporting program through TRIRIGA Application Suite 11.3 and Maximo Application Suite 8.9.
- [Installing Maximo Connector for TRIRIGA](#)
The Maximo Connector for TRIRIGA must be installed by using Maximo Application Suite to create an integration with TRIRIGA Application Suite.
- [Configuring Maximo Connector for TRIRIGA](#)
Configuring Maximo Connector for TRIRIGA is a three-step process that begins with configuring App Connect followed by configuring TRIRIGA Application Suite and then configuring Maximo Application Suite.
- [Troubleshooting connection errors](#)
Depending on the direction of the flow, cross-referencing errors from two systems can help identify the root cause of an issue with the integration.

Overview

You can use Maximo® Connector for TRIRIGA® to share data between Maximo Application Suite and TRIRIGA Application Suite.

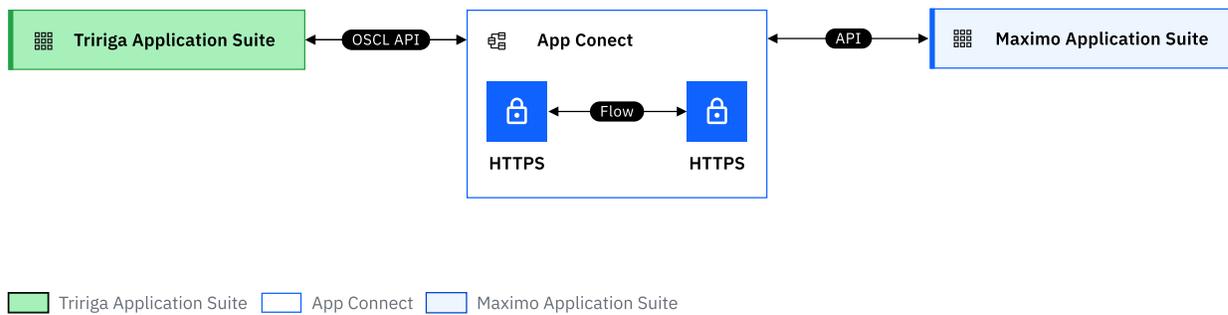
Use case examples

- TRIRIGA Application Suite is the system of record for people and space data while Maximo Application Suite is the system of record for assets. The maintenance team wants consistent reports across the entire organization and more streamlined operations. The Spaces flows that are provided in the App Connect can be used to bulk load all Spaces data from TRIRIGA Application Suite into locations in Maximo Application Suite. Then, the data is continuously synchronized when it is updated in TRIRIGA Application Suite by the facility management team. It applies to assets, or people data in both directions.
- Employees use in TRIRIGA Application Suite to submit a service request for a broken elevator. Because elevators are maintained in Maximo Application Suite, the flow creates a corresponding service request in Maximo Application Suite that is assigned to technicians and then resolved. When this service request is updated, the changes are automatically reflected in the TRIRIGA Application Suite service request so that the originator of the request remains informed of its status. This flow can also operate in reverse if a service request originates from Maximo Application Suite for a maintenance operation that must be tracked in TRIRIGA Application Suite.
- The facility management team has a capital project in TRIRIGA Application Suite to upgrade all the lights to LEDs. A budget, scope, and tasks are already defined in the project. The flow can then create corresponding work orders in Maximo Application Suite for each task to get started by technicians by using Maximo Manage and Maximo Mobile. When the tasks are updated in Maximo Application Suite, those updates flow back into TRIRIGA Application Suite and are reflected in the project plan.

Connector architecture

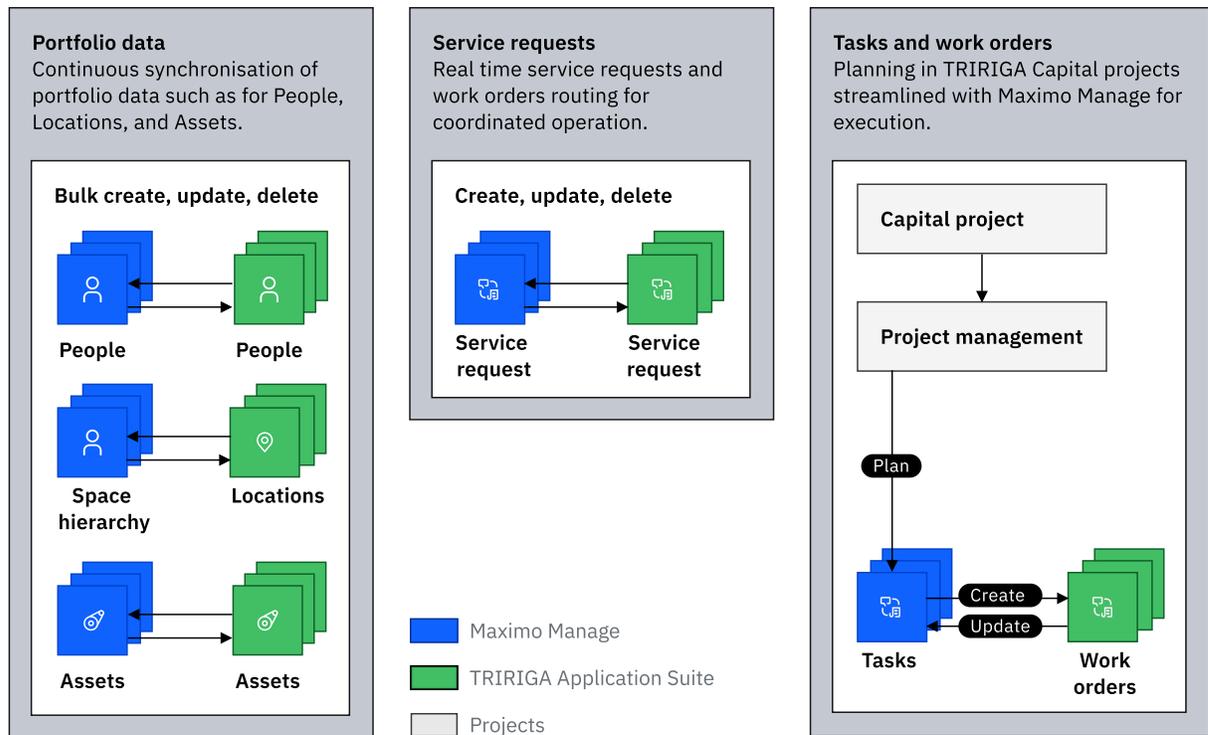
IBM® App Connect provides a flexible environment for integration solutions to transform, enrich, route, and process business messages and data. App Connect flows enable specific integration use cases by connecting to predefined APIs to route and map data. Mappings are predefined and can be customized.

The Maximo Integration Framework for Maximo Application Suite and OSLC API framework for TRIRIGA Application Suite is used and enabled through provided packages that can be imported.



Data mapping diagram

The data mapping diagram illustrates the record types that are available by the APIs and App Connect flows.



App Connect

IBM® App Connect is middleware that provides a flexible environment for integration solutions to transform, enrich, route, and process business messages and data. It is a prerequisite for all the portfolio connectors, and it is made available as a supporting program through TRIRIGA® Application Suite 11.3 and Maximo® Application Suite 8.9.

App Connect flows enable specific integration use cases by connecting to predefined APIs to route and transform data. Flows can be applied in different combinations to support various use cases. Flows handle the data mapping and data validation, and they can be modified for individual requirements. These flows are run based on events or on a schedule.

- [Installing App Connect](#)
Installing App Connect provides you its flows by using which you can integrate two systems to share data.
- [App Connect flows](#)
There are more than 20 flows that are included with the connector to map records between TRIRIGA Application Suite and Maximo Application Suite. These flows include all the necessary mapping fields. You can use these flows in various combinations to implement your integration use cases.

Installing App Connect

Installing App Connect provides you its flows by using which you can integrate two systems to share data.

Procedure

- App Connect Pro SaaS is available in the IBM Cloud® catalog.
- App Connect Enterprise on-premises can also be provisioned within your Red Hat® OpenShift® cluster directly from the Red Hat OpenShift operator. For more information about installing the operator, see [Deploying IBM® App Connect](#).

App Connect flows

There are more than 20 flows that are included with the connector to map records between TRIRIGA® Application Suite and Maximo® Application Suite. These flows include all the necessary mapping fields. You can use these flows in various combinations to implement your integration use cases.

Table 1. Files names for flows from Maximo Application Suite to TRIRIGA

Application Suite.

File	Flow	Operation
PLUSIMXPerson2TRI_v1_0_0.yaml	People	Batch and individual records
PLUSIMXAsset2TRI_v1_0_0.yaml	Assets	Batch and individual records
PLUSIMXServiceReq2TRI_v1_0_0.yaml	Service Requests	Single record at a time
PLUSIMXWorkOrder2TRI_v1_0_0.yaml	Work Orders or Tasks	Single record at a time

Table 2. Files names for flows from TRIRIGA Application Suite to Maximo Application Suite.

File	Flow	Operation
PLUSITRIPerson2MX_v1_0_0.yaml	People	Single record at a time
PLUSITRIOrg2MX_v1_0_0.yaml	People	Single record at a time
PLUSITRISpace2MX_v1_0_0.yaml	Locations or Spaces	Single record at a time
PLUSITRISpaceClass2MX_v1_0_0.yaml	Locations or Spaces	Single record at a time
PLUSITRILocPath2MX_v1_0_0.yaml	Locations or Spaces	Single record at a time
PLUSIMXLocation2TRI_v1_0_0.yaml	Locations or Spaces	Batch and individual records
PLUSITRIAsset2MX_v1_0_0.yaml	Assets	Single record at a time
PLUSITRIAssetSpec2MX_v1_0_0.yaml	Assets	Single record at a time
PLUSITRIServiceReq2MX_v1_0_0.yaml	Service Requests	Single record at a time
PLUSITRIReqClass2MX_v1_0_0.yaml	Service Requests	Single record at a time
PLUSITRIWorkOrder2MX_v1_0_0.yaml	Tasks or Work Orders	Single record at a time
PLUSITRIPEOPLEBATCH_v1_0_0.yaml	Batch People	Batch
PLUSITRIORGANIZATIONBATCH_v1_0_0.yaml	Batch Org	Batch
PLUSITRISPACEBATCH_v1_0_0.yaml	Batch Space	Batch
PLUSITRIPROPERTYBATCH_v1_0_0.yaml	Batch Property	Batch
PLUSITRIBUILDINGBATCH_v1_0_0.yaml	Batch Building	Batch
PLUSITRIFLOORBATCH_v1_0_0.yaml	Batch Floors	Batch
PLUSITRIASSETBATCH_v1_0_0.yaml	Batch Assets	Batch

For more detailed mapping of all the fields, see the [data mapping spreadsheet](#).

Installing Maximo Connector for TRIRIGA

The Maximo® Connector for TRIRIGA® must be installed by using Maximo Application Suite to create an integration with TRIRIGA Application Suite.

The installation procedure depends on the version of Maximo Application Suite that is installed.

- [Installing Maximo Connector for TRIRIGA in Maximo Application Suite 8.10 and later](#)
The Maximo Connector for TRIRIGA can be installed by using the Catalog page in Maximo Application Suite 8.10 and later.
- [Installing Maximo Connector for TRIRIGA in Maximo Application Suite 8.8 and 8.9](#)
The Maximo Connector for TRIRIGA can be installed by using the customized .zip file that is provided from Passport Advantage. This .zip file contains all of the configurations that are necessary to complete the installation process.
- [Installing Maximo Connector for TRIRIGA in Maximo Asset Management 7.6.1.2 and later](#)
The Maximo Connector for TRIRIGA can be installed by deploying the new EAR file on all the Maximo servers.

Installing Maximo Connector for TRIRIGA in Maximo Application Suite 8.10 and later

The Maximo® Connector for TRIRIGA® can be installed by using the Catalog page in Maximo Application Suite 8.10 and later.

Procedure

1. In Maximo Application Suite, click the Administration icon, and from the side navigation menu, click Catalog.
2. Click the Add-ons tab, search for the TRIRIGA Connector, and click its tile.
3. On the TRIRIGA Connector page, review the information and then click Configure.
4. On the Update Manage workspace configuration page, in the Components section, in the New version column, select latest.
5. Click Apply Changes and then click Confirm to begin the installation. The process can take anywhere between 20 minutes to couple of hours based on the cluster resources.
6. Optional: In the Red Hat® OpenShift® cluster, monitor the logs that are created in the build pods of the Manage namespace.

Installing Maximo Connector for TRIRIGA in Maximo Application Suite 8.8 and 8.9

The Maximo® Connector for TRIRIGA® can be installed by using the customized .zip file that is provided from Passport Advantage. This .zip file contains all of the configurations that are necessary to complete the installation process.

Procedure

1. In Maximo Application Suite, click Administration icon.
2. On the Suite administration page, click the Applications tile.
3. On the Applications page, click Manage.
4. On the Manage page, click Actions, then click Update configuration.
5. In the Configurations list, click the edit icon for Customization.
6. In the Customization section, set System managed to off and then click Add customization archive.
7. In the File address field, enter the path of the .zip file that contains the configurations.
8. Scroll up the page, click Apply changes, and then click Confirm to update the instance. The process can take between 20 minutes to 1-2 hours depending on the cluster resources.
9. Optional: In the Red Hat® OpenShift® cluster, monitor the logs that are created in the build pods of the Manage namespace.

Installing Maximo Connector for TRIRIGA in Maximo Asset Management 7.6.1.2 and later

The Maximo® Connector for TRIRIGA® can be installed by deploying the new EAR file on all the Maximo servers.

Procedure

1. To update the Java™ classes and .dbc files, on the Maximo Admin workstation, replace the Maximo SMP directory /opt/IBM/SMP/maximo with the contents from the solution .zip file that is provided.
2. Shutdown the Maximo server.
3. Run the **UpdateDB** command to install the solution components.
 - a. Open the /opt/IBM/SMP/maximo/tools/maximo directory.
 - b. Run the **./updatedb.sh** command.
4. Build the Maximo EAR file.
 - a. Open the /opt/IBM/SMP/maximo/deployment directory.
 - b. Run the **./buildmaximoear.sh** command.
5. Deploy the new Maximo EAR file on all Maximo servers.
 - a. In the WebSphere console, click Applications > Application types > WebSphere enterprise applications.
 - b. Click MAXIMO and then click Update.
 - c. Click Browse and select the EAR file that you built.
 - d. Click Next and accept all default values.
 - e. After deployment, click Save.
6. Start the applications and the Maximo server.

Configuring Maximo Connector for TRIRIGA

Configuring Maximo® Connector for TRIRIGA® is a three-step process that begins with configuring App Connect followed by configuring TRIRIGA Application Suite and then configuring Maximo Application Suite.

Before you begin

- Ensure that you have an instance of App Connect Enterprise or App Connect Pro with the Designer component.
- Ensure that you have administrative access to your Maximo Application Suite instance with an API key that is generated for this integration.
- Ensure that you have TRIRIGA Application Suite with dedicated user and password for this integration.
- Ensure a secure connection between TRIRIGA Application Suite, App Connect, and Maximo Application Suite. You can use Secure Gateway. For more information, see [Getting started with Secure Gateway](#).
- Import the App Connect certificate to Maximo Application Suite to enable encrypted communication.
 - For version 8.9 and later, see [Adding App Connect certificate in Maximo Application Suite 8.9 and later](#).
 - For version 7.6.1.2 and later, see [Adding App Connect certificate in Maximo Asset Management 7.6.1.2 and later](#).
- Import the App Connect certificate to TRIRIGA Application Suite to enable encrypted communication. For more information, see [Adding certificate in TRIRIGA Application Suite](#).
- **Configure App Connect**
The App Connect needs to be configured by creating account for the systems that are integrated through the connector. The configuration process also includes importing flows in App Connect, which define which data can be shared between integrated systems.
- **Add App Connect certificate**
Before you can use Maximo Connector for TRIRIGA, you must add necessary certificates in Maximo Application Suite and TRIRIGA Application Suite.
- **Configuring TRIRIGA Application Suite for integration**
To use Maximo Connector for TRIRIGA, the TRIRIGA Application Suite must be configured by importing object migration package and configuring the integration object.
- **Configuring Maximo Application Suite for a new organization**
Configure your instance of Maximo Application Suite to receive records from TRIRIGA Application Suite.

- [Testing the configuration](#)
You can test that the configuration is complete by sending a test payload.

Configure App Connect

The App Connect needs to be configured by creating account for the systems that are integrated through the connector. The configuration process also includes importing flows in App Connect, which define which data can be shared between integrated systems.

- [Authenticating App Connect](#)
Establish the connection between two systems by using App Connect. Access to an instance of App Connect with a deployed instance of a Designer is required.
- [Importing App Connect flows](#)
The flows can be imported by using either App Connect Enterprise or App Connect SaaS.

Authenticating App Connect

Establish the connection between two systems by using App Connect. Access to an instance of App Connect with a deployed instance of a Designer is required.

Before you begin

Note: IBM® App Connect Professional or App Connect Enterprise is needed to run these flows. The flows have been tested on IBM Cloud® App Connect, AWS App Connect, as well as the containerized version of App Connect.

To establish the connection between two systems, two HTTP accounts must be created on the Catalog page.

Procedure

1. After all of the connectors are loaded, in the HTTP field, enter `http`.
2. For the first account, select Connect to begin setting up the initial HTTP account.
Note: App Connect creates an account with a generic name in sequential order. For example, if Account 1 and Account 2 are present, the new account is named as Account 3.
3. Use the following table to associate the proper credentials for the accounts.

Table 1. Account names and their details.

Flow	Account Name	Username	Password	API key	API location	API key name
Maximo® Application Suite to TRIRIGA® Application Suite	mxtririga	Your TRIRIGA username	Your TRIRIGA password			
TRIRIGA Application Suite to Maximo Application Suite	trimaximo			Your Maximo API key	header	apikey

4. After the account is connected, open the Catalog page and in the HTTP section, rename the new account to match the names that you created, such as mxtririga.

Importing App Connect flows

The flows can be imported by using either App Connect Enterprise or App Connect SaaS.

- Locate the .yaml files in the provided .zip file.
- Import the Selected Flows into App Connect Enterprise or App Connect SaaS on IBM Cloud®.
- [Importing flows by using App Connect Enterprise \(CP4I\) and App Connect SaaS \(AWS\)](#)
Flows need to be imported by using App Connect Enterprise for Maximo® Connector for TRIRIGA® so they can be used to start or stop sharing data between an integrated systems..
- [Importing flows by using App Connect SaaS \(IBM Cloud\)](#)
Flows need to be imported by using App Connect SaaS for Maximo Connector for TRIRIGA so they can be used to start or stop sharing data between an integrated systems.

Importing flows by using App Connect Enterprise (CP4I) and App Connect SaaS (AWS)

Flows need to be imported by using App Connect Enterprise for Maximo® Connector for TRIRIGA® so they can be used to start or stop sharing data between an integrated systems..

Procedure

1. On the App Connect Dashboard, click New and then click Import Flow.

2. Provide the file to import for the flow.
The flow is uploaded onto the App Connect instance.
3. Click the Edit flow to see the individual nodes of this flow. Be sure to select the HTTP account that was configured for Maximo Application Suite to TRIRIGA Application Suite for the connector.
4. Click Done.
5. Click the options icon and then click Start API.
6. After the flow is running, on the Test tab, select POST. Click Try It. Take note of the URL and security credentials.

Importing flows by using App Connect SaaS (IBM Cloud)

Flows need to be imported by using App Connect SaaS for Maximo® Connector for TRIRIGA® so they can be used to start or stop sharing data between an integrated systems.

Procedure

1. In App Connect, in the API Info section of the Manage tab, ensure the path that points to the flow is correct in Route field. The path is used to create the necessary flow URL.
2. In the Sharing outside of Cloud Foundry organization section, click Create API key and documentation link.
3. Provide a name to generate an API key to use with this flow along and a documentation link. The end of the URL in the documentation has the path that completes the route URL.
4. Copy the end of the URL that begins with tri and add it to the flow URL.
Note: The six-character string that precedes the path on the documentation must match the last six characters of the route that is specified in the Route field.

Add App Connect certificate

Before you can use Maximo® Connector for TRIRIGA®, you must add necessary certificates in Maximo Application Suite and TRIRIGA Application Suite.

- [Adding the App Connect certificate in Maximo Application Suite 8.9 and later](#)
You must import the App Connect certificate in the Maximo Application Suite to enable an encrypted communication for Maximo Connector for TRIRIGA .
- [Adding the App Connect certificate in Maximo Asset Management 7.6.1.2 and later](#)
You must import the App Connect in Maximo Asset Management to enable an encrypted communication for Maximo Connector for TRIRIGA . Configuring the WebSphere® certificate tests the connection to a Secure Sockets Layer (SSL) port and retrieves the signer from the server during the connection establishment.
- [Adding the App Connect certificate in TRIRIGA Application Suite](#)
You must import the App Connect certificate in TRIRIGA Application Suite to enable encrypted communication for Maximo Connector for TRIRIGA .

Adding the App Connect certificate in Maximo Application Suite 8.9 and later

You must import the App Connect certificate in the Maximo® Application Suite to enable an encrypted communication for Maximo Connector for TRIRIGA® .

Procedure

1. Extract the App Connect certificate from an imported flow URL.
2. In the App Connect, go to the flow's page, click Test, and then Try It to get the proper URL.
3. In Maximo Application Suite, click the AppSwitcher icon, click the Workspaces card, and then open the workspace where Maximo Manage is deployed.
4. Click Actions, click Update configuration, and then click the pencil icon for Imported Certificates.
5. Disable System managed, click Add, enter the extracted certificate in the fields, and then click Confirm.
6. Click Apply Changes to update the truststore with the new certificate.

Adding the App Connect certificate in Maximo Asset Management 7.6.1.2 and later

You must import the App Connect in Maximo® Asset Management to enable an encrypted communication for Maximo Connector for TRIRIGA® . Configuring the WebSphere® certificate tests the connection to a Secure Sockets Layer (SSL) port and retrieves the signer from the server during the connection establishment.

Procedure

1. Log in to the WebSphere console that is hosting the Maximo server.
2. Go to Security > SSL certificate & key management. Under Related Items, click Key stores and certificates.
3. Click CellDefaultTrustStore and go to the next page.
4. In the Additional Properties section, click Signer certificates.
5. On this page, click Retrieve from Port and enter the fields details using the following table.

Table 1. Adding details for retrieving fields from the port .

Field	Value
Host	The host from the imported flow URL
Port	443
Alias	appconnect

- Click Retrieve signer information.
The information from the URL is populated.
- Click Save and then repeat the process for NodeDefaultTrustStore.

Adding the App Connect certificate in TRIRIGA Application Suite

You must import the App Connect certificate in TRIRIGA® Application Suite to enable encrypted communication for Maximo® Connector for TRIRIGA .

Use the following command to import the App Connect certificate:

```
cat <<EOF | oc create -f -
apiVersion: truststore-mgr.ibm.com/v1
kind: Truststore
metadata:
  name: my-tas-truststore
spec:
  license:
    accept: true
  includeDefaultCAs: true
  servers:
  - "example.com:443"
  certificates:
  - alias: alias_1
    crt: |
      -----BEGIN CERTIFICATE-----
      ...
      Certificate 1
      ...
      -----END CERTIFICATE-----
      ...
  - alias: alias_n
    crt: |
      -----BEGIN CERTIFICATE-----
      ...
      Certificate n
      ...
      -----END CERTIFICATE-----
EOF
```

For more information, see [Additional CA certificates](#) from TRIRIGA Application Suite documentation.

Configuring TRIRIGA Application Suite for integration

To use Maximo® Connector for TRIRIGA®, the TRIRIGA Application Suite must be configured by importing object migration package and configuring the integration object.

- [Importing object migration packages](#)
You import the object migration package to configure TRIRIGA Application Suite.
- [Configuring an integration object](#)
Procedure to configure an integration object for the record that is sent.
- [Running in production](#)
Once the configuration of the applications is complete and the connectivity between systems is working as expected, you need to deploy the flow as an integration server via the App Connect dashboard.

Importing object migration packages

You import the object migration package to configure TRIRIGA® Application Suite.

About this task

Import the OM Package that is labeled APICconnector into the TRIRIGA Application Suite instance.

Procedure

1. In TRIRIGA Application Suite, from the menu, select Tools > Administration > Object Migration and select New Import Package to begin the import process. For more information, see [Object Migration overview](#) in the IBM® TRIRIGA documentation.
2. From the menu, select Portfolio > People > My Profile and select the user profile that triggers the action. The Date Time Format field must contain a value in Coordinated Universal Time.

Configuring an integration object

Procedure to configure an integration object for the record that is sent.

Procedure

1. In TRIRIGA® Application Suite, click Tools > System Setup > Integration > Integration Object.
2. In the Name column, type in `apic` and select the record of an integration object that is sent.
3. In the dialog, on the General tab, specify the App Connect flow http URL and the credentials.

Running in production

Once the configuration of the applications is complete and the connectivity between systems is working as expected, you need to deploy the flow as an integration server via the App Connect dashboard.

Procedure

1. On the dashboard view of the Designer application, click the overflow menu of the flow's tile.
2. Select Export, and then Runtime flow asset (BAR).
3. In the App Connect dashboard instance, select Create Server and then the type of integration you want to run.
Note: The flows work with all types of integration sizes. Hence, pick the one that is right for your deployment.
4. Import the bar file you downloaded into the section on the Integrations tab.
5. Go to the Configuration screen and secure the server. For more information, see [Securing a REST-based integration in IBM App Connect](#).
6. Provide the server details such as name, version, and correct license to use.
7. Click Create when you are ready to deploy.

Configuring Maximo Application Suite for a new organization

Configure your instance of Maximo® Application Suite to receive records from TRIRIGA® Application Suite.

Encrypted communication must be enabled by importing the App Connect certificate to Maximo Application Suite. For more information, see [Adding certificate for 8.9+](#) or [7.6.1.2+](#).

- [Creating the TRIRIGA organization](#)
You must create a new organization in Maximo Application Suite for TRIRIGA Application Suite.
- [Creating a clearing account in the chart of accounts](#)
You must create a clearing account in chart of accounts for the TRIRIGA organization.
- [Creating the TRIMAIN site](#)
You must create a main site for TRIRIGA Application Suite.
- [Generating API keys](#)
You must generate an API key for the MXINTADM user and securely store it for later use in the integrated system. By using this API key, the integrated system can access data from Maximo Application Suite.
- [Creating integration controls](#)
Integration controls map fields between Maximo Application Suite and TRIRIGA Application Suite. These integration controls help translate specific external values into values Maximo understands.
- [Enabling object structure security](#)
Procedure to enable object structure security so that user can transact against the specific object structure.
- [Setting definitions in Application Designer](#)
Setting the definitions for objects to be used in the integration. Based on the set definition, each object shares the data between integrated systems.

Creating the TRIRIGA organization

You must create a new organization in Maximo® Application Suite for TRIRIGA® Application Suite.

Procedure

1. In Maximo Manage, from the side navigation menu, click Administration > Organizations and then from the Common Actions menu, click New Organization.
2. In the Organization field, enter `TRIRIGA` and provide a description, such as `TRIRIGA Organization`.
3. Enter the following values in the fields.

Table 1. Adding values for an organization

Field Name	Value
Base Currency 1	USD
Item Set	SET1
Company Set	COMPSET1
Default Item Status	PENDING
Default Stock Category	STK

- In the Common Actions menu, click Save Organization.
Note: Set the organization to Active after creating a clearing account in next topic.
- To activate the organization, set Active to on.

Creating a clearing account in the chart of accounts

You must create a clearing account in chart of accounts for the TRIRIGA® organization.

Procedure

- In Maximo® Manage, from the side navigation menu, click Financial > Chart of Accounts and in the Organizations table, click the TRIRIGA organization.
- From the More Actions, click GL Component Maintenance.
- Add a row with the following values.

Table 1. GL component details

Field Name	Value
GL Component Value	1001
Description	Testing
Active	Yes

Note: Activate the organization created in the previous topic.

Creating the TRIMAIN site

You must create a main site for TRIRIGA® Application Suite.

Procedure

- In Maximo® Manage, from the side navigation menu, click Administration > Organizations and open the TRIRIGA organization.
- On the Sites tab, click the New Row icon.
- In the Site field, enter TRIMAIN and in the Description field, enter MAIN Site.
- Set the site to Active.
- Save the organization.

Generating API keys

You must generate an API key for the MXINTADM user and securely store it for later use in the integrated system. By using this API key, the integrated system can access data from Maximo® Application Suite.

About this task

By using an API key, the external system can access and interact with data in the Maximo Manage system. For more information, see [API keys application](#). Opening the page for creating an API key in Maximo Asset Management and Maximo Application Suite differs slightly.

Procedure

1.

For Maximo Application Suite	For Maximo Asset Management 7.6.1.2 and later
From the side panel, go to Integration > API Keys and then click Add API key.	Go to Administration > Administration > Integration > API Keys and then click Add API key.

- In the User field, click the search icon and then search MXINTADM user.
- In the User column, select the MXINTADM user and then click OK.
- Click Create to generate an API key.
- On the MXINTADM tile, click Copy key and securely store the API key for later use.

Creating integration controls

Integration controls map fields between Maximo® Application Suite and TRIRIGA® Application Suite. These integration controls help translate specific external values into values Maximo understands.

Procedure

1. In Maximo Manage, from the side navigation menu, click Integration > Enterprise Services and then click Create Integration Controls.
2. Click Add New Control > Add New XRef Control. Refer to the following table to create five cross-reference integration controls.

Table 1. Adding integration controls and their values

Integration Control	Maximo value	External value	Description	Domain
PLUSILOCSTATUS	ACTIVE	ACTIVE	TRIRIGA Location Status mapping for inbound flows.	LOCASSETSTATUS
	INACTIVE	REVIEW IN PROGRESS		
	OPERATING	OPERATING		
PLUSIORG	TRIMAIN	IBM®	Organization mapping for Tririga	
	TRIRIGA	TRIRIGA		
PLUSIORGEN	TRIRIGA	EAGLENA	Tririga Organization mapping for Inbound flow	
	TRIRIGA	IBM		
	TRIRIGA	MAXIMO ORG		
	TRIRIGA	TRIRIGA		
PLUSIPRIORITY	1	High	Priority mapping for Tririga	
	2	Medium		
	3	Low		
PLUSISITEEN	TRIMAIN	BEDFORD	Tririga Location mapping for inbound flows	
	TRIMAIN	SPACE 01		
	TRIMAIN	TRIMAIN		

3. Go to the Integration > Enterprise Services and then click New Enterprise Service. Create enterprise services as given in the following table.

Table 2. Associate enterprise service with integration controls.

Enterprise Service	Control
PLUSIASSET	PLUSIORGEN
	PLUSIPRIORITY
	PLUSISITEEN
PLUSILOCATION	PLUSILOCSTATUS
	PLUSISITEEN
	PLUSISTATUS
PLUSIPERSON	PLUSIORGEN
	PLUSISITEEN
PLUSIWO	PLUSIWOPRIORITY

4. Go to the Integration > Publish Channels and then click New Publish Channel. Create publish channels as given in the following table.

Table 3. Associate publishing channels with integration controls.

Publish Channel	Control
PLUSIASSET	PLUSIPRIORITY
PLUSILOCATION	
PLUSIPERSON	PLUSIORG
PLUSISR	
PLUSIWO	PLUSIWOPRIORITY
	PLUSIWOSTART

5. To verify the integration controls, go to the PLUSITRIRIGA External System.
 - a. From the side navigation menu, click Integration > External Systems.
 - b. In the System field, enter PLUSITRIRIGA and then click the PLUSITRIRIGA external system.
 - c. From the More Actions menu, click Setup Integration Controls.
 - d. Ensure that all five integration controls are listed.

Enabling object structure security

Procedure to enable object structure security so that user can transact against the specific object structure.

Procedure

1. In Maximo® Manage, from the side navigation menu, click Integration > Object Structures and search for `MXPERSON` and then select the `MXPERSON` object structure.
2. From the More Actions menu, click Configure Object Structure Storage and enable Use Object Structure for Authorization Name. Repeat these steps for the following objects.
 - `MXASSET`
 - `MXOPERLOC`
 - `MXSR`
 - `MXWO`
 - `MXDOMAIN`
3. From the side navigation menu, select Security > Security Groups and select your security group.
4. On the Object Structures tab, filter for `MXPERSON`.
5. Click Grant Listed Options for This Object Structure and then save the group.

Note: Repeat this procedure for all other changed structures.

Setting definitions in Application Designer

Setting the definitions for objects to be used in the integration. Based on the set definition, each object shares the data between integrated systems.

About this task

To add fields in the user interface to support the connector, you set definitions for the following objects in the Application Designer.

- Person
- Asset
- Location
- Service Request
- Work Order

Procedure

1. In the Maximo® Manage, from the side navigation menu, click System Configuration > Platform Configuration > Application Designer.
2. Add attributes for the person object.
 - a. In the Application field, search for `PERSON` and then click the `PERSON` to open it.
 - b. On the Workspace page, on the Person tab, select the section where you want to add the three text fields.
 - c. From the Common Actions menu, click Control Palette and add a multipart textbox.
 - d. Right-click on the multipart text box, select Properties, and add the values from the following table and then click Save Definition.

Note: Ensure that the Attributes are taken from the `PERSON` object.

Table 1. Adding attributes for the PERSON object

Type of Control	Label	Attribute	Attribute for Part 2 for multipart textbox	Lookup	Input Mode for Part 2 for multipart textbox
Multipart Textbox	TRIRIGA Location Path	PLUSIPRIMARYLOCPATH	PLUSILOCATIONPATH.DESCRPTION	VALUelist	Read only
Multipart Textbox	TRIRIGA Primary Organization	PLUSIORGPATH	PLUSIORGANIZATIONPATH.DESCRPTION	VALUelist	Read only
Textbox	TRIRIGA Record ID	EXTERNALREFID (From the Person Object)			

3. Add attributes for the asset object.
 - a. In the Application field, search for `ASSET` and then click the `ASSET` to open it.
 - b. Follow the same procedure as followed for the `PERSON` object.

Note: Ensure that the Attributes are taken from the `ASSET` object.

Table 2. Adding attributes for the ASSET object.

Type of Control	Label	Attribute	Attribute for Part 2 for multipart textbox	Lookup	Input Mode for Part 2 (For Multipart Textbox)
Multipart Textbox	TRIRIGA Building Equipment Spec	PLUSIASSETSPECNAME	PLUSIASSETSPECCLASS.DESCRPTION	VALUelist	Read only
Multipart Textbox	TRIRIGA Primary Organization	PLUSIORGPATH	PLUSIORGANIZATIONPATH.DESCRPTION	VALUelist	Read only
Multipart Textbox	TRIRIGA Location Path	PLUSILOCPATH	PLUSILOCATIONPATH.DESCRPTION	VALUelist	Read only
Textbox	TRIRIGA Record ID	EXTERNALREFID (From the Asset Object)			

4. Add attributes for the location object.
 - a. In the Application field, search for `LOCATION` and then click the `LOCATION` to open it.
 - b. Follow the same procedure as followed for the `PERSON` object.

Note: Ensure that the Attributes are taken from the `LOCATION` object.

Table 3. Adding attributes for the LOCATION object.

Type of Control	Label	Attribute	Attribute for Part 2 for multipart textbox	Lookup	Input Mode for Part 2 for multipart textbox
Multipart Textbox	TRIRIGA Space Classification	PLUSISPACECLASSIFICATION	PLUSISPCCLASSIFICATION.DESCRPTION	VALUelist	Read only

Type of Control	Label	Attribute	Attribute for Part 2 for multipart textbox	Lookup	Input Mode for Part 2 for multipart textbox
Multipart Textbox	TRIRIGA Parent Location	PLUSIPARENTLOCATION	PLUSIPARENTPATH.DESCRPTION	VALUELIST	Read only
Textbox	TRIRIGA Record ID	EXTERNALREFID (From the Location Object)			

5. Add attributes for the location object.

- In the Application field, search for SR and then click to open it.
- Follow the same procedure as followed for the PERSON object.

Note: Ensure that the PLUSIREQCLASSID attribute is taken from the TICKET object.

Table 4. Adding attributes for the Service Request object.

Field Name	Value
Attribute	PLUSIREQCLASSID
Attribute for Part 2	PLUSIREQCLASS.DESCRPTION
Lookup	VALUELIST
Input Mode for Part 2	Readonly

6. Add attributes for the location object.

- In the Application field, search for WOTRACK and then click to open it.
- Follow the same procedure as followed for the PERSON object.

Note: Ensure that the PLUSIREQCLASSID attribute is taken from the WORKORDER object.

Table 5. Adding attributes for the Work Order object.

Type of Control	Label	Attribute	Attribute for Part 2 for multipart textbox	Lookup	Input Mode for Part 2 for multipart textbox
Multipart Textbox	Tririga Location Path	PLUSILOCPATH	PLUSILOCPATH.DESCRPTION	VALUELIST	Read only
Multipart Textbox	Tririga Primary Organization	PLUSIORGPATH	PLUSIORGANIZATIONPATH.DESCRPTION	VALUELIST	Read only
Textbox	External Ref ID	EXTERNALREFID (From the WorkOrder Object)			

Testing the configuration

You can test that the configuration is complete by sending a test payload.

Procedure

- In Maximo® Application Suite, go to the Integration > End Points.
- In the End Point, search the endpoint to test and then click Test begin the test.
- In the Test data section, send a test payload that is a valid object, such as {"Hello": "World"}.
- Click Test, if the response is anything other than Bad Request, troubleshoot the issue. For more information, see [Troubleshooting connection errors](#).
- In TRIRIGA® Application Suite, use a tool such as Postman to test the connectivity of the App Connect flow. You can use a sample JSON payload from the [TRIRIGA APIs repository](#).

Troubleshooting connection errors

Depending on the direction of the flow, cross-referencing errors from two systems can help identify the root cause of an issue with the integration.

For example, if you face a Not Found error in Maximo® Application Suite in Message Reprocessing while you run the flow, double-check the logs in App Connect to see whether there is a corresponding error. If a corresponding error exists, the root cause might be related to what is sent out of Maximo Application Suite. If no, then the message never left Maximo Application Suite, and you must check the flow to ensure that it is running as expected.

Find logs in App Connect

- In App Connect SaaS and AWS, click the clipboard icon on the side panel to view the logs.
- In App Connect Enterprise, the logs are found in the Integration Server pod. If running from App Connect Designer, this integration server is found in the App Connect namespace in Red Hat® OpenShift®. Typically the Designer integration server has four pods and the logs can be found in the pod with a similar naming convention to des-01-quickstart-ma-designer-designer-flows.

Common errors from Maximo Application Suite

Note: At the time of testing the endpoints, ensure that they are entered correctly in End Points.

Table 1. Troubleshooting common errors from Maximo Application Suite

Error	Cause	Resolution
Response code received from the HTTP request from the endpoint is not successful	Invalid URL in the integration object.	Double check that all of the components are entered correctly in the URL. Make sure that no accidental spaces are added at the beginning or the end.

Error	Cause	Resolution
404: Not Found	The flow is not running.	Make sure that the flow is running before the cron tasks are started.
PKSync error	Certificate error.	Confirm that the certificate is configured correctly.

Message Reprocessing

Errors in Maximo Application Suite can be found in Message Reprocessing in Maximo Manage.

Table 2. Troubleshooting common errors from message reprocessing

Error	Cause	Resolution
Bad Request error	Either an incorrect payload is being sent out or the account configurations are wrong.	Double check to make sure the accounts from the App Connect prerequisite section are correct and that the item in Maximo Application Suite has all of the mapped fields.

Common errors from TRIRIGA Application Suite

Table 3. Troubleshooting common errors from TRIRIGA Application Suite

Error	Cause	Resolution
404 - Not Found: Cannot POST	Invalid URL in the integration object.	Double-check that all of the components are entered correctly in the URL for the specific integration object.
404 - API doesn't exist	The flow is not running.	Double-check that the flow is Active in App Connect.
404 - The HTTP request returned with an error 404 "Not Found"	Incorrect App Connect connector configuration.	Double-check that the credentials that are used in the HTTP post node in App Connect are correct.

Note: If the integrations do not work as intended, in the Admin Console in TRIRIGA Application Suite, clear the OSLC cache.

Integration reference information

Reference information includes a guide to the XML structures and schemas used by the integration framework, the system properties you can set, and predefined collaboration switches provided with applications.

- [System properties for integration](#)
System properties define the behavior and characteristics of the integration framework. To review or change integration framework properties, filter for the properties in the System Properties application.
- [Integration XML](#)
Most integration XML messages are based on an object structure and an operation that a channel or service performs. Standard services, however, do not support object structures and predefined XML schemas are used to construct these XML messages.
- [Collaboration switches](#)
Collaboration switches use a concept of ownership to help users manage the synchronization of inbound data between the integration framework and an external system. The switches provide the ability to control specific subprocesses within an application, based on the ownership of different data objects within a transaction.

System properties for integration

System properties define the behavior and characteristics of the integration framework. To review or change integration framework properties, filter for the properties in the System Properties application.

General integration properties

To see a list of general integration properties, specify `mxe.int` as a filter term in the System Properties application. For Boolean properties (true/false), a value of 0 means false, and a value of 1 means true.

Table 1. General integration properties

Property	Description	Default value
<code>mxe.int.allowdefaultlogin</code>	Controls default login for MIF. When set to 0 (false), default login is prevented. This property overrides the ALLOWDFLTLOGIN setting for the default integration user in the <code>ejb-jar.xml</code> file.	0
<code>mxe.int.containerdeploy</code>	Deploy web services to the application server container. When set to 0 (false), web services are deployed to the product container.	0
<code>mxe.int.credentialmapperclassname</code>	Credential mapper classname is a class file that can be used for mapping credential information when an integration module is implemented.	No default value
<code>mxe.int.generateboolean</code>	Generate Boolean as schema Boolean.	1
<code>mxe.int.globaldir</code>	Specifies the location of a global directory which stores files that are related to integration	No default value
<code>mxe.int.queueusercachesize</code>	Number of users that are cached for inbound queue messages.	10

Property	Description	Default value
mxe.int.resolveschema	Resolves all schema includes to contain inline schema definition.	1
mxe.int.servicedeployer	Web services deployer class is a custom Java™ class for web service deployment when the default deployer class is not used.	No default value
mxe.int.uddiinqurl	Represents the integration UDDI registry inquiry URL.	No default value
mxe.int.uddiname	Represents the integration UDDI registry user ID.	No default value
mxe.int.uddipassword	Integration UDDI registry password.	No default value
mxe.int.uddipuburl	Integration UDDI registry publish URL.	No default value
mxe.int.validateupdates	Validates the database updates completed by integration. When set to 1 (true), the deletion of business objects, attributes, indexes, and relationships by a user through the Database configuration application are validated against integration content. The validation ensures that the data that is deleted is not referenced by an integration component. If a reference exists, the user is not able to complete the delete action.	1
mxe.int.validatepackage	Validates the Migration Manager database updates by integration.	0
mxe.int.verifywebappurl	Verifies web application URL when schema files are generating.	1
mxe.int.webappurl	Represents the integration web application URL. Configure this property to contain the correct host name and port number.	http://localhost/meaweb
mxe.int.wsdcurrentschema	Shows the current schema definition in WSDL.	1
mxe.int.wsdinclude schema	Includes the schema directly in the WSDL.	1
mxe.int.wsdnamespace	Represents the integration WSDL namespace.	http://www.ibm.com/maximo/wsd
mxe.int.xmlnamespace	Represents the integration XML namespace.	http://www.ibm.com/maximo
mxe.int.binarytext	Converts a text value to base 64 encoded value.	0
mxe.int.defaultaction	The default action for flat file import.	AddChange
mxe.int.defaultoperation	The default operation for the application export.	Sync
mxe.int.defaultuser	Represents the Integration default login user.	mxintadm
mxe.int.doclink.maxfilesize	Represents the maximum file size (MB) for attachments that are included as part of an integration message.	10
mxe.int.enabledatemillis	Enables the dates with milliseconds part.	0
mxe.int.expupdatetender	Updates the SENDERSYSID field on the primary object during data export.	0
mxe.int.extractretrycount	The File Extract Retry Count is the number of times an error message is retried during data import when using file-based error management.	0
mxe.int.flatfiledelimiter	Integration flat file text delimiter is the default delimiter value that is used for application import enablement and for data import.	,
mxe.int.flatfilenewline	Retains new line character in flat files. For fields, such as descriptions, that can contain new line characters, the characters are retained in the integration messages when the property value is 1 (true).	0
mxe.int.interactiveimport	Performs the application import as interactive.	0
mxe.int.keyresponse	Provides response content for inbound integration messages for all operations. When set to 1 (true), response content, that includes the primary object key values, is provided for all service operations. When set to 0 (false), response content is provided for Query and Create operations only.	1
mxe.int.maxextractdocs	Represents the number of error documents that are written to each temporary file when an extract file is building .	1000
mxe.int.mdbdelay	Represents the wait time in milliseconds before a message from the error queue is processed.	-1
mxe.int.propagatouser	Propagate authenticated user through the inbound queue. When set to 1 (true), the user of the integration message is saved with the queue message and used during the processing of the message because it is processed from the queue to the business objects.	0
mxe.int.savemessage	Indicates the save JMS message.	0
mxe.int.setglobalns	Controls the truncation of characters that are sent to interface tables.	0
mxe.int.textqualifier	The flat file text qualifier is the default text qualifier value in application import enablement and in data import.	"
mxe.int.updatecfromglcomp	Updates the Chart of Accounts that contain an identified component. When set to 1 (true), processing of inbound GL component data initiates related updates to any chart of account data that references the GL component.	1

Property	Description	Default value
mx.int.usescientific	Uses scientific notation for double values.	1
mx.int.validatexmltext	Validates XML element value for invalid XML characters. When set to 1 (true), an outbound message is validated to ensure that all data in the message uses valid XML characters. If messages contains invalid characters, the operation stops and no outbound message is delivered.	0
mx.int.whereclausepolicy	Sets the where-clause policy for an integration query.	parse
mx.int.adminfromemail	The email address FROM integration administration, which is used as the From email address when integration initiates an email. Must be a valid email address format, such as from@example.com.	No default value
mx.int.admintoemail	The email address TO integration administration, which is used as the To email address when integration initiates an email. Must be a valid email address format, such as to@example.com. You can provide more than one email address in a comma-separated list.	No default value
mx.int.usedbinforfacetb	Sets the processing for interface tables. When set to 1, the interface process refers to the existing table to determine what to insert into the table rather than the object structure definition.	0
mx.int.enableosauth	Enables the authorization configuration of object structures.	1

REST integration properties

To see a list of REST API integration properties, specify `mx.rest` as a filter term in the System Properties application. For Boolean properties (true/false), a value of 0 means false, and a value of 1 means true.

Table 2. REST API integration properties

Property	Description	Default value
mx.rest.format.json.mimetypes	The REST supported mime types for JSON.	application/json
mx.rest.format.xml.mimetypes	The REST supported mime types for XML.	application/xml,text/xml
mx.int.allowrestnpsort	Allow sorting with nonpersistent attributes in REST API.	0
mx.int.disableglvalidation	Disable GL account validation when creating an organization.	0
mx.int.groupname	The default integration group name.	INTADMIN
mx.rest.handler.mbo	The REST MBO resource handler.	com.ibm.tivoli.maximo.rest.MboResourceRequestHandler
mx.rest.handler.os	The REST object structure resource handler.	com.ibm.tivoli.maximo.rest.OSResourceRequestHandler
mx.rest.handler.ss	The REST standard service resource handler.	com.ibm.tivoli.maximo.rest.MaxServiceResourceRequestHandler
mx.rest.serializer.mbo.imglib.image	The REST serializer for the imagelib MBO for image format.	com.ibm.tivoli.maximo.rest.ImageLibSerializer
mx.rest.serializer.mbo.json	The REST serializer for MBO for JSON format.	com.ibm.tivoli.maximo.rest.MboJSONSerializer
mx.rest.serializer.mbo.xml	The REST serializer for MBO for XML format.	com.ibm.tivoli.maximo.rest.MboXMLSerializer
mx.rest.serializer.os.json	The REST serializer for object structures for JSON format.	com.ibm.tivoli.maximo.rest.OSJSONSerializer
mx.rest.serializer.os.xml	The REST serializer for object structures for XML formats.	com.ibm.tivoli.maximo.rest.OSXMLSerializer
mx.rest.serializer.ss.json	The REST serializer for standard services for JSON format.	com.ibm.tivoli.maximo.rest.ServiceMethodResponseJSONSerializer
mx.rest.serializer.ss.xml	The REST serializer for standard services for XML format.	com.ibm.tivoli.maximo.rest.ServiceMethodResponseXMLSerializer
mx.rest.webappurl	Token Authentication on Web Application URL.	No default value
mx.rest.mbo.blockaccess	Blocks access to the comma-separated list of MBOs.	No default value
mx.rest.mbo.defaultformat	The REST default format for all MBOs.	xml
mx.rest.mbo.imglib.defaultformat	The REST default format for the MBO imglib.	image
mx.rest.os.blockaccess	Blocks access to the separated list of object structures.	10
mx.rest.os.defaultformat	The REST default format for all object structures.	xml
mx.rest.ss.defaultformat	The REST default format for all standard service response	xml
mx.rest.supportedformats	The REST supported formats for a response.	xmljsonimage
mx.rest.whereclausepolicy	Sets the where clause policy for REST query.	parse

OSLC integration properties

To see a list of OSLC integration properties, specify `mx.oslc` as a filter term in the System Properties application. For Boolean properties (true/false), a value of 0 means false, and a value of 1 means true.

Table 3. OSLC integration properties

Property	Description	Default value
mx.oslc.dfttconsumerversion	The default OSLC version that the consumer uses.	2
mx.oslc.dfttversion	The default OSLC version for an OSLC provider.	2

Property	Description	Default value
mxo.oslc.enableprovider	Enables the OSLC provider.	1
mxo.oslc.idleexpiry	Indicates the idle expiry time.	300
mxo.oslc.webappurl	The provider's public URL.	http://localhost/maximo/oslc/
mxo.oslc.collectioncount	Adds the total count in the OSLC collection.	0
mxo.oslc.defaulttep	The default OSLC Endpoint.	OSLCDEFAULT
mxo.oslc.defaultformat	The default format for OSLC.	oslcjson
mxo.oslc.errorresponse	The OSLC Error Response Format.	1
mxo.oslc.addpodnameheader	Allow podname to be added to the response header	0
mxo.oslc.preferproviderdesc	Prefers OSLC provider description for resource registry reconciled URLs	false
mxo.oslc.preferpreview	Prefers small preview for OSLC consumer.	false
mxo.oslc.prettyjson	Pretty printed JSON.	0
mxo.oslc.prettyrdf	Pretty printed RDF.	0
mxo.oslc.prqueryep	The Provider Registry Query Endpoint.	PROVIDERREGISTRY
mxo.oslc.prcreateep	Represents the Provider Registry Create Endpoint.	No default value

Integration XML

Most integration XML messages are based on an object structure and an operation that a channel or service performs. Standard services, however, do not support object structures and predefined XML schemas are used to construct these XML messages.

- [XML message overview](#)
When you configure object structures, the integration framework specifies an appropriate XML schema that defines the content and structure of integration messages.
- [XML structure](#)
A typical integration XML message has a root element, an object structure element, and elements for the objects that are defined for the object structure. Object elements contain elements for object fields and elements can contain one or more attributes. Attribute names and values are case-sensitive.
- [Integration XML schemas](#)
XML schemas for channels and services, excluding standard services, are based on the configuration of the objects that are included in the object structure. You can generate schemas in the integration applications.

XML message overview

When you configure object structures, the integration framework specifies an appropriate XML schema that defines the content and structure of integration messages.

Message content

The following channels and services can be used for XML messages based on an object structure:

- Invocation channel
- Publish channel
- Enterprise service
- Object structure service

The following operations are supported:

- Create
- Delete
- Invoke
- Publish
- Query
- Sync
- Update

Operation values are case-sensitive.

Message structure overview

The standard format for an integration XML message begins with a root element that contains an object structure element. The object structure element contains elements for the primary object and its fields and for any child objects that are defined for the object structure. The following example is based on the PERSON object structure, where the primary object and its fields precede child objects and their fields.

```
<?xml version="1.0" encoding="UTF-8"?>
<max:SyncMXPERSOSet xmlns:max="http://www.ibm.com/maximo"> (Root element)
  <max:MXPERSOSet> (Sets the object structure element)
    <max:PERSON> (Object element for primary object)
      <max:PERSONID>Value</max:PERSONID> (Object field element)
      <max:EMPLOYEETYPE>Value</max:EMPLOYEETYPE> (Object field element)
    
```

```

    <max:PHONE> (Child object element)
      <max:PHONENUM>Value</max:PHONENUM> (Child object field element)
      <max:TYPE>Value</max:TYPE> (Child object field element)
    </max:PHONE>
    <max:EMAIL> (Child object element)
      <max:EMAILADDRESS>New value to update</max:EMAILADDRESS>
      <max:TYPE>Value</max:TYPE> (Child object field element)
    </max:EMAIL>
  </max:PERSON>
</max:MXPERSONSet>
</max:SyncMXPERSON>

```

The name of the root element is a concatenation of the operation specified for the channel or service and the name of the object structure. In this example, the **SyncMXPERSON** root element combines the Sync operation and the MXPERSON object structure.

Each element can contain one or more attributes. In this example XML message, the root element includes the namespace attribute.

Schema generation

To generate the schema and view the generated XML, filter for a specific record and select the Generate Schema/View XML action in any of the following applications:

- Enterprise Services
- Invocation Channels
- Object Structures
- Publish Channels
- Web Services Library

XML structure

A typical integration XML message has a root element, an object structure element, and elements for the objects that are defined for the object structure. Object elements contain elements for object fields and elements can contain one or more attributes. Attribute names and values are case-sensitive.

- **Root element and attributes**
The root element of an XML message is based on an object structure and an operation specified for the channel or service used for the communication. The root element can contain one or more attributes.
- **Object structure element**
The object structure element contains an element for the primary object and elements for any child objects defined for the object structure. This element can support multiple occurrences of the primary object and its child objects.
- **Object elements and attributes**
An object element contains elements for the object fields. Each object element can contain one or more attributes.
- **Object field elements and attributes**
If the same field is included in the key for both a parent object and a child object in an object structure, the field is contained in the parent object only. Each object field can include one or more attributes.

Root element and attributes

The root element of an XML message is based on an object structure and an operation specified for the channel or service used for the communication. The root element can contain one or more attributes.

The following table shows the attributes that can apply to root elements. Attribute names and values are case-sensitive. All attributes are optional.

Attribute	Description	Type	Applicable to
baseLanguage	The base language in which the content values are supplied.	string	All input and output operations
creationDate Time	Date and time when the content is generated.	dateTime	All input and output operations
maximoVersion	The major version, minor version, build, and database build that is generated for all published XML.	MaximoVersionType	All input and output operations
messageID	Unique identifier generated for all messages.	string	All input and output operations
transLanguage	The language in which the values for multilanguage-enabled fields are supplied.	string	All input and output operations

Attribute	Description	Type	Applicable to
event	The origin of an outbound XML message. Valid values are: <ul style="list-style-type: none"> 0 (false), indicates that the message is generated by the data export feature. 1 (true), indicates that the message is generated by an outbound integration event listener (that is, data entry in an application). 	eventType	All output operations
uniqueResult	Specifies whether a query expects one record or multiple records in a response. If the value is 0, or the attribute is not specified, the query can return multiple records. If the value is 1, the query can return a single record only and, otherwise, an error occurs.	Boolean	Queries (input)
maxItems	If a query can return multiple records, this attribute limits the number of records to be returned at one time. If this attribute is not specified, the response contains the entire result set.	positiveInteger	Queries (input)
rsStart	Specifies the first record to return in the response. If not specified, the response starts with the first record in the result set. If the number of results in the result set is lower than the rsStart value, the response returns no records. If a maxItems value is specified, the response returns the specified number of records, starting with rsStart value, if one is set. For example, if maxItems =10 and rsStart is not specified, the response returns results 1 through 10. To receive results 11 through 20, resend the query with rsStart =11.	integer	Queries (input)
rsStart	This value matches the rsStart value in the corresponding query. If the query contains a maxItems value, the rsStart value in requests for additional records is rsStart + rsCount + 1. If this attribute is not specified, the response starts with the first record in the result set and includes the number of records specified by the rsCount attribute.	integer	Responses (output)
rsCount	The number of records returned in a message. If the original query specifies a maxItems value, the rsStart value for the subsequent request for additional records is rsStart + rsCount + 1.	integer	Responses (output)
rsTotal	The total number of records in the result set. If the query does not specify a maxItems value, the rsTotal value is the same as the rsCount value.	integer	Responses (output)

Object structure element

The object structure element contains an element for the primary object and elements for any child objects defined for the object structure. This element can support multiple occurrences of the primary object and its child objects.

The primary object element contains elements for each object field. Child object elements, containing elements for their object fields, are listed after the primary object.

Object elements and attributes

An object element contains elements for the object fields. Each object element can contain one or more attributes.

The following table lists the attributes that can apply to an object element. Attribute names and values are case-sensitive. All attributes are optional.

Attribute	Description	Type	Applicable to
action	This value is derived from the action attribute of the primary object within the message. For outbound messages, this attribute is for informational purposes only. For inbound messages, the processing logic uses this value only for the Sync operation. For other operations, this value is ignored.	ProcessingActionType	All input and output operations
relationship	Identifies the relationship that the system uses to retrieve the object using the parent object.	string	All input and output operations
deleteForInsert	Identifies a child object that must be deleted before reinserting. This attribute applies only to inbound messages where the operation is Sync and the action is Change.	string	All input and output operations

Object field elements and attributes

If the same field is included in the key for both a parent object and a child object in an object structure, the field is contained in the parent object only. Each object field can include one or more attributes.

- **Changed field attribute**
A Boolean value can be set to 1 (True) in outbound XML messages to indicate that the value in the field is changed. The changed attribute is not set in XML generated by the data export feature.

- **General ledger field attribute**
The glorder attribute is set in the GLCOMP elements in fields that identify general ledger (GL) accounts, such as a GLDEBITACCT field. Each GLCOMP element contains part of the account number and the glorder attribute identifies how to combine these elements to construct the GL value.
- **Translatable field attribute**
The langenabled attribute is set to 1 (true) on every field that can be translated in outbound XML messages.
- **Synonym field attribute**
For outbound messages, fields that are associated with a synonym-type domain specify the corresponding internal value using the maxvalue attribute. This value is available for customization or exit processing as required. The attribute is informational only, and is not used for inbound message processing.
- **Encrypted field attribute**
When the data in a field, such as a password field, is encrypted, the Boolean attribute, maxencrypted, is set to 1 (true). External systems use this value to determine whether to apply a decryption process to the information in the field.
- **Action attributes**
An action attribute is an optional attribute that specifies to the receiving system the type of processing to perform on an XML message. Action attributes apply to inbound XML messages that synchronize data, using the Sync operation, and to outbound XML messages that use publish channels.
- **Field value types**
The integration framework specifies the processing behavior for the different data types used to format field values.

Changed field attribute

A Boolean value can be set to 1 (True) in outbound XML messages to indicate that the value in the field is changed. The changed attribute is not set in XML generated by the data export feature.

The changed attribute is set in outbound XML messages only when the transaction satisfies all of the following conditions:

- An outbound, event-based transaction creates the message.
- The Change action attribute or the Replace action attribute is set on the primary object.
- The sending object structure has the same parent-child object relationship as the receiving application.

In the following example, the Replace action attribute is set for the parent object and the changed attribute is set to 1 for the ADDRESSLINE1 field.

```
<MXPERSON>
  <PERSON action="Replace">
    <PERSONID>123</PERSONID>
    <ADDRESSLINE1 changed="1" >1 Main Street</ADDRESSLINE1>
  </PERSON>
</MXPERSON>
```

For general ledger (GL) type fields, the changed attribute is always set on the name element, which is GLDEBITACCT in the following example:

```
<GLDEBITACCT changed="1">
  <VALUE>6600-800-SAF</VALUE>
  <GLCOMP glorder="0">6600</GLCOMP>
  <GLCOMP glorder="1">800</GLCOMP>
  <GLCOMP glorder="2">SAF</GLCOMP>
</GLDEBITACCT>
```

General ledger field attribute

The glorder attribute is set in the GLCOMP elements in fields that identify general ledger (GL) accounts, such as a GLDEBITACCT field. Each GLCOMP element contains part of the account number and the glorder attribute identifies how to combine these elements to construct the GL value.

In outbound XML messages, the value of a general ledger type field, including delimiters, is set in the VALUE child element within the field. The components of the value, based on the database definition of the components, are included in GLCOMP elements. The glorder attribute in each GLCOMP element identifies the order of the component, starting from 0 (zero), to a maximum of 20. In the following example, the account number has three GL components

```
<GLDEBITACCT>
  <VALUE>6600-800-SAF</VALUE>
  <GLCOMP glorder="0">6600</GLCOMP>
  <GLCOMP glorder="1">800</GLCOMP>
  <GLCOMP glorder="2">SAF</GLCOMP>
</GLDEBITACCT>
```

Inbound XML messages can set a GL account number in the VALUE element or in GLCOMP elements with associated glorder attributes. If the message includes GLCOMP elements, the account number is recreated based on the delimiters defined in the GLCONFIGURE table. If both VALUE and GLCOMP elements are included in the message, the VALUE element is used and the GLCOMP elements are ignored.

Translatable field attribute

The langenabled attribute is set to 1 (true) on every field that can be translated in outbound XML messages.

Synonym field attribute

For outbound messages, fields that are associated with a synonym-type domain specify the corresponding internal value using the maxvalue attribute. This value is available for customization or exit processing as required. The attribute is informational only, and is not used for inbound message processing.

In the following example, a maxvalue of NOLOT is set for the LOTTYPE field.

```
<MXITEM>
<ITEM>
<ITEMNUM>560-00</ITEMNUM>
<DESCRIPTION>Tubing, Copper-1 In ID X .030 In Wall Test
</DESCRIPTION>
<LOTTYPE maxvalue="NOLOT">NOLOT</LOTTYPE>
```

Encrypted field attribute

When the data in a field, such as a password field, is encrypted, the Boolean attribute, maxencrypted, is set to 1 (true). External systems use this value to determine whether to apply a decryption process to the information in the field.

The following example uses the MXPERSUSER object structure to provide user information, including a password, and the maxencrypted attribute is set on the PASSWORD field in the MAXUSER object.

```
<MXPERSUSER>
<PERSON action="Replace">
<PERSONID>123</PERSONID>
<MAXUSER>
<MAXUSERID>10</MAXUSERID>
<PASSWORD maxencrypted="1"> dmFzdG8=</PASSWORD>
<MAXUSER>
<PERSON>
<MXPERSUSER>
```

Action attributes

An action attribute is an optional attribute that specifies to the receiving system the type of processing to perform on an XML message. Action attributes apply to inbound XML messages that synchronize data, using the Sync operation, and to outbound XML messages that use publish channels.

The following description describes the processing for inbound messages using the Sync operation. The external system must evaluate the action code that is provided with outbound messages and determine the processing that is appropriate for that external application.

Action attributes can apply to the content of the parent object and child objects in an object structure. An action attribute applied to the parent object specifies the overall processing action for parent and child records. Applied to a child object, an action indicates processing that is specific to that record. An attribute provided for a child object is evaluated only when the primary object has an action value of Change. When the action for the primary object is not Change, actions on the child object are ignored.

Business rules take precedence over action attributes. If a business rule prohibits an action that is specified on an inbound XML message, an error occurs. For example, an inbound transaction that attempts to update a closed purchase order generates an error.

If an XML message contains multiple instances of an object structure, each instance of the object structure can specify a different action attribute. In the following example, the COMPANIES record has multiple child COMPCONTACT records, and each instance has its own action attribute.

```
<MXVENDOR>
<COMPANIES action="Change">
  <COMPANY>TEST4
    <NAME>test</NAME>
    <ADDRESS1>100 Main Str</ADDRESS1>
    <COMPCONTACT action="Add">
      <NAME>SMITH</NAME>
      <TITLE>MANAGER</TITLE>
    </COMPCONTACT>
    <COMPCONTACT action="Change">
      <NAME>JONES</NAME>
      <TITLE>ENGINEER</TITLE>
    </COMPCONTACT>
  </COMPANY>
</COMPANIES>
</MXVENDOR>
```

The action attribute can have the following values which are case-sensitive:

- Add
- Delete
- Change
- Replace
- AddChange
- Null

Value	Description
Add	Add records to the database in the receiving system.
Delete	Delete records from the database in the receiving system.
Change	Update existing records in the database in the receiving system.

Value	Description
Replace	Add records or replace records in the receiving system, depending on whether the primary record exists in the database.
AddChange	Add or update existing records in the database in the receiving system.
Null	Add records or replace records in the receiving system, depending on whether the primary record exists in the database.

Default action processing

When an inbound XML messages does not contain an action attribute, the message is processed as follows:

- If the primary record does not exist in the database, the Add action is applied.
- If the primary record exists in the database, the Replace action is applied.

For a message sourced from a flat file or an interface table, you can provide an action code for the primary object only. There is no support for providing action codes for child objects.

Add action

The Add action adds records to the database in the receiving system.

For inbound transactions, an error occurs if the data already exists. If the Add action is set on a parent object, the action extends to child objects and it is not necessary to specify the action at the child object level. Outbound transactions contain an Add action when the insert of an object generates the transaction.

Delete action

The Delete action deletes records from the database in the receiving system.

If the Delete action is set on a parent object, the action extends to child objects and it is not necessary to specify the action at the child object level.

If the Delete action is set on the parent object in an outbound XML message that does not include the child objects, the receiving system is responsible for identifying and deleting child objects.

If the Delete action is set on the parent object in an inbound XML message, the integration framework deletes the related child objects. If the parent object does not exist in the database, no error is reported to the sending system.

Change action

The Change action updates existing records in the database in the receiving system.

A Change action on the primary object in an XML message indicates that the message contains one or more parent or child records that are added, changed, or deleted. The message always contains the parent of any child record to be updated, even if the parent is unchanged.

The Change action on the primary object is the only case where you can supply an action for a child object. When the primary object in an XML message contains a Change action, each child object in the message can contain one of the following actions.

Action attribute of child object	Processing action
Add	Add the child record. If the child record already exists, an error is generated.
Delete	Delete the child record. If the child record does not exist, an error is generated.
Change	Update the child record. If the child record already exists, an error is generated.
Null or no action specified	If the child record exists, update it. If the child record does not exist, add it.

Replace action

The Replace action updates existing records in the database in the receiving system.

A Replace action on the primary object in an XML message indicates that the message contains a complete set of objects that represents the result of additions, changes, and deletions to the object structure. These objects replace the existing database records and any record that is not referenced in the XML message is deleted.

For outbound processing, the Replace action is always used, not the Change action.

For inbound processing, any existing child record that is not explicitly mentioned in the message is deleted. External systems must also delete any child records that are not included in the XML message.

The Replace action can apply only to the primary object in an XML message. If a child record in an inbound XML message contains a Replace action when the primary object contains a Change action, the message is not processed. If a child level record contains a Replace action when the parent contains any action other than Change, the action on the child record is ignored.

AddChange action

The AddChange action adds or updates existing records in the database in the receiving system. The AddChange action is like the Replace action except that the AddChange action does not apply to child objects.

An AddChange action on the primary object adds the primary record and all the sub-records that are specified in the message, if the primary record does not exist in the database. If the primary record does exist, it is updated and any child record that is included in the message. Existing child records that are not specified in the inbound message are not deleted.

The AddChange action is useful when an object structure includes elements that do not exist in the external system. For example, an external system can maintain vendor information but contact information is stored only in the database. An inbound message with a vendor record that has an action value of NULL deletes the contact information in the database. If the action is set to AddChange for this transaction, the vendor information is updated and the contact information remains the same.

Comparison of Change, Replace, and AddChange actions

The Change, Replace, and AddChange actions differ in the information that they include in the XML message and the processing that they require of the receiving system.

Action attribute combinations

The following table shows the combinations of action attributes you can include on primary and child records.

Child Record	Add	Delete	Change	Replace	AddChange	No Value	Remarks
Primary Record							
Add	N/A	N/A	N/A	N/A	N/A	N/A	All child values ignored
Delete	N/A	N/A	N/A	N/A	N/A	N/A	All child values ignored
Change	Yes	Yes	Yes	No	No	Yes (insert, update)	Replace and AddChange not allowed at child level
Replace	N/A	N/A	N/A	N/A	N/A	N/A	All child values ignored
AddChange	N/A	N/A	N/A	N/A	N/A	N/A	All child values ignored
No value	N/A	N/A	N/A	N/A	N/A	N/A	All child values ignored

Field value types

The integration framework specifies the processing behavior for the different data types used to format field values.

Boolean columns

In inbound transactions, an element that represents a Boolean field must contain a value of 0 (false) or 1 (true). If the element does not contain a 0 or a 1, an error is generated. If the XML does not include an element for a Boolean field, the corresponding database value is updated with the default value (0 or 1) that is defined for that column.

Encrypted fields

In inbound transactions, the attribute that represents the maxencrypted field must contain a value of 0 (false) or 1 (true). When the attribute value is 1, a decryption process is applied to the received data. When the attribute value is 0, the received data is not decrypted.

If the attribute does not contain a 0 or a 1, the received data is not decrypted. If the XML field does not include an element for an encrypted field, the received data is not decrypted.

Character encoding

The integration XML uses UTF-8 encoding. If an inbound transaction specifies any other encoding, the entire message must use that encoding. If an error is encountered during the processing of an inbound transaction that uses encoding other than UTF-8, the entire error XML that is written is encoded as UTF-8.

```
<?xml version="1.0" encoding="ISO-8859-2"?>
```

Date format

The integration XML supports the following ISO 8601 date format:

```
2011-04-06T10:11:58-05:00
```

Null columns

If an element in an inbound transaction contains no value, the corresponding database column is updated with a null value. If the XML does not include an element for a particular field, that field is not updated in the database.

For inbound data that is sourced from a flat file or an interface table, you can set a field to null by providing ~NULL~ for the field value in the flat file or interface table. Integration processing creates an empty tag in the corresponding XML message for any ~NULL~ values that are provided. This feature does not support numeric or date fields from an interface table source.

Number format

Regardless of the locale setting of the application server or the database, all decimal fields must use a period (.) as the decimal placeholder. Do not format numbers to the left of the placeholder. This format applies to inbound and outbound data.

\$1,738,593.64 must be in the following format: 1738593.64

Integration XML schemas

XML schemas for channels and services, excluding standard services, are based on the configuration of the objects that are included in the object structure. You can generate schemas in the integration applications.

- [XML schemas overview](#)
An integration framework schema includes a predefined schema component for metadata as well as schema components based on configured objects, object structures, and standard services
- [Schema structures](#)
Schema structures include the predefined Metadata schema component and components for objects, object structures, services and standard services, all of which are generated at the time of schema creation

XML schemas overview

An integration framework schema includes a predefined schema component for metadata as well as schema components based on configured objects, object structures, and standard services

Schemas can be generated to support XML-based integration scenarios where the following components are used:

- Object structure service
- Publish channel
- Invocation channel
- Enterprise service
- Standard service

Key fields

XML schema annotation identifies the key fields for a service or channel from the object structure definition and the data dictionary definitions for the corresponding object.

In the following example, the ITEMNUM element is identified as a key field in the schema for the MXITEM object structure.

```
<xsd:element name="ITEMNUM" minOccurs="0" type="MXString">  
  <xsd:annotation>  
    <xsd:documentation>ITEMNUM is a key field</xsd:documentation>  
  </xsd:annotation>  
</xsd:element>
```

XML validation

Inbound and outbound XML transactions are not validated against the corresponding XML schema. Integration business rules apply to inbound data regardless of schema validation. For object structures and enterprise services, the integration must comply with the schema format at the point where the message is processed by the object structure layer.

Namespace property

You can change the designation of the XML namespace by updating the `mxe.int.xmlnamespace` property in the System Properties application. The default namespace property value is `http://www.ibm.com/maximo`. If you change the namespace property, the MXMeta.xsd file is regenerated. This file contains the metadata schema information that is used to build all other schemas. The integration framework validates the namespace provided with inbound XML messages.

Schema generation

Whenever you change an object structure or the data dictionary, you must regenerate the affected schemas. You must also regenerate the schemas after the following changes:

- Making a database field required or optional
- Changing the data type of a database field
- Adding or removing fields from an object structure
- Changing the structure of an object structure

Schemas are automatically generated when you deploy a web service.

You can manually generate schemas by selecting a record and selecting the Generate Schema/View XML action in the following applications:

- Enterprise Services
- Invocation Channels
- Object Structures
- Publish Channels
- Web Services Library

To access a generated schema, you can use a URL.

Object structure and enterprise service schemas

Use a URL that is similar to the following example in which MXSR is the object structure name that is associated with the service:

```
http://localhost:port/meaweb/schema/service/MXSR
```

For compatibility with version 7.5, URLs that are similar to the following example are still supported:

```
http://localhost:port/meaweb/schema/service/MXSRService.xsd
```

Standard service schemas

Use a URL that is similar to the following example in which ITEM is the name of the service.

```
http://localhost:port/meaweb/schema/service/ss/ITEM
```

For compatibility with version 7.5, URLs that are similar to the following example are still supported:

```
http://localhost:port/meaweb/schema/service/ss/ITEMService.xsd
```

Schema structures

Schema structures include the predefined Metadata schema component and components for objects, object structures, services and standard services, all of which are generated at the time of schema creation

- [Metadata schema](#)
The MXMeta.xsd file contains the metadata information that is used to build all other schemas. Do not modify the MXMeta.xsd file because changes can result in incorrect schemas and issues with web services. The system regenerates this schema when someone changes the Namespace property.
- [Object structure schemas](#)
Object structure schemas define the content of an object structure. Each object structure has its own schema that includes all of the persistent and nonpersistent fields that are defined for each object in the structure. Object structure schemas are used to define input and output types and are not used directly as input or output for any service.
- [Object schemas](#)
Object schemas define the content of objects. Each object has a distinct schema, which includes all the persistent fields for a persistent object and all nonpersistent fields defined for a nonpersistent object. Object schemas are used to define input and output types and are not used directly as input or output for any service.
- [Multi-noun messages](#)
An XML message can contain multiple nouns.
- [Service level schemas](#)
Service level schemas apply to object structure services, enterprise services, and standard services. One schema describes enterprise services and object structure services. A different schema describes standard services.

Metadata schema

The MXMeta.xsd file contains the metadata information that is used to build all other schemas. Do not modify the MXMeta.xsd file because changes can result in incorrect schemas and issues with web services. The system regenerates this schema when someone changes the Namespace property.

In addition to data content, the metadata schema file includes the following additional information about messages:

- Attribute groups
- Content types
- Query data types
- Supporting data types

Attribute groups

The following table lists attributes by group.

Group	Attributes	Applies to
CommonContentGroup	<ul style="list-style-type: none">• baseLanguage• creationDateTime• maxImVersion• messageID• transLanguage	The root element of all input and output schema types.
ObjectStructurePropertyGroup	<ul style="list-style-type: none">• action• relationship• deleteForInsert	The object element of all input and output schema types.
PublishingContentGroup	<ul style="list-style-type: none">• event	The root element of all output schema types.

Group	Attributes	Applies to
QueryContentGroup	<ul style="list-style-type: none"> maxItems rsStart uniqueResult 	The root element of all query input schema types.
ResponseContentGroup	<ul style="list-style-type: none"> rsCount rsStart rsTotal 	The root element of all response output schema types.

Content types

The following table lists the content types in the metadata schema.

Type	Description	Attributes
MaximoVersionType	Concatenated string that identifies: <ul style="list-style-type: none"> major version minor version build database build Identifies software version	
MXBooleanType	Extension of integer	changed
MXDateTimeType	Extension of dateTime	changed
MXDomainType	Extension of string; identifies the corresponding Maxvalue for a domain value.	changed maxvalue
MXDoubleType	Extension of double	changed
MXFloatType	Extension of float	changed
MXGLAccountType	Complex type with 2 values, VALUE and GLCOMP; identifies individual GL components and their sequential order for an account.	changed
MXGLComponentType	Extension of string; identifies GL component sequential order within the chart of accounts structure.	glorder
MXIntType	Extension of integer	changed
MLLangStringType	Extension of MXString	changed languageEnabled
MXLongType	Extension of long	changed
MXStringType	Extension of string	changed

Query types

The following table lists the query types in the metadata schema.

Type	Description	Attribute
MXBooleanQueryType	Extension of integer	operator
MXDateTimeQueryType	Extension of dateTime	operator
MXDomainQueryType	Extension of string	operator maxvalue
MXDoubleQueryType	Extension of double	operator
MXFloatQueryType	Extension of float	operator
MXGLAccountQueryType	Complex type with a value of VALUE	operator
MXGLComponentQueryType	Extension of string	operator
MXIntQueryType	Extension of integer	operator
MXLongQueryType	Extension of long	operator
MXStringQueryType	Extension of string	operator

Data types

The following table lists the data types in the metadata schema.

Type	Description	Restricted Values
BooleanType	Indicates whether the result of a logical test is true or false.	<ul style="list-style-type: none"> 0 (false) 1 (true)
ChangeIndicatorType	Indicates whether a field has a new value.	1 (true)
EventType	Applies only to object structures generated by an event. Indicates whether a published object structure is the result of an event. If the value is 1, the published structure is the	<ul style="list-style-type: none"> 0 (false)

	result of an event. EventType is an extension of BooleanType.	<ul style="list-style-type: none"> • 1 (true)
ProcessingActionType	Processing actions that the integration services support.	<ul style="list-style-type: none"> • Add • Change • Replace • Delete • AddChange
QueryOperatorType	Identifies the Query by Example action to be performed on the corresponding field.	<ul style="list-style-type: none"> • = • != • &lt; • &lt;= • &gt; • &gt;= • SW • EW

Object structure schemas

Object structure schemas define the content of an object structure. Each object structure has its own schema that includes all of the persistent and nonpersistent fields that are defined for each object in the structure. Object structure schemas are used to define input and output types and are not used directly as input or output for any service.

Schema generation

When you generate the following components, the object structure schemas are regenerated:

- The object structure schema by using an action in the Object Structures application
- The enterprise service schema, where the object structure is referenced by the service
- The publish channel schema, where the object structure is referenced by the channel

To access a schema, use a URL that is similar to the following example in which MXPERSON is the object structure name.

`http://localhost:port/meaweb/schema/service/MXPERSON`

For compatibility with version 7.5, URLs that are similar to the following example are still supported:

`http://localhost:port/meaweb/schema/service/MXPERSONService.xsd`

Schema object structure content

An object structure schema has the following elements:

- Object
- Object set
- Object query

For example, the schema for the MXPERSON object structure has the following elements:

Element	Element name	Type
Object	MXPERSON	MXPERSONType
Object set	MXPERSONSet	MXPERSONSetType
Object query	MXPERSONQuery	MXPERSONQueryType

Schema object content

The object element has the following content:

- The MXPERSON element has a type of MXPERSONType.
- The MXPERSONType is a complex type and has the PERSON element, which has a type of MXPERSON_PERSONType.
- The complex type MXPERSON_PERSONType has elements for all the configured attributes of the PERSON object and elements for the child objects in the object structure.
- Additional objects in the schema have a corresponding complex type, such as the MXPERSON_PERSONType, that defines the PERSON object.

Element	Type
PERSON (primary object)	MXPERSON_PERSONType
PHONE (child object)	MXPERSON_PHONEType
EMAIL (child object)	MXPERSON_EMAILType
SMS (child object)	MXPERSON_SMSType

The following example shows the structure of the corresponding XML:

```

<MXPERSON>
  <PERSON>
    <PHONE>
    </PHONE>
    .
    .
    <EMAIL>
    </EMAIL>
    .
    .
    <SMS>
    </SMS>
    .
    .
  </PERSON>
</MXPERSON>

```

Object set content

For the MXPERSON example, the MXPERSONSet element replaces the MXPERSON element and MXPERSONSetType replaces the complex type MXPERSONType. Everything else remains the same. The set element acts as a wrapper for multiple occurrences of the primary object (MXPERSON) and its child objects.

Object query content

You can use query elements only within the context of a service level schema.

The following content format is in the object query element:

- The MXPERSONQuery element is of type MXPERSONQueryType.
- The MXPERSONQueryType is a complex type and has elements for all the configured attributes of the primary object (PERSON) of the object structure.

The object query and the object set differ in the following ways:

- The query element includes only the primary object of the object structure.
- The query element does not include nonpersistent columns.
- The query element can include two occurrences of the elements to support a query on a range, such as a date range.

Because the query includes only the top object of the structure, it is not possible, for example, to query for a person by phone number. The phone number exists in the child PHONE object.

Object schemas

Object schemas define the content of objects. Each object has a distinct schema, which includes all the persistent fields for a persistent object and all nonpersistent fields defined for a nonpersistent object. Object schemas are used to define input and output types and are not used directly as input or output for any service.

File names and location

The naming convention for object schemas is the object name, for example, PERSON.xsd and the files are located in the schema/common/mbo directory.

Schema generation

Object schema files are generated when you generate the following components:

- An object structure schema that contains the object
- An object structure service or enterprise service schema that references an object structure that includes the object
- A standard service schema that contains the object

All object schemas include the MXMeta.xsd schema file.

Schema content

The schema has the following elements (using MXPERSON as an example)

Element	Type	Comments
PERSONMbo	PERSONMboType	This type contains one instance of the PERSONMbo element.
PERSONMboSet	PERSONMboSetType	This type contains multiple instances of the PERSONMbo element.

Element	Type	Comments
PERSONMboKey	PERSONMboKeyType	This type contains a single instance of the PERSON element that is PERSONKeyType. The PERSONKeyType contains the attribute that is the primary key of the PERSON object, PERSONID. If multiple attributes make up the primary key of an object, the <i>objectKeyType</i> contains the attributes that make up the primary key. This element is included in the response to a Create operation.
PERSONMboKeySet	PERSONMboKeySetType	This type contains multiple instances of the PERSON element that is PERSONKeyType. The PERSONKeyType contains the attribute that is the primary key of the PERSON object, PERSONID. If multiple attributes make up the primary key of an object, the <i>objectKeyType</i> contains the attributes that make up the primary key. This element is included in the response of a Create operation.
PERSONMboQuery	PERSONMboQueryType	This type contains two instances of the PERSON element. Two instances allow a query to specify a range, for example, From Date and To Date.

Multi-noun messages

An XML message can contain multiple nouns.

```
<MXPERSON>
  <MXPERSONSET>
    <PERSON>
      .
    <SMS>
  </SMS>
</PERSON>
  <PERSON>
    .
  <SMS>
</SMS>
</PERSON>
</MXPERSONSET>
</MXPERSON>
```

Service level schemas

Service level schemas apply to object structure services, enterprise services, and standard services. One schema describes enterprise services and object structure services. A different schema describes standard services.

Object structure services, enterprise services, and standard services use objects and object structures as input and output for the operations they support. Multiple services can perform the same operation using the same input and output.

Predefined input and output for publish channels and invocation channels are used to invoke external services or to map to other output formats.

File names and location

The naming convention for object structure schemas and enterprise services schemas is *application service name* + Service, for example, PERSONService.xsd where PERSON is the application service name.

The naming convention for service level schemas is *object structure* + Service, for example, MXPERSONService.xsd.

The schema files are located in the <root>/schema/common/service directory.

Schema generation

Predefined service-level schema files are not provided. When you deploy a web service, a service-level schema file is generated for the associated object structure, if one does not exist. You can also generate a service-level schema by using an action in the Web Services Library application

All service level schemas include the metadata schema file and the applicable object structure and object schema files.

Schema content

One schema file is generated for each object structure with multiple data types within each file. Each data type corresponds to each input and output operation that can be deployed or processed as a service. Different services reuse the data types in these schemas. No one service uses all the data types in a single schema.

Service-level schemas contain the following types, using the MXPERSON example:

- CreateMXPERSON
- CreateMXPERSONResponse
- DeleteMXPERSON

- InvokeMXPERSOn
- InvokeMXPERSOnResponse
- PublishMXPERSOn
- QueryMXPERSOn
- QueryMXPERSOnResponse
- SyncMXPERSOn
- UpdateMXPERSOn

- **Standard service schemas input and output**

Standard services are provided by applications to perform specific operations on objects and can expose multiple methods as web services. Standard services are available only for methods that are properly annotated within the service.

- **Object structure and enterprise service input and output**

The object structure contains the content for object structure service and enterprise service schemas. An object structure service supports all defined operations but an enterprise service supports just one specific operation. Multiple enterprise services must be created to support multiple operations even when they reference the same object structure and use the same schema.

Standard service schemas input and output

Standard services are provided by applications to perform specific operations on objects and can expose multiple methods as web services. Standard services are available only for methods that are properly annotated within the service.

The service-level schemas that are generated for standard services are used only by the corresponding actions.

Object structure and enterprise service input and output

The object structure contains the content for object structure service and enterprise service schemas. An object structure service supports all defined operations but an enterprise service supports just one specific operation. Multiple enterprise services must be created to support multiple operations even when they reference the same object structure and use the same schema.

Object structure and enterprise service schemas identify the following:

- The input and output types for object structures and enterprise services
- The input and output of an invocation channel
- The output provided by a publish channel

All operations support the following output types:

- The output for the Create, Update, Delete and Sync operations are the primary object keys, the internal ID field and autokey values.
- The output for a Query operation is a result set of object structures.

The following examples, based on the MXPERSOn object structure, describe the content of object structure and enterprise services:

CreateMXPERSOn element

The CreateMXPersOn element has the following definitions:

- The CreateMXPERSOn element is type CreateMXPERSOnType.
- The CreateMXPERSOnType has element MXPERSOnSet, which is type MXPERSOnSetType. MXPERSOnSet is derived from the object structure schema.
- The MXPERSOnSetType has elements for all the configured attributes of the PERSON object and elements for the child objects (PHONE, EMAIL, and SMS) that are defined in the object structure.

The definitions of the following elements and types are comparable to the CreateMXPERSOn element and type:

Element	Type
UpdateMXPERSOn	UpdateMXPERSOnType
SyncMXPERSOn	SyncMXPERSOnType
InvokeMXPERSOn	InvokeMXPERSOnType
InvokeMXPERSOnResponse	InvokeMXPERSOnResponseType

Create MXPERSOnResponse element

The CreateMXPERSOnResponse element has the following definitions:

- The CreateMXPERSOnResponse element is type CreateMXPERSOnResponseType.
- The CreateMXPERSOnResponseType has element PERSONMboKeySet, which is type PERSONMboKeySetType.
- The PERSONMboKeySetType has element PERSON, which is type PERSONKeyType.
- The PERSONKeyType contains only the PERSONID attribute of the PERSON object, which is the primary key of the PERSON object.

PublishMXPERSOn element

The PublishMXPERSOn element has the following definitions:

- The PublishMXPERSO element is type PublishMXPERSOType.
- The PublishMXPERSOType has element MXPERSOSet, which is type MXPERSOSetType. MXPERSOSet is derived from the object structure schema.
- MXPERSOSetType has elements for all the configured attributes of the PERSON object and for the child objects ((PHONE, EMAIL, and SMS) defined in the object structure.

The Publish element is like the Create element but uses an additional attribute, event, that is defined in the PublishingContentGroup in the metadata schema.

DeleteMXPERSO element

The DeleteMXPERSO element has the following definitions:

- The DeleteMXPERSO element is type DeleteMXPERSOType.
- The DeleteMXPERSOType has element MXPERSODelete, which is type MXPERSODeleteType.
- The MXPERSODeleteType has elements for all the configured attributes of the PERSON object. Delete supports only the top (primary) object of the object structure.

QueryMXPERSO element

The QueryMXPERSO element has the following definitions:

- The QueryMXPERSO element is type QueryMXPERSOType.
- The QueryMXPERSOType has element MXPERSOQuery, which is type MXPERSOQueryType.
- The MXPERSOQueryType has elements for all the configured attributes of the PERSON object. Query supports only querying against the top (primary) object of the object structure.

The Query element uses the additional attributes uniqueResults, maxItems, and rsStart, which are defined in the QueryContentGroup in the metadata schema.

QueryMXPERSOResponse element

The QueryMXPERSOResponse element has the following definitions:

- The QueryMXPERSOResponse element is type QueryMXPERSOResponseType.
- The QueryMXPERSOResponseType has element MXPERSOSet, which is type MXPERSOSetType.
- The MXPERSOSetType has elements for all the configured attributes of the PERSON object and elements for child objects defined in the object structure (PHONE, EMAIL, and SMS).
- Although the QueryMXPERSO element restricts queries to the top object of the object structure (PERSON), the response can contain child objects (PHONE, EMAIL, and SMS).

The Query Response element uses the additional attributes rsStart, rsCount, and Total, which are defined in the ResponseContentGroup in the metadata schema.

Collaboration switches

Collaboration switches use a concept of ownership to help users manage the synchronization of inbound data between the integration framework and an external system. The switches provide the ability to control specific subprocesses within an application, based on the ownership of different data objects within a transaction.

The primary object of the object structure for most master data and document integration objects include an OWNERSYSID attribute. By default, inbound integration processing does not specify any value in the OWNERSYSID field and enterprise services are processed in a standard manner.

- [Format of collaboration switches](#)
Collaboration switches provide a flexible, user-defined way to control the processing of some inbound transactions through bypassing the default processing for certain types of transactions. Collaboration switches are located in the MXCOLLAB table.
- [Retrieving a collaboration switch](#)
Each process control ID is associated with at least three collaboration switches, the default switches and any switches that the user adds. The integration framework provides the logic that determines which system ID values to set when retrieving a collaboration switch from the MXCOLLAB table.
- [Configuring collaboration switches](#)
You can use predefined collaboration switches and you can configure new ones if required.
- [Predefined collaboration switches](#)
You can use the default collaboration switches and the predefined collaboration switches that are provided.

Format of collaboration switches

Collaboration switches provide a flexible, user-defined way to control the processing of some inbound transactions through bypassing the default processing for certain types of transactions. Collaboration switches are located in the MXCOLLAB table.

Switch elements

Each collaboration switch contains four elements, three of which combine to create a unique key. The following table lists these elements and the elements that comprise the unique key are marked with an asterisk (*).

Element	Corresponding MXCOLLAB field
---------	------------------------------

Element	Corresponding MXCOLLAB field
Process control ID*	PCID
System ID 1*	OWNER1SYSID
System ID 2*	OWNER2SYSID
Process control value	PCVALUE

Process control ID

The process control ID identifies a business process in an application, such as the validation of an invoice match, the creation of a blanket PO release, and the update of a physical inventory count.

The following table shows the prefix of the process control ID and indicates the application to which it applies.

Prefix of Process Control ID	Corresponding Application
INV	Invoice
ITM	Item
IV	Inventory
LT	Labor
PO	Purchase order
PR	Purchase requisition
WO	Work order

For example, the IVRC, IVRCY, and IVWO collaboration switches are all related to inventory processing.

System ID values

System ID 1 and System ID 2 identify the internal and external systems. The values in these fields vary, depending on the transaction and the objects in the transaction. In general, System ID 1 identifies the system that creates an object, and System ID 2 identifies the system that creates the record that is being referenced or updated.

Process control value

The process control value specifies whether the business components bypass default processing for the type of transaction indicated by the process control ID, System ID 1, and the System ID 2. The process control value can be 0 (false) or 1 (true) and can have the following meanings:

Value of process control	Description
0	Performs default processing
1	Bypasses default processing

Retrieving a collaboration switch

Each process control ID is associated with at least three collaboration switches, the default switches and any switches that the user adds. The integration framework provides the logic that determines which system ID values to set when retrieving a collaboration switch from the MXCOLLAB table.

Procedure

- The integration framework determines the values for System ID 1 and System ID 2 based on the process control ID in an inbound transaction.
For example, if the process control ID is PRDEL, System ID 1 is THISMX, and System ID 2 is the system that owns the PR.
- If the value in System ID 1 is blank, null, or equal to the value in the MXSYSID row of the MAXVARS table, System ID 1 is set to THISMX.
- If the value in System ID 2 is blank, null, or is equal to the value in the MXSYSID row of the MAXVARS table, and the process control ID is not PRPAB, System ID 2 is set to THISMX.
- If the process control ID is PRPAB, the value in System ID 2 is set to null after step 1, and System ID 2 is set to EXT (if a blanket PO does not exist).
- If both System ID 1 and System ID 2 are now set to THISMX, default processing is used and the remaining logic is not applied.
- The MXCOLLAB table is checked, to identify if it contains a record with the key.
If the record exists, the process control value for the record indicates whether to use or bypass standard processing and the remaining logic is not applied.
- If a matching record does not exist in the database, the key is modified in the following manner:
 - If System ID 1 now equals THISMX and System ID 2 does not equal THISMX, EXT is set as the value for System ID 2.
 - If System ID 1 value does not equal THISMX and System ID 2 equals THISMX, EXT is set as the value for System ID 1.
- The MXCOLLAB table is checked again, to identify if it contains a record with the modified key.
If the record exists, the process control value for the record indicates whether to use or bypass standard processing and the remaining logic is not applied.
- EXT is set as the value for both System ID 1 and System ID 2.
- The record with the modified key is retrieved from the MXCOLLAB table.
This record always exists, because every process control value has a default collaboration switch with both system IDs set to EXT.
- The process control value for the record indicates whether to use or bypass standard processing.

Configuring collaboration switches

You can use predefined collaboration switches and you can configure new ones if required.

- **Viewing collaboration switches**
Use any database tool to execute a SQL query to see the values in the MXCOLLAB table, or generate a report to view its content.
- **Modifying a collaboration switch**
Authorized users can modify the process control value of a collaboration switch. Do not change the value of PCID, OWNER1SYSID, or OWNER2SYSID values on existing collaboration switches.
- **Adding a collaboration switch to the database**
Authorized users can add collaboration switches to the MXCOLLAB table. New switches must use an existing process control ID, but they can use new system IDs.

Viewing collaboration switches

Use any database tool to execute a SQL query to see the values in the MXCOLLAB table, or generate a report to view its content.

Procedure

1. To view the collaboration switches for a single process control ID, use the following SQL query:

```
select  pcid, owner1sysid, owner2sysid, pcvalue
from    mxcollab
where   pcid = 'PCID'
order  by pcid, owner1sysid, owner2sysid;
```

2. To view all collaboration switches, use the following SQL query:

```
select  pcid, owner1sysid, owner2sysid, pcvalue
from    mxcollab
order  by pcid, owner1sysid, owner2sysid;
```

3. To view a short description of the process control IDs, use the following SQL query:

```
select * from mxcollabref order by pcid;
```

Modifying a collaboration switch

Authorized users can modify the process control value of a collaboration switch. Do not change the value of PCID, OWNER1SYSID, or OWNER2SYSID values on existing collaboration switches.

About this task

The values in the MXCOLLAB table are case-sensitive.

Procedure

1. Use a database tool to connect to the Maximo® database.
2. Use the following SQL statement to change the process control value in a collaboration switch :

```
update mxcollab
set pcvalue = PCVALUE
where pcid = 'PCID'
and owner1sysid = 'OWNER1SYSID'
and owner2sysid = 'OWNER2SYSID';
```

3. Restart the application server to refresh the cached values for collaboration switches.

Adding a collaboration switch to the database

Authorized users can add collaboration switches to the MXCOLLAB table. New switches must use an existing process control ID, but they can use new system IDs.

About this task

Only the default collaboration switches can use the values THISMX and EXT in the system ID fields.

Procedure

1. Use a database tool to connect to the Maximo® database.
2. Use the following SQL statement to add a collaboration switch:

```
insert into mxcollab
(pcid, owner1sysid, owner2sysid, pcvalue)
values ('PCID', 'OWNER1SYSID', 'OWNER2SYSID', PCVALUE);
```

Example

For example, you can configure the integration framework to integrate with an Oracle Financials system and other applications. When Oracle Financials issues system-owned inventory, the integration framework accepts the transaction and updates inventory balances and costs in the Maximo database. When other applications issue system-owned inventory, the integration framework accepts the transaction, but does not update inventory balances or costs in the Maximo database.

Before you modify the MXCOLLAB table to reflect these conditions, the INV collaboration switches have the following values:

Process Control ID	System ID 1	System ID 2	Process Control Value
INV	THISMX	EXT	1
INV	EXT	THISMX	0
INV	EXT	EXT	1

To modify the MXCOLLAB table, to support this scenario:

1. To update the collaboration switch, use the following SQL statement:

```
update mxcollab
set pcvalue = 1
where pcid = 'INV'
and owner1sysid = 'EXT'
and owner2sysid = 'THISMX';
```

This statement changes the value of the INV/ EXT/ THISMX collaboration switches to 1 to bypass normal update processing.

2. Use the following SQL statement to add a new collaboration switch for transactions from the Oracle Financials system:

```
insert into mxcollab
(pcid, owner1sysid, owner2sysid, pcvalue)
values ('INV', 'ORC', 'THISMX', 0);
```

The new collaboration switch sets ORC as the system ID, and sets the process control value to 0 so that normal processing is applied to issue transactions received from Oracle Financials. If the OWNERSYSID is blank, the value in the DEFEXTSYS integration control is used.

After you perform this procedure, the INV collaboration switches have the following values.

Process Control ID	System ID 1	System ID 2	Process Control Value
INV	THISMX	EXT	1
INV	EXT	THISMX	1
INV	EXT	EXT	1
INV	ORC	THISMX	0

For example, when you set the value of the ISUIN integration control to 1, issue transactions are accepted from an external system. The INV collaboration switch controls the update of inventory balance and cost related to issues. You can adjust the setting of this switch, if necessary, to bypass that update process.

The INV/EXT/THISMX collaboration switch controls the processing of inventory (where the Process Control ID = INV) that is issued in the external system (System ID 1 = EXT) and owned by the system (System ID 2 = THISMX).

If the value of the INV/EXT/THISMX collaboration switch is 0, default processing applies and inventory balance and cost values are updated.

If the value of the INV/EXT/THISMX collaboration switch is 1, default processing is bypassed and inventory balance and cost values are not updated.

In the example, ISUIN accepts any issues into the system. The INV/EXT/THISMX collaboration switch determines how the inventory business component processes a specific type of issue.

Predefined collaboration switches

You can use the default collaboration switches and the predefined collaboration switches that are provided.

- [Default collaboration switches](#)
Three default collaboration switches are created, with different combinations of system ID values, for each process control ID. Authorized users can create additional switches as needed.
- [Inventory collaboration switches](#)
Predefined collaboration switches are provided for the Inventory application.
- [Invoice collaboration switches](#)
Predefined collaboration switches are provided for the Invoice application.
- [Labor transaction collaboration switches](#)
Predefined collaboration switches are provided for labor transactions.
- [Purchase order collaboration switches](#)
Predefined collaboration switches are provided for purchase orders.
- [Purchase requisition collaboration switches](#)
Predefined collaboration switches are provided for purchase requisitions.
- [Receipt collaboration switches](#)
Predefined collaboration switches are provided for receipts.

- [Work order collaboration switches](#)

Predefined collaboration switches are provided for work orders.

Default collaboration switches

Three default collaboration switches are created, with different combinations of system ID values, for each process control ID. Authorized users can create additional switches as needed.

The default switches use various combinations of the following values in the System ID 1 and System ID 2 fields:

System ID value	Meaning
THISMX	The system identified in MAXVARS.MXSYSID The collaboration switches do not use the actual value in MXSYSID.
EXT	Any system other than the one identified in MAXVARS.MXSYSID

Authorized users can update only the process control value in the default collaboration switches. Deleting a default collaboration switch or modifying a field other than the process control value can result in a system failure.

Inventory collaboration switches

Predefined collaboration switches are provided for the Inventory application.

Process control ID	Description	Value and action		Derivation of system ID 1	Derivation of system ID 2
INV	Update inventory. Used when creating issues, returns, or miscellaneous receipts or adjustments. Inventory must exist in this system.	0 1	Update inventory. Do not update inventory.	INVTRANS or MATUSETRANS	INVENTORY
INVDEL	Delete inventory. Used when deleting externally owned inventory. If value is 1, the item-storerroom will still exist on related open PRs, POs, RFQs, work orders, and so on. This might result in problems receiving/approving these lines.	0 1	Delete item if it passes normal system validations. Delete inventory without any validations and delete INVBALANCES record for the item.	"THISMX"	INVENTORY
INVISS	Enter item issues. Used when issuing material.	0 1	Allow material issues for the inventory. Do not allow material issues for the inventory.	MATUSETRANS	INVENTORY
INVISSR	Enter item issue returns. Used when returning material.	0 1	Allow material returns. Do not allow issue returns for the material.	MATUSETRANS	INVENTORY
INVISSWO	Update work order actual cost, equipment INVCOSTs. Used when processing issues or returns. Meant to handle system to system cases where these updates will be done separately.	0 1	Update work order actual material cost, equipment INVCOST. Do not update work order actual material cost, equipment INVCOST.	MATUSETRANS	WORKORDER
INVPHY	Enter external physical counts. Used when creating physical counts.	0 1	Allow physical count for the inventory. Do not allow physical count for the inventory.	INVTRANS	INVENTORY
INVTR	Update the From storeroom on a transfer or the receipt of internal PO. Used when creating transfers or creating a receipt for an internal POs.	0 1	Update INVBALANCES in the From storeroom. Do not update INVBALANCES in the From storeroom.	MATRECTRANS	LOCATIONS (storeroom for transfer; vendor for internal PO)
ITMDEL	Delete items. Used when deleting items that this system does not own. Attention: If value is 1, the item will still exist on related open PRs, POs, RFQs, work orders, and so on. This might result in problems receiving/approving these lines.	0 1	Delete item if it passes normal system validations. Delete item without any validation. Also delete INVENTORY, INVBALANCES, and INVENDOR records for the item.	"THISMX"	ITEM

Invoice collaboration switches

Predefined collaboration switches are provided for the Invoice application.

Process control ID	Description	Value and action		Derivation of system ID 1	Derivation of system ID 2
IVILC	Update inventory last cost. Used when approving invoices.	0 1	Update inventory last cost. Do not update inventory last cost.	INVOICE	INVENTORY
IVINV	Update inventory average cost. Used when approving invoices.	0 1	Update inventory average cost. Do not update inventory average cost.	INVOICE	INVENTORY
IVMATCH	Use and validate invoice match. Used when approving invoices. If set to 1, IVPO should also be set to 1.	0 1	Validate match. Do not validate any match provided.	"THISMX"	INVOICE
IVPO	Update POs and receipts. Used when approving invoices.	0 1	Update PO status and receipts. Do not update PO status or receipts.	INVOICE	PO
IVPRO	Check and prorate differences between invoice headers and lines. Used when approving invoices.	0 1	Prorate the difference between the header and the line total. Do not prorate the difference between the header and line total.	"THISMX"	INVOICE
IVRC	Create service receipts for invoice lines without a PO reference. Used when approving invoices that contain a line without a PO reference.	0 1	Generate a service receipts for the invoice lines that do not have a PO reference. Do not generate a service receipt for the invoice lines that do not have a PO reference.	"THISMX"	INVOICE
IVRCY	Create service receipts for invoice lines with a PO reference and RECEIPTREQD = N. Used when approving invoices containing a line with a PO reference, when the corresponding POLINE is a service and RECEIPTREQD = N.	0 1	Generate a service receipt for the invoice line. Do not generate a service receipt for the invoice line.	INVOICE	PO
IVTOL	Perform invoice tolerance checking validation. Used when approving invoices.	0 1	Perform all tolerance checks on invoice. Do not perform tolerance checks on invoice.	"THISMX"	INVOICE
IVVLC	Update vendor last cost. Used when approving invoices.	0 1	Update vendor last cost. Do not update vendor last cost.	INVOICE	INVENDOR
IVWO	Update work orders. Used when approving invoice.	0 1	Update work order. Do not update work order.	INVOICE	WORKORDER

Labor transaction collaboration switches

Predefined collaboration switches are provided for labor transactions.

Process Control ID	Description	Value and Action		Derivation of System ID 1	Derivation of System ID 2
LTSRC	Generate service receipts for POs. Used when creating labor transactions or changing status. PO must exist in this system.	0 1	Allow setting value of LABTRANS. GENAPPRSERVRECEIPT to Y; configurable in the Application Setup. Leave value of LABTRANS. GENAPPRSERVRECEIPT as N.	LABTRANS	PO

Purchase order collaboration switches

Predefined collaboration switches are provided for purchase orders.

Process control ID	Description	Value and action		Derivation of system ID 1	Derivation of system ID 2
PODEL	Delete POs. Used when deleting POs. Use only when deleting then subsequently re-adding a PO due to changes in the PO. If any PRLINES contain a reference to the PO, clear them. If necessary, reopen the PR. When the PO is re-added, the PRLINES will be established again.	0 1	Do not delete PO. Delete PO and PRLINES; do not delete POSTATUS.	"THISMX"	PO

Process control ID	Description	Value and action		Derivation of system ID 1	Derivation of system ID 2
POINV	Do not allow unreferenced external inventory for internal POs. Used when adding or updating PO lines and changing the status of internal POs.	0 1	If the item-vendor combination not in INVENTORY table, error. If item-vendor combination not found in INVENTORY table (where PO.VENDOR = LOCATIONS.LOCATION), ignore error.	PO	LOCATIONS, where vendor is the storeroom
POIVM	Create inventory vendor information for inventory. Used when approving POs.	0 1	Update or create INVENDOR record. Do not create INVENDOR record.	PO	ITEM of POLINE
POPR	Update status of PRs. Used when copying PR lines to POs, creating POs from PRs, reopening PRs.	0 1	Change status of PR (auto close based on MAXVAR setting) or reopen when POLINE containing PR reference is deleted, or other instances of reopen. Do not change PR status.	PO	PR
POREL	Create releases for blanket POs. Used when approving PR and the PR lines contain a blanket references, and when a release is created directly from a PO without a PR.	0 1	Generate PO release. (If PRLINE.AGREEMENTPONUM not in PO, do not generate PO release). Do not regenerate PO releases.	PR	PO of the blanket
PORES	Process material reservations. Used when changing the status of internal POs.	0 1	Generate inventory reservations. If item-vendor combination (where vendor is internal storeroom) not in INVENTORY table, do not generate PO reservations. This might happen if POINV is 0. Do not generate inventory reservations.	PO	INVENTORY
PRREL	Create Purchase Orders. Used to allow Purchase Orders to be created with external contracts. The recommendation is to set the pvalue to zero.	0 1	Create PO. Do not create.	"THISMX"	PO

Purchase requisition collaboration switches

Predefined collaboration switches are provided for purchase requisitions.

Process control ID	Description	Value and action		Derivation of system ID 1	Derivation of system ID 2
PRDEL	Delete PRs. Used when deleting PRs. Use only when deleting then subsequently re-adding a PR due to changes in the PR. If WPMATERIAL or MRLINE contain references to the PR, clear them. They will be reestablished when you read PR.	0 1	Do not delete PR. Delete the PR and PRLINES; do not delete PRSTATUS.	"THISMX"	PR
PRINV	Do not allow unreferenced external inventory on internal PRs. Used when storerooms are maintained in an external system. Items are in ITEM master in the system; storeroom is defined as a LOCATION; INVENTORY is not defined for item-storeroom combination because it is not owned by the system. The owner of the PR is the MXSYSID of the system that creates the PR. Validation occurs when an item-storeroom (INVENTORY) is validated on the PRLINE. The OWNERSYSID of the storeroom is compared with the OWNERSYSID of the PR, and the flag determines if the combination is allowed.	0 1	If the item-vendor combination is not in INVENTORY table, error. If the item-vendor combination (vendor is the internal storeroom) is not in INVENTORY table, where PR.VENDOR = LOCATIONS.LOCATION, ignore error. LOCATIONS must exist; that is, pass standard validation for the location.	PR	LOCATIONS, where vendor is the internal storeroom
PRPAB	Do not allow unreferenced external purchase agreements / blankets. Used when adding or updating PR lines and changing the status of PRs.	0 1	If PRLINE.AGREEMENTPONUM is not in PO, error. If PRLINE.AGREEMENTPONUM is not in PO, ignore error.	PR	"EXT" Normally this would be from PO of the blanket, but in this case the blanket PO does not exist

Receipt collaboration switches

Predefined collaboration switches are provided for receipts.

Process control ID	Description	Value and action		Derivation of system ID 1	Derivation of system ID 2
RC	Enter PO receipts. Used when creating receipts.	0	Allow receiving against the PO.	MATRECTRANS or SERVRECTRANS	PO
		1	Do not allow receiving against the PO.		
RCILC	Update inventory last cost. Used when approving receipts.	0	Update inventory last cost.	MATRECTRANS	INVENTORY
		1	Do not update inventory last cost.		
RCINV	Update inventory. Used when receiving, or approving receipts.	0	Update inventory if it exists.	MATRECTRANS	INVENTORY
		1	Do not update inventory.		
RCIV	Generate invoices for PO receipts. Used when approving receipts.	0	Generate invoice if value of PayOnReceipt is set.	MATRECTRANS or SERVRECTRANS	PO
		1	Do not generate invoice, even if value of PayOnReceipt is set.		
RCPO	Update external PO. Used when approving receipt.	0	Update PO.	MATRECTRANS or SERVRECTRANS	PO
		1	Do not update PO.		
RCR	Enter PO receipt return. Used when creating receipt return.	0	Allow receipt returns for the PO.	MATRECTRANS or SERVRECTRANS	PO
		1	Do not allow receipt returns for the PO.		
RCVLC	Update vendor last cost. Used when approving receipt or receiving PO line.	0	Update vendor last cost.	MATRECTRANS	INVVENDOR
		1	Do not update vendor last cost.		
RCWO	Update work orders. Used when approving receipts.	0	Update work order.	MATRECTRANS or SERVRECTRANS	WORKORDER
		1	Do not update work order.		

Work order collaboration switches

Predefined collaboration switches are provided for work orders.

Process control ID	Description	Value and action		Derivation of system ID 1	Derivation of system ID 2
WORES	Process material reservations. Used when changing the status of a work order. Inventory must exist in this system.	0	Generate inventory reservation.	WORKORDER	INVENTORY
		1	Do not generate inventory reservation.		

Integrating with Maximo Application Suite applications

Maximo® Manage includes features that facilitate integration with other Maximo Application Suite applications.

- [Integrating with Asset Data Dictionary](#)
The Asset Data Dictionary is a repository of data and metadata that facilitates data sharing and integration between Maximo Manage and other applications. Using pre-defined artifacts in the Maximo Manage integration framework, you can synchronize data in Maximo Manage with the Asset Data Dictionary, which in turn integrates the data into other applications, such as Maximo Monitor.
- [Integrating Maximo Manage with IoT monitoring systems](#)
You can add metric data that IoT monitoring systems gather from sensor devices to meters in Maximo Manage applications.

Integrating with Asset Data Dictionary

The Asset Data Dictionary is a repository of data and metadata that facilitates data sharing and integration between Maximo® Manage and other applications. Using pre-defined artifacts in the Maximo Manage integration framework, you can synchronize data in Maximo Manage with the Asset Data Dictionary, which in turn integrates the data into other applications, such as Maximo Monitor.

Pre-defined artifacts are available for integrating data about organizations, sites, assets, asset hierarchies, operating locations, location systems, and location hierarchies.

If you configure event-based synchronization, data in the Asset Data Dictionary can be synchronized across applications. For example, if you configure an event that is based on adding a location, when you can add a location to Maximo Manage, the location is also added to Maximo Monitor.

- [Maximo Manage synchronization with the Asset Data Dictionary](#)
To support integration with other applications, the Maximo Manage to Asset Data Dictionary synchronization loads organization, site, asset, and location data from Maximo Manage to the data dictionary. It is an on-going integration that can be performed manually when needed, at regularly scheduled intervals, or as event-based updates when data changes.

- [Maximo Monitor to Maximo Manage integration](#)

The Maximo Monitor to Maximo Manage integration is a one-time process that uses the Asset Data Dictionary to add data about organizations, sites, assets, and locations from Maximo Monitor to Maximo Manage.

Maximo Manage synchronization with the Asset Data Dictionary

To support integration with other applications, the Maximo® Manage to Asset Data Dictionary synchronization loads organization, site, asset, and location data from Maximo Manage to the data dictionary. It is an on-going integration that can be performed manually when needed, at regularly scheduled intervals, or as event-based updates when data changes.

- [Maximo Manage to Asset Data Dictionary synchronization overview](#)

The IBM® Maximo Manage integration framework provides several artifacts for the Maximo Manage to Asset Data Dictionary synchronization, including an external system, publish channels, endpoints, and query templates.

- [Asset Data Dictionary implementation](#)

Asset Data Dictionary is installed automatically when a consuming application, such as Maximo Monitor, is installed. However, some initial configuration is also required to fully implement data synchronization.

- [Initial data synchronization from Maximo Manage to Asset Data Dictionary](#)

The export functions in the External Systems application are used to synchronize data from Maximo Manage to the Asset Data Dictionary.

- [Data synchronization process](#)

After the initial data synchronization, you can export data from Maximo Manage to the Asset Data Dictionary manually when needed, at regularly scheduled intervals, or when data changes.

Maximo Manage to Asset Data Dictionary synchronization overview

The IBM® Maximo® Manage integration framework provides several artifacts for the Maximo Manage to Asset Data Dictionary synchronization, including an external system, publish channels, endpoints, and query templates.

Data from Maximo Manage is added to the Asset Data Dictionary by using pre-defined publish channels in the MASDD external system. Query templates specify what data to synchronize. The MASDD endpoint posts data to the Asset Data Dictionary in JSON format.

The following artifacts are designed specifically for integration with the data dictionary:

MASDD external system

The MASDD external system includes publish channels for outbound data synchronization from Maximo Manage to the Asset Data Dictionary.

Publish channels

The following table describes the publish channels, object structures, and query templates that are associated with the MASDD external system in Maximo Manage:

Table 1. Publish channels for the data dictionary

Publish Channel	Data that the channel publishes	Object Structure	Query Template
MASDDORG	Organizations and sites	MXAPIORGANIZATION	MASDDORG
MASDDMETER	Meters	MXAPIMETER	MASDDMETER
MASDDLOCSYS	Location systems	MXAPILOCSYSTEM	MASDDLOCSYSTEM
MASDDOPERLOC	Locations of type OPERATING	MXAPIOPERLOC	MASDDOPERLOC
MASDDLOCHIER	Location hierarchies	MXAPILOCATION	MASDDLOCHIER
MASDDASSET	Assets	MXAPIASSET	MASDDASSET
MASDDASSETHIER	Asset hierarchies	MXAPIASSET	MASDDASSETHIER
MASDDMEASUREUNIT	Units of measurement	MXAPIMEASUREUNIT	MASDDMEASUREUNIT

Publish channels are configured to publish data in JSON format. An object structure can belong to more than one publish channel, and a different template can be assigned to each publish channel.

Processing uses an outbound queue, which can be JMS or Kafka.

Query templates

To improve efficiency and performance, publish channels have query templates that limit the number of fields to serialize.

Endpoints

Publish channels in the MASDD external system are configured to export data by using the MASDD endpoint. Data is posted in JSON format to the Asset Data Dictionary.

Endpoint properties are configured in Red Hat® OpenShift® and are stored as server bundle properties.

The following properties are added to the endpoints:

- URL
- GRAPH
- USERNAME
- PASSWORD
- TENANT

The Allow Override checkbox must be selected to allow the properties to be overwritten.

After you configure the external system, you can perform an initial export of data from Maximo Manage to the Asset Data Dictionary.

To synchronize the data after the initial data load, you can select one of the following options:

- Export data from Maximo Manage manually using the Data Export or Bulk Data Export actions in the External Systems application.

- Schedule a cron task to export data automatically at regular intervals, such as once a day.
- Enable event listener to initiate processing for a publish channel when a change occurs. To use this option, you must enable event listener on all MASDD publish channels except the MASDDASSETHIER asset hierarchy publish channel. Asset hierarchies are synchronized as part of the MASDDASSET asset integration.

Asset and location status assignment

Statuses for assets and locations in Maximo Manage might not match the statuses of the target application. The following table describes how statuses are mapped from Maximo Manage to the Asset Data Dictionary:

Table 2. Status assignments for the integration

Status in Maximo Manage	Status that is assigned in Asset Data Dictionary
DECOMMISSIONED	DECOMMISSIONED
NOT READY	NOT READY
ARCHIVED (external value)	ARCHIVED
All other values	ACTIVE

Asset Data Dictionary implementation

Asset Data Dictionary is installed automatically when a consuming application, such as Maximo® Monitor, is installed. However, some initial configuration is also required to fully implement data synchronization.

When another application requires data synchronization, the operator for Maximo Manage detects the presence of the Asset Data Dictionary dynamically. You do not have to restart Maximo Manage after the Asset Data Dictionary is installed.

Before you can synchronize your data by using the Asset Data Dictionary, you must also complete the following configurations:

- Configure authorization for the following object structures:
 - MXAPIORGANIZATION
 - MXAPIMETER
 - MXAPILOCSYSTEM
 - MXAPIOPERLOC
 - MXAPIASSET
 - MXAPIMEASUREUNIT
- Configure the outbound queue and an inbound queue for the external system. For more information about Kafka queues, see [Message processing by using a Kafka provider](#). For more information about JMS queues, see [JMS queue configuration](#).
- Enable the MASDD external system.
- If you are using Asset Data Dictionary with Maximo Monitor, create instances of the IOTCONNECTOR cron task for managing the Maximo Monitor metric to Maximo Manage meter updates. You must create a cron task instance for each type of update and in the instance, set both a **FILTER** value and a **METERLIST** value.
- To synchronize Manage data with the data dictionary when any changes occur, enable event listeners.
- Do not enable an event listener on the MASDD external system until your initial data load is complete. Ensure that, before you complete the initial data load, that the event listener is disabled. The initial data export must occur in a specific sequence. Enabling an event listener before initial data is exported might interfere with the ordered loading of the data. For more information, see [Initial data synchronization from Maximo Manage to Asset Data Dictionary](#).

Initial data synchronization from Maximo Manage to Asset Data Dictionary

The export functions in the External Systems application are used to synchronize data from Maximo® Manage to the Asset Data Dictionary.

The following options are available for initial data synchronization:

Export data one publish channel at a time

Use the Data Export action for publish channels on the Publish Channels tab in the External Systems application.

To limit what data is exported, you can set export conditions on each publish channel. The following list contains examples of export conditions. Each condition results in data exported for only the specified object, such as asset number or location name. You can specify multiple objects. For example, the **assetnum in**

('asset_number', 'asset_number', 'asset_number') export condition results in data exported for only the three specified assets.

- **systemid in ('system_ID')**
- **location in ('location_name')**
- **assetnum in ('asset_number')**
- **orgid in ('organization_ID')**
- **metername in ('meter_name')**

Export multiple publish channels sequentially in batches

To export multiple channels sequentially, select the Bulk Data Export action from the More Actions menu in the External Systems application.

Data is synchronized in the following order:

1. Organizations and sites
2. Unit of measure

3. Location systems
4. Operating locations
5. Location hierarchies
6. Assets
7. Asset hierarchies

You can verify the state of messages by enabling message tracking. When message tracking is enabled, the messages appear in the Message Tracking application. For more information, see [Message tracking](#).

You can use the Message Reprocessing application to ensure that messages are not blocking other messages for processing. In the Message Reprocessing application, click Refresh to refresh the table and retrieve any blocking messages.

- [Organization and site synchronization](#)
Organizations and sites are synchronized using the the MASDDORG publish channel.
- [Unit of measure synchronization](#)
Unit of measure is synchronized by using the MASDDMEASUREUNIT publish channel.
- [Meter synchronization](#)
Data for meters is synchronized using the locations and assets integrations. Only meters that are used by assets or locations are synchronized.
- [Location systems synchronization](#)
Location systems are synchronized by using the MASDDLOCSYS publish channel.
- [Operating locations synchronization](#)
Operating locations and location meters are synchronized using the MASDDOPERLOC publish channel. An operating location is a location with the type OPERATING.
- [Location hierarchy synchronization](#)
Operating location hierarchies are synchronized by using the MASDDLOCHIER publish channel. An operating location is a location with the type OPERATING.
- [Asset synchronization](#)
Assets and asset meters are synchronized by using the MASDDASSET publish channel.
- [Asset hierarchy synchronization](#)
Asset hierarchies are synchronized by using the MASDDASSETHIER publish channel.

Organization and site synchronization

Organizations and sites are synchronized using the the MASDDORG publish channel.

The following artifacts are used to synchronize organizations and sites:

- Publish Channel: MASDDORG
- Object Structure: MXAPIORGANIZATION
- Query Template: MASDDORG

You can synchronize all organizations, or you can synchronize a subset. Synchronizing an organization also synchronizes all sites for the organization.

The following table describes how statuses are mapped for the organizations and sites when Maximo® Manage is synchronized with the Asset Data Dictionary.

Table 1. Status assignments for Maximo Manage to Asset Data Dictionary synchronization

Status in Maximo Manage	Status that is assigned in Asset Data Dictionary
ISACTIVE = 1	ACTIVE
ISACTIVE = 0	INACTIVE Data that is inactive is not integrated with Maximo Monitor.

To validate that data was successfully sent to the Asset Data Dictionary, you can use a REST API call that is similar to the following call:

```
https://host:port/maximo/oslc/masdd/organization
```

You can create queries using primary keys, as shown in the following example:

```
https://host:port/maximo/oslc/masdd/organization?orgid=EAGLENA
```

Unit of measure synchronization

Unit of measure is synchronized by using the MASDDMEASUREUNIT publish channel.

The following artifacts are used to synchronize units of measure:

- Publish Channel: MASDDMEASUREUNIT
- Object Structure: MXAPIMEASUREUNIT
- Query Template: MASDDMEASUREUNIT

Although in Maximo® Manage you can specify different units of measurement for different organizations or sites, in the Asset Data Dictionary, the unit of measure is unique and does not vary from organization to organization or site to site. Importing an organization also imports all sites for the organization.

You can synchronize all units of measure, or you can synchronize a subset.

To validate that data was successfully sent to the Asset Data Dictionary, you can use a REST API call that is similar to the following call:

```
https://host:port/maximo/oslc/masdd/measureunit
```

You can create queries by using primary keys, as shown in the following example:

```
https://host:port/maximo/oslc/masdd/measureunit?measureunitid=LBS
```

Meter synchronization

Data for meters is synchronized using the locations and assets integrations. Only meters that are used by assets or locations are synchronized.

The following artifacts are used to synchronize meters:

- Publish Channel: MASDDMETER
- Object Structure: MXAPIMETER
- Query Template: MASDDMETER

You can use the meters integration to delete meters from the Asset Data Dictionary.

To validate that data was successfully sent to the Asset Data Dictionary, you can use a REST API call that is similar to the following call:

```
https://host:port/maximo/oslc/masdd/meter
```

You can create queries for meters using primary keys, as shown in the following example:

```
https://host:port/maximo/oslc/masdd/meter?metername=TEMP-F
```

Location systems synchronization

Location systems are synchronized by using the MASDDLOCSYS publish channel.

The following artifacts are used to synchronize location systems:

- Publish Channel: MASDDLOCSYS
- Object Structure: MXAPILOCSYSTEM
- Query Template: MASDDLOCSYSTEM

You can synchronize all location systems, or you can synchronize a subset.

To validate that data was successfully sent to the Asset Data Dictionary, you can use a REST API call that is similar to the following call:

```
https://host:port/maximo/oslc/masdd/locsystem
```

You can create queries that use primary keys, as shown in the following example:

```
https://host:port/maximo/oslc/masdd/locsystem?systemid=PRIMARY&siteid=BEDFORD
```

Operating locations synchronization

Operating locations and location meters are synchronized using the MASDDOPERLOC publish channel. An operating location is a location with the type OPERATING.

The following artifacts are used to synchronize operating locations:

- Publish Channel: MASDDOPERLOC
- Object Structure: MXAPIOPERLOC
- Query Template: MASDDOPERLOC

You can synchronize all operating locations, or you can synchronize a subset. When you synchronize locations, location meters that have a metric ID are also synchronized.

The following table describes how statuses are mapped for the LOCASSETSTATUS domain when Maximo® Manage is synchronized with the Asset Data Dictionary:

Table 1. Status assignments for synchronization

Status in Maximo Manage	Status that is assigned in Asset Data Dictionary
DECOMMISSIONED	DECOMMISSIONED
NOT READY	NOT READY
ARCHIVED (external value)	ARCHIVED
Any internal value other than DECOMMISSIONED, NOT READY, or ARCHIVED (external value)	ACTIVE

Location hierarchies are not synchronized using this integration. Hierarchies are synchronized using the location hierarchy integration.

To validate that operating location data was successfully sent to the Asset Data Dictionary, you can use a REST API call that is similar to the following call:

```
https://host:port/maximo/oslc/masdd/locations
```

You can create queries for operating locations using primary keys, as shown in the following example:

```
https://host:port/maximo/oslc/masdd/locations?location=TEST1&siteid=BEDFORD
```

Location hierarchy synchronization

Operating location hierarchies are synchronized by using the MASDDLOCHIER publish channel. An operating location is a location with the type OPERATING.

The following artifacts are used to synchronize location hierarchies:

- Publish Channel: MASDDLOCHIER
- Object Structure: MXAPILOCATION
- Query Template: MASDDLOCHIER

You can synchronize all operating location hierarchies, or you can synchronize a subset.

To validate that data was successfully sent to the Asset Data Dictionary, you can use a REST API call that is similar to the following call:

`https://host:port/maximo/oslc/masdd/locations`

You can also create queries by using primary keys, as shown in the following example:

`https://host:port/maximo/oslc/masdd/locations?location=TEST1&siteid=BEDFORD`

Asset synchronization

Assets and asset meters are synchronized by using the MASDDASSET publish channel.

The following artifacts are used to synchronize assets:

- Publish Channel: MASDDASSET
- Object Structure: MXAPIASSET
- Query Template: MASDDASSET

You can synchronize all assets, or you can synchronize a subset.

Assets that are not associated with a location are synchronized. Assets that are associated with locations are synchronized only if the location type is OPERATING.

When you synchronize assets, asset meters that have a metric ID are also synchronized.

The following table describes how statuses are mapped for the LOCASSETSTATUS domain when Maximo® Manage is synchronized with the Asset Data Dictionary:

Table 1. Status assignments for synchronization

Status in Maximo Manage	Status that is assigned in Asset Data Dictionary
DECOMMISSIONED	DECOMMISSIONED
NOT READY	NOT READY
ARCHIVED (external value)	ARCHIVED
Any internal value other than DECOMMISSIONED, NOT READY, or ARCHIVED (external value)	ACTIVE

Asset hierarchies are not synchronized by using this integration. Hierarchies are synchronized by using the asset hierarchy integration.

Assets that are associated with storeroom locations are not synchronized.

To validate that asset data was successfully sent to the Asset Data Dictionary, you can use a REST API call that is similar to the following call:

`https://host:port/maximo/oslc/masdd/asset`

You can create queries for assets by using primary keys, as shown in the following example:

`https://host:port/maximo/oslc/masdd/asset?assetnum=TEST1&siteid=BEDFORD`

To validate that meter data was successfully sent to the Asset Data Dictionary, you can use a REST API call that is similar to the following call:

`https://host:port/maximo/oslc/masdd/meter`

You can create queries for meters by using primary keys, as shown in the following example:

`https://host:port/maximo/oslc/masdd/meter?metername=TEMP-F`

Asset hierarchy synchronization

Asset hierarchies are synchronized by using the MASDDASSETHIER publish channel.

The following artifacts are used to synchronize asset hierarchies:

- Publish Channel: MASDDASSETHIER
- Object Structure: MXAPIASSET
- Query Template: MASDDASSETHIER

You can synchronize all asset hierarchies, or you can synchronize a subset. Asset hierarchies are moved after assets are moved to ensure that hierarchies are accurately correlated with the assets.

To validate that data was successfully sent to the Asset Data Dictionary, you can use a REST API call that is similar to the following call:

`https://host:port/maximo/oslc/masdd/asset`

You can create queries that use primary keys, as shown in the following example:

`https://host:port/maximo/oslc/masdd/asset?assetnum=TEST1&siteid=BEDFORD`

Data synchronization process

After the initial data synchronization, you can export data from Maximo® Manage to the Asset Data Dictionary manually when needed, at regularly scheduled intervals, or when data changes.

The following synchronization options are available:

- Export data from Maximo Manage manually using the Data Export or Bulk Data Export actions in the External Systems application.
- Schedule a cron task to export data automatically at regular intervals, such as once a day.
- Enable event listener to initiate processing for a publish channel when a change occurs. To use this option, you must enable event listener on all MASDD publish channels except the MASDDASSETHIER asset hierarchy publish channel. Asset hierarchies are synchronized as part of the MASDDASSET asset integration.

Processed data is added to the outbound queue. You can configure a cron task to specify how often messages are sent to the data dictionary.

The following table describes the events that trigger data synchronization:

Table 1. Events that trigger data dictionary synchronization

Synchronization	Events that trigger updates to the data
Organizations and sites	An organization becomes active. An organization is deleted. A site is added, deleted, or becomes active.
Location systems	A location system is added. A location system is deleted.
Locations, locations of type OPERATING or any synonyms for OPERATING in the LOCTYPE domain	A location is added. A location is deleted. Location type is changed. A location status is changed. A location meter with a metric ID is added or deleted.
Location hierarchies	A location hierarchy is added. A location hierarchy is deleted.
Assets	An asset is added. An asset is deleted. An asset's parent, location, site ID or asset type is modified. An asset status is changed. An asset meter with a metric ID is added or deleted.
Asset hierarchies	The MASDDASSETHIER publish channel publishes the asset hierarchy for export scenarios. Do not enable an event listener for this publish channel.

Data synchronization must occur in the following order:

1. Organizations and sites
2. Location systems
3. Operating locations
4. Location hierarchies
5. Assets
6. Asset hierarchies

Maximo Monitor to Maximo Manage integration

The Maximo® Monitor to Maximo Manage integration is a one-time process that uses the Asset Data Dictionary to add data about organizations, sites, assets, and locations from Maximo Monitor to Maximo Manage.

Use this integration only for a one-time, initial load of data into Maximo Manage. After the initial data is loaded, Maximo Manage takes ownership of the data and manages any subsequent changes to the data.

- [Maximo Monitor to Maximo Manage integration overview](#)
Maximo Manage provides several artifacts for the Maximo Monitor to Maximo Manage integration, including an external system, enterprise services, and endpoints.
- [Maximo Monitor to Maximo Manage organization and site integration](#)
The External Systems application provides an enterprise service for integrating organization and site data from Maximo Monitor to Maximo Manage.

- [Location integration](#)
The External Systems application provides an enterprise service for integrating location system, operating location, and location hierarchy data from Maximo Monitor to Maximo Manage.
- [Asset integration](#)
The External Systems application provides an enterprise service for integrating asset and asset hierarchy data from Maximo Monitor to Maximo Manage.
- [Maximo Monitor to Maximo Manage integration process](#)
Integration of data from Maximo Monitor to Maximo Manage is performed by using the Get External Data option that is available on the Enterprise Services tab in the External Systems application.

Maximo Monitor to Maximo Manage integration overview

Maximo® Manage provides several artifacts for the Maximo Monitor to Maximo Manage integration, including an external system, enterprise services, and endpoints.

You can use the following artifacts to add data from Maximo Monitor to Maximo Manage:

MASDD external system

The MASDD external system includes enterprise services for inbound data integration from Maximo Monitor to Maximo Manage.

To integrate data from Maximo Monitor into Maximo Manage, you use the MASDD external system and the MASDDLLOAD endpoint. Processing uses an inbound queue, which can be JMS or Kafka.

Enterprise services

The following table describes the object structures and enterprise services that are associated with the MASDD external system in Maximo Manage:

Table 1. Enterprise services for Maximo Monitor to Maximo Manage integration

Object structure	Enterprise service
MXAPIORGANIZATION	MASDDORG
MXAPILOCSYSTEM	MASDDLOCSYS
MXAPIOPERLOC	MASDDOPERLOC
MXAPIOPERLOC	MASDDLOCHIER
MXAPIASSET	MASDDASSET
MXAPIASSET	MASDDASSETHIER

To synchronize data, use the Get External Data option, which is available on the External Service tab for an external system.

Endpoints

Enterprise services in the MASDD external system are configured to export data by using the MASDDLLOAD endpoint. Data is posted in JSON format to Maximo Manage.

Endpoint properties are configured in Red Hat® OpenShift® and are stored as server bundle properties.

The following properties are added to the endpoints:

- URL
- GRAPH
- USERNAME
- PASSWORD
- TENANT

The Allow Override check box must be selected to allow the properties to be overwritten.

Maximo Monitor to Maximo Manage organization and site integration

The External Systems application provides an enterprise service for integrating organization and site data from Maximo® Monitor to Maximo Manage.

The following artifacts are used to integrate organizations and sites:

- Enterprise Service: MASDDORG
- Object Structure: MXAPIORGANIZATION

You can integrate all organizations. Synchronizing an organization also integrates all sites for the organization.

To create an organization in Maximo Manage, you must supply an ITEMSETID, COMPANYID, and BASECURRENCY, which Maximo Monitor does not have. You have two options for providing organizations and sites for Maximo Manage:

- You can manually create an organization in Maximo Manage and then integrate only sites.
- You can add default values for item set, company ID, and base currency by using the following system properties:

Table 1. System properties for organization and site synchronization

Property	Description
mxe.int.masdddfltitemset	Default item set ID.
mxe.int.masdddfltcompset	Default company set ID.
mxe.int.masdddfltbasecurrency	Default currency code.

After you add the default values, you can integrate organization data from Maximo Monitor into Maximo Manage.

Before you can activate an organization, you must specify a clearing account. If you want to disable GL validation, you can set the `mxe.int.disableglvalidation` property to true by specifying 1. If you disable the validation, an organization is created as active with the clearing account set to ?. The following MAXVARS are set to bypass GL validation:

- DISABLEGLSWITCH
- GLVALIDATEFP
- GLCHECKCOA

Before attempting to synchronize organizations and sites, check that the correct permissions are set:

- If the `mxe.int.propagateuser` property is set to 0, it means that the MXINTADM user runs the transactions and therefore, must have access to Inactive Sites, which are set in the Users application.
- If the `mxe.int.propagateuser` property is set to 1, it means that the user executing the Get External Data action must have access to Inactive Sites.

Mismatches in field lengths between Maximo Monitor and Maximo Manage can prevent accurate synchronization.

Integration fails when a field length in Maximo Monitor is greater than the maximum field length in Maximo Manage.

When you integrate data from Maximo Monitor to Maximo Manage, adjustments are sometimes required for field lengths. Except for the descriptions, attributes in Maximo Monitor have a length of 30. Consequently, you must reconfigure attributes in Maximo Manage to a length of 30.

The following tables describe the default field lengths and data types that Maximo Manage uses for the organization and site attributes:

Table 2. Data types and lengths for organization attributes

Attribute	Data type	Length
ORGID	UPPER	8
ORGANIZATIONID	BIGINT	19
DESCRIPTION	ALN	100
ACTIVE	INTEGER	1

Table 3. Data types and lengths for site attributes

Attribute	Data type	Length
ORGID	UPPER	8
SITEID	UPPER	8
SITEUID	BIGINT	19
DESCRIPTION	ALN	100
ACTIVE	ALN	1

The following table describes how organization and site statuses are mapped from Maximo Monitor to Maximo Manage:

Table 4. Organization and site status assignments for the integration from Maximo Monitor to Maximo Manage

Status in Maximo Monitor	Status that is assigned in Maximo Manage
ACTIVE	The ACTIVE flag is set to 1.
ARCHIVED	The ACTIVE flag is set to 0.

Location integration

The External Systems application provides an enterprise service for integrating location system, operating location, and location hierarchy data from Maximo® Monitor to Maximo Manage.

Location systems integration

The following artifacts are used to integrate location systems:

- Enterprise Service: MASDDLOCSYS
- Object Structure: MXAPILOCSYSTEM

You can integrate all location systems.

Mismatches in field lengths between Maximo Monitor and Maximo Manage can prevent accurate integration. Integration fails when a field length in Maximo Monitor is greater than the maximum field length in Maximo Manage.

When integrating from Maximo Monitor to Maximo Manage, adjustments are sometimes required for field lengths. The following table describes the default field lengths that Maximo Manage uses for the location system attributes:

Table 1. Data types and lengths for location systems attributes

Attribute	Data type	Length
SYSTEMID	UPPER	12
SITEID	UPPER	8
LOCSYSTEMID	BIGINT	19
DESCRIPTION	ALN	100

Operating Locations integration

The following artifacts are used to integrate operating locations:

- Enterprise Service: MASDDOPERLOC
- Object Structure: MXAPIOPERLOC

You can integrate all operating locations, or you can integrate a subset.

If Maximo Monitor uses a location type that does not exist in the Maximo Manage LOCTYPE domain, the location type is created in Maximo Manage as a synonym of the OPERATING type.

The following table describes how statuses are mapped for the LOCASSETSTATUS domain from Maximo Monitor to Maximo Manage:

Table 2. Status assignments for the integration

Status in Maximo Monitor	Status that is assigned in Maximo Manage
ACTIVE	The default external value for the OPERATING internal value.
ARCHIVED	A synonym of the OPERATING internal value.

If the imported description from Maximo Monitor exceeds the maximum length that is allowed in the Description field in Maximo Manage, the text is truncated. However, the full description is provided in the Long Description field.

Location hierarchies are not integrated using this integration. Hierarchies are integrated using the location hierarchy integration.

Mismatches in field lengths between Maximo Monitor and Maximo Manage can prevent accurate integration for operating locations. Adjustments are sometimes required for field lengths. The following table describes the default field lengths and data types that Maximo Manage uses for the operating location attributes:

Table 3. Data types and lengths for operating location attributes

Attribute	Data type	Length
LOCATION	UPPER	12
SITEID	UPPER	8
LOCATIONSID	BIGINT	19
TYPE	UPPER	16
STATUS	ALN	20
DESCRIPTION	ALN	100

Location hierarchies integration

The following artifacts are used to integrate location hierarchies:

- Enterprise Service: MASDDLOCHIER
- Object Structure: MXAPIOPERLOC
- Query template: MASDDLOCHIER

You can integrate all location hierarchies. Location hierarchies are moved after locations are moved to ensure that hierarchies are accurately correlated with the locations.

Mismatches in field lengths between Maximo Monitor and Maximo Manage can prevent accurate integration of location hierarchies. Adjustments are sometimes required for field lengths. The following table describes the default field lengths and data types that Maximo Manage uses for the location hierarchy attributes:

Table 4. Data types and lengths for location hierarchy attributes

Attribute	Data type	Length
LOCATION	UPPER	12
SYSTEMID	UPPER	12
PARENT	UPPER	12
SITEID	UPPER	8

Asset integration

The External Systems application provides an enterprise service for integrating asset and asset hierarchy data from Maximo® Monitor to Maximo Manage.

Assets integration

The following artifacts are used to integrate assets:

- Enterprise Service: MASDDASSET
- Object Structure: MXAPIASSET

All assets can be integrated.

If Maximo Monitor uses an asset type that does not exist in the Maximo Manage ASSETTYPE domain, the asset type is created in Maximo Manage as a synonym of the PRODUCTION type. This value is configurable. You can change it by changing the mx.int.masdddftassettype property.

The following table describes how statuses are mapped for the LOCASSETSTATUS domain from Maximo Monitor to Maximo Manage:

Table 1. Status assignments for the integration

Status in Maximo Monitor	Status that is assigned in Maximo Manage
ACTIVE	The default external value for the OPERATING internal value.
ARCHIVED	A synonym of the OPERATING internal value.

If the imported description from Maximo Monitor exceeds the maximum length that is allowed in the Description field in Maximo Manage, the text is truncated. However, the full description is provided in the Long Description field.

Asset hierarchies are not integrated by using this integration. Hierarchies are integrated by using the asset hierarchy integration.

Mismatches in field lengths between Maximo Monitor and Maximo Manage can prevent accurate integration. Integration fails when a field length in Maximo Monitor is greater than the maximum field length in Maximo Manage.

When you integrate data from Maximo Monitor to Maximo Manage, adjustments are sometimes required for field lengths. The following table describes the default field lengths and data types that Maximo Manage uses for the asset attributes:

Table 2. Data types and lengths for asset attributes

Attribute	Data type	Length
ASSETNUM	UPPER	25
SITEID	UPPER	8
ASSETUID	BIGINT	19
ASSETTYPE	UPPER	20
STATUS	ALN	20
DESCRIPTION	ALN	100

Asset hierarchies integration

The following artifacts are used to integrate asset hierarchies:

- Enterprise Service: MASDDASSETHIER
- Object Structure: MXAPIOPERLOC
- Query template: MASDDASSETHIER

You can integrate all asset hierarchies. Asset hierarchies are moved after assets are moved to ensure that hierarchies are accurately correlated with the assets.

Mismatches in field lengths between Maximo Monitor and Maximo Manage can prevent accurate integration of asset hierarchies. Adjustments are sometimes required for field lengths. The following table describes the default field lengths and data types that Maximo Manage uses for the asset hierarchy attributes:

Table 3. Data types and lengths for asset hierarchy attributes

Attribute	Data type	Length
ASSETNUM	UPPER	25
PARENT	UPPER	25
SITEID	UPPER	8

Maximo Monitor to Maximo Manage integration process

Integration of data from Maximo® Monitor to Maximo Manage is performed by using the Get External Data option that is available on the Enterprise Services tab in the External Systems application.

Data must be integrated in the following order:

1. Organizations and sites
2. Location systems
3. Operating locations
4. Location hierarchies
5. Assets
6. Asset hierarchies

After the data is loaded into Maximo Manage, Maximo Manage owns the data and manages any subsequent changes to the data.

Integrating Maximo Manage with IoT monitoring systems

You can add metric data that IoT monitoring systems gather from sensor devices to meters in Maximo® Manage applications.

- [IoT device data integration overview](#)
Data that Internet of Things (IoT) monitoring systems collect from sensor devices can be imported into Maximo Manage by using the Asset Data Dictionary integration features.
- [Associating device metrics to asset and location meters](#)
Metrics data from IoT sensor devices, such as data that is gathered by Maximo Monitor, can be integrated with asset and location meters in Maximo Manage.

You can associate device metrics with asset and location meters directly in the Assets, Locations, and Object Structures applications. You can associate data in bulk for large numbers of devices by importing files that pair the IoT devices with the assets and locations by using a metrics ID.

IoT device data integration overview

Data that Internet of Things (IoT) monitoring systems collect from sensor devices can be imported into Maximo® Manage by using the Asset Data Dictionary integration features.

Metrics are time-based groupings of sensor data that is associated with IoT devices. In IoT monitoring systems, devices can be associated with assets and locations. When a device is associated with an asset or location, the metrics that are associated with the device can be added to the meter data that Maximo Manage maintains for assets and locations.

In Maximo Manage, in the Assets and Locations applications, on the Meters tab, the Metric ID field associates an asset or location meter to a metric that is collected by IoT monitoring systems.

The metrics data can be added to Maximo Manage by using the Asset Data Dictionary artifacts in the integration framework and the IOTCONNECTOR cron task.

The IOTASSET and IOTLOCATIONS enterprise services in the MASDD external system are used to import metrics data into Maximo Manage.

You can create one or more cron task instances and run the IOTCONNECTOR cron task to pull data from IoT monitoring systems into meter readings for assets and locations.

To accommodate the large variety of sensor devices that gather data, Maximo Manage provides various configuration options for the IOTCONNECTOR cron task. For example, you can apply filters to select specific assets or locations. Because some sensors need to be monitored more frequently than others, you can also specify how often to poll for data. If no filter or meter list is specified, the cron task selects all assets and locations and also selects the meters that are associated with a metric ID.

The following table describes the parameters that you can use to configure the IOTCONNECTOR cron task:

Table 1. IOTCONNECTOR cron task parameters

Parameter	Description	Default
FILTER	WHERE clause that filters the assets and locations that are selected when the cron task runs.	Does not apply.
METERLIST	Comma-separated list of meter names for the cron task to process. The meter list is added to the WHERE clause that filters the data.	Does not apply.
PROCESSOR	IoT processor class that implements the <code>com.ibm.tivoli.maximo.iotf.processor.IoTProcessor</code> interface.	<code>com.ibm.tivoli.maximo.iotf.processor.IoTProcessor</code>
BATCHSIZE	Page size to use for the metric data request. For example, if the page size is 100, the cron sends a bulk request for 100 metrics to the Asset Data Dictionary.	100
ASSETBASED	Specifies whether the task processes assets or locations. <ul style="list-style-type: none"> For asset-based metrics, specify 1. For location-based metrics, specify 0. 	1
QUEUEBASED	Specifies whether the response goes through a queue or not.	1
HISTDAYS	Number of days in the past to retrieve metrics if meter readings were never synchronized with metrics. This parameter is used when meter readings were not synchronized for one of the following reasons: <ul style="list-style-type: none"> The cron task is run for the first time. The cron task processes data for a meter that does not have any readings that are registered with Maximo Manage. That is, the <code>lastreadingdate</code> parameter is null in the asset meter or the location for that meter. <p>It is important to determine how many days in the past to request data for metrics that have no meter readings in Maximo Manage. For example, in some monitoring systems, such as Maximo Monitor, metrics might be configured many days before the metric is associated with an asset or location meter. You must specify whether the cron task collects all available historical data or limits the historical data to the number of days that is specified in the HISTDAYS parameter.</p> <p>This parameter is used only when no prior readings exist for a meter. When readings exist, the cron task always uses the value that is specified for the <code>lastreadingdate</code> parameter as a starting point for retrieving the meter data.</p>	7
USELASTREADINGS	Specifies whether to use the last reading that was taken for the metric device. <ul style="list-style-type: none"> To use the last reading for the asset or location meter, specify 1. To use the last run time for the cron task, specify 0. 	1

The ASSETBASED parameter in the cron task determines whether asset or location data is integrated. For example, if the value of the ASSETBASED parameter is 1, the cron task imports all asset metrics by using the FILTER and METERLIST parameters and sends one or more REST API calls to the Asset Data Dictionary by using the batch size that is specified. The Asset Data Dictionary connects with a provider of the metrics data such as Maximo Monitor to retrieve the data.

If the value for the QUEUEBASED parameter is 1, the data is broken into individual transactions before it is added to the queue. For example, if the batch size is 100, a call to the Asset Data Dictionary returns 100 records for a transaction, and the records are broken into 100 separate transactions before they are written to the queue. This process facilitates parallel processing. If the value of the QUEUEBASED parameter is 0, the data is imported directly by using the IOTASSET enterprise service.

Depending on the number of metrics that you select and the batch size that you configure for the cron task, the IOTCONNECTOR cron task might make several requests in a single run. For example, if the data set has 1000 metrics and the batch size is set to 100, which is the default, the cron task attempts to make 10 requests for 100 records each to fetch data for 1000 metrics. If the third request encounters an error for any reason, such as a network, Asset Data Dictionary, or monitoring system issue, the cron task stops the run and does not attempt the remaining seven runs. When the cron task runs next, it uses the `lastreadingdate` from

the asset meter or location meter tables to determine when the last reading for an individual meter was taken. The timestamp is used in the subsequent query to the Asset Data Dictionary for the associated metric. This process ensures that even if errors prevent the cron task from fetching data for a specific metric in one run, the data can be captured in the next successful run.

Associating device metrics to asset and location meters

Metrics data from IoT sensor devices, such as data that is gathered by Maximo® Monitor, can be integrated with asset and location meters in Maximo Manage. You can associate device metrics with asset and location meters directly in the Assets, Locations, and Object Structures applications. You can associate data in bulk for large numbers of devices by importing files that pair the IoT devices with the assets and locations by using a metrics ID.

Before you begin

Before you can associate metrics from IoT devices with asset and location meters in Maximo Manage, you must complete the following tasks:

- Ensure that the IoT devices for your monitoring system are registered in the Asset Data Dictionary.
- In Maximo Manage, ensure that the MXASSET and MXOPERLOC object structures are enabled for flat files by selecting the Support Flat File Structure check box for the object structures.
- Resolve any alias conflicts for field names in the object structures.
- Ensure that the appropriate authorizations are assigned for the object structures.

Associating metrics to meters in the Maximo Manage user interface

In the Assets and Locations applications, you can select an asset or location and then associate metrics data from IoT devices by using the Metric ID field on the Meters tab.

About this task

This task describes how to associate metrics that are collected by IoT devices with meter data in the Assets application in Maximo Manage. In the Locations application, you can perform the same steps to associate metrics data with locations.

Procedure

1. In the Assets application, locate the asset for which you want to import device metrics.
2. On the Meters tab for the asset, select the meter for which you want to import metrics.
3. In the Metric ID field, click the search icon.
4. In the Select Value window, select the metric that you want to associate with the meter.
5. Save the record.

Associating metrics to meters in bulk

You can associate large numbers of metrics with asset and location meters in bulk by importing flat files that pair the IoT devices with the assets and locations by using a metrics ID.

About this task

This task describes how to associate in bulk the metrics that are collected by IoT devices with meter data in the Assets application in Maximo Manage. In the Locations and Object Structures applications, you can perform similar steps to associate metrics data with location meters.

To complete this task, you specify which assets you want to associate metrics with and download a compressed file that contains the following two CSV files that you can use to associate metrics from IoT devices with the corresponding asset meters in Maximo Manage:

asset_metric_<file ID>.csv

The spreadsheet lists data for IoT devices that are associated with the asset or assets that you selected, including metric ID, metric name, device name, and device type. If a metric already is associated with an asset, the meter is listed in the METERNAME cell.

asset_meter_<file ID>.csv

The spreadsheet lists the meters that are associated with the Maximo Manage asset or assets that you selected. If an asset meter is already associated with a metric ID, the metric ID is displayed in the METRICID cell.

You must select one of the files and update it to associate a metric ID with an asset meter. For each meter that you want to associate with a metric ID, you can add the metric ID to the METRICID column to the asset_meter_<file ID>.csv file. Or you can choose to add the meter that corresponds to the metric ID that is listed for the asset in the asset_metric_<file ID>.csv file.

Procedure

1. In the Assets application, choose one of the following options to specify which assets to associate with imported metric data:
 - On the List tab, select the check box for the assets for which you want to import metrics data.
 - Select a single asset for which you want to import metrics data.
2. From the Select Action menu, choose IoT Metric List.
3. In the IoT Metric List window, enter the following information to retrieve data for the metrics:

Table 1. IoT Metric List field descriptions

Field	Description	Default
-------	-------------	---------

Field	Description	Default
Where clause	A valid SQL WHERE clause for the MXASSET and MXOPERLOC object structures. If no WHERE clause is entered, all data is processed. Note: In the Assets and Locations applications, this field is prepopulated with values that are based on the assets or locations that you selected on the List tab or the individual record that you selected.	None
Delimiter	The character to use to separate one cell in the spreadsheet from another.	The default value is specified in the <code>mxe.int.flatfiledelimiter</code> system property.
Text Qualifier	If a delimiter is used in one of the cells, text qualifiers are used to enclose each value.	The default value is specified in the <code>mxe.int.textqualifier</code> system property.
Unmapped Only	If this check box is selected, the spreadsheet includes only assets or locations that are not associated with a metric ID. If the check box is cleared, asset or location meters are included whether they have a metric ID or not. If any asset or location is associated with a metric, the metric is displayed in the spreadsheet.	
Add Header	Specifies whether to add a header row that contains the external system name, enterprise service name, action, and language code. Select this check box if you use the Data Import action for an enterprise service in the External Systems application. A header is not needed when you load by using object structures.	

4. Click OK. After you click OK, a compressed file is downloaded to the default download folder on the computer.
5. Extract the compressed file.
6. Determine which file to update for import into Maximo Manage and select one of the following options to prepare data in the spreadsheet for import.
 - Update the `asset_metric_<file ID>.csv` file.
For each metric ID that you want to associate with a meter, add the meter name to the `METERNAME` column in the `asset_metric_<file ID>.csv` file and save the file. Rows with no meter name are ignored when data is imported into Maximo Manage.
 - Update the `asset_meter_<file ID>.csv` file.
For each meter that you want to associate with a metric ID, add the metric ID to the `METRICID` column in the `asset_meter_<file ID>.csv` file and save the file.
7. After you update the spreadsheet, select one of the following options to import the spreadsheet:
 - Import data by using the `MXASSETInterface` and `MXOPERLOCInterface` enterprise services in the MASDD external system. If you select this option, use a header in the CSV file.
 - In the Assets or Locations application, select the Application Import action. Then, select the MXASSET or MXOPERLOC object structure and synchronize the objects. If you select this option, no header is needed in the CSV file.
 - Make a REST API call by using the MXASSET and MXOPERLOC object structures. If you select this option, no header is needed in the CSV file.
 - In the Object Structures application, select the MXASSET or MXOPERLOC object structure and then use the Data Import action. If you select this option, no header is needed in the CSV file.

Integrating with Cognos Analytics server

From Maximo® Manage 8.6, an integration to IBM® Cognos® Analytics is available. The integration provides an extra suite of Business Intelligence (BI) tools.

- [Installing Cognos Analytics](#)
Installing Cognos Analytics enables features including enabling your authorized users to access Cognos Analytics reporting, synchronization of the Maximo Application Suite security groups to Cognos Analytics, and publishing of Maximo Application Suite object structures as Cognos metadata packages.
- [Configuring Cognos Analytics server](#)
Configure Cognos Analytics server to use it for reporting.

Installing Cognos Analytics

Installing Cognos® Analytics enables features including enabling your authorized users to access Cognos Analytics reporting, synchronization of the Maximo® Application Suite security groups to Cognos Analytics, and publishing of Maximo Application Suite object structures as Cognos metadata packages.

- [Cognos Analytics entitlement for Maximo Application Suite](#)
IBM Cognos Analytics on IBM Cloud Pak® for Data is a supporting program in Maximo Application Suite 8.10 Long Term Support Release (LTSR).
- [Prerequisites for Cognos Analytics](#)
Before you configure IBM Cognos Analytics to work with Maximo Manage, there are certain things you must check for.
- [Collecting key information from Cloud Pak for Data for Cognos Analytics configuration](#)
It is important to collect some key information for Cognos Analytics.

Cognos Analytics entitlement for Maximo Application Suite

IBM® Cognos® Analytics on IBM Cloud Pak® for Data is a supporting program in Maximo® Application Suite 8.10 Long Term Support Release (LTSR).

The usual Supporting Program license terms apply to Cognos Analytics along with the following restrictions specific to creating and editing reports or dashboards:

- Cognos Analytics requires IBM Administrative Base User license. Maximo Application Suite customers must have at least one license.
- It is limited up to three Administrative Base users who can do Cognos Analytics Administrative creating or editing.

- No separate installation AppPoint consumption takes place on installing Cognos Analytics cartridge.
- User AppPoint consumption is based on Limited, Base, or Premium license types.

Prerequisites for Cognos Analytics

Before you configure IBM® Cognos® Analytics to work with Maximo® Manage, there are certain things you must check for.

You must ensure that you have installed the following software before you install Cognos Analytics:

- Red Hat® OpenShift® Container Platform
- IBM Cloud Pak® for Data
- IBM Common Services

To install Cloud Pak for Data and Cognos Analytics, you must follow the instructions in the Ansible playbook. For more information, see [cp4d](#).

Collecting key information from Cloud Pak for Data for Cognos Analytics configuration

It is important to collect some key information for Cognos® Analytics.

Procedure

1. Log on to Red Hat® OpenShift® Container Platform.

Collecting Cloud Pak for Data namespace

2. Go to Administration > Namespaces and check if the ibm-cpd namespace exists.

Collecting Cloud Pak for Data URL

3. Go to Networking > Routes and in the ibm-cpd project you can see a URL in the Location column. Note the URL.

Collecting default admin credentials

4. Use the user name "admin" and go to Workloads > Secrets and select admin-user-details in the Name column. Copy the initial_admin_password in the Data section and note it down.

Collecting the project folder path

5. After you create an instance, come back to Red Hat OpenShift Container Platform and in Workloads > Pods select the reporting pod and create a project folder. Note the project folder path.

Collecting Cognos Analytics administrator details

6. After you create the Cognos Analytics administrator and add the administrator to your instance, note down the user name and password.

Collecting the team content folder name

7. After you create a team content folder for publishing packages, note down the name of the folder.

Collecting data source name

8. After you create a data source, go to Cognos Analytics and note down the data source name.

Configuring Cognos Analytics server

Configure Cognos® Analytics server to use it for reporting.

You must set up platform connections in Cloud Pak for Data. For more information, see [Configuring the content store for Cognos Analytics](#)

- [Creating Cognos Analytics instances](#)
Create a Cognos Analytics instance to manage users.
- [Cognos Analytics system properties](#)
There are eight system properties that apply to Cognos Analytics.
- [Cognos Analytics end point properties](#)
The MXCOGNOS end point has seven end point properties.
- [Creating a Cognos Analytics administrator for publishing packages](#)
You must run a CURL command to create a Cognos Analytics administrator for publishing packages and then create a team content folder where you can configure the endpoint to publish framework packages.
- [Creating a data source in Cognos Analytics](#)
Create a data source for publishing and running reports.

- [Configuring Maximo Manage user synchronization to Cloud Pak for Data](#)
You must check whether the user synchronization is correct by going to the Cloud Pak for Data interface.

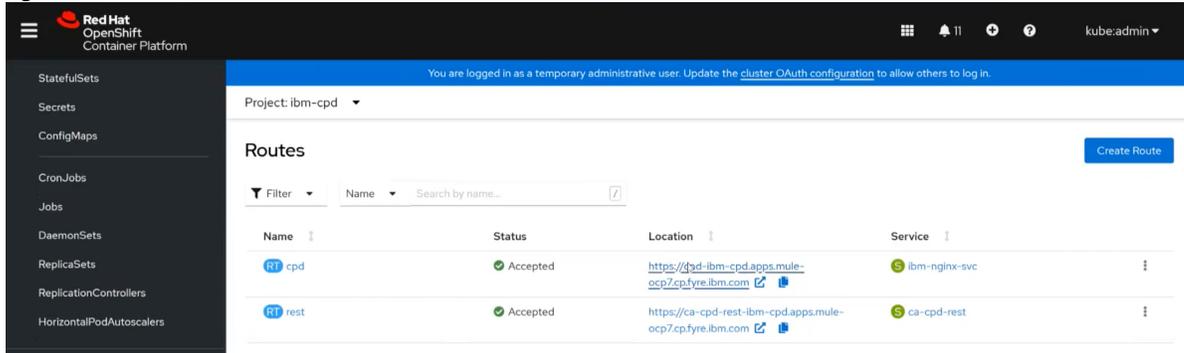
Creating Cognos Analytics instances

Create a Cognos® Analytics instance to manage users.

Procedure

1. Log on to Red Hat® OpenShift® Container Platform and access the IBM Cloud Pak® for Data pod.
2. From the menu, select Networking > Routes and open the cpd route.

Figure 1. CPD route



3. Log on as admin to Cloud Pak for Data by using your IBM® provided credentials.
4. To create a platform connection, go to Platform connections from the navigation menu and click New connection +.
The platform connection is used as a Cognos Analytics content store.
Note: Supported databases are IBM Db2®, Oracle, and Microsoft SQL Server only. IBM Db2 Warehouse is not a supported database.
5. From the menu, select Services catalog.
6. In the Analytics section, verify whether the Cognos Analytics tile is enabled.
7. Go to Instances and select New instance.
8. Select Cognos Analytics and click New instance.
9. In the wizard, select an Instance Name Space, which is ibm-cpd.
10. Select the Shared File Volume Storage, Shared Block Volume Storage, and Plan size and click Next.
11. Select a Content Manager Database and an Audit Database and click Next.
12. Complete the wizard to finish creating a new instance.
13. Go to Instances from the navigation menu to check for the newly created instance.
Note: Check the Status column to see whether it displays Running Instance that is created.

What to do next

Add users or go to Cognos Analytics.

Cognos Analytics system properties

There are eight system properties that apply to Cognos® Analytics.

Cognos Analytics system properties and values

Note: Maximo® Manage user interface does not support configuring system properties.

Property name	Description	Used for
mxe.report.cognos.serverURL	Cognos Analytics Dispatcher or Gateway URL. It is used to launch Cognos Analytics reports or admin.	Report execution
mxe.report.cognos.cpdnamespace	Cognos Analytics project namespace, where Cognos Analytics services are installed. For example, ibm-cpd.	Report execution
mxe.report.cognos.content.store.package.location	Cognos Analytics Team Content folder where the Cognos Analytics package is published. For example, PUBLIC.	Package creation
mxe.report.cognos.datasource	The name of the Cognos Analytics data source name for the Maximo Manage database. For example, MXDB.	Package creation
mxe.report.cognos.db.schemaName	The Maximo Manage database schema name that relates to the Cognos Analytics data source.	Package creation
mxe.report.cognos.db.type	Maximo Manage database type that relates to the Cognos Analytics data source.	Package creation and report execution
mxe.report.cognos.db.sql.name	The SQL Server database name if the database type is SQL Server.	Access to Cognos Analytics outside


```
"email": "<admin_email>",
"user_roles": [
  "User",
  "Administrator"
]
}'
```

2. Log on to Cloud Pak for Data and confirm that the Cognos Analytics administrator is created by going to Access control from the navigation menu.
3. In your Cognos Analytics instance, select Manage access and click Add users +
4. In the Grant access to users and user groups dialog, select the Cognos Analytics administrator you created and select Analytics Administrator as the role from the list.
5. Click Add
6. On the IBM® Cognos Analytics page, select Content from the menu.
7. On the Team content tab, click the Add a folder icon.
8. Specify a name for the folder and click Add.
On the Content page, you can see your new folder.

Creating a data source in Cognos Analytics

Create a data source for publishing and running reports.

Procedure

1. In the Cognos® Analytics instance, click the Overflow menu and select Open.
2. From the menu, click Manage Administration console
3. Click Configuration.
4. Click the New Data Source icon.
5. Specify a name for the data source and click Next.
6. Select the type from the list, ensure that the Configure JDBC connection checkbox is selected, and click Next.
7. In the User ID, Password, and Confirm password fields, specify the login credentials. Click Next.
8. In the Server name field, specify a JDBC server and in the Port number , specify a port number.
9. In the Database name field, specify a database and JDBC connection parameters.
10. Click Test the connection and click Test.
If the configuration works, the status is Succeeded.
11. Click Close twice and click Finish.

Configuring Maximo Manage user synchronization to Cloud Pak for Data

You must check whether the user synchronization is correct by going to the Cloud Pak for Data interface.

About this task

Check whether the user is synchronized from Maximo® Manage to Cognos® Analytics.

Procedure

1. Log on to Cloud Pak for Data by using the URL specified in the End Points application in Maximo Manage.
Note: If you configured a cron task for the synchronization, you must wait for the time interval you specified before you check it in Cloud Pak for Data. The default time interval is 5 minutes.
 2. Click the Manage users tile.
You can see one or more users that you synchronized in the Access control page.
Note: Removing the user from the COGNOSUSERS security group does not remove the synchronization with Cognos. You must delete the user from the table in the Access control page to remove the synchronization.
- [Configuring MXCOGNOS end point](#)
Configure MXCOGNOS end point to synchronize users from Maximo Manage to Cognos Analytics.
 - [Adding users to security group](#)
You must add a user to the right security group for user synchronization with Cognos to work correctly.

Configuring MXCOGNOS end point

Configure MXCOGNOS end point to synchronize users from Maximo® Manage to Cognos® Analytics.

About this task

You must configure the end point before you can synchronize users between Maximo Manage to Cognos Analytics.

Procedure

1. From the navigation menu, go to Integration > End Points.
2. Specify MXCOGNOS as the search criteria in the End Point field.
3. From the search results, select MXCOGNOS and a list of properties for the end point is displayed.
For more information on MXCOGNOS, see [End point system properties](#).
4. Check that the URL for the CPD_ROUTE property has a value. User synchronization cannot happen without this property configured.

Adding users to security group

You must add a user to the right security group for user synchronization with Cognos to work correctly.

About this task

You can add an existing user to the COGNOSUSERS group to synchronize with Cognos.

Procedure

1. From the navigation menu, go to Security > Users.
2. Search for an existing user and select the username from the search results.
Note: You can only search for existing users. New users are created at the Maximo® Application Suite level and migrated to Maximo Manage.
3. Go to the Groups tab and click Select Groups.
4. In the Select Groups dialog, select the COGNOSUSERS group and click OK.
5. Click Save to save your changes to the user.

Using Maximo Manage

The IBM® Maximo® Manage applications are grouped into modules. You can access the modules from the Go To menu in the Navigation toolbar of the user interface.

- **[Administration module](#)**
You use the applications in the Administration module for system administration tasks. You can perform functions such as creating communication templates and setting up organizations.
- **[Analytics module](#)**
You use the applications in the Analytics module to view scheduled reports and KPIs to analyze and understand information about the lifecycle and the maintenance of your assets.
- **[Assets module](#)**
The Assets module contains applications that are designed to manage the assets that are owned or leased by your company from purchase to salvage, from the beginning to the end of the life cycle for an asset.
- **[Building Information Models \(BIM\) module](#)**
You use the applications in the Building Information Models (BIM) module to import building model data in Construction-Operations Building information exchange (COBie) format and then manage and view building models in 3D. You can inspect assets and locations of the building, create work orders and service requests, and search for and create systems from the model.
- **[Change module](#)**
You use the Activities and Tasks application, located in the Change module, to plan, to review, and to manage activities and tasks.
- **[Contracts module](#)**
You use the applications in the Contracts module to manage contracts for labor rates, purchases, leases, warranties, and software. You can create different types of contracts and define the rules that govern each type of contract.
- **[Financial module](#)**
You use the applications in the Financial module to define and manage currency codes, exchange rates, general ledger accounts and resource codes. You can also track project management costs.
- **[Integration module](#)**
The Integration module contains a set of applications that help you to integrate the system with your enterprise applications. You also can create business flows between the system and your other enterprise applications.
- **[Inventory module](#)**
You use the applications in the Inventory module to manage your inventory of spare parts. You can maximize the availability of items for upcoming work tasks, and also reduce excess inventory balances and related carrying costs.
- **[IT Infrastructure module](#)**
The IT Infrastructure module (configuration process manager) applications enable management of the configuration items in your IT environment. They provide a logical model of the IT infrastructure by helping you to identify, control, maintain, and verify the versions of all configuration items in the environment and their attributes and relationships.
- **[Planning module](#)**
You use the applications in the Planning module to plan how work should be performed, such as creating job plans that outline the steps that must be performed for each type of job.
- **[Preventive Maintenance module](#)**
You use the applications in the Preventive Maintenance module to manage the work performed on a regular schedule to keep assets running efficiently. The applications can help you to plan and budget for regular maintenance work by planning the labor, material, service, and tool needs of your regularly scheduled maintenance and inspection work orders.

- **[Purchasing module](#)**
You use the applications in the Purchasing module to manage the purchasing process, including obtaining requests for quotations (RFQs), purchasing the materials and services, and then receiving and invoicing them. The applications also help you to maintain information about the companies from which you purchase, and to integrate legal terms and conditions into the purchasing process.
- **[Release module](#)**
You use the Activities and Tasks application to plan, review, and manage activities and tasks. When you create an activity, you initiate the work process and create a historical record of the work being performed.
- **[Security module](#)**
You use the applications in the Security module to implement and manage security for users and groups.
- **[Self Service module](#)**
Self-Service users (with proper permissions) can register themselves in the system and use the applications in the Self-Service modules (Desktop Requisitions and Service Requests) to create records without the assistance of an administrator or a service desk agent.
- **[Service Desk module](#)**
You use the applications in the Service Desk module to manage customer requests for help, information, and services.
- **[Service Level module](#)**
You use the Service Level module to create and manage service level agreements which document the commitments between service providers and customers. You can also create a service group for each type of service that you provide or procure.
- **[System Configuration module](#)**
The System Configuration module contains the Platform Configuration module and the Migration module.
- **[Task Management module](#)**
The Task Management module contains the Activities and Tasks application, which you use to plan, review, and manage activities and tasks. When you create an activity, you initiate the work process and create a historical record of work being performed.
- **[Work Orders module](#)**
You use the Work Orders module to track the work that has been performed in the past, and future work that is being planned.

Administration module

You use the applications in the Administration module for system administration tasks. You can perform functions such as creating communication templates and setting up organizations.

- **[Sets](#)**
You use the Sets application to create a framework to share item data and company (vendor) data across multiple organizations.
- **[Organizations](#)**
You use the Organizations application to set up the organizations and sites that you use. You must define at least one organization and one site.
- **[Calendars](#)**
Calendars are shared entities that define the framework for shifts, holidays, and so on, for organizations. You use the Calendars application to create and change calendars for organizations and for sites. You can create calendars to define working times as well as shifts. A calendar can also specify non-working time, such as weekends, holidays, and shutdowns.
- **[Resources](#)**
You use the applications in the Resources module (within the Administration module) to create records about the people in your workforce. The people whom you document can include internal and external workers, and other people whose names or IDs might be listed on other records.
- **[Bulletin Board](#)**
In the Bulletin Board application, you can create messages about critical problems and incidents that you can broadcast throughout the organization. You can also view communication logs from service desk agents and their users, and communications that are generated by workflow processes and escalations.
- **[Communication Templates](#)**
You use the Communication Templates application to create and manage communication templates. These templates can be used to standardize frequently used email communications (which are also known as notifications).
- **[Report Administration](#)**
You use the Reports Administration application to view report listings, set report security, and specify the availability of reports and how they open, run, and print.
- **[Conditional Expression Manager](#)**
The Conditional Expression Manager application is a library of conditional classes and expressions. You can apply the conditions to fields, tabs, and other user interface controls in applications to control the presentation. You can also apply conditions to security groups to control access to applications, controls, and data.
- **[Classifications](#)**
Classifications identify and characterize similar objects. A building, a notebook computer, and a centrifugal pump are types of classifications. A classification can also describe an event, such as a broken window or a hard disk failure.
- **[CI Types](#)**
You use the CI Types application to specify which configuration item (CI) types to use when you import actual configuration items from a discovery tool.
- **[Work View](#)**
The Work View application queries the combined ticket and work order tables. You can display the results of the query in the Result Set portlet of your Start Center. You can view a list of all tickets and work orders that you own or that are assigned to your group. The Work View application contains one default query, called WORKVIEW.
- **[Service Address](#)**
You can use service addresses to organize customer locations and assets by address. When you organize customer locations and assets by service address, searching for and finding them is faster.
- **[Map Manager](#)**
You create and configure maps to provide users with a visual representation of their work.
- **[KPI](#)**
The KPI Templates application and the KPI Manager application help you assess and monitor the performance of important activities in your organization. For example, you can create KPIs to monitor the number of work orders that are past their scheduled start date or to identify activities that might require improvement.
- **[Record Release](#)**
In the Record Release application, you can view the records that users currently have in edit mode. You can also release records from edit mode if they are

- left in edit mode erroneously.
- [Time Zone Rules](#)
In the Time Zone Rules application, you can specify time zone rules to identify the local date and time when you create records for a process, such as generating work orders from a preventive maintenance record.
- [Maximo Visual Inspection models](#)
You can train accurate and efficient AI-based models in Maximo Visual Inspection.

Sets

You use the Sets application to create a framework to share item data and company (vendor) data across multiple organizations.

The item and company master records exist at the organization level so that organizations can share the same data. These records are stored in sets, which are stored at the database level.

Grouping items into sets allows users to transfer items among sites within different organizations. Grouping companies into sets ensures that all sites and organizations use consistent names for vendor companies and that accurate consolidated vendor reporting can be performed. The following table describes item sets and company sets.

Table 1. Item sets and company sets

Type of set	Description
Item set	<ul style="list-style-type: none"> • Lets organizations choose from a common set of items. • Unique identifiers are required for each item set and for each item in the set. • Items that you create are cataloged into the item set that is associated with the same organization to which your default insert site belongs.
Company set	<ul style="list-style-type: none"> • Ensures that all sites and organizations use consistent names for vendor businesses. • To negotiate the best prices with vendors, company sets allow you to consolidate vendor reporting and share pricing information when you purchase products or services.

Organizations

You use the Organizations application to set up the organizations and sites that you use. You must define at least one organization and one site.

For each organization, you specify the following properties:

- Base currency
- Default item status
- Item and company sets
- General ledger clearing account
- Address codes for organizational units, including sites, that you can use on records

When your system configuration includes multiple organizations and sites, your company can run the system in multiple facilities from the same database. Using a web browser, each site can access its own site-specific data and common data across the multiple sites.

The architecture of the system enables different organizations and sites to keep parts of their operations separate, while sharing others. For example, different facilities can share purchase agreements and vendors, and share and transfer items, while keeping work order data and job plan data separate.

Organizations and sites

Organizations and sites are logical divisions of a company. The divisions are determined by the types of operations that are performed at different locations, and what data can be shared among them.

An organization is a major division of a company that contains one or more sites. Sites that belong to the same organization must use the same currency. These sites must share the same options for work orders, assets, labor, and other types of data.

A site is a subdivision of an organization that can track inventory and other data separately from other sites. Certain types of information are unique to a site and not visible to other sites within the organization.

Application options

Within the Organizations application, you set defaults for various options that are related to applications or groups of applications, such as Work Order Tracking, Inventory, Purchasing, Preventive Maintenance, and Assets.

When you set certain application options, you must select a site. The setting for that application then applies at the site level. If you do not select a site, then the application setting applies at the organization level. The exceptions to this are system and set level autonumbering, and settings specified in the System Settings window.

Calendars

Calendars are shared entities that define the framework for shifts, holidays, and so on, for organizations. You use the Calendars application to create and change calendars for organizations and for sites. You can create calendars to define working times as well as shifts. A calendar can also specify non-working time, such as weekends, holidays, and shutdowns.

You can create site-specific calendars with names that refer to the site, and have the site agree to use only those calendars. You can define shifts with complex repeating patterns using the Define Pattern window.

You can associate the calendars with types of records. Any number of the following records can reference a single calendar:

- Organizations
- People
- Labor
- Assets
- Locations
- Work orders
- Preventive maintenance
- Tools
- Service level agreements

A calendar record is defined by a start date and end date, and by the shift definitions and non-working time that you apply to it. Non-working time includes holidays and any other type of non-working time that you want to define. Applying shifts and non-working time to a calendar generates the work periods for the calendar.

You are likely to need multiple calendar definitions. For example, you might use a corporate calendar that includes standard shifts and holidays. You could also use an asset calendar that includes a working time calendar for asset uptime.

Information for individuals, such as vacation, sick, personal time, and extra time worked, is not stored on the main calendar record. You use the People application or Assignment Manager to track these exceptions to the standard calendar.

Resources

You use the applications in the Resources module (within the Administration module) to create records about the people in your workforce. The people whom you document can include internal and external workers, and other people whose names or IDs might be listed on other records.

- [Labor](#)
You use the Labor application to create, change, view, and delete labor records for employees and contractors. Labor records can contain personal and work-related information, as well as the type and location of work, procurement card information, and overtime refused by the laborer.
- [Qualifications](#)
You use the Qualifications application to create qualifications and certification requirements for qualifications. A qualification is often indicated by a license or certificate that signifies proficiency in a particular skill.
- [People](#)
You use the People application to create, to modify, to view, and to delete records for individuals. The People application stores information about individuals, such as users, laborers, asset owners, and supervisors who receive workflow notifications.
- [Person Groups](#)
You use the Person Groups application to manage the groups of workers within your organization.
- [Crafts](#)
You use the Crafts application to define craft records for a work plan, and to define skill levels, standard rates, and premium pay codes for crafts. The craft code reflects the type of work that employees and contractors perform.
- [Crew Types](#)
A crew type consists of the required positions, qualifications, and tools that are required to perform a specific type of work. You can assign crew types anywhere that you can assign a craft and skill level.
- [Crews](#)
You define crews from crew types and assign labor and tool resources to manage the crews.

Labor

You use the Labor application to create, change, view, and delete labor records for employees and contractors. Labor records can contain personal and work-related information, as well as the type and location of work, procurement card information, and overtime refused by the laborer.

In addition, you can specify crafts, skill levels, qualifications, and certifications that are associated with labor records.

Before you create a labor record, you must create a corresponding person record. You create person records in the People application.

- [Labor overview](#)
Labor records are useful for tracking labor, analyzing labor, and recovering labor costs associated with assets or parts under warranty. After you setup labor records, you must register them in the Security application to assign privileges and restrictions on the applications persons can access.
- [Working with labor](#)
Crafts are used to identify skill levels, standard rates, and premium pay codes for crafts in forecasting budget requirements. With crafts and qualifications in place, you can create job plans identifying the skill type required for each task, which helps in planning, scheduling, and assigning work.

Labor overview

Labor records are useful for tracking labor, analyzing labor, and recovering labor costs associated with assets or parts under warranty. After you setup labor records, you must register them in the Security application to assign privileges and restrictions on the applications persons can access.

- **[Labor records and person records](#)**
Similar to person records, labor records contain personal information, but are designed to store information about the worker, such as craft, skill level, hours worked, certifications, and so forth. On the other hand, person records contain personal information, and general information, such as workflow and purchasing information.
- **[Assignment of calendars to labor](#)**
A calendar specifies the days when work is performed and includes non-work days, such as weekends or holidays. You can assign a calendar to a labor record to specify the work days for a laborer. You can designate a shift to specify the work hours for the laborer.
- **[Status of qualifications](#)**
When you no longer need a qualification record, you can change the status of that record to inactive.
- **[Zero year to date hours associated with labor](#)**
In the Labor application, you use the Zero Year to Date Hours action to track the hours that associated with a labor record during a calendar or fiscal year.
- **[Labor inventory locations](#)**
A labor inventory location maintains a balance of inventory items that were issued from a storeroom.
- **[Status of labor records](#)**
The status of a labor record indicates whether the record is active, inactive, closed, or canceled.
- **[Deletion rules for labor](#)**
To meet your changing business needs, you can delete labor records.

Labor records and person records

Similar to person records, labor records contain personal information, but are designed to store information about the worker, such as craft, skill level, hours worked, certifications, and so forth. On the other hand, person records contain personal information, and general information, such as workflow and purchasing information.

In the People application, the personal information is stored in database columns that are shared with the Labor application. You can use either the Labor application or People application to add or change the data in these fields.

Before you create a labor record, you must create a corresponding person record in the People application. A person record is unique within the database. A labor record is unique within an organization. A single person record can be listed on labor records in multiple organizations. However, a person record can only be listed on a single labor record within each organization.

Assignment of calendars to labor

A calendar specifies the days when work is performed and includes non-work days, such as weekends or holidays. You can assign a calendar to a labor record to specify the work days for a laborer. You can designate a shift to specify the work hours for the laborer.

A shift specifies the hours when work is performed. There can be one or more shifts associated with a given calendar.

You create calendars in the Calendars application.

Status of qualifications

When you no longer need a qualification record, you can change the status of that record to inactive.

When you associate a qualification with a labor record, the status of the qualification defaults to active. If necessary, you use the Change Qualification Status function to change the status of the qualification.

Zero year to date hours associated with labor

In the Labor application, you use the Zero Year to Date Hours action to track the hours that associated with a labor record during a calendar or fiscal year.

The year to date values are updated each time labor hours are reported for the laborer in one of the following applications:

- Activities tab of the Incidents application, Problems application, or Service Requests application
- Actual Labor tab of the Activities application, Changes application, Releases application, or Work Order Tracking application
- Labor tab of the Quick Reporting application
- Labor Reporting application

Typically you would only use this option at the end of the fiscal year.

Labor inventory locations

A labor inventory location maintains a balance of inventory items that were issued from a storeroom.

To issue inventory items or tools to a laborer, you use the Create Labor Inventory Location action to create a labor inventory location for that laborer. You use the Issues and Transfers application to issue or transfer inventory items and tools to locations.

For example, a mobile maintenance worker maintains an inventory of spare parts and tools in a vehicle. The worker would be responsible for the parts and tools until they are used on a work order or are returned to a storeroom.

Status of labor records

The status of a labor record indicates whether the record is active, inactive, closed, or canceled.

When you create a labor record, the status of the record defaults to active.

To change the status of one labor record, you use the Change Status action. To change the status of multiple labor records, you select the labor records and then use the Change Status action.

You cannot change the status of a labor record from active to inactive under the following conditions:

- The labor ID is listed on an assignment for a work order that is in any status except closed or canceled.
- The labor ID is listed on a job plan record.
- The labor ID is listed on a work plan for a work order that is in any status except closed or canceled.
- The corresponding person record has a status of active.

Deletion rules for labor

To meet your changing business needs, you can delete labor records.

When you delete a labor record, the qualification associations and qualification history are deleted. If a labor record is listed on another record, instead of deleting the labor record, change the status to inactive.

You cannot delete a labor record if the record meets any of the following conditions:

- The labor ID is listed on a work plan or an assignment for a work order that is in any status except closed or canceled.
- The labor ID is listed as a labor transaction for work order that is in any status except closed or canceled

Working with labor

Crafts are used to identify skill levels, standard rates, and premium pay codes for crafts in forecasting budget requirements. With crafts and qualifications in place, you can create job plans identifying the skill type required for each task, which helps in planning, scheduling, and assigning work.

- [Associating crafts with labor](#)
In the Labor application, you associate crafts and skill levels with a labor record. Crafts that are associated with labor indicate the skills that the laborer has. When you manage assignments, you can find available laborers with the appropriate skills.
- [Adding qualifications to labor](#)
A qualification indicates a particular job skill or specialized training. A qualification is often indicated by a license or certificate, signifying proficiency in a skill. You list qualifications on a labor record to indicate that the worker has completed general or specific training.

Associating crafts with labor

In the Labor application, you associate crafts and skill levels with a labor record. Crafts that are associated with labor indicate the skills that the laborer has. When you manage assignments, you can find available laborers with the appropriate skills.

Procedure

1. In the Labor application, select the labor record with which you want to associate a craft.
2. Click the Crafts tab.
3. Click New Row.
4. Specify a value for the craft.
The pay rate information is displayed in the Rate field.
5. Optional: Specify additional information for the craft, such as skill level, vendor name, and contract.
6. Save your changes.

Adding qualifications to labor

A qualification indicates a particular job skill or specialized training. A qualification is often indicated by a license or certificate, signifying proficiency in a skill. You list qualifications on a labor record to indicate that the worker has completed general or specific training.

Before you begin

You must create the qualification record in the Qualifications application. If the qualification requires a skill level, the laborer must have the matching skill level listed on the labor record.

About this task

You can associate any number of qualifications with an existing labor record in the Labor application. After you save the record, you cannot delete a qualification from the labor record. However, you can change the status of the qualification to inactive.

Procedure

1. In the Labor application, select the labor record with which you want to associate a qualification.
2. Click the Qualifications tab.
3. Click New Row.
4. Specify the qualification and the year that the laborer first acquired competence in the qualification.
5. Optional: Specify a value for the certificate number, and specify additional information about the certificate:
 - a. Press Tab key and specify the validation date for the certificate.
 - b. Specify the effective date of the certificate.
 - c. Specify additional information about the certificate, such as the individual who validated the certificate requirements and the organization that issued the certificate.
6. Save your changes.

What to do next

Some qualifications must be renewed periodically. You use the Extend/Renew Qualification function to renew an existing qualification for a labor record.

Qualifications

You use the Qualifications application to create qualifications and certification requirements for qualifications. A qualification is often indicated by a license or certificate that signifies proficiency in a particular skill.

Using corresponding labor records, you can associate individuals with a qualification. You can also view qualifications associated with a particular labor record and renew and change the status of qualifications.

- [Qualifications overview](#)
You can create qualifications and certification requirements for qualifications.
- [Working with qualifications](#)
You can track the qualifications associated with labor, and create qualifications and certification requirements for qualifications. You can also indicate that a laborer is qualified to perform a specific function and associate labor with qualifications.

Qualifications overview

You can create qualifications and certification requirements for qualifications.

- [Status changes](#)
When you no longer need to use a qualification record, you can change the status of that record to inactive.

Status changes

When you no longer need to use a qualification record, you can change the status of that record to inactive.

Qualification status changes

If you change the status of a qualification to inactive, that qualification cannot be associated with a labor record. However, labor records that are already associated with the qualification are unaffected by this change in qualification status.

In the Qualifications application, you use the Change Status action to change the status of qualifications.

Qualifications status changes for labor

You can change the status of a qualification associated with a labor record. The status change of the qualification is applicable only for that labor record; the overall status of the qualification is not changed.

Working with qualifications

You can track the qualifications associated with labor, and create qualifications and certification requirements for qualifications. You can also indicate that a laborer is qualified to perform a specific function and associate labor with qualifications.

- [Creating qualifications](#)
To track the qualifications associated with labor, you create qualifications and certification requirements for qualifications.
- [Associating labor with qualifications](#)
To indicate that a laborer is qualified to perform a specific function, you can associate labor with qualifications.

Creating qualifications

To track the qualifications associated with labor, you create qualifications and certification requirements for qualifications.

Procedure

1. In the Qualifications application, click New Qualification.
2. Optional: If the Qualification field is blank, enter a qualification identifier.
3. Optional: Enter a description of the qualification.
4. Specify the type of qualification.
5. Optional: Provide this information for the certificate:
 - a. If a certificate is required for the qualification, select the Certificate Required check box.
 - b. Specify values such as duration period and required use period.
6. Optional: In the Required Craft and Skill Levels table window, click New Row to specify prerequisite crafts for the qualification.
7. Optional: In the Tools That Require This Qualification table window, click New Row to specify tools that require operators to have this qualification.
8. Save the qualification record.

What to do next

Some qualifications must be renewed periodically. You use the Extend/Renew Qualification function to renew an existing qualification for a qualification record.

Associating labor with qualifications

To indicate that a laborer is qualified to perform a specific function, you can associate labor with qualifications.

Before you begin

To associate labor with qualifications, both the labor record and the qualification record must be active. The laborer also must have the prerequisite crafts and skill levels for the qualification listed on their labor record.

Procedure

1. In the Qualifications application, select the qualification record that you want to associate with a labor record.
2. Click the Associated Labor tab.
3. Specify a value for labor.
4. Specify the first year that the laborer acquired competence in the qualification.
5. Optional: Specify information regarding certification:
 - a. Specify a certificate number.
This information is read-only when the record is saved.
 - b. Specify the date that the qualification became effective.
 - c. Specify the date that the certificate was validated.
 - d. Specify additional information, such as the person who validated the certificate requirements and the organization that issued the certificate.
6. Save your changes.

People

You use the People application to create, to modify, to view, and to delete records for individuals. The People application stores information about individuals, such as users, laborers, asset owners, and supervisors who receive workflow notifications.

A person record is a record for an individual whose name could appear as a text field value. Workflow assignments are made to roles. All roles resolve to a person, to a person group, or to an e-mail address.

The name of a person is used as the text field value in the Reported By field or in the Affected Person field on a service request, in the Supervisor field on a labor record, or in a Ship To field or Bill To Attention field on a purchasing record.

You must create a person record for any individual who is assigned tasks as part of a workflow process. When you create records in the Labor application and in the Users application, you must create a person record. Person records might have to be created for other individuals who do not have records in the Labor application or in the Users application.

Person records that you create for use as part of workflow processes contain the values in the following fields:

Supervisor

The person who oversees or manages the individual. This information is used for escalations.

Primary E-mail

The E-mail address where notifications are sent.

Primary Calendar

The work calendar that the individual follows. This information is used when determining assignments and escalations.

Primary Shift

The shift that the individual works. This information is used when determining assignments and escalations.

Workflow E-mail Notification

The circumstances when the individual receive e-mail notifications for task assignments. The default value is PROCESS.

Workflow Delegate

The person identifier of the individual designated to receive assignments when the primary individual is unavailable for an extended time (for example, on vacation or on sick leave).

Delegate From and Delegate To

The time period when workflow processes route assignment to the delegate. If these fields are empty, all workflow assignments are routed to the delegate.

- [People overview](#)
The People application stores information about individuals, such as users, laborers, asset owners, and supervisors who receive workflow notifications.
- [Working with people](#)
You can create people records, change the status of people records, change the availability for people records, view the history of people records, and view related assets and locations.

People overview

The People application stores information about individuals, such as users, laborers, asset owners, and supervisors who receive workflow notifications.

- [Person statuses](#)
There are two person statuses: active and inactive. A person must be active to be assigned to a labor record or a user record. Inactive persons do not appear in select value lists.
- [Deletion of person records](#)
To manage the personal and official information for the individuals in your organization, you can delete person records. You can also change the status of a person record to inactive rather than delete the record.

Person statuses

There are two person statuses: active and inactive. A person must be active to be assigned to a labor record or a user record. Inactive persons do not appear in select value lists.

The default status of a person record is active.

You cannot change a person status to inactive if the person ID is listed:

- As a supervisor on another person record or job plan record
- As a custodian or a user for an asset or location
- On a ticket record as an owner
- On a communication template or a ticket template
- As a ship to contact or a bill to contact on a purchasing record
- As a member of a person group
- On an assignment or notification on an active workflow process

When you change the status of a person to inactive, the associated labor records and user records statuses are also changed to inactive. However, when you change the status of an inactive person to active, the status of the associated labor records and user records do not change. You must change the status of these records to active in the Labor application and Users application.

Deletion of person records

To manage the personal and official information for the individuals in your organization, you can delete person records. You can also change the status of a person record to inactive rather than delete the record.

You cannot delete a person record if the person ID is listed:

- On a user record or labor record
- Either as a supervisor on another person record or on a job plan record
- As a custodian or a user on an asset or location
- On a ticket record as an owner
- On a communication template or a ticket template

In the People application, you use the Delete Person action to delete person records.

Working with people

You can create people records, change the status of people records, change the availability for people records, view the history of people records, and view related assets and locations.

- [Creating person records](#)
To store personal and official information, you can create and maintain records about people in your organization, such as users, laborers, asset owners, supervisors, and individuals who receive workflow notifications.
- [Changing the status of multiple persons](#)
To manage the status of the people working in your organization, you can change the status of multiple persons to either active or inactive.
- [Changing availability for assigned work](#)
Using calendars, you can indicate when a person is available to be assigned work.
- [Viewing the history of persons](#)
Each time you change the status of a person record, a history transaction is listed. You can view a read-only history of these changes.
- [Viewing related assets and locations for persons](#)
You can associate a person record, as an owner or as a custodian, with an asset or location.

Creating person records

To store personal and official information, you can create and maintain records about people in your organization, such as users, laborers, asset owners, supervisors, and individuals who receive workflow notifications.

Before you begin

You create person records for any individual who could appear on another record. However, you must create a person record for each individual who has a labor or user record.

Procedure

1. In the People application, click New Person.
2. Optional: If the Person field is blank, type a unique person identifier.
3. Specify employee and workplace-related information.
If you change the First Name field or Last Name field, these changes overwrite the nickname in the Display Name field.
4. Optional: Type a nickname in the Display Name field.
5. Optional: Specify workflow and work order information, important dates, and procurement card details.
6. Click Save Person.

What to do next

The information in the Personal section of the person record is shared with the Labor and Users applications. You can enter or change the information in these fields from any of these three applications.

Changing the status of multiple persons

To manage the status of the people working in your organization, you can change the status of multiple persons to either active or inactive.

Before you begin

A person must have an active status to be assigned to a labor record or a user record. Inactive persons do not appear in select value lists, and cannot be assigned to new labor records or new user records.

Procedure

1. On the List tab in the People application, select the Select Records check box.
2. Select the check boxes for the person records that you are changing.
3. Select the Change Status action.
4. Specify a new status.
5. Optional: In the Memo field, type a reason for the status change.

6. Click OK.
7. Click Close.

Changing availability for assigned work

Using calendars, you can indicate when a person is available to be assigned work.

About this task

The calendar and shift determine a person's standard working hours.

Procedure

1. In the People application, access the person whose work hours you want to change.
2. Select the Modify Person Availability action.
3. In the Display From field in the Modify Person Availability window, select the starting date that you want the work dates to display from.
4. In the Work Dates table window, select the date that you want to change the availability for.
5. In the Modify Work Dates table window, change the values in the Start Time field, End Time field, and Work Hours field.
6. Specify a reason code.
7. Click OK.

Viewing the history of persons

Each time you change the status of a person record, a history transaction is listed. You can view a read-only history of these changes.

Procedure

1. In the People application, access the person record whose status history you want to view.
2. Select the View History action.
3. View the information and click OK.

Viewing related assets and locations for persons

You can associate a person record, as an owner or as a custodian, with an asset or location.

About this task

After you create these associations in either the Locations application or Assets application, you can view a read-only list of assets and locations associated with the person record.

Procedure

1. In the People application, access the person's record whose assets and locations you want to view.
2. Select the View Related Assets and Locations action.
In the View Related Assets and Locations window, you can view the assets and locations information.
3. Click OK.

Person Groups

You use the Person Groups application to manage the groups of workers within your organization.

A person group can be the recipient of a document that is routed by a workflow process. If a document is routed to a person group, everyone in the group receives the document, unless you configure the process to send the document only to the person whose calendar indicates availability.

A primary member of a group who is designated as a group default cannot be deleted.

You can assign roles to person groups using the Roles application. You can also use the Work Order application to assign a person group to a work order or use the Service Requests/Incidents/Problems application to assign a ticket to a person group.

- [Person group overview](#)

A person group consists of people who might or might not be workers. After you create a person group, you can designate it as a work group, an owner group on a work order, or an owner group on a ticket.

- [Working with person groups](#)

You can create, view, and change person records. A person group can be the recipient of a document routed by the Workflow application.

Person group overview

A person group consists of people who might or might not be workers. After you create a person group, you can designate it as a work group, an owner group on a work order, or an owner group on a ticket.

- [Person groups](#)

A person group is a list of individuals with similar job responsibilities, levels of authority, and security clearances. When person groups are defined, responsibility for records such as tickets and work orders, can be assigned to a group. A person group can also receive a record routed by a workflow process.

- [Deletion rules for person groups](#)

As your business needs change, you can delete person groups.

Person groups

A person group is a list of individuals with similar job responsibilities, levels of authority, and security clearances. When person groups are defined, responsibility for records such as tickets and work orders, can be assigned to a group. A person group can also receive a record routed by a workflow process.

The member of the group who receives a routed record depends on the calendar and shift. For example, if a purchase order or a work order is routed to a person group, everyone in the group can receive the record unless the workflow process is configured to send it only to the member whose calendar shows that he or she is available. When you create person groups, you also can define one or more alternates for each person in the group.

Deletion rules for person groups

As your business needs change, you can delete person groups.

In the Person Groups application, you use the Delete Person Group action to delete person groups.

You cannot delete a person group if the person group ID meets any of these conditions:

- The person group ID is listed on a work order or ticket that is in any status except closed or canceled.
- The person group ID is listed on any activities on a ticket template with a status of active.
- The person group ID is listed on a communications template or a ticket template.
- The person group ID is listed on a service group as the contact group.
- The person group ID is listed on a preventive maintenance record or job plan record.
- The person group ID is listed on an assignment or notification on an active workflow process.
- The person group ID is listed on an organization record as the site contact group.

Working with person groups

You can create, view, and change person records. A person group can be the recipient of a document routed by the Workflow application.

- [Creating person groups](#)

You use the Person Groups application to create groups of people. After you create these groups, you can assign the groups ownership of tickets and work orders.

- [Specifying alternate persons for notifications and workflows](#)

To ensure availability, you can specify alternate persons for notifications and workflow assignments.

Creating person groups

You use the Person Groups application to create groups of people. After you create these groups, you can assign the groups ownership of tickets and work orders.

Procedure

1. In the Person Groups application, click New Person Group.
2. In the People table window, click New Row to add persons to the group.
You can add a person multiple times to a person group within the same level, such as within multiple sites or within several organizations.
3. Specify a value for the person.
4. Optional: To use the person for a specific organization or site, specify a value in the Use for Organization field or Use for Site field.
These values are used to determine whether to route a workflow assignment or a notification to a specific person at an organization or site.
5. Optional: To designate default settings for the person, select these options:
 - a. To designate the person as the default person for an organization or a site, select the Organization Default checkbox or Site Default check box.

- You can designate only one person as the default for each organization and each site. If you do not select this option, the group default is used.
- b. To designate the person to be the default person for the group, select the Group Default checkbox.
If you do not select this option, the first person added to the group becomes the group default.
 6. In the Sequence field, specify a numeric value to indicate the assignment sequence for the person.
 7. Optional: In the Alternates table window, click New Row to add people as alternates for notifications and workflow assignments.
 8. Save your changes.

Specifying alternate persons for notifications and workflows

To ensure availability, you can specify alternate persons for notifications and workflow assignments.

About this task

You can specify alternate persons for each primary member in the person group. Each primary member can have one or more alternate persons.

Procedure

1. In the Person Groups application, select the person group for whose members you want to specify alternates.
2. In the People table window, select the person for whom you want to specify alternate persons.
3. In the Alternates For table window, click New Row to add alternate persons.
4. Specify a person identifier.
When you enter the person identifier, the following information is displayed: name of the person, the calendar, and shift information.
5. In the Sequence field, specify a numeric value to indicate the assignment sequence for the person.
6. Save your changes.

Crafts

You use the Crafts application to define craft records for a work plan, and to define skill levels, standard rates, and premium pay codes for crafts. The craft code reflects the type of work that employees and contractors perform.

You also can:

- Associate labor records with crafts and skill levels
- Specify multiple skill levels for each craft

To distinguish between a junior level mechanic and a senior level mechanic, you do not create two separate craft records. You can create a one mechanic craft record and set up junior and senior skill levels within the mechanic craft. Each skill level within the mechanic craft can have different standard rates.

- [Crafts overview](#)
Craft records define skill levels, standard rates, and premium pay codes for crafts.
- [Working with crafts](#)
You create craft records to define skill levels, standard rates, and premium pay codes for crafts. You can associate craft records with labor records.

Crafts overview

Craft records define skill levels, standard rates, and premium pay codes for crafts.

- [Standard rates and premium pay codes](#)
In the Crafts application, you can specify standard rates for each craft, and add premium pay codes for premium pay rates.
- [Disassociation of labor records from craft records](#)
Crafts that are associated with labor indicate the skills that the laborer has. If a laborer no longer has a craft, you can disassociate that craft from a labor record. When you manage assignments, you can find available laborers with the appropriate skills.
- [Deletion rules for crafts](#)
As your business needs change, you can delete craft records from the database.

Standard rates and premium pay codes

In the Crafts application, you can specify standard rates for each craft, and add premium pay codes for premium pay rates.

Standard rates

Standard rates are used as default rates for a work plan. The following rules apply to standard rates:

- You can specify a standard rate as a general rate for a craft.
- You can specify standard rates for each skill level within a craft.

- You can establish standard rates for external vendors (with or without labor contracts) for crafts and for skill levels within a craft.

Premium pay codes

You can define premium pay codes to reflect situations in which the cost of the labor that is being reported needs to be increased, such as overtime pay, skill pay, or hazardous duty. The following rules apply to premium pay codes:

- Before you can associate premium pay codes with a craft, you must define the premium pay codes.
- You can establish any number of premium pay types and rates for each craft record.
- Premium pay can be calculated as a multiplier, an increment, or as an hourly amount.
- If a premium pay code is defined as applying to all new crafts, the pay code is displayed in the Premium Pay table window of new crafts.

Disassociation of labor records from craft records

Crafts that are associated with labor indicate the skills that the laborer has. If a laborer no longer has a craft, you can disassociate that craft from a labor record. When you manage assignments, you can find available laborers with the appropriate skills.

The following rules apply to disassociating labor records from craft records:

- When you disassociate a labor record from a craft, the labor record is not deleted from the database.
- If a default craft is the only craft with which a labor record is associated, you can disassociate that labor record from its default craft.

Deletion rules for crafts

As your business needs change, you can delete craft records from the database.

The following rules apply to deleting craft records:

- Before you delete a craft record, you must delete all of the skill levels within that craft.
- You cannot delete a craft record that is referenced by job plans, labor contracts, or open work orders.

Working with crafts

You create craft records to define skill levels, standard rates, and premium pay codes for crafts. You can associate craft records with labor records.

- [Creating crafts](#)
You create craft records in the Crafts application. Craft records define the type of work performed by employees and contractors, and provide detailed information about standard rates, skill levels, and premium pay codes associated with crafts.
- [Associating labor with crafts](#)
In the Crafts application, you associate labor records with an existing craft. Crafts that are associated with labor indicate the skills that the laborer has. When you manage assignments, you can find available laborers with the appropriate skills.

Creating crafts

You create craft records in the Crafts application. Craft records define the type of work performed by employees and contractors, and provide detailed information about standard rates, skill levels, and premium pay codes associated with crafts.

Procedure

1. In the Crafts application, click New Craft.
2. Optional: If the Craft field is empty, enter a value.
This value must be unique within an organization.
3. Enter the standard rate for the craft, irrespective of the skill level.
4. Optional: In the Skill Levels table window, click New Row and specify information for skill level, rank, and standard rate.
5. Optional: In the Outside Rates table window, click New Row and specify information for external vendors for the craft or a particular skill level:
 - a. Specify a skill level, vendor, and standard rate for the vendor.
 - b. Select a contract for a vendor.
If a contract exists, you can change the standard rate only if the contract has not been approved. To create new contracts, use the Labor Rate Contracts application.
6. Optional: In the Premium Pay table window, click New Row and specify premium pay codes and rate types, and change the rates.
7. Save the craft record.

Associating labor with crafts

In the Crafts application, you associate labor records with an existing craft. Crafts that are associated with labor indicate the skills that the laborer has. When you manage assignments, you can find available laborers with the appropriate skills.

About this task

For a work order, specifying a skill level helps to determine the rate that is charged by the labor code, based on the level of expertise. When you specify a skill level, the standard rate for the skill level overwrites the craft rate in the Standard Rate field and Rate field.

Procedure

1. In the Crafts application, select the craft record with which you want to associate a labor record.
2. Click the Associated Labor tab.
3. Click New Row.
4. Specify values for labor, skill level, and rate.
5. Optional: To have the labor rates default to the rate and rate type from the standard and premium pay rates, select the Inherit check box.
When the check box is selected, the Rate field becomes read-only.
6. Optional: Specify a vendor and a contract.
You can associate a labor record with a contracted rate only if the contract is approved.
7. Save your changes.

Crew Types

A crew type consists of the required positions, qualifications, and tools that are required to perform a specific type of work. You can assign crew types anywhere that you can assign a craft and skill level.

Hourly rates are applied to crew types to calculate the cost of the work performed by the crew type. The hourly rate for the crew type is used to build job plans to estimate the cost of work, unless an override hourly rate is specified. The hourly rate is automatically updated whenever a change is made to a required position.

A craft and skill level combination corresponds to the minimum labor requirement for the position. A craft and skill level defines a type of labor resource that is used to calculate costs. For example, an overhead line crew type (OHLINE) consists of the following positions: one lineman, a helper, a bucket truck, and a utility trailer. The resources are used to calculate the estimated cost.

Qualifications are skills or certifications that can be specific to a position or appropriate for any crew member. Tools, such as vehicles, are often required to perform the work. Some tools require their users to hold associated qualifications. You also can view qualifications that are associated with any of the tools assigned to the crew type.

You can use the crew type to build a job plan in the Job Plans or Work Order applications. The crew type must have a status of active before it can be used in other applications.

The positions, qualifications, and tools for a crew type are copied to a crew record when you are creating a crew.

- [Defining crew types](#)
Crew types are used as templates to create crews within the Crews application for planning and estimating work.

Defining crew types

Crew types are used as templates to create crews within the Crews application for planning and estimating work.

Procedure

1. In the Crew Types application, open a new crew type.
2. Specify the name, status, and organization for the crew type.
For example, CrewType1 has an hourly rate of \$100 an hour, is active, belonging to Organization XYZ.
3. Open a new row and specify the crafts, qualifications, and tools that are required for the crew type.
4. Save the crew type.

Crews

You define crews from crew types and assign labor and tool resources to manage the crews.

- [Crews](#)
A crew consists of labor and assets that are required to perform work. You use a crew type to build your crew and then assign the required positions, qualifications, and assets that the crew needs.
- [Creating crews](#)
A crew record specifies the positions, the qualifications, and the tools that are required to perform the assigned work of that crew. You create a crew record to assign these resources to the crew and schedule the time and shift patterns of the crew.
- [Assigning crews and labor to work](#)
When you assign a crew or labor to work orders or job plans, the requirements are matched to the requirements of the work order.

- [Reporting crew work hours](#)

You can report the hours that a crew worked, the assets that it used, and which work order it did. You can change the crew record if the labors who were originally assigned to the crew did not do the work. Modifying a crew record to report actuals does not change the original crew.

Crews

A crew consists of labor and assets that are required to perform work. You use a crew type to build your crew and then assign the required positions, qualifications, and assets that the crew needs.

When you create a crew, you associate the crew with a calendar and shift. Crew records can be different from the original crew type.

The positions have craft and skill level requirements associated with them, which are the minimum standard for that position. There should be one position for each permanent member of the crew. An individual crew record can add additional positions that were not included in the crew type.

You can assign labor to positions on a crew. A labor can be assigned to only one crew at a time. You can also create overlapping assignments, by assigning multiple labors to the same position for the same time period. Overlapping assignments is useful when, for example, you must add another person to the crew temporarily. You can assign internal labor or outside labor (contractor) to a crew. When you create an overlapping assignment, you can replace the first labor with the second labor or assign both labors to the position.

You assign labor and assets to crews in the Crews application, or you can assign them graphically using the Graphical Crew Management application.

Crews can be assigned anywhere that you can assign a labor, and reporting for the crew can also be done in the same locations.

- [Crew tools](#)

A tool is a type of inventory item that is associated with a specific asset, such as a bucket truck, fork lift, or trencher. Tools can be associated with a crew to perform a specific type of work.

- [Crew statuses](#)

The status of a crew record indicates whether the record is active or inactive.

- [Crew availability](#)

You configure crew availability two ways. One is to define the availability factor for crews, which defines the percentage of a day that the crew is available to work. The second way is to modify availability by specifying times that a crew is unavailable, off sick, or working extra time.

Crew tools

A tool is a type of inventory item that is associated with a specific asset, such as a bucket truck, fork lift, or trencher. Tools can be associated with a crew to perform a specific type of work.

A tool rate defines the cost of an asset. A tool sequence identifies the generic title of a tool, and acts like a placeholder for the tool that is assigned to the crew. The tool sequence must be unique within the crew in an organization.

The asset is identified by a unique asset number. An asset is the unique item that is being used by the crew. For example, a tool might be a truck, and the asset might be the truck with vehicle identification number (VIN) 984887. An asset that is assigned to a crew has a specific start date and an optional end date.

You can define a rate for a tool and for an asset. If a rate is entered for an asset, it overrides any rate specified in the tool rate.

Crew statuses

The status of a crew record indicates whether the record is active or inactive.

If a crew is referenced by an active work order or job plan, you cannot change its status to inactive. When you change the status of a crew from active to inactive, all the assignments of labor and assets for that crew end.

Crew availability

You configure crew availability two ways. One is to define the availability factor for crews, which defines the percentage of a day that the crew is available to work. The second way is to modify availability by specifying times that a crew is unavailable, off sick, or working extra time.

You can configure the availability factors for crews by using the Crew Assignment Options action in the Organizations application. You determine crew availability to calculate the time that is available to complete work. For example, an availability factor of .80 means that crews are available for work assignments 80% of the time. The other 20% of time might be used for meetings or administrative work. The availability factor applies to all crews for every day, and not to a specific crew or a specific date and time.

In the Crews application, you modify crew availability for planning purposes using the Modify Availability action. You update when a crew is available so that you can assign work to them. You can modify the work hours of a crew for a specific day, such as adding extra-hours, sickness time, and vacation. For unplanned or emergency work, you can modify availability to add the extra hours to a shift, and then assign the task to the labor or crew.

Creating crews

A crew record specifies the positions, the qualifications, and the tools that are required to perform the assigned work of that crew. You create a crew record to assign these resources to the crew and schedule the time and shift patterns of the crew.

Before you begin

Define a crew type in the Crew Type application.

About this task

The positions, qualifications, and tools for that crew type are copied to the crew record. The default status of a crew is active.

Procedure

1. In the Crews application, click New Crew and specify the crew name and description.
2. Specify the crew type.
3. Optional: Modify the crew requirements, such as the craft, qualifications, and tools.
4. On the Assigned Labor tab, click New Row and assign labor to the required positions. Or, you can enter an unrestricted row to resolve any assignment conflicts automatically.
5. Optional: Specify assets for tool requirements.
6. Save the record.

Assigning crews and labor to work

When you assign a crew or labor to work orders or job plans, the requirements are matched to the requirements of the work order.

Procedure

1. In the Assignment Manager application, filter the work list to display the work orders to which you want to assign a crew or labor.
2. Select the work orders to which you want to assign a crew or labor.
3. Select the crew or labor to which you want to assign the work.
4. From the Select Action menu, assign a crew or labor to the work order.
The work list is updated with the name of the labor or crew who perform the work.
5. Add other details of the assignment, such as the start and end dates of the work order.
6. Save the record.

Reporting crew work hours

You can report the hours that a crew worked, the assets that it used, and which work order it did. You can change the crew record if the labors who were originally assigned to the crew did not do the work. Modifying a crew record to report actuals does not change the original crew.

About this task

You can report the hours that a crew works in any application where you can report actuals for labors.

Procedure

1. In the Work Order Tracking application, report the hours that a crew worked. On the Actuals tab, select the Labor tab, and then select Enter Time By Crew.
When you enter hours by crew, one labor record for each labor, and one tool record for each asset that is assigned to the crew are created. You can adjust labor and crews by adding or deleting those records.
2. Specify the crew that did the work, and the date of the work.
3. Refresh the screen to display the labor, tools, and work orders that are associated with the crew.
4. Optional: Modify the labor, tools, and work order data.
5. Click OK to save the record.

Bulletin Board

In the Bulletin Board application, you can create messages about critical problems and incidents that you can broadcast throughout the organization. You can also view communication logs from service desk agents and their users, and communications that are generated by workflow processes and escalations.

You can specify an audience for a message. If you do, only members of that audience can see the message. You also specify the date and time for the message to appear and to expire.

Recipients can view bulletin board messages from the navigation bar of an application or from the Start Center.

Communication Templates

You use the Communication Templates application to create and manage communication templates. These templates can be used to standardize frequently used email communications (which are also known as notifications).

You can use communication templates in the following ways:

- You can add file attachments or document folders to communication templates. When an email communication is sent, the attachments are included in the email communication, either in a folder or in an attachment.
- You can use communication templates with the workflow process. For example, you might have a workflow process for purchase requisitions that uses a communication template. When a user submits a request for a notebook, the purchase request enters the workflow and must be approved by an immediate supervisor. When the purchase request is approved, the status is set to approved. An email communication is then sent out using the communication template to the user who submitted the request.
- You can use communication templates with the escalation process. For example, when a service desk agent does not complete assignments within six hours, you can create an escalation configuration that uses communication templates. The assignment is escalated to the supervisor, and the supervisor receives an email communication.
- Service desk agents can create and send email communications from the ticket applications (the Service Requests application, the Incidents application, and the Problems application). These email communications are sent by using standardized information from communication templates. The recipients of the email communications can respond. The service desk agents can view the two-way dialog in the communication log in the ticket applications.

Report Administration

You use the Reports Administration application to view report listings, set report security, and specify the availability of reports and how they open, run, and print.

- [Report development](#)
Reports display important information to help your organization analyze the data that Maximo® Manage generates. The embedded reporting tool is Business Intelligence and Reporting (BIRT). In the Manage Report Development Guide, you can find information on how to install and configure the BIRT report designer, and develop and extend reports. You can also integrate your Manage system with Cognos® or external reporting systems.
- [Administering reports](#)
You can add reports and data sources, configure reports, manage security, and monitor report performance so that users can quickly analyze Manage data.
- [Ad hoc report administration](#)
You can specify which users can create and run ad hoc reports and define the types of analysis that users can perform.
- [Ad hoc report creation](#)
You can quickly create reports to get information for your business needs.

Report development

Reports display important information to help your organization analyze the data that Maximo® Manage generates. The embedded reporting tool is Business Intelligence and Reporting (BIRT). In the Manage Report Development Guide, you can find information on how to install and configure the BIRT report designer, and develop and extend reports. You can also integrate your Manage system with Cognos® or external reporting systems.

Administering reports

You can add reports and data sources, configure reports, manage security, and monitor report performance so that users can quickly analyze Manage data.

- [Adding reports](#)
After creating a report, use the Report Administration application to register the report to the database so the user can access and run it. If you use the `reports.cmd` command to import all reports, libraries, and resource files, do not individually add reports through this procedure.
- [Report management](#)
You can prevent users from previewing, creating, or running reports that might affect system performance. Reports can affect system performance if users schedule unnecessary reports, or run reports against too many records or application records, or preview and run reports that query too many records. To prevent users from exporting reports in formats that your organization does not permit, you can define report export options.
- [Importing reports](#)
Import a BIRT Report Design file (the report file) to either add a new report or bring an updated version of an existing report into your database. Before you import the design file, you must import any associated library files.
- [Importing library files](#)
Library files contain components that you can use in report designs to provide consistent behavior and performance. Library files are useful when many reports use the same component multiple times. You import a library file before you import the corresponding reports.
- [Adding data sources](#)
You add data sources so you that can run reports on a reporting or subordinate database.
- [Setting report file security](#)
You can set security for each report to determine which groups have access.
- [Setting application security](#)
You can set security for each application to determine which groups have access to reports in that application.
- [Running reports using request pages](#)
When you run a report, use the Request Page dialog box to enter parameter, schedule, and e-mail information. Enter this information to specify the details of the report, when it will be run, and who will receive it.

- [Creating browser shortcuts for reports](#)

You can create a shortcut so the user can click an icon in the application toolbar to open a report in the browser.

- [Enabling the printing of attached documents](#)

To print Microsoft Office documents with a report, you must enable ActiveX controls through Internet Explorer. You can print Microsoft Office documents that have the following document extensions: .doc, .ppt, and .xls.

Adding reports

After creating a report, use the Report Administration application to register the report to the database so the user can access and run it. If you use the `reports.cmd` command to import all reports, libraries, and resource files, do not individually add reports through this procedure.

Procedure

1. Click the New Report icon.
2. In the Report File Name field, type the file name of the report, with the file extension, exactly as you created it in the report designer.
3. In the Report Type field, select the type of report.
4. In the Application field, enter the application that end users use to run this report. The application name you select determines the application from which the user can access the report and the attribute names of any report parameters.
5. Select the Report Folder field. This field defaults to the value you enter in the Application field.
6. Optional: To add a parameter-based report, add a new row and enter parameter information.
After you register parameters, the end user can use those parameters to have the system filter data. The report generates only the information that the end user needs.
7. Save the report.
8. Generate the request page to apply the changes.

Report management

You can prevent users from previewing, creating, or running reports that might affect system performance. Reports can affect system performance if users schedule unnecessary reports, or run reports against too many records or application records, or preview and run reports that query too many records. To prevent users from exporting reports in formats that your organization does not permit, you can define report export options.

Application record limits

You can set the maximum number of application records that users can select when they run application reports. In the Report Administration application, open the report. On Report tab, in the Settings section, limit the number of application records that users can select. You can limit application records only for reports without parameters.

Security group limits

To stop the unnecessary execution of huge reports on the report server, you can set report server records limits for users in each security group. The limit includes the application records that the report runs against and any associated child and grandchild records. If a user runs a report and the report server records limit is reached before the report completes, the report execution stops. To set report server records limits select the Set Security Group Limits action. Select the security group, and specify the report server records limit.

To help users manage their scheduled reports more efficiently, and prevent them from scheduling unnecessary reports, you can set a maximum number of scheduled reports for users in each security group. To set scheduled report limits, select the Set Security Group Limits action. Select the security group, and specify the maximum number of scheduled reports.

To prevent the execution of large ad hoc reports while they are being created, you can set the maximum number of application records that power users can preview. To set the ad hoc report records limit, select the Set Security Group Limits action. Select the security group, and specify the maximum number of ad hoc report records that users can preview.

Report cancellation

To maintain system performance, you can monitor reports that are running or respond to escalations that alert you to long-running reports. To monitor reports that are still running select the View Report Processing action. In addition, the REPORTLONG escalation automatically notifies you about reports that are taking too long to complete. The REPORTLONG escalation is configured to automatically notify users in the RPTADMIN role, which is assigned to the REPORTADMIN security group, when reports are running longer than is specified in the escalation.

Report file formats

Users can export files when they execute reports. To specify the file formats that users can export reports to, select the Set Report File Export Options action. Select the default export file format and the export file formats that users can select. After you define the report file formats that users can select, you must restart any servers on which reports are enabled.

Importing reports

Import a BIRT Report Design file (the report file) to either add a new report or bring an updated version of an existing report into your database. Before you import the design file, you must import any associated library files.

Procedure

1. Select the Import Report action.
2. In the Report Design File field, enter the location of the report file you are importing.
3. In the Report Resource File field, enter the location of any resource files, which contain items such as images or external files.
4. Save your changes.

Importing library files

Library files contain components that you can use in report designs to provide consistent behavior and performance. Library files are useful when many reports use the same component multiple times. You import a library file before you import the corresponding reports.

About this task

This procedure applies only to BIRT reports.

Procedure

1. Select the Import Library File action.
2. Optional: In the Existing Library File field, enter the file name of the library. Use this field to import an updated version of a library file.
3. In the Library File field, enter the file location.
4. Optional: In the Report Resource File field, enter the location of any resource files. Resource files contain items such as images or external files.
5. Save your changes.

Adding data sources

You add data sources so you that can run reports on a reporting or subordinate database.

Procedure

1. Select the Configure Data Sources action.
2. Complete the following fields.
 - Data Source Name – The Source Name of the Database on which you want to run reports. You can run reports against any type of database that has a JDBC driver.
 - Database URL – the JDBC connection URL of the database. This URL will vary depending on the database you connect to.
 - Database Driver – the JDBC driver defined for that database.
 - Database User Name – the database user name the server uses to attach to the database server.
 - Database User Password – the password for the Database User Name.
3. Save your changes.

Setting report file security

You can set security for each report to determine which groups have access.

Procedure

1. Select a report.
2. In the Security tab, add a row to the Report Level Security section.
3. Enter a group name in the Group field.
4. Save your changes.

Setting application security

You can set security for each application to determine which groups have access to reports in that application.

Procedure

1. In the Report Administration application, select Set Application Security.
2. In the Applications section, select an application, and add a new row.

3. In the Application Level Security section, you can add, change, or delete security settings for a group.
4. Save your changes.

- **Setting all application security**

You can quickly enable and remove access to reports for security groups in all applications.

Setting all application security

You can quickly enable and remove access to reports for security groups in all applications.

Procedure

1. Select the Set All Application Security action.
2. Specify a security group.
3. Select the type of report that you want to set access for.
For example, to enable access to BIRT Reports, select the BIRT Reports check box.
4. Save your changes.

What to do next

If you need to remove access to reports for security groups in all applications, select the Remove All Application Security action, and specify the security groups and reports.

Running reports using request pages

When you run a report, use the Request Page dialog box to enter parameter, schedule, and e-mail information. Enter this information to specify the details of the report, when it will be run, and who will receive it.

Procedure

1. In the Parameters section, specify the information to appear on the report. You must specify information for all required parameters.
2. Select a schedule option.
3. If you selected a schedule option that will run the report in the future, enter the e-mail information.

Creating browser shortcuts for reports

You can create a shortcut so the user can click an icon in the application toolbar to open a report in the browser.

About this task

You can create a shortcut only for reports without parameters, such as the Work Order Details report.

Procedure

1. Select a report that has no parameters.
2. In the Toolbar Sequence field, enter a number.
For example, if you type 1, the icon for this report appears first in the application toolbar. The system validates the number that you enter. You cannot use the same number more than once.
3. Select the Browser View of Report check box.
4. In the Browser View Location field, enter a value. This field determines the application tabs that have an active Browser View icon.
5. Save your changes.
If you have not previously configured this report to open in your browser, generate the request page.

Results

To check the shortcut, go to the application and locate the Browser View icon on the toolbar. Move the cursor over the icon to see the report name as the tool tip. Users can click this icon to open the selected report in the report browser.

- **Creating printing shortcuts for reports**

When you create a printing shortcut on the application toolbar, you can click the icon once to print a report, instead of clicking multiple times. You can add this function only for those reports without parameter, such as the Work Order Details report.

- **Creating a printing shortcut for reports with attached documents**

When you add the Direct Print with Attachments icon to an application toolbar, you click the icon once to print a report with attachments, instead of clicking multiple times. You can add this function only for those reports without parameters, for example the Work Order Details report.

Creating printing shortcuts for reports

When you create a printing shortcut on the application toolbar, you can click the icon once to print a report, instead of clicking multiple times. You can add this function only for those reports without parameter, such as the Work Order Details report.

Procedure

1. Select a report that has no parameters.
2. Select the Limit Records check box.
3. In the Max Record Limit field, enter the maximum number of records on which a user can run the report.
4. In the Toolbar Sequence field, enter a number to indicate the position of the icon on the toolbar
5. Select the Direct Print check box.
6. In the Direct Print Location field, specify a value.
7. Save the report.
8. If you have not previously configured this report for direct printing, generate the page.

Creating a printing shortcut for reports with attached documents

When you add the Direct Print with Attachments icon to an application toolbar, you click the icon once to print a report with attachments, instead of clicking multiple times. You can add this function only for those reports without parameters, for example the Work Order Details report.

About this task

Attached document files with the following file extensions cannot be printed:

- .ppt
- .pptx

Procedure

1. Select a report that has no parameters.
2. Select the Limit Records check box.
3. In the Max Record Limit field, enter the maximum number of records on which a user can run the report. This value can be any number greater than zero.
4. In the Toolbar Sequence field, enter a number for the order in which the icon should appear in the toolbar.
5. Select the Direct Print with Attachments check box.
6. In the Direct Print with Attachments Location field, specify a value.
7. Save the report.
8. If you have not previously enabled this report for direct printing of attached documents, generate the request page.

Enabling the printing of attached documents

To print Microsoft Office documents with a report, you must enable ActiveX controls through Internet Explorer. You can print Microsoft Office documents that have the following document extensions: .doc, .ppt, and .xls.

Before you begin

In addition to configuring ActiveX controls in your browser, you must also ensure that the Global Value field in the mxe.activex property is set to 1. Use the System Properties application to set this value.

Procedure

1. In Internet Explorer, select Tools, Internet Options to open the Internet Options window.
2. On the Security tab, click Custom Level to open the Security Settings window.
3. Enable the following ActiveX controls and plug-ins:
 - Automatic Prompting for ActiveX controls
 - Binary and script behaviors
 - Download signed ActiveX controls
 - Download unsigned ActiveX controls
 - Initialize and script ActiveX controls not marked as safe
 - Run ActiveX controls and plug-ins
 - Script ActiveX controls marked safe for scripting
4. Save your settings.
5. Click Trusted Sites, and click Sites to open the Trusted Sites window.
6. In the Add this Web site to the zone field, type the application URL from which you expect to receive attachments.
7. Click Add.

Ad hoc report administration

You can specify which users can create and run ad hoc reports and define the types of analysis that users can perform.

Ad hoc report permissions

Too many ad hoc reports can drain database and application server resources. Therefore, to avoid unnecessary reports, you must carefully manage which security groups can create and run ad hoc reports. You enable security groups to run ad hoc reports or create ad hoc reports, or both, for each application. In the Security Groups application, select a security group, and in the Applications tab, specify an application, and select Run Reports and Create Reports.

Calculation expressions

You can enable calculation expressions in ad hoc reports for each application so that users can perform deeper analysis of data. You enable calculation expressions for each security group. In the Security Groups application, select a security group, and in the Applications tab, specify an application, and enable the calculate tab on ad hoc reports.

Summary expressions

You can enable summary expressions in ad hoc reports for each application so that users can create aggregate functions on fields to simplify their analysis. You enable summary expressions for each security group. In the Security Groups application, select a security group, and in the Applications tab, specify an application, and enable the summarize tab on ad hoc reports.

Ad hoc report expression library

You define an expression library for users to select from when they create ad hoc reports. By defining an expression library, you can ensure that when users create calculation expressions, they can select only SQL expression values that are permitted by the organization. Only specific report administrators must define the expression library. To define the expression library, the ad hoc expression library must be enabled for the report administrator's security group. In the Security Groups application, select the report administrator's security group, and enable the ad hoc expression library. In the Report Administration application, select the Define Ad Hoc Reporting Library action, and define the expression keywords that users are permitted to use.

Ad hoc report creation

You can quickly create reports to get information for your business needs.

You can create ad hoc reports from applications so that the data is filtered for that specific application. If you created an advanced search query in an application, you can apply this query to the report. You can specify the style of the report; select the categories and fields to include; develop calculations; aggregate functions to summarize data; format the report by filtering, grouping, and sorting information; and schedule the report. After you create a report, you can download the data into other formats, such as Microsoft Excel.

To access reports that you created, select the Run Report action. You can run, edit, or delete reports that you select, and specify the users to receive a copy.

Conditional Expression Manager

The Conditional Expression Manager application is a library of conditional classes and expressions. You can apply the conditions to fields, tabs, and other user interface controls in applications to control the presentation. You can also apply conditions to security groups to control access to applications, controls, and data.

Conditions can be class-type or expression-type. Class type expressions are specified in a file. Expression type conditions are entered into the condition library using the expression syntax.

- [Creating conditional expressions and classes](#)

You can create conditional expression-type and class-type conditions. Then you can apply the conditions to control access to data and to user interface controls.

- [Conditional expression syntax](#)

You enter conditional expressions using a syntax similar to Structured Query Language (SQL) with some additional variables.

- [Sample conditional class files](#)

Sample condition class files are stored in a folder under the root directory of the product installation. You can use the sample files when you create class-type conditions.

Creating conditional expressions and classes

You can create conditional expression-type and class-type conditions. Then you can apply the conditions to control access to data and to user interface controls.

About this task

To handle complex operations with multiple conditions, you can create an automation script that contains the condition logic. For more information, see [Automating routine tasks with automation scripts](#). Then, you can create a single condition that references the automation script and applies the condition as needed.

Procedure

- In the Conditional Expression Manager, add a row and change the auto-generated Condition identifier to a meaningful identifier. Enter a complete description of the condition in the Description field.
A meaningful identifier and a complete description help you identify a condition later.
- Select the condition type and enter the condition.
 - If you selected expression type, enter an expression, or click Condition Expression Builder to build an expression in the Condition Expression Builder.
 - If you selected class type, enter the class file name. The file must be in a folder under the root of the product folder, for example `Maximo_home\maximo\samples`
- Save the condition.

Conditional expression syntax

You enter conditional expressions using a syntax similar to Structured Query Language (SQL) with some additional variables.

When you create a conditional expression, use a colon (:) to define a variable. The colon is used to avoid ambiguity when you create expressions that relate the current record to a different, specific record.

You can have subselect in an expression,

```
exists (select 1 from workorder where wonum=:wonum).
```

The first `wonum` is the `wonum` attribute on the work order object. At run time, the second `wonum` is replaced with the value of the `wonum` attribute for the current record.

Replacement variables

Syntax	Description	Comments
<code>:yes</code>	true	Logically true, 1 if stored in the database
<code>:no</code>	false	Logically false, 0 if stored in the database
<code>&date&</code>	Current® date	
<code>&datetime&</code>	Current date and time	
<code>&user&</code>	Logged in user	For example, if a user is signed in as Smith, <code>:owner.id=&user&</code> converts to <code>:ownerid='SMITH'</code>
<code>&personid&</code>	Person ID of logged in user	For example, if a user is logged in as Smith, <code>:reportby=&personid&</code> converts to <code>:reportby='SMITH'</code>
<code>&appname&</code>	Application name	For example, in the Work Order Tracking application, <code>&appname& = WOTRACK</code> converts to <code>WOTRACK = WOTRACK</code> . This variable is useful for setting different behavior for different copies of an application.
<code>&mboname&</code>	Name of the current business object	For example, in the work order object, <code>object = &mboname&</code> converts to <code>object = WORKORDER</code>
<code>&ownername&</code>	Name of the owner business object	For example, in the Work Order Tracking application, <code>&ownername&.jobplan.priority>&ownername&.priority</code> converts to <code>workorder.jobplan.priority>workorder.priority</code>

Bind variables

Syntax	Description	Examples
<code>:<relationship name>.<attrname></code>	Value of an attribute of a related business object of the current business object	<code>:location.description</code>
<code>:&owner&.<attrname></code>	Value of an attribute of the owner business object	When you apply a job plan to a work order, the system copies the priority of the job plan to the child work order. The condition can be: <code>:&owner&.jobplan.priority>:&owner&.priority</code> . In this example, the system copies this information if the job plan has a higher priority than the parent work order.
<code>:&owner&.<relationship name>.<attrname></code>	Value of an attribute of the related business object of the owner business object	See the example for <code>:&owner&.<attrname></code>
<code>:&old_<attrname></code>	The initial value from the database of the attribute	For example, if you change the value of a field from 1 to 2 to 3 to 4, the original value is 1.

Conditional expressions examples

- `:wostatus='APPR'`
- `:type='EM'`
- `:ownerid=&user&`
- `:supervisor!=&personid&`
- `:asset.assettype = 'IT' and :personid=&owner`

- `:reportby=:&personid&`
- `:assetspec.classstructureid = 122`
- `:po.poline.receivedqty=0`
- `:&owner&.jobplan.priority>:&owner&.priority`
- `:owner&.po.$old_description like '%Turbin%'`

Sample conditional class files

Sample condition class files are stored in a folder under the root directory of the product installation. You can use the sample files when you create class-type conditions.

To use a sample condition class, enter the file name in the Class field in the Conditional Expression Manager application.

Sample condition classes

- Evaluates to true: `psdi.common.condition.AlwaysTrue`
- Evaluates to false: `psdi.common.condition.AlwaysFalse`

Classifications

Classifications identify and characterize similar objects. A building, a notebook computer, and a centrifugal pump are types of classifications. A classification can also describe an event, such as a broken window or a hard disk failure.

You use the Classifications application to create classifications and to establish classification hierarchies. You also use classifications to simplify the task of managing and of retrieving historical data from other applications.

You can use classifications to align with external standards, such as vendor standards and industry standards. You can also use classifications to define the escalation path for incidents.

CI Types

You use the CI Types application to specify which configuration item (CI) types to use when you import actual configuration items from a discovery tool.

Configuration item types indicate a class of actual configuration items, such as a computer system or operating system. A type is a form of classification that is displayed in the CI Types application.

You import the configuration item types using a discovery tool and an integration tool. In the second stage of the import process, you import the actual configuration items that are associated with only a subset of configuration item types. You complete this stage in the CI Types application, and select the configuration item types that you want to import and change their status to active.

The following points apply to configuration types:

- In the CI Types application, you cannot change a configuration type classification; however, you can view the classification structure in the Classification application.
- You cannot create, change, or delete configuration item types. To specify which configuration item types to use, you change their status to active.

When you delete configuration item types, the associated classifications are not affected. You also change the status of a configuration item type to inactive.

- [Configuration items management](#)
You can search for and import configuration item types into the asset management database as a way to filter data. You can view attributes, relationships, relationship rules, and classifications for configuration item types. You can also view configuration type instances for the configuration item types you import.

Configuration items management

You can search for and import configuration item types into the asset management database as a way to filter data. You can view attributes, relationships, relationship rules, and classifications for configuration item types. You can also view configuration type instances for the configuration item types you import.

Configuration item discovery

You use the discovery tool to find configuration items that exist in your information technology infrastructure.

You can use the settings in the discovery tool to specify the types of configuration items to search for. Some examples of configuration items include: computers, systems, routers, and switches. The discovered configuration items reside in the discovery tool database, including configuration item types.

Configuration item data import

You use Integration Composer and the IBM® Tivoli® Integration Adapter to import data from the discovery engine. You can import the data in two stages:

Stage 1

You import configuration item types as classifications, including their attributes and relationships, and the relationship rules between various configuration item types. You can view the classifications and attributes in the Classifications application. You can view relationships and relationship rules in the Relationships application. You can also view the list of configuration item types in the Configuration Item Types application.

You can manage only a subset of the configuration items that the discovery tool finds. In the Configuration Item Types application, you can select the configuration item types that you want to manage under configuration management and change control. The import process in stage 2 imports only the configuration item types that you select.

Stage 2

You import configuration item instances into the Actual Configuration Items application. The import brings only the configuration items that are associated with the configuration item types that you selected in the Configuration Item Types application. Selecting configuration item types is a way to filter the data. The import process also brings the relationships that exist between the various configuration items.

Authorized configuration item creation

Configuration management and change control processes do not operate on actual configuration items. Instead, they operate as authorized configuration items which are items that conform to rules and relationships that you define in the Configuration Items application.

When you create an authorized configuration item, it can be linked to an actual configuration item record. You can also create an authorized configuration item that is independent of any actual configuration item record, because not all configuration items need to work with the discovery engine. You can create a link between the authorized configuration item and the actual configuration item in the Configuration Items and Actual Configuration Items applications.

You can create an authorized classification hierarchy that maps to an actual classification hierarchy. Partial mappings can exist between the two classifications, rather than a complete mirror image. You can use the Manage CI Hierarchies action in the Classifications application to define the configuration item hierarchies.

- [Status of configuration item types](#)
The status of a configuration item type determines whether actual configuration items associated with that type are imported into the Actual Configuration Items application.
- [Actual configuration items](#)
An actual configuration item is an item that is loaded into the Actual Configuration Items application from the discovery engine using the IBM Tivoli Integration Composer. You can load configuration items into the database from a discovery engine or an asset management database. First load your configuration item data into the discovery engine using the bulk loader interface.
- [Configuration item collections](#)
In the Configuration Items application, you can associate collections with a configuration item.
- [Configuration item changes](#)
When you create configuration items, you can change them to suit your business needs.
- [Configuration item statuses](#)
You can change the status of configuration item records to suit your business needs.
- [Configuration item deletion](#)
You can either delete or decommission a configuration item.

Status of configuration item types

The status of a configuration item type determines whether actual configuration items associated with that type are imported into the Actual Configuration Items application.

A configuration item type can have one of the following statuses:

- **New** - This status applies to all configuration item types when you import them into the CI Types application. Actual configuration items that are associated with a configuration item type with a status of new are not imported. After you activate or deactivate a new configuration item type, you cannot change the status back to new.
- **Active** - Actual configuration items that are associated with a configuration item type with a status of active are imported.
- **Inactive** - Actual configuration items that are associated with a configuration item type with a status of inactive are not imported.

In the CI Types application, you use the Change Status action to change the status of a configuration item type.

Work View

The Work View application queries the combined ticket and work order tables. You can display the results of the query in the Result Set portlet of your Start Center. You can view a list of all tickets and work orders that you own or that are assigned to your group. The Work View application contains one default query, called WORKVIEW.

The WORKVIEW query includes all non-historical tickets and work orders owned by the user or by your group, listed by priority. You can choose to use the default query or create your own query. The Work View application refreshes the query results in real time to reflect the status and information in the database.

An administrator assigns the Result Set portlet to Start Center templates as needed. When you create a query and mark it as public, users have access to it. Users also have access to the Result Set portlet and can use the query in their Start Center. If you have not enabled reporting or Workflow for this application, the menus do not contain any actions.

- [Working with work view queries](#)
Work view queries contain results taken from the combined ticket and work order tables. You can edit work view queries, change the default work view query, and delete work view queries.

Working with work view queries

Work view queries contain results taken from the combined ticket and work order tables. You can edit work view queries, change the default work view query, and delete work view queries.

- [Editing work view queries](#)
You can edit the description of a query, and specify whether it is marked as a public query or whether it is a default query.
- [Changing default work view queries](#)
You specify a query as your default query when you save the query.
- [Deleting work view queries](#)
You can delete queries at any time. There is no restriction on deleting a query that is being used in a Result Set portlet on a Start Center. The Start Center displays a message that the portlet has not been set up. Users then select a new query for their Result Set portlet.

Editing work view queries

You can edit the description of a query, and specify whether it is marked as a public query or whether it is a default query.

About this task

You cannot modify the Structured Query Language (SQL) clause of a query. To use a different SQL clause, save a new query. If the original query is no longer valid, delete it.

Procedure

1. Select View/Manage Queries.
2. Optional: Edit the Description field.
3. Optional: Clear or select the Default check box.
4. Optional: Clear or select the Public check box.
5. Save your edits.

Changing default work view queries

You specify a query as your default query when you save the query.

Procedure

1. Select View/Manage Queries.
2. In the View/Manage Queries window, clear the Default check box from another query, if needed.
3. Check the Default check box to mark a query as the default query.
4. Save your changes.

Deleting work view queries

You can delete queries at any time. There is no restriction on deleting a query that is being used in a Result Set portlet on a Start Center. The Start Center displays a message that the portlet has not been set up. Users then select a new query for their Result Set portlet.

Procedure

1. Select View/Manage Queries.
2. In the View/Manage Queries window, select Mark Row for Delete for each query that you want to delete.
3. Save your changes.

Service Address

You can use service addresses to organize customer locations and assets by address. When you organize customer locations and assets by service address, searching for and finding them is faster.

- [Service addresses](#)
A service address can represent the location of one or more assets or physical locations for a customer.
- [Address systems](#)
An address system is a hierarchical system that creates relationships between addresses. You can use address systems to determine the address ancestry

throughout the hierarchy of location addresses.

- [Adding service addresses to records](#)
You add service addresses to assets, locations, work orders, and service requests so that you can search records by address.
- [Creating address systems for sites](#)
You can build a hierarchy of locations to assign service addresses to child records.
- [Configuring service addresses](#)
Service addresses provide a way to find assets and locations. Before a service address can be used, you must configure options for the way your organization uses service addresses.

Service addresses

A service address can represent the location of one or more assets or physical locations for a customer.

When field crews are directed to an asset, a service address identifies the location of the asset and informs the crew how to navigate to it. The service address contains detailed location information. This information helps you to assign the correct resources when you provide service or support for an asset or a location.

When you create work for a location or an asset, the service address is copied to the service request or the work order. If the asset or location does not have an associated service address, you can use the service address of the closest ancestor in the address hierarchy.

If a work order or a service request has a service address and an asset or location is added where the address does not match, you can inherit the address from the asset or location.

When an asset is added to a work order or service request that has an address, you can use the address from the asset or location.

Service addresses provide an additional way to find assets and locations, or groups of assets and locations.

Information in service addresses

Each service address has an address code. Address codes are unique to an organization, and can be available to all locations at all sites in an organization.

Service addresses can contain general or detailed location information. For example, a service address for an asset might not be exact, especially in remote areas. However, the service address is typically precise enough so that it can direct a repair crew to that location. This information is useful for crews that work in remote locations, where a point of reference might be difficult to describe.

Here are some examples of service address details:

- 300 feet behind large red outbuilding
- Mile marker 584
- X coordinate 44.4545445 and Y coordinate -78.56456456

Spatial scheduling travel time

You can automatically calculate the travel time between service addresses using your map provider. In the Graphical Assignment application, from the Select Action menu, choose Populate Destination Travel Time Matrix. The values appear in the Service Addresses application. Values calculated by your map provider are regularly updated and removed from the matrix. You must repeat the process to repopulate the travel times.

You can manually enter travel time between service addresses in the Service Addresses application, using the Spatial Scheduling Travel Time option from the Select Action menu. Values that you enter manually are saved indefinitely.

Address systems

An address system is a hierarchical system that creates relationships between addresses. You can use address systems to determine the address ancestry throughout the hierarchy of location addresses.

In the Locations application, locations often require parent locations to illustrate a relationship between the locations. Locations with a service address can help you identify where the customer is located and help group multiple assets as child records of the location. If a parent location has a service address and belongs to an address system, the address system is used to assign service addresses to child records. You can then use the service address to identify the location of the child records on the map. This capability applies also to assets that are child records of the location.

You can assign only one system within a site as the address system, so you must decide which system determines address ancestry.

Example

Breaker H344, a circuit breaker at a substation, is a location that belongs to the Bedford site. The Bedford site uses the BEDADDR system as the address system. Breaker H344 has a power pole child location. The power pole has a transformer child asset. If you use the Open Drilldown action, you can see the complete location hierarchy for breaker H344.

Adding service addresses to records

You add service addresses to assets, locations, work orders, and service requests so that you can search records by address.

Procedure

1. Select the record for which you want to add a service address.
2. Specify a service address.

Creating address systems for sites

You can build a hierarchy of locations to assign service addresses to child records.

About this task

A system cannot be an address system and a network system at the same time.

Procedure

1. In the Locations application, select a location, and then select the Manage Systems action.
2. Create an address system.

Configuring service addresses

Service addresses provide a way to find assets and locations. Before a service address can be used, you must configure options for the way your organization uses service addresses.

Procedure

1. In the Organizations application, select your organization.
2. Select the Service Address Options action and select the options for your organization.

Map Manager

You create and configure maps to provide users with a visual representation of their work.

- [Enabling maps](#)
To enable maps, define the site, select a map provider, define a license key and any specific map provider options that are required, such as https support.
- [Developing maps and routes for applications](#)
You can develop and extend public maps so that users can view and work with records associated with locations. You can also configure maps to show routes. You can add one or more maps to any application.
- [Configuring map tips](#)
Map feature tips provide additional information about features that are identified on a map. By configuring map tips, you can easily access information for data visualization or call actions without leaving the map view.

Enabling maps

To enable maps, define the site, select a map provider, define a license key and any specific map provider options that are required, such as https support.

About this task

You add map provider details to a map so that records such as work orders can appear on the map. When a record includes an address, and longitude and latitude or x and y coordinates, that record can appear on a map.

Procedure

1. In the Map Manager application, click New Map.
2. Select the map provider.
You must obtain the appropriate license key from the map provider that you select.
3. Specify the site that the map will use.
A site can use only one map. The user will only see the map that is assigned to the site that they are also assigned to.
4. Specify the map provider details.
5. Specify the initial map location.
6. Select the Active check box to make this map active for the sites that you specified and save the map.

Results

The map is shown on the Map tab in the Locations, Assets, Incidents, Changes, and other applications.

Developing maps and routes for applications

You can develop and extend public maps so that users can view and work with records associated with locations. You can also configure maps to show routes. You can add one or more maps to any application.

Procedure

1. In the Application Designer application, select the application that you want to develop maps or routes for.
2. Click the Map tab and highlight the map section.
3. Click the Control Properties icon and enter the properties that you want to assign to the maps or routes.

Configuring map tips

Map feature tips provide additional information about features that are identified on a map. By configuring map tips, you can easily access information for data visualization or call actions without leaving the map view.

- [Map feature tips](#)
To provide additional information about records that are identified on a map, you can define the type of information that is displayed. This information is defined by using templates and menu items. The additional information is displayed in an information window on the map for the associated record.
- [Map feature tip templates](#)
Map tip templates define the information that is displayed in a information window on a map. You use a rich text editor to add or modify the attributes on the template.
- [Adding additional information to map records](#)
To provide additional information about records that are identified on a map, you can define the information in a template and add menu item actions that you can apply for the record.
- [Creating dialog boxes for map tip menu items](#)
You can create and customize the appearance of a dialog box and use it as a menu item on the map tips window.
- [Assigning map markers to work types and work order priorities](#)
You must assign map markers to the work types that you created and to work order priorities. Map markers make it easier for users to distinguish work orders and work types from other map features.

Map feature tips

To provide additional information about records that are identified on a map, you can define the type of information that is displayed. This information is defined by using templates and menu items. The additional information is displayed in an information window on the map for the associated record.

A map tip object defines the template and menu items for the map tip. The templates define the content of the information window. Menu items define the actions for each map tip. Existing dialog boxes are used as menu item actions. The following table lists the existing dialog boxes that you can add as menu items to the map tip information.

Menu item label	Dialog identifier	Record
Asset Details	astdetails	Asset records
Drilldown	drilldown	Assets and location records
Service Address Related Records	maptips_sa_dialog	Service address records
View Work Details	wopms_byasset	Assets records
View Work Details	wopms_byloc	Location records

You can also add authorization access to the object and menu items. Signature options must be created for the Map Manager application in the Application Designer application. Using signature options for the object template and menu items determines user access to view the additional information for a record. Using signature options for the object and menu items is optional. If signature options are not used, then security is not validated.

Map feature tip templates

Map tip templates define the information that is displayed in a information window on a map. You use a rich text editor to add or modify the attributes on the template.

The content of the map tip template is defined by the selected object. The template supports variable replacements that represent attributes in the record. For example, if the map tip template contains the attribute variable `${assetnum}`, then the variable is replaced by the asset number attribute in the information window.

The templates also supports one-to-one relationship attribute retrieval. For example, `${relationshipname.attributename}` shows service address information related to the current record directly as `${serviceaddress.streetaddress}`. In the information window, the service address information displays

as Address: 250 York street, London.

Message variables are represented as `#{msggroup|msgkey}`. If the template contains the message variable, then the variable is replaced by the message content related to the message group and message key. For example, `#{map|assetstatus}`.

Image variables can also be used as `!{image:optional_path}`. For example, `!{image}`. Image variables return an html image tag set with the url of the image associated with the current item record.

For example, to view the image that is associated with an item record for the asset, add `!{image}` to the template for the asset. If you want to view the image that is associated with the asset item record on the current work order, then you add `!{image:ASSET}` to the template for the work order, where ASSET is the relationship on the work order object that returns the work order asset.

Adding additional information to map records

To provide additional information about records that are identified on a map, you can define the information in a template and add menu item actions that you can apply for the record.

About this task

Default templates and menu items are provided during the installation process, however, you can also modify all templates and menu items.

Procedure

1. In the Map Manager application, select a map record.
2. On the MapTips tab, specify the object.
The default template and associated menu items are added.
3. Optional: To modify the content of the template, click Select fields.
4. Optional: Specify the security access for the object.
5. Specify the menu item details.
6. Save the record.

Results

When a user selects a record on a map, the associated information window shows more information about that record.

Creating dialog boxes for map tip menu items

You can create and customize the appearance of a dialog box and use it as a menu item on the map tips window.

About this task

When you create a dialog box for map tips, the dialog box must be defined in the system library XML file.

You can use the Service Address Details dialog box as a template. The dialog identifier of the Service Address Details dialog box is `maptips_sa_dialog`.

Procedure

1. In the Application Designer application, create the dialog box.
2. In the Map Manager application, select the MapTips tab and specify the object.
3. Specify the menu item details of the new dialog box.
4. Save the record.

Assigning map markers to work types and work order priorities

You must assign map markers to the work types that you created and to work order priorities. Map markers make it easier for users to distinguish work orders and work types from other map features.

Procedure

1. Open the `maximo/applications/maximo/properties/map-symbology-config.json` file.
This file is used to define configuration settings for map symbology, including images, colors, and labels.
2. Assign map markers to the work types that you created.
3. Assign map markers to the work order priorities.

What to do next

You must shut down the Maximo® application server and rebuild the maximo.ear file by running the maximo/deployment/buildmaximoear.cmd program. Redeploy the rebuilt maximo.ear file on your application server and restart the application server.

KPI

The KPI Templates application and the KPI Manager application help you assess and monitor the performance of important activities in your organization. For example, you can create KPIs to monitor the number of work orders that are past their scheduled start date or to identify activities that might require improvement.

- [KPI Manager](#)

In the KPI Manager application, you create key performance indicators to track critical performance variables over time. You can view key performance indicators (KPIs) in the start center or in the KPI Manager application.

KPI Manager

In the KPI Manager application, you create key performance indicators to track critical performance variables over time. You can view key performance indicators (KPIs) in the start center or in the KPI Manager application.

With the appropriate authorization, you can also use the Create KPI action to create key performance indicators in other applications.

- [Historical trends and values for key performance indicators](#)

In the KPI Manager application, you can view historical information about key performance indicators (KPIs).

- [Creating key performance indicators](#)

You create key performance indicators to track critical performance variables over time.

- [Example: Creating KPI templates to generate KPIs](#)

A system administrator wants to reuse common KPI queries to quickly create multiple KPIs.

Historical trends and values for key performance indicators

In the KPI Manager application, you can view historical information about key performance indicators (KPIs).

The following three tabs display historical information about KPIs:

- On the Historical Trends tab, you view KPIs over period of time, compare KPIs, and view historical values.
- On the Trend tab, you view a chart of a selected KPIs over a specific period of time. The chart can display in days, weeks, months, or years. You also can compare other KPIs to the selected KPI.
- On the Historical Values tab, you view data points for individual KPIs for a specific period of time.

Creating key performance indicators

You create key performance indicators to track critical performance variables over time.

Procedure

1. In the Key Performance Manager application, click New KPI.
2. Provide a unique name for the key performance indicator.
3. Optional: Provide a description of the key performance indicator.
4. Specify either decimal or percentage as the calculation type.
5. Specify the selection criteria.
6. In the Query Details section, specify the KPI query.
7. To change the graph from green to yellow to red, in the KPI Parameters section, specify values in the Target field, Caution At field, and Alert At field.
If you want a low number, specify a low value in the Target field and a high value in the Alert At field. If you want a high number, specify a high value in the Target field and a low value in the Alert At field.
8. If you want everyone to have access to the KPI, select the Public? checkbox.
9. Optional: Specify values for linking the key performance indicator.
10. Save the key performance indicator.

What to do next

If you want to restrict who can see the KPI, from the Security tab, specify the security groups that have access to the KPI.

Example: Creating KPI templates to generate KPIs

A system administrator wants to reuse common KPI queries to quickly create multiple KPIs.

About this task

A system administrator, John, works for a large manufacturing company, which has three sites: Boston, Miami, and Detroit. Work supervisors want John to create KPIs so that they can monitor incomplete work orders in each of the sites. John can make the site a variable in the query so that he can use the same KPI template to create KPIs for each site. After he creates the KPI template, he can update it later.

Procedure

1. In the KPI Templates application, create a KPI template.
2. In the Application field, select WOTRACK.
3. Specify the decimal calculation.
4. Enter the following KPI query:

```
select count(wonum) from workorder where status not in ('COMP', 'CLOSE')
and istask = 0 and targstartdate < sysdate and siteid=${mysiteid}
```

5. To define variables for the KPI query, in the KPI Variables section, click New Row.
 - a. In the Variable Name field, enter `mysiteid`.
 - b. In the Object field, select WORKORDER.
 - c. In the Attribute field, select SITEID.
6. Create the KPIs.
 - a. In the KPI section, click New Row and enter the target, caution, alert values for the KPI that you want to create for the Boston site.
 - b. In the Variable Values section, enter `BOSTON` as the value for the `mysiteid` variable.
 - c. In the KPI section, click New Row and enter the target, caution, alert values for the KPI that you want to create for the Miami site.
 - d. In the Variable Values section, enter `MIAMI` as the value for the `mysiteid` variable.
 - e. In the KPI section, click New Row and enter the target, caution, alert values for the KPI that you want to create for the Detroit site.
 - f. In the Variable Values section, enter `DETROIT` as the value for the `mysiteid` variable.
7. Save the KPI template and click Generate KPIs.
You can access the generated KPIs in the KPI Manager application.

Record Release

In the Record Release application, you can view the records that users currently have in edit mode. You can also release records from edit mode if they are left in edit mode erroneously.

Time Zone Rules

In the Time Zone Rules application, you can specify time zone rules to identify the local date and time when you create records for a process, such as generating work orders from a preventive maintenance record.

- [Creating time zone rules](#)

Records can show the local date and time of the user who is accessing the record even if the record was created in a different time zone. To display the local date and time on a record for a process, you create a time zone rule by associating the process and the process rule with the Manage business object. Time zone rules can be associated with a process at the system, organization, or site level.

Creating time zone rules

Records can show the local date and time of the user who is accessing the record even if the record was created in a different time zone. To display the local date and time on a record for a process, you create a time zone rule by associating the process and the process rule with the Manage business object. Time zone rules can be associated with a process at the system, organization, or site level.

About this task

When you specify a process and a process rule for an object, the time zone rule is applied to identify the local date and time. A *process* determines the action to apply to the object when identifying the correct time zone. The *process rule* determines which time zone from the main object or a related record is used to identify the local date and time.

For example, for a process that generates work orders from a preventive maintenance record, different time zones can be associated with related asset and location records to calculate the target start date of a work order. You can specify a time zone rule that uses the time zone that is associated with the asset, if one is specified and, otherwise, uses the time zone that is associated with the location. If no time zone is associated with the asset or the location, the server time zone is applied.

You can also associate a time zone with a record or with a selection of records by using the Associate Time Zone action in the Organizations, Locations, Assets, and Preventive Maintenance applications.

Procedure

1. In the Time Zone Rules application, create a time zone rule.

2. Specify a process and process rule.
3. Optional: Specify an organization or a site to associate with the time zone rule.
4. Save your changes.
5. To create the records that contain the time zone that is used, select the Associate Time Zone action.

Maximo Visual Inspection models

You can train accurate and efficient AI-based models in Maximo® Visual Inspection.

For more information about how you can train and work with models, see [Training and working with models](#).

Analytics module

You use the applications in the Analytics module to view scheduled reports and KPIs to analyze and understand information about the lifecycle and the maintenance of your assets.

- [Viewing scheduled reports](#)
You can view scheduled reports that might be too large to send by email.
- [Monitoring performance](#)
You monitor KPIs to track the success of business factors that your work contributes toward. If a KPI is performing poorly, it might indicate an area of your work that requires attention.

Viewing scheduled reports

You can view scheduled reports that might be too large to send by email.

After you schedule a report, you receive a link to that report to view it in the Report Viewer application.

Monitoring performance

You monitor KPIs to track the success of business factors that your work contributes toward. If a KPI is performing poorly, it might indicate an area of your work that requires attention.

To quickly view KPIs outside of the Start Center, go to the KPI Viewer application. On the List tab, you can see the KPIs that track your work, in particular, the areas that most need improvement. On the KPI tab, you can see more information about KPIs, for example, you can see details about the factors that affect the KPIs. In the Historical Trends tab, you can track the performance of the KPIs over time. In the Log tab, you can enter information about KPIs and see a record of actions that are associated with the KPIs.

Assets module

The Assets module contains applications that are designed to manage the assets that are owned or leased by your company from purchase to salvage, from the beginning to the end of the life cycle for an asset.

Asset records for purchased or leased information technology assets are maintained in the Assets application. You create these records in the Assets application or when you use the Receive Rotating Items action in the Receiving application. An information technology asset has a class structure identifier that belongs to the parent-level information technology classification used in your enterprise.

- [Assets](#)
You use the Assets application to track physical assets, to define relationships between assets, and to manage assets throughout their life cycles.
- [Asset Templates](#)
You can specify common asset information in an asset template that you can then apply to multiple assets.
- [Locations](#)
Use the Locations application to specify and to track locations for assets. You can also organize locations into logical hierarchical systems or network systems. Using hierarchies or systems of locations and specifying the locations for assets on an asset record provides the groundwork for gathering and tracking information about the history of an asset, including its performance at specific sites, as it is moved from location to location. With locations organized into systems, you can quickly find a location on the Drilldown page, and identify the asset at that location.
- [Meters](#)
You use the Meters application to add or to modify meter definitions. Meter definitions include names for the meters as well as sets of attributes that describe the meters. Meters are used to track asset or location performance. An asset or a location can have multiple meters associated with it.
- [Relationships](#)
A relationship uses basic terms to describe the dependency or connectivity between configuration items. The basic terms include runs on, installed on, contained, and so forth.
- [Meter Groups](#)
You use the Meter Groups application to define a logical grouping of meters that comprise a meter group. Meter groups represent a collection of meters that are used together numerous times.

- [Condition Monitoring](#)

You use the Condition Monitoring application to create and to view measurement point records for assets and for locations. A measurement point record defines the limits of acceptable meter readings for a characteristic meter or for a gauge meter on an asset or at a location.

- [Failure Codes](#)

You use the Failure Codes application to build and to display failure hierarchies. Hierarchies help you construct accurate histories of the failures that affect your assets and operating locations. After reporting and analyzing failure trends, you can take preventive measures. The identifier of a failure hierarchy is the failure class.

Assets

You use the Assets application to track physical assets, to define relationships between assets, and to manage assets throughout their life cycles.

- [Assets overview](#)

You use the Assets application to create and to store asset numbers and corresponding information, such as parent, location, vendor, status, and maintenance costs for each asset. You can build the asset hierarchy as an arrangement of buildings, departments, assets, and subassemblies. The asset hierarchy provides a convenient way to roll up maintenance costs so that you can check accumulated costs at any level, at any time. You can also find a particular asset quickly.

- [Working with assets](#)

You can create, view, modify, and delete assets.

Assets overview

You use the Assets application to create and to store asset numbers and corresponding information, such as parent, location, vendor, status, and maintenance costs for each asset. You can build the asset hierarchy as an arrangement of buildings, departments, assets, and subassemblies. The asset hierarchy provides a convenient way to roll up maintenance costs so that you can check accumulated costs at any level, at any time. You can also find a particular asset quickly.

Use the Assets application to perform the following tasks:

- Search for asset records.
- View, modify, add, or delete the main record for an asset.
- Create the asset hierarchy and view the subassemblies and parts of an asset.
- View, modify, add, or delete safety records for an asset.
- View or add metering information for an asset.
- Specify or view the specifications for an asset as recorded in the Classifications application.
- [Rotating assets and non-rotating assets](#)
Assets can be either rotating or non-rotating. Rotating assets are assets that are interchangeable, such as motors, pumps, fire extinguishers, or PC monitors. Rotating assets have both a unique asset number and an inventory item number. You can use the item number to track assets as a group as assets are moved in and out of inventory and other types of locations. The asset number is useful for tracking instances of assets as they are moved from one location to another and from one site to another.
- [Asset depreciation](#)
Depreciation schedules reduce the value of an asset according to user-defined period thresholds. Depreciation provide a more accurate view of an asset's current value and facilitate better decision-making regarding an asset's lifecycle.

Rotating assets and non-rotating assets

Assets can be either rotating or non-rotating. Rotating assets are assets that are interchangeable, such as motors, pumps, fire extinguishers, or PC monitors. Rotating assets have both a unique asset number and an inventory item number. You can use the item number to track assets as a group as assets are moved in and out of inventory and other types of locations. The asset number is useful for tracking instances of assets as they are moved from one location to another and from one site to another.

Before you can create a record for a rotating asset in the Assets application, the rotating item record must first be created in the Item Master application.

Non-rotating assets do not move in and out of storerooms. A non-rotating asset has a unique asset number, but does not have an item number because it is not tracked in inventory.

Example of a rotating asset

A company might have four identical (same make, same model) centrifugal pumps, so all four pumps would have the same item number. To track the use, the repairs, and the locations of each individual pump, each pump has its own, unique asset number.

Asset depreciation

Depreciation schedules reduce the value of an asset according to user-defined period thresholds. Depreciation provide a more accurate view of an asset's current value and facilitate better decision-making regarding an asset's lifecycle.

Asset depreciation contributes to an asset's lifecycle story. When you apply a depreciation schedule to an asset, a depreciation expense is periodically allocated to the cost of an asset's original purchase value. The schedule can be straight line or double declining. In a straight-line schedule, the expense is an equal amount each period. In a double declining schedule, the expense is a percentage of the item's cost. The rate at which this expense is applied is determined by a user-defined period threshold. Period thresholds can be either date-based or usage-based. Date-based periods can be calculated monthly, quarterly, semi-yearly, or yearly. Usage-based periods are calculated based on meter life-to-date intervals.

A depreciation schedule can be added to an asset by using an action in the Assets application or by applying an asset template that contains a depreciation schedule. Depreciation schedules can also be inherited from rotating items during the receiving or invoicing process. After an asset has a depreciation schedule, you can adjust or remove the schedule in the Manage Depreciation Schedule dialog box, or you can swap the depreciation schedule with another asset in the Swap Depreciation Schedule dialog box.

Working with assets

You can create, view, modify, and delete assets.

- **[Creating assets](#)**
You use the Assets application to create and to store asset numbers and corresponding information, such as parent, location, vendor, up/down status, and maintenance costs for each asset.
- **[Adding assets to collections](#)**
You use the Assets application to add one or more selected assets to one or more active collections. A collection is a group that can contain assets, locations, and classification items. An asset can be added to more than one collection.
- **[Adding relationships to assets](#)**
You specify relationships between assets and locations to define a logical connection between separate assets. For example, you can define an intersection between a road and a railway line or a connection between a network cable and a computer.
- **[Viewing related assets](#)**
All asset relationships have a source asset and a target asset. You can view all relationships for an asset or you can filter the view to see a subset of its relationships.
- **[Issuing items from a storeroom](#)**
You use the Assets application to issue items to an asset. You also can use this application to return items from an asset to a storeroom. You can issue both rotating and non-rotating items, and you can issue items from different storerooms.
- **[Modifying assets](#)**
After you create an asset, you can add it to a collection, change its status, add downtime information, add meter information, move the asset, swap the asset, change the item number, or zero the year-to-date amount.
- **[Importing asset-related digital data](#)**
You can import asset-related digital data into Maximo® Manage from IBM® Digital Twin Exchange. After you configure integration components, you use the Assets application to connect to Digital Twin Exchange and import the data.

Creating assets

You use the Assets application to create and to store asset numbers and corresponding information, such as parent, location, vendor, up/down status, and maintenance costs for each asset.

Procedure

1. On the toolbar of the Assets application, click the New Asset icon.
 2. In the Asset Description field, type a description.
 3. In the Rotating Item field, if the asset is rotating, type a value.
 4. If this asset has a parent, type a value in the Parent field. If the parent asset is associated with a location, the location identifier is copied to the Location field. Only assets that are in non-inventory locations can be assigned as parents. You cannot build a hierarchy when assets are in a storeroom.
 5. Optional: Type information in the other fields as needed.
 6. Click Save Asset.
- **[Applying item assembly structures](#)**
You use the Assets application to apply an item assembly structure to a rotating asset or to an operating location.
 - **[Associating users and custodians with assets](#)**
You can associate a person with an asset as a custodian, as a user, or as both. A user is someone who uses the asset. A custodian is someone responsible for the care of the asset. An asset can have multiple users and multiple custodians. If an asset has no users or custodians, anyone can create an incident or service request for the asset.
 - **[Associating services with assets](#)**
You can associate one or more services with an asset. Examples of services are e-mail support, telecommunications, customer support, and PC support. If a service changes, you can identify affected assets.
 - **[Associating safety information with assets](#)**
You can associate safety information, such as tag-out procedures, hazards, and hazardous materials lists with an asset.

Applying item assembly structures

You use the Assets application to apply an item assembly structure to a rotating asset or to an operating location.

About this task

When you apply an item assembly structure with rotating and non-rotating items to an asset record, the non-rotating items are shown on the Spare Parts tab of the asset record. If a rotating item in an item assembly structure has child items, the child items are applied to the selected asset or to the location record. As a result, the child items do not have their own inventory balance.

Procedure

1. From the Assets application, display the asset to which you want to apply an item assembly structure.
2. Select the Apply Item Assembly Structure action.
3. You can either assign unique numbers to the rotating items or have the product assign numbers.

Option	Description
If you want to assign unique numbers to each rotating item	<ol style="list-style-type: none">a. In the Asset field, specify a value.b. In the Item field, click Detail Menu and select Move To.c. Repeat step a and b to assign numbers to all the items in the hierarchy.
If you want the product to assign numbers to all the rotating items in the hierarchy	Click Autonumber All. All the items in the first level of the hierarchy are assigned a number. If there are any child items in the item assembly structure hierarchy, they are also numbered.

4. Click OK, then click Save Asset.

Associating users and custodians with assets

You can associate a person with an asset as a custodian, as a user, or as both. A user is someone who uses the asset. A custodian is someone responsible for the care of the asset. An asset can have multiple users and multiple custodians. If an asset has no users or custodians, anyone can create an incident or service request for the asset.

About this task

If you use the Desktop Requisitions application or the Service Requests application, you can create a request with that asset only if you are an associated user or a custodian for that asset. In other applications, when a caller contacts a service desk agent, the agent can associate the caller with the ticket and then associate the appropriate assets with the ticket.

By default, the first person that you associate with an asset is the primary contact for that asset. You can change the primary contact. You can designate one or more people as users, and one or more people as custodians.

Procedure

1. From the Assets application, display the asset for which you want to associate users and/or custodians.
2. Select the Associate Users and Custodians action. For each person listed, data displays indicating whether a person is a user, a custodian, or both. If a person is the primary contact for the asset, the Primary check box is selected.
3. Click New Row.
4. In the Person field, type the identifier of the person you want to associate with the asset.
5. To designate the relationship that a person has with an asset, perform either or both of the following actions:
 - a. To designate the person as a user, select the User check box.
 - b. To designate the person as a custodian, select the Custodian check box.
6. To designate a person as the primary contact, select the Primary check box. When you select the Primary check box, the Primary check box clears for the person previously designated as the primary contact.
7. Click OK.

Associating services with assets

You can associate one or more services with an asset. Examples of services are e-mail support, telecommunications, customer support, and PC support. If a service changes, you can identify affected assets.

Procedure

1. From the Assets application, display the asset with which you want to associate a service or service group.
2. Select the Associate Services action.
3. In the Associate Services window, click New Row.
4. In the Service Group field, type a value.
5. To select a service within the service group, specify a value in the Service field. If you do not select a service group and you select a service that is associated with a service group, the service group displays in the Service Group field.
6. Click OK.

Associating safety information with assets

You can associate safety information, such as tag-out procedures, hazards, and hazardous materials lists with an asset.

- **[Associating tag out procedures with assets](#)**
You use the Assets application to associate tag out procedures with assets. A tag out procedure is a detailed description of how to take work assets out of service or how to place them back into service, to ensure a safe working environment.
- **[Associating hazards with assets](#)**
You use the Assets application to add hazards to asset and to location records. When you build safety plans using the Safety Plans application and use those safety plans on work orders, the hazards associated with specific assets and locations are included on the work order.
- **[Associating hazardous materials with assets](#)**
You use the Assets application to add hazardous materials to asset records and to location records. When you build safety plans in the Safety Plan application and then use those safety plans in work orders, the hazardous materials associated with specific assets and locations are included on the work order.
- **[Associating safety-related issues with assets](#)**
You use the Assets application to associate issues of safety that workers need to be aware of when they perform work on a selected asset.

Associating tag out procedures with assets

You use the Assets application to associate tag out procedures with assets. A tag out procedure is a detailed description of how to take work assets out of service or how to place them back into service, to ensure a safe working environment.

Before you begin

Before you can associate a tag out procedure with an asset, the tag out procedures must be associated with a hazard using the Safety Hazards application.

Procedure

1. From the Assets application, display the asset record with which you want to associate a tag out procedure.
2. On the Safety tab, click the Lock Out/Tag Out sub tab.
3. Under the Hazards table window, click New Row.
4. In the Hazard field, specify a value.
5. In the Hazards table window, select the hazard for which you want to add a tag out procedure.
6. Under the Tag Out Procedures table window, click New Row.
7. In the Tag Out field, specify a value.
8. Click Save Asset. The lock out steps for the selected tag out display in the Lock Out Operations table window in read-only format. Use the Lock Out/Tag Out application to create the specific lock out steps that display in this table.

Associating hazards with assets

You use the Assets application to add hazards to asset and to location records. When you build safety plans using the Safety Plans application and use those safety plans on work orders, the hazards associated with specific assets and locations are included on the work order.

Before you begin

Before you can add a hazard to an asset record, the hazard must have been defined using the Safety Hazards application.

Procedure

1. On the Safety tab of the Assets application, click the Hazards and Precautions sub tab.
2. Under the Hazards table window, click New Row.
3. In the Hazard field, specify a hazard. Only precaution-enabled hazards display in the Select Value window. If the hazard you select has precautions associated with it, the precautions display in the Precautions table window. If the hazard is hazardous-material enabled, the hazard displays, along with its hazardous material information, on the Hazardous Materials sub tab of the Safety tab. The Precautions table is display-only.
4. Click Save Asset.

Associating hazardous materials with assets

You use the Assets application to add hazardous materials to asset records and to location records. When you build safety plans in the Safety Plan application and then use those safety plans in work orders, the hazardous materials associated with specific assets and locations are included on the work order.

Procedure

1. From the Assets application, display the asset record with which you want to associate hazardous material.
2. On the Safety tab, click the Hazardous Materials sub tab.
3. Under the Hazardous Materials table window, click New Row.

4. In the Hazard field, type a value. If the hazard you select has precautions associated with it, the precautions display in the Precautions table window. The Precautions table window is read-only.
5. Click Save Asset.

Associating safety-related issues with assets

You use the Assets application to associate issues of safety that workers need to be aware of when they perform work on a selected asset.

About this task

If the asset record has hazards or has tag outs associated with it, be sure to associate the record with itself. Doing so makes the safety-related information available when creating a safety plan or a job plan for that asset.

Procedure

1. From the Assets application, display the asset record with which you want to associate a safety-related asset.
2. On the Safety tab, click the Safety-Related Assets sub tab.
3. Under the Safety-Related Assets table window, click New Row.
4. In the Asset field or in the Location field, type a value.
5. Repeat steps 3 - 4 for each asset that you want to associate with the current record. If the current asset record has hazards or tag outs associated with it, be sure to add its asset identifier to the Safety-Related Assets table window.
6. Click Save Asset.

Adding assets to collections

You use the Assets application to add one or more selected assets to one or more active collections. A collection is a group that can contain assets, locations, and classification items. An asset can be added to more than one collection.

Procedure

1. On the List tab of the Assets application, filter the list to display the assets that you want to add to a collection.
2. Click the Select Records check box, and select the check box for each asset that you want to add to a collection. To select all the assets, check the Select All Records box in the header row of the Assets window.
3. Select the Add Assets to Collections action.
4. In the Collection field of the Add Assets to Collections window, click Detail Menu to select an option and to retrieve a value.
5. Click OK.

Adding relationships to assets

You specify relationships between assets and locations to define a logical connection between separate assets. For example, you can define an intersection between a road and a railway line or a connection between a network cable and a computer.

Before you begin

Before you can add a relationship to an asset, you must first create the relationship definition in the Relationships application.

Procedure

1. Select an asset and click the Relationships tab.
2. In the Relationships table, click New Row.
3. Optional: If you want to sort relationships sequentially, enter a sequence number for the relationship. Otherwise, relationships are shown in the order of entry.
4. Specify a Relationship or use the Detail menu to select a value.
5. In the Target Asset field, specify the asset that is the target in the relationship. If the Source Asset is not the currently selected asset, specify the current asset in the Target Asset field.
6. Click New Row to add further relationships or Save.

What to do next

When you have entered the Source Asset, Relationship and Target Asset, the relationship is validated against any rules created in the Relationship application. If the relationship is not valid, an error message is shown. However, if the relationship definition has the Allow Over-Ride option selected, a message is shown, asking if the relationship should be applied regardless. You can override the validation warning by clicking OK.

- [Granting access to asset relationship functions](#)
Signature options, which are defined in the Security Groups application, are used to control access to functions in applications. By using signature options,

you can grant access to specific groups of users. In the Assets application, the ability to create asset relationships and view relationship history is controlled by signature options.

Granting access to asset relationship functions

Signature options, which are defined in the Security Groups application, are used to control access to functions in applications. By using signature options, you can grant access to specific groups of users. In the Assets application, the ability to create asset relationships and view relationship history is controlled by signature options.

Procedure

1. In the List tab of the Security Groups application, select the group to be granted access to the relationship functions. For example, the MAXEVERYONE group is for all Maximo® users.
2. Under the Applications tab, in the Description column, click Assets.
3. Scroll down to the third panel, listing Assets application functions, then navigate to the Relationships Tab line. To allow access to this function, click the Grant Access check box for each function name and Save
4. Navigate to the View Asset Relationship History line. To allow access to this function, click the Grant Access check box for each function name and Save
5. Navigate to the Topology Viewer Presentation line. To allow access to this function, click the Grant Access check box for each function name and Save

Viewing related assets

All asset relationships have a source asset and a target asset. You can view all relationships for an asset or you can filter the view to see a subset of its relationships.

Procedure

1. Select an asset and click the Relationships tab.
2. In the Filter By menu, select one of the options. Click the refresh icon to show the set of relationships you chose.
3. To sort the relationships list by any of the columns, select the sort arrow icon next to the field title. The default is the sequence number column.
4. Click the detail menu next to a source or target asset to move to or view related asset information.
You can also use other functions in this menu to view historical asset information.
5. To retrace your steps through a series of source or target asset Move to navigational commands, click the View History toolbar icon and select an asset from the list.

Issuing items from a storeroom

You use the Assets application to issue items to an asset. You also can use this application to return items from an asset to a storeroom. You can issue both rotating and non-rotating items, and you can issue items from different storerooms.

Procedure

1. From the List tab in the Assets application, select the asset to which you want to issue items.
2. Select the Issue Items from Storeroom action.
3. In the Issue Items from Storeroom window, specify a default storeroom and/or a storeroom site from which to issue items.
4. In the Associated Items table window, click New Row.
5. In the Item field, specify the item you want to issue.
6. In the Storeroom field, specify a storeroom.
7. In the Quantity field, type the number of items that you want to issue.
8. In the Transaction Type field, select ISSUE if you are issuing the item to the asset, or RETURN, if you are returning the item to a storeroom.
9. Specify other values as needed:
 - a. Depending on the item, you might be able to specify a bin, a lot, a work order, and other values.
 - b. If you use general ledger accounts, specify them fully.
10. Click New Row to add another item to be issued to the same asset.
11. Click OK.

Example

For example, if you are configuring a laptop computer in the Assets application, you might need to issue software to it. Rather than opening the Inventory application to issue the software, you can use the Assets application to issue the software.

Modifying assets

After you create an asset, you can add it to a collection, change its status, add downtime information, add meter information, move the asset, swap the asset, change the item number, or zero the year-to-date amount.

- **[Changing the status of assets](#)**
You use the Assets application to change the status of an asset. Assets have a designated status that indicates whether they are operational. When you create an asset record, the default status is Not Ready.
- **[Adding depreciation schedules to assets](#)**
You add depreciation schedules to assets to reduce the value of that asset according to user-defined period thresholds. In date-based schedules, the value depreciates at specific time intervals. In usage-based schedules, the value declines based on an asset meter. For example, you can set a depreciation schedule on a vehicle that is based on miles driven or time in service.
- **[Swapping depreciation schedules between assets](#)**
If you need to replace an asset that has a depreciation schedule, you can swap depreciation schedules between the original asset and the replacement asset.
- **[Reporting asset downtimes](#)**
You use the Assets application to report the start and end time of the downtime for an asset after it has occurred.
- **[Adding meters to assets](#)**
Use the Assets application to associate multiple meters with an asset. If the selected asset is associated with a meter group, the meters in that group display in the Meters window on the Meters tab.
- **[Moving assets](#)**
You can move an asset from a non-inventory location to another non-inventory location or to a storeroom. You can move assets from your current site to another site within your organization, or to a site in a different organization.
- **[Swapping assets](#)**
You use the Assets application to replace one asset with another asset, and to specify a location for the asset you swap out. You can swap any number of assets at once. You cannot move rotating assets from inventory locations. Use the Inventory application to issue rotating assets or to transfer rotating assets.
- **[Changing item numbers](#)**
You can change the item number of the current rotating asset record.
- **[Zeroing out asset costs](#)**
You use the Assets application to zero out the year to date or the total costs for an asset. This action might be performed once per year.
- **[Rolling up maintenance costs](#)**
In the Assets application, you can calculate the maintenance cost of your assets by rolling up costs that you incur for labor, materials, tools, and services.

Changing the status of assets

You use the Assets application to change the status of an asset. Assets have a designated status that indicates whether they are operational. When you create an asset record, the default status is Not Ready.

About this task

When you change the status of an asset, you can select an option to apply the new status to all child assets.

If a rotating asset has a status of Decommissioned, you cannot change the status for this asset. The Decommissioned status indicates that the rotating asset has been returned to the vendor. The asset record becomes a history record that cannot be changed.

Procedure

1. From the Assets application, display the asset whose status you want to change.
2. Select the Change Status action.
3. In the New Status field, select a status from the drop-down list.
4. Click OK.

Adding depreciation schedules to assets

You add depreciation schedules to assets to reduce the value of that asset according to user-defined period thresholds. In date-based schedules, the value depreciates at specific time intervals. In usage-based schedules, the value declines based on an asset meter. For example, you can set a depreciation schedule on a vehicle that is based on miles driven or time in service.

Before you begin

An asset must have values for a starting cost and a salvage amount before you can set a depreciation schedule. You can define both of these values when you create the depreciation schedule.

Procedure

1. Select an asset and click the Depreciation Schedule > Manage Depreciation Schedule action.
2. In the Schedule Definition table, click New Row and specify either a straight-line calculation or a double-declining calculation in the Method field.
3. In the Period Type field, specify either a date or meter schedule.
4. In the Periods field, specify the number of depreciation periods that are in the schedule.
5. Depending on the period type you specified, specify either the date period information or meter period information.
6. Click OK to save the schedule.

Swapping depreciation schedules between assets

If you need to replace an asset that has a depreciation schedule, you can swap depreciation schedules between the original asset and the replacement asset.

Procedure

1. Select the asset that needs to be replaced and click the Depreciation Schedule > Swap Depreciation Schedule action.
2. In the Target Asset table, specify the replacement asset.
3. Click OK to complete the swap.

Reporting asset downtimes

You use the Assets application to report the start and end time of the downtime for an asset after it has occurred.

About this task

An asset might incur both operational and non-operational downtime. You can create multiple downtime reports on a single work order.

Procedure

1. From the Assets application, display the record for the asset for which you want to report downtime.
2. Select the Report Downtime action.
3. In the Start Date field, the system date is displayed. Edit the date if necessary.
4. In the End Date field, specify a date the downtime ended or will end. The Hours field shows the total downtime hours based upon the start date and the end date. This calculation considers the calendar for the asset and the elapsed time between the start and end of downtime.
5. In the Downtime Code field, specify a code to describe the downtime.
6. In the Downtime Type section, select either of the following fields:
 - a. Operational If the downtime occurred when the asset was in use.
 - b. Non-Operational If the downtime occurred when the asset was not in use.
7. Click OK.

- [Changing downtime asset status](#)

You use the Assets application to change the status of an asset from downtime to uptime or from uptime to downtime.

- [Managing downtime history](#)

You use the Assets application to view and to modify information about the downtime that has been reported against an asset. For example, if a downtime period extends beyond the planned end date that was recorded, you can change the end date.

Changing downtime asset status

You use the Assets application to change the status of an asset from downtime to uptime or from uptime to downtime.

Procedure

1. From the Assets application, display the record for the asset for which you want to change the status.
2. Select the Report Downtime action.
3. Select the Change Status action.
4. Optional: Edit the date in the Status Date field, if the date of the status change is not the system date.
5. In the Downtime Code field, click Select Value and specify a reason for the status change.
6. In the Downtime Type section, select either of the following options:
 - a. Operational If the status change occurs when the asset is in use.
 - b. Non-Operational If the status change occurs when the asset is not in use.
7. Click OK.

Related tasks

- [Managing downtime history](#)

Managing downtime history

You use the Assets application to view and to modify information about the downtime that has been reported against an asset. For example, if a downtime period extends beyond the planned end date that was recorded, you can change the end date.

Procedure

1. From the Assets application, display the asset record for which you want to manage downtime history.
2. Select the Manage Downtime History action.
3. In the Details window, select the row for the downtime whose details you want to view, and modify information as needed.
4. Click OK and click Save Asset.

Related tasks

- [Changing downtime asset status](#)

Adding meters to assets

Use the Assets application to associate multiple meters with an asset. If the selected asset is associated with a meter group, the meters in that group display in the Meters window on the Meters tab.

Procedure

1. In the Assets application, display the asset to which you want to add a meter.
2. On the Meters tab, click New Row. If a value appears in the Meter Group field and there are meters in that meter group, those meters display in the Meters window.
3. In the Meter field, specify a meter.
4. If you select a continuous type of meter, specify one of the following options for the Average Calculation Method:
 - a. All To use all the readings to calculate the average of the readings.
 - b. Sliding Days To use a specific number of days to calculate the average of the readings. If you specify Sliding, type a value in the Sliding Window Size field for the number of days to use in the calculation.
 - c. Sliding Readings To use a specific number of readings to calculate the average of the readings. If you specify Sliding, type a value in the Sliding Window Size field for the number of readings to use in the calculation.
 - d. Static To set the average reading and never recalculate it. If you specify Static, type a value in the Average Units/Day field.
5. For a continuous type of meter, in the Reading Type field, specify Delta (to report incremental use) or Actual (to report cumulative use).
6. For a continuous type of meter, in the Accept Rolldown From field, specify Asset (for the readings of the parent asset to apply to the current asset), Location (for the readings of the location to apply to the current asset), or None.
7. If the asset is a linear asset, such as a roadway or a pipeline, specify values in the Linear Segment Details section as needed.
The Linear feature is available through a separately licensed product extension.
8. Click Save Asset.

- [Specifying meter readings](#)

You use the Assets application to report meter readings for a selected asset.

- [Assigning meter groups to assets](#)

You use the Assets application to assign a meter group to an asset.

- [Updating meter history](#)

Use the Manage Meter Reading History action in the Assets application to view or to update historical meter readings.

- [Resetting meter readings](#)

You use the Assets application to clear the readings for a continuous type of meter.

- [Deleting asset records](#)

You use the Assets application to delete asset records from the database.

- [Updating historical meter readings](#)

Use the Assets application to update the history of a meter or to insert a historical reading.

- [Replacing meters](#)

You use the Assets application to replace meter. Use the replace feature when a physical meter breaks and you want to replace it. The replace feature lets you record a starting value for the replacement meter. The starting value of the replacement meter might not be zero if it has been previously used.

Specifying meter readings

You use the Assets application to report meter readings for a selected asset.

Before you begin

You might need to acquire the proper authorization to specify historical readings.

About this task

A historical reading has a New Reading Date that is before the last reading date.

Procedure

1. On the Meters tab of the Assets application, display the asset for which you want to type meter readings.

2. Select the Enter Meter Readings action.
3. In the New Reading field for the meter, specify a value. The Average Units/Day field value is calculated.
4. If you are entering a delta reading, select the Delta check box. If the meter was set up as a delta reading type, the check box is selected by default. If you are specifying an actual reading that is a rollover reading, select the Rollover check box. In a rollover reading, the new reading value is less than the Previous Reading value due to a rollover.
5. To view the details for the meter, click View Details.
6. Optional: Edit the date and time in the New Reading Date field.
7. Optional: Type a comment about the reading in the Remarks field.
8. Click OK to save the specified readings and close the dialog box.

Related concepts

- [Updating historical meter readings](#)

Related tasks

- [Assigning meter groups to assets](#)
- [Updating meter history](#)
- [Resetting meter readings](#)
- [Deleting asset records](#)
- [Replacing meters](#)

Assigning meter groups to assets

You use the Assets application to assign a meter group to an asset.

About this task

If the asset is a rotating asset, and its rotating item has a meter group assigned to it, the meter group associated with the item is copied to the asset record and the Meter Group field is read-only. If the item for a rotating asset does not have a meter group assigned to it, you can assign a meter group to the asset. You can also assign a meter group to a non-rotating asset. When an asset has a meter group associated with it, all the meters that belong to that group display in the Meters tab. You can add and delete meters from the list.

Procedure

1. From the Assets application, display the asset to which you want to assign a meter group.
2. In the Meter Group field on the Meters tab, specify a value.

Related concepts

- [Updating historical meter readings](#)

Related tasks

- [Specifying meter readings](#)
- [Updating meter history](#)
- [Resetting meter readings](#)
- [Deleting asset records](#)
- [Replacing meters](#)

Updating meter history

Use the Manage Meter Reading History action in the Assets application to view or to update historical meter readings.

Before you begin

Depending on your security authorization, you might be able to only view historical readings and not to update them.

About this task

When you update a meter reading, the delta (change) readings are applied to all the readings for that meter that are more recent than the date on which you make the update. If the meter is on an asset in a hierarchy, the readings for the assets in the hierarchy are also updated. If the meter is for a location that has assets set up to accept the roll down from their locations, the meters for those assets are updated.

Procedure

1. From the List tab of the Assets application, open the asset record for which you want to update the meter history.
2. Select the Manage Meter Reading History action.
3. In the Manage Meter History window, click the Continuous Meter Readings tab or the Characteristic and Gauge Meter Readings tab to view and update meters based on their meter types.
4. On the Continuous Meter Readings tab, you can enter the modified reading when the Enter as Delta check box is not selected. Select the Enter as Delta check box to specify a delta for the selected meter.
5. Specify the updated meter readings and click OK.

Related concepts

- [Updating historical meter readings](#)

Related tasks

- [Specifying meter readings](#)
- [Assigning meter groups to assets](#)
- [Resetting meter readings](#)
- [Deleting asset records](#)
- [Replacing meters](#)

Resetting meter readings

You use the Assets application to clear the readings for a continuous type of meter.

Procedure

1. From the Assets application, display the asset record for the meter that you want to reset.
2. Select the Reset/Replace Meters action.
3. Click View Details to view information for the selected meter.
4. Specify values as needed in the Since Last Repair field, the Since Last Overhaul field, the Since Last Inspection field, the Since Install field, the Rollover field, and the Average field.
5. Click OK.

Related concepts

- [Updating historical meter readings](#)

Related tasks

- [Specifying meter readings](#)
- [Assigning meter groups to assets](#)
- [Updating meter history](#)
- [Deleting asset records](#)
- [Replacing meters](#)

Deleting asset records

You use the Assets application to delete asset records from the database.

About this task

If the asset you want to delete is referenced on an active job plan, a location, a preventive maintenance, a purchase order, a route, a safety plan, or a work order, you cannot delete the asset record.

Procedure

1. On the List tab of the Assets application, select the asset you want to delete.
2. Select the Delete Asset action, and click Yes.

Related concepts

- [Updating historical meter readings](#)

Related tasks

- [Specifying meter readings](#)
- [Assigning meter groups to assets](#)
- [Updating meter history](#)
- [Resetting meter readings](#)
- [Replacing meters](#)

Updating historical meter readings

Use the Assets application to update the history of a meter or to insert a historical reading.

The following rules apply to updating historical meter readings:

- If you specify a modified reading for an asset or for a location, the change is applied to all delta (change) readings that are more recent than the date of the modified reading for that meter. Subsequent meter readings are updated until the first actual reading is reached.
- Only readings of meters and of assets (those assets that were set up to inherit meter readings from parents) that were members of the hierarchy at the time of the original meter reading are updated. Meters and assets added to the hierarchy after the original meter reading remain unchanged.
- When a reading is modified, the modified date, the user, and a reason for the change is recorded.
- A historical reading can be greater than a subsequent reading only if the meter has a rollover point.

Related tasks

- [Specifying meter readings](#)
- [Assigning meter groups to assets](#)
- [Updating meter history](#)
- [Resetting meter readings](#)
- [Deleting asset records](#)
- [Replacing meters](#)

Replacing meters

You use the Assets application to replace meter. Use the replace feature when a physical meter breaks and you want to replace it. The replace feature lets you record a starting value for the replacement meter. The starting value of the replacement meter might not be zero if it has been previously used.

Procedure

1. From the Assets application, display the asset record for the meter that you want to replace.
2. Select the Reset/Replace Meters action.
3. Click View Details to view information for the selected meter.
4. In the Last Reading field, specify a value.
5. Click OK.

Related concepts

- [Updating historical meter readings](#)

Related tasks

- [Specifying meter readings](#)
- [Assigning meter groups to assets](#)
- [Updating meter history](#)
- [Resetting meter readings](#)
- [Deleting asset records](#)

Moving assets

You can move an asset from a non-inventory location to another non-inventory location or to a storeroom. You can move assets from your current site to another site within your organization, or to a site in a different organization.

About this task

When you move multiple assets, you might want to specify the same information for most or all of the assets. For example, you might want to specify the same location, or remove the parent for all assets that you are moving.

Procedure

1. From the List tab, display the asset that you want to move.
2. Select the Move/Modify Assets action.
3. In the Move/Modify Assets window, click the Assets tab.
4. To add assets, click Select More Assets.
5. To move the assets, perform any of the following actions in the Mass Move section:

Option	Description
To move the assets to a different site	<ol style="list-style-type: none"> a. Specify a value in the To Site field, or click Detail Menu to retrieve a value. The site can be in the organization in which you logged in or a different organization. b. Next to the To Site field, click Apply. If the site to which you want to move the assets has an asset with the same identifier as one that you are moving, you must assign a different identifier for the asset you are moving. Every asset within a site must have a unique identifier.
To move the assets to a different location	<ol style="list-style-type: none"> a. Type a value in the To Location field, or click Detail Menu to retrieve a value. b. Next to the To Location field, click Apply.
To move the assets to a different parent	<ol style="list-style-type: none"> a. Type a value in the To Parent field, or click Detail Menu to retrieve a value. b. Next to the To Parent field, click Apply.
To move all the assets to one parent	<ol style="list-style-type: none"> a. Type a value in the To Parent field. b. Click Apply. c. Perform one of the following actions: <ul style="list-style-type: none"> • To perform the move immediately, click Execute Now. • To perform the move when the work order's status is COMP (Complete), click Save as Plan.
To move the assets to a different bin	<ol style="list-style-type: none"> a. Specify a value in the To Bin field, or click Detail Menu to retrieve a value. b. Next to the To Bin field, click Apply.

6. Optional: You can edit any fields for individual assets.
7. Click OK, then click Save.

Swapping assets

You use the Assets application to replace one asset with another asset, and to specify a location for the asset you swap out. You can swap any number of assets at once. You cannot move rotating assets from inventory locations. Use the Inventory application to issue rotating assets or to transfer rotating assets.

Before you begin

The ability to swap assets to and from another site or another organization depends upon your security authorization.

About this task

The following rules apply to swapping assets:

- You can swap rotating assets from one organization to another only if both organizations use the same item set.
- Every asset within a site must have a unique identifier. If the replacing asset from another site or organization has the same asset identifier as an asset in your current site, you are prompted to assign a new asset identifier for the replacing asset.

Procedure

1. From the List tab of the Assets application, or from the asset record you want to swap, click Swap Assets.
2. In the Swap Assets window for the asset that you want to swap out, perform either of the following actions:
 - a. In the To Location field, click Detail Menu to assign the asset to a location within the current site.
 - b. To assign the asset to another site, click the View Details icon. In the To Site field, click Select Value. Optional: Select values for the To Location field, the To Parent field, or the Bin field.
3. To select a replacement, perform either of the following actions:
 - a. To choose a replacing asset from within the current site, in the Replacing Asset field, click Detail Menu.
 - b. To choose a replacing asset from another site, click View Details, then in the From Site field, click Select Value. In the Replacing Asset field, click Detail Menu.
4. If you accessed the Swap Assets window from an asset record and want to swap additional assets, click Select More Assets to add assets to the list. Repeat steps 2 and 3 for each asset you added.
5. Click OK.

Changing item numbers

You can change the item number of the current rotating asset record.

About this task

Changing item numbers is useful because some industries require different part numbers for the same type of part, depending on what the part is used for. A different part number can indicate that the same part has different installation requirements when it is used for different things.

Procedure

1. On the Asset tab of the Assets application, display the asset record whose item number you want to change.
2. Select the Change Item Number action.
3. In the New Item field, type a value, and click OK.

Zeroing out asset costs

You use the Assets application to zero out the year to date or the total costs for an asset. This action might be performed once per year.

Procedure

1. From the Assets application, display the record whose costs you want to reset.
2. From the Select Action menu, select Zero Asset Costs.
3. In the Zero Asset Costs window, select either of the following options:
 - a. Select the Zero Year to Date Costs check box, to zero all costs to date within the current year.
 - b. Select the Zero Total Costs check box, to zero all costs for the asset.
4. Click OK.

Rolling up maintenance costs

In the Assets application, you can calculate the maintenance cost of your assets by rolling up costs that you incur for labor, materials, tools, and services.

About this task

If a work order is associated with an asset, the costs for labor, materials, tools, and services can be rolled up to the asset when the work order is closed. When you roll up maintenance costs for an asset, the cost is rolled up to the top-level asset in the hierarchy that the asset belongs to.

Costs can be rolled up manually or automatically. By default, cost rollups are manual. If you want costs to be calculated and rolled up automatically when a work order is closed, you must set the `mxe.workorder.rollupMaintenanceCosts` system property to 1. After you configure the system property for automatic rollups, all subsequent costs that are associated with work orders are rolled up automatically. However, any unprocessed maintenance costs that existed before the configuration are not automatically rolled up. You must roll up any preexisting, unprocessed maintenance costs manually.

If you upgrade to Maximo® Manage 8.5, run the Maintenance Cost Rollup Report to roll up pending maintenance costs before the upgrade.

Procedure

1. In the Assets application, from the More Actions menu, select Roll Up Maintenance Costs.
The Maintenance Cost Rollup window lists assets that have pending maintenance costs to roll up and any assets for which cost rollups failed.
2. Optional: To review the asset hierarchy for an asset, click the Show Hierarchy icon on the asset row.
3. To roll up maintenance costs, select one of the following options:
 - To roll up maintenance costs for a single asset, select the asset and then click the Roll Up Costs icon on the asset row.
 - To roll up maintenance costs for all assets that are displayed in the window, click Roll Up All Costs.

Results

Maintenance costs are rolled up to the top-level asset in the hierarchy that the asset belongs to.

- [Rolling up maintenance costs by using an automation script](#)
Use an automation script to do a one-time rollup that resolves all preexisting transactions. The script updates the Total Cost and YTD Cost of each asset that is associated with a work order that was closed after you committed your previous rollup.

Rolling up maintenance costs by using an automation script

Use an automation script to do a one-time rollup that resolves all preexisting transactions. The script updates the Total Cost and YTD Cost of each asset that is associated with a work order that was closed after you committed your previous rollup.

About this task

Complete these steps to roll up maintenance costs for your assets by using an automation script.

Procedure

1. Download the [automation script](#). Copy the script to a location that is accessible by Maximo® Manage.
2. To create the automation script, log in to Maximo Manage as an administrator.

3. Go to Automation Scripts from the side menu, and select More Actions...>Create...Script.
4. In the Create Script window, enter a name and description for your script.
5. In the Script Language field, enter `python`.
6. Copy the script from the file that you downloaded to the Script field in the Create Script window.
7. Click Create.
A system message is displayed to indicate that the script was created successfully.
8. Close the system message.
9. Using a REST client (such as the Firefox RESTClient extension), send the following URL request by using the POST method to start the automation script that you created:
`http://<maximo_url>:<maximo_port>/maximo/oslc/script/<automation script name>`
Note: This step can take a few minutes depending on the number of records that must be processed.
10. Confirm the receipt of a status 200, which indicates the rollout process was completed successfully.

Importing asset-related digital data

You can import asset-related digital data into Maximo® Manage from IBM® Digital Twin Exchange. After you configure integration components, you use the Assets application to connect to Digital Twin Exchange and import the data.

- [Overview](#)
By using the integration between IBM Maximo Manage and IBM Digital Twin Exchange, you can import digital data directly from Digital Twin Exchange into your Manage database to ensure that you can access the latest information that manufacturers provide about the equipment that you own.
- [Configuring the integration](#)
You must specify an integration endpoint, configure a server certificate, set a prefix identifier, increase the length of a Manage attribute, configure security authorization for object structures, specify the update processing mode that is used for imports, and grant access to an application function to enable the integration between Maximo Manage and Digital Twin Exchange.
- [Importing data from the digital data source](#)
By using the Assets application, you can import data from Digital Twin Exchange into Maximo Manage. During an import, predefined statuses are assigned to the asset, item, and job plan records that are created in the Manage database. Job-plan-related records might be updated if you import the same digital data into Maximo Manage more than once.
- [Integration mapping](#)
Integration mapping identifies the data that is mapped in the integration points for spare parts, assets, and job plans from IBM Digital Twin Exchange to IBM Maximo Manage.
- [Customizing the integration](#)
You can customize integration mapping to populate additional fields in Maximo Manage with incoming data from Digital Twin Exchange.
- [Troubleshooting integration problems](#)
Troubleshooting is a systematic approach to solving problems that you encounter when you use the integration. The troubleshooting approach is to determine why something does not work as expected and specify how to resolve the problem.

Overview

By using the integration between IBM® Maximo® Manage and IBM Digital Twin Exchange, you can import digital data directly from Digital Twin Exchange into your Manage database to ensure that you can access the latest information that manufacturers provide about the equipment that you own.

Digital Twin Exchange is a source of digital data that is provided by manufacturers. After a manufacturer loads digital data for a piece of equipment into Digital Twin Exchange, a Manage customer who buys that equipment and its digital data can use this integration to import the latest and most accurate digital data for the equipment into their Manage database.

In Maximo Manage, you import digital data by using the Assets application. You connect to the digital data source, preview the products that you are entitled to import, and decide whether you want to import them. When you import digital data, asset-related items, such as assets, spare parts, and job plans are automatically created in the Manage database.

This integration between Maximo Manage and Digital Twin Exchange is unidirectional.

Configuring the integration

You must specify an integration endpoint, configure a server certificate, set a prefix identifier, increase the length of a Manage attribute, configure security authorization for object structures, specify the update processing mode that is used for imports, and grant access to an application function to enable the integration between Maximo® Manage and Digital Twin Exchange.

- [Configuring the integration endpoint](#)
To ensure that you can retrieve the digital data that you are entitled to from Digital Twin Exchange, you must configure the `mxe.dtendpoint` system property to specify the location of the Digital Twin Exchange server.
- [Configuring the server certificate](#)
To enable secure communication between Maximo Manage and Digital Twin Exchange, you must configure a secure socket layer (SSL) certificate for Digital Twin Exchange. You use your application server to add the certificate authority (CA) SSL certificate as a signer certificate to your trusted key store.
- [Configuring the integration prefix for database records](#)
To help you identify records in the Manage database that originate from Digital Twin Exchange, you configure the `mxe.dtexprefix` system property. You specify a value that is prefixed to asset, item, and job plan numbers that are created in the Manage database during imports from Digital Twin Exchange. The default value for this prefix is `DT-`.

- [Configuring the length of the ASSETNUM attribute](#)
To ensure that a field length error does not occur during an import, you must increase the length of the ASSETNUM attribute in the ASSET object.
- [Configuring security authorization for object structures](#)
To avoid security issues when you import digital data, you must configure security authorization in Maximo Manage for the MXITEM, MXAPIASSETSPARE, and MXAPIJOBPLAN object structures.
- [Configuring the update mode for job plan data](#)
You can configure how existing job-plan-related items, such as job tasks and work assets, are updated in Maximo Manage when the same digital product is imported more than once. You configure a system property to specify the update mode, which can be either replace or merge. The default update mode is merge.
- [Granting access to the digital data import functionality](#)
Access to the digital data import functionality is controlled by security signature options, which are defined in the Security Groups application. By using signature options, you can grant access to the digital data import functionality to specific groups of users.

Configuring the integration endpoint

To ensure that you can retrieve the digital data that you are entitled to from Digital Twin Exchange, you must configure the `mxe.dtendpoint` system property to specify the location of the Digital Twin Exchange server.

Procedure

1. In the System Properties application, in the Global Properties section, filter for and expand the `mxe.dtendpoint` property.
2. In the Global Value field, update the host name in the URL to point to the location of the Digital Twin Exchange server.
3. Save the changes and click Live Refresh to update the values in the database.

Configuring the server certificate

To enable secure communication between Maximo® Manage and Digital Twin Exchange, you must configure a secure socket layer (SSL) certificate for Digital Twin Exchange. You use your application server to add the certificate authority (CA) SSL certificate as a signer certificate to your trusted key store.

About this task

You might also need to add the trusted key store into the server XML, synchronize server nodes, or restart the server. For more information about how to configure an SSL certificate, see the documentation for your application server.

Configuring the integration prefix for database records

To help you identify records in the Manage database that originate from Digital Twin Exchange, you configure the `mxe.dtexprefix` system property. You specify a value that is prefixed to asset, item, and job plan numbers that are created in the Manage database during imports from Digital Twin Exchange. The default value for this prefix is DT-.

Procedure

1. In the System Properties application, in the Global Properties section, filter for and expand the `mxe.dtexprefix` property.
2. In the Global Value field, specify the prefix.
3. Save the changes and click Live Refresh to update the values in the database.

Configuring the length of the ASSETNUM attribute

To ensure that a field length error does not occur during an import, you must increase the length of the ASSETNUM attribute in the ASSET object.

Procedure

1. In the Database Configuration application, filter for and open the ASSET object.
2. On the Attributes tab, filter for the ASSETNUM attribute.
3. In the Details section, set the value in the Length field to 25.
4. Click Save.
5. Update the database to enable these changes to take effect.

Configuring security authorization for object structures

To avoid security issues when you import digital data, you must configure security authorization in Maximo® Manage for the MXITEM, MXAPIASSETSPARE, and MXAPIJOBPLAN object structures.

Procedure

1. In the Object Structures application, filter for and open the MXITEM object structure.
2. Click the Configure Object Structure Security action.
3. In the Configure Object Structure Security window, ensure that the Use Object Structure for Authorization Name check box is selected.
4. Ensure that the Visible check box is selected for all signature options and click OK.
5. Repeat steps 1 to 4 for the MXAPIASSETSPARE and MXAPIJOBPLAN object structures.
6. In the Users application, filter for and open the MXINTADM user.
7. Click the Groups tab and note the security groups that this user belongs to.
8. In the Security Groups application, perform the following actions for each security group that the MXINTADM user belongs to:
 - a. On the Object Structures tab, filter for and open the MXITEM object structure.
 - b. In the security options section, click Grant Listed Options for This Object Structure.
 - c. Repeat steps a and b for the MXAPIASSETSPARE and MXAPIJOBPLAN object structures.
 - d. Save your changes.

Configuring the update mode for job plan data

You can configure how existing job-plan-related items, such as job tasks and work assets, are updated in Maximo® Manage when the same digital product is imported more than once. You configure a system property to specify the update mode, which can be either replace or merge. The default update mode is merge.

About this task

When you use replace for the update mode, if a job-plan-related item, such as a job task, is associated with a job plan in Maximo Manage, but is no longer associated with that job plan on the incoming digital record, the job task is deleted from the Manage job plan. When you use merge for the update mode, the job task is not deleted. In both scenarios, job tasks that are associated with a Manage job plan and remain associated with that job plan on the incoming record are updated, and new job tasks are created if required.

Procedure

1. In the System Properties application, in the Global Properties section, filter for and expand the mxe.dtjobplanaction property.
2. In the Global Value field, enter REPLACE or MERGE depending on which mode you want to use.
3. Save the changes and click Live Refresh to update the values in the database.

Granting access to the digital data import functionality

Access to the digital data import functionality is controlled by security signature options, which are defined in the Security Groups application. By using signature options, you can grant access to the digital data import functionality to specific groups of users.

Procedure

1. In the Security Groups application, on the List tab, select the group to be granted access.
2. On the Applications tab, in the Description column, click Assets.
3. In the panel that lists the actions that are associated with the Assets application, filter for the Import Digital Data action.
4. Select the Grant Access check box and save your changes.

Importing data from the digital data source

By using the Assets application, you can import data from Digital Twin Exchange into Maximo® Manage. During an import, predefined statuses are assigned to the asset, item, and job plan records that are created in the Manage database. Job-plan-related records might be updated if you import the same digital data into Maximo Manage more than once.

- [Integration overview](#)
When you import digital data into Maximo Manage from Digital Twin Exchange, asset-related items, such as assets, spare parts, and job plans, are automatically created in the Manage database.
- [Importing digital data](#)
You use the Assets application to import digital data into Maximo Manage. When the import is complete, asset-related and job-plan-related database records are automatically created for the products that you select.
- [Initial statuses of import-related records](#)
When you import digital data into Maximo Manage, a predefined status is assigned to each asset, item, and job plan record that is created in the database.
- [Processing of job-plan-related components](#)
When you import the same digital data more than once, job-plan-related components for that data, such as job tasks and work assets, are updated in Maximo Manage, and some components might be inserted or deleted.

Integration overview

When you import digital data into Maximo® Manage from Digital Twin Exchange, asset-related items, such as assets, spare parts, and job plans, are automatically created in the Manage database.

You use the Assets application to import digital data into Maximo Manage. You specify the digital data source and the connection parameters. The connection parameters are your IBMid and your Digital Twin Exchange key.

You request a preview of product data from Digital Twin Exchange. The connection parameters and the URL that is configured in the mxe.dtendpoint system property are used to connect to Digital Twin Exchange and request the digital data.

The list of products that you are entitled to import is displayed, and you decide whether you want to import them. You can select individual products to import from the list.

When you import a digital product, asset-related and job-plan-related data is retrieved from Digital Twin Exchange for the product that you select, and corresponding records are created in the Manage database. Records for spare parts, attachments, and job plans can be created and updated during import processing. Asset records can be created but cannot be updated.

To prevent database dependency issues, records are created in the Manage database in the following order:

1. Item records for spare parts
2. Asset records
3. Job plan records
4. Attachment records

The value that is specified in the mxe.dtexprefix system property is prefixed to internal identifiers to set the item, spare part, and job plan numbers in the database. The importing of each digital data product requires several calls to Digital Twin Exchange APIs. If an API call fails, that product and any remaining unimported products are not imported. For example, when you attempt to import four products, if the first two are imported successfully but the third is not because an API call fails, then both the third and fourth products are not imported.

During an import, asset-related and job-plan-related records are created in Maximo Manage for only the default site and organization that are associated with the current user session.

Importing digital data

You use the Assets application to import digital data into Maximo® Manage. When the import is complete, asset-related and job-plan-related database records are automatically created for the products that you select.

Procedure

1. In the Assets application, click the Import Digital Data action.
2. Review the request parameters:
 - Ensure that the Digital Twin Email parameter contains the IBMid that you use to access Digital Twin Exchange.
 - Ensure that the Key parameter contains the key that you use in Digital Twin Exchange.
3. Click Request Data.
4. Review the list of matching products and select the products that you want to import.
5. Click Import Data to import the products that you select or click Cancel to exit.

Initial statuses of import-related records

When you import digital data into Maximo® Manage, a predefined status is assigned to each asset, item, and job plan record that is created in the database.

The following table indicates the status that is assigned to each Manage record after the import is complete:

Table 1. Initial statuses of Manage records after digital data is imported

Record	Initial status
Asset	NOT READY
Item record for spare part	ACTIVE
Job Plan	DRAFT

Processing of job-plan-related components

When you import the same digital data more than once, job-plan-related components for that data, such as job tasks and work assets, are updated in Maximo® Manage, and some components might be inserted or deleted.

The following processing occurs when digital data that already exists in Maximo Manage is imported again:

- If a component that is associated with the job plan in Maximo Manage matches a component in the incoming digital record for that job plan, the Manage component is replaced by the incoming component.
- If a new component is associated with the job plan in the incoming digital record, the new component is created for the job plan in Maximo Manage.
- If a component that is associated with the job plan in Maximo Manage is no longer associated with the job plan in the incoming digital record, one of the following actions is taken based on the update mode that is configured:
 - If you are using replace for the update mode, the Manage component is deleted.
 - If you are using merge for the update mode, the Manage component is not deleted.

Integration mapping

Integration mapping identifies the data that is mapped in the integration points for spare parts, assets, and job plans from IBM® Digital Twin Exchange to IBM Maximo® Manage.

- **Spare parts**
The spare parts integration point uses the internal API for the MXITEM Manage object structure and the ITEM Manage destination object.
- **Assets**
The assets integration point uses the internal APIs for the MXAPIASSETSPARE Manage object structure and the ASSET and SPAREPART Manage destination objects.
- **Job plans**
The job plans integration point uses the internal APIs for the MXAPIJOBPLAN Manage object structure and the JOBPLAN, JOBTASK, and JPASSETSPLINK Manage destination objects.

Spare parts

The spare parts integration point uses the internal API for the MXITEM Manage object structure and the ITEM Manage destination object.

The following table outlines the relevant mapping for this integration point:

Table 1. Mapping for spare parts

Digital Twin Exchange source field	ITEM attribute	Data type	Length
[DTE prefix]||"-||ID	ITEMNUM	Upper	30
NAME	DESCRIPTION	ALN	200
DESCRIPTION	DESCRIPTION_LONGDESCRIPTION	ALN	32000
"ACTIVE"	STATUS	Not applicable	Not applicable
ITEMIMAGE	Not applicable	Not applicable	Not applicable
"DTEX"	SOURCESYSID	ALN	10

[DTE prefix] is the prefix that is configured in the mxe.dtexprefix system property.

Assets

The assets integration point uses the internal APIs for the MXAPIASSETSPARE Manage object structure and the ASSET and SPAREPART Manage destination objects.

The following table outlines the relevant mapping for this integration point:

Table 1. Mapping for assets

Digital Twin Exchange source field	ASSET attribute	SPAREPART attribute	Data type	Length
PRODUCT_ID-SEQNR	ASSETNUM	Not applicable	Upper	25
NAME	DESCRIPTION	Not applicable	ALN	200
DESCRIPTION	DESCRIPTION_LONGDESCRIPTION	Not applicable	ALN	32000
ITEMIMAGE	Not applicable	Not applicable	Not applicable	Not applicable
Not applicable	Not applicable	ITEMSETID	Upper	8
Not applicable	ORGID	ORGID	Upper	8
"DTEX"	SOURCESYSID	Not applicable	ALN	10
PRODUCT_ID	EXTERNALREFID	Not applicable	ALN	10
[DTE prefix]||"-||ID (of spare part)	Not applicable	ITEMNUM	Upper	30
QUANTITY	Not applicable	QUANTITY	DECIMAL	15.2

[DTE prefix] is the prefix that is configured in the mxe.dtexprefix system property.

The value of the SPAREPART.ITEMSETID attribute is set to the item set that is associated with the current session for the user who imports the data.

The values of the ASSET.ORGID and SPAREPART.ORGID attributes are set to the organization that is associated with the current session for the user who imports the data.

Job plans

The job plans integration point uses the internal APIs for the MXAPIJOBPLAN Manage object structure and the JOBPLAN, JOBTASK, and JPASSETSPLINK Manage destination objects.

The following table outlines the relevant mapping for this integration point:

Table 1. Mapping for job plans

Digital Twin Exchange source field	JOBPLAN attribute	JOBTASK attribute	JPASSETSPLINK attribute	Data type	Length
[DTE prefix]||"-||ID (of job plan)	JPNUM	Not applicable	JPNUM	Upper	12
NAME	DESCRIPTION	Not applicable	Not applicable	ALN	200
DESCRIPTION	DESCRIPTION_ LONGDESCRIPTION	Not applicable	Not applicable	ALN	32000
"DTEX"	SOURCESYSID	Not applicable	Not applicable	ALN	10
TASK	Not applicable	JPTASK	Not applicable	Integer	12
DESCRIPTION	Not applicable	DESCRIPTION	Not applicable	ALN	200
SEQUENCE	Not applicable	TASKSEQUENCE	Not applicable	Integer	12
DURATION	Not applicable	TASKDURATION	Not applicable	Duration	8
PRODUCT_ID-SEQNR	Not applicable	Not applicable	ASSETNUM	Upper	30
Not applicable	Not applicable	Not applicable	PLUSJPRENUM	DECIMAL	15.2
Not applicable	Not applicable	Not applicable	SITEID	Upper	8
Not applicable	Not applicable	Not applicable	ORGID	Upper	8

[DTE prefix] is the prefix that is configured in the mx.dtexprefix system property.

The values of the JPASSETSPLINK.SITEID and JPASSETSPLINK.ORGID attributes are set to the site and organization that are associated with the current session for the user who imports the data.

Customizing the integration

You can customize integration mapping to populate additional fields in Maximo® Manage with incoming data from Digital Twin Exchange.

- [Customizing integration mapping](#)

You can create an automation script to customize mapping for an integration point in the integration between Maximo Manage and Digital Twin Exchange. You specify the additional Manage fields that you want to populate with incoming Digital Twin Exchange data during an import.

Customizing integration mapping

You can create an automation script to customize mapping for an integration point in the integration between Maximo® Manage and Digital Twin Exchange. You specify the additional Manage fields that you want to populate with incoming Digital Twin Exchange data during an import.

About this task

The default integration mapping for assets maps the incoming Digital Twin Exchange product identifier to the ASSETNUM attribute in the ASSET object in Maximo Manage. You can customize this mapping to also map the Digital Twin Exchange product identifier to the SERIALNUM attribute in the ASSET object.

Procedure

1. In the Automation Scripts application, select the Create>Script for Integration action.
2. Select Object Structure as the integration component.
3. In the Object Structure field, select MXAPIASSETSPARE.
4. Select Inbound Processing as the processing point.
5. In the Script Language field, select python.
6. In the bottom section, paste the following script:

```
from psdi.mbo import MboConstants
from com.ibm.tivoli.maximo.digitaldata import digitaltwin
from psdi.server import AppService, MXServer

def afterMboData(ctx):
    ctx.log("afterMboData")
    if ctx.getMbo() is not None:
        dtServer = MXServer.getMXServer().lookup("DIGITALTWIN")
        if ctx.getMbo().isBasedOn("ASSET"):
            # get product id
            assetnum = ctx.getMbo().getString("assetnum")
            indx = assetnum.rindex("-")
            id= assetnum[0:indx]
```

```
# get products api response body
productPayload = dtServer.getProducts(id)

# get productid from response
productId = str(productPayload.get("id"))

#set maximo serialnum to product id
ctx.getMbo().setValue("serialnum", productId)
```

7. Click Create.

Troubleshooting integration problems

Troubleshooting is a systematic approach to solving problems that you encounter when you use the integration. The troubleshooting approach is to determine why something does not work as expected and specify how to resolve the problem.

- [Database field lengths must be increased](#)
If a digital data import fails because the length of a Manage field that is specified in an integration mapping is too small, a database administrator must increase the field length in Maximo Manage.
- [Authentication to the digital data server fails](#)
If a digital data import fails because a connection request to the Digital Twin Exchange server cannot be authenticated, you might need to update the connection parameter values or verify that a secure socket layer (SSL) certificate for Digital Twin Exchange is configured correctly.
- [Digital data cannot be retrieved from the digital data server](#)
If asset-related or job-plan-related data cannot be retrieved from Digital Twin Exchange during an import, the Digital Twin Exchange APIs might not be available.

Database field lengths must be increased

If a digital data import fails because the length of a Manage field that is specified in an integration mapping is too small, a database administrator must increase the field length in Maximo® Manage.

Symptoms

The digital data import fails to complete.

Causes

A value in the incoming record from the digital data source could not be mapped to the destination field in Maximo Manage because the length of the Manage field is too small to accommodate the value.

Diagnosing the problem

In the digital data list, review the error message for the item that was not imported to determine which Manage field needs to have its length increased. You can also search the Manage log files for more information about which Manage field is affected by the error.

Resolving the problem

To increase the length of the field that causes the error:

1. In the Database Configuration application, filter for the Manage object in the error message.
2. On the Attributes tab, filter for the attribute that caused the import to fail.
3. In the Details section, increase the value in the Length field.
4. Click Save.
5. Update the database to enable these changes to take effect.

Authentication to the digital data server fails

If a digital data import fails because a connection request to the Digital Twin Exchange server cannot be authenticated, you might need to update the connection parameter values or verify that a secure socket layer (SSL) certificate for Digital Twin Exchange is configured correctly.

Symptoms

When you request a preview of digital product data from Digital Twin Exchange, the connection request to the Digital Twin Exchange server fails because an authentication error occurred.

Diagnosing the problem

Review the error message to confirm that the error code and status that are returned from the Digital Twin Exchange server indicate an authentication issue.

Resolving the problem

Ensure that the Digital Twin Email parameter contains the IBMid that you use to access Digital Twin Exchange and that the Key parameter contains the key that you use in Digital Twin Exchange. Verify that a certificate authority (CA) SSL signer certificate for Digital Twin Exchange exists in your trusted key store.

Digital data cannot be retrieved from the digital data server

If asset-related or job-plan-related data cannot be retrieved from Digital Twin Exchange during an import, the Digital Twin Exchange APIs might not be available.

Symptoms

When you import digital product data from Digital Twin Exchange, an error message appears that states that asset, spare part, job plan, or attachment information cannot be retrieved from the digital data source.

Diagnosing the problem

Review the error message to confirm that the error code and status that are returned from the Digital Twin Exchange server indicate that the Digital Twin Exchange APIs are not available.

Resolving the problem

Verify that the Digital Twin Exchange server is running. Contact Digital Twin Exchange support to verify that the Digital Twin Exchange APIs are available.

Asset Templates

You can specify common asset information in an asset template that you can then apply to multiple assets.

You can associate spare parts, meters, and data sheets with the template. Assets that are based on the template inherit these spare parts, meters, and data sheets. You can associate a specification with the asset template on the Specifications tab.

Preventive maintenance information can also be specified for an asset template. When the template is applied to existing assets or new assets, associated PMs, which are based on the master PM, are created for each asset.

You can use asset templates to create multiple assets or to update multiple existing assets.

Example

A pharmaceutical company purchases 100 pressure gauges from the same manufacturer. The pressure gauges share the following identical information:

- Manufacturer
- Model number
- Description
- Operating range
- Accuracy
- Specifications
- Data sheets

A technician creates an asset template to record all the data that is identical. The technician then generates the series of asset records, for the pressure gauges, based on the template. They enter a serial number for each asset number and apply any differences to individual assets.

- [Creating an asset template](#)
You can specify common asset information in an asset template that you can then apply to multiple assets.

Creating an asset template

You can specify common asset information in an asset template that you can then apply to multiple assets.

About this task

When you create an asset template, the status default value is draft. You can also specify spare parts, set up meters, and associate master PMs, specifications, and data sheets, if required.

Procedure

1. In the Asset Template application, click New Asset Template.
2. Enter an asset template identifier and description.
3. Specify the information for the asset template in the Details section.
The data in these fields are applied to all assets that is based on the template.
4. Save the asset template.

What to do next

Change the status of the asset template to apply the template to existing assets or to generate multiple assets.

- [Creating assets from an asset template](#)

You can specify common asset information in an asset template that you can then apply to multiple assets. You can generate these assets in the Asset Template application.

- [Applying an asset template to existing assets](#)

When you apply an asset template to an existing asset, the data in the asset template replaces the data in the asset. Any specification records that are created in the template are also replaced.

Creating assets from an asset template

You can specify common asset information in an asset template that you can then apply to multiple assets. You can generate these assets in the Asset Template application.

Procedure

1. In the Asset Templates application, select the asset template that you want to generate assets from.
2. Open the Generate New Assets window:
 - a. Click Generate New Assets.
 - b. Select a site and click OK.
3. Specify the default asset data that you want the assets to share.
4. Specify the quantity of assets that you want to generate.
5. Specify the starting asset number for the series of asset numbers.
6. If your organization requires a prefix or a suffix for the asset number, specify a value.
7. Click Generate Asset.
The Assets table is populated with assets based on your input.
8. Optional: For assets that are generated with serial numbers, complete the serial numbers so that each asset has the correct unique serial number.
9. Optional: To add an individual asset record, click New Row.
10. Click OK.
The assets are created based on the asset template.

Applying an asset template to existing assets

When you apply an asset template to an existing asset, the data in the asset template replaces the data in the asset. Any specification records that are created in the template are also replaced.

About this task

To retain any data on the existing assets, leave the corresponding fields blank in the asset template. Template records for spare parts, PMs, meters, and data sheets are added to the records of the assets.

Procedure

1. In the Asset Templates application, select the asset template that you want to apply to existing assets.
2. Open the Apply to Existing Assets window:
 - a. Click Apply to Existing Assets.
 - b. Select a site and click OK.
3. Specify the default asset data that you want the assets to share.
4. Click OK to apply the asset template to the existing assets.

Locations

Use the Locations application to specify and to track locations for assets. You can also organize locations into logical hierarchical systems or network systems. Using hierarchies or systems of locations and specifying the locations for assets on an asset record provides the groundwork for gathering and tracking information about the history of an asset, including its performance at specific sites, as it is moved from location to location. With locations organized into systems, you can quickly find a location on the Drilldown page, and identify the asset at that location.

Use the Locations application to perform the following functions:

- Search for locations, saved queries, and bookmarks.
- View or specify detailed information specific to a location.
- View the history of, move transactions into and out of a selected location.
- View, modify, add, or delete safety records associated with a selected location.
- Associate a meter group with a location, and add and remove meters from a location.
- Type or view the specifications for a location as recorded in the Classifications application.
- View assets at a selected location.
- **Locations overview**
Locations and location hierarchies represent functional areas of an organization. Use locations to track movement of assets from place to place. Locations typically are static areas while assets might move to various locations. Write work orders and tickets for locations and charge the costs either to the location or asset. Some locations are virtual, rather than physical.
- **Working with locations**
In the Locations application, create locations for virtual or physical sites or areas. Organize locations into hierarchical or network systems. Assign users and custodians for tickets or work to be done at the location. Create tickets and work orders for a location. Associate meters and safety information with locations.

Locations overview

Locations and location hierarchies represent functional areas of an organization. Use locations to track movement of assets from place to place. Locations typically are static areas while assets might move to various locations. Write work orders and tickets for locations and charge the costs either to the location or asset. Some locations are virtual, rather than physical.

- **Types of locations**
A location is defined as a place where assets are operated, are stored, or are repaired. Using systems of locations and specifying the location for assets on asset records provides the groundwork for gathering and tracking valuable information about the history of assets, including asset performance at specific sites, and as an asset is moved from location to location.
- **Managing systems**
You can create hierarchical systems or network systems to organize your locations. Depending on your needs, you might have one or more systems. Regardless of how many systems you have, each site must have only one primary system.
- **General ledger account codes**
If you track records and transactions with general ledger account codes, consider how you use general ledger accounts when you create location records and asset records and their hierarchies and systems.
- **Meters in locations**
Adding meters to location records lets you enter meter readings and maintain historical records of meter readings against a location.
- **Update meter history rules**
Use the Manage Meter Reading History action in the Locations application to view or to update historical meter readings. When you update a meter reading, the delta (change) readings for that meter that are more recent than the date on which you make the update are applied. Readings taken at a location might roll down to the assets in that location if those assets are set up to accept them. If you require an audit trail of original reading data before an update, use the Audit feature.
- **Status of locations**
A location status is an internal value that the system uses with its business logic. Depending on your settings, you can change the status of child locations when you change a parent location.

Types of locations

A location is defined as a place where assets are operated, are stored, or are repaired. Using systems of locations and specifying the location for assets on asset records provides the groundwork for gathering and tracking valuable information about the history of assets, including asset performance at specific sites, and as an asset is moved from location to location.

Locations can be of the following types:

- Operating locations are the location in which an asset operates. Work orders and tickets are written either against the location itself or against the asset in an operating location. Use operating locations when building a location hierarchy.
- Asset types of locations are vendor, salvage, and repair. Assets can be located in asset types of locations. You can track an asset not only as it moves from one operating location to another, but as it moves to a vendor or to a repair location, and perhaps to a salvage location.
- Inventory types of locations are labor and courier. These locations can maintain a balance of an item or items issued from a storeroom. For example, a courier location holding a batch of items issued from a storeroom is responsible for the items until they are received into another location.

Managing systems

You can create hierarchical systems or network systems to organize your locations. Depending on your needs, you might have one or more systems. Regardless of how many systems you have, each site must have only one primary system.

Use the Manage Systems option of the Locations application to perform the following tasks:

- Add a system. The first location you specify for a system becomes the top-level location in the system. For every location you add to the system after the first location, you must specify a parent location. Plan carefully before adding the location to any new system.
- Change a system from a hierarchical type to a network type. Note, you cannot change a network type of system to a hierarchical type of system.

- Select a system to be the primary system. The first system created for a site automatically becomes the primary system. You can make another system the primary system by designating it as the primary system.

General ledger account codes

If you track records and transactions with general ledger account codes, consider how you use general ledger accounts when you create location records and asset records and their hierarchies and systems.

You can assign general ledger accounts to location records, to asset records, or to both. On records or transactions where you specify both a location and an asset identifier, such as a work order, the general ledger accounts of the asset and the location are merged, with general ledger components in the asset taking precedence over general ledger components in the location. This applies if you have general ledger accounts for both types of records. If you specify account codes for both locations and assets, use one component for the location, and another component for the asset.

Meters in locations

Adding meters to location records lets you enter meter readings and maintain historical records of meter readings against a location.

Before you can attach a meter to a location, use the Meters application to add the meter. Use the Assets application to configure assets to accept meter readings from their locations. Then, by adding meters to locations, such as assembly lines, meter readings can roll down to all the assets that are in those locations. The following types of meters are supported:

- Continuous meters measure consumption and are cumulative. These types of meters track items, such as miles traveled, hours elapsed, engines started, pieces produced, or fuel consumed.
- Gauge meters show a range of values, such as fuel levels, temperature, pressure, noise level or, oil level. Gauge meters are recorded via condition monitoring points.
- Characteristic meters are observational in nature and have a list of possible values. These types of meters are used to track items, such as noise level, vibration level, clarity, or color. Characteristic meters are recorded via condition monitoring points.

Meter readings for a location do not roll down to child locations.

Example of temperature meter readings

Use meter readings, such as room temperature, to help you to evaluate whether a heating system or a cooling system is working properly.

Update meter history rules

Use the Manage Meter Reading History action in the Locations application to view or to update historical meter readings. When you update a meter reading, the delta (change) readings for that meter that are more recent than the date on which you make the update are applied. Readings taken at a location might roll down to the assets in that location if those assets are set up to accept them. If you require an audit trail of original reading data before an update, use the Audit feature.

Keep in mind the following considerations when updating meter history:

- A meter reading cannot be less than the previous meter reading unless the meter has a rollover point. The same is true for historical changes. A reading cannot exceed a subsequent reading if the meter does not have a rollover point. Since a meter rollover might be changed, the metadata, including rollover, for an inserted reading is copied from the preceding reading.
- If a reading is deemed acceptable, the averages and cumulative readings are recalculated and the change rolls down the asset hierarchy. Verification is performed to see if any preventive maintenance is due as a result of the meter reading change. This check is performed on all assets whose meter readings are changed.
- Child records are updated as a result of a reading change, and preventive maintenance checks are triggered for those assets. All `METERREADING` entries for reading corrections include the time and date stamp and the user identifier.
- Use the Meters application to insert a meter reading for a date that is earlier than the current meter reading date. When such a record is inserted, the mode of the meter update is verified for the next reading in the history table. If that record was updated by specifying a delta value, then the meter reading is recalculated for that record, as well as for subsequent records that were recorded after the inserted record date. This occurs until it reaches a record that was updated by giving an actual meter reading. The history for the children that were attached to the asset during the inserted record date is updated as well by applying the delta reading of the parent. If the next reading was updated by specifying an actual meter reading, then the inserted record does not affect any subsequent readings.

Status of locations

A location status is an internal value that the system uses with its business logic. Depending on your settings, you can change the status of child locations when you change a parent location.

When you change the status of a location to Decommissioned, you must consider whether the change affects other records. If the location you are decommissioning is on an active route, is part of a safety plan, or is preventive maintenance, you must select the appropriate check box. Otherwise, you cannot change the status of a location to Decommissioned.

To review the route, the safety plan, or the preventive maintenance record, go to the relevant application, where you can remove the location from the record. Return to the location record and change the status to Decommissioned. Decommissioned locations do not appear in select value lists, but they are maintained in the database as historical records and can be accessed from the Locations application.

The following three options are available only when the selected status of a location is Decommissioned:

Roll New Status down to All Assets in All Changed Locations

Select this check box to specify that all assets in all changed locations change to the specified status.

Remove All References to this Location from All Routes

Select this check box to specify that the asset is no longer referenced on active routes while the location is in the specified status. For example, if you set the status of a location to Decommissioned, you might want the location removed from inspection routes.

Remove All References to This Location from All Safety Plans

Select this check box to specify that the locations are no longer referenced on active safety plans while the location is in the specified status.

Change the Status of All Associated PMs to Inactive

Select this check box to specify that any preventive maintenance records associated with the location are set to Inactive while the location is in the specified status.

Working with locations

In the Locations application, create locations for virtual or physical sites or areas. Organize locations into hierarchical or network systems. Assign users and custodians for tickets or work to be done at the location. Create tickets and work orders for a location. Associate meters and safety information with locations.

- [Creating locations](#)
You can specify and track locations for assets. You can also organize locations into logical hierarchical systems or network systems. Using hierarchies or systems of locations and specifying the location for assets on the asset record provides the groundwork for gathering and tracking information about the history of an asset.
- [Adding locations to one or more collections](#)
A collection is a group that can contain assets, locations, and classification items. You can add a location to one or more collections and view a list of all the collections to which a selected location belongs.
- [Changing the status of locations](#)
Use the Change Status action to change the status of an operating location. Operating locations have a designated status that indicates whether they are operational. When you create a location record, the default status is Not Ready.
- [Duplicating location records](#)
You can create a location record that copies certain information from an existing location record.

Creating locations

You can specify and track locations for assets. You can also organize locations into logical hierarchical systems or network systems. Using hierarchies or systems of locations and specifying the location for assets on the asset record provides the groundwork for gathering and tracking information about the history of an asset.

Procedure

1. On the toolbar of the Locations application, click New Location.
 2. In the Location field, specify a value, and type a description.
 3. In the Type field, type a value. If the type you choose is Operating, you can select the action Associate Systems with Location from the Select Action menu and place this location in a system and relate it to other locations.
 4. Fill additional fields as needed. An asterisk (*) indicates a required field. Some fields display only if the type is Operating.
 5. Click Save Location.
- [Associating systems with locations](#)
A location can exist in hierarchical systems, in network systems, or in both types of systems. When you associate a hierarchical system with a location, you must specify the parent for the location within that system. This applies if the new location is not the first location assigned to that system. When you associate a network system with a location, specifying the parent for the location is optional.
 - [Applying item assembly structures](#)
You use the Apply Item Assembly Structure (IAS) action in the Locations applications to apply an assembly structure to an operating location. If a rotating item in the item assembly structure has child items, the children are also applied to the selected location record.
 - [Associating users and custodians](#)
You can associate a person with a location as a custodian, as a user, or as both a user and a custodian. A user is the person who uses the location. A custodian is the person who is responsible for the care of the location. A location can have multiple users and multiple custodians.
 - [Associating services with locations](#)
You can associate one or more services with a location. Examples of services are e-mail support, telecommunications, customer support, and PC support. One of the benefits of associating services with locations is that when you have changes to a service, you can easily identify all the locations that are affected by the change in service.
 - [Associating safety-relating assets with locations](#)
Use the Locations application to associate assets relating to safety that workers might need to be aware of when they perform work on a selected asset. If the selected asset has hazards or tag outs associated with it, be sure to associate the record with itself. Doing so makes the safety-related information available when creating a safety plan or a job plan for that asset.
 - [Adding meters to locations](#)
Use the Meters tab to associate multiple meters with an operating location.

Associating systems with locations

A location can exist in hierarchical systems, in network systems, or in both types of systems. When you associate a hierarchical system with a location, you must specify the parent for the location within that system. This applies if the new location is not the first location assigned to that system. When you associate a network system with a location, specifying the parent for the location is optional.

Procedure

1. On the Location tab of the Locations application, display the record to which you want to add one or more systems.
2. Select the Associate Systems with Location action.
3. Under the Systems table window, click New Row.
4. In the System field, specify a value.
5. In the Parent field, type a value. If the system you selected in step 4 is a hierarchical system, a parent is required unless this is the first location to be associated with that system.
6. Repeat steps 3 - 5 for each system that you want to associate with this location.
7. Click OK and click Save Location.

- **Adding parents to locations**

A location in a network system can belong to one or more parents. A location in a hierarchical system can have only one parent.

- **Replacing parent locations**

Use the Locations application to replace the parent location in a particular system with a different parent location.

Adding parents to locations

A location in a network system can belong to one or more parents. A location in a hierarchical system can have only one parent.

Procedure

1. In the Locations application, on the Location tab, display the location record to which you want to add parent locations.
2. In the Systems table window, select the systems in which you want to add a parent for the current location.
3. Under the Parent table window, click New Row.
4. In the Parent field, type a value, or click Detail Menu and select an option.
5. Repeat steps 3 - 4 for each parent you want to add within the selected systems.
6. Click Save Location.

Replacing parent locations

Use the Locations application to replace the parent location in a particular system with a different parent location.

Procedure

1. From the List tab of the Locations application, display the location record that you want to change.
2. Select the View/Modify Parents action.
3. In the New Parent field, type a value. The parent is validated to ensure the following:
 - a. The parent is in the selected system.
 - b. The parent does not currently exist as the parent to the current location in the selected system.
 - c. The parent does not exist in the child location hierarchy of the selected location.
4. Click OK.

Applying item assembly structures

You use the Apply Item Assembly Structure (IAS) action in the Locations applications to apply an assembly structure to an operating location. If a rotating item in the item assembly structure has child items, the children are also applied to the selected location record.

Procedure

1. In the Locations application, display the location to which you want to apply an item assembly structure.
2. Select the Apply Item Assembly Structure action.
3. To assign numbers to the operating locations in the hierarchy in the Location Hierarchy table, perform either of the following actions:
 - a. To individually assign a value to each item, specify a value in the Current Location field. To number the next item in the hierarchy, click Detail Menu in the Item field, and select Move To. Repeat these steps until you have completed assigning numbers to all the items in the hierarchy.
 - b. To autonumber each rotating item displayed, click Autonumber All.
4. Click OK to close the window.
5. Save the record.

Associating users and custodians

You can associate a person with a location as a custodian, as a user, or as both a user and a custodian. A user is the person who uses the location. A custodian is the person who is responsible for the care of the location. A location can have multiple users and multiple custodians.

About this task

By default, the first person you associate with the location is designated as the primary contact for that location. You can change the primary contact. If a location does not have any users or any custodians, anyone can create a ticket for that location. Self-service users can create requests only for locations that list them as a user or custodian.

Procedure

1. In the Locations application, display the location with which you want to associate users or custodians.
2. Select the Associate Users and Custodians action.
3. Click New Row.
4. In the Person field, type the name of the person that you want to associate with the location.
5. To designate the relationship of the person with the location, perform either or both of the following actions:
 - a. To designate the person as a user, select the User check box.
 - b. To designate the person as a custodian, select the Custodian check box.
6. To designate a person as the primary contact, select the Primary check box. When you select this check box, the system clears the Primary check box in the record of the person previously designated as the primary contact. Only one person can be designated as the primary contact for a location.
7. To add another user or custodian, click New Row.
8. To save the associations and to return to the record, click OK.

Associating services with locations

You can associate one or more services with a location. Examples of services are e-mail support, telecommunications, customer support, and PC support. One of the benefits of associating services with locations is that when you have changes to a service, you can easily identify all the locations that are affected by the change in service.

Procedure

1. From the List tab of the Locations application, display the location with which you want to associate a service or a service group.
2. Select the Associate Services action.
3. Click New Row.
4. In the Service Group field, specify a value.
5. In the Service field, specify a value. If you do not select a service group and you select a service that is associated with a service group, the service group displays in the Service Group field.
6. Click OK to associate the service with the location and to return to the record.

Associating safety-relating assets with locations

Use the Locations application to associate assets relating to safety that workers might need to be aware of when they perform work on a selected asset. If the selected asset has hazards or tag outs associated with it, be sure to associate the record with itself. Doing so makes the safety-related information available when creating a safety plan or a job plan for that asset.

Procedure

1. From the List tab of the Locations application, display the record with which you want to associate a safety-related asset.
 2. On the Safety tab, click the Safety-Related Assets sub tab.
 3. Under the Safety-Related Assets table, click New Row.
 4. In the Asset or in the Location fields, specify a value or click Detail Menu and select an option.
 5. Repeat steps 3 - 4 for each asset that you want to associate with the current record. If the current location record has hazards or tag outs, add its asset identifier to the Safety-Related Assets table window.
 6. Click Save Location.
- [Associating hazards with locations](#)
You can add hazards to asset records and to location records so that when a work order is created on an asset or location, the appropriate safety information is available. The safety information defined in the Assets application and in the Location application might be added to a safety plan or added directly to the work order.
 - [Associating tag out procedures with location records](#)
When you associate a tag out procedure with an asset, you first associate a hazard with the asset, then you associate the tag out to eliminate the hazard for that asset. You can add tag out procedures to asset records and to location records so that when a work order is created on an asset or a location, the appropriate safety information is available. The safety information defined in the Assets application and in the Locations application might be added to a safety plan or added directly to the work order.

Associating hazards with locations

You can add hazards to asset records and to location records so that when a work order is created on an asset or location, the appropriate safety information is available. The safety information defined in the Assets application and in the Location application might be added to a safety plan or added directly to the work order.

Before you begin

Before you can add a hazard to a location record, the hazard must have already been defined in the Hazards application.

Procedure

1. From the List tab of the Locations application, open the location record to which you want to associate a hazard.
2. On the Safety tab, click the Hazards and Precautions sub tab.
3. Under the Hazards table window, click New Row.
4. In the Hazard field, click Detail Menu and select an option. If the hazard you selected has precautions associated with it, the precautions are shown in the Precautions table window. If the hazard is hazardous-material-enabled, the hazard is shown on the Hazardous Materials sub tab of the Safety tab, along with its hazardous-material information.
5. Click Save Location.

Associating tag out procedures with location records

When you associate a tag out procedure with an asset, you first associate a hazard with the asset, then you associate the tag out to eliminate the hazard for that asset. You can add tag out procedures to asset records and to location records so that when a work order is created on an asset or a location, the appropriate safety information is available. The safety information defined in the Assets application and in the Locations application might be added to a safety plan or added directly to the work order.

Before you begin

Before you can associate a tag out procedure with an asset, the tag out procedure must be defined in the Lock Out/Tag Out application.

Procedure

1. From the List tab of the Locations application, display the location record with which you want to associate a tag out procedure.
2. On the Safety tab, click the Lock Out/Tag Out sub tab.
3. Under the Hazards table window, click New Row.
4. In the Hazard field, click Detail Menu and select the tag-out-enabled hazard that you want to eliminate.
5. In the Hazards table window, select the hazard with which you want to add a tag out procedure.
6. Under the Tag Out Procedures table window, click New Row.
7. In the Tag Out field, click Detail Menu and select an option to eliminate the hazard.
8. Click Save Location.

Adding meters to locations

Use the Meters tab to associate multiple meters with an operating location.

Procedure

1. From the List tab of the Locations application, display the location to which you want to add a meter.
2. On the Meters tab, under the Meters table window, click New Row. If there is a value in the Meter Group field and there are meters in that meter group, those meters are listed in the Meters table window.
3. In the Meter field, specify a meter or click Detail Menu to select an option and to retrieve a value.
4. If you selected a continuous type of meter, specify the following values for the Average Calculation Method:
 - a. All to calculate the average of all the readings.
 - b. Sliding Days to calculate the average of the readings over a specific number of days.
 - c. Sliding Readings to calculate the average of a specific number of readings.
 - d. Static to set the average and never recalculate it.
5. In the Reading Type field, select Delta to report incremental usage or Actual to report cumulative usage.
6. If the Average Calculation Method is Sliding, specify a value in the Sliding Window Size field for the number of days or the number of readings to use in the calculation.
7. If the Average Calculation Method is Static, specify a value in the Average Units/Day field.
8. Click Save Location.

- [Adding meter readings](#)

Use the Locations application to specify meter readings for a location. A historical reading has a New Reading Date that is prior to the last reading date.

- **Updating meter history**
Use the Manage Meter Reading History action in the Locations application to view or to update historical meter readings. When you update a meter reading, the delta (change) readings for that meter that are more recent than the date on which you make the update are applied. Readings taken at a location might roll down to the assets in that location if those assets are set up to accept them.
- **Replacing meters**
Use the Reset Meter Readings action to clear the readings for a meter. Use this action when you replace a physical meter after it breaks and you want to replace it. This action is used for continuous type meters. Use this function to record a starting value for the replacement meter.
- **Resetting meters**
Use the Reset Meter Readings action to clear the readings for a meter. Use this action when you reset a meter. The Reset/Replace Meters action is for the continuous type of meter.

Adding meter readings

Use the Locations application to specify meter readings for a location. A historical reading has a New Reading Date that is prior to the last reading date.

Before you begin

You must have the appropriate security authorization to specify meter readings.

Procedure

1. On the Meters tab of the Locations application, display the location for which you want to specify meter readings.
2. Select the Enter Meter Readings action.
3. In the New Reading field for that meter, specify a value. The Average Units/Day field value is calculated and displays.
4. Optional: If you specify a delta reading, select the Delta check box. If the location of the meter was set up as a delta reading type, the check box is selected by default.
5. Optional: If you specify an actual reading that is a rollover reading (the new reading value is less than the Last Reading value due to a rollover), select the Rollover check box.
6. Click View Details.
7. In the New Reading Date field, edit the date and time.
8. In the Remarks field, type a comment about the reading.
9. Click OK and click Save Location. If the location is associated with a preventive maintenance, the meter reading fields on the preventive maintenance record are updated.

Updating meter history

Use the Manage Meter Reading History action in the Locations application to view or to update historical meter readings. When you update a meter reading, the delta (change) readings for that meter that are more recent than the date on which you make the update are applied. Readings taken at a location might roll down to the assets in that location if those assets are set up to accept them.

Before you begin

Depending on your security authorization, you might only have the authority to view historical readings and not to update historical readings. If you require an audit trail of original reading data before an update, use the Audit feature.

About this task

If a meter or a location has been added to the hierarchy since the original meter reading, its readings are not updated since it was not present at the time of the original reading. The update stops as soon as the first actual reading is reached. The change is also applied to locations that were attached to the original location at the time the meter reading was taken (reading date) and that can inherit values from the parent. When a reading is modified, the meter reading, the modified date, the user, and a reason for the change are recorded.

Procedure

1. From the List tab of the Locations application, open the location record for which you want to update the meter history.
2. Select the Manage Meter Reading History action.
3. In the Manage Meter History window, click the Continuous Meter Readings tab or the Characteristic and Gauge Meter Readings tab to view and update meters based on their meter types.
4. On the Continuous Meter Readings tab, you can enter the modified reading when the Enter as Delta check box is not selected. Select the Enter as Delta check box to specify a delta for the selected meter.
5. Specify the updated meter readings and click OK.

Replacing meters

Use the Reset Meter Readings action to clear the readings for a meter. Use this action when you replace a physical meter after it breaks and you want to replace it. This action is used for continuous type meters. Use this function to record a starting value for the replacement meter.

Procedure

1. From the List tab of the Locations application, display the location record whose meter you want to replace.
2. Select the Reset/Replace Meters action.
3. To view information for the selected meter, click View Details.
4. Specify a value in the Last Reading field.
5. Click OK to replace the meter and to return to the record.

Resetting meters

Use the Reset Meter Readings action to clear the readings for a meter. Use this action when you reset a meter. The Reset/Replace Meters action is for the continuous type of meter.

Procedure

1. From the List tab of the Locations application, display the location record whose meter you want to reset.
2. Select the Reset/Replace Meters action.
3. To view information for the selected meter, click View Details.
4. Specify values as needed in the Since Last Repair field, in the Since Last Overhaul field, in the Since Last Inspection field, in the Since Install field, in the Rollover field, and in the Average field.
5. Click OK to reset the meter and to return to the record.

Adding locations to one or more collections

A collection is a group that can contain assets, locations, and classification items. You can add a location to one or more collections and view a list of all the collections to which a selected location belongs.

Procedure

1. From the List tab of the Locations application, display the location record whose collections you want to manage.
2. Select the Manage Location Collections action.
3. Click New Row.
4. In the Collection field, type a collection. To select more than one collection, click Select Collections and choose one or more collections.
5. Click OK.

- [Adding locations to collections](#)

A collection is a group that can contain assets, locations, and classification items. A location can be added to more than one collection.

Adding locations to collections

A collection is a group that can contain assets, locations, and classification items. A location can be added to more than one collection.

Procedure

1. On the List tab of the Locations application, filter the list to display the locations that you want to add to a collection.
2. Click Select Record, and select the check box for each location that you want to add to a collection.
3. To select all the locations, select the Select All Records check box in the header row of the Locations window.
4. Select the Add Locations to Collections action.
5. In the Collection field, click Detail Menu to select an option and retrieve a value.
6. Click OK or click Cancel to return to the List tab without adding the selected locations to the collection.

Changing the status of locations

Use the Change Status action to change the status of an operating location. Operating locations have a designated status that indicates whether they are operational. When you create a location record, the default status is Not Ready.

Procedure

1. From the List tab of the Locations application, display the location for which you want to change status.
2. Select the Change Status action.

3. In the New Status field, select a status from the drop-down list. Select Decommissioned as the status only if you intend that status change to be permanent.
4. Click OK.

Duplicating location records

You can create a location record that copies certain information from an existing location record.

About this task

Duplicating a location record copies most of the location information. However, it does not duplicate data specific to a location, such as the data in the Children tables.

Procedure

1. In the Locations application, open the record that you want to duplicate.
2. Select the Duplicate Location action.
3. Specify the details for the new duplicate record.
4. Save the record.

Meters

You use the Meters application to add or to modify meter definitions. Meter definitions include names for the meters as well as sets of attributes that describe the meters. Meters are used to track asset or location performance. An asset or a location can have multiple meters associated with it.

While there may be instances where the same meter is used more than once on the same asset or location, meters in the following applications reflect logical meters:

- Meter Groups
- Assets
- Locations
- Preventive Maintenance
- Job Plans
- Items
- Condition Monitoring

Meters in these applications are used to track meter readings, not physical meters.

- [Meter value resets](#)
You use the Meters application to reset one or more values relating to a meter. If a preventive maintenance is attached to a given meter, changing the current reading affects the reading at the next preventive maintenance.
- [Working with meters](#)
You can create meters to track asset or location performance. You can also duplicate or delete meters.

Meter value resets

You use the Meters application to reset one or more values relating to a meter. If a preventive maintenance is attached to a given meter, changing the current reading affects the reading at the next preventive maintenance.

Industries that use rotating equipment rely heavily on the ability to reset meter readings without losing historical information. When a rotating asset is sent out for repair, it might be replaced – requiring meter readings to be reset. When testing an asset, readings might need to be reset upon completion of testing. Changing cumulative readings does not affect preventive maintenance generation, since these values do not drive preventive maintenance. When a meter reading is updated, the Next Meter Reading field is also updated for all the meter-based preventive maintenance that is active against the asset.

Working with meters

You can create meters to track asset or location performance. You can also duplicate or delete meters.

- [Creating meters](#)
You use the Meters application of the Assets module to add or to modify meter definitions, including the names for the meters and the sets of attributes that describe the meters.
- [Specifying meter readings on work orders](#)
You can enter meter readings for the asset and the location on a work order. An asset can be set up to inherit the meter readings of its parent asset or its location.
- [Duplicating meters](#)
The quickest way to create a meter is to duplicate an existing one, and then modify it as needed. When you duplicate a meter, all the information from the existing meter is copied to the new meter.

- [Deleting meters](#)
You use the Meters application of the Assets module to delete meters that you have defined.

Creating meters

You use the Meters application of the Assets module to add or to modify meter definitions, including the names for the meters and the sets of attributes that describe the meters.

About this task

Define the meters whose readings you can use to track the performance of an asset or a location. An asset or a location can have multiple meters associated with it.

Procedure

1. On the toolbar for the Meters application, click New Meter.
2. In the Meter field, type a meter name.
3. In the Meter Description field, type a description.
4. In the Meter Type field, specify the type of meter, as follows:
 - a. If the meter type is characteristic, specify a domain in the Domain field. Only the value associated with this domain is available when this meter is attached to an asset, to a preventive maintenance location, or to a condition monitoring point.
 - b. If the meter type is continuous, specify a reading type in the Reading Type field.
5. Complete the other fields as needed, and click Save Meter.

Specifying meter readings on work orders

You can enter meter readings for the asset and the location on a work order. An asset can be set up to inherit the meter readings of its parent asset or its location.

About this task

To find out if an asset is inheriting meter readings, go to the asset record and check the value in the Accept Rolldown From field.

Procedure

1. Display the record for which you want to enter a reading.
2. From the Select Action menu, select Enter Meter Readings.
3. To enter a meter reading, select either of the following options:
 - To enter a meter reading for the asset, click the Asset Meter Readings tab.
 - To enter a meter reading for the location, click the Location Meter Readings tab. If the asset and location have meters, and the asset inherits the meter reading for the location, enter a reading for either the asset or the location. If the asset has child records that inherit meter readings, the meter readings for the child records are updated. If the location has assets that inherit meter readings for the location, the readings for the assets in that location are updated.
4. In the New Reading field, enter a value, or click Select Value. The system date and time display in the New Reading Date field. The log in name for the user displays in the Inspector field.
5. To change the inspector, specify a value, or click Detail Menu to retrieve a value.
6. To enter the reading and return to the record, click OK.

Duplicating meters

The quickest way to create a meter is to duplicate an existing one, and then modify it as needed. When you duplicate a meter, all the information from the existing meter is copied to the new meter.

Procedure

1. Display the meter you want to duplicate.
2. Select the Duplicate Meter action.
3. Type a value in the Meter field.
4. Modify the meter as necessary, and click Save Meter.

Deleting meters

You use the Meters application of the Assets module to delete meters that you have defined.

About this task

You cannot delete a meter if it is attached to any of the following types of records:

- Asset
- Location
- Item
- Condition monitoring
- Preventive maintenance (applies to master preventive maintenance records only)
- Meter group
- Job plan

Procedure

1. Display the meter record that you want to delete.
2. Select the Delete Meter action.

Relationships

A relationship uses basic terms to describe the dependency or connectivity between configuration items. The basic terms include runs on, installed on, contained, and so forth.

You define and work with relationships in these ways:

- In the Relationships application, you create the formal definitions and accompanying rules for relationships.
- In the Configuration Items application, you associate configuration items with each other using the relationships that you define in the Relationships application.

When you create relationships you specify several properties and rules, including these properties:

- **Directionality** - The directionality of a relationship affects what is found when a user searches for configuration items that are based on relationships. Relationships can be unidirectional, such as installed on or bidirectional.
- **Complementarity** - If a relationship is complementary, one relationship implies another relationship. For example, the relationship of operating system A to computer B is installed on. This relationship implies that the relationship of computer B to operating system A is installed with.
- **Cardinality** - This property specifies whether you can have multiple configuration items as the source and the target. For example, an operating system can be installed on many computers, which is a one-to-many relationship. In addition, a computer can have a one-to-one relationship, which means that the computer runs one operating system.
- **Containment** - This property specifies whether there is a parent-child relationship between configuration items.
- **[Relationships overview](#)**
A relationship describes the dependency or connectivity between configuration items. A relationship can be unidirectional or bidirectional. Rules exist for changing or deleting relationships.
- **[Creating relationships](#)**
You create relationships to define rules that determine how assets or configuration items relate to each other. These rules affect how you deploy, manage, and search for assets and configuration items.
- **[Defining asset relationship rules](#)**
You can apply rules to relationships by classification and attribute.

Relationships overview

A relationship describes the dependency or connectivity between configuration items. A relationship can be unidirectional or bidirectional. Rules exist for changing or deleting relationships.

- **[Unidirectional and bidirectional relationships](#)**
A relationship describes the dependency or connectivity between configuration items. A relationship can be either unidirectional or bidirectional. The results of a search are affected when relationships are bidirectional or unidirectional.
- **[Asset-based relationships](#)**
A relationship describes the dependency or connectivity between assets. You can define relationships, such as `installed on` or `terminates`, and then apply them to relevant assets.
- **[Relationship cardinality](#)**
Cardinality is when you define a relationship, and you specify whether one or more configuration items can be in the source classification and target classification.
- **[Relationship change rules](#)**
You can change relationships to fit your business needs.
- **[Deletion rules for relationships](#)**
You can delete relationships as your business needs change.

Unidirectional and bidirectional relationships

A relationship describes the dependency or connectivity between configuration items. A relationship can be either unidirectional or bidirectional. The results of a search are affected when relationships are bidirectional or unidirectional.

Unidirectional relationships

A unidirectional relationship is valid in only one direction. The following phrases are examples of unidirectional relationships: installed on, installed with, contains, member of, starts from, resides on, succeeded by, and preceded by.

For example, an operating system is installed on a computer. A computer is not installed on an operating system. However, in another type of unidirectional relationship, you can specify that a computer contains an operating system.

Bidirectional relationships

A bidirectional relationship is valid in both directions. Intersects is an example of a bidirectional relationship.

Search results

The distinction between unidirectional relationships and bidirectional relationships is important when you search configuration items based on relationships.

Relationship	Search results
Bidirectional	<ul style="list-style-type: none">• A user searches for all configuration items with an interfaces with relationship to application Z. Since interfaces with is a bidirectional relationship, the search program searches for these occurrences:<ul style="list-style-type: none">◦ The source configuration item is application Z and the relationship is interfaces with.◦ The target configuration item is application Z and the relationship is interfaces with.
Unidirectional	<ul style="list-style-type: none">• For unidirectional relationships, the search program searches for one combination. For example, a user searches for all configuration items with a member of relationship to an EMAIL SERVICE application, where EMAIL SERVICE is the target configuration item. The search program searches for the following occurrence: the target configuration item is EMAIL SERVICE and the relationship is member of.• You can define one unidirectional relationship to be complementary to another unidirectional relationship. For example, in your relationship definition, you specify that installed on is complementary to installed with. A user wants to find all configuration items that are installed on AppServer K. The search program searches for these occurrences:<ul style="list-style-type: none">◦ The target configuration item is AppServer K and the relationship is installed on.◦ The source configuration item is AppServer K and the relationship is installed with.

Asset-based relationships

A relationship describes the dependency or connectivity between assets. You can define relationships, such as `installed on` or `terminates`, and then apply them to relevant assets.

In the Relationships application, you create the formal definitions and accompanying rules for relationships.

In the Assets application, you associate assets with each other by using the relationships.

When creating a relationship between assets, you can define rules to validate that certain conditions are met. A relationship identifies a dependency or connectivity between two assets and the relationship rules validate the following criteria:

- Asset classifications, to ensure that only valid types of assets are related.
- Asset attributes, to ensure that certain values or conditions are met within a classification.

To accommodate complex validations, within a relationship definition multiple rules can be created, related, and grouped.

A relationship can contain none, one, or many validation rules. Each relationship rule consists of the following criteria:

- The classification requirement of the source asset.
- An attribute, a value, and a condition (equal to, less than, and so on) within the source asset classification.
- The classification requirement of the target asset.
- An attribute, a value, and a condition (equal to, less than, and so on) within the target asset classification.

Two or more relationship rules can be grouped together. Within a group, the validation requirement for the combination of rules is determined by the Within Group setting. This value determines whether all conditions must be met, or any one of them.

Similarly, there can be multiple groups of rules. Across all groups, at least one rule group validation condition must be met.

Linear asset relationships

Asset relationships can be applied to point or linear assets. Linear assets can be defined as segments or layers, where you define an asset's location and how it relates to another.

Linear Asset Manager provides additional features for managing linear assets and is enabled under a separate license key. You must install a Linear Asset Manager license to use linear asset features.

When you are working with a linear asset in the Assets application, under the Relationships tab, you can enter additional linear data for an asset relationship, identifying the start and end measures for source and target assets.

Alternatively, you can select from a list of reference points for the source and target measures. Reference points are enabled by the Use as Reference check box and automatically populate the measures on subsequent reference point selections.

Relationship cardinality

Cardinality is when you define a relationship, and you specify whether one or more configuration items can be in the source classification and target classification.

The following list describes the possible values of cardinality are:

- 1:n - one to many
- 1:1 - one to one
- n:n - many to many

The following table describes the cardinality values:

Cardinality	Relationship rules
1:n	<ul style="list-style-type: none">• A configuration item that belongs to the source classification can have the relationship with multiple configuration items that belong to the target classification.• A configuration item that belongs to the target classification can have the relationship with only one configuration item that belongs to the source classification.• For example, you specify a 1:n cardinality for an installed with relationship between computer systems and operating systems. Therefore, a computer system instance can be installed with many operating system instances. This 1:n value also implies that an operating system instance can have an installed with relationship with only one computer system instance.
1:1	<ul style="list-style-type: none">• A configuration item that belongs to the source classification can have the relationship with only one configuration item that belongs to the target classification.• A configuration item that belongs to the target classification can have the relationship with only one configuration item that belongs to the source classification.• For example, you specify a 1:1 cardinality for a runs on relationship between operating systems and computer systems. Therefore, an operating system instance can run on only one computer system instance.
n:1	<ul style="list-style-type: none">• Multiple configuration items that belong to the source classification can have the relationship with only one configuration item that belongs to the target classification.• A configuration item that belongs to the target classification can have the relationship with multiple configuration items that belong to the source classification.• For example, you specify an n:1 cardinality for an installed on relationship between operating systems and computer systems. Therefore, multiple operating system instances can be installed on one computer system instance. This n:1 value also implies that an operating system instance can be installed on only one computer system instance.
n:n	<ul style="list-style-type: none">• Multiple configuration items that belong to the source classification can have the relationship with multiple configuration items that belong to the target classification.

Relationship change rules

You can change relationships to fit your business needs.

The following list describes the rules regarding changing relationships:

- You cannot change rules that are part of the common data model.
- You cannot delete the rule if any configuration items use the rule.
- You cannot change the containment flag if any configuration items use the rule.
- You cannot change the Is Target Parent setting if any configuration items use the rule.

You can change the cardinality in these ways:

- If 1:1, you can change the cardinality to 1:n, n:1, and n:n.
- If 1:n, you can change the cardinality to n:n.
- If n:1, you can change the cardinality to n:n.

If n:n, you cannot change the cardinality.

Deletion rules for relationships

You can delete relationships as your business needs change.

You cannot delete a relationship when a relationship meets one of these conditions:

- The relationship is used to associate any configuration items.
- The relationship or relationship rule is imported.

Creating relationships

You create relationships to define rules that determine how assets or configuration items relate to each other. These rules affect how you deploy, manage, and search for assets and configuration items.

Procedure

1. In the Relationships application, click the New Relationship icon.
2. Select the type of relationship. Type defines the relationship as either `BIDIRECTIONAL` or `UNIDIRECTIONAL`.
3. In the Use With field, enter or select `ASSET`, for asset relationships, or `CI`, for configuration item relationships.
4. Optional: If the linear asset features are available, specify these options:
 - To use the relationship with linear assets, select Linear.
 - To use the relationship as a reference point in linear assets, select Is Reference Point.
5. Optional: Specify a complementary relationship.
Including a complementary relationship allows search programs to find instances of a configuration item when it is a source and when it is a target.
6. Optional: Define asset or CI relationship rules.
7. Save the new relationship.

Defining asset relationship rules

You can apply rules to relationships by classification and attribute.

Before you begin

Ensure that classifications and attributes are defined and understand the relationship rule and group structure for validation purposes.

Procedure

1. In the Relationships application, select a relationship with Use With set to `ASSET`.
2. In the Asset Relationship Rules table, click New Row.
3. Select a source and target classification pair.
4. For grouped rule validation purposes, select the Within Group condition; where `AND` indicates that all rules must be met and `OR` indicates that any one must be met.
5. Optional: For the Source Classification and Target Classification definitions, enter or select a Source Attribute value.
6. Optional: For the Source Classification and Target Classification, enter or select the source attribute Condition value, where:

Option	Description
EQUALS	True if the attribute data equals the value.
NOTEQUAL	True if the attribute data does not equal the value.
GREATER	True if the attribute data is greater than the value.
GREATEROREQUAL	True if the attribute data is greater than or equal to the value.
LESS	True if the attribute data is less than the value.
LESSOREQUAL	True if the attribute data is less than or equal to the value.
LIKE	True if the attribute data contains the text entered in the value. Use for searching text.
NOTLIKE	True if the text entered in the value is not contained within the attribute data. Use for searching text.

7. Optional: For the Source Classification and Target Classification, enter the corresponding Value for the selected Condition.
8. Optional: Add additional lines by using New Row and new groups by changing the Group number.
9. Save your relationship rules.

Meter Groups

You use the Meter Groups application to define a logical grouping of meters that comprise a meter group. Meter groups represent a collection of meters that are used together numerous times.

By creating a meter group, you can add multiple meters to an asset or to a location at the same time. Once meter groups are defined, you can add meters to a group and remove meters from a group. Meter groups can be applied to assets, to locations, and to rotating items using the Inventory Control application to designate the meters associated with a rotating item.

Meter group information is copied to a record under the following conditions:

- An item assembly structure containing rotating items that have meter groups is applied to an asset or to a location record.
- The asset or the location record includes a rotating item number that has a meter group.
- A non-rotating asset or location record is created and a meter group is specified on the Asset tab of the Assets application.

- **Creating meter groups**

You use the Meter Groups application to define a logical grouping of meters. Meter groups represent a collection of meters that are used together multiple times. For example, you can add multiple meters to an asset, to a location, or to a rotating asset at the same time.

Creating meter groups

You use the Meter Groups application to define a logical grouping of meters. Meter groups represent a collection of meters that are used together multiple times. For example, you can add multiple meters to an asset, to a location, or to a rotating asset at the same time.

Before you begin

Meters must be defined in the Meters application before they can be added to a meter group or used in other applications.

About this task

You cannot add multiple meters with the same name to a group. To track readings for multiple meters of the same type for an asset, create unique meter names for each meter.

Procedure

1. On the toolbar, click New Meter Group.
2. In the Meter Group field, specify a unique name for the meter group, and type a description.
3. Select the Apply New Meters Where Group Is Used check box if you want to add the meter to existing assets. If you select this option, the value defaults to the detail section of the record. You can edit this value. If you leave this box unchecked, the meter is added to assets that use this meter group in the future.
4. Click New Row to add meters to the group.
5. Specify the name of the meter you want to add.
6. Complete the remaining required fields.
7. Click Save Meter Group.

- **Duplicating meter groups**

A quick way to create a meter group is to duplicate an existing meter group, and then modify it. When you duplicate a meter group, all the information from the existing meter group is copied to the new meter group.

Duplicating meter groups

A quick way to create a meter group is to duplicate an existing meter group, and then modify it. When you duplicate a meter group, all the information from the existing meter group is copied to the new meter group.

Procedure

1. Display the meter group that you want to duplicate.
2. Select the Duplicate Meter Group action.
3. Specify a value in the Meter Group field.
4. Modify the meter group by changing the meter group description and by adding or by deleting meters.
5. Click Save Meter Group.

Condition Monitoring

You use the Condition Monitoring application to create and to view measurement point records for assets and for locations. A measurement point record defines the limits of acceptable meter readings for a characteristic meter or for a gauge meter on an asset or at a location.

In this application, you can generate preventive maintenance work orders. You can also generate work orders with a specific job plan for assets or for locations with meter readings that are outside the defined limits.

- **Condition monitoring overview**

Condition monitoring involves using measurement points to define acceptable ranges for meters on an asset or location. When the meter readings exceed the acceptable range, then you can generate work orders to address the situation.

- **Working with condition monitoring**

Measurement point records define acceptable condition and performance measurements for a meter on an asset or a location where this type of data is collected. When condition monitoring detects measurements outside of the acceptable range, then you can generate work orders to correct the problem.

Condition monitoring overview

Condition monitoring involves using measurement points to define acceptable ranges for meters on an asset or location. When the meter readings exceed the acceptable range, then you can generate work orders to address the situation.

- **Measurement points**

When you inspect an asset or a location, you can record and view the meter readings that correspond to measurement points in the job plan of the associated work order. If the point on the asset or the location on the work order correspond to the meter on the job plan that you are adding to the work

order, the point identifier is inserted in the Measurement Point field on the plan. If a measurement point identifier is used on the work plan of a work order, you cannot delete the corresponding measurement point record.

- [Work orders](#)
You use the Condition Monitoring application to create work orders that will correct alarm conditions.

- [Work order history](#)
You use the History table on the Condition Monitoring tab in the Assets application to view information about work orders that you generated. Work orders listed in this table were generated using the Condition Monitoring application only, and are listed in order by effective date. You can modify the effective date when you use the Generate Work Order option. The effective date in the History table may not be the date and time the work order was generated. If the preventive maintenance in the PM field of the Condition Monitoring tab was part of a preventive maintenance hierarchy when you used the Generate Work Order option, you generated work orders for the entire hierarchy. Only the work order generated for the preventive maintenance in the PM field displays in the History table.

Measurement points

When you inspect an asset or a location, you can record and view the meter readings that correspond to measurement points in the job plan of the associated work order. If the point on the asset or the location on the work order correspond to the meter on the job plan that you are adding to the work order, the point identifier is inserted in the Measurement Point field on the plan. If a measurement point identifier is used on the work plan of a work order, you cannot delete the corresponding measurement point record.

Work orders

You use the Condition Monitoring application to create work orders that will correct alarm conditions.

When you generate a work order, one of the following actions may occur:

- A work order hierarchy may be created.
- The default safety plans are copied to the work orders.
- The measurement point number may be copied to a work plan operation.

Preventive maintenance work orders

If the preventive maintenance record displayed on the Condition Monitoring tab is part of a hierarchy, generate work orders for the entire preventive maintenance hierarchy when you initiate the work order generation process. Generate work orders for preventive maintenance records above and below the preventive maintenance in the hierarchy. The work order listed in the History table is the one generated for the preventive maintenance in the PM field when you use the Generate Work Order option.

Default safety plans are copied to work orders depending on the asset and on the location shown on the Condition Monitoring tab. Default safety plans are also copied to the job plan associated with the preventive maintenance work orders on the Condition Monitoring tab.

Meter readings are copied to the work plans for the work order, under certain circumstances. When you generate preventive maintenance work orders using the Condition Monitoring tab, the same fields are updated in the preventive maintenance record as are updated when you generate work orders from within the Preventive Maintenance application.

Work order history

You use the History table on the Condition Monitoring tab in the Assets application to view information about work orders that you generated. Work orders listed in this table were generated using the Condition Monitoring application only, and are listed in order by effective date. You can modify the effective date when you use the Generate Work Order option. The effective date in the History table may not be the date and time the work order was generated. If the preventive maintenance in the PM field of the Condition Monitoring tab was part of a preventive maintenance hierarchy when you used the Generate Work Order option, you generated work orders for the entire hierarchy. Only the work order generated for the preventive maintenance in the PM field displays in the History table.

Working with condition monitoring

Measurement point records define acceptable condition and performance measurements for a meter on an asset or a location where this type of data is collected. When condition monitoring detects measurements outside of the acceptable range, then you can generate work orders to correct the problem.

- [Creating measurement point records](#)
You use the Condition Monitoring application to create measurement point records and associate the records with your assets and locations.
- [Specifying point measurements](#)
You use the Condition Monitoring application to specify and to view meter readings for your equipment or location measurement points. The Measurements table on the Condition Monitoring tab shows the date, the time, and the value of the measurement.
- [Deleting measurement points](#)
You use the Condition Monitoring application to delete a measurement point. You can delete measurement points as long as they are not referenced by work orders.
- [Generating work orders to address specific problems](#)
When the meter reading of an asset or a location is outside of specified limits, you can generate work orders to address the problem.

Creating measurement point records

You use the Condition Monitoring application to create measurement point records and associate the records with your assets and locations.

Procedure

1. From the Condition Monitoring tab of the Condition Monitoring application, click New Measure Point, and type a value in the Point field, if needed.
2. In the Meter field, specify the meter name or click Detail Menu to select a meter for this measurement point.
3. In the Asset or the Location field, type the identifier. If you choose an asset that is associated with a location, the location identifier displays in the Location field.
4. If the meter is of a continuous type, specify the upper and lower warning limits and action limits. In the Upper Warning Limit field and in the Lower Warning Limit field, type the values for the meter readings that define the upper warning limit and the lower warning limit.
5. In the Upper Action Limit field and in the Lower Action Limits field, specify the values for the meter readings that define the upper action limit and the lower action limit. If these limits are reached, these values cause a preventive maintenance or a job plan to be generated when you select the Generate Work Orders action. Measurements at or beyond the warning limits indicate that you must monitor this point carefully. Measurements at or beyond the action limits alert you that the asset or the location may require maintenance or repair.
6. In the Upper Limit PM field or in the Upper Limit Job Plan field, type the identifier of the preventive maintenance record or the job plan record to use on all work orders that you generate for a higher than acceptable reading on this measurement point. The preventive maintenance record or the job plan record must already be associated with the asset or the location, and cannot be a master preventive maintenance record.
7. In the Lower Limit PM field or in the Lower Limit Job Plan field, type the identifier of the preventive maintenance record or the job plan record to use on all work orders that you generate for a lower than acceptable reading on this measurement point. The preventive maintenance record or the job plan record must already be associated with the asset or the location, and cannot be a master preventive maintenance record.
8. In the Upper Limit Priority field, type a value to use when scheduling the upper limit work order.
9. In the Lower Limit Priority field, type a value to use when scheduling the lower limit work order.
10. If the meter type is characteristic, complete the characteristic action values. These are observational readings that result in the initiation of a preventive maintenance or a job plan. Under the Characteristic Action Value table, click New Row.
11. In the Value field, specify a value, or click Detail Menu to select a value for this characteristic action value. You can enter one action value for each type of observation for a given characteristic meter. For example, if a meter has possible values of high, medium, and low, specify one preventive maintenance or one job plan to use if the value is high; one to use if the value is medium; and a third one to use if the value is low.
12. Click Save Measure Point.

Specifying point measurements

You use the Condition Monitoring application to specify and to view meter readings for your equipment or location measurement points. The Measurements table on the Condition Monitoring tab shows the date, the time, and the value of the measurement.

Procedure

1. From the Condition Monitoring tab of the Condition Monitoring application, and under the Measurements table, click New Row.
2. In the Date/Time field, type a date, or click Select Date and Time and select a date on the calendar.
3. Depending on the type of meter, specify the measurement reading in the Measurement field, or click Select Value in the Observation field.

What to do next

Repeat steps 1 to 3 for each reading you want to enter, click Done and then click Save Record.

Deleting measurement points

You use the Condition Monitoring application to delete a measurement point. You can delete measurement points as long as they are not referenced by work orders.

Procedure

1. From the Condition Monitoring tab of the Condition Monitoring application, find the measure point you want to delete.
2. Select the Delete Measure Point action.

Generating work orders to address specific problems

When the meter reading of an asset or a location is outside of specified limits, you can generate work orders to address the problem.

Procedure

1. From the List tab of the Condition Monitoring application, select the records for which you want to generate work orders.

2. Select the Generate Work Orders action.
3. In the Effective Date field, specify the effective date. You can modify this field until you generate the work orders.
4. Optional: In the Memo field, type a short description of the work orders. This field is used only in the Condition Monitoring application. The description is not copied to the Description field of a work order.
5. Optional: If you want to use the action limits of the measurement point as the criteria for generating work orders for an asset, select the Use Action Limits as Work Order Generation Criteria box. When you use the action limits as criteria, you can generate work orders only when meter readings are outside the upper limits or outside the lower action limits.
6. Click OK.

Failure Codes

You use the Failure Codes application to build and to display failure hierarchies. Hierarchies help you construct accurate histories of the failures that affect your assets and operating locations. After reporting and analyzing failure trends, you can take preventive measures. The identifier of a failure hierarchy is the failure class.

- [Failure codes overview](#)
Failure codes are specified on asset records and on location records. Failure codes are linked in parent-child relationships to form a failure hierarchy.
- [Working with failure codes](#)
You can build a failure code hierarchy, navigate a failure code hierarchy, copy a failure hierarchy, and copy failure codes.

Failure codes overview

Failure codes are specified on asset records and on location records. Failure codes are linked in parent-child relationships to form a failure hierarchy.

- [Failure hierarchies](#)
A failure hierarchy is a set of data on the problems, the causes, and the remedies for asset failures and for operating location failures. A failure hierarchy is identified by its failure class. A failure hierarchy resembles other hierarchies. There is a top-level category with one or more levels of failure codes below it. Each failure code can have one or more child failure codes.
- [Failure analysis](#)
After you have built failure hierarchies, you can record, report and analyze asset and location failures.

Failure hierarchies

A failure hierarchy is a set of data on the problems, the causes, and the remedies for asset failures and for operating location failures. A failure hierarchy is identified by its failure class. A failure hierarchy resembles other hierarchies. There is a top-level category with one or more levels of failure codes below it. Each failure code can have one or more child failure codes.

Failure analysis

After you have built failure hierarchies, you can record, report and analyze asset and location failures.

You can use the Quick Reporting application or the Work Order Tracking application to record asset failures and location failures on work orders. To record failures for a work asset, report failures on work orders for the asset by choosing the appropriate failure codes from the failure hierarchy. If you associate the failure class of an existing failure hierarchy with the asset in the Assets application or the Locations application, then the value is the default value for the failure class on the work order. You can change this default value. If you have not previously associated the failure class of an existing failure hierarchy with the asset in the Assets application or the Locations application, then there is no default value for the failure class. You can select a failure class when you create a work order.

You can use reports to view failure histories of your work assets. Conduct failure analyses to review histories of asset failures and of location failures over time. Look for issues such as breakdown trends or mean time between failures on printed reports. You can correlate this failure information with other data such as preventive maintenance (PM) schedules to develop ways to reduce or limit asset failures in the future.

Working with failure codes

You can build a failure code hierarchy, navigate a failure code hierarchy, copy a failure hierarchy, and copy failure codes.

- [Building failure hierarchies](#)
You use the Failure Codes application to build failure hierarchies.
- [Navigating failure hierarchies](#)
A failure hierarchy consists of a top-level failure class and several lower levels of failure codes.
- [Copying failure hierarchies](#)
You use the Failure Codes application to copy a failure with its causes and remedies from an existing failure hierarchy into a new hierarchy or into a hierarchy that you are modifying.
- [Duplicating failure codes](#)
You use the Failure Codes application to copy failure codes from an existing failure hierarchy into a new hierarchy or into a hierarchy that you are modifying.

Building failure hierarchies

You use the Failure Codes application to build failure hierarchies.

About this task

A failure hierarchy is a tree type of structure that shows relationships between identified problems, causes, and remedies for asset failures and for operating location failures. Failure hierarchies are built from the top-level of the hierarchy down to the bottom level of the hierarchy.

Procedure

1. Perform the following steps to create the first level of the hierarchy:
 - a. Click New Failure Code.
 - b. In the Failure Class field, type a value.
 - c. In the Failure Class Description field, type a description.
 - d. Under the Problems table, click New Row.
 - e. In the Problem field, type a value, and type a description.
 - f. Repeat steps 3 to 5 for each problem in the hierarchy.
 - g. Click Done and click Save Failure Code.
2. Perform the following steps to create the second level of the hierarchy:
 - a. In the Problem table, select the failure code to which you want to add a cause or a child.
 - b. Under the Causes table, click New Row.
 - c. In the Cause field, type a value.
 - d. In the Description field, type a description.
 - e. Repeat steps 2 to 4 for each cause that you want to add to the selected problem in the hierarchy.
 - f. Click Done and click Save Failure Code.
3. Perform the following steps to create the third level of the hierarchy:
 - a. In the Causes table, select the failure code to which you want to add a remedy or a child.
 - b. Under the Remedies table, click New Row.
 - c. In the Remedy field, specify a value.
 - d. In the Description field, type a description.
 - e. Repeat steps 2 to 4 for each remedy you want to add to the selected cause in the hierarchy.
 - f. Click Done and click Save Failure Code.

Navigating failure hierarchies

A failure hierarchy consists of a top-level failure class and several lower levels of failure codes.

About this task

Typical failure codes are Problem, Cause, and Remedy. Each cause in a hierarchy can have multiple problems. Each problem can have multiple remedies. Navigating the failure hierarchy lets you view the problems that are associated with certain causes, and which causes are associated with specific remedies within a hierarchy. Navigating the hierarchy also lets you identify the problem for which you want to add a cause or a remedy.

Procedure

1. Display the failure code record.
2. In the Problems table, click the row containing the failure code with the children that you want to view. If the failure code has children, the children are displayed in the Causes table.
3. In the Causes table, click the row containing the failure code with the children that you want to view. If the failure code has children, the children are displayed in the Remedies table.

Copying failure hierarchies

You use the Failure Codes application to copy a failure with its causes and remedies from an existing failure hierarchy into a new hierarchy or into a hierarchy that you are modifying.

Procedure

1. Display the record to which you want to copy a failure hierarchy.
2. In the Failure Class field, specify a value
3. Select the Copy Failure Hierarchy action.
4. Select the check box for the failure class and the problem that you want to copy.
5. Click OK and click Save Failure Code.

Duplicating failure codes

You use the Failure Codes application to copy failure codes from an existing failure hierarchy into a new hierarchy or into a hierarchy that you are modifying.

About this task

Duplicating a failure code is useful when you have an asset, such as a motor, that can be expected to have the same failure class as an existing motor. When you duplicate the failure codes for the existing motor, all of the problems, causes, and remedies associated with that motor are copied to the failure hierarchy for the new motor.

Procedure

1. Display the failure code record that you want to duplicate.
2. Select the Duplicate Failure Code action.
3. In the Failure Class field, specify a value for the new failure class.
4. In the Description field, type a description.
5. Click Save Failure Code.

Building Information Models (BIM) module

You use the applications in the Building Information Models (BIM) module to import building model data in Construction-Operations Building information exchange (COBie) format and then manage and view building models in 3D. You can inspect assets and locations of the building, create work orders and service requests, and search for and create systems from the model.

- [BIM Projects](#)
You used the BIM Projects application to import building model data in Construction-Operations Building information exchange (COBie) format. You can also define filters, map COBie attributes to existing Manage attributes that include custom attributes, create projects at a site level, and configure global settings for each project. You can import COBie data by using validate, import, update, and merge sessions for the project.
- [Manage BIM Viewer](#)
You use the Manage BIM Viewer application to view imported building model data in the assets and locations of the buildings and also view the import session details. You can also use a building model viewer to view a 3D version of the building.

BIM Projects

You used the BIM Projects application to import building model data in Construction-Operations Building information exchange (COBie) format. You can also define filters, map COBie attributes to existing Manage attributes that include custom attributes, create projects at a site level, and configure global settings for each project. You can import COBie data by using validate, import, update, and merge sessions for the project.

Manage BIM Viewer

You use the Manage BIM Viewer application to view imported building model data in the assets and locations of the buildings and also view the import session details. You can also use a building model viewer to view a 3D version of the building.

Change module

You use the Activities and Tasks application, located in the Change module, to plan, to review, and to manage activities and tasks.

When you create an activity, you initiate the work process and create a historical record of the work being performed.

- [Changes application](#)
You use the Changes application to plan, review, and report actuals for implementing changes or deploying new, standard configurations to existing assets. You also can create changes in other applications. A change is a type of work record. Other types of work records are work orders, releases, and activities.
- [Activities and Tasks](#)
You use the Activities and Tasks application to plan, to review, and to manage activities and tasks. An activity initiates the work process and creates a historical record of the work being performed. Activities are created in the Incidents and Problems applications. A task is a specific unit of work on a work order.

Changes application

You use the Changes application to plan, review, and report actuals for implementing changes or deploying new, standard configurations to existing assets. You also can create changes in other applications. A change is a type of work record. Other types of work records are work orders, releases, and activities.

The change management process

A change typically begins when someone submits a service request to upgrade an original asset. For example, to upgrade a pump with a larger motor. In effect, that person is requesting to change the configuration of that pump. The upgraded pump will have more horsepower, a higher gallon-per-minute rate, and so on, than the original pump asset.

After the service request is approved, a Change is created. The change is written up against the Asset number or CI number of that pump. The configuration of that pump changes from a smaller motor to a larger motor.

Sometimes, a change involves a more complex process such as requiring high-level approvals, in-depth testing, and validation. The process might also include notifying anyone who uses that asset about the pending change and obtaining their approval regarding when the change can occur, and identifying what else the change might affect.

You use the Changes application to define, plan, and schedule the work required to implement a change. You also can use it to assign an owner to the change, categorize the change, and update its status as it moves towards completion. You can relate other records to the change to simplify management of multiple, similar records, and you can create follow-up records directly from the change.

When the change work is completed, you — or the owner of the change — can open the change record and report actual start and finish times, labor hours and costs, material quantities, locations, and costs, and tool quantities, hours, and costs.

- [Changes overview](#)
A change specifies a particular task, and the labor, materials, services, and tools needed to complete the task.
- [Working with changes](#)
When you create a change, you specify information about the work that must be performed for an asset, location, or configuration item. You can add work plans or job plans. You can also record actuals as the work progresses.

Changes overview

A change specifies a particular task, and the labor, materials, services, and tools needed to complete the task.

- [Change management plans](#)
After you create a change, you can use the Plans tab to specify estimates for labor, craft, materials, services, and tools. you also can add child changes and create tasks for the change.
- [Changes](#)
A change specifies the asset, location, and the work required. You can apply service level agreements and assign ownership. The status of the change is modified as it moves through processing cycle. Duplicating a change can save time when you need to create a change with similar information.
- [Work packages](#)
When you create a work package, you group existing change under a new parent change. A work package can be useful, for example, when you have a change with 100 separate tasks and 90 of the tasks have been completed. You can group the remaining 10 tasks into a work package with a new parent change. The 10 tasks become tasks under the new change, and any change that are not tasks become children of the new change.
- [Actuals on changes](#)
As work progresses on the change, you can report the actual labor hours, materials, and tools used.
- [Record relationships](#)
Relationships between records, such as tickets and work orders, help simplify record management. You can create record relationships manually, or relationships might be created automatically when you take certain actions.
- [Measurement points for work assets on changes](#)
Work assets on a change can have measurement points, which allow you to track the usage of your assets. You can add measurement points to a change until the change is closed.
- [Preventive maintenance work alerts](#)
To help reduce the downtime of an asset, you can use PM Alerts to be notified of pending preventive maintenance work that is due near the time that an asset is being repaired or a work order (a change, release, activity, or work order) is generated against a location. With the help of PM Alerts, you can save time and money by performing upcoming routine maintenance while performing non-routine repairs.
- [Work record approval](#)
When work records, such as work orders, changes, and releases, have a status of Waiting on Approval, you can change the status to Approved.
- [Linear segment details](#)
You use the Linear Segment Details section to locate a linear segment or point on a linear asset. The Linear Segment Details section, which displays on tabs in several applications, appears only if you are working with a linear asset.
- [Rules for modifying archived changes](#)
Closed and canceled changes are archived, and become historical records. You might be able to add additional information to a historical record by using the Edit History Change action.
- [Deletion rules for changes](#)
For auditing purposes, you cannot always delete changes. If you cannot delete a specific change, you can stop all action on a change by changing the status to canceled.

Change management plans

After you create a change, you can use the Plans tab to specify estimates for labor, craft, materials, services, and tools. you also can add child changes and create tasks for the change.

Job plans

An easy way to add a work plan to a change is to associate a job plan with the change. When you insert an identifier in the Job Plan field, the system copies the job plan, called a work plan, to the change. You can also add a job plan by using another application to generate a change that already has a job plan

Tasks

You can insert or edit work plan tasks on the Plans tab. You can also add inspection data for the work asset.

If a current work plan is based on a job plan, the system copies all task and plan data from the job plan. The job plan serves as a template for the work plan. Changes you make to the work plan on the change do not affect the original job plan.

You can add or edit plan tasks until the change is closed. You cannot delete tasks if the change is approved or has actuals reported for the task.

After you close the change, you can use the Edit History Change action to add or modify tasks.

- [Work plan removal](#)
Under certain circumstances, you can remove a work plan from a change by using the Remove Work Plan action.

Work plan removal

Under certain circumstances, you can remove a work plan from a change by using the Remove Work Plan action.

When you remove a work plan, all information in the Plans tab, except for non-task children, is removed. Also, if the work plan has a job plan, the job plan identifier is removed.

If any task in the work plan cannot be removed based on the deletion rules for changes, you cannot use the Remove Work Plan action. You can still delete labor, material, services, and tools information, as well as any tasks that do meet the deletion rules.

Changes

A change specifies the asset, location, and the work required. You can apply service level agreements and assign ownership. The status of the change is modified as it moves through processing cycle. Duplicating a change can save time when you need to create a change with similar information.

- [Service level agreements](#)
A service level agreement (SLA) typically is a written agreement that outlines the commitment between a service provider and its customers. A commitment is a service level that all parties have agreed to, such as asset reliability or availability.
- [Ownership of changes](#)
You can designate an individual or a group as the owner of a change or ticket. Ownership means that the person or group has administration responsibility for that record. Assigning ownership does not change that person or group's availability to work or to have ownership of additional records.
- [Change statuses](#)
The status of a change indicates its position in the processing cycle. The status determines which actions can be performed on the change. For example, if the change is approved (APPR), then the tasks can start.
- [Duplication of changes](#)
To save time, you can create a copy of a change that includes information from the original change. You can duplicate a change with its tasks, without its tasks, or with its hierarchy. When you duplicate the change hierarchy, the child tasks are also duplicated.

Service level agreements

A service level agreement (SLA) typically is a written agreement that outlines the commitment between a service provider and its customers. A commitment is a service level that all parties have agreed to, such as asset reliability or availability.

The SLA describes one or more commitments and the escalation actions or notifications associated with each commitment. Escalation actions or notifications might be associated with an SLA to ensure that commitments are met. An escalation process can monitor all activities and send notifications or perform other activities to ensure that commitments are met.

The types of records to which service level agreements can be applied include tickets, such as service requests, and work-based records, such as work orders. Before you can apply an SLA to a record, the record must have a site defined.

A service level agreement can be associated with a record in several ways:

- An SLA might automatically be applied to a record from within a workflow or escalation process, or from another SLA.
- You can select an action to apply an SLA, which applies the best match automatically.
- You can view SLAs and select an action to select or clear the SLAs that you want to manually apply to the record.

When you apply a service level agreement to a record, the following events occur:

- The SLA Applied check box on the main tab of the record is selected to document the action.
- Any escalations that are associated with the SLA are activated.
- The Target Start, Target Finish, and Contact values for the record might be calculated automatically as follows:

Automatically calculated values
When an SLA is applied that includes a response commitment, the response commitment date populates the Target Start date field of the record.
When an SLA is applied that includes a resolution commitment, the resolution commitment date populates the Target Finish date field of the record.
When an SLA is applied that includes a contact commitment, the contact commitment date populates the Target Contact date field of the record.

Ownership of changes

You can designate an individual or a group as the owner of a change or ticket. Ownership means that the person or group has administration responsibility for that record. Assigning ownership does not change that person or group's availability to work or to have ownership of additional records.

Ownership can change hands throughout the course of the record life cycle. You can change ownership until the record has a status of CLOSE.

You use the View History action to see the ownership and status history of a record. Record ownership is not required for a change or ticket.

You can assign ownership in the following ways:

- Use the Select Owner action to choose a person or owner.
- Use the Take Ownership action if you want to be responsible for that record.

Change statuses

The status of a change indicates its position in the processing cycle. The status determines which actions can be performed on the change. For example, if the change is approved (APPR), then the tasks can start.

When you change the status of a record, the status of applicable child records that use the inherit status changes option also are changed. If you change the status of global records, the same status change is automatically applied to all globally related records. In addition, the status of a record can be automatically changed. For example, after you assign an owner to a record, the status of that record automatically changes to queued.

A follow-up record can change the status of the originating record, which results in automatic routing or notification of the status change.

WAPPR

The change is waiting for approval. WAPPR is the default status for records created in the Work Order Tracking, Changes, Releases, and Activities and Tasks applications.

APPR

The change is approved and the work can begin. Work plan items on an approved change are reserved in inventory, and records cost and rate data. Rates can be changed in the Inventory application, Labor application, or Tools application. If the rates are changed in any application, the work plan reflects the rates in effect when the change was approved.

WSCH

The change is waiting to be scheduled. WSCH is the default status for records created in the Preventive Maintenance application.

WMATL

Materials must arrive before the work can be performed.

WPCOND

The work can be performed only when the condition of the plant is suitable. For example, certain work might require the shutdown of the plant.

INPRG

The work is in progress. INPRG is the default status for records created in the Quick Reporting application.

COMP

The physical work is completed. If you want to move or change an asset on a change, the move or change occurs when the status is changed to complete.

CLOSE

The change is closed. Inventory reservations for items not used in the change are removed and the change is made into a history record.

CAN

The work is canceled. You cannot cancel a change if the work has already been initiated or if actuals have already been reported. You can use this status when you want to delete a change and deleting is not allowed.

Duplication of changes

To save time, you can create a copy of a change that includes information from the original change. You can duplicate a change with its tasks, without its tasks, or with its hierarchy. When you duplicate the change hierarchy, the child tasks are also duplicated.

To duplicate a change, use the Duplicate Change action. If the change that you are duplicating has a job plan, the plan is copied to the duplicate change. Work actuals, planned moves or modifications are not copied to the duplicate change.

Work packages

When you create a work package, you group existing change under a new parent change. A work package can be useful, for example, when you have a change with 100 separate tasks and 90 of the tasks have been completed. You can group the remaining 10 tasks into a work package with a new parent change. The 10 tasks become tasks under the new change, and any change that are not tasks become children of the new change.

To create work packages, select the change, then use the Create Work Package action.

Actuals on changes

As work progresses on the change, you can report the actual labor hours, materials, and tools used.

- **Actual labor hours for changes**
To track the actual labor hours that were required to complete the work, you use the Labor subtab on the Actuals tab in the Changes application.
- **Actual material use for changes**
To track the actual quantities, locations, and costs for items used on an approved change, you use the Materials subtab on the Actuals tab in the Changes application. You can copy data from an existing plan, modify this data to reflect actual events, or insert new data.
- **Actual tool use for changes**
To track the actual quantities, hours, and rates for tools used on an approved change, you use the Tools subtab on the Actuals tab in the Changes application.
- **Costs on tickets and work orders**
You can view the estimated and actual costs for a single work order or ticket, including costs for labor, material, tools, and services. You can also view total costs for the current record and all the records below it in its hierarchy.

Actual labor hours for changes

To track the actual labor hours that were required to complete the work, you use the Labor subtab on the Actuals tab in the Changes application.

You can specify and change actual hours for labor only on an approved change. You can copy data from an existing plan, and delete from, add to, or change this data to reflect actual events. You can report labor and crafts until you close the change; however, you can change information only until you save the change.

You can report actual labor hours in the following ways:

- Report hours for multiple types of labor at once.
- Copy labor from the work plan.
- Report labor individually.
- Select planned labor.

Actual material use for changes

To track the actual quantities, locations, and costs for items used on an approved change, you use the Materials subtab on the Actuals tab in the Changes application. You can copy data from an existing plan, modify this data to reflect actual events, or insert new data.

When you issue an item to a change and it is not currently a spare part of the asset on the change, the system may automatically add it to the spare parts list of the asset. You can insert new rows until you close the record, but can edit information only until you save the record.

You can report actual material use in the following ways:

- Select multiple items at once.
- Select items reserved in the inventory, based on the work plan.
- Select spare parts for the asset.
- Report materials individually.

Actual tool use for changes

To track the actual quantities, hours, and rates for tools used on an approved change, you use the Tools subtab on the Actuals tab in the Changes application.

You can copy data from an existing plan, and delete from, add to, or change this data to reflect actual events. Changes must be approved before you can report actuals. You can insert new rows until you close the record, but can edit information only before you save the record.

You can report actual tool use in the following ways:

- Select tools from the database.
- Copy tool data from the work plan.
- Select tools that were issued to the change.
- Report individual tool use.

Costs on tickets and work orders

You can view the estimated and actual costs for a single work order or ticket, including costs for labor, material, tools, and services. You can also view total costs for the current record and all the records below it in its hierarchy.

When you view the costs of a ticket or work order, the data is displayed in two tables:

- The Totals table displays the costs for a single ticket or work order.
- The View Hierarchy Grand Totals table displays the costs for the current ticket or work order and all records under its hierarchy.

Each table presents the same information, which is shown in the following table.

Column	Explanation
Current Estimate	Displays read-only calculated values for the current totals from the Labor, Materials, Standard Services, and Tools tabs of the Plans tab for the ticket or work order.
Estimate at Approval	Is set to zero until the work order is approved, then the values are copied from the Current Estimate column and are read-only. If the work order status changes from approved to unapproved, then these fields are cleared. The estimated costs at approval are not affected by the change in status from in progress to completed or closed.
Actual	Displays the read-only values from the Labor (for approved labor only), Materials, and Tools tabs of the Actuals tab. If the status of the record changes from approved, then these fields are not cleared.

Rolling up maintenance costs

After you close a work order that is associated with an asset, you can calculate your maintenance costs by rolling up costs that you incur for labor, materials, tools, and services to the top-level asset in the hierarchy that the asset belongs to.

Costs can be rolled up manually or automatically. By default, cost rollups are manual. If you want costs to be calculated and rolled up automatically when a work order is closed, you must set the `mxe.workorder.rollupMaintenanceCosts` system property to 1. After you configure the system property for automatic rollups, all subsequent costs that are associated with work orders are rolled up automatically. However, any unprocessed maintenance costs that existed before the configuration are not automatically rolled up. You must roll up any preexisting, unprocessed maintenance costs manually.

To calculate the maintenance cost of your assets, use the Roll Up Maintenance Costs action in the Assets application.

If you upgrade to Maximo® Manage 8.5, run the Asset Cost Rollup Report to roll up pending maintenance costs before the upgrade.

Record relationships

Relationships between records, such as tickets and work orders, help simplify record management. You can create record relationships manually, or relationships might be created automatically when you take certain actions.

The types of relationships that can exist between records include:

- Related relationship, which is an informal association of tickets that is used for informational purposes.
- Originator and Follow-up, which keep costs hierarchies separate while still creating a relationship between the tickets.
- Related to Global, which creates a relationship in which the tickets are related to a global issue, which affects many users.

Related records

Using any ticket or work-based application, you can view similar records and relate tickets and work orders to the current record. A related relationship between records is an informal relationship that is for informational purposes only.

A related relationship does not affect status inheritance, affect workflow, or follow a set of business rules. Related relationships can be many-to-many, and do not represent record hierarchies. By relating records informally, you can navigate to related records, view related information for similar records, and view open tickets that are associated with a field. You can create an informal record relationship in the following ways:

- Use the Related Records tab of the application. This tab provides an easy way to create relationships and to view and navigate among informally related records.
- Use the Show Similar Tickets action in any ticket application. The similar ticket search results only include the service requests, incidents, and problems that have the same classification as the current ticket. Global records and history records are not included in the results. Your system administrator might add more restrictions to the search results.

Originator and follow-up tickets and work orders

You can relate tickets and work orders to a record more directly when you create a follow-up record from the ticket using one of the Create actions on the ticket. The ticket you create the follow-up record from is the originator. A follow-up record can be a ticket or a work order. In some cases, a follow-up ticket or work order might be able to change the status of its originating ticket. An originating ticket cannot change the status of a follow-up work order, nor can a follow-up ticket change the status of the originator if there is more than one follow-up. These options are configured by the system administrator.

Globally related tickets

A global ticket is an incident or problem relating to an issue that affects many users. You can relate tickets, including service requests, to a global ticket, which creates a RELATEDTOGLOBAL relationship. This relationship lets you manage the tickets by using the global ticket. When you change the status of the global ticket, the system changes the status of all globally related tickets.

If your administrator has set up automated notifications of status changes, the system changes the status of the tickets related to the global issue. For example, all the initial requestors reporting the same issue are notified of its resolution. On the global ticket, you can also view a list of related records and view the work and

communication logs for all related records.

- **Deletion of record relationships**

On the Related Records tab, you can delete the relationship between a change and any related work orders or tickets.

- **Global records**

A global record is a ticket that is a root cause of other issues or that affects many users, such as computer network failures or flooding in a building. After you mark a record as global, you can relate multiple tickets and then manage all tickets using the global record.

Deletion of record relationships

On the Related Records tab, you can delete the relationship between a change and any related work orders or tickets.

You can delete relationships if the change has a relationship type of RELATED. To delete relationships with work orders that have other relationship types, such as FOLLOWUP or ORIGINATOR, you must delete the work order. To delete relationships with tickets to other relationship types, you must go to the tickets applications.

Measurement points for work assets on changes

Work assets on a change can have measurement points, which allow you to track the usage of your assets. You can add measurement points to a change until the change is closed.

Measurement points are copied to work plans when the following items are matched:

- The measurement point name on the job plan that is listed on the change
- The measurement point name on the asset that is listed on the change
- A measurement point number for the measurement point name

If you add a value for a measurement point, the new measurement and measurement date are copied to the measurement database table. If you add a measurement without adding a value for the measurement point, the measurement data is saved with the change. When you save change with measurement point data, the Measurement Point field becomes read-only.

Preventive maintenance work alerts

To help reduce the downtime of an asset, you can use PM Alerts to be notified of pending preventive maintenance work that is due near the time that an asset is being repaired or a work order (a change, release, activity, or work order) is generated against a location. With the help of PM Alerts, you can save time and money by performing upcoming routine maintenance while performing non-routine repairs.

The following conditions apply to using the PM Alert feature:

For the PM Alert message to display, the preventive maintenance record must have its Alert check box selected and the site listed on the record must be set up to display alerts.

When a corrective maintenance work order reaches the status that is specified in PM Options in the Organizations application, and an active PM exists for the asset and/or location on the work order, the system displays the PM Alert dialog box when either of the following criteria is met:

- The system date is on or after the Estimated Next Due Date minus the PM Alert Lead. For example, if the system date is May 25, and the Estimated Next Due Date is June 1 and the Alert Lead is 10 days, the system will display the PM Alert message. The message would be displayed from May 23 through June 1.
- The current meter reading for the asset or location is greater than the Next Meter Reading projection minus the PM Alert Lead. For example, if the asset's last meter reading was 975 units, and the Next Meter Reading is 1,000 units and the PM Alert Lead is 50 units, the system displays the PM Alert message. The message would be displayed when the asset's reading is at least 950.

The PM Alert dialog box displays the alerts for PMs that are due soon for the asset or location, the descriptions of the PMs, the Estimated Next PM Date, and a check box indicating whether the PM is part of a hierarchy. If the PM is part of a hierarchy, the system checks the other PMs in the hierarchy to see if any of those PMs also are due soon.

To generate a work order from the PM Alert dialog box, click the Generate Work Order check box. The system generates a work order for each PM.

Work record approval

When work records, such as work orders, changes, and releases, have a status of Waiting on Approval, you can change the status to Approved.

Keep in mind the following system behavior that pertains to work record approval:

- When you approve a work record, the system reserves the work plan items in Inventory and records cost and rate data. If rates change in Inventory, Labor, or Tools, the work plan reflects the rates in effect when the change was approved.
- An approved record cannot be deleted.
- When you approve a work record, the tasks on the record are also approved.
- If you approve a work record that has child work orders with their Inherit Status Changes? check box selected, the applicable child work orders are also approved.

- You can change the status of multiple work orders at the same time using the Select Records checkbox on the List tab to select the records, or you can change the status of a displayed record.

Linear segment details

You use the Linear Segment Details section to locate a linear segment or point on a linear asset. The Linear Segment Details section, which displays on tabs in several applications, appears only if you are working with a linear asset.

For example, if you specify a linear asset in the Asset field on a preventive maintenance record, the PM tab displays a Linear Segment Details section. If you enter a point asset, the PM tab does not display this section. The Linear Segment Details section includes fields for both the start point and the end point. If you locate a point, such as a stop sign, the start and the end points are the same.

The following terms are associated with linear segments:

Measure

The absolute distance from the start of a linear asset. You can specify a measure manually. The measure is calculated for you if you enter a reference point and a reference point offset. In the example, using Mile Post 27 and an offset of -528, the calculated measure is 26.9 miles (528 feet = .1 mile).

Offset

A measure from a previously defined reference point. The possible kinds of offsets are the following:

Reference Point Offset

The distance before or after the reference point. Specify an offset value if the segment start or end is before or after the reference point. The value can be negative (before) or positive (after). For example, if the start of the segment is 528 feet before Mile Post 27, type -528.

You cannot specify an offset that, when combined with the reference point, yields a measure that is outside the boundaries of the linear asset. For example, if reference point Mile Post 1 is at 1.0 miles on a linear asset that begins at 0.0 miles, you cannot enter an offset of -2 miles.

Y-Offset

A distance perpendicular to the direction of the linear asset. For example, a speed limit sign is located 10 feet from the right edge of the road. "Right" is positive and "left" is negative. Therefore, the Y offset is 10.

Z-Offset

A distance above a linear asset or below a linear asset. For example, an exit sign is located 18 feet above the surface of the road, and a culvert is 4 feet below the surface of the road. The Z offset for the sign is 18, and the Z Offset for the culvert is -4.

Reference point

A feature instance that you can use as a starting point or as an ending point for a linear segment. A reference point is a means of communicating a work location. For example, it can be more useful to workers to say that roadside plowing on Route 96 begins at the intersection of Routes 96 and 75, and ends at Exit 34. It would be less useful to say the work begins at Mile 27.85 and ends at Mile 33.8.

The use of reference points varies according to department practices and to individual variation among linear assets. Some roads might have accurate and persistent mile post markers and workers can rely on them to locate work. Other roads might have few markers or no accurate markers, and users can rely on reference points. Use labels that maintenance workers in the field can easily identify.

Click Select Value to select the reference point.

Y Reference

The point from which the Y Offset is measured.

The system administrator creates the set of Y Reference values by creating a domain in the Domains application. For roads, some common examples include midline, outer pavement edge, and inner pavement edge. For example, a stop sign is located not just 20 feet from a road, but 20 feet from the midline of a road.

Z Reference

The point from which the Z Offset is measured.

The system administrator creates the set of Z Reference values by creating a domain in the Domains application. For roads, some common examples include road surface and road bed. For example, an exit sign is located 18 feet above the road surface, or a culvert is 12 feet below the road bed.

Rules for modifying archived changes

Closed and canceled changes are archived, and become historical records. You might be able to add additional information to a historical record by using the Edit History Change action.

When you modify an archived change, the following rules apply:

- New costs that were incurred during the edit history must be added to the inventory cost, if it is charge to store.
- You can add actual labor, but you cannot change approved transactions.
- You can add actual materials and actual tools, but you cannot change them.
- You can add or delete child records, whether the child records are tasks.
- You can attach documents.
- You cannot change planned labor, materials, and tools.
- You cannot change information in the following fields:
 - Asset.
 - Location.
 - GL Account.
 - Charge to Store.
 - Status.

Deletion rules for changes

For auditing purposes, you cannot always delete changes. If you cannot delete a specific change, you can stop all action on a change by changing the status to canceled.

The change and its children must meet the following criteria to be deleted:

- Have a status of waiting for approval
- Not have any transactions registered against it, except for status changes
- Not have any actuals reported against it
- Not have any labor assignments associated with it
- Not have been generated for a purchase order or receipt
- Not be in a workflow or have ever been in a workflow
- Not have any measurements or meter readings taken against it
- Cannot be follow-up work or have follow-up work

To delete a change, use the Delete_>...Change action.

Working with changes

When you create a change, you specify information about the work that must be performed for an asset, location, or configuration item. You can add work plans or job plans. You can also record actuals as the work progresses.

- **Creating changes**
You create a change to implement a change to, or deploy new standard configurations to, existing assets.
- **Reporting actuals for work orders**
As work progresses on an approved work order, you can report the actual labor hours, materials, services, and tools used.
- **Specifying meter readings on work orders**
You can enter meter readings for the asset and the location on a work order. An asset can be set up to inherit the meter readings of its parent asset or its location.
- **Reporting downtime for assets**
You can report the start time and the end time of the downtime for an asset after it has occurred.
- **Swapping assets**
You can swap assets associated with a work order. The swap action applies to the work order and all of the assets, locations, and configuration items on its child work orders. The term "work order" can refer to a work order, change, release, or activity record.
- **Creating related records**
To save time and simplify record management, you can create new records and relate them to your change. New records can be changes, incidents, problems, releases, service requests, and work orders. You can view related records on the Related Records tab.
- **Categorizing changes with classifications and attributes**
To simplify the process of finding and managing records, you can categorize changes. Classifications identify changes as involving a type of item, such as a notebook. Attributes further identify the item by providing more details. For example, a notebook can have the attributes memory, speed, and disk space.
- **Setting up work process flows**
Work process flows use relationships between work orders and tasks to automate the flow of status changes. You set relationships between work orders and tasks so that when a task is completed, the next task in the flow can be initiated.
- **Changing the status of a list of records**
You can change the status of multiple records in applications.

Creating changes

You create a change to implement a change to, or deploy new standard configurations to, existing assets.

Procedure

1. In the Changes application, click the New Change icon.
A new record appears with a unique ID in the Change field and many fields are completed by the system. The new change is given a status of Waiting on Approval (WAPPR).
2. Complete all the required fields (*) and the remaining fields, as needed. Typically, you need to complete the following fields on the main tab of the application.

Field	Description
Priority	Specify a priority for the change if you plan to schedule the work.
Location, Asset, Configuration Item, or GL Account	You can create the change for either a location, an asset, a configuration item, or a GL account.
Release Type	Specify the type of the change, such as major, minor, or significant.

Field	Description
Multi Assets, Locations and CIs	After specifying the primary affected asset, location, and configuration item in the designated fields, you can specify multiple related assets, locations, and configuration items in the Multi Assets, Locations, and CIs table window. For example, if you are creating a record to upgrade graphic software on all Product Managers' notebooks, you can define the primary (targeted CI) as Product Managers' Notebooks. Using the Multiple Assets, Locations, and CIs table window, you — or another user — can eventually refine this into the actual list of Product Manager notebooks.

3. Save the record.
4. Optional: Use the additional tabs in the Changes application to add or modify information for this record, as needed. For example, to apply a job plan to the record, or define hierarchy information, use the Plans tab. Save the record after making additions or changes.

- [Creating work plans for changes](#)

You can create a work plan for a change. A work plan describes the labor, materials, tools, services, and tasks that are needed to complete a change.

- [Applying service level agreements to records](#)

You can apply a service level agreement (SLA) to a record to define the agreement and formal commitments between a service provider and a customer. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.

- [Applying routes to work orders](#)

You can apply a route to a work order to define a list of related work assets. For example, you can define assets, locations, or a combination of both; each of which is considered to be a stop along the route. The work assets can be related by location, such as all pumps and motors in a room. Or they can be related by the type of asset, such as all fire extinguishers at a site.

- [Creating records from existing records](#)

To create a relationship between two records, you can create a record from an existing record. The record from which you create a change has a relationship type of ORIGINATOR, and the new record has a relationship type of FOLLOWUP.

Creating work plans for changes

You can create a work plan for a change. A work plan describes the labor, materials, tools, services, and tasks that are needed to complete a change.

Procedure

1. Select the change for which you want to create a work plan.
2. On the Plans tab, provide the following information:

Option	Description
Work plan task information	In the Tasks for Change section, add work plan information.
Labor information	On the Labor subtab, select existing labor or add labor.
Planned materials information	On the Materials subtab, provide information for planned materials or items for the change.
Services information	On the Services subtab, select standard services or add services.
Tools information	On the Tools subtab, select tools or add tools.

3. Save the work plan.

- [Associating work plans with changes](#)

You can associate an existing work plan with a change. A work plan describes the labor, materials, tools, services, and tasks that are needed to complete a change. Modifications made to the associated work plan do not affect the original job plan.

- [Adding work plan tasks to changes](#)

You can add or change work plan tasks until the change is closed. However, you cannot delete work plan tasks from an approved change or from a change that has actuals reported for the work plan task.

- [Selecting job plans](#)

You can select a job plan for a work order, instead of building a work plan from scratch. The job plan you select becomes the work plan. You can choose a job plan from a list of job plans that are associated with the assets identified on the work order.

- [Creating job plans from work plans](#)

You can create a job plan from the work plan instead of recreating the work plan each time that you need it. When you create a job plan from a work plan, the asset management system uses the current work order and its tasks, planned labor, materials, tools, and services to create the job plan.

Associating work plans with changes

You can associate an existing work plan with a change. A work plan describes the labor, materials, tools, services, and tasks that are needed to complete a change. Modifications made to the associated work plan do not affect the original job plan.

Procedure

1. Select the change with which you want to associate a work plan.
2. In the Job Plan field of the Plans tab, specify the plan that you want to associate.
3. Save the change.

Adding work plan tasks to changes

You can add or change work plan tasks until the change is closed. However, you cannot delete work plan tasks from an approved change or from a change that has actuals reported for the work plan task.

Procedure

1. Select the change to which you want to add work plan tasks.
2. On the Plans tab, in the Tasks for Change section, add a new row.
3. Specify the details of the task.
4. Save the change.

Selecting job plans

You can select a job plan for a work order, instead of building a work plan from scratch. The job plan you select becomes the work plan. You can choose a job plan from a list of job plans that are associated with the assets identified on the work order.

Before you begin

You can only select a job plan for a work order if the work order has no plans. If there are any labor, materials, services, or tools planned, the Job Plan field is read-only.

About this task

When you associate a job plan with a work order, if the job plan has a default safety plan for the selected work asset, the safety plan is also copied to the work order.

Procedure

1. Display the work order for which you want to select a job plan.
2. In the Job Plan field, click Detail Menu, and choose Select Value.
3. Select the Show Job Plans for the Work Order's Asset and Location Only check box. This check box limits the list of job plans displayed to the job plans associated with the asset or location that appear on the work order. To view a list of all job plans, clear the check box, and click Refresh.
4. Click the row containing the job plan to select it and return to the work order.

Creating job plans from work plans

You can create a job plan from the work plan instead of recreating the work plan each time that you need it. When you create a job plan from a work plan, the asset management system uses the current work order and its tasks, planned labor, materials, tools, and services to create the job plan.

About this task

The asset management system does not copy child work orders, if any, to the job plan. If the work assets on the work order have an associated safety plan, the asset management system does not copy the safety plan to the job plan.

Procedure

1. In the Work Order Tracking application, display the work order that contains the plan that you want to use to create a job plan.
2. Select the Create Job Plan from Work Plan action.
3. If the Job Plan field is empty, enter a value, or click Autonumber to have the asset management system assign a number to the job plan.
4. Click OK.

Results

The asset management system creates a job plan record that you can now access in the Job Plans application.

Applying service level agreements to records

You can apply a service level agreement (SLA) to a record to define the agreement and formal commitments between a service provider and a customer. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.

About this task

When you apply an service level agreement to work orders, the SLA is applied only to the work order, not to its tasks. If you want to apply a service level agreement to a task, you must display the task as the current record and then apply the SLA.

You can apply service level agreements to tickets and work orders.

Procedure

1. Open an application and display the record that you want to update.
2. Select the Apply SLA action.
3. Click OK.

Results

The SLA Applied check box on the main tab of the selected application is selected. The target start, target finish, and contact values are calculated for the selected record.

Removing service level agreements from records

To maintain accurate records, it might be necessary to remove an invalid or erroneous service level agreement to disassociate it from the record.

Procedure

1. Display the record for which you want to remove a service level agreement.
2. Select the Select/Deselect SLA action.
3. Click Mark Row for Delete for each service level agreement that you want to remove from the record.
4. Click OK.
5. Save the record.

Applying routes to work orders

You can apply a route to a work order to define a list of related work assets. For example, you can define assets, locations, or a combination of both; each of which is considered to be a stop along the route. The work assets can be related by location, such as all pumps and motors in a room. Or they can be related by the type of asset, such as all fire extinguishers at a site.

About this task

Each route stop can have its own job plan, which the system copies to the child work order. You can apply a route to a work order in the Work Order Tracking and Quick Reporting applications.

Procedure

1. Open an application and display the work order record that you want to update.
2. Select the Apply Route action.
3. Select the route that you want to apply to the work order.
A message box opens and displays a list of child work orders that are created from the route.
4. Click Save Work Order.

Results

The created child work orders display as route stops on the Plans tab in the Work Order Tracking application.

Creating records from existing records

To create a relationship between two records, you can create a record from an existing record. The record from which you create a change has a relationship type of ORIGINATOR, and the new record has a relationship type of FOLLOWUP.

Procedure

1. Display the record from which you want to create the related record.
2. Select the Create *z*.Record Type action where Record Type is the type of related record you want to create.
3. Save the record.

Reporting actuals for work orders

As work progresses on an approved work order, you can report the actual labor hours, materials, services, and tools used.

Procedure

1. Display the work order for which you want to report actuals.
2. On the Actuals tab, enter the details on the following subtabs:

Option	Description
Labor	Report hours for labor, copy labor from the work plan, or select planned labor.
Materials	Select materials, select reserved items, and select spare parts.
Services	Select services or standard services.
Tools	Select tools, copy tool data from the work plan, or select tools that were issued to the work order.

3. Save the record.

Specifying meter readings on work orders

You can enter meter readings for the asset and the location on a work order. An asset can be set up to inherit the meter readings of its parent asset or its location.

About this task

To find out if an asset is inheriting meter readings, go to the asset record and check the value in the Accept Rolldown From field.

Procedure

1. Display the record for which you want to enter a reading.
2. From the Select Action menu, select Enter Meter Readings.
3. To enter a meter reading, select either of the following options:
 - To enter a meter reading for the asset, click the Asset Meter Readings tab.
 - To enter a meter reading for the location, click the Location Meter Readings tab. If the asset and location have meters, and the asset inherits the meter reading for the location, enter a reading for either the asset or the location. If the asset has child records that inherit meter readings, the meter readings for the child records are updated. If the location has assets that inherit meter readings for the location, the readings for the assets in that location are updated.
4. In the New Reading field, enter a value, or click Select Value. The system date and time display in the New Reading Date field. The log in name for the user displays in the Inspector field.
5. To change the inspector, specify a value, or click Detail Menu to retrieve a value.
6. To enter the reading and return to the record, click OK.

Reporting downtime for assets

You can report the start time and the end time of the downtime for an asset after it has occurred.

About this task

You can create multiple downtime reports for a single work order.

Procedure

1. Display the record with the asset for which you want to report downtime.
2. Select the Report Downtime action.
3. In the Downtime Report section, select the Report Downtime option.
4. Specify the date the downtime began, or select one of the following options in the Start Date Default section:
 - Reported Date - the date and time the downtime for the asset was reported on the work order.
 - Actual Start Date - the date and time the downtime for the asset actually began.
 - None - no default start date and time.
5. Enter a date the downtime ended or will end.
6. In the Hours field, the system calculates the total downtime hours based upon the start date and the end date. This calculation considers the calendar for the asset. The calculation also considers the elapsed time between the start of downtime, and the end of downtime.
7. In the Downtime Code field, click Select Value to select a code.
8. In the Downtime Type section, select either of the following options:
 - Operational - if the down time occurred when the asset is normally in use
 - Non-Operational - if the down time occurred when the asset is normally not in use.
9. Click OK to report the downtime and return to the record.

Swapping assets

You can swap assets associated with a work order. The swap action applies to the work order and all of the assets, locations, and configuration items on its child work orders. The term "work order" can refer to a work order, change, release, or activity record.

Before you begin

You can execute the swap immediately, or you can save the swap as a plan. If you save the swap as a plan, the changes will apply when the status for the work order is COMP (Complete). When the status of a work order is COMP, you swap assets only using the Execute Now option. When you select Execute Now on any tab, the system executes the changes on all tabs.

When you duplicate a work order that has a planned swap to its assets or locations, the planned action does not get copied to the duplicate work order. Also, when you create a release, or change, or work order from a record using the Select Action menu option, the planned action is not copied to the follow-up record.

Procedure

1. Select the Move/Swap/Modify action.
2. Click the Move/Swap tab.
3. Select the Is this an Asset Swap checkbox.
4. In the Swap Assets section, select the row for the asset you want to swap.
5. To move the asset to a parent or location, type a value in the appropriate field, or click Select Value to retrieve a value.
6. In the Replacement Asset field, specify an asset, or click Select Value to retrieve a value.
7. Perform one of the following actions:
 - To swap the assets immediately, click Execute Now.
 - To swap the assets when the status for the work order is COMP (Complete), click Save as Plan.

Creating related records

To save time and simplify record management, you can create new records and relate them to your change. New records can be changes, incidents, problems, releases, service requests, and work orders. You can view related records on the Related Records tab.

Procedure

1. Select the change for which you want to create related records.
2. From the Select Action menu, select *Create_>RecordType* where *RecordType* is one of the following types:
 - Work Order
 - Service Request
 - Incident
 - Problem
 - Change
 - Release
 - Communication
- [Assigning a parent to a work order](#)

You can assign a parent to a work order and assign tasks to that parent. When you assign work order records to a parent, they become child work orders records of the parent record.

Assigning a parent to a work order

You can assign a parent to a work order and assign tasks to that parent. When you assign work order records to a parent, they become child work orders records of the parent record.

About this task

You cannot assign parent records to closed work order records. If the parent has a value in the Priority field, and the child or children work order records do not, the child or children work order records inherit the parent priority value.

Procedure

1. Open an application and display the work order record that you want to update.
2. On the List tab, select the task that you want to update.
3. Select the Assign To New Parent action.
4. Select the work order record that you want as the new parent.

The asset management system displays the parent work order number in the Parent WO field.
5. Click Save record.

Categorizing changes with classifications and attributes

To simplify the process of finding and managing records, you can categorize changes. Classifications identify changes as involving a type of item, such as a notebook. Attributes further identify the item by providing more details. For example, a notebook can have the attributes memory, speed, and disk space.

Procedure

1. Display the change that you want to categorize.
2. On the Specifications tab, specify a classification.
3. Select the attributes.
4. Save your changes.

- [Categorizing tasks on changes with classifications and attributes](#)

To simplify the process of finding and managing records, you can categorize tasks on changes. Categorizing tasks involves classifying and adding and changing attributes to further group the classification.

Categorizing tasks on changes with classifications and attributes

To simplify the process of finding and managing records, you can categorize tasks on changes. Categorizing tasks involves classifying and adding and changing attributes to further group the classification.

Procedure

1. Display the change with the task that you want to categorize.
2. In the Job Details section of the Plans tab, select the task that you want to categorize.
3. Specify the classification.
4. Optional: You can add attributes, delete attributes, and change the values of the attributes in the row details.
5. Save the change.

Example

A task involves the classification of a notebook. The notebook classification has the attributes of memory, speed, and disk space, which are copied to the change upon classification. As needed, you can add attributes such as operating system and power, change the attribute values, and remove attributes associated with the change.

Setting up work process flows

Work process flows use relationships between work orders and tasks to automate the flow of status changes. You set relationships between work orders and tasks so that when a task is completed, the next task in the flow can be initiated.

Before you begin

To set the process flow for individual tasks, you must select Under Flow Control at the header level for the work order.

About this task

The best practice for consistently using the flow feature is to set up the process flow as a work template at the job plan level.

Procedure

1. Open the work order.
2. Select Under Flow Control.
3. On the Plans tab, display the details for the task.
4. In the Scheduling Information section, next to the Predecessors field, click the Detail Menu icon.
5. Select the tasks that must be completed before this task is initiated.
6. Save the work order.

- [Defining flow actions](#)

A flow action is used in a work process flow to define certain actions that should occur while work is being done. Actions or action groups can be applied to any work order, task, or job plan task.

- [Removing work process flow from work orders or job plans](#)

You can remove work process flow for a work order, a job plan, or task records that have it defined. You can do this at the header level, which will remove it for all the associated tasks as well, or you can remove it at the task level.

- [Suspending work process flows](#)

You can suspend the work process flow for work order or task records that have it defined. For example, if you want to start a work order or task manually,

you could suspend the flow control on that record. The flow remains suspended until you remove the suspension.

- [Stopping workflow processes](#)
You can stop a workflow process for a record. You use the Workflow Administration application to view and stop workflow processes.

Defining flow actions

A flow action is used in a work process flow to define certain actions that should occur while work is being done. Actions or action groups can be applied to any work order, task, or job plan task.

About this task

You can determine whether the action takes place automatically, or if the action only takes place when it is initiated manually. When automatic, the action takes place as soon as the work order or task status is changed to an in progress (INPRG) status value by work process flow. When manual, you must initiate the flow action by running the automation or processing scripts or placing an action button on the target application. Actions and action groups are defined in the Actions application.

Procedure

1. In an application that supports flow action, display the record for which you want to define a flow action.
2. Perform one of the following actions:
 - For a work order, change, release, or job plan record, enter a value in the Flow Action field on the application tab.
 - For a work order or job plan task, enter a value in the Flow Action field in the Task table window. The Tasks table window is found on the main tab of the Job Plans application, or the Plans tab of the Work Order Tracking, Changes, and Releases applications.

The defined action runs when the work order or task status value is changed to INPRG.

3. Specify whether you want the flow action to be automatically run:

Option	Flow Action Assist
Automatically run the flow action	Cleared
Manually run the flow action	Selected

4. Click Save record.

Removing work process flow from work orders or job plans

You can remove work process flow for a work order, a job plan, or task records that have it defined. You can do this at the header level, which will remove it for all the associated tasks as well, or you can remove it at the task level.

About this task

If work process flow is removed at the header level, it will automatically be removed on individual tasks on the record. You cannot retain work process flow for a task that does not have it set at the header level.

Procedure

1. In an application that supports flow action, display the record that you want to remove from work process flow.
2. On the main application tab, clear the Flow Controlled check box. The system removes the work order or the job plan, and all of its tasks from work process flow.
3. Click Save Record.

Suspending work process flows

You can suspend the work process flow for work order or task records that have it defined. For example, if you want to start a work order or task manually, you could suspend the flow control on that record. The flow remains suspended until you remove the suspension.

Before you begin

Removing the suspension restarts the flow. Any successor work orders or tasks with completed predecessors continue the process. Work orders and tasks without predecessors continue the process at the same time as the parent record. The last completed child under a parent rolls its completion up to the parent.

Procedure

1. In an application that supports flow action, display the record on which you want to suspend flow control.
2. On the main application tab, at the header level, select the Suspend Flow Control check box. The system suspends the work process flow on the work order and on all of its tasks.
3. To retain flow control for individual tasks, display the tasks in the Tasks table window, and clear the Suspend Flow Control check box at the task level. Flow control remains in place at the task level. This action does not affect the suspension at the work order header level. You can find the Tasks table window on

- the Plans tab.
4. Click Save Record.

Example

You generally suspend a set of tasks, often under the same parent. For example, you can delay the automatic starting of one whole phase of work until a certain condition has been met. You can also delay starting a phase of work to make changes to the tasks, such as inserting tasks, deleting tasks, and changing the precedence logic.

Stopping workflow processes

You can stop a workflow process for a record. You use the Workflow Administration application to view and stop workflow processes.

Before you begin

The application associated with the workflow process record must be enabled for workflow.

Procedure

1. To stop a workflow process, complete one of the following steps:
 - In a Workflow-enabled application, display the record you want to remove from Workflow. Select the Stop Workflow action.
 - In the Workflow Administration application, select the active process that you want to stop. Click Stop Process on the assignment line.
2. Optional: Create an e-mail notification. The system defaults to the WFSTOP communication template. You can use the WFSTOP communication template to create the notification. You can also manually specify the subject, message, and role recipients.
3. Click OK. The system stops the workflow process. The system also sends any notifications.

Changing the status of a list of records

You can change the status of multiple records in applications.

Procedure

1. In the Work Order application, on the List tab of an application, filter the records so that less than 200 records are displayed.
2. Scroll down the bottom of the screen and select the Select Records check box.
The screen refreshes and each row now has a check box.
3. Select the check boxes for the work orders whose status you want to change.
4. Click the Change Status action and enter the information in the dialog box.
5. Click OK to close the Change Status window.

Activities and Tasks

You use the Activities and Tasks application to plan, to review, and to manage activities and tasks. An activity initiates the work process and creates a historical record of the work being performed. Activities are created in the Incidents and Problems applications. A task is a specific unit of work on a work order.

An activity is a type of work order. A task can be created as part of an activity or part of another work order.

You can use the Activities and Tasks application to perform the following functions:

- Change the status of activities and tasks
 - Take ownership of activities or tasks
 - Assign ownership of activities and tasks to individuals or to workgroups
 - Modify activities and tasks to reflect changes
 - View related preventive maintenance and scheduling information
 - Categorize the activities and tasks using classifications and attributes to simplify their management and retrieval
 - Specify, view, and modify job tasks and the labor, material, services, and tool requirements for work plans
 - View, add, and delete work orders and tickets that are related to an activity or to a task
 - View follow-up records for an activity or a task
 - View and create a work log and communication entries about a record
- [Activities and tasks overview](#)
An activity specifies the tasks, and the labor, materials, services, and tools needed to complete the task. Activities are created to document the required work, which can then be delegated to the individuals responsible for completing the work.
 - [Working with activities](#)
Activities are created in the Incidents and Problems applications. Tasks are created as part of activities and other work orders. You can manage and modify activities and tasks in the Activities and Tasks application. For example, you can change the ownership or status of an activity or task.

Activities and tasks overview

An activity specifies the tasks, and the labor, materials, services, and tools needed to complete the task. Activities are created to document the required work, which can then be delegated to the individuals responsible for completing the work.

- **[Record ownership](#)**
The owner of a record is the person or person group that is in charge of the record from an administrative perspective.
- **[Activity statuses](#)**
The status of an activity indicates its position in the processing cycle. The status determines which actions can be performed on the activity. For example, if the activity is approved (APPR), then the tasks can start.
- **[Measurement points](#)**
When you inspect an asset or a location, you can record and view the meter readings that correspond to measurement points in the job plan of the associated work order. You can also insert measurement points on an activity until the activity or task is closed.
- **[Service level agreements](#)**
A service level agreement (SLA) typically is a written agreement that outlines the commitment between a service provider and its customers. A commitment is a service level that all parties have agreed to, such as asset reliability or availability.
- **[Record relationships](#)**
Relationships between records, such as tickets and work orders, help simplify record management. You can create record relationships manually, or relationships might be created automatically when you take certain actions.
- **[Costs on tickets and work orders](#)**
You can view the estimated and actual costs for a single work order or ticket, including costs for labor, material, tools, and services. You can also view total costs for the current record and all the records below it in its hierarchy.
- **[Work plan removal](#)**
Under certain circumstances, you can remove a work plan from an activity by using the Remove Work Plan action.
- **[Deletion rules for activities](#)**
For auditing purposes, you cannot always delete activities. If you cannot delete a specific activity, you can stop all action on an activity by changing the status to canceled.
- **[Rules for modifying archived activities](#)**
Closed and canceled activities are archived, and become historical records. You might be able to add additional information to a historical record by using the Edit History Activity action.

Record ownership

The owner of a record is the person or person group that is in charge of the record from an administrative perspective.

The owner of a record keeps the customer updated and acts as the point person for any issues involving the work. You can use the Select Owner action to assign record ownership to a person or person group, or you can use the Take Ownership action if you want to take administrative ownership of the record yourself. You can take ownership for more than one application.

Keep in mind the following points regarding record ownership:

- A record can have many different owners during its life cycle.
- You can select an owner or owner group until the record's status is CLOSED.
- To view the ownership history of a record, select View History.
- A workflow or an escalation process may assign ownership, if appropriate.

If the Persons tab on your Select Owner dialog box displays a Person Group field and a Date field, then you can filter the list of persons by the values in these fields. For example, suppose the Person Group field and the Date fields are empty when you open the dialog box. You specify a person group and a date and time, and click Refresh. The system displays only the persons in the specified group who are available on the specified day and time.

Activity statuses

The status of an activity indicates its position in the processing cycle. The status determines which actions can be performed on the activity. For example, if the activity is approved (APPR), then the tasks can start.

When you change the status of an activity, the status of any applicable child activity that uses the inherit status option also changes. If you change the status of global activities, the same status change is automatically applied to all globally related records. In addition, the status of an activity can be automatically changed. For example, after you assign an owner to an activity, the status of that activity automatically changes to queued.

A follow-up record can change the status of the originating activity, which results in automatic routing or notification of the status change.

WAPPR

The activity is waiting for approval. WAPPR is the default status for records created in the Work Order Tracking, Changes, Releases, and Activities and Tasks applications.

APPR

The activity is approved and the work can begin. Work plan items on an approved activity are reserved in inventory, and cost and rate data are recorded. Rates can be changed in the Inventory application, Labor application, or Tools application. If the rates are changed in any application, the work plan reflects the rates in effect when the activity was approved.

WSCH

The activity is waiting to be scheduled. WSCH is the default status for records created in the Preventive Maintenance application.

WMATL

Materials must arrive before the work can be performed.

WPCOND

The work can be performed only when the condition of the plant is suitable. For example, certain work might require the shutdown of the plant.

INPRG

The work is in progress. INPRG is the default status for records created in the Quick Reporting application.

COMP

The physical work is completed. If you want to move or change an asset on an activity, the move or change occurs when the status is changed to complete.

CLOSE

The activity is finalized. Inventory reservations for items not used in the activity are removed and the activity is made into a history record.

CAN

The work is canceled. You cannot cancel an activity if the work has already been initiated or if actuals have already been reported. You can use this status when you want to delete an activity and deleting is not allowed.

Measurement points

When you inspect an asset or a location, you can record and view the meter readings that correspond to measurement points in the job plan of the associated work order. You can also insert measurement points on an activity until the activity or task is closed.

The product copies the measurement point number to the job plan when there is a three-way match between the following items:

- The measurement point name on the job plan listed on the activity.
- The measurement point name on the asset or the location listed on the activity.
- A measurement point number for the measurement point name.

If you specify a measurement for a measurement point, the measurement and measurement date are added to the Measurements table. If you specify a measurement without a measurement point, the measurement data is saved with the activity.

You use the Observation field to record visual inspection data. You use the Inspector field to record the name of the person performing the inspection. You can edit these fields until the activity is closed. Once the activity is closed, you can add or modify operations by selecting the Edit History Activity action.

Service level agreements

A service level agreement (SLA) typically is a written agreement that outlines the commitment between a service provider and its customers. A commitment is a service level that all parties have agreed to, such as asset reliability or availability.

The SLA describes one or more commitments and the escalation actions or notifications associated with each commitment. Escalation actions or notifications might be associated with an SLA to ensure that commitments are met. An escalation process can monitor all activities and send notifications or perform other activities to ensure that commitments are met.

The types of records to which service level agreements can be applied include tickets, such as service requests, and work-based records, such as work orders. Before you can apply an SLA to a record, the record must have a site defined.

A service level agreement can be associated with a record in several ways:

- An SLA might automatically be applied to a record from within a workflow or escalation process, or from another SLA.
- You can select an action to apply an SLA, which applies the best match automatically.
- You can view SLAs and select an action to select or clear the SLAs that you want to manually apply to the record.

When you apply a service level agreement to a record, the following events occur:

- The SLA Applied check box on the main tab of the record is selected to document the action.
- Any escalations that are associated with the SLA are activated.
- The Target Start, Target Finish, and Contact values for the record might be calculated automatically as follows:

Automatically calculated values
When an SLA is applied that includes a response commitment, the response commitment date populates the Target Start date field of the record.
When an SLA is applied that includes a resolution commitment, the resolution commitment date populates the Target Finish date field of the record.
When an SLA is applied that includes a contact commitment, the contact commitment date populates the Target Contact date field of the record.

Record relationships

Relationships between records, such as tickets and work orders, help simplify record management. You can create record relationships manually, or relationships might be created automatically when you take certain actions.

The types of relationships that can exist between records include:

- Related relationship, which is an informal association of tickets that is used for informational purposes.

- Originator and Follow-up, which keep costs hierarchies separate while still creating a relationship between the tickets.
- Related to Global, which creates a relationship in which the tickets are related to a global issue, which affects many users.

Related records

Using any ticket or work-based application, you can view similar records and relate tickets and work orders to the current record. A related relationship between records is an informal relationship that is for informational purposes only.

A related relationship does not affect status inheritance, affect workflow, or follow a set of business rules. Related relationships can be many-to-many, and do not represent record hierarchies. By relating records informally, you can navigate to related records, view related information for similar records, and view open tickets that are associated with a field. You can create an informal record relationship in the following ways:

- Use the Related Records tab of the application. This tab provides an easy way to create relationships and to view and navigate among informally related records.
- Use the Show Similar Tickets action in any ticket application. The similar ticket search results only include the service requests, incidents, and problems that have the same classification as the current ticket. Global records and history records are not included in the results. Your system administrator might add more restrictions to the search results.

Originator and follow-up tickets and work orders

You can relate tickets and work orders to a record more directly when you create a follow-up record from the ticket using one of the Create actions on the ticket. The ticket you create the follow-up record from is the originator. A follow-up record can be a ticket or a work order. In some cases, a follow-up ticket or work order might be able to change the status of its originating ticket. An originating ticket cannot change the status of a follow-up work order, nor can a follow-up ticket change the status of the originator if there is more than one follow-up. These options are configured by the system administrator.

Globally related tickets

A global ticket is an incident or problem relating to an issue that affects many users. You can relate tickets, including service requests, to a global ticket, which creates a RELATEDTOGLOBAL relationship. This relationship lets you manage the tickets by using the global ticket. When you change the status of the global ticket, the system changes the status of all globally related tickets.

If your administrator has set up automated notifications of status changes, the system changes the status of the tickets related to the global issue. For example, all the initial requestors reporting the same issue are notified of its resolution. On the global ticket, you can also view a list of related records and view the work and communication logs for all related records.

- [Deletion of record relationships](#)
On the Related Records tab, you can delete the relationship between a change and any related work orders or tickets.
- [Global records](#)
A global record is a ticket that is a root cause of other issues or that affects many users, such as computer network failures or flooding in a building. After you mark a record as global, you can relate multiple tickets and then manage all tickets using the global record.

Costs on tickets and work orders

You can view the estimated and actual costs for a single work order or ticket, including costs for labor, material, tools, and services. You can also view total costs for the current record and all the records below it in its hierarchy.

When you view the costs of a ticket or work order, the data is displayed in two tables:

- The Totals table displays the costs for a single ticket or work order.
- The View Hierarchy Grand Totals table displays the costs for the current ticket or work order and all records under its hierarchy.

Each table presents the same information, which is shown in the following table.

Column	Explanation
Current Estimate	Displays read-only calculated values for the current totals from the Labor, Materials, Standard Services, and Tools tabs of the Plans tab for the ticket or work order.
Estimate at Approval	Is set to zero until the work order is approved, then the values are copied from the Current Estimate column and are read-only. If the work order status changes from approved to unapproved, then these fields are cleared. The estimated costs at approval are not affected by the change in status from in progress to completed or closed.
Actual	Displays the read-only values from the Labor (for approved labor only), Materials, and Tools tabs of the Actuals tab. If the status of the record changes from approved, then these fields are not cleared.

Rolling up maintenance costs

After you close a work order that is associated with an asset, you can calculate your maintenance costs by rolling up costs that you incur for labor, materials, tools, and services to the top-level asset in the hierarchy that the asset belongs to.

Costs can be rolled up manually or automatically. By default, cost rollups are manual. If you want costs to be calculated and rolled up automatically when a work order is closed, you must set the `mxe.workorder.rollupMaintenanceCosts` system property to 1. After you configure the system property for automatic rollups, all subsequent costs that are associated with work orders are rolled up automatically. However, any unprocessed maintenance costs that existed before the configuration are not automatically rolled up. You must roll up any preexisting, unprocessed maintenance costs manually.

To calculate the maintenance cost of your assets, use the Roll Up Maintenance Costs action in the Assets application.

If you upgrade to Maximo® Manage 8.5, run the Asset Cost Rollup Report to roll up pending maintenance costs before the upgrade.

Work plan removal

Under certain circumstances, you can remove a work plan from an activity by using the Remove Work Plan action.

When you remove a work plan, all information in the Resources tab, except for non-task children, is removed. Also, if the work plan has a job plan, the job plan identifier is removed.

If any task in the work plan cannot be removed based on the deletion rules for changes, you cannot use the Remove Work Plan action. You can still delete labor, material, services, and tools information, as well as any tasks that do meet the deletion rules.

Deletion rules for activities

For auditing purposes, you cannot always delete activities. If you cannot delete a specific activity, you can stop all action on an activity by changing the status to canceled.

The activity and its children must meet the following criteria to be deleted:

- Have a status of waiting for approval
- Not have any transactions registered against it, except for status changes
- Not have any actuals reported against it
- Not have any labor assignments associated with it
- Not have been generated for a purchase order or receipt
- It must not have any failures reported against it.
- Not be in a workflow or have ever been in a workflow
- Not have any measurements or meter readings taken against it
- Cannot be or have follow-up work

To delete an activity, use the Delete_>_Activity action.

Rules for modifying archived activities

Closed and canceled activities are archived, and become historical records. You might be able to add additional information to a historical record by using the Edit History Activity action.

When you modify an archived activity, the following rules apply:

- New costs that were incurred during the edit history must be added to the inventory cost, if it is defined as charge to store.
- You can add actual labor, but you cannot change approved transactions.
- You can add actual materials and actual tools, but you cannot change them.
- You can add or delete child records, whether or not the child records are tasks.
- You can attach documents.
- You cannot change planned labor, materials, and tools.
- You cannot change information in the following fields:
 - Asset.
 - Location.
 - GL Account.
 - Charge to Store.
 - Status.
 - Status Date

Working with activities

Activities are created in the Incidents and Problems applications. Tasks are created as part of activities and other work orders. You can manage and modify activities and tasks in the Activities and Tasks application. For example, you can change the ownership or status of an activity or task.

- **[Planning activities and tasks](#)**
After you associate a task with an activity, you can specify estimates for labor, craft, materials, services, and tools for each task on the activity or for the activity as a whole.
- **[Reporting actuals for activities and tasks](#)**
As work progresses on an approved activity or task, you can report the actual labor hours, materials, services, and tools used.
- **[Applying service level agreements to records](#)**
You can apply a service level agreement (SLA) to a record to define the agreement and formal commitments between a service provider and a customer. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.
- **[Swapping assets](#)**
You can swap assets associated with a work order. The swap action applies to the work order and all of the assets, locations, and configuration items on its

child work orders. The term "work order" can refer to a work order, change, release, or activity record.

- [Relating work orders or tickets to activities or to tasks](#)
You can link work orders and tickets to an activity or task. When you link a record to a work order, its relationship type is RELATED.
- [Classifying activity records](#)
To simplify the process of finding and managing activity records, you can classify the records. Categorizing an activity involves classifying it and adding and modifying attributes to further group the classification.
- [Setting up work process flows](#)
Work process flows use relationships between work orders and tasks to automate the flow of status changes. You set relationships between work orders and tasks so that when a task is completed, the next task in the flow can be initiated.
- [Changing the status of activities or tasks](#)
You can change the status of an activity to indicate the position of the activity as it moves toward completion.

Planning activities and tasks

After you associate a task with an activity, you can specify estimates for labor, craft, materials, services, and tools for each task on the activity or for the activity as a whole.

- [Creating work plans](#)
A work plan describes the labor, materials, tools, services, and tasks you need to complete an activity or task. You can create a work plan manually.
- [Planning work for activities and tasks](#)
You use the Activities and Tasks application to insert, view, or edit planned labor information or planned craft information.
- [Creating tasks for activities](#)
You use the Activities and Task application to create additional tasks or to edit the existing tasks for an activity. After you create a task, you can plan its labor, materials, services, and tools.

Creating work plans

A work plan describes the labor, materials, tools, services, and tasks you need to complete an activity or task. You can create a work plan manually.

Procedure

1. In the Activities and Tasks application, display the record for which you want to create a plan.
2. Make one of the following selections:

Option	Description
If the record is an activity	Click the Plans tab.
If the record is a task	Click the Resources tab, then click the Plans sub tab.

3. Specify work plan data, such as tasks, labor, materials, tools, and services using the sub tabs.
4. Save the record.

- [Creating work plans using job plans](#)
A work plan describes the labor, materials, tools, services, and tasks you need to complete an activity. You can select a job plan, and modify it to your needs.

Creating work plans using job plans

A work plan describes the labor, materials, tools, services, and tasks you need to complete an activity. You can select a job plan, and modify it to your needs.

Procedure

1. In the Activities and Tasks application, display the record for which you want to create a work plan from a job plan.
2. Make one of the following selections:

Option	Description
If the record is an activity	Click the Plans tab.
If the record is a task	Click the Resources tab, then click the Plans sub tab.

3. In the Job Plan field, click Detail Menu and select an option to retrieve a value. When you associate a job plan with a work order, the product copies the labor, the materials, the services, and the tools to the work order plan. If the job plan has a default safety plan for the selected work asset, the product also copies the safety plan to the work order.
4. Optional: Edit the fields to modify any of the information. Changes you make to the work plan do not affect the original job plan.
5. Save the record.

Planning work for activities and tasks

You use the Activities and Tasks application to insert, view, or edit planned labor information or planned craft information.

Procedure

1. Display the activity or task for which you want to plan labor.
2. Make one of the following selections:

Option	Description
If the record is an activity	Click the Plans tab.
If the record is a task	Click the Resources tab, then click the Plans sub tab.

3. Enter the details of the planned work on the following subtabs:

Option	Description
Labor	Add hours for labor or select crafts.
Materials	Add materials, search catalogs, or add spare parts.
Services	Add services.
Tools	Add tools.

4. Save the record.

Creating tasks for activities

You use the Activities and Task application to create additional tasks or to edit the existing tasks for an activity. After you create a task, you can plan its labor, materials, services, and tools.

Procedure

1. Display the activity for which you want to create planned tasks.
2. In the Tasks table window on the Plans tab, click New Row.
3. Specify a unique value in the Task field.
4. To have the tasks performed in a specific order, enter the appropriate value in the Sequence field.
5. Type the amount of time needed to complete the task in the Estimated Duration field.
6. Use the Labor, Materials, Services, and Tools subtabs to plan for the task.
7. Save the activity.

Reporting actuals for activities and tasks

As work progresses on an approved activity or task, you can report the actual labor hours, materials, services, and tools used.

Procedure

1. Display the activity or task for which you want to report actuals.
2. Make one of the following selections:

Option	Description
If the record is an activity	Click the Plans tab.
If the record is a task	Click the Resources tab, then click the Plans sub tab.

3. Enter the details for the actuals on the following subtabs:

Option	Description
Labor	Report hours for labor, copy labor from the work plan, or select planned labor.
Materials	Select materials, select reserved items, and select spare parts.
Services	Select services or standard services.
Tools	Select tools, copy tool data from the work plan, or select tools that were issued.

4. Save the record.

Applying service level agreements to records

You can apply a service level agreement (SLA) to a record to define the agreement and formal commitments between a service provider and a customer. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.

About this task

When you apply an service level agreement to work orders, the SLA is applied only to the work order, not to its tasks. If you want to apply a service level agreement to a task, you must display the task as the current record and then apply the SLA.

You can apply service level agreements to tickets and work orders.

Procedure

1. Open an application and display the record that you want to update.
2. Select the Apply SLA action.
3. Click OK.

Results

The SLA Applied check box on the main tab of the selected application is selected. The target start, target finish, and contact values are calculated for the selected record.

Removing service level agreements from records

To maintain accurate records, it might be necessary to remove an invalid or erroneous service level agreement to disassociate it from the record.

Procedure

1. Display the record for which you want to remove a service level agreement.
2. Select the Select/Deselect SLA action.
3. Click Mark Row for Delete for each service level agreement that you want to remove from the record.
4. Click OK.
5. Save the record.

Swapping assets

You can swap assets associated with a work order. The swap action applies to the work order and all of the assets, locations, and configuration items on its child work orders. The term "work order" can refer to a work order, change, release, or activity record.

Before you begin

You can execute the swap immediately, or you can save the swap as a plan. If you save the swap as a plan, the changes will apply when the status for the work order is COMP (Complete). When the status of a work order is COMP, you swap assets only using the Execute Now option. When you select Execute Now on any tab, the system executes the changes on all tabs.

When you duplicate a work order that has a planned swap to its assets or locations, the planned action does not get copied to the duplicate work order. Also, when you create a release, or change, or work order from a record using the Select Action menu option, the planned action is not copied to the follow-up record.

Procedure

1. Select the Move/Swap/Modify action.
2. Click the Move/Swap tab.
3. Select the Is this an Asset Swap checkbox.
4. In the Swap Assets section, select the row for the asset you want to swap.
5. To move the asset to a parent or location, type a value in the appropriate field, or click Select Value to retrieve a value.
6. In the Replacement Asset field, specify an asset, or click Select Value to retrieve a value.
7. Perform one of the following actions:
 - To swap the assets immediately, click Execute Now.
 - To swap the assets when the status for the work order is COMP (Complete), click Save as Plan.

Relating work orders or tickets to activities or to tasks

You can link work orders and tickets to an activity or task. When you link a record to a work order, its relationship type is RELATED.

Procedure

1. In the Activities and Tasks application, display the record to which you want to add related records.
2. On the Related Records tab, perform either of the following actions:
 - To relate a work order to the current record, in the Related Work Orders table window, click Add Row.
 - To relate a ticket to the current record, in the Related Tickets table window, click Add Row.
3. Type or select a work order in the Work Order field, or specify a ticket in the Related Record Key field.
4. Optional: You can enter a class.
5. Save the activity.

- [Assigning a parent to a work order](#)

You can assign a parent to a work order and assign tasks to that parent. When you assign work order records to a parent, they become child work order records of the parent record.

- [Removing relationships between records](#)

You can remove the relationship between an activity or a task and its related work orders or tickets.

Assigning a parent to a work order

You can assign a parent to a work order and assign tasks to that parent. When you assign work order records to a parent, they become child work orders records of the parent record.

About this task

You cannot assign parent records to closed work order records. If the parent has a value in the Priority field, and the child or children work order records do not, the child or children work order records inherit the parent priority value.

Procedure

1. Open an application and display the work order record that you want to update.
2. On the List tab, select the task that you want to update.
3. Select the Assign To New Parent action.
4. Select the work order record that you want as the new parent.
The asset management system displays the parent work order number in the Parent WO field.
5. Click Save record.

Removing relationships between records

You can remove the relationship between an activity or a task and its related work orders or tickets.

Before you begin

You can remove the relationship between records only if the ticket or the work order has a type of RELATED.

About this task

To delete relationships with work orders of other relationship types, such as FOLLOWUP or ORIGINATOR, delete the work order in any of the following applications:

- Work Order Tracking
- Activities and Tasks
- Changes
- Releases

To delete relationships with tickets of other relationship types, you must go to the tickets applications.

Procedure

1. In the Activities and Tasks application, display the record with the related relationship that you want to delete.
2. On the Related Records tab, select the record in the Related Work Orders table window.
3. Click the Mark Row for Delete icon. You can mark more than one row.
4. Click Save Activity.

Classifying activity records

To simplify the process of finding and managing activity records, you can classify the records. Categorizing an activity involves classifying it and adding and modifying attributes to further group the classification.

About this task

For example, you might classify an activity as a notebook. The notebook classification might have the attributes of memory, speed, and disk space associated with it, which are copied to the record upon classification. As needed, you can add attributes such as operating system and power, change the attribute values, and remove attributes associated with the record.

Procedure

1. In the Activities and Tasks application, display the activity record that you want to categorize.
2. Select a classification for the activity in one of the following ways:

Choice	Description
--------	-------------

Choice	Description
Use the Classification field	In the Classification field of the main application tab or on the Activities and Tasks tab, click Detail Menu and then select Classify to produce a classification hierarchy tree that you can drill down through and select a classification.
Use the Class Description field	In the Class Description field of the main application tab or on the Activities and Tasks tab, you can hasten the classification search as follows: <ol style="list-style-type: none"> Click the Select Value icon next to the Class Description field and enter a keyword or a word string, such as <i>Operating System</i> into the Description field of the window. All classification values that contain the keyword or word string are retrieved. Click a value from the resulting list to select the classification.

- Optional: You can view the attributes that are associated with the selected classification in the Attributes table window. You can also add, delete, and change the values of the attributes in the row details.
- Save the activity.
The full classification path appears in the Classification field, where you can view all nodes of the classification.

Setting up work process flows

Work process flows use relationships between work orders and tasks to automate the flow of status changes. You set relationships between work orders and tasks so that when a task is completed, the next task in the flow can be initiated.

Before you begin

To set the process flow for individual tasks, you must select Under Flow Control at the header level for the work order.

About this task

The best practice for consistently using the flow feature is to set up the process flow as a work template at the job plan level.

Procedure

- Open the work order.
 - Select Under Flow Control.
 - On the Plans tab, display the details for the task.
 - In the Scheduling Information section, next to the Predecessors field, click the Detail Menu icon.
 - Select the tasks that must be completed before this task is initiated.
 - Save the work order.
- [Defining flow actions](#)**
A flow action is used in a work process flow to define certain actions that should occur while work is being done. Actions or action groups can be applied to any work order, task, or job plan task.
 - [Removing work process flow from work orders or job plans](#)**
You can remove work process flow for a work order, a job plan, or task records that have it defined. You can do this at the header level, which will remove it for all the associated tasks as well, or you can remove it at the task level.
 - [Suspending work process flows](#)**
You can suspend the work process flow for work order or task records that have it defined. For example, if you want to start a work order or task manually, you could suspend the flow control on that record. The flow remains suspended until you remove the suspension.
 - [Stopping workflow processes](#)**
You can stop a workflow process for a record. You use the Workflow Administration application to view and stop workflow processes.

Defining flow actions

A flow action is used in a work process flow to define certain actions that should occur while work is being done. Actions or action groups can be applied to any work order, task, or job plan task.

About this task

You can determine whether the action takes place automatically, or if the action only takes place when it is initiated manually. When automatic, the action takes place as soon as the work order or task status is changed to an in progress (INPRG) status value by work process flow. When manual, you must initiate the flow action by running the automation or processing scripts or placing an action button on the target application. Actions and action groups are defined in the Actions application.

Procedure

- In an application that supports flow action, display the record for which you want to define a flow action.
- Perform one of the following actions:
 - For a work order, change, release, or job plan record, enter a value in the Flow Action field on the application tab.
 - For a work order or job plan task, enter a value in the Flow Action field in the Task table window. The Tasks table window is found on the main tab of the Job Plans application, or the Plans tab of the Work Order Tracking, Changes, and Releases applications.

The defined action runs when the work order or task status value is changed to INPRG.

- Specify whether you want the flow action to be automatically run:

Option	Flow Action Assist
Automatically run the flow action	Cleared
Manually run the flow action	Selected

- Click Save record.

Removing work process flow from work orders or job plans

You can remove work process flow for a work order, a job plan, or task records that have it defined. You can do this at the header level, which will remove it for all the associated tasks as well, or you can remove it at the task level.

About this task

If work process flow is removed at the header level, it will automatically be removed on individual tasks on the record. You cannot retain work process flow for a task that does not have it set at the header level.

Procedure

- In an application that supports flow action, display the record that you want to remove from work process flow.
- On the main application tab, clear the Flow Controlled check box. The system removes the work order or the job plan, and all of its tasks from work process flow.
- Click Save Record.

Suspending work process flows

You can suspend the work process flow for work order or task records that have it defined. For example, if you want to start a work order or task manually, you could suspend the flow control on that record. The flow remains suspended until you remove the suspension.

Before you begin

Removing the suspension restarts the flow. Any successor work orders or tasks with completed predecessors continue the process. Work orders and tasks without predecessors continue the process at the same time as the parent record. The last completed child under a parent rolls its completion up to the parent.

Procedure

- In an application that supports flow action, display the record on which you want to suspend flow control.
- On the main application tab, at the header level, select the Suspend Flow Control check box. The system suspends the work process flow on the work order and on all of its tasks.
- To retain flow control for individual tasks, display the tasks in the Tasks table window, and clear the Suspend Flow Control check box at the task level. Flow control remains in place at the task level. This action does not affect the suspension at the work order header level. You can find the Tasks table window on the Plans tab.
- Click Save Record.

Example

You generally suspend a set of tasks, often under the same parent. For example, you can delay the automatic starting of one whole phase of work until a certain condition has been met. You can also delay starting a phase of work to make changes to the tasks, such as inserting tasks, deleting tasks, and changing the precedence logic.

Changing the status of activities or tasks

You can change the status of an activity to indicate the position of the activity as it moves toward completion.

Procedure

- In the Service Requests, in the Problems, or in Incidents application that corresponds to the type of record you are managing, display the record whose status you want to change.
- Select the Change Status action.
- In the New Status field, choose a status from the pull-down menu.
- Click OK to change the status.

What to do next

If you change a ticket to a RESOLVED status, and you are the designated owner of that ticket, you might want to stop the timer or otherwise report the time that you spent resolving the issue.

Contracts module

You use the applications in the Contracts module to manage contracts for labor rates, purchases, leases, warranties, and software. You can create different types of contracts and define the rules that govern each type of contract.

You can adjust prices and payment schedules, associate service level agreements with contracts, and view the history of contracts and contract revisions. You also can create master contracts to associate multiple contracts for the same vendor. When you create a contract, you specify the properties, and terms and conditions of the contract, and you specify the assets, people, or licenses associated with it.

The default installation contains the following types of contracts:

Blanket (volume) contract

An agreement that specifies a vendor, a total dollar amount, and valid dates for the agreement. Typically, a blanket contract is used to purchase services and/or materials at agreed upon prices and terms. You can create release purchase orders in the Purchase Orders application that reference the blanket contract. Blanket contracts are created in the Purchase Contracts application.

Labor contract

A way to define the rates that will be paid for craft and skill combinations, and also rates to be paid to specific contract laborers. You can set up a labor rate contract to create invoices for all approved labor transactions within a specified time period, such as every month. Labor contracts are created in the Labor Rate Contracts application.

Lease contract

An agreement to lease one or more assets from a vendor. Lease contracts specify lease period, payment schedules, and other conditions of the contract. Invoices can be generated based on the payment schedule intervals. This type of agreement may involve more than two parties, as one vendor may sell the assets and another may hold the lease. Lease contracts are created in the Lease/Rental Contracts application.

Pricing contract

A price agreement contract specifies the prices to be paid for specific items purchased from a specific vendor. Typically, a price agreement is used to purchase services and/or materials at agreed upon prices and terms. Pricing contracts are created in the Purchase Contracts application.

Purchase contract

Specifies the terms and conditions for a purchase. Purchase contracts are created in the Purchase Contracts application.

Rental contract

Similar to a lease contract. Rental contracts specify the time period for the rental, payment schedules, and other conditions of the contract. Unlike a lease, a rental contract can be terminated at will, and does not include a buy-out option in the terms of the contract. Rental contracts are created in the Lease/Rental Contracts application.

Service contract

Similar to a warranty, except that some of the items are billed on a per-incident basis. A service contract contain the details of the services to be provided, and if a payment schedule is associated with the contract. Service contracts are created in the Warranty Contracts application.

Master contract

A way to associate many contract types together for the same vendor and define terms and conditions for the relationship with the vendor. A master contract lists all contracts that you have with a particular vendor. For example, a master contract might list rental contracts for tools or equipment, purchase contracts for materials, a labor rate contract, and a warranty on parts and labor. Master contracts are created in the Master Contracts application.

Warranty contract

Created in conjunction with the purchase of an asset and generally has no costs associated with it. This contract contains the details of what is covered by the warranty. If a warranty contract is purchased, this is considered an extended warranty. Warranty contracts are created in the Warranty Contracts application.

Software contract

An agreement in which you can specify the items or services provided, costs, shipping and handling, expected delivery times, financial terms, and vendor information for the software licenses that you have purchased.

Your system administrator can define an unlimited number of contract types using the Organizations application.

- [Purchase Contracts](#)
You use the Purchase Contracts application to maintain purchase contracts with outside vendors. On the contract, you can specify items or services provided and their costs, shipping and handling, expected delivery times, financial terms, and vendor information.
- [Lease/Rental Contracts](#)
You use the Lease/Rental Contracts application to define the overall terms and conditions of an agreement between a vendor and a customer that pertains to rotating assets. A rotating asset is an asset that is interchangeable, such as a motor, pump, or laptop computer.
- [Labor Rate Contracts](#)
You use the Labor Rate Contracts application to specify labor rates for crafts, skills, and, labor. You also can manage outside labor and their rates.
- [Master Contracts](#)
You use the Master Contracts application to associate different types of contracts for the same vendor. A master contract defines the vendor relationship that applies to the contracts associated with that vendor.
- [Warranty Contracts](#)
In the Warranty Contracts application, you create warranty contracts. A warranty contract defines the agreement to maintain one or more assets with an outside service provider for a fee or a scheduled set of payments. The contract also tracks warranty information for assets and locations by time or meter.
- [Terms and Conditions](#)
You use the Terms and Conditions application to specify and to maintain a library of terms and conditions. You can add the terms and conditions to a purchasing document or to a contract. Terms can contain information such as liability concerns, shipping and handling details, and delivery time expectations.

Purchase Contracts

You use the Purchase Contracts application to maintain purchase contracts with outside vendors. On the contract, you can specify items or services provided and their costs, shipping and handling, expected delivery times, financial terms, and vendor information.

You can create the following types of purchase contracts:

- **Blanket contract** - A blanket contract is an agreement to spend a predetermined amount with the specified vendor over a period of time.
- **Price contract** - A price contract specifies that items or services purchased from the specified vendor over a period of time are provided at an agreed-upon price.
- **Purchase contract** - A purchase contract is an agreement to purchase items or services at an agreed-upon price with a vendor. To create this type of contract, you must have a purchase order that does not specify a maximum amount.

Before you can approve a purchase contract, you must have at least one authorized site.

- **[Purchase contracts overview](#)**
You can maintain purchase contracts with outside vendors. On the contract, you can specify items or services provided and their costs, shipping and handling, expected delivery times, financial terms, and vendor information.
- **[Creating purchase contracts](#)**
In the Purchase Contracts application, you can maintain purchase contracts with outside vendors. You can create purchase contracts, blanket contracts, and price contracts.

Purchase contracts overview

You can maintain purchase contracts with outside vendors. On the contract, you can specify items or services provided and their costs, shipping and handling, expected delivery times, financial terms, and vendor information.

- **[Blanket contracts](#)**
A blanket (volume) contract is an agreement to spend a predetermined amount with a specified vendor over a period of time. This type of contract can also list items or services that the vendor will provide.
- **[Release costs for blanket contracts](#)**
In the Purchase Contracts application, you can view the release costs associated with a blanket contract. The summary includes all planned and committed costs against a blanket contract.
- **[Price contracts](#)**
A price contract is a type of purchase contract. You use a price contract to specify that items or services purchased from a vendor over a period time are provided at an agreed-upon price.
- **[Associated purchase contracts](#)**
You can use an approved master contract to create associated purchase contracts for the same vendor. The master contract contains vendor information and defines terms and conditions for transactions with the vendor. The associated contract contains the identifier of the master contract and the current revision number, if applicable.
- **[Release purchase orders](#)**
In the Purchase Contracts application, you can create a release purchase order that has all the properties, information, and terms and conditions of an existing contract. The cost of each release purchase order is tracked against the maximum release amount listed on the contract.
- **[Terms and conditions for purchase contracts](#)**
You can associate terms and conditions with a purchase contract. These terms can contain information such as liability concerns, shipping and handling details, or delivery time expectations.
- **[Contract statuses](#)**
Contract records have a status to indicate where the record is in a contract life cycle. Because contract records have statuses, you can create Workflow processes for contracts to manage approvals, expirations, renewals, and so forth. When you create a new contract, the Status field is set to DRAFT.

Blanket contracts

A blanket (volume) contract is an agreement to spend a predetermined amount with a specified vendor over a period of time. This type of contract can also list items or services that the vendor will provide.

Release purchase orders

You can create release purchase orders from blanket contracts and track committed costs for all purchases that you make. You also can create release purchase orders from purchase requisitions for items or catalog services that reference a blanket contract. When you approve a release purchase order, verification is made that sufficient funds remain to cover the total cost of the purchase order.

Commodity groups and codes

You can associate commodity groups and codes with blanket contracts to help categorize expenses. After you make these associations, you can report on contract use by commodity. You also can use commodity groups and codes to route contracts to the contract manager responsible for this commodity.

Release costs for blanket contracts

In the Purchase Contracts application, you can view the release costs associated with a blanket contract. The summary includes all planned and committed costs against a blanket contract.

All costs are displayed in the contract's default currency. The values in the are calculated at the time that they are displayed.

Price contracts

A price contract is a type of purchase contract. You use a price contract to specify that items or services purchased from a vendor over a period time are provided at an agreed-upon price.

The Purchase Contracts application refers to the price contract when you enter items or service items on a request for quotation, purchase requisition, or purchase order line.

Associated purchase contracts

You can use an approved master contract to create associated purchase contracts for the same vendor. The master contract contains vendor information and defines terms and conditions for transactions with the vendor. The associated contract contains the identifier of the master contract and the current revision number, if applicable.

When you create an associated purchase contract from a master contract, the master contract's vendor information, service level agreements, and certain properties are copied to the associated purchase contract. In addition, the start date is copied from the master contract, which you can change to any date that is after the start date, but before the end date of the master contract.

You create the associated purchase contract in the Master Contracts application. You view and change the associated contract in the Purchase Contracts application.

Release purchase orders

In the Purchase Contracts application, you can create a release purchase order that has all the properties, information, and terms and conditions of an existing contract. The cost of each release purchase order is tracked against the maximum release amount listed on the contract.

You use the Create Release PO action to create a release purchase order. The release purchase order is created with the purchase order identifier and description that you specified. You can also indicate default charge values for the lines that you add to the release purchase order.

Blanket contracts

You can create release purchase orders from approved blanket contracts that meet the following conditions:

- The blanket contract's start and end date that include the current date.
- The blanket contract has the create release property selected.

Terms and conditions for purchase contracts

You can associate terms and conditions with a purchase contract. These terms can contain information such as liability concerns, shipping and handling details, or delivery time expectations.

You create and maintain terms and conditions in the Terms and Conditions application. You also can create terms for a specific record. These terms remain with the record and do not become part of the library of information in the Terms and Conditions application.

Contract statuses

Contract records have a status to indicate where the record is in a contract life cycle. Because contract records have statuses, you can create Workflow processes for contracts to manage approvals, expirations, renewals, and so forth. When you create a new contract, the Status field is set to DRAFT.

Contract records can have one the following status values:

Table 1. Contract statuses

Status	Description
APPR	The contract record is approved. From this status, you can change the record status to CAN, CLOSE, SUSPND, EXPIRED.
CAN	The contract record is canceled or terminated. You cannot modify a contract record that has this status value.
CLOSE	The contract record is closed and all its terms and conditions are met. You cannot modify a contract record that has this status value.
DRAFT	The contract is a draft. In this status you can edit everything according to the properties for this type of contract. From this status, you can change the record status to WAPPR, APPR, CLOSE or CAN.
EXPIRED	The contract record is expired. The end date for the contract has passed. You cannot modify a contract record that has this status value. You can change the status from expire to pending revision by revising the expired contract.
PNDREV	The contract is a revised version of an existing contract. This status is similar to the draft status, but you can only edit specified fields.

Status	Description
REVISED	The contract record is revised. A REVISED status value is assigned to a revised contract that you have approved. You cannot modify anything on this contract record or change its status.
SUSPND	The contract record is suspended. You cannot modify anything on the contract except to change its status to APPR, CAN, or CLOSE.
WAPPR	The contract record is waiting for approval. You can modify the record and change the status to DRAFT, APPR, CLOSE or CAN.
WSTART	The contract record is waiting to start. This status value is assigned to the record when its start date is set for the future. You can change the record status value to APPR.

Creating purchase contracts

In the Purchase Contracts application, you can maintain purchase contracts with outside vendors. You can create purchase contracts, blanket contracts, and price contracts.

Procedure

- In the Purchase Contracts application, click New Purchase Contract.
The status of the new contract is set to draft and the start date is set to the current date.
- Specify one of the following types of contracts:

Option	Description
Blanket contract	To create an agreement to spend a predetermined amount with the vendor over a period of time.
Price contract	To create a contract that specifies that items or services purchased from the vendor over a period of time are provided at an agreed-upon price.
Purchase contract	To create an agreement to purchase items or services at an agreed-upon price with a vendor. To create this type of contract, you must have a purchase order without a specified maximum amount.

- Specify the currency value.
- Optional: If you are creating a blanket contract, specify the following values:

Option	Description
Maximum Release Amount	<ul style="list-style-type: none"> To set a spending limit on a blanket contract, specify a maximum amount when you create the blanket contract. To set a spending limit for each release purchase order against the blanket contract, specify a maximum release amount.

When the create release property is selected, you can specify or change information in the Maximum Release Amount field.

- Optional: Provide additional detail and vendor information.

- [Adjusting prices on contracts](#)
You can apply a price adjustment to a contract record to change the prices of its line items. You can raise or lower prices based on a percentage value.
- [Creating payment schedules for purchase contracts](#)
A payment schedule is a series of scheduled payments for contract line items. You create a payment schedule at the line item level that are typically for high-value items.
- [Associating commodities with contracts](#)
You can associate commodity groups and codes to a contract record to add items for a sale or a purchase as part of the contract. Commodity groups and codes help you categorize and manage contracts and their items and products. You can search for contracts by commodity, report spending on a commodity, and track commodities supplied by specified vendors.
- [Associating service level agreements with contracts](#)
A service level agreement is a written agreement between a service provider and its customers that defines the formal commitments. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.
- [Selecting sites for contract authorizations](#)
You can select multiple sites to authorize for a contract. You can perform this action from more than one application.
- [Authorizing sites with contracts](#)
You can authorize one or more sites on a contract so that they are available for use in the authorized sites. You can add sites from other organizations to the contract only when the applicable sites use the same company and item sets. You can also change vendor data when you add sites to a contract. For example, you can authorize a local vendor branch for each site.
- [Changing the status of a list of records](#)
You can change the status of multiple records in applications.

Adjusting prices on contracts

You can apply a price adjustment to a contract record to change the prices of its line items. You can raise or lower prices based on a percentage value.

About this task

In the Labor Rate Contracts application, price adjustments are made to entries for the rate schedule. You can make price adjustments to contracts with a status of draft, waiting for approval, or pending revision.

Procedure

1. In a contract application, display the record that you want to update.
2. Select the Apply Price Adjustment action.
3. Select the line items that you want to update.
4. In the Adjustment field, enter a percentage value.
5. Click Apply.

The asset management system calculates values for the New Price and New Unit Cost fields. In the Labor Rate Contracts application, the asset management system calculates a value for the New Standard Rate field.

6. Click OK.

The asset management system copies the values to the Unit Cost and Line Cost fields in the Contract Lines table window of the contract. In the Labor Rate Contracts application, the asset management system copies the value to the Standard Rate field of the Rate Schedule table window of the contract.

7. Click Save Contract.

Creating payment schedules for purchase contracts

A payment schedule is a series of scheduled payments for contract line items. You create a payment schedule at the line item level that are typically for high-value items.

Before you begin

To create a payment schedule, the payment schedule property must be selected.

About this task

You can create a payment schedule until the contract is approved.

Procedure

1. In the Purchase Contracts application, select the contract that contains the line for which you want to create a payment schedule.
2. Click the Contract Lines tab to display the contract lines.
3. Select the contract line for which you want to create a payment schedule.
4. Click Payment Schedule.
The Payment Schedule window opens.
5. In the Schedule Lines table window, click New Row.
6. Specify the following information:
 - a. Specify an action that causes the payment.
 - b. Optional: If you are not specifying a line cost value, specify this payment's percentage of the total payments.
This value works with the line cost value; and the line cost is calculated if you specify a percentage and vice-versa. The total of all line percentages must add up to 100.
 - c. Optional: If you are not specifying a payment percent value, specify a line cost value.
 - d. Optional: In the Days Interval field, select the amount of time to elapse between the action and the payment.
A zero in this field indicates that the payment is due at the time that the action occurs.
 - e. In the Target Invoice Status field, specify the status in which the invoice is created.
7. Click OK to create the schedule when the item is ordered.

What to do next

After the item is ordered, you can view invoice information for the item in the Invoices table window of the Payment Schedule window.

Associating commodities with contracts

You can associate commodity groups and codes to a contract record to add items for a sale or a purchase as part of the contract. Commodity groups and codes help you categorize and manage contracts and their items and products. You can search for contracts by commodity, report spending on a commodity, and track commodities supplied by specified vendors.

About this task

You can associate or remove any commodities on a contract that has a waiting for approval (WAPPR) or draft (DRAFT) status.

Procedure

1. In a contract application, display the record that you want to update.
2. Select the Associate Commodities action.
3. In the Commodity Groups table window, click Select Commodity Groups.
4. Choose the commodity groups by selecting the corresponding Commodity Group check boxes.
5. Click OK.
The selected commodity groups are added in the Commodity Groups table window.
6. In the Commodity Codes for Commodity Group table window, click Select Commodity Codes.

7. Choose the commodity codes by selecting the corresponding Commodity Codes check boxes.
8. Click OK.
- The selected commodity codes are added in the Commodity Codes for Commodity Group table window.
9. Click OK to close the Associate Commodities window.

Associating service level agreements with contracts

A service level agreement is a written agreement between a service provider and its customers that defines the formal commitments. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.

Procedure

1. In a contract application, display the contract record for which you want to select one or more service level agreements.
2. Select the Associate SLAs action.
3. Click Select SLAs.
4. Select one or more service level agreements to associate with the contract.
5. To select a service level agreement from the same organization that created the contract, select the Select Record check box. You can select more than one agreement. To cancel a selection, clear the check box. To select all agreements in the list, select the Select All check box next to the Agreements column.
6. Click OK. The service level agreements are copied to the Associate SLAs window.
7. Click OK.

Selecting sites for contract authorizations

You can select multiple sites to authorize for a contract. You can perform this action from more than one application.

Procedure

1. In a contract application, display the contract record for which you want to select sites.
2. Select the Authorize Sites action.
3. Click Select Sites.
4. Select one or more sites. To select a site, select the Select Record check box next to each site you want to add.
5. Click OK. The selected sites are copied to the Authorize Sites window.
6. Optional: Modify the default Bill To and Attention fields.
7. Click OK.

Authorizing sites with contracts

You can authorize one or more sites on a contract so that they are available for use in the authorized sites. You can add sites from other organizations to the contract only when the applicable sites use the same company and item sets. You can also change vendor data when you add sites to a contract. For example, you can authorize a local vendor branch for each site.

Before you begin

You must choose a vendor for the contract before you can authorize a site.

About this task

You can authorize sites for contracts that have a status value of waiting for approval (WAPPR) or draft (DRAFT). You must assign one default vendor for each site.

If you change the value in the Vendor field after you authorize a site, the asset management system copies the new vendor information to the rows that have a default vendor value. The asset management system also deletes the rows that have no default vendor value.

Procedure

1. In a contract application, display the contract record that you want to update.
2. Select the Authorize Sites action.
3. Perform one of the following actions:

Option	Description
Authorize an individual site	<ol style="list-style-type: none"> a. Click New Row. b. In the Vendor field, enter a value. c. In the Site field, enter a value. d. Select the Default check box to specify whether you want the vendor to be the default vendor. e. Enter values in the Bill To and Attention fields. f. Click OK to authorize the site.

Option	Description
Authorize multiple sites	a. Click Select Sites. b. Select the appropriate sites. c. Click OK. d. Enter values in the Bill To and Attention fields. e. Click OK to authorize the sites.

Changing the status of a list of records

You can change the status of multiple records in applications.

Procedure

1. In the Work Order application, on the List tab of an application, filter the records so that less than 200 records are displayed.
2. Scroll down the bottom of the screen and select the Select Records check box.
The screen refreshes and each row now has a check box.
3. Select the check boxes for the work orders whose status you want to change.
4. Click the Change Status action and enter the information in the dialog box.
5. Click OK to close the Change Status window.

Lease/Rental Contracts

You use the Lease/Rental Contracts application to define the overall terms and conditions of an agreement between a vendor and a customer that pertains to rotating assets. A rotating asset is an asset that is interchangeable, such as a motor, pump, or laptop computer.

Rotating assets have an asset number and an inventory item number. Using both of these numbers, you track the asset as it moves from an operating location to a storeroom and back to an operating location.

After the customer receives the assets, the Lease/Rental Contracts application provides the details of the individual costs per asset. Payment schedule details are generally consolidated and provided on a monthly or quarterly basis. The payment schedule details can include the following information:

- Total payment amount
- Total number of payments
- Lease rate factor
- Period payment amount
- Costs associated with each asset that was delivered during the specified time period

When you receive a new payment schedule, you can create a lease contract under the master agreement, add a payment to an existing lease contract, or create a lease contract under the existing master with one line of payment schedule details.

- [Lease and rental contracts overview](#)
When working with contracts for rotating assets, you can change the contract status, create payment schedules, associate leases and contracts with master contracts, and create terms and conditions.
- [Working with lease and rental contracts](#)
A lease or rental contract defines the terms and conditions of the agreement between the vendor and the customer. You can associate items with contracts, purchase leased assets, return leased assets, adjust prices, and create payment schedules.

Lease and rental contracts overview

When working with contracts for rotating assets, you can change the contract status, create payment schedules, associate leases and contracts with master contracts, and create terms and conditions.

- [Contract statuses](#)
Contract records have a status to indicate where the record is in a contract life cycle. Because contract records have statuses, you can create Workflow processes for contracts to manage approvals, expirations, renewals, and so forth. When you create a new contract, the Status field is set to DRAFT.
- [Payment schedules for lease and rental contracts](#)
A payment schedule for a lease or rental contract is a series of scheduled payments for a leased or rented asset. You can schedule the payments to occur weekly, monthly, or on certain days or dates. When you create a payment schedule for an asset, invoice records are generated.
- [Associated lease and rental contracts](#)
You can use an approved master contract to create associated lease or rental contracts for the same vendor. The master contract contains vendor information and defines terms and conditions for transactions with the vendor. The associated contract contains the identifier of the master contract and the current revision number, if applicable.
- [Terms and conditions for labor rate contracts](#)
You can associate terms and conditions with a labor rate contract. These terms can contain information such as liability concerns, shipping and handling details, or delivery time expectations.
- [Contract revisions](#)
You can revise a contract record to make changes to the contract that has a status value of `APPR` (approved). The Revise Contract action is available to contracts that do not have an existing revision and that has the status value of `APPR` (approved).

Contract statuses

Contract records have a status to indicate where the record is in a contract life cycle. Because contract records have statuses, you can create Workflow processes for contracts to manage approvals, expirations, renewals, and so forth. When you create a new contract, the Status field is set to DRAFT.

Contract records can have one the following status values:

Table 1. Contract statuses

Status	Description
APPR	The contract record is approved. From this status, you can change the record status to CAN, CLOSE, SUSPND, EXPIRED.
CAN	The contract record is canceled or terminated. You cannot modify a contract record that has this status value.
CLOSE	The contract record is closed and all its terms and conditions are met. You cannot modify a contract record that has this status value.
DRAFT	The contract is a draft. In this status you can edit everything according to the properties for this type of contract. From this status, you can change the record status to WAPPR, APPR, CLOSE or CAN.
EXPIRED	The contract record is expired. The end date for the contract has passed. You cannot modify a contract record that has this status value. You can change the status from expire to pending revision by revising the expired contract.
PNDREV	The contract is a revised version of an existing contract. This status is similar to the draft status, but you can only edit specified fields.
REVISED	The contract record is revised. A REVISED status value is assigned to a revised contract that you have approved. You cannot modify anything on this contract record or change its status.
SUSPND	The contract record is suspended. You cannot modify anything on the contract except to change its status to APPR, CAN, or CLOSE.
WAPPR	The contract record is waiting for approval. You can modify the record and change the status to DRAFT, APPR, CLOSE or CAN.
WSTART	The contract record is waiting to start. This status value is assigned to the record when its start date is set for the future. You can change the record status value to APPR.

Payment schedules for lease and rental contracts

A payment schedule for a lease or rental contract is a series of scheduled payments for a leased or rented asset. You can schedule the payments to occur weekly, monthly, or on certain days or dates. When you create a payment schedule for an asset, invoice records are generated.

When you create a lease or rental contract, you specify the vendor header information, terms and conditions, the term, total number of payments, lease rate factor, and payment period, as well as a list of rotating items that are going to be leased or rented from the vendor. This information is used on a payment schedule for assets on the contract. The payment schedule can occur weekly, on certain days, or the first day of every month.

When there is a receipt for an asset that is associated with a lease or rental contract, the contract manager can be notified about the receipt and that a payment schedule should be created for the asset.

Associated lease and rental contracts

You can use an approved master contract to create associated lease or rental contracts for the same vendor. The master contract contains vendor information and defines terms and conditions for transactions with the vendor. The associated contract contains the identifier of the master contract and the current revision number, if applicable.

When you create an associated lease or rental contract from a master contract, the master contract's vendor information, service level agreements, and certain properties are copied to the associated lease or rental contract. In addition, the start date is copied from the master contract, which you can change to any date that is after the start date, but before the end date of the master contract.

You create the associated labor rate contract in the Master Contracts application. You view and change the associated contract in the Lease/Rental Contracts application.

Terms and conditions for labor rate contracts

You can associate terms and conditions with a labor rate contract. These terms can contain information such as liability concerns, shipping and handling details, or delivery time expectations.

You create and maintain terms and conditions in the Terms and Conditions application. You also can create terms for a specific record. These terms remain with the record and do not become part of the library of information in the Terms and Conditions application.

Contract revisions

You can revise a contract record to make changes to the contract that has a status value of APPR (approved). The Revise Contract action is available to contracts that do not have an existing revision and that has the status value of APPR (approved).

When you revise a contract, all the information from the original contract is duplicated. The information that is duplicated includes contract lines, terms and conditions, associated service level agreements, commodities, authorized sites, and the contract number.

The status value of a revised contract record is `PNDREV` (pending revision). When you update the revised contract record, you can change its status from `PNDREV` to `WAPPR` (waiting on approval) or `APPR`. If you change the revised contract record status to `APPR`, the status value of the predecessor record changes to `REVISD` (revised). A contract record with the status of `REVISD` cannot be edited or reopened.

The Revision field on a contract record specifies the number of times a contract has been revised. When you create a contract record, the revision value is set to zero. Each time you revise a contract, the revision value is set to the next sequential number.

Example of contract revisions

Contract 333, revision 0, requires an extension. The new end date is six months later than the original end date.

Table 1. Original contract

Contract number	Revision number	Status
333	0	APPR

You can use the `Revise Contract` action to create contract 333, revision 1, with status `PNDREV`. The status of contract 333, revision 0 remains `APPR` and revision 0 is available for use.

Table 2. First contract revision

Contract number	Revision number	Status
333	0	APPR
333	1	PNDREV

You can edit the end date in revision 1 and change its status to `APPR`. The status of revision 0 changes to `REVISD` and revision 0 is no longer available for use.

Table 3. Second contract revision

Contract number	Revision number	Status
333	0	REVISD
333	1	APPR

Working with lease and rental contracts

A lease or rental contract defines the terms and conditions of the agreement between the vendor and the customer. You can associate items with contracts, purchase leased assets, return leased assets, adjust prices, and create payment schedules.

- [Creating lease and rental contracts](#)
You create a lease or rental contract to define the overall terms and conditions of an agreement between a vendor and a customer.
- [Revising contracts](#)
You can create a revised version of a contract. You can also create multiple revisions of a contract.
- [Changing the status of a list of records](#)
You can change the status of multiple records in applications.
- [Creating terms](#)
You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.
- [Associating existing terms with records](#)
You can associate terms and conditions with records to define the rules that your company and your vendors must follow on purchase order and contract transactions.
- [Purchasing leased assets](#)
In the Lease/Rental Contracts application, you can purchase one or more leased assets that are associated with your contracts. The asset can be part of a payment stream.
- [Returning leased assets](#)
In the Lease/Rental Contracts application, you can return one or more leased assets that are associated with your contracts.
- [Adjusting prices on contracts](#)
You can apply a price adjustment to a contract record to change the prices of its line items. You can raise or lower prices based on a percentage value.
- [Creating payment schedules for lease and rental contracts](#)
You use payment schedules to create a series of payments to be made on an asset. You can schedule the payments to occur weekly, monthly, or on certain days or dates.
- [Creating interim charges on lease and rental contracts](#)
You can create an interim charge to synchronize an out-of-schedule payment with the contract payment schedule, usually at the beginning of a contract.

Creating lease and rental contracts

You create a lease or rental contract to define the overall terms and conditions of an agreement between a vendor and a customer.

Procedure

1. In the Lease/Rental Contracts application, click `New Lease/Rental Contract`.
A lease/rental contract is created with a draft status and a start date set to the current date.
2. Optional: Change the contract identifier and provide a description for the contract.
3. Specify whether the type of contract is either lease or rental.
4. Optional: Specify contract dates, vendor information, and cost information.

5. Optional: Specify the following information:
 - Click the Properties tab to specify property information.
 - Click the Contract Lines tab to associate rotating items.
 - Click the Terms and Conditions tab to define terms and conditions.

Note: A lease/rental contract must be approved before you can associate assets with it.

6. Save your changes.

- **Authorizing sites with contracts**

You can authorize one or more sites on a contract so that they are available for use in the authorized sites. You can add sites from other organizations to the contract only when the applicable sites use the same company and item sets. You can also change vendor data when you add sites to a contract. For example, you can authorize a local vendor branch for each site.

- **Associating commodities with contracts**

You can associate commodity groups and codes to a contract record to add items for a sale or a purchase as part of the contract. Commodity groups and codes help you categorize and manage contracts and their items and products. You can search for contracts by commodity, report spending on a commodity, and track commodities supplied by specified vendors.

- **Associating service level agreements with contracts**

A service level agreement is a written agreement between a service provider and its customers that defines the formal commitments. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.

- **Adding rotating items to lease or rental contracts**

In the Lease/Rental Contracts application, you can manage your lease and rental contracts by adding rotating items. A rotating item is an interchangeable inventory item, such as a computer.

- **Associating assets with leases and rental contracts**

To manage your leases and rental contracts, you can associate the assets that are used with specific leases and rental contracts.

- **Associating locations with lease and rental contracts**

You can associate more than one location with a lease or rental contract in the Lease/Rental Contracts application.

Authorizing sites with contracts

You can authorize one or more sites on a contract so that they are available for use in the authorized sites. You can add sites from other organizations to the contract only when the applicable sites use the same company and item sets. You can also change vendor data when you add sites to a contract. For example, you can authorize a local vendor branch for each site.

Before you begin

You must choose a vendor for the contract before you can authorize a site.

About this task

You can authorize sites for contracts that have a status value of waiting for approval (WAPPR) or draft (DRAFT). You must assign one default vendor for each site.

If you change the value in the Vendor field after you authorize a site, the asset management system copies the new vendor information to the rows that have a default vendor value. The asset management system also deletes the rows that have no default vendor value.

Procedure

1. In a contract application, display the contract record that you want to update.
2. Select the Authorize Sites action.
3. Perform one of the following actions:

Option	Description
Authorize an individual site	<ol style="list-style-type: none"> a. Click New Row. b. In the Vendor field, enter a value. c. In the Site field, enter a value. d. Select the Default check box to specify whether you want the vendor to be the default vendor. e. Enter values in the Bill To and Attention fields. f. Click OK to authorize the site.
Authorize multiple sites	<ol style="list-style-type: none"> a. Click Select Sites. b. Select the appropriate sites. c. Click OK. d. Enter values in the Bill To and Attention fields. e. Click OK to authorize the sites.

Associating commodities with contracts

You can associate commodity groups and codes to a contract record to add items for a sale or a purchase as part of the contract. Commodity groups and codes help you categorize and manage contracts and their items and products. You can search for contracts by commodity, report spending on a commodity, and track commodities supplied by specified vendors.

About this task

You can associate or remove any commodities on a contract that has a waiting for approval (WAPPR) or draft (DRAFT) status.

Procedure

1. In a contract application, display the record that you want to update.
2. Select the Associate Commodities action.
3. In the Commodity Groups table window, click Select Commodity Groups.
4. Choose the commodity groups by selecting the corresponding Commodity Group check boxes.
5. Click OK.
The selected commodity groups are added in the Commodity Groups table window.
6. In the Commodity Codes for Commodity Group table window, click Select Commodity Codes.
7. Choose the commodity codes by selecting the corresponding Commodity Codes check boxes.
8. Click OK.
The selected commodity codes are added in the Commodity Codes for Commodity Group table window.
9. Click OK to close the Associate Commodities window.

Associating service level agreements with contracts

A service level agreement is a written agreement between a service provider and its customers that defines the formal commitments. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.

Procedure

1. In a contract application, display the contract record for which you want to select one or more service level agreements.
2. Select the Associate SLAs action.
3. Click Select SLAs.
4. Select one or more service level agreements to associate with the contract.
5. To select a service level agreement from the same organization that created the contract, select the Select Record check box. You can select more than one agreement. To cancel a selection, clear the check box. To select all agreements in the list, select the Select All check box next to the Agreements column.
6. Click OK. The service level agreements are copied to the Associate SLAs window.
7. Click OK.

Adding rotating items to lease or rental contracts

In the Lease/Rental Contracts application, you can manage your lease and rental contracts by adding rotating items. A rotating item is an interchangeable inventory item, such as a computer.

Before you begin

To add rotating items, the status of the contract must be approved.

About this task

You can only add a rotating item once. When you reserve rotating items on a purchase order, the serialized assets are associated with the lease or rental contract on receipt.

Procedure

1. In the Lease/Rental Contracts application, select the contract to which you want to add rotating items.
2. Click the Contract Lines tab.
3. Specify the item using one of these options:
 - Click New Row and specify a value in the Item field.
 - Click Vendor Items to choose from a list of items from the specified vendor.
4. Optional: Specify values for line cost, lease end, commodity group, and commodity coe.
5. Specify a value for order unit.
6. Optional: Specify values for manufacturer, catalog number, model, and delivery time.
7. Optional: Specify whether an inspection is required.
8. Save your changes.

Associating assets with leases and rental contracts

To manage your leases and rental contracts, you can associate the assets that are used with specific leases and rental contracts.

Before you begin

To associate assets with a lease or rental contract, the lease or contract must be approved.

Procedure

1. In the Lease/Rental Contracts application, select the appropriate contract.
2. Click the Associated Assets tab.
3. Click Select More Assets.
4. In the Select Assets dialog box, select the assets that you want to associate.
5. Click OK.
6. Save your changes.

Associating locations with lease and rental contracts

You can associate more than one location with a lease or rental contract in the Lease/Rental Contracts application.

Before you begin

To associate locations with a contract, the contract must be in an approved status.

Procedure

1. In the Lease/Rental Contracts application, select the contract with which you want to associate a location.
2. Select the Associated Assets tab.
3. Click Select Locations.
4. In the Select Locations dialog box, select the locations that you want to associate with this contract

What to do next

When you associate a location with a lease or rental contract, the application automatically sets dates for that line in the Associated Assets table. The start date is the current date, but you can modify it to a future date. The end date is calculated by adding the term of the contract in months to the start date.

Revising contracts

You can create a revised version of a contract. You can also create multiple revisions of a contract.

Before you begin

A contract must have an Approved (APPR) status before you can revise it.

About this task

The Revision field of the contract indicates the number of times a contract has been revised. When you insert a contract record, the revision number is zero. As you make revisions to the contract, the next consecutive number is inserted in the Revision field. This option is available in more than one application.

Procedure

1. In a contract application, display the contract you want to revise.
2. Select the Revise Contract action.
3. Type a description.
4. Optional: Fill in additional fields as needed. An asterisk (*) indicates a required field.
5. Click OK. A new version of the contract with a status of pending revision (PNDREV) is created. Note that the original version of the contract remains in the APPR (Approved) status and is still valid while you are completing the revision.
6. Make the required changes to the revised version of the contract.
7. Change the status of the revised contract to APPR (Approved) to make it active. This action also changes the status of the originating contract to REVISED.
8. Click Save Contract.

Changing the status of a list of records

You can change the status of multiple records in applications.

Procedure

1. In the Work Order application, on the List tab of an application, filter the records so that less than 200 records are displayed.
2. Scroll down the bottom of the screen and select the Select Records check box.
The screen refreshes and each row now has a check box.
3. Select the check boxes for the work orders whose status you want to change.
4. Click the Change Status action and enter the information in the dialog box.
5. Click OK to close the Change Status window.

Creating terms

You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.

Before you begin

Terms and conditions can only be added to purchasing or contracts records set at statuses in progress or waiting on approval.

Procedure

1. In a purchasing or contract application, display the record for which you want to create a term.
2. On the Terms and Conditions tab, click New Row.
3. Specify the sequence and term.
4. Optional: Select the Send to Vendor check box.
5. Save the record.

What to do next

You can set default term and condition values according to site and contract type in the Organizations application. When you create a contract record in a contracts application, the contract inherits the default term and condition values that you assigned to the selected contract type in the Organizations application.

Associating existing terms with records

You can associate terms and conditions with records to define the rules that your company and your vendors must follow on purchase order and contract transactions.

About this task

The Terms and Conditions application maintains a library of terms and conditions with which you and your vendors must comply. You can select terms from this library to apply to contract and purchasing records.

Procedure

1. In a purchasing or contract application, display the record for which you want to select a term.
2. On the Terms and Conditions tab, click Select Terms.
3. Select the Select Record check box next to each term that you want to associate with the record.
4. Click OK.
5. Optional: Select the term in the Terms and Conditions table window and select the Send to Vendor check box.
6. Save the record.

Purchasing leased assets

In the Lease/Rental Contracts application, you can purchase one or more leased assets that are associated with your contracts. The asset can be part of a payment stream.

Before you begin

To purchase the asset, the status of the lease contract must be approved.

Procedure

1. In the Lease/Rental Contracts application, select the contract whose asset you want to purchase.
2. Select the End Lease > Purchase Asset action.

3. In the Purchase Assets dialog box, select PO or Invoice to specify the type of document to generate for final payment.
4. In the Target Status field, specify the status to apply to the generated purchase order or invoice.
5. To specify a purchase order number or invoice number, select one of the following options:
 - To manually assign a purchase order number or invoice number, specify the number in the Number field.
 - To generate a purchase order number or invoice number, click Autonumber.
6. Click Select Assets.
7. In the Select Assets dialog box, select the assets to purchase and click OK.
8. Click OK.
9. Save your changes.

Returning leased assets

In the Lease/Rental Contracts application, you can return one or more leased assets that are associated with your contracts.

Before you begin

To return the asset, the status of the lease contract must be approved.

Procedure

1. In the Lease/Rental Contracts application, select the contract whose asset you want to return.
2. Select the End Lease > Return Asset action.
3. In the Return Assets dialog box, select one of the following options to specify a purchase order number or invoice number:
 - To manually assign a purchase order number or invoice number, specify the number in the Invoice Number field.
 - To generate a purchase order number or invoice number, click Autonumber.
4. In the Target Status field, select the status to apply to the invoice.
5. Click Select Assets.
6. In the Select Assets dialog box, select the assets to return and click OK.
7. Click OK.
8. Save your changes.

Adjusting prices on contracts

You can apply a price adjustment to a contract record to change the prices of its line items. You can raise or lower prices based on a percentage value.

About this task

In the Labor Rate Contracts application, price adjustments are made to entries for the rate schedule. You can make price adjustments to contracts with a status of draft, waiting for approval, or pending revision.

Procedure

1. In a contract application, display the record that you want to update.
2. Select the Apply Price Adjustment action.
3. Select the line items that you want to update.
4. In the Adjustment field, enter a percentage value.
5. Click Apply.

The asset management system calculates values for the New Price and New Unit Cost fields. In the Labor Rate Contracts application, the asset management system calculates a value for the New Standard Rate field.
6. Click OK.

The asset management system copies the values to the Unit Cost and Line Cost fields in the Contract Lines table window of the contract. In the Labor Rate Contracts application, the asset management system copies the value to the Standard Rate field of the Rate Schedule table window of the contract.
7. Click Save Contract.

Creating payment schedules for lease and rental contracts

You use payment schedules to create a series of payments to be made on an asset. You can schedule the payments to occur weekly, monthly, or on certain days or dates.

Before you begin

The contract must be approved before you can create a payment schedule.

About this task

The payment schedule option must be selected on the Properties tab.

Procedure

1. In the Lease/Rental contracts application, select the contract for which you want to generate a payment schedule.
2. Select the Manage Payments action.
The Payment Schedule dialog box opens.
3. On the Payments tab in the Schedule table window, click New Row.
4. Specify values for the target invoice status, the start date, and the general ledger debit account.
5. Optional: Specify additional schedule information.
6. In the Schedule Lines table window, click Select Assets.
7. Specify values for general debit account, periodic payment, and line cost.
8. Click Generate Payments to generate scheduled invoices with specified due dates for all assets listed.
9. Click OK.
10. Save your changes.

- [Revising payment schedules for leases and rental contracts](#)

A payment schedule is a series of payments to be made on a leased or rented asset on a schedule basis, such as weekly, monthly, or on certain days or dates. To reflect your changing business needs, you can revise a payment schedule for leased or rented assets.

Revising payment schedules for leases and rental contracts

A payment schedule is a series of payments to be made on a leased or rented asset on a schedule basis, such as weekly, monthly, or on certain days or dates. To reflect your changing business needs, you can revise a payment schedule for leased or rented assets.

Before you begin

To revise payment schedules, the status of the lease contract must be approved.

About this task

When you generate scheduled invoices for the revised schedule, the system date is used as the start date.

Procedure

1. In the Lease/Rental Contracts application, select the contract whose payment schedule you want to revise.
2. Select the Manage Payments action.
3. On the Payment tab in the Payment Schedule dialog box, select the schedule and revision that you want to revise.
4. Click Revise Schedule.
When you revise a schedule, the remaining scheduled invoices are canceled.
5. Click OK.
6. Update fields as necessary.
7. Click Generate Payments.
8. Click OK.
9. Save your changes.

Creating interim charges on lease and rental contracts

You can create an interim charge to synchronize an out-of-schedule payment with the contract payment schedule, usually at the beginning of a contract.

Before you begin

Before you can create an interim charge on a lease or rental contract, the contract must be approved.

Procedure

1. In the Lease/Rental Contracts application, select the contract for which you want to create an interim charge.
2. Select the Manage Payments action.
3. In the Payment Schedule dialog box, click New Row.
4. In the Interim Charge field, specify the amount that is due in this payment cycle to synchronize the payment schedule.
5. Click Generate Payments.
The payments, including the interim charge, are generated.
6. Save your changes.

Example

You leased or rented a car on the 10th day of the payment cycle and, therefore, you would not owe anything from the beginning of the payment cycle to the 10th day of the payment cycle. You are only responsible for payment from the 11th day until the end of the payment cycle. After making the interim charge payment, you are synchronized with the payment schedule.

Labor Rate Contracts

You use the Labor Rate Contracts application to specify labor rates for crafts, skills, and, labor. You also can manage outside labor and their rates.

When you create a labor rate contract, a unique contract number is generated. You can append this number to differentiate the contract from other contracts. For example, if you have multiple sites and want to track contracts associated with them individually, you can append contract numbers from a site with an indicator such as a building number or site name.

When you reference craft records or skill records on a labor rate contract, you reference records that were created and maintained in the Crafts application, but you can apply individual rates in a labor rate contract. You also can associate individual labor records with a labor rate contract.

- [Labor rate contacts overview](#)
You can create associated labor rate contracts for the same vendor, set contract statuses, and select terms and conditions for labor rate contracts.
- [Working with labor rate contracts](#)
You can create labor rate contracts, create labor rate schedules, and create payment schedules for leased and rented assets. You can also associate labor and crafts with labor rate contracts, and can create terms.

Labor rate contacts overview

You can create associated labor rate contracts for the same vendor, set contract statuses, and select terms and conditions for labor rate contracts.

- [Associated labor rate contracts](#)
You can use an approved master contract to create associated labor rate contracts for the same vendor. The master contract contains vendor information and defines terms and conditions for transactions with the vendor. The associated contract contains the identifier of the master contract and the current revision number, if applicable.
- [Contract statuses](#)
Contract records have a status to indicate where the record is in a contract life cycle. Because contract records have statuses, you can create Workflow processes for contracts to manage approvals, expirations, renewals, and so forth. When you create a new contract, the Status field is set to DRAFT.
- [Terms and conditions for labor rate contracts](#)
You can associate terms and conditions with a labor rate contract. These terms can contain information such as liability concerns, shipping and handling details, or delivery time expectations.

Associated labor rate contracts

You can use an approved master contract to create associated labor rate contracts for the same vendor. The master contract contains vendor information and defines terms and conditions for transactions with the vendor. The associated contract contains the identifier of the master contract and the current revision number, if applicable.

When you create an associated labor rate contract from a master contract, the master contract's vendor information, service level agreements, and certain properties are copied to the associated labor rate contract. In addition, the start date is copied from the master contract, which you can change to any date that is after the start date, but before the end date of the master contract.

You create the associated labor rate contract in the Master Contracts application. You view and change the associated contract in the Labor Rate Contracts application.

Contract statuses

Contract records have a status to indicate where the record is in a contract life cycle. Because contract records have statuses, you can create Workflow processes for contracts to manage approvals, expirations, renewals, and so forth. When you create a new contract, the Status field is set to DRAFT.

Contract records can have one the following status values:

Table 1. Contract statuses

Status	Description
APPR	The contract record is approved. From this status, you can change the record status to CAN, CLOSE, SUSPND, EXPIRED.
CAN	The contract record is canceled or terminated. You cannot modify a contract record that has this status value.
CLOSE	The contract record is closed and all its terms and conditions are met. You cannot modify a contract record that has this status value.
DRAFT	The contract is a draft. In this status you can edit everything according to the properties for this type of contract. From this status, you can change the record status to WAPPR, APPR, CLOSE or CAN.
EXPIRED	The contract record is expired. The end date for the contract has passed. You cannot modify a contract record that has this status value. You can change the status from expire to pending revision by revising the expired contract.
PNDREV	The contract is a revised version of an existing contract. This status is similar to the draft status, but you can only edit specified fields.

Status	Description
REVISED	The contract record is revised. A REVISED status value is assigned to a revised contract that you have approved. You cannot modify anything on this contract record or change its status.
SUSPND	The contract record is suspended. You cannot modify anything on the contract except to change its status to APPR, CAN, or CLOSE.
WAPPR	The contract record is waiting for approval. You can modify the record and change the status to DRAFT, APPR, CLOSE or CAN.
WSTART	The contract record is waiting to start. This status value is assigned to the record when its start date is set for the future. You can change the record status value to APPR.

Terms and conditions for labor rate contracts

You can associate terms and conditions with a labor rate contract. These terms can contain information such as liability concerns, shipping and handling details, or delivery time expectations.

You create and maintain terms and conditions in the Terms and Conditions application. You also can create terms for a specific record. These terms remain with the record and do not become part of the library of information in the Terms and Conditions application.

Working with labor rate contracts

You can create labor rate contracts, create labor rate schedules, and create payment schedules for leased and rented assets. You can also associate labor and crafts with labor rate contracts, and can create terms.

- [Creating labor rate contracts](#)
When you create a labor rate contract, you can specify labor rates for crafts, skills, and, labor. You also can manage outside labor and their rates.
- [Creating labor rate schedules](#)
In the Labor Rate Contracts application, you create labor rate schedules to manage the crafts and skills of the people in a vendor contract. You also retain the information associated with a labor rate contract, and reference the rates when specific crafts, skills, or individual laborers are planned for work.
- [Creating payment schedules for leased and rented assets](#)
A payment schedule is a series of scheduled payments to be made on a leased or rented asset. You can schedule payments to occur weekly, monthly, or on certain days or dates.
- [Associating labor with labor rate contracts](#)
To manage labor that you use in your organization, you can associate labor with labor rate contracts.
- [Creating terms](#)
You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.
- [Applying service level agreements to records](#)
You can apply a service level agreement (SLA) to a record to define the agreement and formal commitments between a service provider and a customer. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.
- [Adjusting prices on contracts](#)
You can apply a price adjustment to a contract record to change the prices of its line items. You can raise or lower prices based on a percentage value.
- [Revising contracts](#)
You can create a revised version of a contract. You can also create multiple revisions of a contract.

Creating labor rate contracts

When you create a labor rate contract, you can specify labor rates for crafts, skills, and, labor. You also can manage outside labor and their rates.

Procedure

1. In the Labor Rate Contracts application, click New Labor Rate Contract.
A unique contract number is generated, the status is set to draft, and the date is set to the current date.
2. Optional: Provide a description for the labor rate contract.
3. Provide additional information for the labor rate contract.
4. Save the contract.

What to do next

You can append the contract number to differentiate the contract from other contracts. For example, if you want to individually track contracts that are associated with multiple sites, you append contract numbers from a site with an indicator, such as a building number or site name.

Creating labor rate schedules

In the Labor Rate Contracts application, you create labor rate schedules to manage the crafts and skills of the people in a vendor contract. You also retain the information associated with a labor rate contract, and reference the rates when specific crafts, skills, or individual laborers are planned for work.

About this task

You manage craft records and skill records in the Crafts application.

Procedure

1. In the Labor Rate Contracts application, select the contract for which you want to create a labor rate schedule.
2. Click the Rate Schedule tab.
3. To create a labor rate schedule, complete one of these steps:
 - Click Select Crafts to specify a value for the craft.
 - Click New Row to add a craft.
4. Specify the standard pay rate for the craft and skill.
5. Save your changes.

Creating payment schedules for leased and rented assets

A payment schedule is a series of scheduled payments to be made on a leased or rented asset. You can schedule payments to occur weekly, monthly, or on certain days or dates.

Before you begin

To create a payment schedule for a contract, the contract must be approved. Before you can approve the contract, you must specify the lease rate factor, term in months, payment period, and number of payments on the Contract tab in the Lease/Rental Contracts application. In addition, you must select the Payment Schedule check box on the Properties tab.

Procedure

1. In the Lease/Rental Contracts application, select the contract for which you want to create a payment schedule.
 2. Select the Manage Payments action.
 3. In the Payment Schedule dialog box, click New Row.
 4. Specify or change the values for target invoice status, start date, and the general ledger debit account.
 5. Click Select Assets.
 6. Select the assets for the payment schedule.
Periodic payment for each asset that you selected are generated. In addition, you can change the following information for each asset: general ledger debit account, periodic payment, line cost, and tax code.
 7. Click Generate Payments to generate scheduled invoices with specified due dates for all assets listed.
 8. On the Payment Details tab, review the scheduled invoices.
- [Viewing payment schedules for leases and rental contracts](#)
To manage your payment schedules, you can view payment details associated with a leases or rental contracts.

Viewing payment schedules for leases and rental contracts

To manage your payment schedules, you can view payment details associated with a leases or rental contracts.

Procedure

1. In the Lease/Rental Contracts application, select the contract for which you want to view a payment schedule.
2. Select the Manage Payments action.
3. Click the Payment Details tab.

Associating labor with labor rate contracts

To manage labor that you use in your organization, you can associate labor with labor rate contracts.

About this task

To associate labor with a labor rate contract, the contract must have a status of approved. You can select only craft and skill combinations that are defined on the rate schedule.

Procedure

1. In the Labor Rate Contracts application, select the contract for which you want to associate labor.
2. Click the Associated Labor tab.

3. Click Select Labor.
4. Select the labor that you want to associate with the contract.
You can select more than one labor.
5. Click OK.
6. Save your changes.

What to do next

After you associate labor with the contract, you can specify crafts and skill levels.

- [Associating crafts with labor rate contracts](#)
You can associate crafts and their skill levels with labor rate contracts.

Associating crafts with labor rate contracts

You can associate crafts and their skill levels with labor rate contracts.

About this task

You can associate crafts with labor rate contracts that are in a status of draft, pending revision, or waiting for approval.

Procedure

1. In the Labor Rate Contracts application, select the contract for which you want to associate a craft.
2. Click the Rate Schedule tab.
3. In the Rate Schedule table window, click Select Crafts.
4. Select the crafts that you want associated with the contract.
You can select more than one craft.
5. Click OK.
6. Save your changes.

Creating terms

You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.

Before you begin

Terms and conditions can only be added to purchasing or contracts records set at statuses in progress or waiting on approval.

Procedure

1. In a purchasing or contract application, display the record for which you want to create a term.
2. On the Terms and Conditions tab, click New Row.
3. Specify the sequence and term.
4. Optional: Select the Send to Vendor check box.
5. Save the record.

What to do next

You can set default term and condition values according to site and contract type in the Organizations application. When you create a contract record in a contracts application, the contract inherits the default term and condition values that you assigned to the selected contract type in the Organizations application.

Applying service level agreements to records

You can apply a service level agreement (SLA) to a record to define the agreement and formal commitments between a service provider and a customer. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.

About this task

When you apply an service level agreement to work orders, the SLA is applied only to the work order, not to its tasks. If you want to apply a service level agreement to a task, you must display the task as the current record and then apply the SLA.

You can apply service level agreements to tickets and work orders.

Procedure

1. Open an application and display the record that you want to update.
2. Select the Apply SLA action.
3. Click OK.

Results

The SLA Applied check box on the main tab of the selected application is selected. The target start, target finish, and contact values are calculated for the selected record.

Adjusting prices on contracts

You can apply a price adjustment to a contract record to change the prices of its line items. You can raise or lower prices based on a percentage value.

About this task

In the Labor Rate Contracts application, price adjustments are made to entries for the rate schedule. You can make price adjustments to contracts with a status of draft, waiting for approval, or pending revision.

Procedure

1. In a contract application, display the record that you want to update.
2. Select the Apply Price Adjustment action.
3. Select the line items that you want to update.
4. In the Adjustment field, enter a percentage value.
5. Click Apply.
The asset management system calculates values for the New Price and New Unit Cost fields. In the Labor Rate Contracts application, the asset management system calculates a value for the New Standard Rate field.
6. Click OK.
The asset management system copies the values to the Unit Cost and Line Cost fields in the Contract Lines table window of the contract. In the Labor Rate Contracts application, the asset management system copies the value to the Standard Rate field of the Rate Schedule table window of the contract.
7. Click Save Contract.

Revising contracts

You can create a revised version of a contract. You can also create multiple revisions of a contract.

Before you begin

A contract must have an Approved (APPR) status before you can revise it.

About this task

The Revision field of the contract indicates the number of times a contract has been revised. When you insert a contract record, the revision number is zero. As you make revisions to the contract, the next consecutive number is inserted in the Revision field. This option is available in more than one application.

Procedure

1. In a contract application, display the contract you want to revise.
2. Select the Revise Contract action.
3. Type a description.
4. Optional: Fill in additional fields as needed. An asterisk (*) indicates a required field.
5. Click OK. A new version of the contract with a status of pending revision (PNDREV) is created. Note that the original version of the contract remains in the APPR (Approved) status and is still valid while you are completing the revision.
6. Make the required changes to the revised version of the contract.
7. Change the status of the revised contract to APPR (Approved) to make it active. This action also changes the status of the originating contract to REVISED.
8. Click Save Contract.

Master Contracts

You use the Master Contracts application to associate different types of contracts for the same vendor. A master contract defines the vendor relationship that applies to the contracts associated with that vendor.

In the Master Contracts application, you can manage vendor contracts, list properties that are associated with the contract, list the children contracts that are linked or associated to a master contract, and associate terms and conditions with a contract.

Master contracts can have one or more associated contracts and can contain multiples of a particular type of contract.

- [Master contracts overview](#)
You can change the status of a master contract, associate terms and conditions for a master contract, associate contracts with a master contract, and create copies of a master contract.
- [Working with master contracts](#)
You can create master contracts, revise contracts, change the statuses of contracts, authorize sites, associate service level agreements, and create terms and conditions.

Master contracts overview

You can change the status of a master contract, associate terms and conditions for a master contract, associate contracts with a master contract, and create copies of a master contract.

- [Contract statuses](#)
Contract records have a status to indicate where the record is in a contract life cycle. Because contract records have statuses, you can create Workflow processes for contracts to manage approvals, expirations, renewals, and so forth. When you create a new contract, the Status field is set to DRAFT.
- [Associated contracts](#)
In the Master Contracts application, you can create associated contracts for an approved master contract. Master contracts can have one or more associated contracts, and can contain several contracts of a particular type.
- [Terms and conditions for master contracts](#)
You can associate terms and conditions with a master contract. These terms can contain information such as liability concerns, shipping and handling details, or delivery time expectations.
- [Copies of master contracts](#)
You can copy an existing master contract, and use the copy as a template for a new master contract.

Contract statuses

Contract records have a status to indicate where the record is in a contract life cycle. Because contract records have statuses, you can create Workflow processes for contracts to manage approvals, expirations, renewals, and so forth. When you create a new contract, the Status field is set to DRAFT.

Contract records can have one the following status values:

Table 1. Contract statuses

Status	Description
APPR	The contract record is approved. From this status, you can change the record status to CAN, CLOSE, SUSPND, EXPIRED.
CAN	The contract record is canceled or terminated. You cannot modify a contract record that has this status value.
CLOSE	The contract record is closed and all its terms and conditions are met. You cannot modify a contract record that has this status value.
DRAFT	The contract is a draft. In this status you can edit everything according to the properties for this type of contract. From this status, you can change the record status to WAPPR, APPR, CLOSE or CAN.
EXPIRED	The contract record is expired. The end date for the contract has passed. You cannot modify a contract record that has this status value. You can change the status from expire to pending revision by revising the expired contract.
PNDREV	The contract is a revised version of an existing contract. This status is similar to the draft status, but you can only edit specified fields.
REVISED	The contract record is revised. A REVISED status value is assigned to a revised contract that you have approved. You cannot modify anything on this contract record or change its status.
SUSPND	The contract record is suspended. You cannot modify anything on the contract except to change its status to APPR, CAN, or CLOSE.
WAPPR	The contract record is waiting for approval. You can modify the record and change the status to DRAFT, APPR, CLOSE or CAN.
WSTART	The contract record is waiting to start. This status value is assigned to the record when its start date is set for the future. You can change the record status value to APPR.

Associated contracts

In the Master Contracts application, you can create associated contracts for an approved master contract. Master contracts can have one or more associated contracts, and can contain several contracts of a particular type.

Terms and conditions are not copied to associated contracts. However, when a purchase order references an associated contract, the terms and conditions from the associated contract and master contract are copied to the purchase order.

In the Warranty Contracts application, you can change the start and end dates, authorized sites, commodities, properties for extendable, extension period, and conditions for extension.

Creating associated contracts

In the Master Contracts application, you use the Create Associated Contract action to create an associated contract. When you create an associated contract, the following information is copied from the master contract:

- Identifier and revision number
- Vendor information
- Associated service level agreements
- Properties for extendable, extension period, conditions for extension
- Start and end dates
- Authorized sites
- Commodities

Viewing associated contracts

In the Master Contracts application, you view associated contracts on the Associated Contracts tab. When you view associated contracts, all contracts that are associated with the master, regardless of the revision of the master contract that you are viewing, are displayed.

Terms and conditions for master contracts

You can associate terms and conditions with a master contract. These terms can contain information such as liability concerns, shipping and handling details, or delivery time expectations.

You create and maintain terms and conditions in the Terms and Conditions application. You also can create terms for a specific record. These terms remain with the record and do not become part of the library of information in the Terms and Conditions application.

Copies of master contracts

You can copy an existing master contract, and use the copy as a template for a new master contract.

When you duplicate a contract, all related information is copied, including authorized sites, commodities, service level agreement information, and terms and conditions.

When you copy a master contract, associated contracts are not copied.

Working with master contracts

You can create master contracts, revise contracts, change the statuses of contracts, authorize sites, associate service level agreements, and create terms and conditions.

- [Creating master contracts](#)
A master contract defines the relationship with a vendor, and contains terms and conditions that apply to associated contracts. You create a master contract in the Master Contracts application.
- [Revising contracts](#)
You can create a revised version of a contract. You can also create multiple revisions of a contract.
- [Changing the status of a list of records](#)
You can change the status of multiple records in applications.
- [Authorizing sites with contracts](#)
You can authorize one or more sites on a contract so that they are available for use in the authorized sites. You can add sites from other organizations to the contract only when the applicable sites use the same company and item sets. You can also change vendor data when you add sites to a contract. For example, you can authorize a local vendor branch for each site.
- [Associating service level agreements with contracts](#)
A service level agreement is a written agreement between a service provider and its customers that defines the formal commitments. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.
- [Creating terms](#)
You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.
- [Associating existing terms with records](#)
You can associate terms and conditions with records to define the rules that your company and your vendors must follow on purchase order and contract transactions.

Creating master contracts

A master contract defines the relationship with a vendor, and contains terms and conditions that apply to associated contracts. You create a master contract in the Master Contracts application.

Procedure

1. In the Master Contracts application, click New Master Contract.
The new contract is displayed with a draft status, a start date set to the current date, and the contract type set to master.
2. Optional: Specify values for the vendor reference number, buyer, start date, end date, renewal date, and total cost.
You can change the total cost until the contract is approved.
3. Specify the currency for the contract.
4. Optional: In the Vendor table window, provide information for the vendor.
5. Save the master contract.

What to do next

When you create a master contract, the contract is given a unique contract number. You can append this number to further differentiate this contract from other contracts. For example, if you have multiple sites and want to track contracts by site, you can append contract numbers from a site with indicators, such as building numbers or site names.

Revising contracts

You can create a revised version of a contract. You can also create multiple revisions of a contract.

Before you begin

A contract must have an Approved (APPR) status before you can revise it.

About this task

The Revision field of the contract indicates the number of times a contract has been revised. When you insert a contract record, the revision number is zero. As you make revisions to the contract, the next consecutive number is inserted in the Revision field. This option is available in more than one application.

Procedure

1. In a contract application, display the contract you want to revise.
2. Select the Revise Contract action.
3. Type a description.
4. Optional: Fill in additional fields as needed. An asterisk (*) indicates a required field.
5. Click OK. A new version of the contract with a status of pending revision (PNDREV) is created. Note that the original version of the contract remains in the APPR (Approved) status and is still valid while you are completing the revision.
6. Make the required changes to the revised version of the contract.
7. Change the status of the revised contract to APPR (Approved) to make it active. This action also changes the status of the originating contract to REVISED.
8. Click Save Contract.

Changing the status of a list of records

You can change the status of multiple records in applications.

Procedure

1. In the Work Order application, on the List tab of an application, filter the records so that less than 200 records are displayed.
2. Scroll down the bottom of the screen and select the Select Records check box.
The screen refreshes and each row now has a check box.
3. Select the check boxes for the work orders whose status you want to change.
4. Click the Change Status action and enter the information in the dialog box.
5. Click OK to close the Change Status window.

Authorizing sites with contracts

You can authorize one or more sites on a contract so that they are available for use in the authorized sites. You can add sites from other organizations to the contract only when the applicable sites use the same company and item sets. You can also change vendor data when you add sites to a contract. For example, you can authorize a local vendor branch for each site.

Before you begin

You must choose a vendor for the contract before you can authorize a site.

About this task

You can authorize sites for contracts that have a status value of waiting for approval (WAPPR) or draft (DRAFT). You must assign one default vendor for each site.

If you change the value in the Vendor field after you authorize a site, the asset management system copies the new vendor information to the rows that have a default vendor value. The asset management system also deletes the rows that have no default vendor value.

Procedure

1. In a contract application, display the contract record that you want to update.
2. Select the Authorize Sites action.
3. Perform one of the following actions:

Option	Description
Authorize an individual site	<ol style="list-style-type: none">a. Click New Row.b. In the Vendor field, enter a value.c. In the Site field, enter a value.d. Select the Default check box to specify whether you want the vendor to be the default vendor.e. Enter values in the Bill To and Attention fields.f. Click OK to authorize the site.
Authorize multiple sites	<ol style="list-style-type: none">a. Click Select Sites.b. Select the appropriate sites.c. Click OK.d. Enter values in the Bill To and Attention fields.e. Click OK to authorize the sites.

Associating service level agreements with contracts

A service level agreement is a written agreement between a service provider and its customers that defines the formal commitments. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.

Procedure

1. In a contract application, display the contract record for which you want to select one or more service level agreements.
2. Select the Associate SLAs action.
3. Click Select SLAs.
4. Select one or more service level agreements to associate with the contract.
5. To select a service level agreement from the same organization that created the contract, select the Select Record check box. You can select more than one agreement. To cancel a selection, clear the check box. To select all agreements in the list, select the Select All check box next to the Agreements column.
6. Click OK. The service level agreements are copied to the Associate SLAs window.
7. Click OK.

Creating terms

You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.

Before you begin

Terms and conditions can only be added to purchasing or contracts records set at statuses in progress or waiting on approval.

Procedure

1. In a purchasing or contract application, display the record for which you want to create a term.
2. On the Terms and Conditions tab, click New Row.
3. Specify the sequence and term.
4. Optional: Select the Send to Vendor check box.
5. Save the record.

What to do next

You can set default term and condition values according to site and contract type in the Organizations application. When you create a contract record in a contracts application, the contract inherits the default term and condition values that you assigned to the selected contract type in the Organizations application.

Associating existing terms with records

You can associate terms and conditions with records to define the rules that your company and your vendors must follow on purchase order and contract transactions.

About this task

The Terms and Conditions application maintains a library of terms and conditions with which you and your vendors must comply. You can select terms from this library to apply to contract and purchasing records.

Procedure

1. In a purchasing or contract application, display the record for which you want to select a term.
2. On the Terms and Conditions tab, click Select Terms.
3. Select the Select Record check box next to each term that you want to associate with the record.
4. Click OK.
5. Optional: Select the term in the Terms and Conditions table window and select the Send to Vendor check box.
6. Save the record.

Warranty Contracts

In the Warranty Contracts application, you create warranty contracts. A warranty contract defines the agreement to maintain one or more assets with an outside service provider for a fee or a scheduled set of payments. The contract also tracks warranty information for assets and locations by time or meter.

Service contracts

You also use a warranty contract to create a service contract. A service contract indicates that an outside service provider maintains one or more assets. Payment for service can be made with a single fee or with a scheduled set of payments.

- [Warranty contracts overview](#)
You can use a warranty contract to create a service contract. A service contract indicates that an outside service provider maintains one or more assets.
- [Managing warranty contracts](#)
You can create and update warranty contracts between your company and a vendor. You can also associate assets and locations with contracts to specify the coverage for each asset or location included in a contract. You can associate terms and conditions with contracts.

Warranty contracts overview

You can use a warranty contract to create a service contract. A service contract indicates that an outside service provider maintains one or more assets.

- [Associated warranty contracts](#)
You can use an approved master contract to create associated warranty contracts for the same vendor. The master contract contains vendor information and defines terms and conditions for transactions with the vendor. The associated contract contains the identifier of the master contract and the current revision number, if applicable.
- [Status of warranty contracts](#)
As your business needs change, you can change the status of warranty contracts to approved, canceled, closed, or waiting on approval. When you create a warranty contract, the status of the contract is set to draft.
- [Terms and conditions for warranty contracts](#)
You can associate terms and conditions with a warranty contract. These terms can contain information such as liability concerns, shipping and handling details, or delivery time expectations.
- [Contract revisions](#)
You can revise a contract record to make changes to the contract that has a status value of `APPR` (approved). The `Revise Contract` action is available to contracts that do not have an existing revision and that has the status value of `APPR` (approved).
- [Contract statuses](#)
Contract records have a status to indicate where the record is in a contract life cycle. Because contract records have statuses, you can create Workflow processes for contracts to manage approvals, expirations, renewals, and so forth. When you create a new contract, the Status field is set to `DRAFT`.

Associated warranty contracts

You can use an approved master contract to create associated warranty contracts for the same vendor. The master contract contains vendor information and defines terms and conditions for transactions with the vendor. The associated contract contains the identifier of the master contract and the current revision number, if applicable.

When you create an associated warranty contract from a master contract, the master contract's vendor information, service level agreements, and certain properties are copied to the associated warranty contract. In addition, the start date is copied from the master contract, which you can change to any date that is after the start date, but before the end date of the master contract.

You create the associated warranty contract in the Master Contracts application. You view and change the associated contract in the Warranty Contracts application.

Status of warranty contracts

As your business needs change, you can change the status of warranty contracts to approved, canceled, closed, or waiting on approval. When you create a warranty contract, the status of the contract is set to draft.

To change the status of a warranty contract, you use the Change Status action. In addition, a workflow process can cause an automatic status change.

To approve a warranty contract, you must specify a vendor, at least one authorized site, and a start date.

Terms and conditions for warranty contracts

You can associate terms and conditions with a warranty contract. These terms can contain information such as liability concerns, shipping and handling details, or delivery time expectations.

You create and maintain terms and conditions in the Terms and Conditions application. You also can create terms for a specific record. These terms remain with the record and do not become part of the library of information in the Terms and Conditions application.

Contract revisions

You can revise a contract record to make changes to the contract that has a status value of `APPR` (approved). The Revise Contract action is available to contracts that do not have an existing revision and that has the status value of `APPR` (approved).

When you revise a contract, all the information from the original contract is duplicated. The information that is duplicated includes contract lines, terms and conditions, associated service level agreements, commodities, authorized sites, and the contract number.

The status value of a revised contract record is `PNDREV` (pending revision). When you update the revised contract record, you can change its status from `PNDREV` to `WAPPR` (waiting on approval) or `APPR`. If you change the revised contract record status to `APPR`, the status value of the predecessor record changes to `REVISD` (revised). A contract record with the status of `REVISD` cannot be edited or reopened.

The Revision field on a contract record specifies the number of times a contract has been revised. When you create a contract record, the revision value is set to zero. Each time you revise a contract, the revision value is set to the next sequential number.

Example of contract revisions

Contract 333, revision 0, requires an extension. The new end date is six months later than the original end date.

Table 1. Original contract

Contract number	Revision number	Status
333	0	APPR

You can use the Revise Contract action to create contract 333, revision 1, with status `PNDREV`. The status of contract 333, revision 0 remains `APPR` and revision 0 is available for use.

Table 2. First contract revision

Contract number	Revision number	Status
333	0	APPR
333	1	PNDREV

You can edit the end date in revision 1 and change its status to `APPR`. The status of revision 0 changes to `REVISD` and revision 0 is no longer available for use.

Table 3. Second contract revision

Contract number	Revision number	Status
333	0	REVISD
333	1	APPR

Contract statuses

Contract records have a status to indicate where the record is in a contract life cycle. Because contract records have statuses, you can create Workflow processes for contracts to manage approvals, expirations, renewals, and so forth. When you create a new contract, the Status field is set to `DRAFT`.

Contract records can have one the following status values:

Table 1. Contract statuses

Status	Description
APPR	The contract record is approved. From this status, you can change the record status to <code>CAN</code> , <code>CLOSE</code> , <code>SUSPND</code> , <code>EXPIRED</code> .
CAN	The contract record is canceled or terminated. You cannot modify a contract record that has this status value.
CLOSE	The contract record is closed and all its terms and conditions are met. You cannot modify a contract record that has this status value.

Status	Description
DRAFT	The contract is a draft. In this status you can edit everything according to the properties for this type of contract. From this status, you can change the record status to WAPPR, APPR, CLOSE or CAN.
EXPIRED	The contract record is expired. The end date for the contract has passed. You cannot modify a contract record that has this status value. You can change the status from expire to pending revision by revising the expired contract.
PNDREV	The contract is a revised version of an existing contract. This status is similar to the draft status, but you can only edit specified fields.
REVISED	The contract record is revised. A REVISED status value is assigned to a revised contract that you have approved. You cannot modify anything on this contract record or change its status.
SUSPND	The contract record is suspended. You cannot modify anything on the contract except to change its status to APPR, CAN, or CLOSE.
WAPPR	The contract record is waiting for approval. You can modify the record and change the status to DRAFT, APPR, CLOSE or CAN.
WSTART	The contract record is waiting to start. This status value is assigned to the record when its start date is set for the future. You can change the record status value to APPR.

Managing warranty contracts

You can create and update warranty contracts between your company and a vendor. You can also associate assets and locations with contracts to specify the coverage for each asset or location included in a contract. You can associate terms and conditions with contracts.

- [Creating warranty contracts](#)
You create warranty contracts to define the agreement to maintain one or more assets with an outside service provider for a fee or a scheduled set of payments.
- [Estimating payments for service warranty contracts](#)
To track payment information, you can estimate the payments for service warranty contracts.
- [Authorizing sites with contracts](#)
You can authorize one or more sites on a contract so that they are available for use in the authorized sites. You can add sites from other organizations to the contract only when the applicable sites use the same company and item sets. You can also change vendor data when you add sites to a contract. For example, you can authorize a local vendor branch for each site.
- [Selecting sites for contract authorizations](#)
You can select multiple sites to authorize for a contract. You can perform this action from more than one application.
- [Associating service level agreements with contracts](#)
A service level agreement is a written agreement between a service provider and its customers that defines the formal commitments. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.
- [Revising contracts](#)
You can create a revised version of a contract. You can also create multiple revisions of a contract.
- [Creating and associating terms](#)
You can associate specific terms and conditions with contracts and records.

Creating warranty contracts

You create warranty contracts to define the agreement to maintain one or more assets with an outside service provider for a fee or a scheduled set of payments.

Procedure

1. In the Warranty Contracts application, click New Warranty Contract.
The status is set to draft and the start date is set to the current date.
2. In the Type field, specify whether you are creating a warranty or service contract.
3. Specify the value for currency.
4. Optional: Specify additional details and vendor information.
5. Save the contract.

What to do next

New contracts are assigned a unique contract number. You can append data to this number to differentiate this contract from others. For example, when you have multiple sites and want to track contracts associated with them individually, you can append a site identifier to the contract number.

- [Associating assets with warranty contracts](#)
You associate specific assets with a warranty so that the assets inherit all coverage that is specified on the warranty contract.
- [Associating locations with warranty contracts](#)
To manage your warranty contracts, you can associate specific locations with warranty contracts.
- [Specifying service type and duration of warranty contracts](#)
In the Warranty Contracts application, you can manage warranty contracts by specifying the service type and duration of the warranty contract.

Associating assets with warranty contracts

You associate specific assets with a warranty so that the assets inherit all coverage that is specified on the warranty contract.

Before you begin

To associate assets with a contract, the contract must be approved.

Procedure

1. In the Warranty Contracts application, select the contract with which you want to associate assets.
2. Click the Associated Assets tab.
3. Click Select More Assets.
4. In the Select Assets window, select the assets that you want to associate with the contract.
5. Click OK.
6. For each asset that you selected, complete the following steps:
 - a. In the Assets/Locations table window, select the asset.
 - b. In the Contract Lines table window, specify a start date.
 - c. Optional: In the Meters table window, update the meter information.
7. Save your changes.

Associating locations with warranty contracts

To manage your warranty contracts, you can associate specific locations with warranty contracts.

Before you begin

To associate locations with a warranty contract, that contract must be approved.

Procedure

1. In the Warranty Contracts application, select the contract with which you want to associate locations.
2. Click the Associated Assets tab.
3. Click Select Locations.
4. Select the locations that you want to associate with the contract.
5. Click OK.
6. For each location that you selected, complete the following steps:
 - a. In the Assets/Locations table window, select the location.
 - b. In the Contract Lines table window, specify a start date.
 - c. Optional: In the Meters table window, update the meter information.
7. Save your changes.

Specifying service type and duration of warranty contracts

In the Warranty Contracts application, you can manage warranty contracts by specifying the service type and duration of the warranty contract.

About this task

You can only add contract lines to contracts that are in a status of draft, pending revision, or waiting on approval.

Procedure

1. In the Warranty Contracts application, select the contract for which you want to specify the service type and duration.
2. Click the Contract Lines tab.
3. In the Contract Lines table window, click New Row.
4. Select one of the following values for line type:

Option	Description
Service	If the line type is for a service, provide a description. Service is the default value.
Standard Service	If the line type is for a standard service, specify a value in the Item field.

5. Optional: If the payment schedule property is selected on the Properties tab, specify the extended cost or lump sum cost of the line in the Line Cost field.
6. Specify values for the duration and time unit.

The Time Unit field works with the Duration field.

For example, to set the duration to one year, enter 1 in the Duration field, and specify years in the Time Unit field.
7. Optional: Provide additional contract line information.
8. In the Meter Lines for Contract Line table window, click New Row.

The contract line number changes with the contract line that you selected.
9. Specify values for the measure unit and the duration.
10. Save your changes.

Estimating payments for service warranty contracts

To track payment information, you can estimate the payments for service warranty contracts.

Before you begin

To estimate payments for a service warranty contract, you must specify a payment schedule on the Properties tab.

About this task

The status of the warranty contract must be draft, pending revision, or waiting on approval.

Procedure

1. In the Warranty Contracts application, select the contract for which you want to estimate payments.
 2. Select the Manage Payments action.
The Manage Payments window displays the total cost of the service lines in the Total Line Costs field.
 3. Specify the start date and end date of the payments.
If the status of the contract is pending revision and at least one invoice has been paid, you cannot change the Start Date field.
 4. Click Schedule to specify a payment schedule.
 5. Click Estimate Payments.
The estimated payment is shown in the Payment field.
 6. Click OK to apply the estimated payment to the contract.
 7. Save your changes.
- [Creating one-time payments for warranty contracts](#)
To manage payments within your organization, you can create one-time payments for warranty contracts.
 - [Creating payment schedules for warranty contracts](#)
You can create a payment schedule to make a series of payments over time for a warranty contract.

Creating one-time payments for warranty contracts

To manage payments within your organization, you can create one-time payments for warranty contracts.

Before you begin

To create one-time payments, the payment schedule property must be selected on the Properties tab.

About this task

The status of the contract must be draft, pending revision, or waiting on approval.

Procedure

1. In the Warranty Contracts application, select the contract for which you want to create a one-time payment.
2. Select the Manage Payments action.
3. Optional: In the Manage Payments window, change the description.
4. Specify the payment value.
5. Optional: Specify a tax code.
The tax amount is calculated.
6. In the Target Invoice Status field, specify the status for the invoice that is generated for the payment.
7. Specify values for the start date and general ledger debit account.
8. Click OK.
9. Save your changes.
10. Select the Change Status action.
11. Change the status of the contract to approved.
The payment is scheduled for the start date, the scheduled invoice is generated, and the value of the invoice is displayed in the Total Cost field.

Creating payment schedules for warranty contracts

You can create a payment schedule to make a series of payments over time for a warranty contract.

Before you begin

To create one-time payments, the payment schedule property must be selected on the Properties tab.

About this task

The status of the contract must be draft, pending revision, or waiting on approval.

Procedure

1. In the Warranty Contracts application, select the contract for which you want to schedule payments.
2. Select the Manage Payments action.
3. Optional: In the Manage Payments window, change the description.
4. In the Payment field, specify the amount of each payment and the tax code.
The tax amount is calculated.
5. In the Target Invoice Status field, specify the status for the invoice that is generated for the payment.
6. Specify the start date and end dates for the payments.
If the status of the contract is pending revision and at least one invoice has been paid, you cannot change this value.
7. Specify a value for the schedule for the payments and the general ledger debit account.
8. Click Estimate Payment.
The payment amount is calculated, based on the schedule that you specified, and the amount is displayed in the Payment field.
9. Click OK to accept the payment amount.
10. Save your changes.
11. Select the Change Status action.
12. Change the status of the contract to approved.
The payments are scheduled to begin on the start date, the scheduled invoices are generated, and the total value of all the invoices is displayed in the Total Cost field.

Authorizing sites with contracts

You can authorize one or more sites on a contract so that they are available for use in the authorized sites. You can add sites from other organizations to the contract only when the applicable sites use the same company and item sets. You can also change vendor data when you add sites to a contract. For example, you can authorize a local vendor branch for each site.

Before you begin

You must choose a vendor for the contract before you can authorize a site.

About this task

You can authorize sites for contracts that have a status value of waiting for approval (WAPPR) or draft (DRAFT). You must assign one default vendor for each site.

If you change the value in the Vendor field after you authorize a site, the asset management system copies the new vendor information to the rows that have a default vendor value. The asset management system also deletes the rows that have no default vendor value.

Procedure

1. In a contract application, display the contract record that you want to update.
2. Select the Authorize Sites action.
3. Perform one of the following actions:

Option	Description
Authorize an individual site	<ol style="list-style-type: none">a. Click New Row.b. In the Vendor field, enter a value.c. In the Site field, enter a value.d. Select the Default check box to specify whether you want the vendor to be the default vendor.e. Enter values in the Bill To and Attention fields.f. Click OK to authorize the site.
Authorize multiple sites	<ol style="list-style-type: none">a. Click Select Sites.b. Select the appropriate sites.c. Click OK.d. Enter values in the Bill To and Attention fields.e. Click OK to authorize the sites.

Selecting sites for contract authorizations

You can select multiple sites to authorize for a contract. You can perform this action from more than one application.

Procedure

1. In a contract application, display the contract record for which you want to select sites.
2. Select the Authorize Sites action.

3. Click Select Sites.
4. Select one or more sites. To select a site, select the Select Record check box next to each site you want to add.
5. Click OK. The selected sites are copied to the Authorize Sites window.
6. Optional: Modify the default Bill To and Attention fields.
7. Click OK.

Associating service level agreements with contracts

A service level agreement is a written agreement between a service provider and its customers that defines the formal commitments. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.

Procedure

1. In a contract application, display the contract record for which you want to select one or more service level agreements.
2. Select the Associate SLAs action.
3. Click Select SLAs.
4. Select one or more service level agreements to associate with the contract.
5. To select a service level agreement from the same organization that created the contract, select the Select Record check box. You can select more than one agreement. To cancel a selection, clear the check box. To select all agreements in the list, select the Select All check box next to the Agreements column.
6. Click OK. The service level agreements are copied to the Associate SLAs window.
7. Click OK.

Revising contracts

You can create a revised version of a contract. You can also create multiple revisions of a contract.

Before you begin

A contract must have an Approved (APPR) status before you can revise it.

About this task

The Revision field of the contract indicates the number of times a contract has been revised. When you insert a contract record, the revision number is zero. As you make revisions to the contract, the next consecutive number is inserted in the Revision field. This option is available in more than one application.

Procedure

1. In a contract application, display the contract you want to revise.
2. Select the Revise Contract action.
3. Type a description.
4. Optional: Fill in additional fields as needed. An asterisk (*) indicates a required field.
5. Click OK. A new version of the contract with a status of pending revision (PNDREV) is created. Note that the original version of the contract remains in the APPR (Approved) status and is still valid while you are completing the revision.
6. Make the required changes to the revised version of the contract.
7. Change the status of the revised contract to APPR (Approved) to make it active. This action also changes the status of the originating contract to REVISED.
8. Click Save Contract.

Creating and associating terms

You can associate specific terms and conditions with contracts and records.

- [Creating terms](#)
You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.
- [Associating existing terms with records](#)
You can associate terms and conditions with records to define the rules that your company and your vendors must follow on purchase order and contract transactions.

Creating terms

You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.

Before you begin

Terms and conditions can only be added to purchasing or contracts records set at statuses in progress or waiting on approval.

Procedure

1. In a purchasing or contract application, display the record for which you want to create a term.
2. On the Terms and Conditions tab, click New Row.
3. Specify the sequence and term.
4. Optional: Select the Send to Vendor check box.
5. Save the record.

What to do next

You can set default term and condition values according to site and contract type in the Organizations application. When you create a contract record in a contracts application, the contract inherits the default term and condition values that you assigned to the selected contract type in the Organizations application.

Associating existing terms with records

You can associate terms and conditions with records to define the rules that your company and your vendors must follow on purchase order and contract transactions.

About this task

The Terms and Conditions application maintains a library of terms and conditions with which you and your vendors must comply. You can select terms from this library to apply to contract and purchasing records.

Procedure

1. In a purchasing or contract application, display the record for which you want to select a term.
2. On the Terms and Conditions tab, click Select Terms.
3. Select the Select Record check box next to each term that you want to associate with the record.
4. Click OK.
5. Optional: Select the term in the Terms and Conditions table window and select the Send to Vendor check box.
6. Save the record.

Terms and Conditions

You use the Terms and Conditions application to specify and to maintain a library of terms and conditions. You can add the terms and conditions to a purchasing document or to a contract. Terms can contain information such as liability concerns, shipping and handling details, and delivery time expectations.

The terms entered in the Terms and Conditions application are available from tabs in the purchasing and contract applications. From the tabs, you can select a term from the library to associate with a purchasing record or with a contract record.

- [Terms and conditions overview](#)
Terms and conditions can contain information such as liability concerns, shipping and handling details, and delivery time expectations. You can create term types which can be associated with terms and conditions.
- [Working with terms and conditions](#)
You can define and delete terms and conditions that can be used in the purchasing and contracts applications. You can associate terms and conditions with purchase order and contract records to determine the rules that your company and your vendors must follow on purchase order and contract transactions.
- [Terms and conditions overview](#)
Terms and conditions can contain information such as liability concerns, shipping and handling details, and delivery time expectations. You can create term types which can be associated with terms and conditions.
- [Working with terms and conditions](#)
You can define and delete terms and conditions that can be used in the purchasing and contracts applications. You can associate terms and conditions with purchase order and contract records to determine the rules that your company and your vendors must follow on purchase order and contract transactions.

Terms and conditions overview

Terms and conditions can contain information such as liability concerns, shipping and handling details, and delivery time expectations. You can create term types which can be associated with terms and conditions.

- [Terms and conditions](#)
You can create and maintain a library of terms and conditions that your company and your vendors must follow on purchase order and contract transactions. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.

- [Term types](#)
A term type is a user-defined value that is associated with a term in the Terms and Conditions application. The term type allows you to filter all records in the Terms and Conditions library by searching on the Type field. Defining a term type is optional.
- [Terms and conditions](#)
You can create and maintain a library of terms and conditions that your company and your vendors must follow on purchase order and contract transactions. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.
- [Term types](#)
A term type is a user-defined value that is associated with a term in the Terms and Conditions application. The term type allows you to filter all records in the Terms and Conditions library by searching on the Type field. Defining a term type is optional.

Terms and conditions

You can create and maintain a library of terms and conditions that your company and your vendors must follow on purchase order and contract transactions. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.

You can create a library of term and condition values in the Terms and Conditions application. You use the library to look up and associate terms and conditions to purchase order and contract records. The library is accessible in the Purchase Orders and contracts applications.

You can set default term and condition values according to site and contract type in the Organizations application. When you create a contract record in a contracts application, it inherits the default term and condition values that you assigned to the selected contract type in the Organizations application.

Term types

A term type is a user-defined value that is associated with a term in the Terms and Conditions application. The term type allows you to filter all records in the Terms and Conditions library by searching on the Type field. Defining a term type is optional.

Working with terms and conditions

You can define and delete terms and conditions that can be used in the purchasing and contracts applications. You can associate terms and conditions with purchase order and contract records to determine the rules that your company and your vendors must follow on purchase order and contract transactions.

- [Defining terms](#)
You use the Terms and Conditions application to define terms that apply to purchase orders.
- [Creating and deleting terms](#)
You can create terms and conditions for contracts and records. You can delete terms when they are no longer needed.
- [Associating existing terms with records](#)
You can associate terms and conditions with records to define the rules that your company and your vendors must follow on purchase order and contract transactions.
- [Modifying terms](#)
You use the Terms and Conditions application to modify the terms of a purchase order.
- [Modifying the sequence of terms for records](#)
You can change the order in which the terms for a record display. You can modify the sequence to display a more logical order, or to list certain terms sequentially.
- [Setting default terms](#)
You use the Terms and Condition application to specify that certain terms default on all purchase orders that are created.
- [Sorting terms by type](#)
You use the Terms and Conditions application to sort terms by type.
- [Defining terms](#)
You use the Terms and Conditions application to define terms that apply to purchase orders.
- [Creating and deleting terms](#)
You can create terms and conditions for contracts and records. You can delete terms when they are no longer needed.
- [Associating existing terms with records](#)
You can associate terms and conditions with records to define the rules that your company and your vendors must follow on purchase order and contract transactions.
- [Modifying terms](#)
You use the Terms and Conditions application to modify the terms of a purchase order.
- [Modifying the sequence of terms for records](#)
You can change the order in which the terms for a record display. You can modify the sequence to display a more logical order, or to list certain terms sequentially.
- [Setting default terms](#)
You use the Terms and Condition application to specify that certain terms default on all purchase orders that are created.
- [Sorting terms by type](#)
You use the Terms and Conditions application to sort terms by type.

Defining terms

You use the Terms and Conditions application to define terms that apply to purchase orders.

Procedure

1. In the Organization table window, select the organization for which you want to define a term.
2. Click New Row.
3. Specify a value in the Term field. The value must be unique.
4. Type a description
5. Optional: Specify a value in the Type field. The value you define can be used to filter the Terms and Conditions library. For example, you might have defined a type as `PURCHASE`, in which all the corresponding records contain information applicable to purchase orders. You could then search on `PURCHASE` and find only the relevant terms.
6. To be able to edit the term when it is associated with records in other applications, select the Editable check box. Otherwise, clear the check box.
7. To have the term appear as a default on all future purchase orders, select the Default on PO check box. Otherwise, clear the check box.
8. Click Save Terms and Conditions.

Creating and deleting terms

You can create terms and conditions for contracts and records. You can delete terms when they are no longer needed.

- **Creating terms**
You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.
- **Deleting terms**
You use the Terms and Conditions application to delete terms.
- **Creating terms**
You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.
- **Deleting terms**
You use the Terms and Conditions application to delete terms.

Creating terms

You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.

Before you begin

Terms and conditions can only be added to purchasing or contracts records set at statuses in progress or waiting on approval.

Procedure

1. In a purchasing or contract application, display the record for which you want to create a term.
2. On the Terms and Conditions tab, click New Row.
3. Specify the sequence and term.
4. Optional: Select the Send to Vendor check box.
5. Save the record.

What to do next

You can set default term and condition values according to site and contract type in the Organizations application. When you create a contract record in a contracts application, the contract inherits the default term and condition values that you assigned to the selected contract type in the Organizations application.

Deleting terms

You use the Terms and Conditions application to delete terms.

Procedure

1. In the Terms and Conditions application, in the Organization table window, select the organization to which the term belongs.
2. Click the Mark Row for Delete icon. To undo the delete before saving, click the Mark Row for Delete icon once more.
3. Click Save Terms and Conditions.

Associating existing terms with records

You can associate terms and conditions with records to define the rules that your company and your vendors must follow on purchase order and contract transactions.

About this task

The Terms and Conditions application maintains a library of terms and conditions with which you and your vendors must comply. You can select terms from this library to apply to contract and purchasing records.

Procedure

1. In a purchasing or contract application, display the record for which you want to select a term.
2. On the Terms and Conditions tab, click Select Terms.
3. Select the Select Record check box next to each term that you want to associate with the record.
4. Click OK.
5. Optional: Select the term in the Terms and Conditions table window and select the Send to Vendor check box.
6. Save the record.

Modifying terms

You use the Terms and Conditions application to modify the terms of a purchase order.

About this task

Modifying a term does not update records that reference the term. The modifications only affect future instances.

Procedure

1. In the Terms and Conditions application, in the Organization table window, select the organization to which the term you want to edit belongs.
2. Click View Details.
3. In the Details table window, edit the term information.
4. Click Save Terms and Conditions.

Modifying the sequence of terms for records

You can change the order in which the terms for a record display. You can modify the sequence to display a more logical order, or to list certain terms sequentially.

Procedure

1. In the appropriate Purchasing or Contract application, display the record with which you want to associate a term.
2. Click the Terms and Conditions tab.
3. In the Terms and Conditions table window, locate the rows for which you want to change the sequence.
4. In the Sequence column for the appropriate rows, specify a value. You can enter any integer up to 9999. The product defaults the sequence numbers to multiples of 10. You can rearrange the order without renumbering the entire sequence.
5. Click Save.

Setting default terms

You use the Terms and Condition application to specify that certain terms default on all purchase orders that are created.

About this task

Modifying a term does not update records that reference the term. The modifications only affect future instances.

Procedure

1. In the Terms and Conditions application, in the Organization table window, select the organization to which the term you want to edit belongs.
2. Click View Details.
3. In the Details table window, select the Default on PO check box.
4. Click Save Terms and Conditions.

Sorting terms by type

You use the Terms and Conditions application to sort terms by type.

About this task

Only terms associated with one organization can be viewed at one time.

Procedure

1. In the Terms and Conditions application, in the Organization table window, select the organization to which the term you want to sort by type belongs.
2. In the Terms and Conditions table window for that site, click the Type column title. The terms are sorted by type.

Financial module

You use the applications in the Financial module to define and manage currency codes, exchange rates, general ledger accounts and resource codes. You can also track project management costs.

- **Currency Codes**
You use the Currency Codes application to define and manage currencies. A currency code is a user-defined value that represents a currency. For example, CND represents the Canadian dollar.
- **Exchange Rates**
In the Exchange Rates application, you can create exchange rates and modify existing rates. You can also configure multiple base currencies to ensure that all appropriate currencies and exchange rates are in the database. You can also ensure that all affected applications perform the correct calculations.
- **Chart of Accounts**
In the Chart of Accounts application, you can set up organization-specific general ledger accounts and resource codes for standard accounting functions. You create accounts and resource codes to correspond with accounts that you use in your external accounting system. You can also set up financial periods, and specify general validation options.
- **Cost Management**
You use the Cost Management application, with an external project costing system, to track project costs and manage budgets more effectively. By creating a project in the Cost Management application and linking work orders to that project in the Work Order Tracking application, you can generate project cost information to track the financial resources required to complete the project.
- **Budget monitoring**
In the Budget Monitoring application, you can create budget records to monitor transactions in a financial period. Monitoring budget costs can help to ensure that projects or activities, such as work orders, are completed within an agreed budget and can improve estimation of the costs of future projects.

Currency Codes

You use the Currency Codes application to define and manage currencies. A currency code is a user-defined value that represents a currency. For example, CND represents the Canadian dollar.

The Currency Codes application stores currency codes at the system level. All organizations can view, use, and add currency codes. After you create an active currency code, you can use that currency code in applications that have a Currency field. For example, the Purchase Requisitions application, Purchase Orders application, Invoices application, and Companies application have a Currency field.

Though you use the Currency Codes application to define currencies, you use the following applications to manage other aspects of currency administration:

- Organizations - to specify the base currency for an organization.
- Exchange Rates - to specify exchange rates between currencies for defined periods.

Foreign currencies

When you have purchasing records in a foreign currency, the current exchange rate is used to calculate the base cost in the currency of your company. Purchasing records include purchase requisitions, purchase orders, and invoices.

Deleting currency codes

You can delete currency codes that you are no longer using. You cannot delete currency codes if they meet any of these conditions:

- The currency code is used in a Currency field on any record (unless the status is closed or cancelled).
- The currency is used in an active exchange rate in the Exchange Rates application.
- The currency is specified as the base currency for an organization.
- The currency code is referenced in the following tables: PO, PR, COMPANY INVOICE, MATRECTRANS, MATUSETRANS, SERVRECTRANS, INVOICETRANS, and RFQVENDOR (unless the records are flagged as history or inactive).

Exchange Rates

In the Exchange Rates application, you can create exchange rates and modify existing rates. You can also configure multiple base currencies to ensure that all appropriate currencies and exchange rates are in the database. You can also ensure that all affected applications perform the correct calculations.

Because exchange rates are stored at the organization level, each organization defines and maintains its own exchange rates.

When you specify an amount in a foreign currency, the active exchange rate is located. Then, the cost in the base currency of your company is calculated. If the Exchange Rates application finds that the exchange rate between two currencies is not defined, specific rules and logic are used to calculate the exchange rate from other exchange rates.

To define currency codes, use the Currency Codes application. To specify the base currency for an organization, use the Organizations application.

Chart of Accounts

In the Chart of Accounts application, you can set up organization-specific general ledger accounts and resource codes for standard accounting functions. You create accounts and resource codes to correspond with accounts that you use in your external accounting system. You can also set up financial periods, and specify general validation options.

The application stores general ledger accounts at the organization level. Because general ledger accounts cannot be shared across organizations, each organization must have its own chart of accounts system.

To use the Chart of Accounts functions appropriately, specify the following information in other applications:

- In the Database Configuration application, specify the system-level, default format of general ledger account codes, such as the number and the length of components.
- In the Organizations application, define tax codes, rates, and dates.
- In the Domains application, add company types.

Cost Management

You use the Cost Management application, with an external project costing system, to track project costs and manage budgets more effectively. By creating a project in the Cost Management application and linking work orders to that project in the Work Order Tracking application, you can generate project cost information to track the financial resources required to complete the project.

The Cost Management application supports the integration of the enterprise application management system and Oracle® Projects applications. If the Adapter for the Oracle® application is installed and the projects interface is activated, the Cost Management application can retain projects, tasks, and cost summary information from Oracle® Projects.

Deleting cost management projects

In the Cost Management application, you use the Delete Project action to delete projects that are not parents to other projects. To delete a parent project, you must clear the Parent Project field for the child projects or delete the child projects.

Similarly, you can delete a task that has no child tasks.

Budget monitoring

In the Budget Monitoring application, you can create budget records to monitor transactions in a financial period. Monitoring budget costs can help to ensure that projects or activities, such as work orders, are completed within an agreed budget and can improve estimation of the costs of future projects.

As an administrator, you can create budget records by configuring focal points and calculation rules. Focal points represent the item that you are monitoring in the budget record, such as assets, locations, or general ledger accounts or components. You create focal points, for example, to track costs on check type master preventive maintenance (PM) records for a specific model of an asset. You can configure calculation rules that are based on estimated, committed, and actual costs.

Users create transactions for work orders, purchase requisitions, purchase orders, receipts, invoices, and issues. The budget records then monitor these transactions and are used to create reports.

Budget reports provide a summarized and detailed view of costs by type, such as labor, tools, services, materials. Budget reports also provide a summarized and detailed view of costs by status such as estimated, committed, and actual costs, and compare them with related budgeted amounts.

Integration module

The Integration module contains a set of applications that help you to integrate the system with your enterprise applications. You also can create business flows between the system and your other enterprise applications.

The Integration Framework includes the following key features:

- Pre-defined content to assist in implementing integration requirements in a timely manner. This content is a comprehensive set of outbound (channels) and inbound (services) integration interfaces that are available to use immediately.
- Applications to configure, pre-define, and to create new integration definitions.

- Applications to facilitate the customization of pre-defined content using a processing rule engine, Java™, and Extensible Stylesheet Language Transformations (XSLT).
- Support for multiple communication modes, including:
 - Web Services.
 - HTTP.
 - Java Message Service (JMS) messaging.
 - Database interface tables.
 - XML/Flat files.
 - Event-based, batch, program-initiated, and user-initiated processing of outbound and inbound messages.
 - Load and performance scalability using JMS queues.
 - Support for clustered environments that reduce system downtime, increase system availability, and improve system performance.
 - Support for UI-based integration, including context-based launching of external applications.
 - Support for integration to Operational Management Products (OMPs).
 - Support for bulk export of data using user-defined SQL query.
 - Support for bulk importing of XML or flat files.
 - Dynamic XML schema generation for all integration artifacts (channels and services).
 - Dynamic generation of Web Services Interoperability (WS-I) compliant Web Services, including Web Service Definition Language (WSDL).
 - Provides the concept of an adapter that is used to group related integration artifacts. You can configure and deploy adapters for enterprise connectivity with various systems. Each adapter can have its own interface and delivery mode. Pre-configured adapters for Oracle and SAP are available as add-ons.
- **Object structures**
An object structure is the common data layer that the integration framework components use for outbound and inbound application message processing. An object structure consists of one or more related business objects that define the content of an XML or JSON message (schema).
- **Publish Channels**
You can use the Publish Channels application to create and modify publish channel records, which send outbound integration messages to an external system. When publish channel processing is triggered, the integration message is delivered to the outbound queue, from where it is then delivered to an external system.
- **Invocation Channels**
You use the Invocation Channels application to create and manage invocation channel records. Invocation channels support the service-oriented architecture capability by enabling the integration framework to call external applications and process the responses. The execution of an invocation channel is synchronous, and a response can be returned from the external service to the caller without using a queue.
- **Enterprise Services**
You can use the Enterprise Services application to create and modify enterprise service records which receive inbound integration messages from an external system. When enterprise service processing is triggered, the integration message is moved into an inbound queue, from where it is processed into the application.
- **Web Services Library**
You can use the Web Services Library application to create and deploy web services for all service types, object structure, enterprise, and standard services. By deploying web services, external applications can make SOAP-based calls to retrieve or update business object data. The application generates the XML schema and Web Services Description Language (WSDL) files for all of your web services.
- **Endpoints**
You use the Endpoints application to create and manage endpoints and their handlers. Endpoints and handlers enable the routing of outbound messages to an external application. Endpoints are used for outbound message processing only, with the exception of interface tables, where the endpoint defines the location of the interfaces for both inbound and outbound processing.
- **External Systems**
You use the External Systems application to create and manage external system records. External systems are any external applications that you exchange data with using the integration framework.
- **Logical Management Operations**
Logical management operations define actions that the integration framework takes on operational management products. Operational management products are individual external products that you can use to implement logical management operations.
- **Integration Modules**
You use the Integration Modules application to create and manage integration module records. An integration module is a component that resides between the process management product and the operational management product.
- **Launch in Context**
You use the Launch in Context application to create and modify launch entry records which open an external application in the same or a different browser session. You can open applications independently or as part of an application integration scenario.
- **Message Tracking**
You use the Message Tracking application to track and view the processing history of queue-based enterprise service, and queue-based publish channel messages.
- **Message Reprocessing**
You use the Message Reprocessing application to download, view, and manage integration framework messages that have been flagged with an error. You can download, view, and correct the error XML file without needing to gain access the integration server error files.
- **JSON Mapping**
You use the JSON Mapping application to map data from external systems into the Maximo database, using JSON format.
- **JSON Resources**
You use the JSON Resources application to show external data in the Maximo database.
- **Interactions**
With the interactions module, you can quickly integrate an application with a web service without authoring Java code or redeploying Java files.
- **API keys application**
You use API keys to enable an inbound machine-to-machine integration for an external client. API keys can be used by the OSLC and REST APIs and also can be used as part of the Manage integration framework.

Object structures

An object structure is the common data layer that the integration framework components use for outbound and inbound application message processing. An object structure consists of one or more related business objects that define the content of an XML or JSON message (schema).

An object structure provides the message content for channels and services and enables application-based import and export. In addition, an object structure, on its own, can be called as a service, supporting the Create, Update, Delete, Sync, and Query operations.

Note: Use the object structures that are provided with your Manage system whenever possible, instead of creating a new or duplicate object structure. If the outbound integration messages are in the JSON format, you can modify which data is shared from that object structure by creating a message template for the object structure.

- **[Identification of object structure data](#)**

If you are adding or modifying object structures, identification of the data to include requires some understanding of the applications and their associated objects. Review the data model of an application to determine which objects, database tables, and views contain the data to transfer to and from an external system.

- **[Alternate keys](#)**

Inbound message processing relies on the key field(s) of an object to find an existing record in the system to support updates and deletes. The default processing relies on the primary key to retrieve existing records. Sometimes a primary key is unknown to an external application and an alternate key (known by the external system) is defined to support the updating and deleting of records by the external system.

- **[Object fields](#)**

The integration framework and the external system exchange a subset of the data columns in the objects within the object structure. Subject to certain restrictions, you can control the content of the object fields within the message by including persistent and nonpersistent columns of individual objects.

- **[Interface table and flat file considerations](#)**

If you use an object structure for exchanging data with interface tables or flat files, you must ensure that the object structure does not contain duplicate column names.

- **[Modification of a predefined object structure](#)**

There are certain restrictions if you modify a predefined object structure.

- **[Configuring an object structure](#)**

You can create new object structures and during that process you can generate schema files, include or exclude fields, and resolve alias conflicts. You can also specify inbound setting restrictions, set advanced configuration properties, configure application authorization, and configure message templates for outbound integration messages.

- **[Message templates that specify outbound data](#)**

Message templates are an additional option for editing the structure of an outbound message. You use message templates to limit which data from the associated object structure is included in the message.

Publish Channels

You can use the Publish Channels application to create and modify publish channel records, which send outbound integration messages to an external system. When publish channel processing is triggered, the integration message is delivered to the outbound queue, from where it is then delivered to an external system.

Publish channel processing can be triggered by one of the following event-driven or user-driven events:

- Object events (insert, update, delete)
- Data export

The content of a publish channel data structure is based on the schema of the associated object structure. You can use the object structure processing rules to define the conditions under which the integration framework can skip or stop a message. The processing rules can also change the data in the publish channel before it is delivered to the external system. You can also provide processing logic against the integration message by using a Java™ class or XSL map.

Invocation Channels

You use the Invocation Channels application to create and manage invocation channel records. Invocation channels support the service-oriented architecture capability by enabling the integration framework to call external applications and process the responses. The execution of an invocation channel is synchronous, and a response can be returned from the external service to the caller without using a queue.

You can configure the invocation channel record to integrate with the Integration Module application.

The initiation of an invocation channel is implemented by using an action class that calls an invocation channel. You can implement an action by using the following means:

- An application user interface control
- Workflow routing
- Escalation

Enterprise Services

You can use the Enterprise Services application to create and modify enterprise service records which receive inbound integration messages from an external system. When enterprise service processing is triggered, the integration message is moved into an inbound queue, from where it is processed into the application.

Enterprise service processing can be triggered by the following:

- Web Service invocation or HTTP servlet call

- Interface table cron task
- User-initiated or cron task-initiated data import
- Message delivery directly to an inbound JMS message

The content of an enterprise service data structure is based on the content of the associated object structure. You can use the processing rules to define the conditions under which the integration framework can skip or stop a message. The processing rules can also change the data in the enterprise service message before it is delivered to the external system. You can also provide processing logic for the integration message by using a Java™ class or XSL map.

Web Services Library

You can use the Web Services Library application to create and deploy web services for all service types, object structure, enterprise, and standard services. By deploying web services, external applications can make SOAP-based calls to retrieve or update business object data. The application generates the XML schema and Web Services Description Language (WSDL) files for all of your web services.

Endpoints

You use the Endpoints application to create and manage endpoints and their handlers. Endpoints and handlers enable the routing of outbound messages to an external application. Endpoints are used for outbound message processing only, with the exception of interface tables, where the endpoint defines the location of the interfaces for both inbound and outbound processing.

You can use endpoints to perform the following tasks:

- Identify a target location for integration framework data publication
- Use an encrypted value to apply additional security for data storage and display
- Work with a handler to identify how outbound data is routed to a target location
- Work with a handler to define the data format that is used for data transfers

External Systems

You use the External Systems application to create and manage external system records. External systems are any external applications that you exchange data with using the integration framework.

You can use the External Systems application to perform the following functions:

- Name the systems that exchange data with the integration framework.
- Specify the protocol that the integration framework uses to send data to the external system.
- Identify the publish channels and enterprise services that each system implements.
- Create interface tables.
- Perform data import and export.
- Manage JMS queues.

Logical Management Operations

Logical management operations define actions that the integration framework takes on operational management products. Operational management products are individual external products that you can use to implement logical management operations.

You can use the Logical Management Operations application to identify the following characteristics of a logical management operation:

- The source and response object names that associated with the logical management operation, which defines the data source and target for the logical management operation.
- The specific object field attributes the data source and target use.
- The invocation pattern the logical management operation uses.
- A secondary namespace identifier for the logical management operation record.

To implement a logical management operation, you define a relationship between the integration module and the logical management operation in the Integration Modules application. You can use the integration module endpoint handler to identify how the integration framework communicates with the operational management product. The integration module can then map a response to your defined response object in the logical management operation. You can use the View IM action to view the related integration modules for a selected logical management operation.

Integration Modules

You use the Integration Modules application to create and manage integration module records. An integration module is a component that resides between the process management product and the operational management product.

You can use the Integration Module application to associate logical management operations and operational management products with an integration module record. The associations with logical management operations define the actions that process managers run. The associations with operational management products define the external applications that you can invoke from a process management product.

You must define and configure the following components before the process management product can call an integration module to perform a logical management operation on an operational management product:

- Logical management operations
- Operational management products
- Invocation channels
- Object structures
- Endpoints

Launch in Context

You use the Launch in Context application to create and modify launch entry records which open an external application in the same or a different browser session. You can open applications independently or as part of an application integration scenario.

The launch entry record can utilize the following options in the Application Designer to open an external application:

- Select action menu items
- Hyperlinks
- Buttons

You use the Launch in Context application to create and update launch entries. A launch entry defines a URL that opens a console for an external application. The launch entry can pass data, referred to as context, from the application to the external console. You can configure a console URL for any application with a web-based console. Additionally, you can configure console URLs for consoles that use Java™ Web Start. You cannot use a launch entry to open applications that are not enabled for the web. You can configure a launch point from any application.

Message Tracking

You use the Message Tracking application to track and view the processing history of queue-based enterprise service, and queue-based publish channel messages.

The Message Tracking application works with the Message Reprocessing application. When you use the Message Tracking application, you can determine which messages are flagged with an error. You then can select a failed message and go to the Message Reprocessing application to take appropriate action to correct erroneous data.

When you enable message tracking, the integration framework writes all the processed messages to the asset management system database. The asset management system then assigns a status to each message. The status represents the message position in the integration framework queue-based processing cycle.

Message Reprocessing

You use the Message Reprocessing application to download, view, and manage integration framework messages that have been flagged with an error. You can download, view, and correct the error XML file without needing to gain access the integration server error files.

Failed messages can be managed in the following ways in the Message Reprocessing application:

- Change the message statuses to stop message processing or to reprocess a message
- Correct, process, save, or cancel the error XML file
- Delete the message from the database

The Message Reprocessing application works with the Message Tracking application when you enable message tracking in either the Publish Channels application or the Enterprise Services application. In the Message Tracking application, you can determine which tracked messages are flagged with an error.

If you have not enabled message tracking, you can go to the Message Reprocessing application to check for transaction errors.

JSON Mapping

You use the JSON Mapping application to map data from external systems into the Maximo® database, using JSON format.

For more information, see [JSON Mapping application information](#).

JSON Resources

You use the JSON Resources application to show external data in the Maximo® database.

The JSON Resources application allows nonpersistent Maximo business objects to be populated with data from an external system. For more information, see [JSON Resources application information](#).

Interactions

With the interactions module, you can quickly integrate an application with a web service without authoring Java™ code or redeploying Java files.

- [Web service interactions overview](#)
An interaction can start a web service and send data to it from an application. The interaction can then display data returned from the web service and save this data to the application database.
- [Creating interactions](#)
The Create Interactions wizard application guides you through all the steps required to create and configure an interaction. After you complete the wizard process and test the interaction, users can start working with it immediately with no requirement for additional configuration or deployment.

Web service interactions overview

An interaction can start a web service and send data to it from an application. The interaction can then display data returned from the web service and save this data to the application database.

To implement interactions requires knowledge of:

- XML schemas
- Web services
- The integration framework
- Customizing applications and application user interfaces

An interaction can manage the following processes:

- Prepare a request for a web service.
- Invoke a web service from an application.
- Retrieve results from the web service in the form of a response.
- Display the results in an application.
- Optionally, apply the response data into the system database.
- Report any errors that occur during the request or response processes.

Two applications are provided to help you create and manage interactions:

- Create and configure interactions in the Create Interaction application.
- Review, modify, and delete interactions in the Interactions application.

After you create an interaction, users can perform the following tasks from the application user interface:

- Start the interaction.
- View and, if configured, change the parameters of the request to the web service.
- Invoke the web service by sending the request.
- Optionally, view data received from the web service and commit this data to the database.
- [Creating interactions](#)
The Create Interactions wizard application guides you through all the steps required to create and configure an interaction. After you complete the wizard process and test the interaction, users can start working with it immediately with no requirement for additional configuration or deployment.

Creating interactions

The Create Interactions wizard application guides you through all the steps required to create and configure an interaction. After you complete the wizard process and test the interaction, users can start working with it immediately with no requirement for additional configuration or deployment.

Before you begin

Before you run the Create Interactions application, ensure that you have all the information required for the configuration. During the process, you must specify the web service, define the structure of messages, and map the data between the application and the web service.

A logging tool is provided to log configuration activity and maintain a log file of the items that are configured. To generate a detailed log of the configuration, in the Logging application, set the interaction logger to DEBUG mode.

Procedure

1. To configure the web service for the interaction, in step 1 of the process:
 - a. Specify the URL for the WSDL file for the web service.
 - b. When the screen refreshes with information from the WSDL file, specify one port for the interaction.

- c. Specify one operation for the interaction and check Process Response if you want the web service to return data to the application during the interaction.
2. Review the contents of the request to the web service in step 2, and modify the request object structure by removing any unnecessary elements.
3. Optional: Review the contents of the response from the web service in step 3, and modify the response object structure by removing any unnecessary elements.
This step is included only if you checked the Process Response option in step 1.
4. To configure the application for the interactions, in step 4 of the process:
 - a. Specify the application that uses the interaction.
 - b. Configure the application binding for the interaction, including the main object, the signature option, the interaction mode, and the user interface components.
 - c. Specify the security groups that are authorized to initiate the interaction.
5. Configure the Request tab of the Interactions window in step 5, including specifying the fields that users can see and whether they can edit them.
6. Optional: Configure the Response tab of the Interactions window in step 6, including specifying the fields that users can see and whether they can edit them.
This step is included only if you checked the Process Response option in step 1.
7. You can map information from the application to the web service in step 7. Mapped information is entered automatically into the request when users start the interaction.
8. Optional: You can map information from the web service to the application in step 8. If you check the Commit Response option, the mapped information is saved automatically to the database.
9. Review the configurations in the final step of the process.

What to do next

To monitor the time it takes to execute the interaction, in the Logging application, set the integration logger to either INFO mode or DEBUG mode.

You can view the interaction and modify mapping information in the Interactions application. If you intend to modify an interaction, select the Deactivate Interaction action before you make any changes and reactivate it after you complete the modification.

API keys application

You use API keys to enable an inbound machine-to-machine integration for an external client. API keys can be used by the OSLC and REST APIs and also can be used as part of the Manage integration framework.

In a machine-to-machine integration, an external machine interacts with Manage data in the Manage system without the use of a browser. API keys are a native form of authentication that do not require an external repository for password storage.

By default, all API keys are encrypted at storage. This setting is controlled by the `mxe.secureapikey` property.

Adding API keys for REST APIs

When an API key is assigned to the external client, the external client can access and interact with data in the Manage system by using the API key as an `apikey` query parameter or an `apikey` request header in REST API calls. REST API calls that use an API key do not create a persistent server connection, and the API key must be part of all REST API requests that the external client makes.

For more information and to use an API key, on the API Keys subtab of the Integration tab of the Administration Work Center, from the Action menu, select API documentation. Select Authorize to use your API key.

To use an API key, go to Integration > API Keys application from the menu.

Using externally created API keys

You can use externally created API keys as an API key in Maximo® Manage. Create this type of API key by using the `MXAPIAPIKEY` REST API and providing your generated API key by using the "apikey" json property, as shown in the following code:

```
POST /oslc/os/mxapiapikey
{
  "apikey": "<outside generated apikey>",
  "expiration": -1
}
```

Security access

As the system administrator, you must synchronize Manage users for the external clients before API keys are created for those clients. The permissions that are associated with the API key are determined by the permissions for the associated user. You can create and configure API keys on the API Keys subtab of the Integration tab of the Administration Work Center. You can create and configure API keys from the API Keys application under Integration.

You also can specify security that enables only the logged-in user to create an API key. To limit the creation of API keys to the logged-in user, go to the System Properties application and filter for the `mxe.apikeyforloggedinuser` property. In the Global Value field, specify 1 and save the record. Select Live Refresh to apply the value immediately.

To disable access to the Manage system for an external client, you can delete the associated API key, but the external client might still access the Manage system by using another configured authentication system. If an API key is compromised, delete the key and create another key for that user.

- [Searching for API keys](#)
You can search for API keys in the API Keys application.

- [Sorting API keys](#)

You can sort API keys in the API Keys application.

- [Adding API keys](#)

When an API key is assigned to the external client, the external client can access and interact with data in the Manage system. The interaction happens by using the API key as an apikey query parameter or an apikey request header in REST API calls. REST API calls that use an API key do not create a persistent server connection, and the API key must be part of all REST API requests that the external client makes.

- [Copying API keys](#)

It is possible to copy an API key value for your use.

- [Deleting API keys](#)

You can delete an API key if necessary.

- [Changing the layout](#)

You can switch between a tile and a tabular layout for the APIs you create.

Searching for API keys

You can search for API keys in the API Keys application.

Procedure

In the API Keys application, specify a string in the Search field.
The search results are displayed based on your search string.

Sorting API keys

You can sort API keys in the API Keys application.

Procedure

In the API Keys application, select a sort criteria from the list.
The API keys are sorted according to the criteria you select.
Tip: Use the up or down arrow to sort in ascending or descending order.

Adding API keys

When an API key is assigned to the external client, the external client can access and interact with data in the Manage system. The interaction happens by using the API key as an apikey query parameter or an apikey request header in REST API calls. REST API calls that use an API key do not create a persistent server connection, and the API key must be part of all REST API requests that the external client makes.

Procedure

1. In the API Keys application, click Add API key +.
2. In the Add API key dialog, select the user the API key is for, in the User field.
3. Specify the token expiry in minutes period using the + and - controls.
4. Click Create.

You can see the API key that you created in the API Keys page.

Copying API keys

It is possible to copy an API key value for your use.

Procedure

In the API Keys application, click Copy key for the API key whose value you want to copy.
A notification is displayed stating that the key is copied to the clipboard.

Deleting API keys

You can delete an API key if necessary.

Procedure

In the API Keys application, click the Delete icon to delete the API you want to remove.

Changing the layout

You can switch between a tile and a tabular layout for the APIs you create.

Procedure

Select the list or the grid icon to toggle between APIs displayed in a table or APIs displayed as tiles.

- [Managing columns](#)
You can add or remove columns to the tabular layout of the existing API keys.
- [Viewing APIs with filters](#)
In the tabular layout of the API Keys page, you can use filters to customize the list displayed and hover over a row to view the copy and delete options.

Managing columns

You can add or remove columns to the tabular layout of the existing API keys.

Procedure

1. In the tabular view of the API Keys page, click the Column Selection icon.
2. Click Manage columns and in the Select value dialog, select the columns that you want to see from the list.
3. Click OK to see the table updated with your column selection.

Viewing APIs with filters

In the tabular layout of the API Keys page, you can use filters to customize the list displayed and hover over a row to view the copy and delete options.

Procedure

Click the Filters icon to see the available filters.

Note: If you add columns using Manage columns, you can see those column headings as filters.
The list of API keys in the table is displayed according to the filters that you select.

Inventory module

You use the applications in the Inventory module to manage your inventory of spare parts. You can maximize the availability of items for upcoming work tasks, and also reduce excess inventory balances and related carrying costs.

The goal is to find a balance of inventory stock. Maintenance work can be performed with minimum delays due to unavailable materials, without keeping seldom used items in stock.

Spare-parts management tasks include the following:

- Track the items that you have in stock
- Identify when stock falls below user-defined reorder points
- Create purchase requisitions and purchase orders to restock items
- Report on items received
- Define items for stocking in your storeroom
- Insert and maintain services that your company requisitions
- Manage information about the tools used to perform work
- Manage existing tools in storerooms
- Keep track of items (stocked, nonstocked, and special order items) and receive indications when stock falls below a specified reorder point so that you know when to reorder
- Perform issues, returns, and transfers
- Build a master list of condition codes for a particular item set
- Add and maintain information about storeroom locations, and view the items stocked within a storeroom
- [Item Master](#)
You use the Item Master application to define items that are stocked in your storerooms. You group these items in an item set that can be shared by the organizations that use the item set.
- [Service items](#)
You use the Service Items application to insert and maintain services that your company requisitions, either on a frequent or infrequent basis.

- **[Tools](#)**
You use the Tools application to manage information about the tools used to perform work. Tools are typically nonconsumable items for which you charge an hourly rate for their use. Examples of tools include air compressors, nail guns, calibration equipment, and heavy equipment such as cranes and excavators.
- **[Stocked Tools](#)**
You use the Stocked Tools application to manage existing tools in storerooms.
- **[Inventory](#)**
You can use the Inventory application to store information about all aspects of inventory materials. You can monitor the storeroom balance of inventory items and tools. You can track the condition of items and the cost of inventory stock, and you can reorder items when stock must be replenished.
- **[Count Books](#)**
You use the Count Books application to select inventory for periodic counting and to record the results of physical counts. You can then reconcile discrepancies between expected and actual quantities.
- **[Inventory Usage](#)**
With the daily use of inventory items and tools, inventory materials must be moved between storerooms to supply the different areas of a site. You use the Inventory Usage application to create inventory usage records that track the issue, transfer, and return of inventory items within and across organizations.
- **[Shipment Receiving](#)**
In a large organization, you can transfer inventory items or tools between storerooms within the same site or across sites and organizations and track their delivery. You create shipment receipt records to acknowledge the receipt of transferred items and update inventory balances at the destination storeroom.
- **[Condition Codes](#)**
You use the Condition Codes application to build the master list of condition codes for a particular item set.
- **[Storerooms](#)**
You use the Storerooms application to add and maintain information about storeroom locations, as well as view the items stocked within a storeroom. You also use this application to associate the general ledger accounts with each storeroom, define the lead time calculation for items in a storeroom, and flag the storeroom to function as an internal supplier to other storerooms.

Item Master

You use the Item Master application to define items that are stocked in your storerooms. You group these items in an item set that can be shared by the organizations that use the item set.

When you create an item record, define the main attributes of the item (such as the commodity codes, the order, and issue units, whether an item is lotted, rotating, or condition-enabled). You can also specify any alternate items that you can use in its place and a list of the condition codes that you want applied to the item. The safety hazards and tax codes that you apply to an item are specific to a single organization.

Use the Item Master application to perform the following tasks for each item:

- Create condition-enabled items to track the value of an item as its condition changes.
- Create item kits that are collections of items that you issue as a single unit.
- Add items to one or more storerooms.
- Specify the safety hazards and tax codes that vary by organization.
- Specify items as consignment items that are considered part of the consignment inventory, and that are paid for when consumed.
- Specify items as tax-exempt.
- Specify the percentage of items that can be received over the amount ordered in the initial agreement.
- Define other information related to an item, such as vendors that carry the item, specifications for the item, and the parts needed to build an item assembly structure.
- Attach outside documents that relate to an item.
- **[Items overview](#)**
When you work with the Items Master application, you work with rotating items, meters, meter groups, item kits, item assembly structures, and item statuses.
- **[Working with master items](#)**
You can add item records, associate items with vendors, add specifications, create item structures, create condition-enabled structures, create item kits, and add alternate items. You can also change the status of the item, duplicate the item, specify organization details, and delete items.

Items overview

When you work with the Items Master application, you work with rotating items, meters, meter groups, item kits, item assembly structures, and item statuses.

- **[Rotating items](#)**
A rotating item is a serialized asset, such as a pump or a notebook, that you define with a common item number. You designate an item as rotating because it shares properties of both items and assets.
- **[Item kits](#)**
An item kit is a group of items that are issued as a single unit. You can assemble an item kit and add the kit to a storeroom as a package of items.
- **[Item assembly structures](#)**
An item assembly structure is a list of parts and subassemblies that you need to build an item or to define the requirements of a location. Use item assembly structures on rotating items and on items in a kit.
- **[Item master statuses](#)**
You can manage the status of an item for all related records. A set of inheritance rules are used to apply changes to an item from a higher level to a lower level. A change to the item status is applied to the organization and to the inventory level. From the organization level, a status change is applied to the inventory level.
- **[Stock category types](#)**
There are three stock category types: non-stocked (NS) items, special order (SP) items, and stocked (STK) items. Using stock category types helps you identify items for reorder and minimizes administration work when ordering occasionally used items.

- **Consignment items**
Consignment items are owned by external vendors. The consignment items are located in a local storeroom, and are considered part of the consignment inventory. You can keep consignment items in your storeroom, and pay for those types of items when you use them.
- **Meters**
You can create meters and associate meters with items. The associated asset or location record is updated with the quantity that was issued and decreases the storeroom balance of that item.
- **Meter groups**
A meter group is a set of meters that you can apply to an asset record. Any meter group that is associated with the rotating item is automatically applied to any assets that are created for that item.
- **Tax-exempt status**
The tax-exempt option indicates whether an item, a tool, or a service is taxable. You might want to set the tax-exempt status, depending on where an item or a service is acquired, and how an item or a service is used.

Rotating items

A rotating item is a serialized asset, such as a pump or a notebook, that you define with a common item number. You designate an item as rotating because it shares properties of both items and assets.

A rotating item can have an inventory value and an issue cost. A rotating item is an inventory item with a generic item number, a current balance, and multiple instances that can be used in various locations around a plant. For example, you might track 10 individual five-horsepower pumps with the single item identifier PUMP-5HP.

A rotating item cannot be consumed, and is maintained as an asset. After creating an item and adding it to a storeroom, you can either use the Assets application to create the asset record for the item you want to track, or create a purchase order for the rotating item and serialize it when you receive it. When you associate an asset with a rotating item, balances can be displayed and tracked for the item. A rotating item is tracked both by its item number in Inventory records and by its asset number in Assets records. An item cannot be both a spare part and a rotating item.

Example of a rotating item

10 notebooks of the same model share the same attributes. All 10 notebooks have the common item number FermionT23. To track each notebook as an individual asset, flag the items as rotating when you create them.

Item kits

An item kit is a group of items that are issued as a single unit. You can assemble an item kit and add the kit to a storeroom as a package of items.

You use the Item tab of the Item Master application to create a kit record for an item. After you create a kit record for an item, you can define the structure of the kit using the Item Assembly Structure tab. You can specify the items that will make up the kit and the quantities of each item to be included.

You can preassemble item kits and issue them to work orders; all cost and balance information are updated on the kit inventory record. The individual items that make up a kit are considered part of the kit. The items are not tracked separately in inventory once you have assembled them into a kit. This means that balances for an item record do not include any instances of that item that are currently part of a kit. When you assemble a kit, the balance of the item kit record is increased, and the current available balance of the components used to construct the item kit is decreased.

Note: when you build the components of the kit, you cannot use items that are flagged as rotating, condition-enabled, or lotted.

The kit can be used to perform a specific task, such as routine maintenance. You can then issue an item kit to a work order using the single item kit record, instead of entering multiple, separate item records. The technicians on a work order use all the components within the kit to perform their work. They can also return any unused components back to a storeroom.

Use the Disassemble Kit action to break an item kit back into its respective components in inventory. Disassembling a kit decreases the balance of the item kit record and increases the balance of the individual kit components in the storeroom.

Considerations when working with item kits

When working with item kits, the following rules apply:

- When adding a kit to a storeroom, if the component items do not exist in the storeroom, inventory records are created for these items.
- You cannot create item kits that contain condition-enabled, rotating, or lotted items.
- You cannot assemble or disassemble item kits across storerooms. You must gather or return items to a single storeroom location.
- You cannot assemble more kits than there are individual parts in the storeroom.

Example of an item kit

A construction company writes several hundred work orders each year to maintain its paving equipment. Most of the jobs associated with the work orders require the same type of labor craft, bill of materials, and tools. If maintaining a steam roller always requires the same six items, create an item record and flag it as a kit. Use the Item Master application to define the list of component items and their quantities.

Item assembly structures

An item assembly structure is a list of parts and subassemblies that you need to build an item or to define the requirements of a location. Use item assembly structures on rotating items and on items in a kit.

You can copy an item assembly structure. You can use the item assembly structure for an existing item as a template and copy it to another item record. If an existing item assembly structure is like what you need, you can save time when compared with creating another item assembly structure.

Specify the item assembly structure on an item record, and use the parent item number associated with the item assembly structure to identify it. While you can use any item as the top level of an item assembly structure, you can apply an item assembly structure to an asset or to an operating location only if you mark the parent item as a rotating item.

Example of an item assembly structure

A five-horsepower motor and its constituent parts are used in 10 rotating asset subassembly structures in a plant. Rather than specifying the component parts on all 10 asset records, you can create the asset records and copy the five-horsepower motor item assembly structure to each record. The item assembly structure is applied to the asset subassembly structure and/or to the spare part. Similarly, you could copy the same item assembly structure to the 10 operating locations in the plant that require the motor and its parts. You can apply item assembly structures to asset and to location records within those respective applications.

Item master statuses

You can manage the status of an item for all related records. A set of inheritance rules are used to apply changes to an item from a higher level to a lower level. A change to the item status is applied to the organization and to the inventory level. From the organization level, a status change is applied to the inventory level.

The following status types are available:

- Pending items are not available when you attempt to record selected general ledger transactions. Items that are in Pending status are not visible from item lookups. This status applies to the following general ledger transactions:
 - Material Use Transactions (MATUSETRANS)
 - Material Receipts Transactions (MATRECTRANS)
 - Inventory Transactions (INVTRANS) except for Insert Item (INSERTITEM)
- Planning items are not available when you attempt to record selected general ledger transactions. This status applies to the following general ledger transactions:
 - MATUSETRANS
 - MATRECTRANS (Issue, Transfer, or Receipt types, only)
- Active items are available without any restrictions.
- Pending Obsolescence items can be used, but cannot replenish existing balances.
- Obsolete items cannot be used in the system, except to generate invoices and for historical purposes. Items that are in Obsolete status are not visible when you are looking up items.

Stock category types

There are three stock category types: non-stocked (NS) items, special order (SP) items, and stocked (STK) items. Using stock category types helps you identify items for reorder and minimizes administration work when ordering occasionally used items.

Non-stocked (NS) items

Items that you do not stock on a regular basis, and that are not automatically reordered. Because an item is sometimes needed, retain the record for the item in the database. The record for the item is useful both for cost tracking purposes and for future reference. For example, the record contains the vendor's name, the price, or other pertinent item-specific information. A non-stocked item can include an item that is needed once a year for inspections, or an item that is stocked during certain seasons of the year. For example, air filters must be replaced once a year. You can keep the record of the item in your database for future replacements.

Special order (SP) items

Items that you order only once, for an unexpected need or for a one-time work order. A special order item is not kept in stock. You do not need a permanent record of the item in your database. In most cases, after the item is received, you can delete the record for the special order item from the database.

Stocked (STK) items

Items that you stock continually because they are frequently needed. A stocked item is the default value for an item added to a storeroom. Stocked items are included in the reorder process. Stocked items have a reorder criteria (for example, a reorder point and an economic order quantity) that is specific to each storeroom location.

Consignment items

Consignment items are owned by external vendors. The consignment items are located in a local storeroom, and are considered part of the consignment inventory. You can keep consignment items in your storeroom, and pay for those types of items when you use them.

When you create an item, you can specify the item as a consignment item. Rotating items and condition-enabled items cannot be flagged as consignment items.

Invoices for consignment items are generated in any of the following ways:

Consumption

An invoice is generated automatically when the item is consumed from the storeroom.

Frequency

If invoices are based on a frequency, then the product-provided cron task (ConsignmentInvoiceCronTask) evaluates consignment items to be processed. The frequency and units specified for the inventory record are used to determine the next invoice date. The cron task is set to run daily, unless you specify another value. A single invoice that contains up to the maximum number of lines is created for each vendor. You use the Organizations application to set the maximum number of lines on consignment invoices.

Manual

You generate an invoice manually.

Meters

You can create meters and associate meters with items. The associated asset or location record is updated with the quantity that was issued and decreases the storeroom balance of that item.

When you associate a meter with an item and issue the item to a work order, to an asset, or to a location, the associated asset or location record is updated with the quantity that was issued and decreases the storeroom balance of that item. This occurs only when the meter on the item matches the meter on the asset or on the location.

Meters can be of the following types:

- Continuous, such as gallons to date or running time meters.
- Gauge, such as temperature readings.
- Characteristic, such as a color or a vibration level.

Example of a continuous meter

You can track fuel consumption for an asset. Define FUEL as a meter and GASOLINE as an item. Use the Item Master application to associate the meter FUEL with the item GASOLINE. When you issue fuel for an asset, such as for a truck, the balance of the fuel in the storeroom is decreased by the amount issued. Use the Meters tab in the Assets application to see that the amount of fuel issued to the truck increases by the amount specified.

Meter groups

A meter group is a set of meters that you can apply to an asset record. Any meter group that is associated with the rotating item is automatically applied to any assets that are created for that item.

Example of a meter group

A pump is a rotating item. On a pump, meters might track inlet pressure, outlet pressure, and vibrations. Meters are common to all pumps that share an item number. Instead of having to add these meters to each asset record created for a rotating item, create a meter group with this collection of pump-related meters and associate it with the rotating item. Each time you create an asset record for the pump, the meter group, and its meters are automatically associated with the asset record.

Tax-exempt status

The tax-exempt option indicates whether an item, a tool, or a service is taxable. You might want to set the tax-exempt status, depending on where an item or a service is acquired, and how an item or a service is used.

The situations under which items or services are tax-exempt vary depending upon your location, and upon current tax regulations. For example, the storeroom for an item might be in a location where sales taxes are not collected. In some cases, if an item becomes part of a product, that item can be tax-exempt. If the item is used as a stand-alone item, then the item is taxable. The buyer for your organization determines the tax-exempt status of items, of tools, and of services.

You can override the tax-exempt status for items, for tools, and for services in the following applications:

- Purchase Requisitions
- Purchase Orders
- Invoices

When you specify the tax-exempt status, you can apply the status at the organization level and at the vendor level.

Working with master items

You can add item records, associate items with vendors, add specifications, create item structures, create condition-enabled structures, create item kits, and add alternate items. You can also change the status of the item, duplicate the item, specify organization details, and delete items.

- [Creating item master records](#)
You can create item records which identify items and contain information associated with items.
- [Creating item assembly structures](#)
You can create item assembly structures that are lists of parts and subassemblies. A structure is needed to build an item or to define the requirements for a

location. Use item assembly structures on rotating items and on items in a kit. You can apply item assembly structures as a template when creating rotating asset records and location records.

- [Adding items to storerooms](#)

You can add items to a single storeroom or to multiple storerooms. An inventory record is created when you add an item to a storeroom.

- [Viewing contracts](#)

You can view the contracts that are associated with an item.

- [Specifying organization details for items](#)

You can specify organization details for items. You can group items in item sets, and multiple organizations can use the item sets. The safety hazards and tax codes that you apply to an item are specific to a single organization. You can also specify the tax-exempt status for the item at the organization level.

- [Creating item kits](#)

An item kit is a group of items that are issued as a single unit. You assemble an item kit and add it to a storeroom as one package of items that carries with it the required costing and balance information. You can define the items that comprise a kit.

- [Associating commodities with contracts](#)

You can associate commodity groups and codes to a contract record to add items for a sale or a purchase as part of the contract. Commodity groups and codes help you categorize and manage contracts and their items and products. You can search for contracts by commodity, report spending on a commodity, and track commodities supplied by specified vendors.

Creating item master records

You can create item records which identify items and contain information associated with items.

About this task

When creating an item record, list the parts that are used interchangeably with the item, and specify any condition codes for the item. You can choose to number items manually or have items automatically numbered.

The first time that you create an item, you can specify the percentage of items that can be received over the amount ordered in the initial agreement. The percentage value is applied to the organization level and to the vendor level. You can subsequently modify the receipt tolerance percentage in the Item/Organization Details window. You can also modify the receipt tolerance percentage in the Purchase Orders application.

Procedure

1. On the toolbar of the Item Master application, click New Item.
2. If the Item field is empty, type a value, and add a description to the Description field.
3. In the Lot Type field, specify whether the item is lotted (LOT or NOLOT).
4. Optional: In the Receipt Tolerance % field, indicate the percentage of items that can be received over the amount specified on the initial agreement.
5. Specify additional fields as needed. An asterisk (*) indicates a required field.
6. Click Save Item to add the item record to the database.

- [Adding alternate items](#)

You can add alternate items to an item record. You designate alternate items when you want to use inventory items interchangeably.

- [Associating items with vendors](#)

You can associate vendors with items to manage a list of vendors that supply an item.

- [Adding specifications to items](#)

You can add specifications that define an item.

Adding alternate items

You can add alternate items to an item record. You designate alternate items when you want to use inventory items interchangeably.

About this task

If you want two items to be alternates for each other, assign each as an alternate for the other. For example, you can assign two different brands of motor oil to be alternates for each other.

Procedure

1. In the Item Master application, display the record to which you want to add an alternate item.
2. In the Alternate Items table window, click New Row to add an alternate item.
3. In the Item field, type a value or click Detail Menu to select an option and to retrieve an alternate item.
4. Enter additional fields as needed, and click Save Item to add the alternate item to the item record.

Associating items with vendors

You can associate vendors with items to manage a list of vendors that supply an item.

Before you begin

Create vendors using the Companies application, and store vendors at the organization level. The list of available vendors is filtered to show only those vendors that are created for the organization and the company set to which you belong. Create a list that includes vendors from whom you have already ordered, as well as vendors that you have not used. You can then use the historical vendor data to compare vendor prices and delivery information.

About this task

You can specify whether a vendor is the default vendor for the item in the organization. You can change the vendor on the work plan or the requisition. Each item in an organization can have one default vendor. You can also specify whether an item is tax-exempt.

Procedure

1. From the List tab of the Item Master application, display the item record with which you want to associate a vendor.
2. Click the Vendors tab to display the vendors that stock the item.
3. In the Vendors window, click New Row.
4. In the Vendor field, type a value.
5. In the Promised Lead Time (Days) field, specify the number of days it takes the vendor to supply the item.
6. Enter additional fields as needed. An asterisk (*) indicates a required field.
7. Optional: Select the Default Vendor check box if the vendor is the default vendor for this item. If you select the Default Vendor check box, when you add the item to a work plan as a direct issue item or create a requisition for the item, the information for the default vendor and details about the item (such as make, model, catalog code, and unit cost) are copied to the requisition.
8. Optional: Select the Tax Exempt check box if you want the item to be tax-exempt.
9. Optional: Click New Row to specify additional vendors.
10. Click Save Item to associate the vendors to the item record.

Adding specifications to items

You can add specifications that define an item.

About this task

Use the Specifications tab to classify an item and to apply the template that is associated with the classification you used. Specification templates contain attributes about an item, such as the size, the speed, the material, and the capacity. Use this list of attributes to define specific information about an item, making it easier to distinguish an item from a similar item.

Procedure

1. Use the Item Master application to display the item record to which you want to add specifications.
2. Click the Specifications tab, and in the Classification field, click Detail Menu and then Classify to select a classification path for the item.
3. In the Alphanumeric field or in the Numeric field, type a value.
4. In the Unit of Measure field, type a value or click Select Value to retrieve the unit of measure used to express the attribute. For example, if the attribute is SPEED, the unit of measure can be HP (horsepower).
5. Click Save Item to associate the specification values with the record for the item. If you need to change the specifications for an item, either reclassify the item using the Classification field or change the values in the Specifications table.

Creating item assembly structures

You can create item assembly structures that are lists of parts and subassemblies. A structure is needed to build an item or to define the requirements for a location. Use item assembly structures on rotating items and on items in a kit. You can apply item assembly structures as a template when creating rotating asset records and location records.

About this task

When you create an item assembly structure for an item, the following rules apply:

- If the parent item is a rotating item, add either rotating or non-rotating items to the item assembly structure.
- If the parent item is a non-rotating item, add other non-rotating items only to the item assembly structure. Rotating items cannot be added to the item assembly structure if the parent item is not a rotating item.
- If a rotating item is applied to an item assembly structure, any child rotating items become part of the parent rotating item and do not have their own inventory balance.
- If the item assembly structure is for an item kit, do not include rotating items or condition-enabled items.

Procedure

1. From the List tab of the Item Master application, display the item record for which you want to create an item assembly structure.
2. From the Item Assembly Structure tab, click New Row to open the Children window.

3. In the Item field, specify a value.
4. Optional: Change the number in the Quantity field.
5. Optional: Type remarks for this item in the Remarks field.
6. Optional: Click New Row to add another item.
7. Click Save Item to associate the item assembly structure with the item record.

What to do next

By using the Move To action to change the Current Level item, you can also traverse up and down the hierarchy, viewing item assembly structures that are nested within other item assembly structures. The Children window shows the item assembly structure of the item listed as the current item. The Move To action does not work unless an item has an item assembly structure associated with it.

- [Viewing nested item assembly structures](#)

You can change the Current® Level item and traverse up and down the hierarchy, viewing item assembly structures that are nested within other item assembly structures. The Children window shows the item assembly structures for the item listed as the current item.

Viewing nested item assembly structures

You can change the Current® Level item and traverse up and down the hierarchy, viewing item assembly structures that are nested within other item assembly structures. The Children window shows the item assembly structures for the item listed as the current item.

Before you begin

The Move To action does not work unless an item has an item assembly structure associated with it.

Procedure

1. From the List tab of the Item Master application, display the item record for which you want to view nested item assembly structures.
2. From the Item Assembly Structure tab, click View Details to expand the row.
3. In the Item field, click Detail Menu and select Move To. The item moves to the Current Level field, and the children display in the table.
4. The Belongs To field indicates the item to which the current item belongs. To move back up the hierarchy, click Detail Menu in the Belongs To field, and select Move To. The parent moves up to the Current Item field, and its children display in the table.

Adding items to storerooms

You can add items to a single storeroom or to multiple storerooms. An inventory record is created when you add an item to a storeroom.

About this task

To track the balance for the item, specify the unit of measure that is used for issuing the item. When you add an item to a storeroom, the inventory control account, the shrinkage cost account, and the inventory cost adjustment account default to the values that are specified in the storeroom record. For consignment items, the account values that are specified in the company record for the consignment vendor are used. Use the Inventory application to show these account fields and to edit them on the inventory record so that you can make the accounts specific to an item and to a location.

In the Organizations application, in the Item Options dialog box, an administrator can limit the number of items that can be created in the inventory at once.

Procedure

1. In the Item Master application, select an item or items.
2. Add items to a storeroom or storerooms:

Option	Steps
<p>Add items to a single storeroom.</p>	<ol style="list-style-type: none"> a. Select the Add Items To Storeroom action. b. Optionally, change the Site for the storeroom. c. In the Storeroom field, specify a value, and click OK. d. In the second dialog box that opens, specify an issue unit and issue cost type for each item. e. If the Item is a consignment type of item, expand the Details section for the item, and select the Consignment check box. <ul style="list-style-type: none"> • In the Consignment Vendor field, specify the company that provides the item that invoices are generated for. • In the Invoice Generation Type field, specify the type of invoice to be generated. If you select FREQUENCY as the invoice type, specify a value for the frequency, and a value for the frequency units. If values for the frequency and frequency units are specified, the next invoice date defaults to the current date and time. You can select a different date for the next invoice date.
<p>Add items to multiple storerooms.</p>	<ol style="list-style-type: none"> a. Select the Add Items to Multiple Storerooms action. b. Specify a site or, if your organization configured storeroom hierarchies, specify the top storeroom in the hierarchy. c. Click Refresh, select the storerooms that you want to add the items to, and click OK. d. In the second dialog box that opens, specify default values for the selected storerooms and click Apply to Selected. e. Optionally, select the Run Storeroom Update in the Background check box and specify an email. When inventory records are created in the background, you can continue to work in the user interface and receive an email when the creation is complete.

3. Click OK to create the inventory records.

Viewing contracts

You can view the contracts that are associated with an item.

Procedure

1. From the List tab of the Item Master application, display the item record whose contracts you want to view.
2. On the Vendors tab, select the View Contracts action.
3. Use the Filter area to narrow the list of contracts that you want to display in the table. For example, specify a contract number, a contract type, or a status and then click Filter Table.
4. Click OK when you are done viewing the contracts.

Specifying organization details for items

You can specify organization details for items. You can group items in item sets, and multiple organizations can use the item sets. The safety hazards and tax codes that you apply to an item are specific to a single organization. You can also specify the tax-exempt status for the item at the organization level.

Before you begin

After creating an item, use the Item Master application to add, to view, to modify, or to delete the information that applies to an organization.

Procedure

1. From the List tab of the Item Master application, select the item to which you want to add organizational details.
2. Click the Item tab to view the record for the item that you selected.
3. Select the Item/Organization Details action.
4. In the Items/Organization Details window, select the organization to which you want to add organizational details.
5. Optional: Add a safety hazard.
6. Optional: Add a tax code.
7. Optional: Specify whether the item is tax-exempt.
8. Optional: Modify the percentage of items that can be received over the quantity ordered. The receipt tolerance percentage value was set when the item record was created.
9. Click OK and click Save Item.

Creating item kits

An item kit is a group of items that are issued as a single unit. You assemble an item kit and add it to a storeroom as one package of items that carries with it the required costing and balance information. You can define the items that comprise a kit.

Procedure

1. On the toolbar of the Item Master application, click New Item.
2. On the Item tab, specify a value, and type a description.
3. Select the Kit check box to indicate that this item is a kit.
4. Enter additional fields as needed. An asterisk (*) indicates a required field.
5. To add items to the kit, from the Item Assembly Structure tab, click New Row to open the Children window.
6. In the Item field, type a value. You can only add items that are not condition-enabled, rotating, or lotted.
7. Optional: Change the number in the Quantity field.
8. Optional: Type remarks for this item in the Remarks field.
9. Optional: Click New Row to add another item.
10. Click Save Item to add the new item record to the database.

Associating commodities with contracts

You can associate commodity groups and codes to a contract record to add items for a sale or a purchase as part of the contract. Commodity groups and codes help you categorize and manage contracts and their items and products. You can search for contracts by commodity, report spending on a commodity, and track commodities supplied by specified vendors.

About this task

You can associate or remove any commodities on a contract that has a waiting for approval (WAPPR) or draft (DRAFT) status.

Procedure

1. In a contract application, display the record that you want to update.
2. Select the Associate Commodities action.
3. In the Commodity Groups table window, click Select Commodity Groups.
4. Choose the commodity groups by selecting the corresponding Commodity Group check boxes.
5. Click OK.
The selected commodity groups are added in the Commodity Groups table window.
6. In the Commodity Codes for Commodity Group table window, click Select Commodity Codes.
7. Choose the commodity codes by selecting the corresponding Commodity Codes check boxes.
8. Click OK.
The selected commodity codes are added in the Commodity Codes for Commodity Group table window.
9. Click OK to close the Associate Commodities window.

Service items

You use the Service Items application to insert and maintain services that your company requisitions, either on a frequent or infrequent basis.

The Service Items application allows you to create service item records and to view or manage a list of vendor companies that supply the service item.

- [Service items overview](#)
Service items are services that your company requisitions, such as grounds maintenance or plant security. You can prorate service items, set status for service items, create measurement units, and maintain service items as part of the item set.
- [Working with service items](#)
You can create service items, associate general ledger accounts with service items, change the status of a service item, view a service item on a work order, and create units of measurement.

Service items overview

Service items are services that your company requisitions, such as grounds maintenance or plant security. You can prorate service items, set status for service items, create measurement units, and maintain service items as part of the item set.

- [Prorated service items](#)
Adding service items to the cost of a particular item increases the stocked item average cost. To avoid this increase, you can add the service item to issue on receipt items only.
- [Service item statuses](#)
You can manage the status for a service item for all related records. The system uses a set of inheritance rules to apply changes to a service item from a higher level to a lower level. In the Service Item application, a change to a service item status is applied to the organization level.
- [Tax-exempt status](#)
The tax-exempt option indicates whether an item, a tool, or a service is taxable. You might want to set the tax-exempt status, depending on where an item or a service is acquired, and how an item or a service is used.
- [Measurement units and conversion factors](#)
A unit of measure describes the quantity used to measure an item, tool, or a service. You use a unit of measure to measure the items and services that you order, issue, and transfer. Examples of units of measure include EACH, CASE, IN (inches), and ROLL.
- [Item sets](#)
Item sets let multiple organizations within a company view and choose from a common set of items stocked in the storeroom. An organization can be associated with only one item set. However, multiple organizations can use the same item set.

Prorated service items

Adding service items to the cost of a particular item increases the stocked item average cost. To avoid this increase, you can add the service item to issue on receipt items only.

Items issued directly to a work order, general ledger account, location, or asset have the service item added to the cost of the individual item only.

This option is set up in the Organizations application.

Service item statuses

You can manage the status for a service item for all related records. The system uses a set of inheritance rules to apply changes to a service item from a higher level to a lower level. In the Service Item application, a change to a service item status is applied to the organization level.

The following status types are available:

- **Pending** - Service items are not available when you try to record selected general ledger transactions. Service items in pending status are not visible from service item lookups. This status applies to the following general ledger transactions: material use (MATUSETRANS), material receipts (MATRECTRANS), inventory (INVTRANS), except for insert item (INSERTITEM).
- **Planning** - Service items are not available when you try to record selected general ledger transactions. This status applies to the following general ledger transactions: material use (MATUSETRANS), material receipts (MATRECTRANS) for issue, transfer, or receipt types, only.
- **Active** - These service items are available for full system capabilities.
- **Pending Obsolescence** - You can use any existing service items, but cannot replenish existing balances.
- **Obsolete** - You cannot use these service items, except to generate invoices. Obsolete items are not visible from service item lookups.

Tax-exempt status

The tax-exempt option indicates whether an item, a tool, or a service is taxable. You might want to set the tax-exempt status, depending on where an item or a service is acquired, and how an item or a service is used.

The situations under which items or services are tax-exempt vary depending upon your location, and upon current tax regulations. For example, the storeroom for an item might be in a location where sales taxes are not collected. In some cases, if an item becomes part of a product, that item can be tax-exempt. If the item is used as a stand-alone item, then the item is taxable. The buyer for your organization determines the tax-exempt status of items, of tools, and of services.

You can override the tax-exempt status for items, for tools, and for services in the following applications:

- Purchase Requisitions
- Purchase Orders
- Invoices

When you specify the tax-exempt status, you can apply the status at the organization level and at the vendor level.

Measurement units and conversion factors

A unit of measure describes the quantity used to measure an item, tool, or a service. You use a unit of measure to measure the items and services that you order, issue, and transfer. Examples of units of measure include EACH, CASE, IN (inches), and ROLL.

A conversion factor represents the numeric value or ratio that is used to relate one unit of measure to another. The conversion factor is an alternate value that is used to represent a unit of measure. You can use this alternate value to define an item order or transfer quantity and storeroom balance.

Before adding items to storerooms, you must first define the of units of measure, and then define the conversion ratios for those units. You can delete a unit of measure only when the asset management system is not using it in a conversion, on a specification template, or on a meter record. You can delete a conversion factor at any time. If a transaction is processed that used the conversion you deleted, you are prompted to enter a new conversion to finish the transaction.

You can add and modify units of measure and conversion factors in the following applications:

- Purchase Orders
- Purchase Requisitions
- Receiving
- Item Master
- Service Items
- Tools
- Stocked Tools
- Inventory

Example of conversion factor use

When you receive an item, the system takes the received order unit value along with the storeroom issue unit and checks for an existing conversion. When all receipt lines pass validation, the system receives the items and adjusts the storeroom balances accordingly. If an item does not exist in the receiving storeroom, the system creates an inventory record for the item and sets the issue unit equal to the received unit.

You order light bulbs in bulk and the unit of measure is a case, with a quantity received of 36. However, when you issue the item, you issue it one at a time. In this case, you can define a measure unit of CASE and another measure unit of EACH. You define a conversion ratio from CASE to EACH with a factor of 36. When you receive an order of bulbs into a storeroom, the received order unit of one CASE is converted into the storeroom issue unit of 36 EACH.

Item sets

Item sets let multiple organizations within a company view and choose from a common set of items stocked in the storeroom. An organization can be associated with only one item set. However, multiple organizations can use the same item set.

You identify an item set with a unique name or number, and each item that belongs to the item set has a unique item number.

When you create an organization, you associate an item set to it. When you create an item, by default the item is placed into the item set associated with the organization for your default insert site.

Working with service items

You can create service items, associate general ledger accounts with service items, change the status of a service item, view a service item on a work order, and create units of measurement.

- **[Creating service items](#)**
You use the Service Items application to create a service item record. A service item record identifies the item, lets you associate information with an item, and view or manage a list of vendor companies that supply service items.
- **[Specifying organization details for service items](#)**
You can specify organization details for service items. Typically, general ledger accounts and tax codes are specific to a single organization. In the Service Items application, you can identify the default general ledger account used in the purchasing process for this service, if no other charging entity is specified (such as a work order, a location, and so on).
- **[Changing the status of service items](#)**
The status of a service item can help you implement and enforce policies related to record creation and modification. You can change the status of a service item and apply that change to its dependent records.
- **[Reordering direct issue items and services](#)**
You can reorder direct issue items and services that are listed on approved work orders and are issued without being received into inventory.
- **[Creating units of measure](#)**
You can create a unit of measure to describe the quantity used to measure an item, tool, or a service. You use a unit of measure to measure the items and services that you order, issue, and transfer in the asset management system. Examples of units of measure include EACH, CASE, IN (inches), and ROLL.
- **[Creating conversion factors](#)**
You can create a conversion factor to define the numeric value or ratio that the asset management system uses to relate one unit of measure to another. The conversion factor is an alternate value that is used to represent a unit of measure. You can use this alternate value to define an item order or transfer quantity and storeroom balance.
- **[Creating commodity groups](#)**
You can create a commodity group to identify a grouping of items, tools, or services. A commodity group contains a grouping of individual commodity codes. Classifying items, tools, services with commodity groups and commodity codes provides a way for you to analyze spending by product type. You first define a commodity group and then add and associate individual commodity codes to the group.
- **[Copying service items](#)**
You can use the Duplicate Service Item action to create a copy of an existing service item. Once you copy a service item, you can then change it as needed.

Creating service items

You use the Service Items application to create a service item record. A service item record identifies the item, lets you associate information with an item, and view or manage a list of vendor companies that supply service items.

Procedure

1. In the Service Items application, click the New Service Item icon.
2. Enter information in the Service Item field, Description field, Commodity Group field, and Commodity Code field.
3. Optional: If the service item is not taxable, select the Tax Exempt check box. The buyer for your organization determines the tax-exempt status of service items.
4. Optional: In the Receipt Tolerance % field, specify the percentage of service items that can be received over the amount ordered in the initial agreement. The percentage value is applied to the organization level and to the vendor level.
5. Optional: If you want to prorate the cost of the service item on purchase requisitions, purchase orders, and invoice lines, select the Prorate check box. You can add costs only to items that are issued on receipt.
6. Optional: If you want to require an inspection of the service item, select the Inspection Required check box.
7. In the Vendor field, select a value.
8. Optional: Complete additional fields.
9. Save your changes.

Specifying organization details for service items

You can specify organization details for service items. Typically, general ledger accounts and tax codes are specific to a single organization. In the Service Items application, you can identify the default general ledger account used in the purchasing process for this service, if no other charging entity is specified (such as a work order, a location, and so on).

Before you begin

After creating an item, use the Service Items application to add, to view, to modify, or to delete the information that applies to an organization.

Procedure

1. On the List tab of the Service Items application, display the service item to which you want to add organizational details.
2. Click the Service tab.
3. Select the Service Item/Organization Details action.
4. In the Service Item/Organization Details window, specify the general ledger account for the service item.

5. Enter the tax code associated with the service item and organization.
6. Optional: Specify whether the service item is tax-exempt.
7. Optional: Modify the percentage value of service items that can be received over the quantity ordered. The percentage value was set when the service item record was created.
8. Click OK to enter or update the service item.

Changing the status of service items

The status of a service item can help you implement and enforce policies related to record creation and modification. You can change the status of a service item and apply that change to its dependent records.

Procedure

1. In the Service Items application, select the service item for which you want to change the status.
2. Click Change Status. The statuses that are available depend on the status of the service item.
3. Optional: If you want the system to pass the status change to dependent records, select the Roll New Status to Organizations check box. By default, this check box is not selected unless you choose obsolete status.
4. Click OK to change the status.

Reordering direct issue items and services

You can reorder direct issue items and services that are listed on approved work orders and are issued without being received into inventory.

Procedure

1. In the Service Items application, display the direct issue item or service that you want to reorder.
2. Click the Service tab.
3. Select the Reorder > Reorder Direct Issue Items/Svcs action.
4. Optional: In the Reorder Direct Issue Items and Services window, select one of the following options:
 - Select the Consider Contracts When Creating PRs/POs check box for existing contracts to be considered when deciding reorder vendors and price.
 - In the Additional Lead Time (Days) field, enter a value.
5. Click one of the following options:

Option	Description
Run Reorder	<ul style="list-style-type: none"> • In the Reorder Results window, you view information about the number of items ordered and the purchase order and purchase requisition identifiers of the new purchasing records. • Optional: You can run a report or reorder items.
Preview	<ul style="list-style-type: none"> • In the Reorder Items Detail window, you view order details for the items that you are reordering and edit order amounts.

6. Click OK.
- [Viewing items or services for approved work orders](#)
You can view items or services that are listed on approved work orders and are issued without being received into Inventory.

Viewing items or services for approved work orders

You can view items or services that are listed on approved work orders and are issued without being received into Inventory.

Procedure

1. In the Service Items application, display the service item that you want to view.
2. Click the Service tab.
3. Select the Reorder > Reorder Direct Issue Items/Svcs action.
4. In the Reorder Direct Issue Items and Services window, click Preview.
You can view order details for the items that you are reordering. You also can edit order amounts, run a report, or reorder items from this window.
5. Optional: Clear the Run in Background Mode check box and click Run Reorder.
6. Click OK.

Creating units of measure

You can create a unit of measure to describe the quantity used to measure an item, tool, or a service. You use a unit of measure to measure the items and services that you order, issue, and transfer in the asset management system. Examples of units of measure include EACH, CASE, IN (inches), and ROLL.

About this task

A unit of measure works with a conversion factor. The conversion factor represents the numeric value or ratio that the asset management system uses to relate one unit of measure to another. You can create units of measure and conversion factors in many applications:

- Assets
- Purchase Orders
- Purchase Requisitions
- Receiving
- Item Master
- Meters
- Service Items
- Tools
- Stocked Tools
- Inventory

You can delete a unit of measure only when it is not used in a conversion, on a specification template, or on a meter record.

Procedure

1. Open an application.
2. Select the Unit of Measure and Conversion > Add/Modify Units of Measure action.
3. Insert a row.
4. In the Unit of Measure field, specify an identifier for the unit of measure.
5. Optional: Enter values in the following fields:
 - Abbreviation
 - DescriptionThe abbreviation value along with an asset classification is used to create descriptions for assets, locations, and items.
6. Click OK.

Creating conversion factors

You can create a conversion factor to define the numeric value or ratio that the asset management system uses to relate one unit of measure to another. The conversion factor is an alternate value that is used to represent a unit of measure. You can use this alternate value to define an item order or transfer quantity and storeroom balance.

Before you begin

You must define the units of measure before you can create conversion ratios.

About this task

You can create units of measure and conversion factors in the following applications:

- Purchase Orders
- Purchase Requisitions
- Receiving
- Item Master
- Service Items
- Tools
- Stocked Tools
- Inventory

Procedure

1. Open an application.
2. Select the Unit of Measure and Conversion > Add/Modify Conversions action.
3. Click New Row.
4. Enter values in the following fields:

Option	Description
From Unit of Measure	The original unit of measure value that you are converting from in the conversion factor calculation.
To Unit of Measure	The unit of measure value that you are changing or replacing in the conversion factor calculation.
Conversion Factor	The ratio that is applied to relate one unit of measure to another.
5. Optional: In the Item Number field, enter the item number that is associated to the conversion.
6. Click OK.

Creating commodity groups

You can create a commodity group to identify a grouping of items, tools, or services. A commodity group contains a grouping of individual commodity codes. Classifying items, tools, services with commodity groups and commodity codes provides a way for you to analyze spending by product type. You first define a commodity group and then add and associate individual commodity codes to the group.

About this task

Once you have defined commodities you can associate them with company, contract, and item records. You can also associate commodities with individual purchase order or requisition lines for items, service items, or tools that do not have commodity codes assigned to them, including special order materials or services.

You can create commodity groups and codes in the following asset management system applications:

- Companies
- Item Master
- Purchase Orders
- Service Items
- Tools

Procedure

1. Open an application.
2. Select the Add/Modify Commodity Codes action.
3. In the Commodity Groups table window, click New Row.
4. In the Commodity Group field, enter an identifier for the commodity group.
5. Specify whether you want a service type item or service level agreement to use this commodity group.

Option	Service
Use commodity group	Selected
Do not use commodity group	Cleared

6. In the Commodity Codes for Commodity Group table window, click New Row.
7. In the Commodity Code field, enter an identifier for the commodity.
8. Specify whether you want a service type item or service level agreement to use this commodity code.

Option	Service
Use commodity code	Selected
Do not use commodity code	Cleared

9. Click OK.

Copying service items

You can use the Duplicate Service Item action to create a copy of an existing service item. Once you copy a service item, you can then change it as needed.

Procedure

1. In the Service Items application, display the service item that you want to copy.
2. Click the Service tab.
3. Select the Duplicate Service Item action to copy the service item.

Tools

You use the Tools application to manage information about the tools used to perform work. Tools are typically nonconsumable items for which you charge an hourly rate for their use. Examples of tools include air compressors, nail guns, calibration equipment, and heavy equipment such as cranes and excavators.

When you create a tool record, you define the main attributes of the tool (such as commodity codes, issue unit, whether the tool is lotted or rotating), along with any alternate tools that can be used in its place and a list of the qualifications necessary for a person to use the tool. All tools are marked as capitalized.

Tools are defined at the Item set level, so several organizations can share a tool set. Some of the data on a tool record can be specific to an organization or site. For example, the storerooms for a tool are managed at the site level. Vendors for a tool are managed at the organization level.

In the Tools application, you can perform the following tasks:

- Catalog tools in an item set, which can then be shared by organizations that use the item set.
- Add the tool to one or more storerooms.
- Use the tool on job plans and work orders (when you use a tool on a work order, the tool can be reserved in the specified storeroom).
- Issue, receive, and transfer tools from storerooms.
- Specify the tool rate, general ledger accounts, associated vendor, tax-exempt status, and tax codes that vary by organization.
- Specify the percentage of tools that can be received over the quantity ordered in the initial agreement. The percentage value is applied to the organization level and to the vendor level when the tool record is created.
- Add a list of vendors that carry the tool.
- List the specification for the tool.
- Copy or delete a tool.
- Attach external documents that relate to the tool.

- [Tools overview](#)

When managing tools, you need to have an understanding of tool statuses and rotating tools.

- [Working with tools](#)

Tool records are a type of item record, so they can be managed in the same way that items are managed. They can be tracked in inventory, reserved in storerooms, charged to work orders, and so on. Tools can be owned by your company or leased from a vendor.

Tools overview

When managing tools, you need to have an understanding of tool statuses and rotating tools.

- [Tool statuses](#)

You can manage a tool's status for all related records. A set of inheritance rules is used to apply status changes from a higher level to a lower level.

- [Rotating tools](#)

A rotating tool is an individual serialized asset, such as a nail gun or back hoe, that is defined by a common tool number. You mark a tool as rotating because it shares the same properties as an asset and you want to track each instance of that tool as an asset to monitor maintenance costs, downtime, etc.

- [Tax-exempt status](#)

The tax-exempt option indicates whether an item, a tool, or a service is taxable. You might want to set the tax-exempt status, depending on where an item or a service is acquired, and how an item or a service is used.

Related tasks

- [Working with tools](#)

Tool statuses

You can manage a tool's status for all related records. A set of inheritance rules is used to apply status changes from a higher level to a lower level.

In the Tools application, a tool status change is applied to the organization level. From the organization level, a status change is applied to the inventory level.

The following list describes tool statuses:

- Pending - Pending items are not available when you try to record selected general ledger transactions, and are not visible from tool lookups. This status applies to the following general ledger transactions:
 - Material use transactions (MATUSETRANS)
 - Material receipts transactions (MATRECTRANS)
 - Inventory transactions (INVTRANS), except for insert item (INSERTITEM)
- Planning - Planning items are not available when you try to record selected general ledger transactions. This status applies to the following general ledger transactions:
 - Material use transactions
 - Material receipts transactions (only issue, transfer, or receipt types)
- Active - Active items are available without restrictions.
- Pending obsolescence - This status indicates that you can use existing items, but cannot replenish existing balances.
- Obsolete - You can use obsolete items only to generate invoices. Obsolete items are not visible from tool lookups.

Rotating tools

A rotating tool is an individual serialized asset, such as a nail gun or back hoe, that is defined by a common tool number. You mark a tool as rotating because it shares the same properties as an asset and you want to track each instance of that tool as an asset to monitor maintenance costs, downtime, etc.

For example, you may have ten air compressors of the same model that share the same attributes, and they are all known by the common tool number Fermion-AC23. However, you want to be able to track each one as an individual asset, so you mark the tool as rotating.

After creating the tool and adding it to a storeroom, you can either use the Assets application to create the asset records for each individual tool you wish to track, or create a purchase order for the rotating tool and serialize it when you receive it. Once you have associated an asset to a rotating tool, the system can display and track balances for this tool. A rotating tool is tracked both by its tool number in Stocked Tool records and by its unique asset number in Assets records.

Tax-exempt status

The tax-exempt option indicates whether an item, a tool, or a service is taxable. You might want to set the tax-exempt status, depending on where an item or a service is acquired, and how an item or a service is used.

The situations under which items or services are tax-exempt vary depending upon your location, and upon current tax regulations. For example, the storeroom for an item might be in a location where sales taxes are not collected. In some cases, if an item becomes part of a product, that item can be tax-exempt. If the item is used as a stand-alone item, then the item is taxable. The buyer for your organization determines the tax-exempt status of items, of tools, and of services.

You can override the tax-exempt status for items, for tools, and for services in the following applications:

- Purchase Requisitions
- Purchase Orders

- Invoices

When you specify the tax-exempt status, you can apply the status at the organization level and at the vendor level.

Working with tools

Tool records are a type of item record, so they can be managed in the same way that items are managed. They can be tracked in inventory, reserved in storerooms, charged to work orders, and so on. Tools can be owned by your company or leased from a vendor.

- [Adding tools](#)
A tool record defines a tool and allows you to associate information with the tool. Tools are used to perform work, such as building, maintenance, and repairs.
- [Adding tools to storerooms](#)
When you add a tool to a storeroom, you can indicate that the tool is stored at this location. Tool balances are tracked in the Stocked Tools application.
- [Associating vendors with tools](#)
To manage a list of vendors that supply tools, you can associate vendors with specific tools.
- [Changing the status of tools](#)
Tool item statuses allow you to implement and enforce policies related to record creation and modification.
- [Changing the organization details of tools](#)
Tools are grouped into item sets that multiple organizations can use. However, the hourly tool rates, general ledger accounts, and tax codes that you apply to a tool are specific to a single organization.
- [Copying tool records](#)
If you need to create a tool that has similar attributes to another tool that exists, you can copy the existing tool record and reuse information as needed.
- [Creating units of measure](#)
You can create a unit of measure to describe the quantity used to measure an item, tool, or a service. You use a unit of measure to measure the items and services that you order, issue, and transfer in the asset management system. Examples of units of measure include EACH, CASE, IN (inches), and ROLL.
- [Creating commodity groups](#)
You can create a commodity group to identify a grouping of items, tools, or services. A commodity group contains a grouping of individual commodity codes. Classifying items, tools, services with commodity groups and commodity codes provides a way for you to analyze spending by product type. You first define a commodity group and then add and associate individual commodity codes to the group.

Related concepts

- [Tools overview](#)

Adding tools

A tool record defines a tool and allows you to associate information with the tool. Tools are used to perform work, such as building, maintenance, and repairs.

About this task

When you add a tool record, you can list other tools that are interchangeable with this tool and qualifications that a person needs to use the tool.

Procedure

1. In the Tools application, click New Tool.
 2. Optional: If the Tool field is blank, enter a value.
 3. Enter an item description and lot type.
 4. Optional: Complete the remaining fields to further define the tool.
 5. Save your changes.
- [Adding alternate tools](#)
You can add alternate tools to a tool record. You can add a list of alternate tools that can be used to perform the same work if a shortage of a particular tool were to occur.
 - [Adding qualifications for tools](#)
You can add qualifications to a tool record if there are certain skills or certifications that a person needs to use the tool.
 - [Classifying tools](#)
You can classify tools to make it easier to distinguish a tool from similar tools. Attributes that you can use include size, speed, material, and capacity.

Adding alternate tools

You can add alternate tools to a tool record. You can add a list of alternate tools that can be used to perform the same work if a shortage of a particular tool were to occur.

About this task

If you want two tools to be alternates for each other, you must assign each as an alternate for the other.

Procedure

1. In the Tools application, open an existing tool record.
2. On the Tool tab, insert a row.
3. In the Tool field, specify a value.
4. Save your changes.

Adding qualifications for tools

You can add qualifications to a tool record if there are certain skills or certifications that a person needs to use the tool.

Before you begin

You create qualifications in the Qualifications application, and store qualifications at the organization level.

Procedure

1. In the Tools application, open a tool record.
2. From the Tool tab, click New Row.
3. In the Qualification field, specify a qualification.
4. Save your changes.

Classifying tools

You can classify tools to make it easier to distinguish a tool from similar tools. Attributes that you can use include size, speed, material, and capacity.

About this task

Classifying tools also helps you search for them quickly. If you do not remember a tool number, you can use a classifications search. While working with work orders, job plans, and on purchasing lines, you can use the Detail Menu in the Tool field to view classifications, attributes, and associated tools.

Procedure

1. In the Tools application, open a tool record.
2. Click the Specifications tab.
3. In the Classifications field, click Detail Menu and then Classify to select a classification path for the tool.
4. In the Alphanumeric field or Numeric field, specify a value for the tool.
5. Specify a value for the measure unit used to express the attribute.
For example, if the attribute is SPEED, the unit of measure can be MPH, for miles per hour.
6. Save your changes.

What to do next

If you need to change a tool's specification, reclassify the tool from the Classification field or change the values in the Specifications table.

Adding tools to storerooms

When you add a tool to a storeroom, you can indicate that the tool is stored at this location. Tool balances are tracked in the Stocked Tools application.

About this task

To track the balance of a tool, you must specify the unit of measure in which the tool is issued.

Procedure

1. In the Tools application, select a tool.
2. Select the Add Tools To Storeroom action.
3. In the Storeroom field, specify a storeroom location.
4. Optional: Change the site for the storeroom.
5. Click OK.
6. Optional: Specify a default bin, current balance, and issue unit.
7. Click OK.

Associating vendors with tools

To manage a list of vendors that supply tools, you can associate vendors with specific tools.

Procedure

1. In the Tools application, open a tool record.
2. Click the Vendors tab to display the vendors that stock the tool.
3. In the Vendors table window, insert a row and specify a vendor.
4. In the Promised Lead Time (Days) field, enter the number of days it takes the vendor to supply the tool.
5. Optional: Complete the remaining fields to further define the vendor.
6. Save your changes.

Changing the status of tools

Tool item statuses allow you to implement and enforce policies related to record creation and modification.

About this task

Status changes are applied to the organization level. From the organization level, a status change is applied to the inventory level.

Procedure

1. In the Tools application, select the tool for which you want to change the status.
2. In the toolbar, click the Change Status icon.
The statuses that are available to you depend on the status of the tool.
3. Optional: If you want to apply the status change to lower-level records, select the Roll New Status to Organizations and Inventory check box.
4. Save your changes.

Changing the organization details of tools

Tools are grouped into item sets that multiple organizations can use. However, the hourly tool rates, general ledger accounts, and tax codes that you apply to a tool are specific to a single organization.

Procedure

1. In the Tools application, open a tool record.
2. Select the Tool/Organization Details action.
3. If you selected the Outside check box on the Tool tab to indicate that an external vendor supplied the tool, you can add the vendor company in the Outside Vendor field of the Tools/Organization Details window.
When you associate a vendor to a tool at the organizational level, the control account number for the vendor defaults to the Control Account field. If the tool is not supplied by an outside vendor, the control account defaults from the tool control account for the organization.
4. In the Tool Rate field, specify the hourly rate that is charged to job plans, work order plans, and work order actuals when the tool is used.
5. Optional: Specify values for the general ledger account, and the tax code.
6. Optional: Specify whether the tool is tax-exempt.
7. Optional: Modify the percentage of tools that can be received over the quantity ordered. The percentage value was set when the tool record was added.
8. Click OK.
9. Save your changes.

Copying tool records

If you need to create a tool that has similar attributes to another tool that exists, you can copy the existing tool record and reuse information as needed.

Procedure

1. In the Tools application, open a tool record.
2. Select the Duplicate Tool action.
3. Enter information for the tool and a description of the tool.
4. Optional: Change other fields.
5. Save your changes.

Creating units of measure

You can create a unit of measure to describe the quantity used to measure an item, tool, or a service. You use a unit of measure to measure the items and services that you order, issue, and transfer in the asset management system. Examples of units of measure include EACH, CASE, IN (inches), and ROLL.

About this task

A unit of measure works with a conversion factor. The conversion factor represents the numeric value or ratio that the asset management system uses to relate one unit of measure to another. You can create units of measure and conversion factors in many applications:

- Assets
- Purchase Orders
- Purchase Requisitions
- Receiving
- Item Master
- Meters
- Service Items
- Tools
- Stocked Tools
- Inventory

You can delete a unit of measure only when it is not used in a conversion, on a specification template, or on a meter record.

Procedure

1. Open an application.
2. Select the Unit of Measure and Conversion > Add/Modify Units of Measure action.
3. Insert a row.
4. In the Unit of Measure field, specify an identifier for the unit of measure.
5. Optional: Enter values in the following fields:
 - Abbreviation
 - DescriptionThe abbreviation value along with an asset classification is used to create descriptions for assets, locations, and items.
6. Click OK.

Creating commodity groups

You can create a commodity group to identify a grouping of items, tools, or services. A commodity group contains a grouping of individual commodity codes. Classifying items, tools, services with commodity groups and commodity codes provides a way for you to analyze spending by product type. You first define a commodity group and then add and associate individual commodity codes to the group.

About this task

Once you have defined commodities you can associate them with company, contract, and item records. You can also associate commodities with individual purchase order or requisition lines for items, service items, or tools that do not have commodity codes assigned to them, including special order materials or services.

You can create commodity groups and codes in the following asset management system applications:

- Companies
- Item Master
- Purchase Orders
- Service Items
- Tools

Procedure

1. Open an application.
2. Select the Add/Modify Commodity Codes action.
3. In the Commodity Groups table window, click New Row.
4. In the Commodity Group field, enter an identifier for the commodity group.
5. Specify whether you want a service type item or service level agreement to use this commodity group.

Option	Service
Use commodity group	Selected
Do not use commodity group	Cleared

6. In the Commodity Codes for Commodity Group table window, click New Row.
7. In the Commodity Code field, enter an identifier for the commodity.
8. Specify whether you want a service type item or service level agreement to use this commodity code.

Option	Service
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Option	Service
Use commodity code	Selected
Do not use commodity code	Cleared

9. Click OK.

Stocked Tools

You use the Stocked Tools application to manage existing tools in storerooms.

In the Stocked Tools application, you can perform the following tasks:

- View information about a stocked tool, including balance summaries, balance details, and issue history.
- Add new bin location and balance information for a stocked tool.
- Associate vendors with a tool and analyze vendor data.
- View a list of all assets associated with a rotating tool.
- Issue, return, or transfer a stocked tool.
- View the inventory transactions for a tool.
- Adjust the physical count and the current balance for a tool.
- Specify or modify the percentage of stocked tools that can be received over the quantity ordered. When a tool record is created in the Item Master application, the receipt tolerance percentage can be specified. The receipt tolerance percentage is applied to the organization level and to the vendor level for the tool.
- [Stocked tools overview](#)
When managing existing tools in storerooms, you need to have an understanding of rotating tools and item sets.
- [Working with stocked tools](#)
In the Stocked Tools application, you can manage the tools, change the status of tools, issue tools, transfer tools, view availability, and create units of measurement.

Stocked tools overview

When managing existing tools in storerooms, you need to have an understanding of rotating tools and item sets.

- [Rotating tools](#)
A rotating tool is an individual serialized asset, such as a nail gun or back hoe, that is defined by a common tool number. You mark a tool as rotating because it shares the same properties as an asset and you want to track each instance of that tool as an asset to monitor maintenance costs, downtime, etc.
- [Item sets](#)
Item sets let multiple organizations within a company view and choose from a common set of items stocked in the storeroom. An organization can be associated with only one item set. However, multiple organizations can use the same item set.
- [Tax-exempt status](#)
The tax-exempt option indicates whether an item, a tool, or a service is taxable. You might want to set the tax-exempt status, depending on where an item or a service is acquired, and how an item or a service is used.

Rotating tools

A rotating tool is an individual serialized asset, such as a nail gun or back hoe, that is defined by a common tool number. You mark a tool as rotating because it shares the same properties as an asset and you want to track each instance of that tool as an asset to monitor maintenance costs, downtime, etc.

For example, you may have ten air compressors of the same model that share the same attributes, and they are all known by the common tool number Fermion-AC23. However, you want to be able to track each one as an individual asset, so you mark the tool as rotating.

After creating the tool and adding it to a storeroom, you can either use the Assets application to create the asset records for each individual tool you wish to track, or create a purchase order for the rotating tool and serialize it when you receive it. Once you have associated an asset to a rotating tool, the system can display and track balances for this tool. A rotating tool is tracked both by its tool number in Stocked Tool records and by its unique asset number in Assets records.

Item sets

Item sets let multiple organizations within a company view and choose from a common set of items stocked in the storeroom. An organization can be associated with only one item set. However, multiple organizations can use the same item set.

You identify an item set with a unique name or number, and each item that belongs to the item set has a unique item number.

When you create an organization, you associate an item set to it. When you create an item, by default the item is placed into the item set associated with the organization for your default insert site.

Tax-exempt status

The tax-exempt option indicates whether an item, a tool, or a service is taxable. You might want to set the tax-exempt status, depending on where an item or a service is acquired, and how an item or a service is used.

The situations under which items or services are tax-exempt vary depending upon your location, and upon current tax regulations. For example, the storeroom for an item might be in a location where sales taxes are not collected. In some cases, if an item becomes part of a product, that item can be tax-exempt. If the item is used as a stand-alone item, then the item is taxable. The buyer for your organization determines the tax-exempt status of items, of tools, and of services.

You can override the tax-exempt status for items, for tools, and for services in the following applications:

- Purchase Requisitions
- Purchase Orders
- Invoices

When you specify the tax-exempt status, you can apply the status at the organization level and at the vendor level.

Working with stocked tools

In the Stocked Tools application, you can manage the tools, change the status of tools, issue tools, transfer tools, view availability, and create units of measurement.

- [Managing stocked tools](#)
You can add bins and locations to stocked tools, adjust balances, adjust physical counts, associate vendors, manage vendor lists, and create spare parts lists.
- [Changing the status of stocked tools](#)
Tool statuses allow you to implement and enforce policies related to record creation and modification. You can change the status of a tool record in the Stocked Tools application.
- [Issuing stocked tools](#)
You can specify tools on job plans and work orders to indicate which tools are needed to perform a task. In the Stocked Tools application, you can issue tools to those work orders to indicate that the tools are dispatched for use with the job.
- [Transferring stocked tools](#)
You can transfer stocked tools from one storeroom to another, including cross-site transfers within an organization if you have access to those storerooms. When you transfer a tool, the From Storeroom field defaults to the current storeroom for the stocked tool you are viewing.
- [Viewing availability of stocked tools](#)
You use the Stocked Tools application to view how many stocked tools are available by location or lot, exist on purchasing requests and order, and are reserved. You can also view the availability of any alternate tools.
- [Creating units of measure](#)
You can create a unit of measure to describe the quantity used to measure an item, tool, or a service. You use a unit of measure to measure the items and services that you order, issue, and transfer in the asset management system. Examples of units of measure include EACH, CASE, IN (inches), and ROLL.
- [Creating conversion factors](#)
You can create a conversion factor to define the numeric value or ratio that the asset management system uses to relate one unit of measure to another. The conversion factor is an alternate value that is used to represent a unit of measure. You can use this alternate value to define an item order or transfer quantity and storeroom balance.

Managing stocked tools

You can add bins and locations to stocked tools, adjust balances, adjust physical counts, associate vendors, manage vendor lists, and create spare parts lists.

- [Adding bin locations and balances to stocked tools](#)
You use the Stocked Tools application to add bin locations and a current balance and physical count for new bins.
- [Setting year to date inventory quantities to zero](#)
At the end of each year, you must move the usage history for the selected records from the current year history to the previous year history. By default, inventory records are saved for the current year and the previous four years.
- [Reconciling balances](#)
You can adjust current balances based on a physical count. This transaction is for the selected item in a selected storeroom only. By default, the storeroom that is identified in the Inventory tab.
- [Adjusting the physical counts of stocked tools](#)
You can adjust the physical count for a tool that is stocked in a storeroom. The physical count is a number that you can adjust at predefined intervals, such as monthly, quarterly, or annually.
- [Adjusting current balances of stocked tools](#)
You use the Stocked Tools application to adjust the current balance of a stocked tool. The current balance is a running total of how many instances of the tool are in a storeroom. For each bin in the storeroom, you can enter a new current balance, and specify the control and shrinkage account numbers associated with the adjustment.
- [Associating vendors with stocked tools](#)
You can associate vendors with a stocked tool and manage a list of vendors that supply a tool. The list can include vendors from which you have already ordered and vendors that you have not used. You can use the historical vendor data to compare vendor prices and delivery information.
- [Creating spare part lists for stocked tools](#)
You use the Stocked Tools application to create a list of parent assets to indicate where a tool is used as a spare part (or child tool).

Adding bin locations and balances to stocked tools

You use the Stocked Tools application to add bin locations and a current balance and physical count for new bins.

About this task

If you want to adjust an existing tool's current balance or physical count, use the actions for that functionality.

Procedure

1. In the Stocked Tool application, display a tool record.
2. In the Balances table window on the Stocked Tools tab, click New Row to add a new bin location for this tool.
3. Optional: Enter values for the bin, lot, and current balance.
4. Save your changes.

Setting year to date inventory quantities to zero

At the end of each year, you must move the usage history for the selected records from the current year history to the previous year history. By default, inventory records are saved for the current year and the previous four years.

Procedure

1. In the Inventory application, select the records whose usage history you want to change.
2. Select the Inventory Adjustments > Zero Year to Date Quantities action.
3. Click OK.

Reconciling balances

You can adjust current balances based on a physical count. This transaction is for the selected item in a selected storeroom only. By default, the storeroom that is identified in the Inventory tab.

About this task

The system includes issues, returns, transfers, and receipts after the physical count to calculate the new balance.

Procedure

1. From the List tab of the Inventory application, display the item you want.
2. Click the Inventory tab.
3. Select the Reconcile Balances action.
4. Click Select Value to choose the control account and the shrinkage general ledger account.
5. Click OK. A reconcile adjustment transaction for the adjustment is generated. The Quantity field in the transaction record reflects the change to the current balance after the adjustment is made.

Adjusting the physical counts of stocked tools

You can adjust the physical count for a tool that is stocked in a storeroom. The physical count is a number that you can adjust at predefined intervals, such as monthly, quarterly, or annually.

About this task

You cannot adjust the physical count of a rotating tool. After you perform an inventory count, you can adjust the physical count for any storeroom and enter the count date. You can then reconcile the balance to the current count.

Procedure

1. In the Stocked Tools application, open a tool record.
2. Select the Adjustments > Physical Count action.
3. To specify the date on which the physical count was taken, do one of the following in the Physical Count Adjustment window:
 - In the Physical Count Date field, click the Set Date and Time icon and adjust the date for all rows.
 - Edit the Count Date field to adjust the date for individual rows.
4. Click Refresh to update the count dates.
5. For each bin that you want to adjust, enter a new physical count value in the New Count field.
6. Click OK.

Adjusting current balances of stocked tools

You use the Stocked Tools application to adjust the current balance of a stocked tool. The current balance is a running total of how many instances of the tool are in a storeroom. For each bin in the storeroom, you can enter a new current balance, and specify the control and shrinkage account numbers associated with the adjustment.

About this task

You cannot adjust the current balance of a rotating tool.

Procedure

1. In the Stocked Tools application, open a tool record.
2. Select the Adjustments > Current Balance action to open the Current Balance Adjustment window.
3. In the New Balance field for each bin that you want to adjust, enter a new balance value.
4. Click OK.

Associating vendors with stocked tools

You can associate vendors with a stocked tool and manage a list of vendors that supply a tool. The list can include vendors from which you have already ordered and vendors that you have not used. You can use the historical vendor data to compare vendor prices and delivery information.

Before you begin

Before you can associate vendors to a stocked tool, you must create the vendors in the Companies application.

Procedure

1. In the Stocked Tools application, select the tool to which you want to associate vendors.
2. On the Vendors tab, click New Row.
3. Specify a value for the vendor.
The values for the vendor, the vendor description, the currency, and the tax code are provided.
4. In the Promised Lead Time (Days) field, specify the number of days for the vendor to supply the tool.
5. Optional: In the Receipt Tolerance % field, specify or modify the percentage of stocked tools that can be received over the quantity ordered.
6. Optional: If the stocked tool is not taxable, select the Tax Exempt check box. The buyer for your organization determines the tax-exempt status of tools.
7. Optional: Complete the remaining fields to further define the vendor.
8. Save your changes.

Creating spare part lists for stocked tools

You use the Stocked Tools application to create a list of parent assets to indicate where a tool is used as a spare part (or child tool).

About this task

If you use the Spare Parts tab in the Assets application to associate tools to the asset, you can view the tools on the Where Used tab in the Stocked Tools application.

Procedure

1. In the Stocked Tools application, display a tool record.
2. On the Where Used tab, click New Row to add a parent asset.
3. In the Quantity field, enter how many instances of the stocked tool are used on the parent asset.
4. Optional: Enter remarks about the location and additional parent assets.
5. Save your changes.

Changing the status of stocked tools

Tool statuses allow you to implement and enforce policies related to record creation and modification. You can change the status of a tool record in the Stocked Tools application.

Procedure

1. In the Stocked Tools application, select the tool for which you want to change the status.
2. In the toolbar, click the Change Status icon.
The statuses that are available depend on the status of the tool.
3. Click OK to change the status.

Issuing stocked tools

You can specify tools on job plans and work orders to indicate which tools are needed to perform a task. In the Stocked Tools application, you can issue tools to those work orders to indicate that the tools are dispatched for use with the job.

Before you begin

When you issue a tool from the Stocked Tools application, you must specify to whom you are issuing the tool.

Procedure

1. In the Stocked Tools application, open a tool record.
2. Select the Issue Current Tool action.
3. Optional: In the Issue Current Tool window, change the value in the Bin field to issue the tool from a different bin.
4. In the Quantity field, specify the number of tools that you want to issue.
5. Optional: In the Rotating Asset field, specify the value for the rotating tool.
6. In the Transaction Type field, specify the value for type:

Option	Description
ISSUE	To issue a tool to a person, as well as to an asset, location, or work order
RETURN	To return a tool to a storeroom

7. In the Issue To field, specify the recipient of the tool (person ID).
8. Optional: Complete the remaining fields.
9. Click OK.

Results

The tool is issued to the intended recipient and the stocked tool balance is adjusted.

Example

You can also issue a stocked tool from a storeroom directly to someone who needs the tool to perform work. For example, you might need to have a hammer available for employees, yet you do not want to associate this tool with a work order because hammers are not specific to any work order. You also can use the Issue function to return tools to a storeroom.

Transferring stocked tools

You can transfer stocked tools from one storeroom to another, including cross-site transfers within an organization if you have access to those storerooms. When you transfer a tool, the From Storeroom field defaults to the current storeroom for the stocked tool you are viewing.

Before you begin

You transfer items between storeroom locations or bins from the same site or another site in the same organization.

Procedure

1. In the Stocked Tools application, open a tool record.
2. Select the Transfer Current Tool action.
3. In the Transfer Current Tool window, specify the number of tools that you want to transfer.
4. Select a storeroom to which to transfer the tool.
5. Optional: Specify the bin numbers.
6. Select a site to which to transfer the tool.
7. Optional: If the Conversion Factor field is blank, enter the conversion ratio for the transaction.
For example, if the storeroom from which you are transferring is measured in boxes, and your receiving storeroom is each, then your conversion ratio is between box and each.
8. Optional: Specify general ledger debit and credit values.
9. Click OK.

Results

The tools are transferred to the storeroom that you specified and the supplying and receiving storerooms balances are adjusted.

Viewing availability of stocked tools

You use the Stocked Tools application to view how many stocked tools are available by location or lot, exist on purchasing requests and order, and are reserved. You can also view the availability of any alternate tools.

Procedure

1. In the Stocked Tools application, open the tool record for which you want to view availability.
2. Select the View Tool Availability action.
3. In the View Tool Availability window, complete the following steps to view information:
 - Click the All Locations tab to view how many tools are available in any storeroom.
 - Click the All Lots tab to view how many tools are available in each lot.
 - Click the Purchasing tab to view the quantity of tools on order from all outstanding approved and unapproved purchase requisitions referenced in the purchase orders, as well as approved and unapproved purchase orders.
 - Click the Alternates tab to view how many alternate tools are available for this tool.
 - Click the Reservations tab to view how many tools are currently reserved.

Creating units of measure

You can create a unit of measure to describe the quantity used to measure an item, tool, or a service. You use a unit of measure to measure the items and services that you order, issue, and transfer in the asset management system. Examples of units of measure include EACH, CASE, IN (inches), and ROLL.

About this task

A unit of measure works with a conversion factor. The conversion factor represents the numeric value or ratio that the asset management system uses to relate one unit of measure to another. You can create units of measure and conversion factors in many applications:

- Assets
- Purchase Orders
- Purchase Requisitions
- Receiving
- Item Master
- Meters
- Service Items
- Tools
- Stocked Tools
- Inventory

You can delete a unit of measure only when it is not used in a conversion, on a specification template, or on a meter record.

Procedure

1. Open an application.
2. Select the Unit of Measure and Conversion > Add/Modify Units of Measure action.
3. Insert a row.
4. In the Unit of Measure field, specify an identifier for the unit of measure.
5. Optional: Enter values in the following fields:
 - Abbreviation
 - DescriptionThe abbreviation value along with an asset classification is used to create descriptions for assets, locations, and items.
6. Click OK.

Creating conversion factors

You can create a conversion factor to define the numeric value or ratio that the asset management system uses to relate one unit of measure to another. The conversion factor is an alternate value that is used to represent a unit of measure. You can use this alternate value to define an item order or transfer quantity and storeroom balance.

Before you begin

You must define the units of measure before you can create conversion ratios.

About this task

You can create units of measure and conversion factors in the following applications:

- Purchase Orders
- Purchase Requisitions
- Receiving
- Item Master
- Service Items
- Tools
- Stocked Tools
- Inventory

Procedure

1. Open an application.
2. Select the Unit of Measure and Conversion > Add/Modify Conversions action.
3. Click New Row.
4. Enter values in the following fields:

Option	Description
From Unit of Measure	The original unit of measure value that you are converting from in the conversion factor calculation.
To Unit of Measure	The unit of measure value that you are changing or replacing in the conversion factor calculation.
Conversion Factor	The ratio that is applied to relate one unit of measure to another.

5. Optional: In the Item Number field, enter the item number that is associated to the conversion.
6. Click OK.

Inventory

You can use the Inventory application to store information about all aspects of inventory materials. You can monitor the storeroom balance of inventory items and tools. You can track the condition of items and the cost of inventory stock, and you can reorder items when stock must be replenished.

You can monitor the use of special order items and stocked items. Vendor information can be stored and items can be reordered promptly when the storeroom balance indicates that the items must be replenished.

You can check the balances of individual items and tools at the bin and lot level for each storeroom. If an item is stored in more than one location, you can view balances for all storeroom locations on one screen.

If this item is already in a pick list, you can view the picked quantity in the Other Balance Summary Information section. Pick lists are created and managed in the Reservations page of the Manage Inventory Work Center.

Use the ABC Analysis area on the Inventory tab to determine the requirement for an item. You can consider the usefulness of the item and determine the financial benefit that would result from investing in an item.

Use the Inventory application to perform the following tasks:

- Search the database for inventory items and tools.
- Specify the balances of items and item costs.
- Specify the bins and lots where items are stored, and view the storeroom locations.
- Issue, transfer, and return inventory items by site and storeroom location.
- Specify reorder details, such as the reorder point, the lead time, and the order unit of an item. You can also specify information about the vendors that supply an item and the multiple manufacturers or models that are associated with each vendor.
- Identify and track rotating assets that are associated with a rotating item.
- List all assets for which an item is listed as a subassembly or a spare part.
- Specify the percentage of items that can be received over the quantity ordered.

- **[ABC analysis](#)**

ABC analysis is a technique that identifies the items that represent the greatest investment for your company in terms of monetary value and turnover rate.

- **[Rotating assets](#)**

A rotating asset is an interchangeable asset that you can move in and out of service as needed. The term applies to assets that can be repaired or refurbished rather than replaced.

- **[Inventory costs](#)**

You control the cost of inventory items and tools by using a range of costing methods. You can set a standard cost, or you can issue inventory items at an average cost so that price variations are reflected. Last-in-first-out (LIFO) and first-in-first-out (FIFO) costing captures and applies the cost of items on receipt.

- **[Issues, transfers, and returns in inventory](#)**

Organizations consume the items and tools in inventory storerooms in different ways. Issues, transfers, and returns are methods for monitoring and controlling the movement and consumption of inventory items and tools.

- **[Consignment items in inventory](#)**

Consignment items are inventory items that are kept in a storeroom on-site and owned by an external vendor. The vendor retains financial ownership of the consignment items until they are used by the organization that is storing them.

- **[Inventory replenishment](#)**

With the daily use of inventory items and tools, organizations must replenish inventory stock to stay functional. You replace used inventory stock by reserving and reordering items and tools that you need.

ABC analysis

ABC analysis is a technique that identifies the items that represent the greatest investment for your company in terms of monetary value and turnover rate.

The ABC analysis feature ensures that crucial inventory does not fall below minimum levels, and helps to ensure that the current balance figures for items remain reconciled with the actual count. The ABC type for an item is determined by running an ABC analysis report that multiplies the year-to-date issued quantity by the last cost of the item. Each item is sorted in descending order of the dollar value that is reached by this calculation. The ABC type is set to A, B, or C based on a percentage that you set as a default in the Organizations application.

The ABC analysis report changes the cycle count frequency for an item, based on the ABC type and on the count frequency. If the ABC type is set to N, the cycle count frequency does not change. In the Organizations application, set the count frequency to the number of days for each ABC type.

Example

The ABC type is set to A, B, or C based on a percentage that you set as a default. For example, you can set the following percentages:

- Type A breakpoint 30%
- Type B breakpoint 30%
- Type C breakpoint 40%

When you apply these values, the top 30% of items by cost are type A, the next 30% of items are type B, and the last 40% are type C.

Rotating assets

A rotating asset is an interchangeable asset that you can move in and out of service as needed. The term applies to assets that can be repaired or refurbished rather than replaced.

Rotating assets can be items such as pumps and motors, fire extinguishers, motors and transmissions, and notebook computers and network printers.

Before a rotating asset can be created, you must define the item in the Item Master application. You create rotating assets in the Assets application or by receiving a purchase order that contains a rotating asset.

Item number

A rotating asset has an item number, which can be used to track the rotating asset as it moves from one storeroom to another or to a repair facility. By using an asset number and an item number, you can track identical assets individually or with their shared item number as a group.

Example

A company might have 50 identical fire extinguishers (the same model from the same manufacturer) that have the same item number. Each fire extinguisher has a unique asset number. You can use the asset number to track information such as when the asset was purchased, when it was inspected, and when it must be replaced.

Inventory costs

You control the cost of inventory items and tools by using a range of costing methods. You can set a standard cost, or you can issue inventory items at an average cost so that price variations are reflected. Last-in-first-out (LIFO) and first-in-first-out (FIFO) costing captures and applies the cost of items on receipt.

LIFO and FIFO costing is more precise than other costing methods. You can monitor the value of your inventory stock based on actual receipt costs. The costing method that you apply is used whenever an inventory transaction occurs.

LIFO costing

Last-in-first-out costing uses the receipt cost of items that are the newest in stock.

FIFO costing

First-in-first-out costing uses the receipt cost of items that are the oldest in stock.

Example

Prices generally rise over time because of inflation. As a result, the older inventory items in stock can decrease in value. Under the FIFO costing method, as the older and cheaper goods are sold, the newer and more expensive goods remain as assets to the company.

A company that uses the LIFO costing method sells the most expensive (newest) inventory stock first. As profits are decreased, the company benefits from a lower rate of tax.

Issues, transfers, and returns in inventory

Organizations consume the items and tools in inventory storerooms in different ways. Issues, transfers, and returns are methods for monitoring and controlling the movement and consumption of inventory items and tools.

You create inventory usage records to track the issue, transfer, and return of inventory items within and across organizations. You can also make quick issues and transfers of inventory as you work.

You use inventory usage records for the following tasks:

Issuing items

You can issue inventory items or tools by assigning them to a work order, to an asset, to an operating location, or to a general ledger (GL) account. You can also issue items to satisfy reservations, such as for use on a work order. Items can be issued to a charging entity that belongs to the same site or across sites within an organization.

Transferring items

You can transfer inventory items or tools from one storeroom to another storeroom to satisfy the requirement for the items in another location. You can move inventory stock between storerooms located in two different sites of the same organization, or between sites that belong to separate organizations.

Returning items

You can return inventory items to the original storeroom. For example, you can return parts that were previously issued from a storeroom, but were not used.

Consignment items in inventory

Consignment items are inventory items that are kept in a storeroom on-site and owned by an external vendor. The vendor retains financial ownership of the consignment items until they are used by the organization that is storing them.

Consignment items are not included in the inventory valuation of an organization. Consignment items have a financial impact only when they are consumed, at which point, payment must be made to the vendor.

Rotating items and condition-enabled items cannot be flagged as consignment items.

Example

A factory uses plant machinery that is critical for production. The factory stocks certain service parts as consignment items, either because their budget is restrictive or demand for such items is irregular.

The vendor who supplies the parts benefits from this arrangement by providing a ready supply of parts and thus saving on expedited freight costs. The vendor can also be certain that the customer does not procure the replacement parts from a competitor.

Inventory replenishment

With the daily use of inventory items and tools, organizations must replenish inventory stock to stay functional. You replace used inventory stock by reserving and reordering items and tools that you need.

- **[Inventory item reservations](#)**
You can create reservations for inventory items and tools to ensure that they are replenished in the inventory stock on time. You can create hard reservations or soft reservations, which are based on the importance of the inventory requirement.
- **[Reordering inventory items](#)**
You can reorder inventory items or tools when the storeroom balance indicates that the items must be replenished. You can also reorder items that are listed on approved work orders, which can be issued without being received into inventory.
- **[Reorder locks](#)**
When you reorder items in the Inventory application, a lock is placed on the storeroom being restocked. This action prevents other users from reordering items for the same storeroom at the same time.

Inventory item reservations

You can create reservations for inventory items and tools to ensure that they are replenished in the inventory stock on time. You can create hard reservations or soft reservations, which are based on the importance of the inventory requirement.

A *hard reservation* is a request for materials that is defined by the need for an item within a specific timeframe. You can specify that the reorder process includes only hard reservations. You can also specify that inventory items can be issued from a storeroom only when they are associated with a hard reservation. Hard reservations of inventory items are prioritized so that they cannot be superseded by other requests.

A *soft reservation* is a request for materials that is not subject to a timeframe. You can create a soft reservation to ensure that the item or tool is available for issue at any time that it is needed.

Hard and soft reservation types can be set automatically. You can apply automatic processing to determine hard or soft reservations, which are based on the date that the materials are required. You select automatic processing for reservation types in the Purchase Orders, Purchase Requisitions, and Desktop Requisitions applications. In the Reservation type field of a work order, reservations are set in the Planned Material line. In an internal purchase order, when an attendant storeroom is selected on a purchase order line, you set reservations in the Reservation type hidden field.

The *backorder* reservation type can also be applied using automatic processing. Backorder indicates that an inventory item or tool can have only hard reservations, and that the reservation quantity must be satisfied by the available balance on the inventory record. An organization must disallow negative availability to use the Backorder reservation type.

Example

Organizations planning large-scale projects require specific materials during a set timeframe. You can specify the materials that must be replenished in the inventory stock at regular intervals. You can specify that other materials must be available for use only when needed.

Reordering inventory items

You can reorder inventory items or tools when the storeroom balance indicates that the items must be replenished. You can also reorder items that are listed on approved work orders, which can be issued without being received into inventory.

Procedure

1. From the List tab of the Inventory application, select the item or tool that you want to reorder.
2. On the Inventory tab, select the Reorder...>Reorder Items action and specify the reorder options that you want to apply to the record.
3. Click the Reorder Details tab and specify the reorder and vendor data for the item. If you are applying a reorder point to the item record, the reorder point value is calculated based on the data you enter in the Safety Stock, Lead Time, and Economic Order Quantity fields.

Reorder locks

When you reorder items in the Inventory application, a lock is placed on the storeroom being restocked. This action prevents other users from reordering items for the same storeroom at the same time.

When you reorder items in preview mode, you can inadvertently create a reorder lock even though you are no longer using the process. While you are in preview mode, reorder locks can occur under the following circumstances:

- You click a browser navigation button.
- The server times out while the reorder process is running. If the server times out, restart the server.
- The session times out. If the session times out, the lock clears after 30 minutes. Your system administrator can change this setting to a longer duration or to a shorter duration. The length of time for the lock can be specified in the `mxe.reorder.previewtimeout` property.

Reorder locks must be removed after the reorder process is complete. You remove reorder locks by selecting Reorder...>Clear Reorder Locks.

Count Books

You use the Count Books application to select inventory for periodic counting and to record the results of physical counts. You can then reconcile discrepancies between expected and actual quantities.

- [Count Books overview](#)
When you create a count book, you specify the items from the storeroom that you want to include in the count book. You record physical counts for items, and reconcile individual items or groups of items.
- [Managing inventory count](#)
After you create a count book and record physical counts, you reconcile the physical count values of items parts with their current balance values.

Count Books overview

When you create a count book, you specify the items from the storeroom that you want to include in the count book. You record physical counts for items, and reconcile individual items or groups of items.

- [Inventory count books](#)
A *count book* is a list of items in a storeroom for which you want to periodically record inventory physical counts. You can check the accuracy of the system-calculated balances relative to the physical counts and reconcile the differences.
- [Inventory count groups](#)
Inventory count groups (ICGs) can be used to subdivide items in a storeroom into smaller groups so that count books can be managed more efficiently.
- [Inventory count tolerances](#)
You establish plus and minus count tolerances, expressed as percentages, for each item in a storeroom. The tolerances are used to determine the accuracy of the physical count compared to the system-calculated current balance.
- [Item balance reconciliation](#)
When you reconcile item balances, the physical count is compared to the adjusted current balance for each item. You can reconcile item balances for counts that match the current balance from the Count Books application.

Inventory count books

A *count book* is a list of items in a storeroom for which you want to periodically record inventory physical counts. You can check the accuracy of the system-calculated balances relative to the physical counts and reconcile the differences.

You can do the following tasks by using count books:

- Select rotating items and non-rotating items from a storeroom for periodic physical counting.
- Record, view, and analyze the physical counts.
- Reconcile any discrepancies between expected and actual quantities.

You follow a standard sequence of steps when you create and use a count book.

1. Create the count book and identify the storeroom where the count occurs.
2. Specify a selection criterion for storeroom items.
3. For any selection criterion that requires it, select the item to be counted. For some criteria, such as All, you do not have to select items.
4. Approve the count book.
5. Conduct the physical count, record the results, and save the count book.
6. Reconcile item balances.
7. Complete the count book.

When you change the count book status to complete (COMP), the current balance values are updated in the Inventory application. Accounting entries are generated for the inventory adjustments.

Inventory count groups

Inventory count groups (ICGs) can be used to subdivide items in a storeroom into smaller groups so that count books can be managed more efficiently.

To use inventory count groups, you must create ICG identifiers for the PLUSTCB_ICG domain in the Domains application. The ICG identifiers are then available for associating with items in the Inventory application. They are also available for assigning to count books in the Count Books application.

You manually assign inventory count groups to items in the Inventory application. Use the Count Group value to assign a group identifier to multiple items. Using an inventory count group name that is common to a subset of storeroom items, you can select that group of items for a count book.

By subdividing the items in a storeroom into multiple count groups, you can create a series of count books with different inventory count groups for each. With this approach, you can count items in the storeroom periodically: daily, weekly, or monthly, for example.

You can also use inventory count groups to classify items by other criteria, such as Hazardous, High Value, or Critical Spare. You can define the count groups that match your business requirements.

Example for counting items every three months

Suppose that you want to count all items in a storeroom one time every three months (every 60 work days). And you want to count an equal number of items every day. Divide the items in that storeroom into 60 groups. If you have 1200 items in a storeroom, you can assign inventory count groups as follows:

items	Inventory count group
The first 20 items (1200 divided by 60 equals 20)	C1
The next 20 items, and the next 20	C2, C3®, ...
The last 20 items	C60

You can now specify C1 as an inventory count group in the Select items table in the Count Books application. The first 20 items in the storeroom are selected for counting.

Inventory count tolerances

You establish plus and minus count tolerances, expressed as percentages, for each item in a storeroom. The tolerances are used to determine the accuracy of the physical count compared to the system-calculated current balance.

For example, a plus tolerance of five percent means that a physical count of 105 is considered a match with a system-calculated current balance of 100. The difference of the physical count from the system-calculated current balance is five percent or less. A physical count of 106 is not a match. You can reconcile physical counts from the Count Books application for counts that are a match, within tolerances, of the current balance values. Physical counts that are not a match must be manually reconciled in the Inventory application.

You set default tolerances on the Count Books Options window in the Organizations application. The tolerance values that are established in the Organizations application are used as the default tolerance values for all items. However, you can change the default tolerance values for individual items in the Inventory application.

Item balance reconciliation

When you reconcile item balances, the physical count is compared to the adjusted current balance for each item. You can reconcile item balances for counts that match the current balance from the Count Books application.

To reconcile the balance of items from the Count Books application, the physical count must be a match with the system-calculated current balance. That is, it must be within tolerances as defined in the Organizations application or in the Inventory application. For matches, the adjusted current balance is reset to the physical count value when you select Reconcile. After you reconcile item balances and change the status of the count book to COMP (complete), the inventory balances in the database are updated.

Items with a physical count that is not a match must be reconciled manually in the Inventory application.

For non-rotating items, standard inventory processing is used to adjust the current balance and to account for the change in inventory value. You can also count rotating items. For rotating items, you must reconcile any counting discrepancies for each individual serial number by using the Move Asset action in the Assets application.

After you reconcile item balances, you can undo the reconciliation for individual count book lines or all count book lines. For some items, you might want to investigate count discrepancies, even if within tolerances, and manually adjust the current balance in the Count Book application. When you undo the reconciliation of item balances, the updated GL Debit Account and GL Credit Account values remain in place. You can undo the reconciliation of item balances until you change the count book status to complete (COMP).

Managing inventory count

After you create a count book and record physical counts, you reconcile the physical count values of items parts with their current balance values.

- **Creating count books**
You create count books to record physical counts of items in inventory. You specify a selection criterion and based on the criterion, either you or the system selects items for that count book.
- **Reconciling item balances**
You can reconcile item balances for items whose physical count is recorded in a count book. When you reconcile item balances, the adjusted current balance values for storeroom items are set to the physical count values.

Creating count books

You create count books to record physical counts of items in inventory. You specify a selection criterion and based on the criterion, either you or the system selects items for that count book.

About this task

You can add new items to a count book when you choose the selection type as ITEMS and when the count book status is either waiting for approval (WAPPR) or approved (APPR).

You can delete any items that are already selected in a count book, when a count book status is WAPPR. You cannot delete any items that are already selected when a count book status is APPR.

You can change the selection type to one of the following sample selection types, when a count book status is WAPPR. Selection type changes are not possible when a count book status is APPR.

- ALL
- ITEMS
- ROTATING
- ICG
- TOOLS

Procedure

1. In the Count Books application, click New Count Book.
2. Specify the storeroom that you want to count.
3. Specify GL accounts in the GL Credit Account and GL Debit Account fields.
4. Specify the selection criterion.

The selection criterion determines the set of items that is added to the count book. Selection criteria are defined in the Inventory Counting Options window in the Organizations application.

- Specify **ALL** to add all of the countable items in the storeroom to the Count Book Lines tab. If you select ALL, you do not specify items in the Select Items table.
 - Specify **CNTFRQ** (count frequency) to select all countable items in the storeroom whose physical count is due on or before the date in the Count Date field. Selection is based on the last count date and the count frequency value of each item. You specify the count frequency for items in the Inventory application.
 - Specify **ICG** (inventory count group) to select members of the count group. The ICG must be the ICG for at least one countable item in the storeroom. You can specify multiple ICGs. You assign an inventory count group to an item in the Inventory application.
 - Specify **ITEM** to select one or more items. The item numbers that you specify must exist as countable items in the storeroom.
 - Specify **ROTATING** to select rotating items (serialized items) only, that is, items that have an asset number and an item number.
 - Specify **TOOLS** to select only items that are tools, that is, items whose commodity group is Tools.
5. If you specify **CNTFRQ**, **ITEM**, or **ICG** as the selection criterion, specify at least one value in the Select items table.
The value or values that you specify direct the selection of items or groups of items for the count book. To select values, specify the essential data for the specified selection criterion.
 - If you specified **CNTFRQ**, specify a date in the Count Date field. Items that have a count that is scheduled before that date, based on the value in the Count Frequency field in the Inventory application, are selected.
 - If you specified **ITEM**, specify an item in the Selection Items field. Click New Row to add items..
 - If you specified **ICG**, specify an inventory count group in the Selection ICG field. Click New Row to add ICGs.
 6. Save the count book.

Results

The selected items are listed on the Count Book Lines tab.

What to do next

Approve the count book and record the physical count for all items on the Count Book Lines tab.

Reconciling item balances

You can reconcile item balances for items whose physical count is recorded in a count book. When you reconcile item balances, the adjusted current balance values for storeroom items are set to the physical count values.

Procedure

1. In the Count Books application, select an in-progress count book that has physical count data.
2. From the menu, select the Reconcile action.
The item balances are reconciled for counts that match. The Reconcile checkbox is selected for count book lines that are reconciled.
3. Optional: "Unreconcile" any count book line for which you do not want the item current balance to be set to the physical count. Clear the Reconcile checkbox for the count book line.
When you unreconciled item balances, the updated GL Debit Account and GL Credit Account values remain in place. You can click the Unreconcile action to undo reconciliation of all reconciled rows.
4. Save the count book.

What to do next

To make the reconciled balances permanent in the database, change the status of the count book to complete (COMP) and save the count book.

Inventory Usage

With the daily use of inventory items and tools, inventory materials must be moved between storerooms to supply the different areas of a site. You use the Inventory Usage application to create inventory usage records that track the issue, transfer, and return of inventory items within and across organizations.

You can monitor the balance of inventory items that are in stock, and you can issue items or tools directly to charge entities such as work orders, locations, or assets. You can also issue items or tools against a general ledger account on-site, across sites in an organization, or across organizations.

- [Inventory usage records](#)
You use inventory usage records to track the issue, transfer, and return of inventory items within and across organizations.
- [Issues, transfers, and returns in inventory](#)
Organizations consume the items and tools in inventory storerooms in different ways. Issues, transfers, and returns are methods for monitoring and controlling the movement and consumption of inventory items and tools.

Inventory usage records

You use inventory usage records to track the issue, transfer, and return of inventory items within and across organizations.

Inventory usage records can contain multiple usage lines, which track the movement of inventory items into and out of storerooms and bins. Inventory usage lines can be added or removed from inventory usage records so that records can be updated quickly and easily.

Items that are associated with an inventory usage line can be picked by using the Pick and Stage feature in the Manage Inventory Work Center. If items are associated with a pick list, you can view information about the pick list and its status in the line detail.

Inventory usage records are categorized into types that summarize the intended purpose of the inventory usage record.

- [Inventory usage types](#)
Inventory usage types categorize the intended purpose of an inventory usage record. Inventory usage types indicate that a record comprises only issue or return items, only transfer items, or a mixture of all item types.
- [Inventory usage record statuses](#)
Changing the status of inventory usage records initiates transactions that adjust inventory information. Inventory transactions can adjust storeroom balances or the financial data that is associated with the inventory record.
- [Split Usage Quantity feature](#)
If you require a quantity of inventory items that exceeds the amount that is stored in a single storage bin, you can split the inventory usage line across multiple bins to meet the required quantity.

Inventory usage types

Inventory usage types categorize the intended purpose of an inventory usage record. Inventory usage types indicate that a record comprises only issue or return items, only transfer items, or a mixture of all item types.

When you create a record in the Inventory Usage application, the default usage type is Mixed. You can change the usage type before you start filling out the record by adding inventory usage lines.

Inventory usage records can have one of the following usage types:

Issue

All usage lines in the record contain items for issue or return only.

Transfer

All usage lines in the record contain items for transfer only.

Mixed

The record contains a combination of issue lines, transfer lines, and return lines.

Inventory usage record statuses

Changing the status of inventory usage records initiates transactions that adjust inventory information. Inventory transactions can adjust storeroom balances or the financial data that is associated with the inventory record.

The following statuses apply to inventory usage records:

Status	Description
Entered	The default status for an inventory usage record when it is created. When a record is in Entered status, some default fields cannot be modified.
Shipped	Indicates that the item has been removed from the inventory storeroom and is in transit to its final destination.
Staged	Indicates that inventory items are ready and waiting to be issued or transferred. When you set the usage record status to Staged, you must choose the stage bin that you want to use. You cannot change the status of the record to Staged if the record contains one or more usage lines of the type Return. You cannot change the status of the record to Staged if the status is Shipped, Cancelled, or Complete.
Complete	Indicates that the issue, transfer, or return of items is complete. When you change the status to Complete, the appropriate transactions are generated to adjust the balance of inventory storerooms.
Cancelled	Cancelled records cannot be edited, and any staged balances are reversed. This status is available if the current inventory usage status is Entered or Staged.

Split Usage Quantity feature

If you require a quantity of inventory items that exceeds the amount that is stored in a single storage bin, you can split the inventory usage line across multiple bins to meet the required quantity.

When the default bin does not contain a sufficient quantity of items to satisfy the quantity on the inventory usage line, you can create a single inventory usage line to request items from multiple storage bins. When the inventory usage record is complete, multiple transactions are initiated to source the items from the locations you specified. The split usage quantity feature initiates different behavior for rotating items and for non-rotating items.

Non-rotating items

When the quantity in a storage bin does not meet the required quantity on the inventory usage line, the split usage quantity feature is activated. The feature is triggered when the status of the record changes to Staged, Shipped, or Complete. When you are prompted, you must specify the additional bins to source the items from in the Split Usage Quantity window. You can either click New Row or Auto-Split. You can also modify the original usage line quantity, or cancel this process.

Rotating items

All rotating item usage lines that have a quantity of more than one must be split, as each usage line can contain only one rotating asset. You can select from a list of rotating items to meet the required quantity on the inventory usage line. The total quantity must be less than or equal to the quantity on the corresponding usage line. You can also automatically add rotating items to the record by clicking Auto-Split.

Auto-Split feature

You can eliminate the manual process of selecting multiple storage bins or individual rotating assets, by selecting Auto-Split from the Split Usage Quantity window.

The Auto-Split feature checks the following item attributes and assigns the available stocked items:

- A lotted item is requested. The inventory balances are sorted by the USEBY date, and the closest expiring lot items are selected. Subsequent expiring lots are allocated to the inventory usage line until the quantity is met.
- A non-rotating item or non-lotted item is requested. If the quantity of the default bin is insufficient, the Split Usage Quantity window opens and the bins are listed by the balance in ascending order. The listed bins are sourced in order until the quantity is met.
- A rotating item is requested and the quantity is more than one. The Auto-Split feature searches for all available rotating items and sorts the list in ascending order. The first available item is assigned to the first split line, and the second item is assigned to the second, until the quantity of the inventory usage line is satisfied.

Issues, transfers, and returns in inventory

Organizations consume the items and tools in inventory storerooms in different ways. Issues, transfers, and returns are methods for monitoring and controlling the movement and consumption of inventory items and tools.

You create inventory usage records to track the issue, transfer, and return of inventory items within and across organizations. You can also make quick issues and transfers of inventory as you work.

You use inventory usage records for the following tasks:

Issuing items

You can issue inventory items or tools by assigning them to a work order, to an asset, to an operating location, or to a general ledger (GL) account. You can also issue items to satisfy reservations, such as for use on a work order. Items can be issued to a charging entity that belongs to the same site or across sites within an organization.

Transferring items

You can transfer inventory items or tools from one storeroom to another storeroom to satisfy the requirement for the items in another location. You can move inventory stock between storerooms located in two different sites of the same organization, or between sites that belong to separate organizations.

Returning items

You can return inventory items to the original storeroom. For example, you can return parts that were previously issued from a storeroom, but were not used.

Staging items for issue or transfer

You can reserve inventory items and store them in a stage bin before they are issued or transferred. By setting the status of the inventory usage record to Staged, you can ensure that the correct quantity of inventory stock is held until it can be moved to its destination.

Before you begin

You must specify the general ledger accounts on the inventory usage record before the status can be changed to Staged.

Procedure

1. From the Inventory Usage tab of the Inventory Usage application, select the record for which you want to stage items for issue or transfer.
2. Change the status of the inventory usage record to Staged.
3. In the Change Status window, select from the stage bin options and save the record.

Transferring inventory items by shipment

You use shipments to transfer inventory items or tools between storerooms within an organization. Shipment records monitor information about the transfer of items from an inventory storeroom and the receipt of the same items at the destination site or storeroom.

About this task

You can create shipment records for transfer records that have either Entered status or Staged status. You use the Shipment Receiving application to record the receipt of shipped items. When you ship items to a location within the same site, purchase orders are not required.

Procedure

1. From the Inventory Usage tab of the Inventory Usage application, select the transfer record for which you want to create a shipment.
2. Click Set inventory usage record to Shipped status and change the status of the inventory usage record to Shipped.
3. In the Create Shipment window, specify the shipment information and save the record.

Splitting the quantity on an inventory usage line

When an inventory usage line specifies an item quantity that exceeds the number of items in the primary storage bin, you must split the line across multiple bins to meet the required quantity.

Procedure

1. On the Split Usage Quantity window, select the line for the item quantity that exceeds the current available balance.
2. Choose from the following options:

Option	Description
Non-rotating items	If the item is a non-rotating item, select New Row under the Split Across Multiple Bins table window. Specify the additional bins to source for the items on the inventory usage line.
Rotating items	If the item is a rotating item, select New Row under the Select Rotating Assets table window. Specify the rotating items to allocate to the inventory usage line.

3. Click OK.

Shipment Receiving

In a large organization, you can transfer inventory items or tools between storerooms within the same site or across sites and organizations and track their delivery. You create shipment receipt records to acknowledge the receipt of transferred items and update inventory balances at the destination storeroom.

You create shipment receipt records to log information such as the quantity of items that were received, the date the items were received, and the destination storeroom for the shipment.

When the shipped items are received, the storeroom balance is updated for the inventory records at the destination site. The quantity of received items is also verified to determine whether the number of shipped items satisfies the requirement at the destination site. The shipment is considered to be complete or partial based on this requirement, and the inventory usage record is updated according to this status.

- [Shipment inspection statuses](#)
A site or organization can specify that an inspection is required upon receipt of inventory items. The inspection status indicates the stage of inspection that applies to the shipment item.
- [Rules for voiding shipment receipts](#)
You can void a shipment receipt transaction that was created in error. When you void a shipment receipt, the record returns to its former state and storeroom balances are resolved.

Shipment inspection statuses

A site or organization can specify that an inspection is required upon receipt of inventory items. The inspection status indicates the stage of inspection that applies to the shipment item.

The following statuses apply to shipment items that undergo an inspection:

Status	Description
Waiting for Inspection (WINSPI)	Indicates that the item is in the process of being received, but is not entered into inventory. The item is in a holding location, where it stays until the inspection is complete. After inspection, the item status changes to either Waiting for Serialization or Complete, depending on whether it is a rotating item.
Waiting for Serialization (WASSET)	Indicates that the item is a rotating item and that review and acceptance of the asset numbers in the receipt is required. If the item requires inspection, the inspection has already occurred. The item is still in the holding location; it has not been sent to its destination storeroom or to its direct issue location. After the item is serialized, the status is changed to Complete.
Complete (COMP)	Indicates that the item was received, and if necessary, inspected and serialized. When the status of the item changes to Complete, a transfer transaction is created. The item is transferred to the appropriate storeroom or to a direct issue location. If the item is not rotating and does not require inspection, its status is Complete when it is received.

Rules for voiding shipment receipts

You can void a shipment receipt transaction that was created in error. When you void a shipment receipt, the record returns to its former state and storeroom balances are resolved.

A voided receipt has the same effect on storeroom balances as a return, but a voided receipt cannot be used on a credit invoice.

The following conditions apply to voiding shipment receipts:

- You can void non-rotating items.
- You can void shipment line items that are in Waiting for Inspection (WINSPI) status.
- You can void shipment line items that have been inspected but not returned.

Condition Codes

You use the Condition Codes application to build the master list of condition codes for a particular item set.

Using condition codes

Condition codes are used to manage your inventory by tracking the value of each item. Each time an item is issued, transferred, or returned, you specify the physical condition of the item based on codes that you set up. You use the Inventory application to manage condition-enabled items. After you set up the master list of condition codes in the Condition Codes application, use the Item Master application to specify items as condition-enabled.

If you mark an item as condition-enabled, you must assign at least one condition code to it. For each condition-enabled item, one condition code must have a full-value rate of 100%. This condition code is used as the reference point to calculate values for any other condition codes for this item.

Example: Condition codes and rates

The following condition codes and their corresponding condition rates might be established at a transportation company for tire tread depth:

- 9/16" (condition rate = 100%)

- 15/32" (condition rate = 80%)
- 11/32" (condition rate = 60%)
- Casing (condition rate = 20%)
- [Condition codes overview](#)
Condition codes track the value of items in your inventory. Condition codes are expressed in percentages. The new condition indicates that the value is worth 100% of its value.
- [Creating condition codes](#)
You use the Condition Codes application to build the master list of condition codes for a particular item set. You manage your inventory by using condition codes to track the worth of each item in a set. An organization is assigned to one item set, and multiple organizations can use the same item set.

Condition codes overview

Condition codes track the value of items in your inventory. Condition codes are expressed in percentages. The new condition indicates that the value is worth 100% of its value.

- [Condition rates](#)
Condition rates signify the value of an item, and are expressed as a percentage. A condition code of NEW equates to 100 percent as the condition rate, while a condition code of FAIR might have 50 percent as the condition rate. For each condition-enabled item, one condition code must have a full-value rate of 100%.
- [Condition-enabled items](#)
A condition-enabled item has a value or worth you want to assign and track based on its physical condition. You can apply different rates to an item as its condition changes from use, such as from new to used. When you create an item in the Item Master application, you can select the Condition Enabled check box if you plan to apply one or more conditions to the item.
- [Types of enablement](#)
The condition of an item is specified using the Condition Enabled field of the Item Master application. When you categorize an item as being condition-enabled, the value is based on the physical condition of that item. You use the Condition Codes application to apply one or more condition codes to items. Items that are not classified based on their condition do not have condition codes attached to them.
- [Item sets](#)
Item sets let multiple organizations within a company view and choose from a common set of items stocked in the storeroom. An organization can be associated with only one item set. However, multiple organizations can use the same item set.

Condition rates

Condition rates signify the value of an item, and are expressed as a percentage. A condition code of NEW equates to 100 percent as the condition rate, while a condition code of FAIR might have 50 percent as the condition rate. For each condition-enabled item, one condition code must have a full-value rate of 100%.

Condition-enabled items

A condition-enabled item has a value or worth you want to assign and track based on its physical condition. You can apply different rates to an item as its condition changes from use, such as from new to used. When you create an item in the Item Master application, you can select the Condition Enabled check box if you plan to apply one or more conditions to the item.

Before you can assign condition codes to items, you must create the codes in the Condition Codes application. You define condition codes at the item set level, which makes them available to any item records in that item set. One condition code must be at a full-value (100%) rate, and any other codes you create will be a percentage of that. For example, you might establish the following condition codes (and their corresponding rates) at a transportation company for Tire Model T100:

- New (condition rate 100%)
- Good (condition rate 80%)
- Retread (condition rate 40%)
- Fair (condition rate 40%)
- Poor (condition rate 10%)

If you mark an item as condition enabled, you must assign at least one condition code to it. For each condition-enabled item, one condition code must have a "full-value" rate of 100%. The system uses this condition code as the reference point to calculate values for any other condition codes for this item. Therefore, if you associate only one condition to an item, it must be a full-value 100% rate. For example, a tire is new and the cost is \$60.00. The system calculates the cost of a tire with a status of Fair to be \$24.00 (which is \$60.00 multiplied by the .40 Fair rate). When you mark an existing item as condition-enabled, you are required to add the condition code(s) and then the system applies the full-rate condition code to any inventory records that exist for that item.

You can remove a condition code from an item before you add the item to a storeroom. However, after you add a condition-enabled item to a storeroom, the system creates an inventory record and preserves the condition code. When you add a condition-enabled item to a storeroom, the system, by default, applies the full-value condition code with the 100% rate. You can edit the cost and balance information in the Add Items to Storeroom dialog box, as needed. However, as the system only adds the full rate condition code to the storeroom, you still must add any additional condition codes for the item manually in the Inventory Application.

Types of enablement

The condition of an item is specified using the Condition Enabled field of the Item Master application. When you categorize an item as being condition-enabled, the value is based on the physical condition of that item. You use the Condition Codes application to apply one or more condition codes to items. Items that are not classified based on their condition do not have condition codes attached to them.

Item sets

Item sets let multiple organizations within a company view and choose from a common set of items stocked in the storeroom. An organization can be associated with only one item set. However, multiple organizations can use the same item set.

You identify an item set with a unique name or number, and each item that belongs to the item set has a unique item number.

When you create an organization, you associate an item set to it. When you create an item, by default the item is placed into the item set associated with the organization for your default insert site.

Creating condition codes

You use the Condition Codes application to build the master list of condition codes for a particular item set. You manage your inventory by using condition codes to track the worth of each item in a set. An organization is assigned to one item set, and multiple organizations can use the same item set.

About this task

If you mark an item as condition-enabled, you must assign at least one condition code to it. For each condition-enabled item, one condition code must have a full-value rate of 100%. The condition code with the full-value rate of 100% is used as the reference point to calculate values for any other condition codes for this item.

Procedure

1. From the Condition Codes application, select the item set for which you want to create a condition code.
2. Click New Row and type a name and a description for the condition code.
One code for the full value, or 100% rate, is required.
3. In the Condition Rate field, type a percentage that indicates the condition of the item, and save the condition code.

What to do next

After you build the master list of condition codes, set up condition-enabled items using the Item Master application, and manage condition-enabled item balances using the Inventory application.

Storerooms

You use the Storerooms application to add and maintain information about storeroom locations, as well as view the items stocked within a storeroom. You also use this application to associate the general ledger accounts with each storeroom, define the lead time calculation for items in a storeroom, and flag the storeroom to function as an internal supplier to other storerooms.

Reorder storeroom

You can also specify that all the items in a storeroom are reordered from only one storeroom. In the Storerooms application, you select the Select Reorder Storeroom action and specify a reorder storeroom and a reorder site. When you specify a reorder storeroom, you do not have to manually specify reorder settings, such as a vendor, in the inventory record for each item in the current storeroom.

Storeroom hierarchies

You can create a storeroom hierarchy by specifying parent storerooms. The parent storeroom must have the same organization and site as the current storeroom and cannot be a descendant of the current storeroom. Storeroom hierarchies can be useful when you want to apply a change to multiple storerooms at once, such as adding items to multiple storerooms.

- [Storerooms overview](#)
You can add and maintain information about storeroom locations, and view the items stocked within a storeroom. You can also associate the general ledger accounts with each storeroom, define the lead time calculation for items in a storeroom, and flag the storeroom to function as an internal supplier to other storerooms.
- [Working with storerooms](#)
You can add and delete storerooms as a means of tracking where your inventory is stored and from where it is issued. You can issue items internally from the default storeroom, and change the lead time calculations to analyze vendors and determine when to reorder items.

Storerooms overview

You can add and maintain information about storeroom locations, and view the items stocked within a storeroom. You can also associate the general ledger accounts with each storeroom, define the lead time calculation for items in a storeroom, and flag the storeroom to function as an internal supplier to other storerooms.

- [Control accounts and storerooms](#)
The Storerooms application contains two control accounts that are used for items and tools. The general ledger control account is the control account for inventory items, and the tool control account applies only to tools.
- [Lead time calculations for storerooms](#)
Lead time is the time between when an item is ordered and when it is received. When items are received, a lead time calculation is used to update the lead time on the inventory record.

Control accounts and storerooms

The Storerooms application contains two control accounts that are used for items and tools. The general ledger control account is the control account for inventory items, and the tool control account applies only to tools.

When you create a storeroom, you specify its general ledger and control accounts. You use the general ledger accounts to track financial transactions for a storeroom location.

When you add an item to a storeroom (into inventory), the account number defaults to the inventory record that is created. When you add a tool to a storeroom (as a stocked tool), the account number defaults to the stocked tool record that is created.

Lead time calculations for storerooms

Lead time is the time between when an item is ordered and when it is received. When items are received, a lead time calculation is used to update the lead time on the inventory record.

You can use lead times as a factor to analyze vendors and determine the time to reorder items in the reorder routine.

For a given storeroom, the Recent Lead Time Weight in % is the weight in percent given to the most recent receipt of an order. You can give the most recent record more (or less) importance in the calculation of lead time. You can weigh the lead time calculation by specifying that a certain percent of the calculation is based on the most recent receipt for that inventory item, while the remaining percentage (the difference) is assigned automatically to the original lead time, or the lead time that is currently set for the inventory item.

Working with storerooms

You can add and delete storerooms as a means of tracking where your inventory is stored and from where it is issued. You can issue items internally from the default storeroom, and change the lead time calculations to analyze vendors and determine when to reorder items.

- [Adding storeroom locations](#)
Storeroom locations are the names of your inventory storerooms, the places inventory items are stored in and issued from. You use the Storerooms application to add new storeroom locations.
- [Deleting storeroom locations](#)
To manage the storerooms that you created, you use the Storerooms application to delete a storeroom location.
- [Changing lead time calculations for storerooms](#)
Lead time is the time between when an item is ordered and received. To analyze vendors and determine when to reorder items, you can change how lead times are calculated.
- [Specifying storerooms on purchase orders and purchase requisitions](#)
You use the Storerooms application to specify whether you want a storeroom to internally supply and reserve inventory items for use with internal purchase requisitions and internal purchase orders.

Adding storeroom locations

Storeroom locations are the names of your inventory storerooms, the places inventory items are stored in and issued from. You use the Storerooms application to add new storeroom locations.

Procedure

1. In the Storerooms application, click the New Storeroom icon.
2. Enter a location and description.
3. Optional: Specify values for the general ledger account codes.
4. Optional: In the Recent Lead Time Weight in % field, enter the percent value for the weight given to the most recent order to calculate the lead time of the inventory item.
5. Optional: In the Ship To Labor field and Ship To Address field, select the shipping labor code and address information.
6. Optional: In the Bill To Labor field and Bill To Address field, select the billing labor code and address information.
7. To designate the storeroom as the default storeroom for the site, select the Default Storeroom check box.
8. To use this storeroom to supply items for use with internal purchase requisitions and purchase orders, select the Use in PO/PR check box.

9. Click the Save Storeroom icon to create a storeroom location.

Deleting storeroom locations

To manage the storerooms that you created, you use the Storerooms application to delete a storeroom location.

Before you begin

You cannot delete a storeroom if items or tools are stocked in it.

Procedure

1. In the Storerooms application, select the storeroom location that you want to delete.
2. Select the Delete Storeroom action.
3. Click Yes to delete the storeroom that you selected.

Changing lead time calculations for storerooms

Lead time is the time between when an item is ordered and received. To analyze vendors and determine when to reorder items, you can change how lead times are calculated.

Procedure

1. In the Storerooms application, select a storeroom.
2. In the Recent Lead Time Weight in % field, enter a value. You can specify different lead time weights for different storeroom locations.
3. Save your changes.

Results

When you change this calculation, the weight in percent used for the current inventory lead time is automatically considered 100% minus the value in the Recent Lead Time Weight in % field.

Example

For a storeroom, the Recent Lead Time Weight in % is set to 20%. A quantity of 100 items is ordered, for which the item has an existing lead time of 30 days. The entire shipment is received in 20 days (recent lead time). The inventory item's lead time recalculates based on the recent receipt of the item as follows:
 $0.20 (20 \text{ days}) + 0.80 (30 \text{ days}) = 28 \text{ days}$
28 days become the recalculated lead time for the inventory items. When the item is reordered, 28 is the value for inventory item's existing lead time.

Specifying storerooms on purchase orders and purchase requisitions

You use the Storerooms application to specify whether you want a storeroom to internally supply and reserve inventory items for use with internal purchase requisitions and internal purchase orders.

Procedure

1. In the Storerooms application, open or add a storeroom location.
2. On the Storeroom tab, select the Use in PO/PR check box.
3. Click the Save Storeroom icon to make the storeroom available as an internal supplier in the Purchase Orders and Purchase Requisition applications.

IT Infrastructure module

The IT Infrastructure module (configuration process manager) applications enable management of the configuration items in your IT environment. They provide a logical model of the IT infrastructure by helping you to identify, control, maintain, and verify the versions of all configuration items in the environment and their attributes and relationships.

- **Configuration Items**
You use the Configuration Items application to define, create, and manage relationships among configuration items according to relationship rules that you specify in the Relationships application. A configuration item is any component of an information technology infrastructure that is controlled by configuration management.
- **Relationships**
A relationship uses basic terms to describe the dependency or connectivity between configuration items. The basic terms include runs on, installed on,

contained, and so forth.

- **Collections**

You can create collections of records such as configuration items, assets, and locations to make the records easier to access and manage in other applications. In the Collections application, you can create, view, change, or delete collections.

Configuration Items

You use the Configuration Items application to define, create, and manage relationships among configuration items according to relationship rules that you specify in the Relationships application. A configuration item is any component of an information technology infrastructure that is controlled by configuration management.

In the Configuration Items application, you can manage configuration item collections, and you can create service requests, incidents, problems, work orders, changes, and releases for the configuration item.

Configuration items vary in complexity, size, and type. A configuration item can be a complete service, including all hardware, software, documentation, and so on. The smallest unit for a configuration item is typically the smallest component that you change independently of other configuration items, such as a minor hardware component.

In practice, most configuration items with which you deal are at a higher level, including assets, services, items, and locations. Some configuration items can be physical locations, such as a data center. Discovery tools typically do not find these configuration items; you can associate them with location records.

You can use discovery tools to locate and characterize some configuration items. Discovered configuration items are called actual configuration items. You can view them in the Actual Configuration Item application.

When you work with configuration items, the following things apply:

- Configuration items are managed individually, and are typically treated as self-contained units for identification and change control purposes.
- Configuration items are identified uniquely with names and other attributes.
- The lowest level configuration item is typically the smallest unit that are changed independently of other components.

Creating configuration items

In the Configuration Items application, you create the configuration items that you want to be under configuration management and change control. The configuration items that you create are sometimes referred to as authorized configuration items, or simply, CIs.

You often create a CI based on the database record of an actual configuration item, or actual CI, that was created by a discovery tool. The record you create in the Configuration Items application, however, is the authorized version of the actual CI in the Actual Configuration Items application.

Creating records for configuration items

In the Configuration Items application, you can create the following kinds of records for a CI:

- Service requests
- Incidents
- Problems
- Work order
- Changes
- Releases

Associating configuration items

You can associate, or link, a CI with another record, such as an asset, location, item, service, or service group. You can associate an actual CI with an authorized CI in the following ways:

- In the Configuration Items application, you can create an authorized CI and associate it with an actual CI.
- In the Configuration Items application, you can associate an existing authorized CI with an actual CI.
- In the Actual CI application, you can create an authorized CI (a new record in the Configuration Items application) by selecting an actual CI and specifying a classification.

Not all CIs have an association with other records.

Comparing attributes of associated configuration items

When an authorized CI, the "as planned" version of the CI, is associated with an actual CI, the "as built" (or discovered) version of the CI, the values of their attributes should match. Any mismatches need to be investigated for cause and corrected. The Configuration Items application provides a comparison feature where such mismatches are highlighted. When any currently displayed authorized CI is associated (linked) with an actual CI, you can view an attribute comparison of the two CIs in the Specifications table, where any discrepancies in their attribute values are highlighted.

From the Specifications table on CI Details tab, you can view any attribute discrepancies that exist between the currently displayed, authorized CI and its associated actual CI (if one exists). If a CI is at present linked to an existing actual CI, the Specifications table adds a Discovered Variance column (for the actual CI) next to the Authorized Value column (for the authorized CI). These columns present a side-by-side, authorized-vs.-discovered comparison of the values for the complete set of authorized attributes.

Here is how the attribute comparison works:

- If the attribute values of the two CIs match one another, the matched value is displayed in the Authorized Value column only.

- If the values do not match, the two mismatches are displayed *and highlighted* in each column.
- If a mismatched *discovered* value is a value of null or "empty," the text `No Discovered Value` is displayed in the Discovered Variance column and the data in both columns are highlighted.

Note: If an authorized CI attribute has no corresponding attribute at all in the actual CI, nothing is displayed in the Discovered Variance column and nothing is highlighted. Here the attribute is treated as an extra attribute in the authorized CI, not a variance. That is, sometimes an attribute is intentionally added to an authorized CI, but not to the actual CI, so it cannot be discovered and imported as an attribute of the actual CI.

Maintaining consistency between the actual and authorized versions of your CIs is part of controlling your IT environment. It ensures that your Content Management System accurately reflects your physical and logical infrastructure. The attribute comparison in the Specifications table provides you with quick visibility of attribute mismatches, so that you can take steps to correct them. This comparison can bring to your attention possible incongruities or unauthorized changes to a CI, or even validate that an approved change request to reconcile identified mismatches between attribute values was completed as expected.

- [Configuration items management](#)
You can search for and import configuration item types into the asset management database as a way to filter data. You can view attributes, relationships, relationship rules, and classifications for configuration item types. You can also view configuration type instances for the configuration item types you import.
- [Working with configuration items](#)
You create configuration items that you want to keep under configuration management and change control. You can manage relationships among configuration items according to relationship rules that you specify in the Relationships application. You can also create records for a configuration item and associate a configuration item with another record.

Configuration items management

You can search for and import configuration item types into the asset management database as a way to filter data. You can view attributes, relationships, relationship rules, and classifications for configuration item types. You can also view configuration type instances for the configuration item types you import.

Configuration item discovery

You use the discovery tool to find configuration items that exist in your information technology infrastructure.

You can use the settings in the discovery tool to specify the types of configuration items to search for. Some examples of configuration items include: computers, systems, routers, and switches. The discovered configuration items reside in the discovery tool database, including configuration item types.

Configuration item data import

You use Integration Composer and the IBM® Tivoli® Integration Adapter to import data from the discovery engine. You can import the data in two stages:

Stage 1

You import configuration item types as classifications, including their attributes and relationships, and the relationship rules between various configuration item types. You can view the classifications and attributes in the Classifications application. You can view relationships and relationship rules in the Relationships application. You can also view the list of configuration item types in the Configuration Item Types application.

You can manage only a subset of the configuration items that the discovery tool finds. In the Configuration Item Types application, you can select the configuration item types that you want to manage under configuration management and change control. The import process in stage 2 imports only the configuration item types that you select.

Stage 2

You import configuration item instances into the Actual Configuration Items application. The import brings only the configuration items that are associated with the configuration item types that you selected in the Configuration Item Types application. Selecting configuration item types is a way to filter the data. The import process also brings the relationships that exist between the various configuration items.

Authorized configuration item creation

Configuration management and change control processes do not operate on actual configuration items. Instead, they operate as authorized configuration items which are items that conform to rules and relationships that you define in the Configuration Items application.

When you create an authorized configuration item, it can be linked to an actual configuration item record. You can also create an authorized configuration item that is independent of any actual configuration item record, because not all configuration items need to work with the discovery engine. You can create a link between the authorized configuration item and the actual configuration item in the Configuration Items and Actual Configuration Items applications.

You can create an authorized classification hierarchy that maps to an actual classification hierarchy. Partial mappings can exist between the two classifications, rather than a complete mirror image. You can use the Manage CI Hierarchies action in the Classifications application to define the configuration item hierarchies.

- [Status of configuration item types](#)
The status of a configuration item type determines whether actual configuration items associated with that type are imported into the Actual Configuration Items application.
- [Actual configuration items](#)
An actual configuration item is an item that is loaded into the Actual Configuration Items application from the discovery engine using the IBM Tivoli Integration Composer. You can load configuration items into the database from a discovery engine or an asset management database. First load your configuration item data into the discovery engine using the bulk loader interface.
- [Configuration item collections](#)
In the Configuration Items application, you can associate collections with a configuration item.
- [Configuration item changes](#)
When you create configuration items, you can change them to suit your business needs.
- [Configuration item statuses](#)
You can change the status of configuration item records to suit your business needs.

- [Configuration item deletion](#)

You can either delete or decommission a configuration item.

Actual configuration items

An actual configuration item is an item that is loaded into the Actual Configuration Items application from the discovery engine using the IBM® Tivoli® Integration Composer. You can load configuration items into the database from a discovery engine or an asset management database. First load your configuration item data into the discovery engine using the bulk loader interface.

- [Actual configuration item details](#)

For configuration items that are based on actual configuration items, you can use the Configuration Items application to view detailed information that is in the Actual Configuration Items application.

Actual configuration item details

For configuration items that are based on actual configuration items, you can use the Configuration Items application to view detailed information that is in the Actual Configuration Items application.

You use the View Actual CI Details action to view the classification, global unique identifier (GUID), and last scan date of an actual configuration item, as well as the attributes associated with the classification. This information is read only.

You can use the Actual CI field of the configuration item to access additional information in the Actual Configuration Items application.

Configuration item collections

In the Configuration Items application, you can associate collections with a configuration item.

To associate collections of configuration items with a specific configuration item, you use the Manage CI Collections action.

For example, you have a collection that includes a group of configuration items in a data center that you want to associate with a specific configuration record.

Configuration item changes

When you create configuration items, you can change them to suit your business needs.

When you change fields, and add or delete rows, the following rules apply:

- The value in one field can determine if you can change the value in another field.
- If you change the classification, the attributes reflect the new classification.
- If the configuration item is protected, you might not be able to change the value of an attribute.

Configuration item statuses

You can change the status of configuration item records to suit your business needs.

You use the Change Status action to change the status of configuration items. A configuration item can have these statuses:

- Not ready - When you create a configuration item, it has a status of not ready.
- Operating - This status indicates that the configuration item is currently being used.
- Decommissioned - Configuration items that have been decommissioned cannot be used in new records. You can access a decommissioned configuration item only in the Configuration Items application. Decommissioned configuration items are not displayed in Select Value windows.

You configure the list of applicable statuses for a configuration item in the CI Lifecycle application.

Configuration item deletion

You can either delete or decommission a configuration item.

You use the Delete action to delete a configuration item. You cannot delete a configuration item if it is used on any other record.

Instead of deleting a configuration item, you can change the status of the configuration item to decommissioned. Decommissioning a configuration item makes the item inaccessible in all other applications.

Working with configuration items

You create configuration items that you want to keep under configuration management and change control. You can manage relationships among configuration items according to relationship rules that you specify in the Relationships application. You can also create records for a configuration item and associate a configuration item with another record.

- **Creating configuration items**
You create configuration items to establish relationships and groupings of infrastructure components in information technology for configuration management and change control.
- **Creating records in configuration items**
You can create records in the Configuration Items application without accessing the Service Desk applications.
- **Specifying relationships between configuration items**
To manage your configuration item collection, you can specify relationships between one configuration item and another configuration item.
- **Adding configuration items to collections**
To manage configuration items, you can add one or multiple configuration items to collections.
- **Viewing the business application topology for actual configuration items**
To view a graphical representation of the relationships of business applications that are associated with actual configuration items, you view the business application topology for an actual configuration item.

Creating configuration items

You create configuration items to establish relationships and groupings of infrastructure components in information technology for configuration management and change control.

Procedure

1. In the Configuration Items application, click New CI.
2. Provide a name for the configuration item.
3. Optional: Provide a description for the configuration item.
4. Optional: Specify these values for the configuration item:

Option	Description
Classification	<ul style="list-style-type: none">• Associate the configuration item with a classification.
Actual CI	<ul style="list-style-type: none">• Base the configuration item on an actual configuration item.• If the Classification field is blank when you specify the value for the actual configuration item, the classification and attributes from the actual configuration item are used.
<ul style="list-style-type: none">• Asset• Location• Item• Service• Service Group	<ul style="list-style-type: none">• Associate the configuration item with an asset, location, item, service, or service group.• Some associations preclude making other associations. For example, if you associate the configuration item with an asset, the Location field, Item field, and Service field become read-only.
<ul style="list-style-type: none">• CI• Location• Site• Organization• Item Set• Calendar• Shift	<ul style="list-style-type: none">• Specify values for the location of the configuration items, the site, the organization, the item set, the calendar, and the shift.• Some values preclude specifying other values.
CI Owner	<ul style="list-style-type: none">• Specify an owner for the configuration item.

5. To add attributes, click New Row.
To add attributes, you must associate the configuration item with a classification.
6. In the Attribute field, specify a value.
7. Optional: Provide information for the remaining fields.
8. Save your changes.

Creating records in configuration items

You can create records in the Configuration Items application without accessing the Service Desk applications.

Procedure

1. In the Configuration Items application, select the configuration item for which you want to create a record.
2. Select the **Create > Record Type** action where *Record Type* is one of the following record types:
 - Service Request
 - Incident
 - Problem

- Change
 - Release
 - Work Order
 - Solution
 - Communication
3. Save the record.

Specifying relationships between configuration items

To manage your configuration item collection, you can specify relationships between one configuration item and another configuration item.

Before you begin

You specify relationships in the Relationship application.

Procedure

1. In the Configuration Items application, display the configuration item for which you want to specify a relationship.
This configuration item is the current configuration item.
2. Click the Related CIs tab.
3. Click New Row.
4. Specify values for the source configuration item and the target configuration item.
The current configuration item can be either a source or target configuration item.
If you specify a configuration item that is not the current record in one of the fields, the other field displays the current configuration item.
5. Specify a value for the relationship.
If both configuration items are associated with classifications, the relationship must be valid. If the relationship is not valid, you receive an error message.
6. Use the Containment check box to determine if there is a containment relationship between the source and target configuration items.
The Containment check box is read only.
7. Save your changes.

Example

You can specify that a particular software program is installed on a particular computer.

Adding configuration items to collections

To manage configuration items, you can add one or multiple configuration items to collections.

Procedure

1. On the List tab in the Configuration Items application, select the Select Records check box.
2. Select the configuration items that you want to add to the collection.
3. Select the Add CIs to Collections action.
4. In the Add CIs to Collections window, specify a value for the collection.
5. Click OK.

Viewing the business application topology for actual configuration items

To view a graphical representation of the relationships of business applications that are associated with actual configuration items, you view the business application topology for an actual configuration item.

Before you begin

To view the business application topology, you open a discovery tool, such as IBM® Tivoli® Application Dependency Discovery Manager. You can view the business application topology for actual configuration items that are associated with configuration items.

Procedure

1. In the Configuration Items application, select the configuration item that is associated with the actual configuration item.
2. Select the View Actual CI Topology > Business Application action.
3. To view the topology, perform one of the following steps:

Option	Description
If the actual configuration item is associated with one operational management product	View the topology.

Option	Description
If the actual configuration item is associated with multiple operational management products	a. Specify an operational management product. b. Click OK. c. View the topology.

4. Close the discovery tool to return to the Configuration Items application.

- [Viewing the application topology for actual configuration items](#)

To view a graphical representation of the relationships of applications that are associated with actual configuration items, you view the application topology for an actual configuration item.

- [Viewing the physical topology for actual configuration items](#)

To view a graphical representation of the relationships that are associated with actual configuration items, you view the physical topology for an actual configuration item.

Viewing the application topology for actual configuration items

To view a graphical representation of the relationships of applications that are associated with actual configuration items, you view the application topology for an actual configuration item.

Before you begin

To view the application topology, you open a discovery tool, such as IBM® Tivoli® Application Dependency Discovery Manager. You can view the application topology for actual configuration items that are associated with configuration items.

Procedure

1. In the Configuration Items application, select the configuration item that is associated with the actual configuration item.
2. Select the View Actual CI Topology > Application action.
3. To view the topology, perform one of the following steps:

Option	Description
If the actual configuration item is associated with one operational management product	View the topology.
If the actual configuration item is associated with multiple operational management products	a. Specify an operational management product. b. Click OK. c. View the topology.

4. Close the discovery tool to return to the Configuration Items application.

Viewing the physical topology for actual configuration items

To view a graphical representation of the relationships that are associated with actual configuration items, you view the physical topology for an actual configuration item.

Before you begin

To view the physical topology, you open a discovery tool, such as IBM® Tivoli® Application Dependency Discovery Manager. You can view the physical topology for actual configuration items that are associated with configuration items.

Procedure

1. In the Configuration Items application, select the configuration item that is associated with the actual configuration item.
2. Select the View Actual CI Topology > Physical action.
3. To view the topology, perform one of the following steps:

Option	Description
If the actual configuration item is associated with one operational management product	View the topology.
If the actual configuration item is associated with multiple operational management products	a. Specify an operational management product. b. Click OK. c. View the topology.

4. Close the discovery tool to return to the Configuration Items application.

Relationships

A relationship uses basic terms to describe the dependency or connectivity between configuration items. The basic terms include runs on, installed on, contained, and so forth.

You define and work with relationships in these ways:

- In the Relationships application, you create the formal definitions and accompanying rules for relationships.

- In the Configuration Items application, you associate configuration items with each other using the relationships that you define in the Relationships application.

When you create relationships you specify several properties and rules, including these properties:

- **Directionality** - The directionality of a relationship affects what is found when a user searches for configuration items that are based on relationships. Relationships can be unidirectional, such as installed on or bidirectional.
- **Complementarity** - If a relationship is complementary, one relationship implies another relationship. For example, the relationship of operating system A to computer B is installed on. This relationship implies that the relationship of computer B to operating system A is installed with.
- **Cardinality** - This property specifies whether you can have multiple configuration items as the source and the target. For example, an operating system can be installed on many computers, which is a one-to-many relationship. In addition, a computer can have a one-to-one relationship, which means that the computer runs one operating system.
- **Containment** - This property specifies whether there is a parent-child relationship between configuration items.
- **[Relationships overview](#)**
A relationship describes the dependency or connectivity between configuration items. A relationship can be unidirectional or bidirectional. Rules exist for changing or deleting relationships.
- **[Creating relationships](#)**
You create relationships to define rules that determine how assets or configuration items relate to each other. These rules affect how you deploy, manage, and search for assets and configuration items.
- **[Defining asset relationship rules](#)**
You can apply rules to relationships by classification and attribute.

Relationships overview

A relationship describes the dependency or connectivity between configuration items. A relationship can be unidirectional or bidirectional. Rules exist for changing or deleting relationships.

- **[Unidirectional and bidirectional relationships](#)**
A relationship describes the dependency or connectivity between configuration items. A relationship can be either unidirectional or bidirectional. The results of a search are affected when relationships are bidirectional or unidirectional.
- **[Asset-based relationships](#)**
A relationship describes the dependency or connectivity between assets. You can define relationships, such as `installed on` or `terminates`, and then apply them to relevant assets.
- **[Relationship cardinality](#)**
Cardinality is when you define a relationship, and you specify whether one or more configuration items can be in the source classification and target classification.
- **[Relationship change rules](#)**
You can change relationships to fit your business needs.
- **[Deletion rules for relationships](#)**
You can delete relationships as your business needs change.

Unidirectional and bidirectional relationships

A relationship describes the dependency or connectivity between configuration items. A relationship can be either unidirectional or bidirectional. The results of a search are affected when relationships are bidirectional or unidirectional.

Unidirectional relationships

A unidirectional relationship is valid in only one direction. The following phrases are examples of unidirectional relationships: `installed on`, `installed with`, `contains`, `member of`, `starts from`, `resides on`, `succeeded by`, and `preceded by`.

For example, an operating system is installed on a computer. A computer is not installed on an operating system. However, in another type of unidirectional relationship, you can specify that a computer contains an operating system.

Bidirectional relationships

A bidirectional relationship is valid in both directions. `Intersects` is an example of a bidirectional relationship.

Search results

The distinction between unidirectional relationships and bidirectional relationships is important when you search configuration items based on relationships.

Relationship	Search results
Bidirectional	<ul style="list-style-type: none"> • A user searches for all configuration items with an interfaces with relationship to application Z. Since interfaces with is a bidirectional relationship, the search program searches for these occurrences: <ul style="list-style-type: none"> ◦ The source configuration item is application Z and the relationship is interfaces with. ◦ The target configuration item is application Z and the relationship is interfaces with.

Relationship	Search results
Unidirectional	<ul style="list-style-type: none"> For unidirectional relationships, the search program searches for one combination. For example, a user searches for all configuration items with a member of relationship to an EMAIL SERVICE application, where EMAIL SERVICE is the target configuration item. The search program searches for the following occurrence: the target configuration item is EMAIL SERVICE and the relationship is member of. You can define one unidirectional relationship to be complementary to another unidirectional relationship. For example, in your relationship definition, you specify that installed on is complementary to installed with. A user wants to find all configuration items that are installed on AppServer K. The search program searches for these occurrences: <ul style="list-style-type: none"> The target configuration item is AppServer K and the relationship is installed on. The source configuration item is AppServer K and the relationship is installed with.

Asset-based relationships

A relationship describes the dependency or connectivity between assets. You can define relationships, such as `installed on` or `terminates`, and then apply them to relevant assets.

In the Relationships application, you create the formal definitions and accompanying rules for relationships.

In the Assets application, you associate assets with each other by using the relationships.

When creating a relationship between assets, you can define rules to validate that certain conditions are met. A relationship identifies a dependency or connectivity between two assets and the relationship rules validate the following criteria:

- Asset classifications, to ensure that only valid types of assets are related.
- Asset attributes, to ensure that certain values or conditions are met within a classification.

To accommodate complex validations, within a relationship definition multiple rules can be created, related, and grouped.

A relationship can contain none, one, or many validation rules. Each relationship rule consists of the following criteria:

- The classification requirement of the source asset.
- An attribute, a value, and a condition (equal to, less than, and so on) within the source asset classification.
- The classification requirement of the target asset.
- An attribute, a value, and a condition (equal to, less than, and so on) within the target asset classification.

Two or more relationship rules can be grouped together. Within a group, the validation requirement for the combination of rules is determined by the Within Group setting. This value determines whether all conditions must be met, or any one of them.

Similarly, there can be multiple groups of rules. Across all groups, at least one rule group validation condition must be met.

Linear asset relationships

Asset relationships can be applied to point or linear assets. Linear assets can be defined as segments or layers, where you define an asset's location and how it relates to another.

Linear Asset Manager provides additional features for managing linear assets and is enabled under a separate license key. You must install a Linear Asset Manager license to use linear asset features.

When you are working with a linear asset in the Assets application, under the Relationships tab, you can enter additional linear data for an asset relationship, identifying the start and end measures for source and target assets.

Alternatively, you can select from a list of reference points for the source and target measures. Reference points are enabled by the Use as Reference check box and automatically populate the measures on subsequent reference point selections.

Relationship cardinality

Cardinality is when you define a relationship, and you specify whether one or more configuration items can be in the source classification and target classification.

The following list describes the possible values of cardinality are:

- 1:n - one to many
- 1:1 - one to one
- n:n - many to many

The following table describes the cardinality values:

Cardinality	Relationship rules
-------------	--------------------

Cardinality	Relationship rules
1:n	<ul style="list-style-type: none"> • A configuration item that belongs to the source classification can have the relationship with multiple configuration items that belong to the target classification. • A configuration item that belongs to the target classification can have the relationship with only one configuration item that belongs to the source classification. • For example, you specify a 1:n cardinality for an installed with relationship between computer systems and operating systems. Therefore, a computer system instance can be installed with many operating system instances. This 1:n value also implies that an operating system instance can have an installed with relationship with only one computer system instance.
1:1	<ul style="list-style-type: none"> • A configuration item that belongs to the source classification can have the relationship with only one configuration item that belongs to the target classification. • A configuration item that belongs to the target classification can have the relationship with only one configuration item that belongs to the source classification. • For example, you specify a 1:1 cardinality for a runs on relationship between operating systems and computer systems. Therefore, an operating system instance can run on only one computer system instance.
n:1	<ul style="list-style-type: none"> • Multiple configuration items that belong to the source classification can have the relationship with only one configuration item that belongs to the target classification. • A configuration item that belongs to the target classification can have the relationship with multiple configuration items that belong to the source classification. • For example, you specify an n:1 cardinality for an installed on relationship between operating systems and computer systems. Therefore, multiple operating system instances can be installed on one computer system instance. This n:1 value also implies that an operating system instance can be installed on only one computer system instance.
n:n	<ul style="list-style-type: none"> • Multiple configuration items that belong to the source classification can have the relationship with multiple configuration items that belong to the target classification.

Relationship change rules

You can change relationships to fit your business needs.

The following list describes the rules regarding changing relationships:

- You cannot change rules that are part of the common data model.
- You cannot delete the rule if any configuration items use the rule.
- You cannot change the containment flag if any configuration items use the rule.
- You cannot change the Is Target Parent setting if any configuration items use the rule.

You can change the cardinality in these ways:

- If 1:1, you can change the cardinality to 1:n, n:1, and n:n.
- If 1:n, you can change the cardinality to n:n.
- If n:1, you can change the cardinality to n:n.

If n:n, you cannot change the cardinality.

Deletion rules for relationships

You can delete relationships as your business needs change.

You cannot delete a relationship when a relationship meets one of these conditions:

- The relationship is used to associate any configuration items.
- The relationship or relationship rule is imported.

Creating relationships

You create relationships to define rules that determine how assets or configuration items relate to each other. These rules affect how you deploy, manage, and search for assets and configuration items.

Procedure

1. In the Relationships application, click the New Relationship icon.
2. Select the type of relationship. Type defines the relationship as either `BIDIRECTIONAL` or `UNIDIRECTIONAL`.
3. In the Use With field, enter or select `ASSET`, for asset relationships, or `CI`, for configuration item relationships.
4. Optional: If the linear asset features are available, specify these options:
 - To use the relationship with linear assets, select Linear.
 - To use the relationship as a reference point in linear assets, select Is Reference Point.
5. Optional: Specify a complementary relationship.

- Including a complementary relationship allows search programs to find instances of a configuration item when it is a source and when it is a target.
- Optional: Define asset or CI relationship rules.
 - Save the new relationship.

Defining asset relationship rules

You can apply rules to relationships by classification and attribute.

Before you begin

Ensure that classifications and attributes are defined and understand the relationship rule and group structure for validation purposes.

Procedure

- In the Relationships application, select a relationship with Use With set to `ASSET`.
- In the Asset Relationship Rules table, click New Row.
- Select a source and target classification pair.
- For grouped rule validation purposes, select the Within Group condition; where `AND` indicates that all rules must be met and `OR` indicates that any one must be met.
- Optional: For the Source Classification and Target Classification definitions, enter or select a Source Attribute value.
- Optional: For the Source Classification and Target Classification, enter or select the source attribute Condition value, where:

Option	Description
EQUALS	True if the attribute data equals the value.
NOTEQUAL	True if the attribute data does not equal the value.
GREATER	True if the attribute data is greater than the value.
GREATEROREQUAL	True if the attribute data is greater than or equal to the value.
LESS	True if the attribute data is less than the value.
LESSOREQUAL	True if the attribute data is less than or equal to the value.
LIKE	True if the attribute data contains the text entered in the value. Use for searching text.
NOTLIKE	True if the text entered in the value is not contained within the attribute data. Use for searching text.

- Optional: For the Source Classification and Target Classification, enter the corresponding Value for the selected Condition.
- Optional: Add additional lines by using New Row and new groups by changing the Group number.
- Save your relationship rules.

Collections

You can create collections of records such as configuration items, assets, and locations to make the records easier to access and manage in other applications. In the Collections application, you can create, view, change, or delete collections.

Instead of selecting from a list of all configuration items, assets, or locations, you specify the collection from which users obtain records.

You can also use collections to provide users limited access to configuration items. In the Security Groups application, you can assign user groups to specific collections. Users in these groups see only the configuration items that are part of the specified collections.

You also can make a collection active or inactive:

- If a collection is active, you can use the collection from other applications.
- If a collection is inactive, you can add, change, and delete collection details. However, you cannot use the collection in other applications.

When you create collections that are based on the appropriate details (for example, locations or departments), you can streamline software deployment, change request management, incident response, and other tasks.

For example, an information technology employee wants to update a software product on some of the computers in a customer service department. The department is in multiple locations. The employee accesses the customer service department collection, and selects computers from a list that is specific to that department.

- [Working with collections](#)

Collections are groupings of records, which makes the records easier to access and manage in other applications. You can create, change, and copy collections.

Working with collections

Collections are groupings of records, which makes the records easier to access and manage in other applications. You can create, change, and copy collections.

- [Creating collections](#)

You create collections to contain configuration items, assets, and locations that you want to group together. By creating collections, the records in the collections are easier to access in other applications.

- [Changing collections](#)

As your business needs change, you can change your collections.

- [Copying collections](#)

You can copy collections to create similar records without entering the same information again. After you copy an existing collection, you change the new collection as needed.

Creating collections

You create collections to contain configuration items, assets, and locations that you want to group together. By creating collections, the records in the collections are easier to access in other applications.

About this task

You can add the same configuration item, asset, or location to multiple collections. You cannot add the same item, asset, or location multiple times to the same collection.

Procedure

1. In the Collections application, click New Collection.
2. Provide a name for the collection.
3. Optional: Provide a description for the collection.
4. Optional: Activate or inactive the collection:
 - If a collection is active, you can use the collection in other applications.
 - If a collection is inactive, you can add, change, and delete collection details. However, you cannot use the collection in other applications.
5. Click New Row.
6. Optional: Specify values for configuration item, asset, or location.
When you specify one of these values, the other two values become inactive.
7. Optional: Specify a value for site.
The associations between sites, assets, and locations determine your ability to specify a value for site. Also, if you specify a site before you specify other values, your choices for asset or location are narrowed. Because configuration items do not belong to any sites, the Site field and Organization field are read-only when you add a configuration item.
The Organization field displays the organization for the specified site.
8. Save your changes.

Changing collections

As your business needs change, you can change your collections.

Procedure

1. In the Collections application, select the collection that you want to change.
2. Optional: Activate or inactivate the collection:
 - If a collection is active, you can use the collection in other applications.
 - If a collection is inactive, you can add, change, and delete collection details. However, you cannot use the collection in other applications.
3. Optional: To change information in the Collection Details table window, delete the row and add a new row.
The information in the Collection Details table window is read-only.
4. Optional: Change additional information.
5. Save your changes.

Copying collections

You can copy collections to create similar records without entering the same information again. After you copy an existing collection, you change the new collection as needed.

About this task

When you copy a collection, all of the information is copied from the existing collection, except for the value for collection.

Procedure

1. Select the collection that you want to copy.
2. Select the Duplicate Collection action.
3. Provide a name for the new collection.
4. Optional: Provide a description for the new collection.
5. Optional: Change additional information.

6. Save your changes.

Planning module

You use the applications in the Planning module to plan how work should be performed, such as creating job plans that outline the steps that must be performed for each type of job.

- **[Job Plans](#)**
You use the Job Plans application to manage job plan records. A job plan is a detailed description of work that is performed for a work order.
- **[Resource Levels Management](#)**
In the Resource Levels Management application, you can create threshold levels that are used to calculate resources for dynamic job plans.
- **[Routes](#)**
Routes simplify the creation of hierarchies of work orders for inspections. A route is a list of related assets, locations, or both. The assets and locations are considered stops along the route.
- **[Safety](#)**
You use the applications in the Safety module (within the Planning module) to inform workers of potential dangers in their work environment and to provide information to protect workers from those dangers. The hazards, precautions, and procedures that you define in these applications can apply to assets, work locations, or both. You associate the records that you create in these applications with Asset, Location, PM (Preventive Maintenance), and Work Order records.
- **[Documenting instrument specifications by using data sheets](#)**
You document your instrument specifications using the data sheet template. These specifications are typically defined by the manufacturer of the instrument.

Job Plans

You use the Job Plans application to manage job plan records. A job plan is a detailed description of work that is performed for a work order.

Job plans generally contain tasks, and information regarding estimated labor, labor hours, materials, services, and tools that are required for the work. To ensure that work on an asset is performed safely, you can add work assets and associate safety plans that can be used when work is performed.

You can specify which organizations and sites can use the information that is on the job plan and its tasks. If you do not specify this information, the job plan can be used in any site of any organization.

You can apply job plans to preventive maintenance records, routes, and work orders. After a job plan becomes a work plan on a work order, you can change the work plan without affecting the job plan.

You also can create a job plan from a work plan that you use frequently.

- **[Job plans overview](#)**
Job plans are detailed descriptions of work tasks (operations), labor, materials, and tools for a type of work. Job plans let you plan and standardize work tasks. You can use a job plan as a template for a work plan on a work order for repetitive maintenance work.
- **[Working with job plans](#)**
Create and modify job plans that become work plans when they are associated with work orders and preventive maintenance records.

Job plans overview

Job plans are detailed descriptions of work tasks (operations), labor, materials, and tools for a type of work. Job plans let you plan and standardize work tasks. You can use a job plan as a template for a work plan on a work order for repetitive maintenance work.

- **[Organizations and sites on job plans](#)**
If your business has multiple facilities, you can set up multiple organizations and sites. Using different organizations and sites allows you to separate and share operations.
- **[Dynamic job plans](#)**
In the Job Plans application, you can create job plans that dynamically calculate work resource requirements based on the scope of the work. This function is useful for businesses that manage continuous assets such as linear pipelines, roads, or tracks.
- **[Job plan tasks](#)**
You can add tasks to job plans to accurately track costs. You can add estimates for labor, materials, services, and tools for the tasks. For each task, you can also create a nested job plan.
- **[Job plan statuses](#)**
Each job plan has a status that indicates whether the job plan is not ready for use, in use, or inactive.
- **[Job plan costs](#)**
You can view the costs for a job plan when it is used at the site that you specify. Since you can specify that certain components of a job plan are available only at certain sites, you can view costs at different sites where the job plan elements can be used.
- **[Job plans and work orders](#)**
You can apply a job plan to a work order. Work orders refer to an activity, change, or release. The job plan that you apply becomes the work plan.
- **[Direct issue items and services for job plans](#)**
Stocked or non-stocked items that are associated with a job plan can be direct issue items. Direct issue items are issued immediately upon receipt to an asset, location, or work order, rather than being stocked in a storeroom.
- **[Safety plan precedence](#)**
You can associate safety plans with assets, locations, and items. You use safety plans to define safety requirements and procedures to fulfill regulatory

- requirements, and to inform employees of hazards that could occur while performing work, as well as actions to take to prevent accidents.
- [Meter information for job plans](#)
You can use a meter name on a job plan task. The meter name is a generic name for a measurement point number.
- [Deletion rules for job plans](#)
As your business needs change, you can delete a job plan.

Organizations and sites on job plans

If your business has multiple facilities, you can set up multiple organizations and sites. Using different organizations and sites allows you to separate and share operations.

You can use multiple organizations and sites to create a job plan that you can use in different ways. For example, you create a job plan that is used on work orders anywhere in your business. On this job plan, you specify that certain tasks on the plan are available only on work orders for a certain organization or site. You can further specify labor, materials, services, and tools for certain tasks.

Example of organizations and sites on job plans

When task 10 is used on a work order at site A, the task uses a certain craft. When task 10 is used on a work order at site B, the task uses a different craft.

Dynamic job plans

In the Job Plans application, you can create job plans that dynamically calculate work resource requirements based on the scope of the work. This function is useful for businesses that manage continuous assets such as linear pipelines, roads, or tracks.

Job plans that are not dynamic apply resources, such as tools or materials, as a static package. For example, a job plan for changing the oil on a truck can specify 4 quarts of oil, which can be applied to each work order for oil changes on trucks.

Dynamic job plans can allocate labor, materials, tools, and services based on variable quantities and duration. For example, rail track maintenance is done in spans of varying length. Therefore, resource requirements for maintaining the rails can fluctuate based on the length of the repair. The amount of labor, tools, materials, and services varies, and the time to complete the work varies.

The key to creating a dynamic job plan is defining a unit of work or maintenance unit. For linear assets, the unit of work can be a distance, such as miles or kilometers. For non-linear assets, a unit of work is generally a quantity.

After you apply a dynamic job plan to a work order, you can specify the scope of the work that is needed to complete the job. Resources are then calculated based on the unit of work and calculation method that are specified in the job plan.

The following resources can be calculated:

- Quantity of
 - Labor
 - Tools
 - Materials
 - Services
- Duration of
 - Job plans
 - Tasks
 - Labor resource hours
 - Tool resource hours

Using the rail track example, you can create a job plan that defines a unit of work as 20 miles and specifies the method to use for calculating resources. When you apply the job plan to your work order and specify that the work covers 200 miles, resources are calculated for 10 units of work.

The following table explains how various calculation methods determine the resource quantity.

Table 1. Dynamic Job Plan Calculation Methods

Calculation method	Description	Calculation process
STATIC	Standard calculation	The resource quantity in the job plan is copied directly to the work order.
PROPORTIONAL	Calculation is proportional to the asset length. Use this method when the duration or resource requirements scale in direct proportion to the scope of the work.	The total work units on the work order is divided by the unit of work in the job plan. Then, that result is multiplied by the duration or resource quantity in the job plan.
LEVEL	Calculation is based on resource levels. Use this method when the requirements do not scale in direct proportion to the work.	The total work units on the work order is divided by the unit of work in the job plan. Then, the proper quantity is selected from a predefined level matrix for the resource.
ATTR LVL	Calculation is based on the asset specification attribute and on the resource level. Use this method when the requirements are based on the type of asset.	The asset specification attribute of the asset on the work order is checked. A by-level table is then used to choose the resource quantity.

Calculation method	Description	Calculation process
ATTR PROP	Calculation is based on the asset specification attribute and is proportional to the scope of the work. Use this method when the requirements are based on the type of asset.	The asset specification attribute or attributes on the work order are checked. Then a formula is used to calculate the resource quantity.

- [Configuring dynamic job plans](#)
Before you can implement dynamic job plans, your administrator must configure a system property to enable dynamic job plans. Administrators must also give users permission to edit dynamic job plans for work orders.
- [Scenario: Creating a dynamic job plan for linear assets](#)
Dynamic job plans are especially useful when you create work for linear assets, such as rail track maintenance, where the labor and materials that are needed for work vary based on the length of the track.
- [Scenario: Creating a dynamic job plan for non-linear assets](#)
You can use dynamic job plans to calculate labor and materials for work on non-linear assets. For example, to determine how much labor is needed for a work order that inspects multiple assets, apply a dynamic job plan that calculates labor based on the number of assets to inspect.

Configuring dynamic job plans

Before you can implement dynamic job plans, your administrator must configure a system property to enable dynamic job plans. Administrators must also give users permission to edit dynamic job plans for work orders.

About this task

By default, the dynamicjobplan system property is not enabled. An administrator must enable the property before you can implement dynamic job plans. In addition, an administrator must update the edit rules for work orders in the Organizations application to ensure that users have permission to edit dynamic job plans.

Procedure

1. To enable the dynamicjobplan system property, complete the following steps:
 - a. Go to System Configuration > Platform Configuration > System Properties.
 - b. Filter to locate the dynamicjobplan system property and expand the row for that property.
 - c. In the Global Value field in the Global Properties Details section, enter 1.
 - d. Save the record.
 - e. Select the check box for the dynamicjobplan property row.
 - f. From the Common Actions menu, click Live Refresh.
 - g. In the Live Refresh window, click OK.
2. To grant edit rights for dynamic job plans, complete the following steps:
 - a. Go to Administration > Organizations.
 - b. Select the organization that you want to give dynamic job plan access to.
 - c. From the More Actions menu, click Work Order Options > Edit Rules.
 - d. In the Edit Rules window, select the check box for the Dynamic Job Plan column and click OK.
 - e. Save the record.

Results

When you complete the configuration steps, the Is dynamic field is available in the Job Plans application, and users can create dynamic job plans.

Scenario: Creating a dynamic job plan for linear assets

Dynamic job plans are especially useful when you create work for linear assets, such as rail track maintenance, where the labor and materials that are needed for work vary based on the length of the track.

Before you begin

The simulation test for this scenario requires a linear asset, such as a rail track or a pipeline. You can use an existing linear asset, or you can create one for the test. For more information, see the documentation for IBM® Maximo® Linear Asset Manager.

About this task

The following scenario explains how to create a dynamic job plan that you can apply to work orders for track maintenance. The job plan uses a proportional calculation to determine the amount of labor and materials that are needed to repair sections of track. The proportional method calculates duration or resource requirements in direct proportion to the scope of the work. For this scenario, the unit of work for the calculation is 1 mile. When this job plan is applied to a work order, it calculates labor and materials for the work order based on the number of units of work that the work order requires. For example, if the work order specifies that 40 miles of track need to be repaired, the job plan calculates the amount of labor and materials that is needed to repair 40 miles of track.

Procedure

1. In the Job Plans application, complete the following steps to create a dynamic job plan:
 - a. Create a new job plan.
 - b. Select Is dynamic.
 - c. In the Dynamic Job Plan Information section, select MILES for the work unit and specify a multiplier of 1.
 - d. Select PROPORTIONAL for the calculation method.
2. In the Job Plan Tasks section of the job plan, enter a repair task.
3. On the Labor subtab, click New Row and complete the following fields:

Option	Description
Task	Select the repair task that you created.
Type	Select HOURS.
Calculation	Select PROPORTIONAL.
Hours	Enter the amount of time that is needed to complete the task for each work unit.

4. Enter a labor, craft, crew, or crew type for the labor record.
 5. On the Materials subtab, click New Row and complete the following fields:
- | Option | Description |
|----------------------|--|
| Task | Select the repair task that you created. |
| Item | Select the item that is required for the task. |
| Item Quantity | Select the number of items that are needed for each work unit. |
| Calculation | Select PROPORTIONAL. |
6. Save the job plan.
 7. To test the job plan, from the More Actions menu, select Simulate Dynamic Job Plan and complete the following steps.
 - a. In Asset field in the Dynamic Job Plan Simulation window, select a linear asset.
 - b. Enter a start and end measure, or accept the default start and end measure boundaries for the asset.
 - c. Click Simulate.
 - d. Check that the Total Work Units field displays the expected value.

Results

If the simulation shows that the job plan can calculate the work accurately, you can activate the job plan and apply it to work orders.

Scenario: Creating a dynamic job plan for non-linear assets

You can use dynamic job plans to calculate labor and materials for work on non-linear assets. For example, to determine how much labor is needed for a work order that inspects multiple assets, apply a dynamic job plan that calculates labor based on the number of assets to inspect.

Before you begin

This scenario creates a dynamic job plan that calculates labor that is required to perform an inspection for a fire extinguisher. To run a simulation to check the accuracy of the job plan, you need two or more active fire extinguisher assets.

About this task

The dynamic job plan in this scenario uses a proportional calculation to determine the amount of labor that is needed for the inspection. The proportional method calculates duration or resource requirements in direct proportion to the scope of the work. For this scenario, the unit of work is EACH, and the multiplier is 1 to indicate that an inspection includes one fire extinguisher.

When this job plan is applied to a work order, the labor for the work order is calculated based on the number of units of work that the work order specifies. For example, if the work order specifies that four fire extinguishers must be inspected, the job plan calculates labor that is needed to inspect four fire extinguishers.

Procedure

1. In the Job Plans application, complete the following steps to create a dynamic job plan:
 - a. Create a job plan for inspecting a fire extinguisher.
 - b. Select Is dynamic.
 - c. In the Dynamic Job Plan Information section, select EACH for the work unit and specify a multiplier of 1.
 - d. Select PROPORTIONAL for the calculation method.
2. In the Job Plan Tasks section of the job plan, enter an inspection task.
3. On the Labor subtab, click New Row and complete the following fields:

Option	Description
Task	Select the inspection task that you created.
Type	Select HOURS.
Calculation	Select PROPORTIONAL.
Hours	Enter the amount of time that is needed to complete an inspection for a fire extinguisher.

4. Enter a labor, craft, crew, or crew type for the labor record.
5. Save the job plan.
6. To test the job plan, from the More Actions menu, select Simulate Dynamic Job Plan and complete the following steps:
 - a. In Asset field in the Dynamic Job Plan Simulation window, select a fire extinguisher asset.
 - b. Click New Row and select another fire extinguisher asset.
 - c. Click Simulate.

d. Check that the Total Work Units field displays the expected amount of time for inspecting the fire extinguishers.

Results

If the simulation shows that the job plan can calculate the labor accurately, you can activate the job plan and apply it to work orders.

Job plan tasks

You can add tasks to job plans to accurately track costs. You can add estimates for labor, materials, services, and tools for the tasks. For each task, you can also create a nested job plan.

Example of job plan tasks

The following table describes tasks that are associated with a job plan to perform annual maintenance on an electric cart. By default, the task identifiers are in increments of 10 to provide you with the flexibility to add tasks within the existing sequence. The sequence is optional; on a work order, the tasks are sorted by sequence, then by task identifier.

Sequence	Task	Description
1	10	<ul style="list-style-type: none">Check tires, lights, horn, mirrors, windshield wipers, steering, key switch, and forward/reverse switch
2	20	<ul style="list-style-type: none">Check brakes, brake lights, and emergency brake
3	30	<ul style="list-style-type: none">Check batteryAdd water as neededCheck terminals and cables
4	40	<ul style="list-style-type: none">Lubricate chain and check sprockets
5	50	<ul style="list-style-type: none">Repack wheel bearingsGrease steering chassis, as needed
6	60	<ul style="list-style-type: none">Operate vehicle for safety check

Job plan statuses

Each job plan has a status that indicates whether the job plan is not ready for use, in use, or inactive.

A job plan can have one of the following statuses:

- Draft** - The draft status is the default status for new job plans. A draft job plan is being developed or reviewed. Job plans with this status are not available in other applications. You must change the status to active to make job plans available to in other applications.
- Active** - An active job plan is complete. Only active job plans are available for use on work orders, preventive maintenance records, and routes.
- Inactive** - You change the status of a job plan to inactive so that the job plan cannot be used on any new work orders.

In the Job Plans application, you use the Change Status action to change the status of a job plan.

Job plan costs

You can view the costs for a job plan when it is used at the site that you specify. Since you can specify that certain components of a job plan are available only at certain sites, you can view costs at different sites where the job plan elements can be used.

In the Job Plans application, you use the View Cost action to view job plan costs. The cost information that you can view includes the total labor hours required to complete the job plan, and the costs for labor, materials, services, and tools.

Example of job plan costs

Job plan 113355 requires that labor A is used at site 1 and labor B is used at site 2. Labor A has an hourly rate of \$34.00 and works for one hour. Labor B has an hourly rate of \$20.00 and works for two hours. You view costs for this job plan. In the Site field, you select site 1 and see a labor cost of \$34.00. When you change to site B, you see a labor cost of \$40.00.

Job plans and work orders

You can apply a job plan to a work order. Work orders refer to an activity, change, or release. The job plan that you apply becomes the work plan.

You can choose a job plan that is associated with the work assets that are identified on the work order. When you associate a job plan with a work order, any default safety plan for the selected work asset is copied to the work order.

You can also specify that nested job plans are processed in the background when job plans are applied to work order type records. Applying large nested job plans can take a significant amount of time to process, so you can continue working while the process occurs in the background. You apply this setting in the Organizations application, by selecting Work Order Options, Other Organization Options, Process Nested Job Plans in the Background.

Example

Job plan #112233 does not have an organization or site defined at the plan level. The job plan does have an organization or an organization and site defined for certain tasks. Some labor records on the job plan are associated with an organization or organization and site. The following tables illustrate the job plan tasks and labor:

Table 1. Tasks on job plan #112233

Task identifier	Organization	Site
10		
15	B	
20		
30		
40	A	
50	A	1

Table 2. Labor on job plan #112233

Task identifier	Labor or craft identifier	Organization	Site
None	Wilson	B	
None	Winston	A	
10	Electrician2		
10	Smith	A	1
15	Ellis	B	
20	Liberi	B	2

Work order #01 has organization A and site 1 defined. When job plan #112233 is applied to this work order, the following tasks, labor, and craft entries are copied to the work order plan:

Table 3. Tasks, labor, and crafts copied to the work plan on WO 01

Job plan-level labor and craft	Organization and site of labor and craft	Task	Task-level labor and craft	Organization and site of labor and craft
Winston	A	10	<ul style="list-style-type: none"> Electrician2 Smith 	<ul style="list-style-type: none"> Organization A Site 1
		20		
		30		
		40		
		50		

Work order #02 has organization A and site 2 defined. When job plan #112233 is applied to this work order, the following tasks, labor, and craft entries are copied to the work order plan:

Table 4. Tasks, labor, and crafts copied to the work plan on WO 02

Job plan-level labor and craft	Organization and site of labor and craft	Task	Task-level labor and craft	Organization and site of labor and craft
Winston	A	10	<ul style="list-style-type: none"> Electrician2 	
		20		
		30		
		40		

Work order #03 has organization B and site 1 defined. When job plan #112233 is applied to this work order, the following tasks, labor, and craft entries are copied to the work order plan:

Table 5. Tasks, labor, and crafts copied to the work plan on WO 03

Job plan-level labor and craft	Organization and site of labor and craft	Task	Task-level labor and craft	Organization and site of labor and craft
Wilson	B	10	<ul style="list-style-type: none"> Electrician2 	
		15	<ul style="list-style-type: none"> Ellis 	B
		20		
		30		

Work order #04 has organization B and site 2 defined. When job plan #112233 is applied to this work order, the following tasks, labor, and craft entries are copied to the work order plan:

Table 6. Tasks, labor, and crafts copied to the work plan on WO 04

Job plan-level labor and craft	Organization and site of labor and craft	Task	Task-level labor and craft	Organization and site of labor and craft
Wilson	B	10	<ul style="list-style-type: none"> Electrician2 	

Job plan-level labor and craft	Organization and site of labor and craft	Task	Task-level labor and craft	Organization and site of labor and craft
		15	• Ellis	B
		20	• Liberi	B
		30		

- **Work order classes for job plans**
To manage job plans, you can associate a default work order class with a job plan. Work orders specify a particular task to be accomplished, and the labor, materials, services, and tools needed to complete the work. The work order classes include activity, change, release, and work order.
- **Job plan conditions**
You apply conditions to job plans to specify that work can begin only when certain conditions are satisfied.
- **Job plan owners**
The owner of a job plan is the party responsible for the service management of the work when the job plan is used on a work order, route, or preventive maintenance record. The owner can be a person or an owner group, and is not the party responsible for performing the work.

Work order classes for job plans

To manage job plans, you can associate a default work order class with a job plan. Work orders specify a particular task to be accomplished, and the labor, materials, services, and tools needed to complete the work. The work order classes include activity, change, release, and work order.

When you use a job plan to create work order-based records, the default class of the job plan defines the class of the work order-based record. When you apply a nested job plan to the work order and the class of the parent is associated with the job plan, the child work order has the same class as the parent. If the class of the parent is not associated with the job plan, the default class of the job plan for the child is used. When you do not associate a work order class with a job plan, you can use the job plan for all classes.

Example of nested job plan

You have job plan 1 and job plan 2, which is nested to job plan 1. You associate nested job plan 2 with change and release work order classes, and change is the default class. When you apply job plan 1 to a release class record, the child that is created for the nested job plan has a release class because release is valid class for job plan 1.

Job plan conditions

You apply conditions to job plans to specify that work can begin only when certain conditions are satisfied.

Job plan conditions automate the creation of new work items on a work order and improve the flow of work in your organization. Conditions can be applied to job plan components and to any corresponding resources. The job plan component can be a task, labor, materials, services, or tools.

You can require that conditions are met for the job plan component and also for the resources that are linked to it. When the conditions that you specify for job plans are met, the component of the job plan is copied to the designated work order.

The conditions that you create for job plans can be designed to suit the needs of your site or organization. You create conditions in the Conditional Expression Manager application.

Example

A maintenance staff member identifies a leaking pump and creates a work order to fix the leak. The staff member specifies the details of the planned work order and applies a job plan. The job plan components have conditions that dictate how the work is to be carried out:

The correct type of seal must be used to fix the leak.

The condition specifies that the seal must be suitable for outdoor use. The job plan identifies two seals in planned material that have specific conditions about their suitability for outdoor or indoor use. The job plan condition requires that if the broken pump is located inside, seal A must be used. If the broken pump is located outside, seal B must be used.

The correct set of tools must be used.

The condition specifies that a specific set of tools must be used to perform the work task. The job plan identifies two sets of tools that can be used to repair pumps. The job plan condition dictates that if the broken pump is model number 123, tool set A must be used. If the pump is model number 456, tool set B must be used.

An additional safety check must be performed.

The condition specifies that an additional safety check task is performed when the job is complete. The job plan condition dictates that if the equipment is in circulation for more than two years, the pump requires an additional safety check.

The conditions are designed to create rules around the work that is performed. If any of the conditions are not met, the job plan component that the condition applies to is not copied to the work order. Only when the conditions are met for the job plan components, can the work be completed.

Job plan conditions and process flow control

Job plan conditions that are not met can have an impact on process flow control. You must define predecessor relationships correctly to avoid a break in the process flow.

Predecessor relationships ensure that the sequential flow of a work order is not disrupted when job plan conditions are not met. If predecessor relationships are defined, but they control a task that is not copied to the work order, a break in the process flow can occur. If a condition is not met, the job plan task cannot be copied to the designated work order. As a result, any tasks that reference the job plan task as a predecessor are also affected.

Example

A job plan scenario that does not have predecessor relationships correctly defined can cause a gap in the process flow.

In the following job plan scenario, the condition that is defined for task 30 might prove false. If the condition proves false, task 30 is not copied to the work order and task 40 no longer refers to task 30 as a predecessor. This outcome is not wanted for the job plan.

Job plan task	Predecessor task and relationship	Condition	Work order task	Predecessor task and relationship	Condition
10	Null value	Null value	10	Null value	Null value
20	10; Finish-to-start	Null value	20	10; Finish-to-start	Null value
30	20; Start-to-start	Condition is defined: Can be true or false.	Null value	Null value	Null value
40	30; Finish-to-start	Null value	40	Null value	Null value

Because the job plan condition that was defined for task 30 proved false, the sequence of tasks is broken. As a result, task 40 is lacking a predecessor relationship, so the status is set to In Progress (INPRG) at the same time as task 10.

A job plan scenario that has predecessor relationships correctly defined can bridge potential gaps in the process flow.

In the following job plan scenario, the condition that is defined for task 30 can still prove false. However, tasks 20 and 30 are defined as predecessors for task 40, so the potential gap in the process flow can be bridged.

Job plan task	Predecessor task and relationship	Condition	Work order task	Predecessor task and relationship	Condition
10	Null value	Null value	10	Null value	Null value
20	10; Finish-to-start	Null value	20	10; Finish-to-start	Null value
30	20; Start-to-start	Condition is defined: Can be true or false.	Null value	Null value	Null value
40	20; Start-to-start*; 30; Finish-to-start	Null value	40	20; Start-to-start	Null value

The condition that was defined for task 30 proved false, so the task and the predecessor value were not copied to the work order. However, by defining task 20 as an alternative predecessor to task 40, the sequential flow of the job plan scenario is uninterrupted.

Related concepts

- [Predecessor relationships](#)

Job plan owners

The owner of a job plan is the party responsible for the service management of the work when the job plan is used on a work order, route, or preventive maintenance record. The owner can be a person or an owner group, and is not the party responsible for performing the work.

If the Owner field and Owner Group field on a work order are blank when you apply a job plan to the work order, the owner information is copied to the work order. When you apply a job plan to a preventive maintenance record, the owner or owner group from the job plan overwrites the existing information about the preventive maintenance record.

Direct issue items and services for job plans

Stocked or non-stocked items that are associated with a job plan can be direct issue items. Direct issue items are issued immediately upon receipt to an asset, location, or work order, rather than being stocked in a storeroom.

Services are always direct issue items.

When you add a service or classify an item as direct issue, the following events occur:

- For the item or service, the values in the Vendor field and Vendor Description field for the primary vendor are populated.
- The direct issue status of the item or service is copied to the work plan that is created from this job plan. When the work order is approved and a user selects the Reorder_>Reorder Direct Issue Itms/Svcs action in the Inventory application, a purchase requisition is generated for this item or service. The item or service is issued without being received in inventory.

If you do not use the direct issue option for an item, that item is not automatically reordered, even when the reorder action is run.

Safety plan precedence

You can associate safety plans with assets, locations, and items. You use safety plans to define safety requirements and procedures to fulfill regulatory requirements, and to inform employees of hazards that could occur while performing work, as well as actions to take to prevent accidents.

When you create a work plan from a job plan, only one safety plan is copied to the work order. The plan for a location or its associated rotating item takes precedence over the plan for the asset or its associated rotating item.

When you copy a safety plan to a work order, this job plan information is evaluated according to the following steps:

1. If the location for the work order has a default safety plan, use that plan. If the location for the work order does not have associated default safety plan, go to the next step.
2. If the rotating item associated with the location has a default safety plan, use that plan. If the rotating item associated with the location does not have a default safety plan, go to the next step.
3. If the asset for the work order has a default safety plan, use that plan. If the asset for the work order does not have a default safety plan, go to the next step.
4. If the rotating item associated with the asset has a default safety plan, use that plan. If the rotating item associated with the asset does not have a default safety plan, do not copy a safety plan to the generated work order.

When a safety plan is copied to a work order, the system copies all hazards, precautions, and hazardous materials.

Meter information for job plans

You can use a meter name on a job plan task. The meter name is a generic name for a measurement point number.

When you use a job plan to build a work plan for an asset or location that is on a work order, the database searches for a three way match between the following items:

- The meter name on the asset or location
- The meter name on the job plan task that is used to build the work plan task
- The measurement point number for the meter name

If there is a match, the measurement point number is added to the work plan task. If there is matching meter information for the asset or location and the job plan used on a work order, the measurement point number is automatically added to a task of a work order record.

Deletion rules for job plans

As your business needs change, you can delete a job plan.

You cannot delete a job plan if another active record, such as a work order or a preventive maintenance record, references the job plan. Before you delete the job plan, change the status of any record that references it to closed or history. To delete a job plan, use the Delete Job Plan action.

If you cannot delete a job plan, you can inactivate it. Inactivation maintains the job plan for reference, removes the job plan from all lookup and display lists, and makes the job plan unavailable for use on another record. To inactivate a job plan, change the job plan's status.

Working with job plans

Create and modify job plans that become work plans when they are associated with work orders and preventive maintenance records.

- [Creating job plans](#)
You use job plans to apply to preventive maintenance records, routes, and work orders to create work plans. A job plan is a detailed description of work that is performed for a work order. After you apply a job plan to a work order, you can customize the work plan or the work order without affecting the original job plan.
- [Classifying job plans](#)
Classification provides you with a way to categorize your job plans. If you want to group job plans together, you can use classification.
- [Setting job plan conditions](#)
To ensure that job plan components are copied to work orders under specific circumstances, you define conditions and then set them in the job plan. By setting conditions, you control when the tasks, labor, materials, services, or tools of a job plan are copied to work orders.
- [Revising job plans](#)
You create job plans so that you can apply revision control to a job plan. When you revise job plans, a record of the changes that are made is saved.
- [Creating work orders when purchasing items on job plans](#)
You can specify that a work order is created when any quantity of an item on a job plan is specified on an approved purchase order. Instead of being stocked in a storeroom, these items are issued directly upon receipt to an asset, location, or work order.
- [Setting up work process flows](#)
Work process flows use relationships between work orders and tasks to automate the flow of status changes. You set relationships between work orders and tasks so that when a task is completed, the next task in the flow can be initiated.

Creating job plans

You use job plans to apply to preventive maintenance records, routes, and work orders to create work plans. A job plan is a detailed description of work that is performed for a work order. After you apply a job plan to a work order, you can customize the work plan or the work order without affecting the original job plan.

Procedure

1. In the Job Plans application, click New Job Plan and complete the fields.
2. On the Labor sub tab, Materials sub tab, Services sub tab, and Tools sub tab, create a new row and complete the fields.
After you click New Row on these tabs, the Organization field and Site field become read-only.
3. On the Work Assets tab, create a new row to define the work assets to associate with safety plans.
4. Save the job plan.

- [Adding work order classes to job plans](#)

To further define job plans, you can add a work order class.

- [Adding tasks to job plans](#)

You can add tasks to a job plan. Tasks describe operational steps for a work order. The tasks can be applied when you create work orders for organizations or sites.

- [Adding nested job plans to tasks](#)

For each job task in a job plan, you can add a nested job plan to define the set of small job plans that are required to complete the task. Nested job plans are reusable components of large work projects that create work order hierarchies.

- [Predecessor relationships](#)

Predecessor relationships indicate when successor work records and tasks can begin to ensure that tasks are completed in a designated order.

- [Adding labor and crafts to job plans](#)

You can add labor and craft information to job plans. You add labor or a craft either at the job plan level or at various task levels. You can maintain multiple skill levels for a craft, multiple vendors and contracts for a skill level, and a pay rate for each combination.

- [Adding inventory items to job plans](#)

To manage your job plans, you can add inventory items.

- [Adding spare parts to job plans](#)

To manage your job plans, you can add spare parts.

- [Adding services to job plans](#)

You can add services to a job plan. Services are directly issued costs that are not labor, materials, or tools, such as telephone bills and travel costs.

- [Adding tools to job plans](#)

To manage job plans, you can add tools that are necessary to complete the job plan.

- [Adding work assets to job plans](#)

You can add work assets, such as locations and items, to a job plan. When you add work assets, you can associate safety plans when the asset is used on a work order. When you generate a work order from the job plan for the work asset, the safety plan or other associated plans are copied to the work order.

- [Associating safety plans with job plans](#)

You can associate safety plans with assets, locations, or items on a job plan. You use safety plans to help ensure that work is performed safely.

Adding work order classes to job plans

To further define job plans, you can add a work order class.

About this task

When you use a job plan to create work-order-based records, the default class of the job plan defines the class of the work order-based record. When you apply a nested job plan to the work order and the class of the parent is associated with the job plan, the child work order has the same class as the parent. If the class of the parent is not associated with the job plan, the default class of the job plan for the child is used.

Procedure

1. In the Job Plans application, select the job plan to which you want to add a work order class.
2. In the Default WO Class field on the Job Plan tab, click Show/Manage Values.
3. In the Select Value window, click New Row to specify a work order class.
4. Optional: Set the work order class as the default for the job plan.
You can set only one work order class as the default for the job plan. The first class that you add is set as the default class.
5. Click OK and save your changes.

Adding tasks to job plans

You can add tasks to a job plan. Tasks describe operational steps for a work order. The tasks can be applied when you create work orders for organizations or sites.

About this task

If the job plan has an organization or site at the job plan level, the tasks that you add inherit the organization or site information.

Procedure

1. In the Job Plans application, select the job plan to which you want to add tasks.
2. In the Job Plan Tasks table window, click New Row.
3. Optional: Specify whether the task is being used at the organization or site level.
The associated values are provided.

4. Specify or change the task identifier.
To add tasks without disrupting the order, number the task identifiers in increments of 10.
5. Optional: Complete the following steps:
 - a. Provide a description of the task.
 - b. Specify the sequence in which the task is performed.
 - c. Specify a value for the nested job plan and meter.
 - d. Specify values for the owner, the owner group and classification.
6. Specify the estimated duration in hours that is needed to complete the task.
7. Save your changes.

Adding nested job plans to tasks

For each job task in a job plan, you can add a nested job plan to define the set of small job plans that are required to complete the task. Nested job plans are reusable components of large work projects that create work order hierarchies.

Procedure

1. In the Job Plans application, select the job plan.
2. In the Job Plan Tasks table window, select the task for which you want to add the nested job plan.
3. Specify a value for the nested job plan.
4. Save your changes.

Predecessor relationships

Predecessor relationships indicate when successor work records and tasks can begin to ensure that tasks are completed in a designated order.

You can define the following relationships:

Relationship	Description
Finish-to-finish	When the status of a predecessor changes to COMP (Complete), its successor changes to INPRG (In Progress). You can change the status of the successor. However, you can only change the status of the successor to COMP if the status of the predecessor is COMP or beyond.
Finish-to-start	When the status of a predecessor changes to COMP (Complete), its successor changes to INPRG (In Progress). The status of the successor cannot be changed to INPRG until the status of the predecessor is COMP.
Start-to-finish	When the status of a predecessor status changes to INPRG (In Progress), the status of its successor changes to INPRG. You can change the status of the successor. However, you can only change the status of the successor to COMP (Complete), if the status of the predecessor is INPRG or beyond.
Start-to-start	When the status of a predecessor status changes to INPRG (In Progress), the status of its successor changes to INPRG. The status of the successor cannot be changed to INPRG until the status of the predecessor is INPRG.

Your work record statuses might be different, depending on the values that you defined in the Organizations application.

For example, Work Order 1 (WO1) has a Finish-to-start relationship with Work Order 2 (WO2). WO1 contains three tasks, the duration of which total 12 hours. WO2 cannot start until all tasks for WO1 are complete (12 hours). The status of WO2 changes to INPRG when all three tasks for WO1 are complete, making WO1 complete.

Lead and Lag time do not affect status changes that occur through flow control.

Adding labor and crafts to job plans

You can add labor and craft information to job plans. You add labor or a craft either at the job plan level or at various task levels. You can maintain multiple skill levels for a craft, multiple vendors and contracts for a skill level, and a pay rate for each combination.

Before you begin

You cannot add both a labor and a craft to a single-line item.

About this task

If the job plan has an organization or site at the job plan level, the labor and crafts that you add inherit the organization or site information.

Procedure

1. In the Job Plans application, select the job plan to which you want to add labor or crafts.
2. On the Labor sub tab of the Job Plan tab, click New Row.
3. Optional: Specify whether the labor or craft is being used at the organization or site level.
The associated values are provided.
4. Optional: To associate the labor or craft with a job plan task, specify a value for the task.

5. To specify whether you are adding labor or a craft, complete one of these steps.
The associated values are provided.
6. Optional: Provide additional information.
When you add, delete, or change quantities or hours, the costs associated with the labor or craft are updated.
7. Save your changes.

Example

The craft of painter has two skill levels: apprentice and master. To add an apprentice painter to a job plan, you must specify the skill level before the hourly rate is copied to the job plan.

Adding inventory items to job plans

To manage your job plans, you can add inventory items.

About this task

If the job plan has an organization or site at the job plan level, the inventory items that you add inherit the organization or site information.

Procedure

1. In the Job Plans application, select the job plan to which you want to add inventory items.
2. On the Materials subtab of the Job Plan tab, click New Row.
3. Optional: Specify whether the inventory item is being used at the organization or site level.
The associated values are provided.
4. Optional: To associate the inventory item with a job plan task, specify a value for the task.
5. Specify a value for the item and the quantity of the item.
6. Optional: Complete the following steps:
 - a. Specify a value for the storeroom.
 - b. If the inventory item must be acquired from another site, specify a value in the Site field.
 - c. Indicate whether the inventory items are direct issue items.
The inventory item's primary vendor is listed. Inventory items that are not direct issue are not automatically reordered.
7. Save your changes.

Adding spare parts to job plans

To manage your job plans, you can add spare parts.

About this task

If the job plan has an organization or site at the job plan level, the spare parts that you add inherit the organization or site information.

Procedure

1. In the Job Plans application, select the job plan to which you want to add spare parts.
2. On the Materials sub tab of the Job Plan tab, click New Row.
3. Optional: To associate the inventory item with a job plan task, specify a value for the task.
4. Click Spare Parts to open the Select Asset Spare Parts window.
5. In the Enter asset to search for spare parts field, specify the asset to which you want to add spare parts.
6. Click Refine to select the spare parts.
7. Click OK.
8. Optional: Complete the following steps:
 - a. Specify a value for the storeroom.
 - b. If the inventory item must be acquired from another site, specify a value in the Storeroom Site field.
 - c. Indicate whether the inventory items are direct issue items.
The spare part's primary vendor is listed.
9. Save your changes.

Adding services to job plans

You can add services to a job plan. Services are directly issued costs that are not labor, materials, or tools, such as telephone bills and travel costs.

About this task

If the job plan has an organization or site at the job plan level, the services that you add inherit the organization or site information.

Procedure

1. In the Job Plans application, select the job plan to which you want to add services.
2. On the Services sub tab of the Job Plan tab, click New Row.
3. Optional: Specify whether the services are being used at the organization or site level.
The associated values are provided.
4. Optional: To specify whether this service is used that this service is used on a task, provide a value for the task.
If you do not provide a task value, the service can be used on the job plan.
5. Specify values for the item set, service item, and quantity.
If you add a service item that has a default vendor, the vendor and the unit cost for the service are provided. If you change the value for quantity, the line cost and unit cost are recalculated.
6. Save your changes.

Adding tools to job plans

To manage job plans, you can add tools that are necessary to complete the job plan.

About this task

If the job plan has an organization or site at the job plan level, the tools that you add inherit the organization or site information.

Procedure

1. In the Job Plans application, select the job plan to which you want to add tools.
2. On the Tools sub tab of the Job Plan tab, click New Row.
3. Optional: Specify whether the tool is being used at the organization or site level.
The associated values are provided.
4. Specify a value for the tool.
5. Optional: To use this tool on a task, specify a value for the task.
If the task's value is in hours, that value is listed in the Tool Hours field.
6. Specify values for tool quantity, tool hours, and rate.
The value for line cost is calculated.
7. Optional: To create a reservation for the tool, select the Reservation Required check box. You do not need to specify a storeroom for the reservation.
8. Save your changes.

Adding work assets to job plans

You can add work assets, such as locations and items, to a job plan. When you add work assets, you can associate safety plans when the asset is used on a work order. When you generate a work order from the job plan for the work asset, the safety plan or other associated plans are copied to the work order.

About this task

If the job plan has an organization or site at the job plan level, every asset that you add inherits the organization or site information.

Procedure

1. In the Job Plans application, select the job plan to which you want to add assets.
2. On the Work Assets tab, click New Row.
3. Specify values for location, asset, and item.
4. Save your changes.

Associating safety plans with job plans

You can associate safety plans with assets, locations, or items on a job plan. You use safety plans to help ensure that work is performed safely.

About this task

When you generate a work order from the job plan for the work asset, the default safety plan or other associated plans are copied to the work order. After the work order is generated, you can replace or change the safety plan information on the work order without affecting the original safety plan.

Procedure

1. In the Job Plans application, select the job plan that contains the work asset with which you want associate a safety plan.
2. On the Work Assets tab, select the row that contains the work asset.

3. To specify a safety plan, complete one of the following steps:
 - a. In the Safety Plan field, specify a safety plan.
 - b. Click New Row and provide the information for the safety plan.
4. Optional: Specify whether you want this plan to be the default safety plan for this work asset.
You can have only one default safety plan for a work asset.

Classifying job plans

Classification provides you with a way to categorize your job plans. If you want to group job plans together, you can use classification.

About this task

You can classify and change the classification of a job plan until the job plan is closed. To remove a classification, in the Classification field, click Detail Menu, > Clear Classification.

Procedure

1. In the Job Plans application, select the job plan that you want to classify.
 2. In the Classification field, select Classify.
 3. In the Classify window, select a classification.
The classification path, from the top level to the node that you selected, is listed in the Classification field.
 4. Save your changes.
- [Adding attributes to job plans](#)
To further define a job plan, you can add attributes. You use attributes to categorize job plans, which helps to manage job plans.
 - [Adding attributes to tasks on job plans](#)
To further define a task on a job plan, you can add attributes. You use attributes to categorize tasks on job plans, which helps to find and manage job plans.
 - [Changing attributes associated with job plans](#)
To further define a job plan, you can change attributes that are associated with job plans. You use attributes to manage and categorize job plans.
 - [Changing attributes associated with tasks on job plans](#)
To further define a task on a job plan, you can change attributes that are associated with job plans. You use attributes to manage and categorize job plans.

Adding attributes to job plans

To further define a job plan, you can add attributes. You use attributes to categorize job plans, which helps to manage job plans.

About this task

Before you can add attributes, there must be a classification associated with the job plan or job plan task.

Procedure

1. In the Job Plans application, select the job plan to which you want to add attributes.
2. In the Classification field on the Specifications tab, specify a classification path.
The attributes associated with that classification are displayed in the Specifications table window.
3. In the Specifications table window, click New Row.
4. Specify an attribute.
5. Provide additional specification information.
6. Save your changes.

Example

A job plan involves the classification of a laptop to which you add the attributes of memory, speed, disk space, and operating system.

Adding attributes to tasks on job plans

To further define a task on a job plan, you can add attributes. You use attributes to categorize tasks on job plans, which helps to find and manage job plans.

About this task

Before you can add attributes, there must be a classification associated with the job plan or job plan task.

Procedure

1. In the Job Plans application, select the job plan that has the task to which you want to add attributes.
2. In the Classification field on the Job Plan tab, specify a classification path.
3. In the Task Specifications table window on the Specifications tab, click New Row.
4. Specify an attribute.
5. Provide additional information for task specifications.
6. Save your changes.

Example

A task on a job plan involves the classification of a notebook to which you add the attributes of memory, speed, disk space, and operating system.

Changing attributes associated with job plans

To further define a job plan, you can change attributes that are associated with job plans. You use attributes to manage and categorize job plans.

Procedure

1. In the Job Plans application, select the job plan with attributes that you want to change.
 2. Optional: In the Classification field on the Specifications tab, change the classification path.
The attributes associated with that classification are displayed in the Specifications table window.
 3. Optional: In the Specifications table window, change the values in the attribute row.
 4. Save your changes.
-

Changing attributes associated with tasks on job plans

To further define a task on a job plan, you can change attributes that are associated with job plans. You use attributes to manage and categorize job plans.

Procedure

1. In the Job Plans application, select the job plan that has the task with the attributes that you want to change.
 2. Optional: In the Classification field on the Job Plan tab, change the classification path.
The attributes associated with that classification are displayed in the Specifications table window.
 3. Optional: In the Task Specifications table window, change the values in the attribute row.
 4. Save your changes.
-

Setting job plan conditions

To ensure that job plan components are copied to work orders under specific circumstances, you define conditions and then set them in the job plan. By setting conditions, you control when the tasks, labor, materials, services, or tools of a job plan are copied to work orders.

Procedure

1. Activate the Set a Condition field, so that it is available in the Job Plans application.
 2. In the Organizations application, select the System Settings > Enable Job Plan Conditions action.
 3. In the Conditional Expression Manager application, create conditions for job plans.
 4. In the Job Plans application, select the job plan component that you want to set a condition for.
 5. In the Set a Condition field, select the condition that you want to set for the job plan component and save the record.
-

Revising job plans

You create job plans so that you can apply revision control to a job plan. When you revise job plans, a record of the changes that are made is saved.

About this task

You can revise job plans that are in active status only. When you revise a job plan, the current job plan is duplicated with the same name. The revision number increments by 1. Work orders with an existing job plan attached are not updated with the revised version.

You can enable revision control in the Organizations application.

Procedure

1. In the Job Plans application, select the job plan that you want to revise.

2. Select the Revise Job Plan action.
3. Enter a description for the revised job plan in the Revision Description field and click OK.
The revised job plan has a status of pending revision. The original job plan remains in active status.
4. Update the revised job plan.
5. After all changes are completed, change the revised job plan to active status.
The original job plan automatically changes to revised status and it can no longer be changed.
6. Save the revised job plan.

Creating work orders when purchasing items on job plans

You can specify that a work order is created when any quantity of an item on a job plan is specified on an approved purchase order. Instead of being stocked in a storeroom, these items are issued directly upon receipt to an asset, location, or work order.

Procedure

1. In the Job Plans application, select the job plan for which you want to create a work order when purchasing an item.
2. On the Work Assets tab, specify a value for the item.
3. Select the Create WO When Purchasing This Item check box.
4. Specify the work type for the work order that will be created.
5. Save your changes.

Setting up work process flows

Work process flows use relationships between work orders and tasks to automate the flow of status changes. You set relationships between work orders and tasks so that when a task is completed, the next task in the flow can be initiated.

Before you begin

To set the process flow for individual tasks, you must select Under Flow Control at the header level for the work order.

About this task

The best practice for consistently using the flow feature is to set up the process flow as a work template at the job plan level.

Procedure

1. Open the work order.
 2. Select Under Flow Control.
 3. On the Plans tab, display the details for the task.
 4. In the Scheduling Information section, next to the Predecessors field, click the Detail Menu icon.
 5. Select the tasks that must be completed before this task is initiated.
 6. Save the work order.
- [Defining flow actions](#)
A flow action is used in a work process flow to define certain actions that should occur while work is being done. Actions or action groups can be applied to any work order, task, or job plan task.
 - [Removing work process flow from work orders or job plans](#)
You can remove work process flow for a work order, a job plan, or task records that have it defined. You can do this at the header level, which will remove it for all the associated tasks as well, or you can remove it at the task level.
 - [Suspending work process flows](#)
You can suspend the work process flow for work order or task records that have it defined. For example, if you want to start a work order or task manually, you could suspend the flow control on that record. The flow remains suspended until you remove the suspension.
 - [Stopping workflow processes](#)
You can stop a workflow process for a record. You use the Workflow Administration application to view and stop workflow processes.

Defining flow actions

A flow action is used in a work process flow to define certain actions that should occur while work is being done. Actions or action groups can be applied to any work order, task, or job plan task.

About this task

You can determine whether the action takes place automatically, or if the action only takes place when it is initiated manually. When automatic, the action takes place as soon as the work order or task status is changed to an in progress (INPRG) status value by work process flow. When manual, you must initiate the flow

action by running the automation or processing scripts or placing an action button on the target application. Actions and action groups are defined in the Actions application.

Procedure

1. In an application that supports flow action, display the record for which you want to define a flow action.
2. Perform one of the following actions:
 - For a work order, change, release, or job plan record, enter a value in the Flow Action field on the application tab.
 - For a work order or job plan task, enter a value in the Flow Action field in the Task table window. The Tasks table window is found on the main tab of the Job Plans application, or the Plans tab of the Work Order Tracking, Changes, and Releases applications.

The defined action runs when the work order or task status value is changed to INPRG.

3. Specify whether you want the flow action to be automatically run:

Option	Flow Action Assist
Automatically run the flow action	Cleared
Manually run the flow action	Selected

4. Click Save record.

Removing work process flow from work orders or job plans

You can remove work process flow for a work order, a job plan, or task records that have it defined. You can do this at the header level, which will remove it for all the associated tasks as well, or you can remove it at the task level.

About this task

If work process flow is removed at the header level, it will automatically be removed on individual tasks on the record. You cannot retain work process flow for a task that does not have it set at the header level.

Procedure

1. In an application that supports flow action, display the record that you want to remove from work process flow.
2. On the main application tab, clear the Flow Controlled check box. The system removes the work order or the job plan, and all of its tasks from work process flow.
3. Click Save Record.

Suspending work process flows

You can suspend the work process flow for work order or task records that have it defined. For example, if you want to start a work order or task manually, you could suspend the flow control on that record. The flow remains suspended until you remove the suspension.

Before you begin

Removing the suspension restarts the flow. Any successor work orders or tasks with completed predecessors continue the process. Work orders and tasks without predecessors continue the process at the same time as the parent record. The last completed child under a parent rolls its completion up to the parent.

Procedure

1. In an application that supports flow action, display the record on which you want to suspend flow control.
2. On the main application tab, at the header level, select the Suspend Flow Control check box. The system suspends the work process flow on the work order and on all of its tasks.
3. To retain flow control for individual tasks, display the tasks in the Tasks table window, and clear the Suspend Flow Control check box at the task level. Flow control remains in place at the task level. This action does not affect the suspension at the work order header level. You can find the Tasks table window on the Plans tab.
4. Click Save Record.

Example

You generally suspend a set of tasks, often under the same parent. For example, you can delay the automatic starting of one whole phase of work until a certain condition has been met. You can also delay starting a phase of work to make changes to the tasks, such as inserting tasks, deleting tasks, and changing the precedence logic.

Resource Levels Management

In the Resource Levels Management application, you can create threshold levels that are used to calculate resources for dynamic job plans.

The thresholds specify a starting point, end point, and a value to use when resources are calculated for anything within that range. For example, maintenance on a rail track less than 6 miles long requires one flagman. Any work over 6 miles requires two flagmen, and work over 20 miles requires three flagmen. Thus, the number of flagmen that are needed is calculated based on a distance threshold. For a starting point of 1 mile and an end point of 6 miles, specify 1 for the number of flagmen that are required. For a starting point of 6 miles and an end point of 20 miles, specify 2 for the number of flagmen. For anything over 20 miles, specify 3 flagmen.

The following table describes the parameters that you can set for calculating threshold levels.

Table 1. Resource Level Field Parameters

Field	Description
Level	User-defined identifier for the resource level.
Description	Description of the resource level.
Type	The type of object that you want to calculate: hours, quantity, or both.
Source	Text field that can be used to identify the regulatory or business source for the resource level.
Quantity Units	Unit of measure for the threshold, such as inches, hours, or miles.
Thresholds	<p>Start - The beginning of the threshold. The start threshold is the lowest number at which the value for this threshold range is selected.</p> <p>End - The end of the threshold. The end threshold is the number at which the value for this threshold range is no longer selected. If you do not specify an end threshold, resources are calculated for any value that is greater than the start threshold.</p> <p>Value - Quantity of items or number of hours to use if the number of work units is between the start and end for this threshold range.</p>

Routes

Routes simplify the creation of hierarchies of work orders for inspections. A route is a list of related assets, locations, or both. The assets and locations are considered stops along the route.

You use the Routes application to create, view, modify, and delete route records. You can use a route in the following ways:

- Apply the route to a work order and generate child work orders for each route stop.
- Apply the route to a work order and generate a single work order that contains a list of assets and locations for all the route stops.
- Apply the route to a work order and generate task work orders for each route stop.
- Apply the route to a preventive maintenance (PM) record, and then generate a work order for the PM.
- [Routes overview](#)
A route is a list of related assets, locations, or both. Route options are involved in work order generation and also linear assets.
- [Working with routes](#)
You can create routes, view the routes assigned to assets and locations, associate linear assets with routes, and run reports on routes.

Routes overview

A route is a list of related assets, locations, or both. Route options are involved in work order generation and also linear assets.

- [Route options and work order generation](#)
When you define a route, the route option that you specify determines the type, number, and content of work orders that are generated. Work orders are generated when you apply the route to a work order or when you associate the route with a preventive maintenance (PM) record and then generate a work order from the PM.
- [Route options and work order descriptions](#)
When you define routes, you specify a route option. This option affects the description that appears on generated work orders, as well as the number, type, and content of those work orders.

Route options and work order generation

When you define a route, the route option that you specify determines the type, number, and content of work orders that are generated. Work orders are generated when you apply the route to a work order or when you associate the route with a preventive maintenance (PM) record and then generate a work order from the PM.

The following table describes the effect of the route options on the generation of work orders.

Option	Generated information
Child Work Orders	<ul style="list-style-type: none"> • A child work order is generated for each route stop. • Any job plan information is copied to the child work order. • If a default safety plan is associated with the job plan, the safety information is copied to the child work order. <p>Restriction: Assets and locations on all route stops must belong to the site associated with the route.</p>

Option	Generated information
Entries in the Work Order's Multi Asset, Location, and CI Table	<ul style="list-style-type: none"> A single work order is generated. It contains a list of the assets and locations for all the route stops. Entries are created in the Multiple Assets, Locations and CIs (Configuration Items) table window in the Work Order Tracking application. Restriction: Job plans cannot be associated with route stops.
Work Order tasks	A task work order is generated for each route stop. Restriction: <ul style="list-style-type: none"> Assets and locations on all route stops must belong to the site associated with the route. Job plans cannot be associated with route stops.

You associate a route with a preventive maintenance (PM) record by adding the route identifier to the PM, in the PM application. When you generate a work order from the PM, a parent work order is created for the asset, location, or general ledger account on the PM. The system also generates child work orders or task work orders for each route stop, or a single work order that lists the assets and locations for all the route stops, as if you applied the route directly to a work order. You can apply a route only at the bottom level of a PM hierarchy.

Route options and work order descriptions

When you define routes, you specify a route option. This option affects the description that appears on generated work orders, as well as the number, type, and content of those work orders.

When you specify the Child Work Orders option or the Work Order Tasks option, the system uses the following logic to assign a description to the generated work orders:

- If the route stop has a description, the route description becomes the work order description.
- If the route stop has no description and it refers to an asset, the work order description is a concatenation of the asset identifier and the asset description. If necessary, the concatenated description is truncated to accommodate the size of the description field.
- If the route stop has no description and it does not refer to an asset, the work order description is a concatenation of the location identifier and location description. If necessary, the concatenated description is truncated to accommodate the size of the description field.

When you specify the Entries in the Work Order's Multi Asset, Location, and CI Table option, no description is generated.

Working with routes

You can create routes, view the routes assigned to assets and locations, associate linear assets with routes, and run reports on routes.

- [Creating routes](#)
You can create a route to list all assets of the same type, all assets in a certain location, or both. For example, an inspection route might list all fire extinguishers in a plant, or all safety equipment in a building.
- [Viewing routes assigned to assets and locations](#)
You can view the routes associated with an asset or location.
- [Running, scheduling, and printing reports within an application](#)
When you are in an application and you need report information, there are several report actions from which you can choose to get that information. For example, you can run a report and then view its table of contents, print the report, and export the report data. You can open and view a report in a browser. You can directly print out a report, with or without attachments. You can schedule a report and send it using e-mail, and you can view and edit scheduled reports.

Creating routes

You can create a route to list all assets of the same type, all assets in a certain location, or both. For example, an inspection route might list all fire extinguishers in a plant, or all safety equipment in a building.

Procedure

- In the Routes application, click New Route.
- If the Route field is empty, specify a value.
- Select a route option to specify the type of work orders to be generated when the route is applied to a work order:

Option	Description
Child Work Orders	A child work order is generated for each route stop.
Entries in the Work Order's Multi Asset, Location, and CI Table	A single work order is generated for all the assets and locations for all the route stops.
Work Order Tasks	A task work order is generated for each route stop.

- If you select the Child Work Orders option or the Work Order Tasks option, you can select the Route Stops Inherit Status Changes check box to simultaneously update the status of all child work orders or task work orders. Otherwise, clear that check box.
- Create one or more route stops:
 - Click New Row.

b. In the Location field or the Asset field, specify a value.

If you select the Child Work Orders option or the Work Order Tasks option, the assets and locations on all route stops must belong to the site associated with the route. To select locations or assets from a list, perform one of the following actions:

To select:	Click:
Assets	Select Assets
Locations	Select Locations
Assets from a list of user-defined relationships when creating routes that involve linear assets	Path Selector

6. If you selected the Child Work Orders option, you can specify a value in the Job Plan field.

7. If the IBM® Maximo® Linear Asset Manager license is installed and you specified a linear asset in the Asset field, additional fields appear. Complete the fields in the Details section and the Linear Segment Details section as needed.

8. Click Save Route.

Viewing routes assigned to assets and locations

You can view the routes associated with an asset or location.

Procedure

1. In the Assets application or the Locations application, display the record whose routes you want to view.
2. Select the View > View Work Details action.
3. In the View Work Details window, click the Routes tab.

Running, scheduling, and printing reports within an application

When you are in an application and you need report information, there are several report actions from which you can choose to get that information. For example, you can run a report and then view its table of contents, print the report, and export the report data. You can open and view a report in a browser. You can directly print out a report, with or without attachments. You can schedule a report and send it using e-mail, and you can view and edit scheduled reports.

About this task

Attached document files with the following file extensions cannot be printed:

- .ppt
- .pptx

Procedure

Complete a report-action task in the following table to select, view, print, or export report information, as needed.

Option	Description
Run a report and optionally print it, export report data, and toggle the table of contents view	<ol style="list-style-type: none"> Select the Reports Menu in the application toolbar and select an application, or select the Run Reports action, to open the Reports dialog box to the On Demand Reports tab. In the Reports to Run table window, click the report that you want to run. In the Request Page dialog box, specify any parameters to define the report, and then click Submit to run the report and open it in your browser. From the Reporting toolbar, perform any of the following actions: <ul style="list-style-type: none"> • Click the Print Report as PDF icon to print the report. Due to spacing default settings, the page length of your report in .PDF print format can exceed the page length in your report browser. • Click the Export Data icon to export the data in .CSV format. • Click the Toggle table of contents icon to see the table of contents for the report that you selected.
Open a report in browser view	<ol style="list-style-type: none"> Click the Browser View icon in the application toolbar to open the report in a report browser. From Browser View, print the report or export the report data in .CSV format.
Direct-print a report in .pdf form using the default printer of the browser	<ol style="list-style-type: none"> Click the Direct Print icon on the application toolbar.
Direct-print a report and all its attachments in .pdf form using the default printer of the browser	<ol style="list-style-type: none"> Click the Direct Print with Attachments icon on the application toolbar to view the number of printable attachments that are attached to the report. Printable attachments have a supported file extension. Click Yes to print all printable attachments.

Option	Description
<p>Schedule a report and send the report as PDF in e-mail</p>	<p>a. Click the Reports Menu in the application toolbar and select an application, or select the Run Reports action, to open the Reports dialog box.</p> <p>b. Click the Scheduling Status tab and select one of the following scheduling options:</p> <ul style="list-style-type: none"> • Once - The report runs on a specific date and time in the future. Use this option to schedule complex or lengthy reports to run during off-peak hours. Specify a date in the format (M or MM) / (D or DD) / YY format. Specify a time in HH:MM format and specify a.m. or p.m. • Recurring - The report runs at regular intervals. Four fields let you determine when the report runs. In the first field, enter a number from 1 through 365. In the second field, enter the interval (day, week, or month). In the third field, enter the day of the week or date of the month. In the fourth field, enter the time in HH:MM format, along with AM or PM. The following examples show the use of these fields: To run a report every day at 6:00 AM, select 1, and then Day. Leave the third field blank and then 6:00 AM. To run a report every other Friday at 5:00 PM, select 2, then Weeks, then Friday, and then 5:00 PM. To run a report every three months at 11:00 PM, on 15th of the month, select 3, then Months, then Day 15, and then 11:00 PM. <p>c. Specify one or more e-mail addresses of the recipients for the report. Enter any comments you want to include in the e-mail message.</p> <p>d. Specify a subject for the report, or use the report name which defaults to this field.</p> <p>e. Click Submit to run the report and send it to the e-mail address at the scheduled time.</p>
<p>View and edit scheduled reports</p>	<p>a. Click the Reports Menu in the application toolbar and select an application, or select the Run Reports action, to open the Reports dialog box.</p> <p>b. Click the Scheduling Status tab to open the Scheduling Status dialog box.</p> <p>c. In the Schedules You Can Edit section, you can view the type of report (once or recurring) and the next run time. You can delete a scheduled report and change schedule information.</p>

Safety

You use the applications in the Safety module (within the Planning module) to inform workers of potential dangers in their work environment and to provide information to protect workers from those dangers. The hazards, precautions, and procedures that you define in these applications can apply to assets, work locations, or both. You associate the records that you create in these applications with Asset, Location, PM (Preventive Maintenance), and Work Order records.

- [Hazards](#)
A hazard is any condition that exists in the workplace that might lead to worker injury, property damage, or financial loss. You use the Hazards application to define hazards, associate preventive measures (precautions) and hazardous materials with hazards, and view tag out procedures that are associated with hazards.
- [Precautions](#)
A precaution is a preventive measure that you take to reduce or eliminate a workplace hazard; for example, wearing hearing protection when working in an area where you are exposed to loud noises. You use the Precautions application to define safety precautions.
- [Lock Out / Tag Out](#)
Tag out procedures are intended to completely eliminate the risks associated with a hazard, and lock out operations must be performed exactly as specified. You use the Lock Out / Tag Out application to create tag out procedures.
- [Safety Plans](#)
Safety plans provide all the safety related information about an asset or location in one record, which you can then copy to job plans and work orders. You must clearly associate safety requirements and procedures with work orders to fulfill the requirements of regulatory agencies. You use the Safety Plans application to create safety plans and to add and view associated work assets, hazards, precautions, and tag out procedures.

Hazards

A hazard is any condition that exists in the workplace that might lead to worker injury, property damage, or financial loss. You use the Hazards application to define hazards, associate preventive measures (precautions) and hazardous materials with hazards, and view tag out procedures that are associated with hazards.

- [Working with hazards](#)
Hazard records define potential dangers associated with assets. You can associate precautions and tag out procedures with hazard records.

Working with hazards

Hazard records define potential dangers associated with assets. You can associate precautions and tag out procedures with hazard records.

- [Creating hazard records](#)
Create a hazard record to ensure that employees working with work assets (assets and locations) are informed of potential dangers associated with those assets.
- [Associating precautions with hazards](#)
You associate a precaution with a hazard to inform employees how to reduce the risks involved with the hazard.
- [Associating tag out procedures with hazards](#)
Associate a tag out procedure with a hazard to ensure that workers take appropriate action when they encounter a safety plan that contains the hazard.

Creating hazard records

Create a hazard record to ensure that employees working with work assets (assets and locations) are informed of potential dangers associated with those assets.

Procedure

1. In the Hazards application, click New Hazard.
2. In the Hazard field, specify an identifier for the hazard.
3. Optional: In the Type field, specify the type of hazard.
4. Specify the type of information that you will associate with the hazard. If you associate a tag out procedure with the hazard, you cannot also associate a precaution or a hazardous material with the hazard.

Option	Description
Precautions	Select the Can Have Precautions check box.
Hazardous materials	Select the Can Have Hazardous Materials check box.
Tag out procedures	Select the Can Have Tag Outs check box.

5. If you selected the Can Have Hazardous Materials check box, complete the fields in the Hazardous Material Information section.
6. Click Save Hazard.

What to do next

- In the Precautions application, you can create a precaution to associate with the hazard.
- In the Assets application or the Locations application, you can associate the hazard with an asset or a location.

Associating precautions with hazards

You associate a precaution with a hazard to inform employees how to reduce the risks involved with the hazard.

Before you begin

- In the Hazards application, create the hazard record and select the Can Have Precautions check box.
- In the Precautions application, create the precaution record.

Procedure

1. In the Hazards application, display the hazard.
2. Associate one or more precautions with the hazard:
 - a. On the Precautions tab, click New Row.
 - b. In the Precaution field, specify a value.
3. Click Save Hazard.

What to do next

- In the Assets application or the Locations application, you can associate the hazard and precaution with an asset or location.
- In the Safety Plans application, you can add the hazards and precaution to a safety plan.

Associating tag out procedures with hazards

Associate a tag out procedure with a hazard to ensure that workers take appropriate action when they encounter a safety plan that contains the hazard.

Before you begin

- In the Hazards application, create the hazard record and select the Can Have Tag Outs check box.
- In the Lock Out / Tag Out application, create the tagout procedure.

About this task

You associate a tag out procedure with a hazard through the asset or location that the hazard applies to.

Procedure

1. In the Assets application or the Locations application, display the work asset or location that you want to associate the hazard with.
2. On the Safety tab, select the Lock Out/Tag Out sub tab.
3. In the Hazards table window, click New Row.
4. In the Hazard field, specify the hazard.
5. In the Tag Out Procedures table window, click New Row.
6. In the Tag Out field, specify the tag out procedure.
The lockout operations appear in the Lock Out Operations table window.

7. Depending on the application that you are using, click Save Asset or Save Location.

What to do next

- In the Safety Plans application, you can associate the tag out procedure with a safety plan.
- In the Work Order Tracking application, you can associate the tag out procedure with a work order.

Precautions

A precaution is a preventive measure that you take to reduce or eliminate a workplace hazard; for example, wearing hearing protection when working in an area where you are exposed to loud noises. You use the Precautions application to define safety precautions.

- [Creating precaution records](#)
Create precaution records to help employees reduce the hazards involved with workplace tasks.

Creating precaution records

Create precaution records to help employees reduce the hazards involved with workplace tasks.

Procedure

1. In the Precautions application, click New Precaution.
2. In the Precaution field, specify an identifier for the precaution.
3. Click Save Precaution.

What to do next

In the Hazards application, associate the precaution with a hazard.

Lock Out / Tag Out

Tag out procedures are intended to completely eliminate the risks associated with a hazard, and lock out operations must be performed exactly as specified. You use the Lock Out / Tag Out application to create tag out procedures.

- [Working with tag out procedures and lock out operations](#)
A tag out procedure describes how to take work assets out of service and place them back in service, to ensure a safe work environment. The tag out procedure is a series of steps, which are called lock out operations.

Working with tag out procedures and lock out operations

A tag out procedure describes how to take work assets out of service and place them back in service, to ensure a safe work environment. The tag out procedure is a series of steps, which are called lock out operations.

- [Creating tag out procedures](#)
Create a tag out procedure to eliminate a hazard and ensure a safe work environment. To create a tag out procedure, you describe the steps, or lock out operations, to remove a work asset from service and place it in a safe condition. Lock out operations can apply to an asset, a location, a locking device, or an activity that is not related to a particular device or asset.
- [Associating tag out procedures with work assets](#)
Associate a tag out procedure with a work asset to enable employees to eliminate the hazards associated with that asset or location.

Creating tag out procedures

Create a tag out procedure to eliminate a hazard and ensure a safe work environment. To create a tag out procedure, you describe the steps, or lock out operations, to remove a work asset from service and place it in a safe condition. Lock out operations can apply to an asset, a location, a locking device, or an activity that is not related to a particular device or asset.

Procedure

1. In the Lock Out / Tag Out application click New Tag Out.
2. In the Tag Out field, specify an identifier for the tag out procedure.
3. In the Location field or the Asset field, specify the location or asset to which the tag out procedure applies.

4. In the Site field, specify the site to which the tag out procedure applies.
5. In the Required State field, specify the state that the location or asset must be in after the tag out procedure is applied.
6. Optional: To attach additional information to the tag out record, click Attachments.
7. Specify the lock out operations in the tag out procedure:
 - a. Click New Row.
 - b. If the lock out operation applies to a particular asset or a location, specify a value in the Location field or the Asset field.
 - c. If the lock out operation does not apply to a particular asset or location, describe the lock out activity in the Description field.
 - d. Optional: In the Locking Device Required State field, specify the state that the asset or location must be in after the lock out step is performed.
 - e. In the Apply Sequence field, specify the sequence number of this step when you tag out the asset.
 - f. In the Remove Sequence field, specify the sequence number of this step when you restore the asset to service.
8. Click Save Tag Out.

What to do next

You can perform any of the following actions:

- In the Assets application or the Locations application, associate the tag out procedure with a hazard and an asset or location.
- In the Safety Plans application, associate the tag out procedure with a safety plan.
- In the Work Order Tracking application, add the tag out procedure to a work order.

Associating tag out procedures with work assets

Associate a tag out procedure with a work asset to enable employees to eliminate the hazards associated with that asset or location.

Before you begin

- In the Hazards application, create a hazard record and select the Can Have Tag Outs check box.
- In the Lock Out / Tag Out application, create a tag out procedure for the hazard.

Procedure

1. In the Assets application or the Locations application, display the asset or location that you want to associate the hazard with.
2. On the Safety tab, select the Lock Out/Tag Out subtab.
3. Click New Row.
4. In the Hazard field, specify the hazard that you want to associate with the asset.
5. Click Save Asset or Save Location.
6. On the Lock Out/Tag Out subtab, select the hazard that you want to associate with the tag out procedure.
7. Below the Tag Out Procedures table window, click New Row.
8. In the Tag Out field, specify the identifier of the tag out procedure.
9. Depending on the application that you are in, click Save Asset or Save Location.
The lock out steps for the tag out procedure appear in the Lock Out Operations table window.

What to do next

In the Safety Plans application, you can associate the tag out procedure with a safety plan.

Safety Plans

Safety plans provide all the safety related information about an asset or location in one record, which you can then copy to job plans and work orders. You must clearly associate safety requirements and procedures with work orders to fulfill the requirements of regulatory agencies. You use the Safety Plans application to create safety plans and to add and view associated work assets, hazards, precautions, and tag out procedures.

When you use a safety plan on a work order, the information about hazards, precautions, and hazardous material is copied to the work order, even if no work assets are associated with the work order.

- [Safety plans overview](#)
A safety plan includes all the information needed to safely perform a specific type of work or job plan. To create a safety plan, you need to understand the relationship between its work assets and locations, related assets and locations, and all related hazards, hazardous materials, precautions, and tag out procedures.
- [Working with safety plans](#)

Safety plans overview

A safety plan includes all the information needed to safely perform a specific type of work or job plan. To create a safety plan, you need to understand the relationship between its work assets and locations, related assets and locations, and all related hazards, hazardous materials, precautions, and tag out procedures.

Before you create a safety plan, consider the following:

1. Have a specific job in mind that requires a safety plan.
2. List the work assets and locations on which a job plan might use this safety plan. When you create a safety plan, the work asset combined with the type of work dictates the safety information that is required.
3. Understand how hazards relate to the work assets.
4. List all related assets and locations that might cause hazards or other safety problems when a job plan is used. You create this asset list on the Safety-Related Assets subtab, which is on the Safety tab in the Assets application and the Locations application.

Working with safety plans

- [Creating safety plans](#)
Create safety plans to inform employees of hazards that they might encounter while performing work and the actions they must take to prevent accidents. You can create generic safety plans for use on all work assets or locations or for use on a particular work asset or location.
- [Adding hazardous materials to safety plans](#)
Add hazardous materials to a safety plan to inform workers of hazards associated with the work assets and related assets and locations on the safety plan.
- [Adding precautions to safety plans](#)
Add precautions to a safety plan to help employees reduce the hazards involved with workplace tasks.
- [Adding tag out procedures to safety plans](#)
Add tag out procedures to safety plans to eliminate the hazards associated with the assets or locations on the safety plan.
- [Associating related work assets and hazards with safety plans](#)
Select the hazards, assets, and locations that apply to a particular safety plan, and the system populates the safety plan with the related hazardous material, precaution, and tag out information.

Creating safety plans

Create safety plans to inform employees of hazards that they might encounter while performing work and the actions they must take to prevent accidents. You can create generic safety plans for use on all work assets or locations or for use on a particular work asset or location.

Procedure

1. In the Safety Plans application, click New Safety Plan.
2. In the Safety Plan field, specify an identifier for the safety plan.
3. Optional: Specify the work assets and locations that might use this safety plan on a work order or a job plan.
 - a. Click New Row.
 - b. In the Location field or the Asset field, specify a value.
You can specify a location or an asset, but not both.
4. Perform one or both of the following actions to associate hazardous material, precaution, and tag out information with the safety plan.

Option	Description
View and select related assets and hazards	Select the Select Hazards action.
Manually add related assets and hazards	Use the tabs to add precautions, hazardous materials, and tag out procedures.

5. Click Save Safety Plan.

What to do next

- In the Job Plans application, you can associate the safety plan with a job plan.
- In the Preventive Maintenance (PM) application, you can associate the safety plan with a PM record through a related job plan.
- In the Work Order Tracking application, you can associate the safety plan with a work order.

Adding hazardous materials to safety plans

Add hazardous materials to a safety plan to inform workers of hazards associated with the work assets and related assets and locations on the safety plan.

Before you begin

1. In the Hazards application, create the hazard, select the Can Have Hazardous Materials check box, and define the hazardous material.
2. In the Safety Plans application, create the safety plan.

Procedure

1. In the Safety Plans application, display the safety plan that you want to update.
2. Associate one or more hazardous materials with the safety plan:
 - a. On the Hazardous Materials tab, click New Row.
 - b. In the Hazard field, specify a hazard.
The NFPA ratings for the hazardous material are displayed.
 - c. Optional: In the Related Location field or the Related Asset field, specify a value.
3. Click Save Safety Plan.

Results

If a precaution is associated with any hazard that you specified, the hazard also appears on the Hazards and Precautions tab.

Adding precautions to safety plans

Add precautions to a safety plan to help employees reduce the hazards involved with workplace tasks.

Before you begin

1. In the Precautions application, create the precaution record.
2. In the Hazards application, create the hazard record, select the Can Have Precautions check box, and associate the precaution with the hazard.
3. In the Safety Plans application, create the safety plan.

Procedure

1. In the Safety Plans application, display the safety plan that you want to update.
2. Associate one or more hazards and precautions with the safety plan:
 - a. On the Hazards and Precautions tab, click New Row.
 - b. In the Hazard field, specify a hazard.
The related precautions appear in the Precautions table window.
 - c. Optional: In the Related Location field or the Related Asset field, specify a related location or asset that can pose a hazard.
3. Click Save Safety Plan.

Results

If any hazard that you specified is associated with a hazardous material, the hazard also appears on the Hazardous Materials tab.

Adding tag out procedures to safety plans

Add tag out procedures to safety plans to eliminate the hazards associated with the assets or locations on the safety plan.

Before you begin

1. In the Hazards application, create the hazard.
2. In the Lock Out / Tag Outs application, create the tag out procedure.
3. In the Assets application or the Locations application, associate the tag out procedure with a hazard through the related asset or location.
4. In the Safety Plans application, create the safety plan.

About this task

To add a tag out procedure to a safety plan, you first associate the procedure with a hazard in the Assets application or the Locations application. After you add a hazard and its related asset or location to a safety plan, the related tag out procedure is automatically added to the safety plan.

Procedure

1. In the Safety Plans application, display the safety plan that you want to update.
2. Associate one or more tag out procedures with the safety plan:
 - a. On the Tag Outs tab, in the Hazards table window, click New Row.
 - b. In the Hazard field, specify a hazard.
Any tag out procedures for that hazard display in the Tag Outs table window.
 - c. In the Work Location field or the Work Asset field, specify the location or asset on which work will be performed.
 - d. Optional: In the Related Location field or the Related Asset field, specify a related location or asset that poses a hazard.
3. Click Save Safety Plan.

Associating related work assets and hazards with safety plans

Select the hazards, assets, and locations that apply to a particular safety plan, and the system populates the safety plan with the related hazardous material, precaution, and tag out information.

Before you begin

1. Define the hazards, hazardous materials, precautions, and tag out procedures that apply to the work asset and related assets and locations.

2. In the Assets and Locations application, associate the hazardous materials, precautions, and tag out procedures with assets that this safety plan will be used on.

Procedure

1. In the Safety Plans application, display the safety plan that you want to update.
2. Select the Select Hazards action.
The Select Hazards window displays the related assets and locations for the safety plan.
3. Select the hazards that you want to apply to the safety plan:
 - a. In the Work Assets table window, select the asset or location whose hazards you want to view.
The hazards display in the Hazards table window.
 - b. In the Hazards table window, select the hazards that you want to add to the safety plan.
 - c. Click Apply.
4. Click OK.

Results

The information that you selected appears on the various tabs in the Safety Plans application.

What to do next

- In the Job Plans application, you can associate the safety plan with a job plan.
- In the Preventive Maintenance (PM) application, you can associate the safety plan with a PM record through a related job plan.
- In the Work Order Tracking application, you can associate the safety plan with a work order.

Documenting instrument specifications by using data sheets

You document your instrument specifications using the data sheet template. These specifications are typically defined by the manufacturer of the instrument.

- **Data sheet templates**
Data sheets are templates that define the calibration process for one or more asset functions. You use the Data Sheet Template application to create data sheets for calibration assets.
- **Data sheets**
Data sheets provide technicians with the information that they need to perform a calibration. A data sheet is a template that defines the specifications of an asset for the calibration process.
- **Non-linear instruments in data sheets**
Non-linear instruments are analog instruments that have their tolerance limits calculated based on the desired output value and not the nominal input value.
- **Tolerance limits on data sheets**
Tolerance is an acceptable value or value range for a specified output value. You define the tolerance limits for accuracy of a calibration point on a data sheet.
- **Creating data sheets**
A data sheet is a template that defines the specifications of an asset for the calibration process. Data sheets give a technician the information necessary to calibrate an analog or discrete asset function.
- **Associating work assets with data sheets**
When you associate an asset with a data sheet, you are attaching a template with predefined calibration points for the work asset.
- **Duplicating the asset function of a data sheet**
When you create multiple data sheets with similar information, you can duplicate the asset function information to save time.
- **Calibration calculations**
During the calibration of an asset, calculations are used to determine whether the asset passes or fails the calibration. These calculations are based on the values that you specify on the data sheet.
- **Data sheet templates**
Data sheets are templates that define the calibration process for one or more asset functions. You use the Data Sheet Template application to create data sheets for calibration assets.
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- **Calibration calculations**
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Data sheets

Data sheets provide technicians with the information that they need to perform a calibration. A data sheet is a template that defines the specifications of an asset for the calibration process.

A data sheet defines the asset function specifications and the calibration point of an asset. The data sheet also defines the functional checks and dynamics checks of an asset, if required.

Data sheets are associated with assets and are copied to calibration work orders for the asset. On the work order data sheet, the technician enters calibration As Found and As Left data. This data is used to analyze asset performance and calibration frequency.

The data sheet also records uncertainty measurement data for instruments and measuring and test equipment (M&TE). This uncertainty data is calculated and imported from an external source into the Data Sheet Template application and the Work Order Tracking application.

- [Asset functions](#)
The asset function specifies the calibration data for the function of an asset. You can specify calibration data about one or more asset functions.
- [Calibration points](#)
A calibration point is the test information that is used to calibrate an asset. The amount of calibration points that are required for a calibration process is determined by business requirements.
- [Dynamic checks](#)
A dynamic check is additional data about the instrument being calibrated.
- [Functional checks](#)
A functional check is an additional check point that is required to calibrate an instrument.
- [Uncertainty measurement for calibration](#)
The results from the calibration of an asset can vary when the asset is measured multiple times. In calibration, the uncertainty measurement helps determine the reliability of the asset by comparing the recorded value to its real value.
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Asset functions

The asset function specifies the calibration data for the function of an asset. You can specify calibration data about one or more asset functions.

Calibration data includes the input and output values of an asset, the tolerance limits of an asset, and the uncertainty measurement data of an asset. The combination of these values is calculated to determine whether the calibration of an instrument passes or fails performance tests.

You can configure a data sheet for the following types of devices:

Analog device

An *analog device* is an instrument that provides continuous results, such as a pressure gauge.

Discrete device

A *discrete device* is an instrument that has only two settings. For example, a discrete device can be a switch that is either on or off or a valve that is either open or closed.

- [Asset function parameters](#)
The asset function specifies the calibration data for an asset. There are two types of asset functions: an analog asset function and a discrete asset function.
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Asset function parameters

The following table lists the parameters that are enabled for analog asset functions and asset discrete functions.

Parameter	Analog	Discrete
Technician Can Insert Points	✓	✓

Parameter	Analog	Discrete
No Adjustment Limit	✓	✓
Input Minimum Field Resolution	✓	✓
Limits clipped at calibration ranges:	✓	
Input Limits Clipped		
Output Limits Clipped		
Input range limits:	✓	
Input Range From		
To		
Input Units	✓	✓
Range on nominal limits and criteria:	✓	
Range Limit From		
To		
As		
Output Minimum Field Resolution	✓	
Output range limits:	✓	
Output Range From		
To		
Output Units	✓	
Square Root of Input	✓	
Process Units	✓	✓
Scaling Factor	✓	✓
Single tolerance range and criteria:	✓	✓
Single From		
To		
As		
Summed tolerance range and criteria:	✓	
Summed EU		
%Span		
%URV		
%Reading		
Applied As		
Uncertainty tolerance range and criteria:	✓	✓
Guardband From		
To		
As		
Status when Exceeded	✓	✓

Calibration points

A calibration point is the test information that is used to calibrate an asset. The amount of calibration points that are required for a calibration process is determined by business requirements.

A calibration point defines the nominal input value and the desired output value for an analog asset function.

A calibration point defines the set point and set point action for a discrete asset function.

Dynamic checks

A dynamic check is additional data about the instrument being calibrated.

A dynamic check point does not affect the calibration of an instrument, but is relevant to the calibration of an instrument. For example, a dynamic check can record the reading of gear settings or controller tuning of an instrument.

Functional checks

A functional check is an additional check point that is required to calibrate an instrument.

The options for a functional check are either pass or fail. For example, a functional check can record a temperature setting that contributes to either a pass or fail.

Uncertainty measurement for calibration

The results from the calibration of an asset can vary when the asset is measured multiple times. In calibration, the uncertainty measurement helps determine the reliability of the asset by comparing the recorded value to its real value.

Any measurement is subject to imperfections. Some of these imperfections are caused by random effects, such as short-term fluctuations in temperature, humidity, and air-pressure, or variability in the performance of the measurer. Repeated measurements show variation because of these random effects.

Other imperfections are caused by systematic effects. These systematic effects can be the offset of a measuring instrument or a change in its characteristics between calibrations. Other systematic effects can be personal bias in reading an analog scale or the uncertainty of the value of a standard.

The uncertainty measurement data for calibration is calculated externally to Maximo® Calibration. Information about calibration assets is exported from Maximo Calibration to the external system, where the information is calculated to determine the correct uncertainty data. The information is then imported into the calibration data sheet tables and the data sheet work order tables. When a data sheet is attached to a work order, the uncertainty measurement data is imported from the Data Sheet Template application.

You use the Manage integration framework to link Maximo Calibration to the external system. Before you configure Maximo Calibration for uncertainty data, you must complete the basic configuration tasks to set up your environment. See the information about basic configuration in the *IBM Maximo Asset Management Integration Guide*.

Non-linear instruments in data sheets

Non-linear instruments are analog instruments that have their tolerance limits calculated based on the desired output value and not the nominal input value.

To indicate that an instrument is non-linear, select the Non-linear check box. If calibration points are already entered, they must be cleared before you can select non-linear.

When an instrument is selected as non-linear, the Engineering Unit (EU) is the only tolerance that is used. Also, the desired output value of the calibration point must be within the output range of the asset function.

Tolerance limits on data sheets

Tolerance is an acceptable value or value range for a specified output value. You define the tolerance limits for accuracy of a calibration point on a data sheet.

You can specify up to four tolerance levels on a data sheet. Tolerance 1 is the tightest (or narrowest) tolerance and Tolerance 4 is the widest. Typically, the manufacturer of the asset establishes the tolerance limits.

Example of using tolerance limits

Tolerance 1 is the output limit range that does not require adjustment for the asset. An asset passes calibration if the actual output value for the asset is within the limit range of Tolerance 1. No additional action is required.

The asset requires adjustment if the actual output value exceeds the limit range of Tolerance 1 but is within the limit range of Tolerance 2. The asset owner is also notified.

Tolerance limits are validated as tightest to widest by using the following criteria:

- Tolerance 1 lower limits > Tolerance 2 lower limits > Tolerance 3 lower limits > Tolerance 4 lower limits
- Tolerance 1 upper limits < Tolerance 2 upper limits < Tolerance 3 upper limits < Tolerance 4 upper limits

Tolerance limits are also validated by using the following criteria:

- The lower tolerance limit value, the From field, must be less than or equal to zero.
- The upper tolerance limit value, the To field, must be greater than or equal to zero.

When a technician enters As-found and As-left values on the work order data sheet, these values are validated to ensure that they are within the specified range.

Creating data sheets

A data sheet is a template that defines the specifications of an asset for the calibration process. Data sheets give a technician the information necessary to calibrate an analog or discrete asset function.

About this task

When you create a data sheet, the status default value is draft.

If you enter a value for an asset function using the comma as the thousand separator, the value becomes a decimal number. For example, if you enter 1,000 and your minimum field resolution is 3, then the value converts to 1.000 (one). If you enter 1000 and your minimum field resolution is 3, then the value converts to 1000.000 (one thousand).

Procedure

1. In the Data Sheet Template application, click New Data Sheet and specify a data sheet name.
2. Create an asset function and specify the type of asset function.
3. Specify whether the asset function is a calibration point, a functional check point, or a dynamic check point.
4. Optional: To allow a field technician to add calibration point rows to a work order data sheet while performing a calibration, select the Technician Insert Points check box.
5. Specify the asset function information.
6. Specify either the calibration point information, the functional check point information, or the dynamic check point information of the asset function.
This checkpoint information is according to the business rules for your company.
7. Save the data sheet.

What to do next

Change the status of the data sheet to approved to add it to a work asset. You can then associate the data sheet to a job plan or to a work order.

- [Revising the version of a data sheet](#)
Changes that are made to data sheets are saved by using revision control. Revision control maintains a historical record to troubleshoot calibration issues with assets when data sheet values have changed.
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Revising the version of a data sheet

Changes that are made to data sheets are saved by using revision control. Revision control maintains a historical record to troubleshoot calibration issues with assets when data sheet values have changed.

About this task

You can revise data sheets that are in approved status only. Data sheet revision numbers increment by 1. You can view the revision history of a data sheet from the Select Action menu. Work orders that the data sheet is attached to are not automatically updated.

When the status of the revised data sheet is set to approved, the status of the previous data sheet is set to Revised. The revised data sheet cannot be edited or reopened.

Job plans that are associated with the data sheet are automatically updated to the revised version.

Procedure

1. In the Data Sheet Template application, select the data sheet that you want to revise.
2. From the Select Action menu, select Revise Data Sheet.
3. Enter a revision description and click OK.
The status of the data sheet is set to Pending Revision.
4. Update the data sheet for this revision and save the changes.

What to do next

You can change the status of the revised data sheet to either Waiting on Approval or Approved.

Associating work assets with data sheets

When you associate an asset with a data sheet, you are attaching a template with predefined calibration points for the work asset.

About this task

You can link one or more assets to a data sheet. You can use the current data sheet for multiple assets that have identical calibration data sheet requirements.

Procedure

1. In the Data Sheet Template application, select the data sheet you want to associate with a work asset.
2. On the Work Assets tab, insert a row.
3. Specify either a location, an asset, or an item.
If you select a location as the work asset, the Asset field is automatically populated.
4. Save the data sheet.

Duplicating the asset function of a data sheet

When you create multiple data sheets with similar information, you can duplicate the asset function information to save time.

About this task

You can duplicate the asset function information of a data sheet that is in draft status and pending revision status only.

Procedure

1. In the Data Sheet Template application, select the asset function of the data sheet that you want to duplicate.
2. Click Duplicate Row.
3. Specify the asset function number and description.
4. Update any fields as required.
5. Save the record.

Calibration calculations

During the calibration of an asset, calculations are used to determine whether the asset passes or fails the calibration. These calculations are based on the values that you specify on the data sheet.

The results of these calculations depend on the type of asset that is being calibrated. The results also depend on whether the tolerance levels are based on the input or the output information of the asset. Your desired output is the result that you want for your asset. The desired output is based on the direction of the values and whether the value is increasing or decreasing.

These calculations are processed on the Data Sheet tab in the Data Sheet application and the Work Order application.

- [Symbols used in calibration formulas](#)
The calibration formulas use specific symbols. These symbols define the algorithms that are used in the calibration calculations.
- [Tolerance criteria for calibration calculations](#)
The tolerance criteria in a data sheet determines which algorithm is used to calculate the lower and upper output limits for each tolerance level. Each tolerance criterion represents a specific calculation formula to calculate tolerance limits.
- [Single tolerance for calibration calculations](#)
You can use a single tolerance criterion for each tolerance level. The single tolerance calculates the desired output.
- [Summed tolerance for calibration calculations](#)
You can use summed tolerance criteria for each tolerance level. Summed tolerance is the total of single tolerance expressions.
- [Square root tolerance for calibration calculations](#)
The square root calculation is used to perform the input limits and output tolerance calculations for differential pressure producing flow meters.
- [Reverse flow calculation for calibration calculations](#)
The reverse flow calculation is used to perform the input limits and output tolerance calculations for linear assets, for example flow indicators in reverse flow.
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Symbols used in calibration formulas

The calibration formulas use specific symbols. These symbols define the algorithms that are used in the calibration calculations.

List of the symbols used in calibration formulas

i	Input value: nominal or actual.
i_{lower}	Input range, lower limit.
i_{upper}	Input range, upper limit.
i_a	Actual input value (as found input).
i_{calc}	Calculated input value (input as calculated from the as found output).
o_{lower}	Output range lower limit.
o_{upper}	Output range upper limit.
o_a	Actual output value (as found output).
o_{calc}	Calculated output value (output as calculated from the input).
Δi	Input range span.
Δo	Output range span.
r_{lower}	Range limit From value (lower limit).
r_{upper}	Range limit To value (Upper limit).
Tolerance	Tolerance value entered, for example, +/- 2.5, +2.5 or -2.5.

Tolerance criteria for calibration calculations

The tolerance criteria in a data sheet determines which algorithm is used to calculate the lower and upper output limits for each tolerance level. Each tolerance criterion represents a specific calculation formula to calculate tolerance limits.

Table 1. Criteria definitions and calculations

Criterion	Criteria definition	Tolerance calculation based on input	Tolerance calculation based on output
Engineering Units (EU)	Tolerances that are based on input are expressed in input units. The tolerance levels are always expressed in output units; therefore, a conversion must occur. The conversion is $\left(\frac{\Delta o}{\Delta i}\right)$ If the tolerance is based on output, then no conversion is required.	Tolerance * $\left(\frac{\Delta o}{\Delta i}\right)$	Tolerance
%Span	The values for the %Span criterion are calculated from the calibrated input span of the asset. The values are then converted to output units and are added to or subtracted from the desired output value to determine the range limits. The span is the algebraic difference of the input upper and lower range values divided by 100. If the tolerance is based on output, then no conversion is required.	Tolerance * $\left(\frac{\Delta i}{100}\right) * \left(\frac{\Delta o}{\Delta i}\right)$	Tolerance * $\left(\frac{\Delta o}{100}\right)$
%URV	The %URV criterion is the upper range value divided by 100. If the upper input range value is used, the value must be converted to output units before the tolerance is calculated. The converted tolerance is then added to or subtracted from the desired output value to determine the range limits. If the tolerance is based on output, then no conversion is required.	Tolerance * $\left(\frac{i_{\text{upper}}}{100}\right) * \left(\frac{\Delta o}{\Delta i}\right)$	Tolerance * $\left(\frac{O_{\text{Upper}}}{100}\right)$

Criterion	Criteria definition	Tolerance calculation based on input	Tolerance calculation based on output
%Reading	The values for the %Reading criterion are calculated from the nominal input value applied to the asset. The values are then divided by 100, converted to output units, and added to or subtracted from the desired output value to determine the range limits. These values are not constant, but vary with nominal input. If the tolerance is based on output, then no conversion is required.	$Tolerance * \left(\frac{i}{100} \right) * \left(\frac{\Delta o}{\Delta i} \right)$	$Tolerance * \left(\frac{o}{100} \right)$

Single tolerance for calibration calculations

You can use a single tolerance criterion for each tolerance level. The single tolerance calculates the desired output.

You use one of two calculations to calculate the desired output. The calculation that is used depends on the direction of the input and the output. The desired output is calculated and then applied to the formulas to calculate tolerance limits.

Table 1. Single tolerance calculations

Description	Input and output	Calculation
Same direction increasing	If Input From to Input To < 0 and Output From to Output To <= 0	Desired output $= (i - i_{Lower}) * \left(\frac{\Delta o}{\Delta i} \right) + o_{Lower}$
Same direction decreasing	If Input From to Input To > 0 and Output From to Output To >= 0	Desired output $= (i - i_{Lower}) * \left(\frac{\Delta o}{\Delta i} \right) + o_{Lower}$
Opposite direction increasing/decreasing	If Input From to Input To < 0 and Output From to Output To >= 0	Desired output $= o_{Upper} - (i - i_{Lower}) * \left(\frac{\Delta o}{\Delta i} \right)$
Opposite direction decreasing/increasing	If Input From to Input To > 0 and Output From to Output To <= 0	Desired output $= o_{Upper} - (i - i_{Lower}) * \left(\frac{\Delta o}{\Delta i} \right)$

Summed tolerance for calibration calculations

You can use summed tolerance criteria for each tolerance level. Summed tolerance is the total of single tolerance expressions.

The calculation converts the individual terms to corresponding output units and then adds all the output units together.

Summed Tolerance = Desired Output + EU + %Span + %URV + %Reading

The following figure shows the formula based on input (where T = tolerance):

Figure 1. Summed tolerance formula based on input

$$= (i - i_{Lower}) * \left(\frac{\Delta o}{\Delta i} \right) + o_{Lower} + \left[T * \left(\frac{\Delta o}{\Delta i} \right) \right] + \left[T * \left(\frac{\Delta i}{100} \right) * \left(\frac{\Delta o}{\Delta i} \right) \right] + \left[T * \left(\frac{i_{Upper}}{100} \right) * \left(\frac{\Delta o}{\Delta i} \right) \right] + \left[T * \left(\frac{i}{100} \right) * \left(\frac{\Delta o}{\Delta i} \right) \right]$$

The following figure shows the formula based on output (where T = tolerance):

Figure 2. Summed tolerance formula based on output

$$= (i - i_{Lower}) * \left(\frac{\Delta o}{\Delta i} \right) + o_{Lower} + \left[T * \left(\frac{\Delta o}{\Delta i} \right) \right] + \left[T * \left(\frac{o_{Upper}}{100} \right) \right] + \left[T * \left(\frac{o}{100} \right) \right]$$

Square root tolerance for calibration calculations

The square root calculation is used to perform the input limits and output tolerance calculations for differential pressure producing flow meters.

Square root calculations

You select the Square Root of Input check box to use this calculation.

The formula for calculating the desired output is included in the square root equations.

The following figure shows the desired output calculation:

Figure 1. Desired output calculation

$$\sqrt{\left(\frac{i}{i_{upper}}\right)^2 * \Delta o + O_{Lower}}$$

Table 1 shows the positive square root equation and negative square root equation for each criterion.

Table 1. Single square root equations for input

Criterion	Description	Positive square root equations	Negative square root equations
EU	When the Square Root of Input check box is selected, the positive square root equation is used for the engineering unit criterion. The negative square root equation is used if the input + tolerance is a negative number.	$\sqrt{\left(\frac{i + Tolerance}{i_{upper}}\right)^2 * \Delta o + O_{Lower}}$	$O_{Lower} - \sqrt{\left(\frac{i + Tolerance}{i_{upper}}\right)^2 * \Delta o}$
%Span	When the Square Root of Input check box is selected, the positive square root equation is used for the %Span criterion. The negative square root equation is used if the input + tolerance is a negative number.	$\sqrt{\left(\frac{i + Tolerance(\frac{\Delta i}{100})}{i_{upper}}\right)^2 * \Delta o + O_{Lower}}$	$O_{Lower} - \sqrt{\left(\frac{i + Tolerance(\frac{\Delta i}{100})}{i_{upper}}\right)^2 * \Delta o}$
%URV	When the Square Root of Input check box is selected, the positive square root equation is used for the %URV criterion. The negative square root equation is used if the input + tolerance is a negative number.	$\sqrt{\left(\frac{i + Tolerance(\frac{i_{Upper}}{100})}{i_{upper}}\right)^2 * \Delta o + O_{Lower}}$	$O_{Lower} - \sqrt{\left(\frac{i + Tolerance(\frac{i_{Upper}}{100})}{i_{upper}}\right)^2 * \Delta o}$
%Reading	When the Square Root of Input check box is selected, the positive square root equation is used for the %Reading criterion. The negative square root equation is used if the input + tolerance is a negative number.	$\sqrt{\left(\frac{i + Tolerance(\frac{\sqrt{V}}{100})}{i_{upper}}\right)^2 * \Delta o + O_{Lower}}$	$O_{Lower} - \sqrt{\left(\frac{i + Tolerance(\frac{\sqrt{V}}{100})}{i_{upper}}\right)^2 * \Delta o}$

Table 2 shows the positive square root equation and negative square root equation for a summed square root.

Table 2. Summed square root equations for input

Description	Summed square root equation
Positive square root equations	$\sqrt{\frac{i + Tolerance + Tolerance(\frac{\Delta i}{100}) + Tolerance(\frac{i_{Upper}}{100}) + Tolerance(\frac{\sqrt{V}}{100})}{i_{upper}} * \Delta o + O_{Lower}}$
Negative square root equations	$O_{Lower} - \sqrt{\frac{i + Tolerance + Tolerance(\frac{\Delta i}{100}) + Tolerance(\frac{i_{Upper}}{100}) + Tolerance(\frac{\sqrt{V}}{100})}{i_{upper}} * \Delta o}$

Reverse flow calculation for calibration calculations

The reverse flow calculation is used to perform the input limits and output tolerance calculations for linear assets, for example flow indicators in reverse flow.

You select the Reverse Flow check box to use this calculation.

The formula for calculating desired output is included in the following equations.

The following figure shows the desired output calculation:

Figure 1. Desired output calculation

$$\left(\left(\frac{i - i_{Lower}}{\Delta i} \right)^2 * \Delta o \right) + O_{Lower}$$

Table 1. Single squared equation for reverse flow

Criterion	Description	Squared equations
EU	When the Reverse Flow check box is selected, the squared equation is used for the engineering unit criterion.	$\left(\left(\frac{i - i_{Lower} + Tolerance}{\Delta i} \right)^2 * \Delta o \right) + O_{Lower}$
%Span	When the Reverse Flow check box is selected, the squared equation is used for the %Span criterion.	$\left(\left(\frac{(i - i_{Lower}) + Tolerance(\frac{\Delta i}{100})}{\Delta i} \right)^2 * \Delta o \right) + O_{Lower}$
%URV	When the Reverse Flow check box is selected, the squared equation is used for the %URV criterion.	$\left(\left(\frac{(i - i_{Lower}) + Tolerance(\frac{i_{Upper}}{100})}{\Delta i} \right)^2 * \Delta o \right) + O_{Lower}$

Criterion	Description	Squared equations
%Reading	When the Reverse Flow check box is selected, the squared equation is used for the %Reading criterion.	$\left(\frac{(i - i_{\text{Lower}}) + \text{Tolerance} \left( \frac{|i|}{100} \right)}{\Delta i} \right)^2 * \Delta o + o_{\text{Lower}}$

Figure 2. Summed squared equations. This equation calculates the reverse flow for summed squared criteria.

$$\left(\frac{(i - i_{\text{Lower}}) + \text{Tolerance} + (\text{Tolerance} \left(\frac{\Delta i}{100} \right)) + (\text{Tolerance} \left(\frac{|i_{\text{Upper}}|}{100} \right)) + (\text{Tolerance} \left(\frac{|i|}{100} \right))}{\Delta i} \right)^2 * \Delta o + o_{\text{Lower}}$$

Preventive Maintenance module

You use the applications in the Preventive Maintenance module to manage the work performed on a regular schedule to keep assets running efficiently. The applications can help you to plan and budget for regular maintenance work by planning the labor, material, service, and tool needs of your regularly scheduled maintenance and inspection work orders.

- [Preventive Maintenance](#)
Create preventive maintenance plans for work assets and locations in the Preventive Maintenance application.
- [Master PM](#)
Use the Master PM application to manage master preventive maintenance records (PMs) that you use as templates for other PMs.

Preventive Maintenance

Create preventive maintenance plans for work assets and locations in the Preventive Maintenance application.

You can use the Preventive Maintenance application to accomplish the following tasks:

- Create templates, called PM records (or PMs), that are used to generate scheduled preventive maintenance work orders.
- Provide detailed descriptions of preventive maintenance work that you perform by assigning job plans to PMs.
- Specify a preventive maintenance schedule for an asset or location. The schedule determines how often work orders are generated from PMs. The schedule can generate work orders based on elapsed time between work orders, on meter units used, or both.
- Select specific days, months, or seasons to generate work orders from a PM.
- Create a PM hierarchy to schedule a group of work orders for an asset or location hierarchy.
- [Preventive maintenance overview](#)
Preventive maintenance (PM) records are templates for scheduled preventive maintenance work. They are used to generate preventive maintenance work orders. PMs can contain job plan and corresponding safety plan information that is copied to work orders.
- [Preventive maintenance frequency schedules](#)
You specify a frequency schedule for a preventive maintenance (PM) to determine how often the PM generates work orders.
- [Preventive maintenance forecasting cron task](#)
A cron task has been created in the Cron Task Setup application to support PM forecasting. The cron task can be configured to update your PM forecasts automatically, based on the criteria you provide.
- [Preventive maintenance hierarchies](#)
A preventive maintenance (PM) hierarchy is a group of PMs with parent-child relationships. Use a PM hierarchy to schedule a group of work orders for an asset hierarchy or a location hierarchy.
- [Sequences for Preventive maintenance job plans](#)
You can assign one or more job plans to a preventive maintenance (PM) record. If you assign more than one job plan to a PM, sequence numbers determine how often a plan is used.
- [Preventive maintenance alerts](#)
A preventive maintenance (PM) alert is a list of almost-due PM records. It indicates that a preventive maintenance work order is about to become due for an asset or a location.
- [Working with preventive maintenance records](#)
When you create PMs, you can associate routes, specify work order status, define frequency, set seasonal dates, assign job plans, and create hierarchies. After PMs are created, you can change the status, generate work orders, override the due date, set meters, and set counters.

Preventive maintenance overview

Preventive maintenance (PM) records are templates for scheduled preventive maintenance work. They are used to generate preventive maintenance work orders. PMs can contain job plan and corresponding safety plan information that is copied to work orders.

Information associated with a PM becomes part of the work order records you generate from the PM. You can create parent-child relationships between similar PMs to build a PM hierarchy, which enables you to generate hierarchies of related work orders. You can also schedule PM work for assets on a route.

When you create PMs for assets or locations, you determine how to schedule work for them. You can create schedules based on the following conditions:

- Elapsed time since the target start date or completion date of previous work. PMs for this work are called time-based PMs.
- Metered asset usage since the target start date or completion date of previous work. PMs for this work are called meter-based PMs.
- A combination of elapsed time and metered usage. For example, you can schedule a PM to trigger work every six months or every 300 hours, whichever comes first.

You can create flexible schedules by using lead times, seasonal and extended dates, and by triggering work outside of a PM frequency cycle.

You can group PMs into hierarchies that model your assets and create PMs for routes. You can duplicate PM data by generating PMs from a template PM called a Master PM.

Calculations used for meter-based PMs

Estimated next due date calculation

If the Generate Work Order Based on Meter Readings (Do Not Estimate) check box is selected, the system calculates the Estimated Next Due Date values for meter-based PMs as follows:

Estimated Next Due Date = Today's Date + (Next Meter Reading - Generate WO Ahead By - Current Meter Reading) / Average Units per Day

Next meter reading calculation

- If the Use Last Work Order's Start Date to Calculate Next Due Date check box on the Frequency tab is selected, then the Next Meter Reading = Meter Reading when the last work order was generated + Frequency.
- If the Use Last Work Order's Start Date to Calculate Next Due Date check box on the Frequency tab is cleared, then the Next Meter Reading = Meter Reading when the last work order was closed + Frequency.
- [Preventive maintenance statuses](#)
Preventive maintenance statuses indicate the position of the PM in the processing cycle and determine whether work orders can be generated.
- [Seasonal preventive maintenance](#)
A seasonal preventive maintenance (PM) record is a PM (or master PM) record that you can activate and deactivate to accommodate work that you do only during certain seasons.

Preventive maintenance statuses

Preventive maintenance statuses indicate the position of the PM in the processing cycle and determine whether work orders can be generated.

DRAFT

PMs have a default status of DRAFT when you create them. Work orders cannot be generated from PMs with a DRAFT status. Typically PMs with this status are in the process of being created or modified.

ACTIVE

PMs must have an ACTIVE status to generate work orders. You can still modify a PM that has a status of ACTIVE.

INACTIVE

PM records that have an INACTIVE status do not generate work orders. Typically PMs with this status have been discontinued, either temporarily or permanently. You can change the status of a PM from INACTIVE to ACTIVE.

Seasonal preventive maintenance

A seasonal preventive maintenance (PM) record is a PM (or master PM) record that you can activate and deactivate to accommodate work that you do only during certain seasons.

You can have multiple active seasons (seasons where work orders are generated) for a single PM. You can also determine on which days of the week a PM is active.

For example, you want PMs for a particular asset to generate work orders only during the summer and winter months. You define two active seasons for this PM, using the Seasonal Dates tab. Also, your company is closed on weekends. You do not want work orders generated on weekend days so you specify that work orders that become due on those days are scheduled for Monday instead.

Preventive maintenance frequency schedules

You specify a frequency schedule for a preventive maintenance (PM) to determine how often the PM generates work orders.

Preventive maintenance work is typically triggered by one or more conditions:

- Elapsed time since previous work. Such PMs are called *time-based PMs*.
- Metered usage of assets. Such PMs are called *meter-based PMs*.
- A combination of elapsed time and metered usage. For example, you can schedule a PM that triggers work every six months or every 300 hours, whichever comes first.

You specify scheduling information about time based and meter based frequencies in the Frequency tab in the Preventive Maintenance application.

You can work with more complex schedules in the PM tab in the Preventive Maintenance application. You can use lead times, seasonal and extended dates, and trigger work outside of a PM frequency cycle for more complex schedules

Fixed schedules and floating schedules

To schedule any master or associated PM, determine whether you want to do work on a fixed schedule or a floating schedule. On a fixed schedule, you plan work based on the target start date of the previous work. The target start increments by a frequency that you specify. On a floating schedule, you plan work based on the closure of the previous work. You cannot generate a new work order until the current one is completed on a floating schedule.

- When you create a fixed-schedule PM, the PM work is scheduled based on the value in the Last Start Date field on each associated PM. The Last Start Date field is on the PM tab of the Preventive Maintenance application.
- When you create a floating-schedule PM, the PM work is scheduled based on the value in the Last Completion Date field. The Last Completion Date field is on the PM tab of the Preventive Maintenance application.

Preventive maintenance forecasting cron task

A cron task has been created in the Cron Task Setup application to support PM forecasting. The cron task can be configured to update your PM forecasts automatically, based on the criteria you provide.

Cron tasks are behind-the-scenes jobs set to run automatically and on a fixed schedule. Changes to preventive maintenance (PM) records and work order generation affect forecast dates, rendering them inaccurate. You use the PMForecastCronTask to set up a schedule to update your PM forecasts in order to maintain accurate dates without having to regenerate the forecast manually. The cron task allows PM forecasts to be updated at predefined intervals.

You can set up multiple cron task instances, representing different types of assets, for different durations. For example, you want to update all PM forecasts on motors every six months, but you want to update the PM forecasts on pressure-control valves every five weeks. You can create a cron task instance for each scenario.

For more information about setting up cron tasks, see the Cron Task Setup application help.

Preventive maintenance hierarchies

A preventive maintenance (PM) hierarchy is a group of PMs with parent-child relationships. Use a PM hierarchy to schedule a group of work orders for an asset hierarchy or a location hierarchy.

PM hierarchies generate an organized group of work orders for an asset or location hierarchy. Work is typically organized this way for inspections and large projects. If any PM in the hierarchy is due, it triggers a generation of work orders for the entire hierarchy.

At the highest level of a PM hierarchy, there is one parent PM. This top-level PM can have one or more child PMs. Each child PM can have one or more child PMs, and so on. A child PM can only have one parent PM.

You can add a sequence number to each PM in a PM hierarchy. The sequence number gives workers an indication of the order in which to perform the work. The sequence number is copied to the work orders that are generated from the PM. However, there is no validation on this number; duplicates and null values are allowed.

You can also generate simple work order hierarchies by applying a route to a PM.

You cannot delete a PM that is part of a hierarchy. You must remove it from the hierarchy before you can delete the PM.

- [Preventive maintenance records associated with routes](#)
When you generate preventive maintenance (PM) records for assets or locations on a route, you create a simple work order hierarchy. This hierarchy has a parent work order for the asset or location on the PM record. The child records in the hierarchy are for each asset or location listed on the route.

Preventive maintenance records associated with routes

When you generate preventive maintenance (PM) records for assets or locations on a route, you create a simple work order hierarchy. This hierarchy has a parent work order for the asset or location on the PM record. The child records in the hierarchy are for each asset or location listed on the route.

When a PM with an associated route generates a work order, the following work order data is used based on the assets on the route:

Sequence numbers

If there are sequence numbers on the assets on the route, they are applied to the generated work orders. Duplicate sequence numbers are allowed.

Job plans

The job plan for the asset's work order comes from the job plan for the asset at that stop on the route. If there is no job plan for the asset at the route stop, the plan comes from the PM record. Job plan tasks generate tasks on the associated work order.

Safety plans

If there is a default safety plan for this job plan when it is used with an asset, the safety plan is copied to the new work order.

Sequences for Preventive maintenance job plans

You can assign one or more job plans to a preventive maintenance (PM) record. If you assign more than one job plan to a PM, sequence numbers determine how often a plan is used.

Job plan sequences let you schedule different levels of maintenance work at specified intervals.

For example, you can assign monthly, quarterly, and yearly job plans for work on an asset. The monthly job might be several simple maintenance tasks, while the quarterly and yearly jobs might be more complex.

You could add a sequence of three job plans to specify different inspections of a turbine:

- A monthly basic inspection of a turbine
- A quarterly inspection of its components
- A yearly inspection of the turbine and its feeder system

By assigning a sequence number to each job plan, you specify which job plan is selected each time a work order is generated from the PM.

How job plans are selected

When you generate a work order from a PM, the system first increments the value in the Counter field by one, then selects the job plan. The system selects the job plan with the highest sequence number that divides evenly into the value in the Counter field. If no sequence number meets this criterion, the primary job plan (sequence number one) is used. The value in the Sequence field means that this job plan would be used on every *n*th work order generated from the PM, where *n* is the sequence number.

Example: Job plan sequence for a turbine

For the turbine inspections, you would create a job plan sequence as follows:

Table 1. Example of a job plan sequence for turbine inspections

Job Plan	Description	Sequence	Meaning
INS-TURB	Inspect turbine	1	This job plan is the default or primary job plan. It is used unless the sequence calls for a different plan. This job plan is used when the value in the Counter field is divisible only by one.
INS-TURBCOMP	Inspect turbine components	3	This job plan is used when three is the highest number that divides evenly into the value of the Counter field.
INS-TURBFEED	Inspect turbine and feeder system	12	This job plan is used when 12 is the highest number that divides evenly into the value of the Counter field.

- [Preventive maintenance counters](#)

The preventive maintenance (PM) counter specifies the number of work orders that were generated from a PM since the first start date.

Preventive maintenance counters

The preventive maintenance (PM) counter specifies the number of work orders that were generated from a PM since the first start date.

You can view the current counter setting on the PM tab. The counter is set to zero when you insert a new PM record. It increases each time you generate a top-level work order from the PM. Child work orders do not increase the counter value on the top-level PM.

When you generate a work order from a PM with a job plan sequence, the job plan with the highest sequence number that divides evenly into the value in the Counter field is selected. If no sequence number meets this criterion, the primary job plan (sequence number one) is used.

You can change the value of the PM counter, typically if you want the PM to use a different job plan than the one that is scheduled to be next.

Preventive maintenance alerts

A preventive maintenance (PM) alert is a list of almost-due PM records. It indicates that a preventive maintenance work order is about to become due for an asset or a location.

If the following criteria are met, the system displays the PM Alert window:

- The PM alert functionality was enabled in the PM Options window in the Organizations application. This includes indicating a work order status at which PM alerts are enabled.
- The corrective maintenance work order reaches the status defined in the Organizations application.

The frequency criteria for the PM are defined as follows:

Table 1. Frequency criteria for PMs

For:	a PM alert is generated if:
time-based PMs	the Next Due Date minus the Alert Lead is less than or equal to the system date.
meter-based PMs on an asset:	the Next Meter Reading minus the Meter Reading, minus the Alert Lead is less than or equal to zero.
meter-based PMs on a location:	the Next Meter Reading minus the Meter Reading, minus the Alert Lead is less than or equal to zero.

- [Preventive maintenance lead time](#)

Lead time is an amount of time that you specify on a preventive maintenance (PM) record so that work orders are generated in advance of their next due dates.

- [Preventive maintenance next due dates](#)

The next due date of a preventive maintenance (PM) record is the date it is next scheduled to generate a work order.

Preventive maintenance lead time

Lead time is an amount of time that you specify on a preventive maintenance (PM) record so that work orders are generated in advance of their next due dates.

There are two types of lead time:

- lead time that is added to a single top-level PM to allow advance time for gathering tools and materials.
- slack time that is added to one or more PMs to allow generation of weekly or monthly batches of work orders.

The system adds lead time and slack time to the system date when determining whether a PM will generate a work order.

Preventive maintenance next due dates

The next due date of a preventive maintenance (PM) record is the date it is next scheduled to generate a work order.

Due dates apply to any PMs that have the Use Frequency Criteria check box selected.

The next due date is determined by comparing values in the Estimated Next Due Date field on the Frequency tab of a PM, and the using the earliest date.

Other frequency criteria such as lead time, seasonal dates, and extended dates can affect when a PM generates a work order. For example, if a due date falls outside of the seasonal dates, the system finds the earliest date that falls in the active season and generates the work order for that date instead.

In addition, if the PM is part of a hierarchy, it can generate a work order because another PM in the hierarchy is due and it triggers all PMs in the hierarchy to generate work orders.

Example: Next due date for an oil change

A PM for an oil change is both time-based and meter-based. It is scheduled to generate a work order every 3,000 miles or three months, whichever comes first. The estimated next due date on the Time Based Frequency subtab might be January 30, based on average time elapsed between previous oil changes. The estimated next due date on the Meter Based Frequency subtab might be January 15, based on average mileage. The next due date for this PM would be January 15, the earlier of the two dates.

Working with preventive maintenance records

When you create PMs, you can associate routes, specify work order status, define frequency, set seasonal dates, assign job plans, and create hierarchies. After PMs are created, you can change the status, generate work orders, override the due date, set meters, and set counters.

- [Creating preventive maintenance records](#)
Create preventive maintenance (PM) records to generate work orders for preventive maintenance work that you schedule.
- [Generating work orders from preventive maintenance records](#)
You can generate work orders from PM records.
- [Adding an extended date to a preventive maintenance record](#)
Add an extended date to a preventive maintenance (PM) record to override the typical next due date for generating PM work orders.
- [Setting meter values on a preventive maintenance record based on the reading at the last work order](#)
Set a meter value from the last work order on a preventive maintenance (PM) record when you create a PM for an asset that has a meter history.
- [Setting preventive maintenance counters](#)

If you have the appropriate access, you can reset the preventive maintenance (PM) counter. You might reset the PM counter if you want the PM to use a different job plan than the one that is scheduled to be next.

Creating preventive maintenance records

Create preventive maintenance (PM) records to generate work orders for preventive maintenance work that you schedule.

Procedure

1. In the Preventive Maintenance application, on the toolbar, click New PM. If the PM field is empty, specify a value.
2. Enter a description. Click Long Description if you need more space.
3. In the Location, Asset, or GL Account fields, specify a value.
The asset or location is the entity for which you intend to schedule work - you must enter a value in one of these fields. If you have specified a GL account, when work orders are generated from the PM record, the system takes any unspecified segments from the associated location and or asset.
4. Optional: Build a PM for the assets on a route. In the Route field, specify a value.
5. Fill the remaining required fields as appropriate.

Select the Use this PM to Trigger PM Hierarchy check box if you want to generate work orders for the entire hierarchy when this PM becomes due. If you want to generate a work order for only this PM when it becomes due, and not the other PMs in the hierarchy, clear the check box.

Select the Child Work Orders and Tasks Will Inherit Status Changes check box if you want work orders generated from this PM to inherit status changes from a parent work order.

6. Click the Frequency tab. In the Work Order Generation Information section, select the following check boxes as appropriate:

- **Use Last Work Order's Start Date to Calculate Next Due Date**
Select this check box if you want generated work orders to be calculated from the target start date of the last work order. If you do not want to calculate the Next Due Date based on the target start of the last work order (for example, if you want the next work order to be generated when the last work order was completed instead), clear the check box.
- **Generate Work Order Based on Meter Readings (Do Not Estimate)**
Select this check box if you want work orders generated only when the defined meter reading has been reached. Clear this check box if you want the next work order due date to be based on the average metered usage.
- **Generate Work Order When Meter Frequency is Reached**
Select this check box if you want work orders for this PM to be automatically generated when the meter frequency has been reached and entered. This check box can only be selected if the Generate WO Based on Meter Reading (Do Not Estimate) check box has been selected.

7. Define the frequency with which you want the PM to generate work orders. The PM frequency can be time-based, meter-based, or both.

- For time-based master PMs, define the frequency criteria as wanted.
- For meter-based master PMs, define the frequency criteria as wanted.

8. If the PM is a seasonal PM, define the days/dates that you want the PM to be active on the Seasonal Dates tab.

9. On the Job Plan Sequence tab, enter job plan data for the PM.

10. If the PM is the parent record in a PM hierarchy, define the child PMs on the PM Hierarchy tab.

11. Click Save PM.

- **[Defining alert lead time for preventive maintenance records](#)**

You can define the lead time for preventive maintenance (PM) alert messages so that alerts display before work orders are generated.

- **[Defining seasonal dates for work order generation](#)**

You can specify the active months or seasons of a preventive maintenance (PM) record. The PM only generates work orders during those periods that you specify.

- **[Assigning job plans to preventive maintenance records](#)**

You can assign a job plan to a preventive maintenance (PM) record so that the job plan becomes a work plan on any work order you generate from the PM.

- **[Creating hierarchies of preventive maintenance records](#)**

Create a preventive maintenance (PM) hierarchy to mirror an asset or location hierarchy, so that work orders generated from the PM hierarchy are organized in a logical manner.

- **[Preventive maintenance forecasting](#)**

You can generate preventive maintenance (PM) forecasts from the Preventive Maintenance application.

Defining alert lead time for preventive maintenance records

You can define the lead time for preventive maintenance (PM) alert messages so that alerts display before work orders are generated.

Procedure

1. In the Preventive Maintenance application, display the PM record that you want to define alert lead time for.

2. Click the Frequency tab.

- For time-based PMs, on the Time Based Frequency subtab, specify the alert lead time (in days) in the Alert Lead (Days) field.
- For meter-based PMs, click the Meter Based Frequency subtab, then click the Detail Menu to display the meter information. If no meter was previously defined, define one now by clicking New Row. Specify the alert lead (in meter frequency units) in the Alert Lead field.

3. Click Save PM.

- **[Defining frequency for time-based preventive maintenance records](#)**

You can define frequency for a time-based preventive maintenance (PM) record to specify how often work orders are generated from it. For time-based PMs, the generation criteria is based on elapsed time since the target start date or completion date of previous work.

- **[Defining frequency for meter-based preventive maintenance records](#)**

You can define a frequency schedule for a meter-based preventive maintenance (PM) record to specify how often work orders are generated from it. For meter-based PMs, the generation criteria is based on metered asset usage since the target start date or completion date of previous work.

Defining frequency for time-based preventive maintenance records

You can define frequency for a time-based preventive maintenance (PM) record to specify how often work orders are generated from it. For time-based PMs, the generation criteria is based on elapsed time since the target start date or completion date of previous work.

About this task

If the PM has a lead time, then it needs to be generated that many days before it is due. Both the lead time specified in the organization setup and the lead time specified on the Generation window in the PM application are used to generate PMs in advance. If you specify a lead time of 5 days in the organizational setup and 5 days in the PM application, then the PM should be generated 10 days before the PM is due.

If the PM is associated with a master PM, updates to the master PM record overwrite changes you made to the frequency of the associated PM. If you want to prevent updates by the master PM, select the Override Updates from Master PM check box on the PM tab.

Procedure

1. In the Preventive Maintenance application, select the PM record that you want to define frequency for.
2. On the Frequency tab, determine whether you want the PM to be on a fixed or floating schedule. In the Work Order Generation Information section, select the following check boxes as appropriate:
 - **Use Last Work Order's Start Date to Calculate Next Due Date**
Select this check box if you want the due dates of generated work orders to be calculated from the target start date of the last work order. If you do not want to calculate the next due date based on the target start of the last work order, clear the check box. For example, if you want the next work order to be generated when the last work order was actually completed instead of when it started, clear the check box.
 - **Generate Work Order Based on Meter Readings (Do Not Estimate)**
Select this check box if you want work orders generated only when the defined meter reading has been reached. Clear this check box if you want the next work order due date to be based on the average metered usage.
 - **Generate Work Order When Meter Frequency is Reached**
Select this check box if you want work orders for this PM to be automatically generated when the meter frequency has been reached and entered. This check box can only be selected if the Generate Work Order Based on Meter Readings (Do Not Estimate) check box has been selected.
3. On the Time Based Frequency subtab, determine how much time you want to elapse between generating work orders from the PM. Enter or select the appropriate information in the Frequency and Frequency Units fields.
4. In the Estimated Next Due Date field, specify a value.
This date is the first date that the PM is scheduled to generate work orders.
5. Click Save PM.

Defining frequency for meter-based preventive maintenance records

You can define a frequency schedule for a meter-based preventive maintenance (PM) record to specify how often work orders are generated from it. For meter-based PMs, the generation criteria is based on metered asset usage since the target start date or completion date of previous work.

About this task

If the PM is associated with a master PM, updates to the master PM record overwrite changes you make to the frequency of the PM. If you want to prevent updates by the master PM, select the Override Updates from Master PM check box on the PM tab.

Procedure

1. In the Preventive Maintenance application, select the PM that you want to define frequency for.
2. On the Frequency tab, determine whether you want the PM to be on a fixed or floating schedule. In the Work Order Generation Information section, select the following check boxes as appropriate:
 - **Use Last Work Order's Start Date to Calculate Next Due Date**
Select this check box if you want the due dates of generated work orders to be calculated from the target start date of the last work order. If you do not wish to calculate the next due date based on the target start of the last work order (for example, if you want the next work order to be generated when the last work order was completed instead), clear the check box.
 - **Generate Work Order Based on Meter Readings (Do Not Estimate)**
Select this check box if you want work orders generated only when the defined meter reading has been reached. Clear this check box if you want the next work order due date to be based on the average metered usage.
 - **Generate Work Order When Meter Frequency is Reached**
Select this check box if you want work orders for this PM to be automatically generated when the meter frequency has been reached and entered. This check box can only be selected if the Generate Work Order Based on Meter Readings (Do Not Estimate) check box has been selected.
3. On the Meter Based Frequency subtab, click New Row.
4. Determine how much metered activity should occur between PM work orders for this asset. In the Meter field, specify a value.
You can only select continuous-type meters.
5. Optional: Specify values in the Frequency and First Start Reading fields.
The First Start Reading value will be the first meter reading at which the PM will generate work orders.
6. Optional: To define multiple meter frequency criteria, repeat steps 3 through 5.
7. Click Save PM.

Defining seasonal dates for work order generation

You can specify the active months or seasons of a preventive maintenance (PM) record. The PM only generates work orders during those periods that you specify.

About this task

A PM can have more than one active season.

An extended date on the PM overrides seasonal dates. If the extended date on a PM changes the due date to one that is outside the active season, you can generate work orders from that PM.

If the PM is associated with a master PM, updates to the master PM record overwrite changes you make to the seasonal dates on the associated PM when you update existing PMs. To prevent updates by the master PM, select the Override Updates from Master PM check box on the PM tab.

Procedure

1. In the Preventive Maintenance application, display the PM record you want to define active dates for.
2. On the Seasonal Dates tab, in the Active Dates section, click New Row.
3. Specify values for the start month and start day, and the end month and end day for the active season.
4. To define multiple active seasons, repeat steps 2-3.
5. Click Save PM.

- **Defining when work orders are generated**

You can specify on which days of the week a PM is active. Work orders are generated from PMs only on the specified active days.

Defining when work orders are generated

You can specify on which days of the week a PM is active. Work orders are generated from PMs only on the specified active days.

About this task

An extended date on the PM overrides seasonal dates. If the extended date on a PM changes the due date to one that is outside the active season, you can generate work orders from that PM.

If the PM is associated with a master PM, updates to the master PM record overwrite changes you make to the seasonal dates on the associated PM when you update existing PMs. To prevent updates by the master PM, select the Override Updates from Master PM check box on the PM tab.

Procedure

1. In the Preventive Maintenance application, select the PM record you want to define active days for.
2. On the Seasonal Dates tab, in the Active Days section, select the check boxes for each day that you want the PM to generate work orders. To keep the PM from generating work orders on a certain day, clear the check box for that day.
3. Click Save PM.

Assigning job plans to preventive maintenance records

You can assign a job plan to a preventive maintenance (PM) record so that the job plan becomes a work plan on any work order you generate from the PM.

About this task

If a job plan has a default safety plan when used with the selected work asset, the safety plan is copied to the work order.

When you add a single job plan to the Job Plan Sequence tab, the job plan does not appear in the Job Plan field on the PM tab. A job plan only appears in the Job Plan field of the PM tab when the following criteria are met:

- you add the job plan directly to the PM tab
- you add more than one job plan on the Job Plan Sequence tab

If the PM is associated with a master PM, updates to the master PM record overwrite changes you made to the job plan data on the PM. If you want to prevent updates by the master PM, select the Override Updates from Master PM check box on the PM tab.

Procedure

1. In the Preventive Maintenance application, display the PM record that you want to assign a job plan to.
2. On the PM tab, in the Job Plan field, specify a value.
3. Click Save PM.

- **Assigning multiple job plans to preventive maintenance records**

You can assign multiple job plan to a preventive maintenance (PM) record so that the job plans become a work plan on any work order you generate from the PM. When you assign multiple job plans, assign sequence numbers to the job plans to specify how often the PM uses each plan.

Assigning multiple job plans to preventive maintenance records

You can assign multiple job plan to a preventive maintenance (PM) record so that the job plans become a work plan on any work order you generate from the PM. When you assign multiple job plans, assign sequence numbers to the job plans to specify how often the PM uses each plan.

About this task

If a job plan has a default safety plan when used with the selected work asset, the safety plan is copied to the work order.

If the PM is associated with a master PM, updates to the master PM record overwrite changes you made to the job plan data on the PM. If you want to prevent updates by the master PM, select the Override Updates from Master PM check box on the PM tab.

Procedure

1. In the Preventive Maintenance application, display the PM record that you want to assign job plans to.
2. On the Job Plan Sequence tab, click New Row.
3. In the Job Plan field, specify a value.
4. In the Sequence field, specify a number.
5. Repeat steps 2 through 4 for each job plan that you want to add to the PM.
6. View the job plan sequence to check that it provides the sequence that you want.
7. Click Save PM.

Creating hierarchies of preventive maintenance records

Create a preventive maintenance (PM) hierarchy to mirror an asset or location hierarchy, so that work orders generated from the PM hierarchy are organized in a logical manner.

Before you begin

Create a PM for each asset in the hierarchy, then group the PMs so they generate a hierarchy of work orders for the assets.

About this task

There is a single top-level PM. This PM can have one or more child PMs. Each child PM can have one or more child PMs, and so on. A child PM can only have one parent PM.

You cannot delete a PM that is part of a hierarchy. You must remove it from the hierarchy before you can delete the PM.

Procedure

1. In the Preventive Maintenance application, display the PM record that you want to create a hierarchy for.
2. Click the PM Hierarchy tab.
3. Optional: In the Parent field, specify a value.
4. Add one or more child PMs.
 - a. Click New Row in the Children window.
 - b. In the PM field, specify a value.

If the child PM has an associated asset or location record, that data is automatically entered in the appropriate fields for the child PM.
 - c. Optional: In the Sequence field, specify a number.
5. Click Save PM.

- [Changing the parent preventive maintenance records in a preventive maintenance hierarchy](#)
You can change the parent in a preventive maintenance (PM) record hierarchy to remove a child PM from one parent and associate it with a different parent.
- [Removing child preventive maintenance records from a preventive maintenance hierarchy](#)
You can remove a child preventive maintenance (PM) record from a PM hierarchy to make the PM a top-level PM.
- [Removing parent preventive maintenance records from a preventive maintenance hierarchy](#)
You can remove a parent preventive maintenance (PM) record from a PM hierarchy so that a child PM of the parent PM becomes a top-level PM.

Changing the parent preventive maintenance records in a preventive maintenance hierarchy

You can change the parent in a preventive maintenance (PM) record hierarchy to remove a child PM from one parent and associate it with a different parent.

Procedure

1. In the Preventive Maintenance application, select the child PM record that you want to change the parent for.
2. Click the PM Hierarchy tab.
3. Delete the value in the Parent field and specify a new value.
4. Click Save PM.

Results

The child PM is removed from the previous parent and is associated with the new parent.

Removing child preventive maintenance records from a preventive maintenance hierarchy

You can remove a child preventive maintenance (PM) record from a PM hierarchy to make the PM a top-level PM.

Procedure

1. In the Preventive Maintenance application, select the parent PM record that you want to remove child PMs from.
2. Click the PM Hierarchy tab.
3. Find the row in the Children table window containing the PM that you want to remove and click Mark Row for Delete.
4. Click Save PM.

Results

The PM is removed from the hierarchy and is made a top-level PM.

Removing parent preventive maintenance records from a preventive maintenance hierarchy

You can remove a parent preventive maintenance (PM) record from a PM hierarchy so that a child PM of the parent PM becomes a top-level PM.

Procedure

1. In the Preventive Maintenance application, select the child PM record that you want to remove a parent from.
2. Click the PM Hierarchy tab.
3. Delete the value in the Parent field.
4. Save the record.

Results

The PM is removed from the hierarchy. The PM becomes a top-level PM.

Preventive maintenance forecasting

You can generate preventive maintenance (PM) forecasts from the Preventive Maintenance application.

- [Preventive maintenance forecast logic](#)
You can generate a forecast by using the Generate Forecast action in the Preventive Maintenance application, or by using the PM Forecast cron task. When you forecast a preventive maintenance (PM) record, the forecast is generated based on the frequency criteria that are specified on the Frequency tab, and seasonal information. The generated forecast appears on the Forecast tab of the Preventive Maintenance application.
- [Forecast edit rules](#)
You can edit the forecast dates of a PM under certain circumstances. For example, you might need to change a forecast date to accommodate a vacation or a plant shut down.
- [Deleting forecasts](#)
You can delete forecasts that are erroneous or no longer needed from the Preventive Maintenance application.
- [Editing records when a PM forecast exists](#)
If you make edits to records in Maximo® Asset Management that affect a preventive maintenance (PM) forecast, there are restrictions and business rules that apply.
- [Callable actions for PM forecasting](#)
Certain actions within the Actions application were created in order to allow you to set up automated processes for PM forecasting.

Preventive maintenance forecast logic

You can generate a forecast by using the Generate Forecast action in the Preventive Maintenance application, or by using the PM Forecast cron task. When you forecast a preventive maintenance (PM) record, the forecast is generated based on the frequency criteria that are specified on the Frequency tab, and seasonal information. The generated forecast appears on the Forecast tab of the Preventive Maintenance application.

The forecast logic is as follows:

Time-based PMs

When a PM is time-based, the Estimated Next Due Date is calculated by taking the current date and adding the frequency and frequency units to it. For example, a Frequency of 3 with a Frequency Unit of days would add three days to the current date. The Estimated Next Due Date then becomes the first forecasted PM date. Subsequent forecasted dates continue in the same frequency until the end of the forecast duration. Seasonal information, such as active days and dates, is taken into account during forecasting.

- First Forecast Date = Estimated Next Due Date where Estimated Next Due Date = Current Date + Frequency (Frequency/Units)
- Subsequent Forecast Dates = Previous Forecast Date + Frequency

Meter-based PMs

When a PM is meter-based, the forecast uses the value in the Average Meter Units/Day field to determine the Estimated Next Due Date. Subsequent forecasted dates are determined by the Average Meter Units/Day value. Because a meter-based forecast is generated based on average meter units, any change to the average deletes the forecast. No forecast is generated if the last meter reading date is null or if the Average Meter Units/Day is zero. When the Average Meter Units/Day change, the forecast is deleted. Seasonal information, such as active days and dates, is taken into account during forecasting.

- Estimated Next Due Date = Last Start Date + (Meter Frequency days/Average Meter Units per Day)
- Subsequent Forecast Dates = Previous Forecast Date + (Meter Frequency days/Average Meter Units per Day)

Seasonal dates

Seasonal Dates are taken into account during forecasting. If the projected forecast date for a PM occurs in an inactive season, the PM is forecasted on the earliest date in an active season (that occurs after the Next Due Date).

Target start dates

If the Use Last Work Order's Start Date to Calculate Next Due Date field is selected, the PM is forecasted based on the Estimated Next Due Date of the previous PM record. If the field is not selected (meaning that the next PM forecast is calculated based on the completion date of the previous forecasted instance), the forecast is based on the previous forecast date plus the job plan duration from the job plan that is associated with the PM. If no job plan duration is available for the PM, the forecast is based solely on the frequency criteria.

Extended dates

If a PM contains an Extended Date on its Frequency tab, the Extended Date overrides the Estimated Next Due Date in a forecast. The first forecasted date is equal to the Extended Date. All subsequent forecasts, however, are based on the Estimated Next Due Date, not the Extended Date, unless the Adjust Next Due Date check box is selected. For example, a PM has a frequency of three days, an Estimated Next Due Date of December 1, and an Extended Date of December 2. The Adjust Next Due Date check box is cleared (set to No). When a forecast is generated, the first forecast date is December 2. Subsequent forecast dates (based on the Estimated Next Due Date of December 1) are December 4, December 7.

When a forecast has been generated, the Extended Date is cleared, and the field becomes read-only. Any changes to the forecast dates must be entered in the New Date field.

When a forecast exists

When a forecast exists for a PM record, you can extend the forecast period by changing the date in the Forecast Until field in the Generate Forecast window. If the date you enter is after the date in the Last Forecast Date field, the new forecast dates are added to the existing forecast on the Forecast tab. The date that you enter in the Forecast Until field must be a date that is 30 days after the Last Forecast Date.

For example, if the Last Forecast Date of a PM is 12/31/2009, and you enter 02/28/2010 in the Forecast Until field, any forecasted dates between December 31 and February 28 are added to the existing forecast on the Forecast tab.

Duplicated PMs

When you duplicate a PM record, forecasts that exist for the original record are not duplicated. To generate forecasts for the new PM, select Generate Forecast action, or wait for the PM Forecast cron task to run.

PM hierarchies

Child PMs are forecasted when a Parent PM is forecasted.

Forecast edit rules

You can edit the forecast dates of a PM under certain circumstances. For example, you might need to change a forecast date to accommodate a vacation or a plant shut down.

You can edit a forecast date by entering a date in the New Date field. You can enter a New Date for one forecast instance at a time. The New Date, and accompanying comments, remain visible on the Forecast tab indefinitely. You can reforecast by using the prompt message at Save, selecting the Generate Forecast action, or by clicking the Process Pending Reforecast button.

Restrictions as to which dates in a forecast can be edited are as follows:

- You can enter a New Date only for the first forecast date of a meter-based PM, not for subsequent dates. Since the first forecasted date is based on the Estimated Next Due Date, you can modify that date in the forecast. Subsequent forecast dates are determined by the Average Units per Day, so they are approximate.
- You can enter a New Date only for the first forecast date of a PM that has its Use Last Work Order's Start Date to Calculate Next Due Date check box cleared. You cannot edit subsequent dates, as they are approximate.

Other restrictions for editing forecasts include:

- If the Reforecast Subsequent Dates field is selected, subsequent forecast dates are recalculated when you generate the forecast again, or when the PMForecast cron task runs. Forecast dates that are awaiting reforecast have the Reforecast Pending check box selected. Until the forecast is regenerated, no other changes to forecast dates can be made.
- You cannot enter a New Date that is the same as, or earlier than, the previous forecast date.
- If the Reforecast Subsequent Dates field is cleared, you cannot enter a New Date that is later than the next forecast date.

You can clear a pending forecast if you want to change a New Date that you entered before the forecast has been regenerated.

Forecast locks

You can lock or unlock a forecast based on your business needs. New dates cannot be entered in a locked forecast. The Lock Forecast Dates and Unlock Forecast Dates actions are available in the Preventive Maintenance application.

Deleting forecasts

You can delete forecasts that are erroneous or no longer needed from the Preventive Maintenance application.

Procedure

1. In the PM application, display the preventive maintenance record that you want to delete the forecast for.
2. Select the Delete Forecast action.

- [Preventive maintenance forecast deletion rules](#)
You can delete a PM forecast that is erroneous or no longer needed.

Preventive maintenance forecast deletion rules

You can delete a PM forecast that is erroneous or no longer needed.

When you generate a forecast for a PM or PM hierarchy for the first time, all forecast dates are accurate and up-to-date. However, if you change the PM record and then generate the forecast again, new dates are forecasted based on the updated data, but old dates also remain in the forecast. The only way to remove all erroneous dates from the forecast is to delete the forecast, and then regenerate it. For example, if the frequency criteria on a PM has changed, the forecast might be inaccurate. Generating the forecast again adds new forecast dates, but does not delete forecast dates that were based on the original frequency criteria. To create a clean forecast, delete the initial forecast, and then regenerate.

You can delete a forecast directly from the preventive maintenance record, or from the List tab of the PM application.

The logic for deleting a forecast is as follows:

Deleting a single PM from a forecast

When a PM that is not part of a PM hierarchy has a forecast, you can delete the entire forecast, or any instances within the forecast. You can delete all forecasted dates at once, or only the ones that you select.

Deleting a PM hierarchy from a forecast

When a PM hierarchy has a forecast, the entire forecast can be deleted, but only at the parent level. Deleting a parent from the forecast automatically deletes any children of that parent from the forecast as well. The children cannot be deleted from the forecast on their own.

Changing a PM hierarchy that has been forecasted

When a PM hierarchy has a forecast, any changes to the structure of the hierarchy render a forecast inaccurate. When you change the PM hierarchy, the original forecast is automatically deleted. You must regenerate the forecast by selecting the Generate Forecast action or by using the PM Forecast cron task.

Deleting a forecast date

You can delete a forecast date in the Preventive Maintenance application. In a time-based PM, you can delete dates from the bottom of the forecast up. In meter-based PM, or in a PM in which the Use Last Work Order's Start Date to Calculate Next Due Date check box is cleared, forecast dates cannot be deleted. In this case, you must delete the entire forecast and regenerate it in the Preventive Maintenance application. You cannot delete a forecast date from a schedule in the Scheduler application.

Other changes that affect the PM forecast

When you change the dates or frequency information of a PM, it affects the accuracy of an existing forecast. The forecast is deleted. The fields are as follows:

Tab	Field
PM	<ul style="list-style-type: none">• Include This PM in the Forecast• Job Plan• Status
Frequency (Time Based)	<ul style="list-style-type: none">• Frequency• Frequency Units• Use Last WO's Start Information to Calculate Next Due Frequency
Frequency (Meter Based)	<ul style="list-style-type: none">• Meter (insertion or deletion)• Frequency
Seasonal Dates	<ul style="list-style-type: none">• Days• Active Dates• Start Month/Start Day• End Month/End Day
Job Plan Sequence	<ul style="list-style-type: none">• Job Plan

Forecast locks

You can lock or unlock a forecast based on your business needs. New dates cannot be entered in a locked forecast. The Lock Forecast Dates and Unlock Forecast Dates actions are available in the Preventive Maintenance application.

Editing records when a PM forecast exists

If you make edits to records in Maximo® Asset Management that affect a preventive maintenance (PM) forecast, there are restrictions and business rules that apply.

- [PM edits when a forecast exists](#)
When you change a preventive maintenance record that has an existing forecast, the forecast can be affected.
- [Work order generation of forecasted PMs](#)
When a preventive maintenance (PM) record becomes due, a work order is generated. If a forecast exists for the preventive maintenance record, it is affected.
- [Work order cancellation when a forecast exists](#)
When you cancel a work order for a preventive maintenance (PM) record for which a forecast exists, the cancellation can affect the forecasted dates.

PM edits when a forecast exists

When you change a preventive maintenance record that has an existing forecast, the forecast can be affected.

The dates within a PM forecast are determined by the values in certain fields on the preventive maintenance record, for example, frequency and seasonal information. When you edit these fields, the forecast for the PM becomes inaccurate. After a warning message indicates the conflict, the forecast is deleted. You must generate a new forecast that includes the updated information, or wait for the PMForecast cron task to run.

PM field changes that affect the forecast include the following:

- Include This PM in the Forecast field
- Frequency information
- Seasonal Dates information
- insertion or deletion of job plan sequences

PM counter

When a forecast exists, the PM counter alters the order of the job plans in the forecast (if a job plan sequence exists). Changes to the PM counter affect the PM forecast in the following ways:

- If the Use Last WO's Start Information to Calculate Next Due Frequency check box is selected (set to Yes), the forecast dates remain the same, and the job plan information is automatically updated on the Forecast tab.
- If the Use Last WO's Start Information to Calculate Next Due Frequency check box is cleared (set to No), the forecast is deleted. You must generate a new forecast, or wait for the PMForecast cron task to run.

Status changes

Status changes affect the PM forecast in the following ways:

- Changing the status of a PM, or any child within a PM hierarchy, deletes the PM forecast.
- Changing the status of an asset or location on the PM record deletes the PM forecast.

Asset moves

Assets are often moved from place to place within an organization. Asset moves affect the PM forecast in the following ways:

- When an asset is moved within its current site, the forecast remains in place, unaffected.
- When an asset is moved to a new site, the forecast is deleted from the original PM. If a master PM exists, a new PM record is created for the asset in its new site. The forecast must be generated for the new PM, manually or by using a cron task.

Work order generation of forecasted PMs

When a preventive maintenance (PM) record becomes due, a work order is generated. If a forecast exists for the preventive maintenance record, it is affected.

PM records that have a forecast in place use the following business logic when a work order is generated. In all cases, when a work order is generated, the forecasted date for that instance of the PM is deleted.

Time-based PMs

- When a time-based PM has its Use Last Work Order's Start Date to Calculate Next Due Date check box selected (set to Yes), the generated work order uses the New Date if one is provided. If no New Date exists, the generated work order uses the forecasted date.
- When a time-based PM has its Use Last Work Order's Start Date to Calculate Next Due Date check box cleared (set to No), the generated work order uses the New Date if one is provided. If no New Date exists, the PM uses standard work order generation business logic.

Meter-based PMs

For meter-based PMs, generated work orders use the New Date if one is provided. If no New Date exists, PMs use standard work order generation business logic.

Combination PMs

Some PMs are both time- and meter-based. When a work order is generated from a PM that is both time-based and meter-based, the rules for time-based PMs apply.

Work order cancellation when a forecast exists

When you cancel a work order for a preventive maintenance (PM) record for which a forecast exists, the cancellation can affect the forecasted dates.

If you cancel the last generated work record on a PM that contains a forecast, the forecast is updated to include the deleted instance. If you cancel any other work record in the forecast (other than the last one), the forecast is not updated.

For example, a PM forecast is created for a PM record that has scheduled dates of January 21, February 21, March 21, and April 21. Three work orders are generated for January, February, and March. The forecast is updated, deleting the January, February, and March dates from the forecast (because actual work records were created). If you cancel the March 21 work record, the forecast is updated to include March 21, and now includes two forecast dates: March 21 and April 21. However, if you then cancel the January 21 work record, no changes are made to the forecast, and only the April 21 forecast date remains.

Callable actions for PM forecasting

Certain actions within the Actions application were created in order to allow you to set up automated processes for PM forecasting.

An action is an event that you want the system to trigger when it encounters records that meet certain conditions. You define the conditions that cause these actions to occur, allowing you to customize your PM forecasting implementation. For example, an asset with meter-based PMs associated with it has fluctuating usage. The asset's Average Meter Units Per Day is constantly changing, and its PM forecasts are rendered inaccurate. You can set the callable actions to automatically delete and regenerate the forecasts. The callable actions for PM forecasting include:

Delete Forecast

Although most forecast deletions are performed automatically after the user is advised, you can also set the Delete Forecast action to be called from an escalation or workflow process.

- Action Name: Delete Forecast
- Type: Application
- Object: PM
- Parameters Required: None

Generate Forecast

Although most PM forecasts can be created by using the PMForecast cron task, you can also set the Generate Forecast action to be called from an escalation or workflow process.

- Action Name: Generate Forecast
- Type: Application
- Object: PM
- Parameters Required: duration (in days) to generate the forecast for. This value must be a positive integer greater than zero.

Reforecast

Although most PMs can be reforecasted by using the PMForecast cron task, you can also set the Reforecast action to be called from an escalation or workflow process.

- Action Name: Reforecast
- Type: Application
- Object: PM
- Parameters Required: None

Generate Work Orders

You can set up the Generate Work Order action to automatically generate work orders that meet certain conditions, rather than frequency criteria. If the action is called from an escalation or workflow process, the forecast uses the work order generation business rules for the creation of work orders.

- Action Name: Generate Workorder
- Type: Application
- Object: PM
- Parameters Required: There are two parameters required for this action, which must be separated by a colon (for example Y:15).
 - Use Frequency Criteria: The first value in the parameter must be Y or N (OR 1 or 0). If you want to use frequency criteria in the work order generation, enter Y (or 1). If you do not want to use frequency criteria, enter N (or 0).
 - Generate work orders for today plus this number of days: The second value in the parameter is the number of days in advance you want to generate work for. This value must be a positive integer greater than, or equal to, zero.

In the example Y:15, work orders are generated for 15 days, using frequency criteria as defined on the PM record. If you only enter the number of days in advance to create the work for (15), the system uses frequency criteria in work order generation by default.

Generating work orders from preventive maintenance records

You can generate work orders from PM records.

Before you begin

The PM status must be ACTIVE, and the asset or location listed on the PM must have a status of OPERATING.

About this task

You use the Generate Work Orders dialog box to accomplish the following tasks:

- generate a single work order from a single top-level PM
- generate a hierarchy of work orders from a top-level PM in a PM hierarchy
- generate a hierarchy of work orders from a PM with a route
- select multiple top-level PMs from which to generate work orders

When you generate work orders from a PM with an associated job plan, default safety and measurement point information is copied to the work orders.

Procedure

1. In the Preventive Maintenance application, select the PM record for which you want to generate one or more work orders. To generate work orders for multiple top-level PM records, first use the List tab to find and select a subset of PM records.
2. Select the Generate Work Orders action.
3. In the Generate Work Orders dialog box, use the following fields to specify which PMs generate work orders:
 - Generate WOs Due Today Plus This Number of Days
Insert a "slack" time value in days to generate work orders in advance of their due dates. You might add slack time if your site generates work orders by batch (that is, weekly or monthly).
 - Use Frequency Criteria
By default, this box is selected. When selected, the system evaluates the frequency criteria for the selected set of records to determine which PMs are due to generate work orders. If a PM is part of a hierarchy, it may trigger work order generation from the entire PM hierarchy.

Clear this check box to generate work orders for the top-level PM in the selected set, regardless of their due dates. If a top-level PM is part of a hierarchy, it might trigger work order generation from the entire hierarchy.
 - Run work order generation in the background
Select this box to suppress the display of the Generating Work Orders notification and the Display Work Orders Generated page.
 - Notification E-mail for Work Order Generation
Specify the e-mail address of the worker to be notified about the generated work orders.

4. Click OK.

- **Generating work order hierarchies**

You can generate work order hierarchies from PM hierarchies and from PM records that have associated routes.

- **Adding lead time to top-level preventive maintenance records**

Add lead time to a top-level preventive maintenance (PM) record to allow advance time for gathering tools and materials.

- **Adding slack time to preventive maintenance records**

Add slack time to one or more preventive maintenance (PM) records to allow the generation of weekly or monthly batches of work orders.

Generating work order hierarchies

You can generate work order hierarchies from PM hierarchies and from PM records that have associated routes.

About this task

When generating work orders, the system evaluates all PMs in the hierarchy to determine if any are due to generate work orders:

- It first evaluates the top-level PM, and if that PM is due, the PM triggers the PM hierarchy to generate its work order hierarchy.
- If the top-level PM is not due, the system evaluates each child PM in the hierarchy. If it finds a child PM that is due, and the Use this PM to Trigger PM Hierarchy check box is selected on the child PM, the child PM triggers the PM hierarchy to generate its work order hierarchy.
- The system inserts each work order into a work order hierarchy at the same level as the PM that generated it.
- If the system cannot generate work orders for one PM in a hierarchy, it does not generate work orders for any PMs in the hierarchy. For example, if it has a GL account that is not valid, work orders are not generated.

You can apply routes to PM records. When you generate work orders for a PM with an applied route, you generate a work order for the work asset on the PM record, and a work order task for each asset listed on the route.

Procedure

1. In the Preventive Maintenance application, display the top-level PM record for which you want to generate work orders. To generate work orders for multiple top-level PM records, first use the List tab to find and select a subset of PM records.
2. From the Select Action menu, select Generate Work Orders.
3. In the Generate Work Orders dialog box, use the following fields to specify which PMs generate work orders:
 - **Generate WOs Due Today Plus This Number of Days**
Insert a "slack" time value in days to generate work orders in advance of their due dates. You might insert slack time if your site generates work orders by batch (that is, weekly or monthly).
 - **Use Frequency Criteria**
By default, this box is selected. When selected, the system evaluates the frequency criteria for the selected set of records to determine which PMs are due to generate work orders. If a PM is part of a hierarchy, it may trigger work order generation from the entire PM hierarchy.

Clear this check box to generate work orders for the top-level PMs of the selected set, regardless of their due dates. If a top-level PM is part of a hierarchy, it can trigger work order generation from the entire hierarchy.
 - **Run work order generation in the background**
Select this box to suppress the display of the Generating Work Orders notification and the Display Work Orders Generated page.
 - **Notification E-mail for Work Order Generation**
Specify the e-mail address of the worker to be notified about the generated work orders.

4. Click OK.

Adding lead time to top-level preventive maintenance records

Add lead time to a top-level preventive maintenance (PM) record to allow advance time for gathering tools and materials.

Procedure

1. In the Preventive Maintenance application, select the appropriate top-level PM record.
Attention: Add lead time only to top-level PMs.
2. On the PM tab, select the Lead Time Active check box.
3. In the Lead Time (Days) field, specify a time value (in days).
4. Select the Generate Work Orders action.
When you use the Generate Work Order action on a PM in a hierarchy, all PMs in the hierarchy are evaluated. If any PM meets frequency criteria because lead time was applied, it triggers generation of work orders from the entire hierarchy.
5. Click OK to generate the work orders.

Adding slack time to preventive maintenance records

Add slack time to one or more preventive maintenance (PM) records to allow the generation of weekly or monthly batches of work orders.

Procedure

1. In the Preventive Maintenance application, on the List tab, select a set of records that you want to add slack time to.
2. Select the Generate Work Orders action.
3. In the Generate Work Orders window, specify the time value (in days) in the Generate WOs Due Today Plus This Number of Days field.
For example, if you have a PM due to generate work orders every day, and you specify 10, 11 work orders are generated.
4. Click OK to generate the work orders.

Adding an extended date to a preventive maintenance record

Add an extended date to a preventive maintenance (PM) record to override the typical next due date for generating PM work orders.

About this task

An extended date only applies to the current PM record; it does not apply to other PMs in a PM hierarchy. Extended dates override seasonal dates.

Procedure

1. In the Preventive Maintenance application, select the PM record that you want to add an extended date to.
2. On the Frequency tab, ensure that there is a date in the Estimated Next Due Date field. If you need a value in the Estimated Next Due Date field, specify a value.
3. In the Extended Date field, specify a value.
4. Select the Adjust Next Due Date check box to let the system adjust this date after generating the work order for the PM. Select this check box to add an extended date.
If the Adjust Next Due Date check box is selected, the calculation of the next due date after a work order is generated from the PM is: Extended Date + Frequency.

If the Adjust Next Due Date check box is cleared, the calculation is: Next Due Date + Frequency.

If the extended date is later than the calculation of the Next Due Date + Frequency, you might disrupt the frequency cycle of the PM. A warning window advises you that using such an extended date might disrupt the frequency cycle and the job plan sequence. Click OK to continue with the extended date that you have entered. Click Cancel to clear the Extended Date field or to enter a different extension date.

Setting meter values on a preventive maintenance record based on the reading at the last work order

Set a meter value from the last work order on a preventive maintenance (PM) record when you create a PM for an asset that has a meter history.

About this task

If you know the meter history for the asset, you can schedule future preventive maintenance work accordingly. If you do not know the meter history for the asset, you can create a starting point from which to schedule the next work order. Changing a meter value on the PM does not change the meter value on the asset record.

Procedure

1. In the Preventive Maintenance application, select the appropriate PM record.
2. Select the Set Reading at Last WO action.
3. In the New Reading field, specify a value.
4. Click OK to set the new meter value on the PM.

Results

The PM record reflects the new meter reading on the Frequency tab.

Setting preventive maintenance counters

If you have the appropriate access, you can reset the preventive maintenance (PM) counter. You might reset the PM counter if you want the PM to use a different job plan than the one that is scheduled to be next.

Procedure

1. In the Preventive Maintenance application, select the PM record whose counter you want to reset.
Tip: You can view the current job plan sequence by selecting the View Sequence action from the Select Action menu. You can view the current counter setting on the PM tab.
2. Select the Set PM Counter action.
3. In the New PM Counter field, type a value.
4. Click OK to close the window and return to the PM tab.
5. Click Save PM.

Example: Preventive maintenance counters for a turbine

You have the following job plan sequence on a PM. The Counter value is 3. The next work order generated from the PM uses the job plan associated with sequence 4. You decide to repeat job plan sequence 1 rather than run job sequence 4, so you change the Counter value to 2. The job plan with sequence 1 is implemented next and job sequence 4 is postponed:

Table 1. Example of PM counters for turbine inspections

Job Plan	Description	Sequence
INS-TURB	Inspect turbine	1
INS-TURBCOMP	Inspect turbine components	4
INS-TURBFEED	Inspect turbine and feeder system	12

Master PM

Use the Master PM application to manage master preventive maintenance records (PMs) that you use as templates for other PMs.

You can use the Master PM application to accomplish the following tasks:

- Create, modify, and view master PMs.
- Use a master PM to create and update associated PMs.
- Specify a preventive maintenance schedule for a master PM record. The schedule determines how often work orders are generated from associated PMs. The schedule can generate work orders based on elapsed time between work orders, on meter units used, or both.
- Select specific days, months, or seasons to generate work orders from associated PMs.
- Specify the status of all work orders that are generated from associated PMs.
- Assign a sequential list of job plans to a master PM so that you can schedule different levels of maintenance work at intervals that you specify.
- Define when alert messages are generated.
- **Master Preventive Maintenance records**
Master preventive maintenance records (master PMs) are templates that you use for other PMs, called *associated PMs*. Master PMs can be shared across sites and organizations.
- **Working with master Preventive Maintenance**
You can create, modify, and view master PMs. You can also set PM alerts and frequencies.

Master Preventive Maintenance records

Master preventive maintenance records (master PMs) are templates that you use for other PMs, called *associated PMs*. Master PMs can be shared across sites and organizations.

A master PM does not generate work orders like other PMs. Instead, it is used to generate associated PMs. Associated PMs are managed in the Preventive Maintenance application. You can create associated PM records from master PM records, or make associations between PM records and a master PM. You can use the scheduling information about a master PM record to update its associated PM records.

Master PMs can contain job plan information, as well as information about active seasons for associated PMs. When you create a master PM, you determine how associated PMs schedule work for the assets. You can create schedules based on the following conditions:

- Elapsed time since the target start date or completion date of previous work. PMs for this work are called time-based PMs.
- Metered equipment usage since the target start date or completion date of previous work. PMs for this work are called meter-based PMs.
- A combination of elapsed time and metered usage. For example, you can schedule a PM to trigger work every six months or every 300 hours, whichever comes first.

You can create flexible schedules for PMs by using lead times, seasonal and extended dates, and by triggering work outside of a PM frequency cycle.

- **Master PM frequency schedules**
You specify a frequency schedule for a master preventive maintenance (PM) record to determine how often work orders are generated from associated PMs.
- **Extended dates**
An extended date overrides a preventive maintenance (PM) record's typical next due date for generating PM work orders. This date only applies to the current PM record; it does not apply to other PMs in a PM hierarchy.
- **Seasonal Preventive maintenance**
A seasonal preventive maintenance (PM) record is a PM (or master PM) record that you can activate and deactivate to accommodate work that you do only during certain seasons.
- **Job plans on master preventive maintenance**
A job plan is a detailed description of work that you perform on an asset. You associate a job plan with a master PM to create work plans.
- **Preventive maintenance alerts**
A preventive maintenance (PM) alert is a list of almost-due PM records. It indicates that a preventive maintenance work order is about to become due for an

asset or a location.

Master PM frequency schedules

You specify a frequency schedule for a master preventive maintenance (PM) record to determine how often work orders are generated from associated PMs.

One or more of the following conditions typically trigger preventive maintenance work:

- Elapsed time since previous work. Such PMs are called time-based PMs.
- Metered usage of equipment. Such PMs are called meter-based PMs.
- A combination of elapsed time and metered usage. For example, you can schedule a PM to trigger work every six months or every 300 hours, whichever comes first.

You enter scheduling information about the Frequency tab in the Master PM application.

You can work with more complex schedules by using lead times, seasonal and extended dates, and by triggering work outside of a PM frequency cycle.

Fixed schedules and floating schedules

To schedule any master or associated PM, determine whether you want to work on a fixed schedule or a floating schedule. On a fixed schedule, you plan work based on the target start date of the previous work. The target start increments by a frequency that you specify. On a fixed schedule, you can create multiple work orders in advance. On a floating schedule, you plan work based on the closure of the previous work. You cannot generate a new work order until the current one is completed on a floating schedule.

- When you create a fixed-schedule PM, the PM work is scheduled based on the value in the Last Start Date field on each associated PM. The Last Start Date field is on the PM tab of the Preventive Maintenance application.
- When you create a floating-schedule PM, the PM work is scheduled based on the value in the Last Completion Date field. The Last Completion Date field is on the PM tab of the Preventive Maintenance application.

Extended dates

An extended date overrides a preventive maintenance (PM) record's typical next due date for generating PM work orders. This date only applies to the current PM record; it does not apply to other PMs in a PM hierarchy.

The Extended Date and related fields are on the Frequency tab in the Preventive Maintenance and Master PM applications.

Things to know about extended dates:

- An extended date overrides seasonal dates of a PM.
- If an extended date is used on a parent PM in a hierarchy and one child PM is due to generate a work order earlier than the extension date, the entire PM hierarchy generates work orders earlier than the extension date. After the work orders are generated, all extended dates in the hierarchy are cleared.
- After you generate work orders from the PM, the system clears the values in the Extended Date field and the Adjust Next Due Date check box.
- You can choose whether the extended date affects subsequent due dates for a PM:
If the Adjust Next Due Date check box is selected, the calculation of the next due date after a work order is generated from the PM is: $\text{Extended Date} + \text{Frequency}$.

If the Adjust Next Due Date check box is cleared, the calculation is: $\text{Next Due Date} + \text{Frequency}$.

If the extended date is later than the calculation of the $\text{Next Due Date} + \text{Frequency}$, you can disrupt the frequency cycle of the PM. A warning window advises you that using such an extended date can disrupt the frequency cycle and job plan sequence of the PM.

Seasonal Preventive maintenance

A seasonal preventive maintenance (PM) record is a PM (or master PM) record that you can activate and deactivate to accommodate work that you do only during certain seasons.

You can have multiple active seasons (seasons where work orders are generated) for a single PM. You can also determine on which days of the week a PM is active.

For example, you want PMs for a particular asset to generate work orders only during the summer and winter months. You define two active seasons for this PM, using the Seasonal Dates tab. Also, your company is closed on weekends. You do not want work orders generated on weekend days so you specify that work orders that become due on those days are scheduled for Monday instead.

Job plans on master preventive maintenance

A job plan is a detailed description of work that you perform on an asset. You associate a job plan with a master PM to create work plans.

When a master preventive maintenance (PM) record has a job plan associated with it, the job plan becomes a work plan on any work order the system generates from the associated PMs. The work order contains tasks for each operation in the work plan. You can modify the tasks on a work order without affecting the original

job plan.

You can assign one or more job plans to a master PM. If you assign more than one job plan, you must specify how often that plan is used by assigning a sequence number to it.

If a job plan has a default safety plan when used with the selected work asset, the system copies the safety plan to the work order.

- [Sequence numbers for master PM job plans](#)

You can assign one or more job plans to a master PM. If you assign more than one job plan to a master PM, sequence numbers determine how often a plan is used.

Sequence numbers for master PM job plans

You can assign one or more job plans to a master PM. If you assign more than one job plan to a master PM, sequence numbers determine how often a plan is used.

For example, you can assign monthly, quarterly, and yearly job plans for work on an asset. The monthly job might be several simple maintenance tasks, while the quarterly and yearly jobs might be more complex.

You could add a sequence of three job plans to specify different inspections of a turbine:

- A monthly basic inspection of a turbine
- A quarterly inspection of its components
- A yearly inspection of the turbine and its feeder system

By assigning a sequence number to each job plan, you specify which job plan is selected each time a work order is generated from the associated PM records.

How job plans are selected

When you generate a work order from a PM, the system first increments the value in the Counter field by one, then selects the job plan. The system selects the job plan with the highest sequence number that divides evenly into the value in the Counter field. If no sequence number meets this criterion, the primary job plan (sequence number 1) is used. The value in the Sequence field means that this job plan would be used on every *n*th work order generated from the PM, where *n* is the sequence number.

Example: Job plan sequence for a turbine

For the turbine inspections, you would create a job plan sequence as follows:

Table 1. Example of a job plan sequence for turbine inspections

Job Plan	Description	Sequence	Meaning
INS-TURB	Inspect turbine	1	This job plan is the default or primary job plan. It is used unless the sequence calls for a different plan. This job plan is used when the value in the Counter field is divisible only by one.
INS-TURBCOMP	Inspect turbine components	3	This job plan is used when three is the highest number that divides evenly into the value of the Counter field.
INS-TURBFEED	Inspect turbine and feeder system	12	This job plan is used when 12 is the highest number that divides evenly into the value of the Counter field.

Preventive maintenance alerts

A preventive maintenance (PM) alert is a list of almost-due PM records. It indicates that a preventive maintenance work order is about to become due for an asset or a location.

If the following criteria are met, the system displays the PM Alert window:

- The PM alert functionality was enabled in the PM Options window in the Organizations application. This includes indicating a work order status at which PM alerts are enabled.
- The corrective maintenance work order reaches the status defined in the Organizations application.

The frequency criteria for the PM are defined as follows:

Table 1. Frequency criteria for PMs

For:	a PM alert is generated if:
time-based PMs	the Next Due Date minus the Alert Lead is less than or equal to the system date.
meter-based PMs on an asset:	the Next Meter Reading minus the Meter Reading, minus the Alert Lead is less than or equal to zero.
meter-based PMs on a location:	the Next Meter Reading minus the Meter Reading, minus the Alert Lead is less than or equal to zero.

Working with master Preventive Maintenance

You can create, modify, and view master PMs. You can also set PM alerts and frequencies.

- [Creating master preventive maintenance](#)
Create a master preventive maintenance (PM) record to create associated PMs and maintain scheduling information for associated PMs.
- [Updating associated preventive maintenance](#)
You can modify schedules and job plans on a master PM and apply the changes to all the associated PMs.

Creating master preventive maintenance

Create a master preventive maintenance (PM) record to create associated PMs and maintain scheduling information for associated PMs.

Procedure

1. In the Master PM application, on the toolbar, click New Master PM. If the Master PM field is empty, enter a value.
 2. Enter a description field. Click Long Description if you need more space.
 3. If you are creating associated PMs for assets and locations that have rotating items, enter the identifier in the Item field.
 4. If you want to create associated PMs for the location of an item, select the Create Associated PMs for Item's Location check box. If you want to create associated PMs for the asset of an item, select the Create Associated PMs for Item's Asset check box.
If you do not select the check boxes, you will not see the asset or location associated with that item in the Create Associated PMs window.
 5. Fill in the remaining required fields, along with other fields as appropriate.
 6. On the Frequency tab, define the frequency with which you want the associated PMs to generate work orders. The master PM frequency can be time-based, meter-based, or both.
 - For time-based master PMs, define the frequency criteria. Select the Update Time Based Information in Existing PMs check box if you want to update the following fields every time you update this master PM's associated PMs: Frequency, Frequency Units, and Alert Lead.
 - For meter-based master PMs, define the frequency criteria. Select the Update Meter Based Information in Existing PMs check box if you want to update the following fields when you update the associated PMs: Frequency, Alert Lead, and Generate WO Ahead By.
Attention: If an associated PM has a different frequency than its master PM, updating the associated PM overwrites the frequency data. Any changes made to the associated PM are lost during the update. To keep the frequency data on the associated PM, select the Override Updates from Master PM check box in the associated PM record.
 7. If the master PM is a seasonal PM, enter the days, dates, or both that you want the associated PMs to be active on the Seasonal Dates tab. Select the Update Existing PMs Seasonal Dates check box if you want to update seasonal information on associated PMs when you select the Update Associated PMs action. Any changes that you made to the seasonal dates of an associated PM are lost during an update.
 8. On the Job Plan Sequence tab, enter job plan data for the master PM. Select the Update Job Plan Sequence in Existing PMs check box if you want to update job plan data on associated PMs when you select the Update Associated PMs action. Any changes that you made to job plan data on an associated PM are lost during an update.
 9. Save the record.
- [Creating associated PMs from a master PM](#)
Create associated preventive maintenance records (PMs) from a master PM to schedule preventive maintenance work and to generate PM work orders for a rotating item's asset, location, or both.
 - [Specifying the status of associated PM work orders](#)
On a master preventive maintenance (PM) record, you can specify the status of all work orders that the system generates from the associated PMs.
 - [Setting the frequency of master PMs](#)
You specify a frequency schedule for a master preventive maintenance (PM) record to determine how often work orders are generated from associated PMs.
 - [Specifying the generation of work orders before their due dates](#)
Lead time is an amount of time that is added to the system date when determining if an associated preventive maintenance (PM) record will generate a work order. When you specify lead time on a master PM record, work orders from the associated PMs are generated in advance of their next due dates.
 - [Defining when work orders are generated](#)
You can specify on which days of the week a master preventive maintenance (PM) record is active. Work orders are generated from associated PMs only on the specified active days.
 - [Defining seasonal dates for work order generation](#)
You can specify the active months or seasons of a master preventive maintenance (PM) record. The associated PMs of a seasonal PM only generate work orders during those periods that you specify.

Creating associated PMs from a master PM

Create associated preventive maintenance records (PMs) from a master PM to schedule preventive maintenance work and to generate PM work orders for a rotating item's asset, location, or both.

Procedure

1. Open the Master PM application, on the Master PM tab, display the master PM from which you want to create associated PMs.
2. Check that there is a value in the Item field. This item must be a rotating item associated with the asset, location, or both for which you want to create PMs.
3. Select either or both of the following check boxes, as appropriate:
 - Create Associated PMs for Item's Location
 - Create Associated PMs for Item's Asset
4. Select the Create Associated PMs action.
5. In the Create Associated PMs window, select the check boxes of the assets, locations, or both for which you want to create PMs. The list includes asset and location identifiers of the rotating item shown in the Item field on the master PM.
If you have already created associated PMs for an asset or location, the list does not include those assets or locations.
6. Click OK to create the associated PMs. The system assigns identifiers to the PMs and displays a confirmation window, listing the new associated PM records.
7. Click Close to close the confirmation window.

Specifying the status of associated PM work orders

On a master preventive maintenance (PM) record, you can specify the status of all work orders that the system generates from the associated PMs.

Procedure

1. On the Master PM tab of the Master PM application, display the master PM record.
2. In the Work Order Status field, specify a value.
 - If the item on the PM belongs to an item set, then the Select Value list contains only those statuses that are available in all organizations that share that item set.
3. Save the record.

Setting the frequency of master PMs

You specify a frequency schedule for a master preventive maintenance (PM) record to determine how often work orders are generated from associated PMs.

- [Defining frequency for time-based master PMs](#)
Specify frequency for a time-based master preventive maintenance (PM) record to determine how often its associated PMs generate work orders.
- [Defining frequency for meter-based master PMs](#)
Specify frequency for a meter-based master preventive maintenance (PM) record to determine how often its associated PMs generate work orders.
- [Defining the alert lead time for master PMs](#)
You can define the lead time for master preventive maintenance (PM) alert messages so that alerts display before work orders are generated.
- [Overriding the next due date for associated PMs](#)
You can add an extended date to a master preventive maintenance (PM) record. An extended date overrides the next due date on an associated PM record.

Defining frequency for time-based master PMs

Specify frequency for a time-based master preventive maintenance (PM) record to determine how often its associated PMs generate work orders.

About this task

For time-based PMs, the generation criteria is based on elapsed time since the target start date or completion date of previous work.

Procedure

1. In the Master PM application, display the master PM record that you want to define frequency for.
2. Click the Frequency tab.
3. To specify the type of schedule that you want to use for associated PMs, choose either of the following options:
 - To create a fixed schedule PM, select the Use Last Work Order's Start Date to Calculate Next Due Date check box.
 - To create a floating schedule PM, clear the Use Last Work Order's Start Date to Calculate Next Due Date check box.
4. On the Time Based Frequency subtab, determine how much time you want to elapse between generating work orders from the associated PMs. Enter or select the appropriate information in the Frequency and Frequency Units fields.
5. In the Next Due Date (used during PM create only) field, specify a value.
The value in the Next Due Date field is the first date on which the associated PMs generate work orders.
6. Optional: Update time-based frequency information about the associated PMs by selecting the Update Time Based Information in Existing PMs check box.
When you update associated PMs, the time-based information is copied to the associated PM records.
7. Save the record.

Defining frequency for meter-based master PMs

Specify frequency for a meter-based master preventive maintenance (PM) record to determine how often its associated PMs generate work orders.

About this task

For meter-based PMs, the generation criteria is based on metered equipment usage since the target start date or completion date of previous work.

Procedure

1. In the Master PM application, display the master PM you want to define frequency for.
2. Click the Frequency tab.
3. Select one of the following options to specify whether you want associated PMs to be on a fixed or floating schedule:
 - To use a fixed schedule, select the Use Last Work Order's Start Date to Calculate Next Due Date check box.
 - To use a floating schedule, clear the Use Last Work Order's Start Date to Calculate Next Due Date check box.

4. On the Meter Based Frequency subtab, click New Row.
5. In the Meter field, specify a value based on how much metered activity you want to occur between PM work orders for this asset.
You can only select continuous-type meters.
6. Optional: In the Frequency and First Start Reading fields, specify values.
The value in the First Start Reading field is the first meter reading at which the associated PMs generate work orders.
7. Optional: Enter multiple meter frequency criteria by repeating steps 4 through 6.
8. Optional: Update meter-based frequency information about the associated PMs by selecting the Update Meter Based Information in Existing PMs check box.
When you update associated PMs, the meter-based information is copied to the associated PM records.
9. Save the record.

Defining the alert lead time for master PMs

You can define the lead time for master preventive maintenance (PM) alert messages so that alerts display before work orders are generated.

Procedure

1. In the Master PM application, display the master PM record that you want to define alert lead time for.
2. Click the Frequency tab.
 - For time-based master PMs, on the Time Based Frequency subtab, specify the alert lead time, in days, in the Alert Lead (Days) field.
 - For meter-based master PMs, click the Meter Based Frequency subtab, then click the detail menu to display the meter information. (If no meter was previously defined, define one now by clicking New Row. In the Alert Lead field, specify the alert lead, in meter frequency units.
3. Save the record.

Overriding the next due date for associated PMs

You can add an extended date to a master preventive maintenance (PM) record. An extended date overrides the next due date on an associated PM record.

About this task

When you update associated PMs, the extended date is copied to all associated PMs, which affects the next time they generate PM work orders. The extended date only applies to the associated PM record; it does not apply to other PMs that are further down in a PM hierarchy. Extended dates override seasonal dates.

Procedure

1. In the Master PM application, display the record you want to add an extended date to.
2. Click the Frequency tab.
3. Check that there is a date in the Next Due Date (Used During PM Create Only) field. If you need a value in the Next Due Date (Used During PM Create Only) field, select a date.
4. In the Extended Date field, specify a date.
The date must be later than the next due date.
5. Select the Adjust Next Due Date check box to let the system adjust this date after generating a work order for an associated PM.
You must have an extended date defined to select this check box.
If the Adjust Next Due Date check box is selected, the calculation of the next due date after a work order is generated from the PM is: Extended Date + Frequency.

If the Adjust Next Due Date check box is cleared, the calculation is: Next Due Date + Frequency.

If the extended date is later than the calculation of the Next Due Date + Frequency, you can disrupt the frequency cycle of the associated PM. A warning window advises you that using such an extended date might disrupt the frequency cycle and job plan sequence of the PM. Click OK to continue with the extended date you have entered. Click Cancel to clear the Extended Date field or to enter a different extension date.

Specifying the generation of work orders before their due dates

Lead time is an amount of time that is added to the system date when determining if an associated preventive maintenance (PM) record will generate a work order. When you specify lead time on a master PM record, work orders from the associated PMs are generated in advance of their next due dates.

Procedure

1. In the Master PM application, display the master PM record that you want to apply lead time to.
2. On the Master PM tab, select the Lead Time Active check box.
3. Enter a time value (in days) in the Lead Time (Days) field.
4. Save the record.

Example

For example, you have a master PM that specifies that on the 15th of each month, a work order is to be performed. You want an extra day each month to gather the tools required for the job. You set the lead time on the master PM to one day. The system generates work orders from the associated PMs one day earlier than it would have otherwise, that is, on the 14th.

Defining when work orders are generated

You can specify on which days of the week a master preventive maintenance (PM) record is active. Work orders are generated from associated PMs only on the specified active days.

Procedure

1. In the Master PM application, display the master PM record that you want to define active days for.
2. Click the Seasonal Dates tab.
3. In the Active Days section, select the check boxes for each day that you want the associated PMs to generate work orders. To keep the associated PMs from generating work orders on a certain day, clear the check box for that day.
4. Save the record.

Defining seasonal dates for work order generation

You can specify the active months or seasons of a master preventive maintenance (PM) record. The associated PMs of a seasonal PM only generate work orders during those periods that you specify.

About this task

A master PM can have multiple active seasons.

Procedure

1. In the Master PM application, display the master PM record that you want to define active dates for.
2. Click the Seasonal Dates tab.
3. In the Active Dates section, click New Row.
4. Specify the start month and start day, and the end month and end day for the active season of the master PM.
5. To define multiple active seasons, repeat steps 3 and 4.
6. Optional: Update the seasonal dates on the associated PM records by selecting the Update Existing PMs Seasonal Dates check box.
When you update associated PMs, the seasonal dates are copied to the associated PM records.
7. Save the record.

Updating associated preventive maintenance

You can modify schedules and job plans on a master PM and apply the changes to all the associated PMs.

About this task

In the Preventive Maintenance application, if an associated PM has the Override Updates from Master PM check box selected, the master PM does not affect its schedule.

Procedure

1. In the Master PM application, display the master PM whose associated PMs you want to update.
2. On the Frequency tab, change the master scheduling information about the PM.
3. Review the information in the Work Order Generation Information area.
The fields correspond to information that the master PM updates on the associated PMs.
4. Optional: Select the Update Existing PMs check box to update the Extended Date field of the associated PMs.
5. On the Time Based Frequency and Meter Based Frequency subtabs of the Frequency tab, ensure that the following check boxes are selected to update the appropriate frequency information:
 - For time-based master PMs, ensure that the Update Time Based Information in Existing PMs check box is selected. The Frequency, Frequency Units, and Alert Lead (Days) fields on the associated PMs are updated when you update associated PMs.
 - For meter-based master PMs, ensure that the Update Meter Based Information in Existing PMs check box is selected. The Frequency, Alert Lead, and Generate WO Ahead By fields are updated on the associated PMs when you update associated PMs.
6. On the Seasonal Dates tab, change the active days, dates, or both. To update seasonal dates on the associated PMs, select the Update Existing PMs Seasonal Dates check box.
7. On the Job Plan Sequence tab, change the job plan information. To update job plan sequences on the associated PMs, select the Update Job Plan Sequence in Existing PMs check box.
8. Save the master PM.
9. Select the Update Associated PMs action.

10. Select the check box for each site that you want to update associated PMs.
11. Click OK.

Purchasing module

You use the applications in the Purchasing module to manage the purchasing process, including obtaining requests for quotations (RFQs), purchasing the materials and services, and then receiving and invoicing them. The applications also help you to maintain information about the companies from which you purchase, and to integrate legal terms and conditions into the purchasing process.

- **[Purchase Requisitions](#)**
You use the Purchase Requisitions application to create purchase requisitions for items, for supplies, or for services. You can also use this application to create purchase orders from purchase requisitions.
- **[Purchase Orders](#)**
You use the Purchase Orders application to create purchase orders and to change existing purchase orders. You can create purchase orders and reuse the data and vendor information while applying consistent terms and contracts.
- **[Receiving](#)**
In a large enterprise, you can have a centralized purchasing department for several sites. Each site receives its own materials and services. You use the Receiving application to receive materials and services. You use this application to record materials and services to the database when they are delivered to a site. You can also return materials to vendors.
- **[Shipment Receiving](#)**
In a large organization, you can transfer inventory items or tools between storerooms within the same site or across sites and organizations and track their delivery. You create shipment receipt records to acknowledge the receipt of transferred items and update inventory balances at the destination storeroom.
- **[Invoices](#)**
You use the Invoices application to record vendor invoices as you receive them. You can also record debit and credit notes from vendors, and match invoice details against purchase orders and receipts. You can reverse approved or paid invoices, credit memos, or debit memos. Items that are part of the consignment inventory can be invoiced when the items are used.
- **[Request for Quotations](#)**
You use the Request for Quotations application to create requests for quotations and to store the quotations. Based on the quotations, you can assess the vendor who best meets your needs.
- **[Companies](#)**
The Companies application maintains detailed information about vendors, manufacturers, and other companies.
- **[Company Master](#)**
You use the Company Master application to create company master records that belong to a particular company set. You can also use the Company Master application to associate a company master record with an organization.
- **[Terms and Conditions](#)**
You use the Terms and Conditions application to specify and to maintain a library of terms and conditions. You can add the terms and conditions to a purchasing document or to a contract. Terms can contain information such as liability concerns, shipping and handling details, and delivery time expectations.

Purchase Requisitions

You use the Purchase Requisitions application to create purchase requisitions for items, for supplies, or for services. You can also use this application to create purchase orders from purchase requisitions.

When you have records that are associated with purchase requisitions, such as contracts and requests for quotations, you can view these records. You can obtain a comprehensive look at all of the data that is related to purchase requisitions.

- **[Purchase requisitions overview](#)**
A purchase requisition (PR) is a written request issued internally to a purchasing department to order items or services. The creation of a purchase requisition sets off a chain reaction of activities as outlined in the purchasing process.
- **[Working with purchase requisitions](#)**
When you create a purchase requisition (PR), you can add line items from inventory, materials, tools, services, or standard services to a purchase requisition (PR). When you associate items such as terms and conditions, contracts, conversion factors, or units of measure with a PR, you can ensure consistency from your vendors.

Purchase requisitions overview

A purchase requisition (PR) is a written request issued internally to a purchasing department to order items or services. The creation of a purchase requisition sets off a chain reaction of activities as outlined in the purchasing process.

You can create the following types of purchase requisitions:

- Internal purchase requisitions: requesting the transfer of materials from another company storeroom.
- External purchase requisitions: requesting the purchase of the necessary materials from an outside vendor. You can specify the vendor.
- **[Purchasing process](#)**
The steps in the purchasing process include creating purchase requisitions, creating purchase orders, receiving services and items, and recording vendor invoices.
- **[Purchase record attributes](#)**
Attributes are used to categorize items. For example, the purchasing record for a computer can have the attributes of memory, disk space, and speed. When

you create a purchase order, you can use the Classifications feature to search for items based on attributes.

- **Purchase requisition statuses**
Once a purchase requisition has been created, you use the purchase requisition status to indicate where it is in the processing cycle.
- **Tax-exempt status**
The tax-exempt option indicates whether an item, a tool, or a service is taxable. You might want to set the tax-exempt status, depending on where an item or a service is acquired, and how an item or a service is used.
- **Terms and conditions**
You can create and maintain a library of terms and conditions that your company and your vendors must follow on purchase order and contract transactions. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.
- **Currency conversions**
When you specify a foreign currency on a purchase requisition or purchase order, two values are calculated: the total cost that is expressed in the foreign currency, and the total base cost that is expressed in the base currency or your company currency.

Purchasing process

The steps in the purchasing process include creating purchase requisitions, creating purchase orders, receiving services and items, and recording vendor invoices.

The following example illustrates the purchasing process from requisitioning through invoicing.

Step 1: Create the purchase requisition

You can create and approve a purchase requisition 98074 for the following services and related materials:

- Two contract programmers (1,000 hours each)
- Two personal computers
- A software package
- Rental furniture (desks, chairs)

Step 2: Create the purchase orders

You can create the following purchase orders, one for each vendor by using the Copy PR Line Items to PO action in the Purchase Orders application:

- Purchase order 98105 that contains two contract programmers (1,000 hours each)
- Purchase order 98106 that contains two personal computers
- Purchase order 98107 that contains a software package
- Purchase order 98108 that contains rental furniture (desks, chairs)

Step 3: Receive the services and items

When you record receipts from each vendor, you must use the appropriate receipts tab in the Receiving application and the Select Ordered Services and Select Ordered Items actions.

Step 4: Record vendor invoices

After you purchase materials and services, your company receives bills, or invoices, from the vendors. You use the Invoices application to record vendor invoices as you receive them. When you create invoice records you can list purchase order details on the invoice when it is appropriate.

You use the Copy PO Lines action to copy lines from either the receipts or the purchase order to the Invoice Lines tab. You can also view lines that are not on the invoice for items or services received, and add the lines to the invoice.

Purchase record attributes

Attributes are used to categorize items. For example, the purchasing record for a computer can have the attributes of memory, disk space, and speed. When you create a purchase order, you can use the Classifications feature to search for items based on attributes.

Attributes are set up in the Classifications application and are then associated with individual items in the Item Master application. When you view a purchasing record, you can see any attributed associated with the line item on the Specifications tab.

When you add line items to a purchase order, you can search for items by attribute. If your inventory has many types of similar items, using Classifications can help you locate the exact type of item that you want to add.

Purchase requisition statuses

Once a purchase requisition has been created, you use the purchase requisition status to indicate where it is in the processing cycle.

Changing statuses on purchase requisitions affects both field functionality and access to various action pages. You can change the status of multiple purchase requisitions at the same time by using the List tab.

Purchase requisitions can have the following statuses:

Waiting for Approval (WAPPR)

WAPPR is the status that a purchase requisition is assigned when it is created. Some default fields are read-only.

Approved (APPR)

APPR status is available only if your business rules require approvals. The default configuration does not require approvals for purchase requisitions and purchase requisition line items that transfer to purchase requisitions. You must have a monetary approval limit equal to or greater than the total cost of the purchase order. Your system administrator sets approval limits for each user.

Closed (CLOSE)

CLOSE status indicates that all the purchase requisitions line items have been assigned to one or more purchase orders. All fields are read only, and the record can no longer be modified. If you try to close a purchase requisition and a line item has not yet been assigned, a message is displayed. Your system administrator can set the system to automatically close purchase requisitions once you transfer all the line items to purchase orders, requests for quotations, or contracts.

Canceled (CAN)

CAN status is available if the current purchase requisition status is Approved (APPR) and if none of its line items have been assigned to a purchase order. All fields are read only, and a record can no longer be modified.

Tax-exempt status

The tax-exempt option indicates whether an item, a tool, or a service is taxable. You might want to set the tax-exempt status, depending on where an item or a service is acquired, and how an item or a service is used.

The situations under which items or services are tax-exempt vary depending upon your location, and upon current tax regulations. For example, the storeroom for an item might be in a location where sales taxes are not collected. In some cases, if an item becomes part of a product, that item can be tax-exempt. If the item is used as a stand-alone item, then the item is taxable. The buyer for your organization determines the tax-exempt status of items, of tools, and of services.

You can override the tax-exempt status for items, for tools, and for services in the following applications:

- Purchase Requisitions
- Purchase Orders
- Invoices

When you specify the tax-exempt status, you can apply the status at the organization level and at the vendor level.

Terms and conditions

You can create and maintain a library of terms and conditions that your company and your vendors must follow on purchase order and contract transactions. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.

You can create a library of term and condition values in the Terms and Conditions application. You use the library to look up and associate terms and conditions to purchase order and contract records. The library is accessible in the Purchase Orders and contracts applications.

You can set default term and condition values according to site and contract type in the Organizations application. When you create a contract record in a contracts application, it inherits the default term and condition values that you assigned to the selected contract type in the Organizations application.

Currency conversions

When you specify a foreign currency on a purchase requisition or purchase order, two values are calculated: the total cost that is expressed in the foreign currency, and the total base cost that is expressed in the base currency or your company currency.

Example of currency conversion

Your base currency is US\$ (US dollar). You enter a purchase requisition for gaskets to be ordered from a French company. On the PR tab, select **EUR** (Euro) in the Currency field. On the PR Lines tab you enter 25 in the Quantity field, and 3.14 in the Unit Cost field. Using the active exchange rate of 1.17726 for the **EUR**, two values are calculated and displayed on the PR tab:

- Total Cost: $(25 \times 3.14 \text{ Euro}) = 78.50 \text{ Euro}$
- Total Base Cost: $(78.50 \text{ Euro} \times 1.17726 \text{ exchange rate}) = 92.41 \text{ US dollars}$

Working with purchase requisitions

When you create a purchase requisition (PR), you can add line items from inventory, materials, tools, services, or standard services to a purchase requisition (PR). When you associate items such as terms and conditions, contracts, conversion factors, or units of measure with a PR, you can ensure consistency from your vendors.

- [Records related to purchase requisitions](#)

If you have records that are associated with purchase requisitions, such as invoices, contracts, and requests for quotations, you can view these records. You

- can obtain a comprehensive look at all of the data that are related to purchase requisitions.
- [Changing the status of a list of records](#)
You can change the status of multiple records in applications.
- [Creating purchase requisitions](#)
You create purchase requisitions to identify items or services you need.
- [Creating purchase orders from purchase requisitions](#)
You can create a purchase order from within a purchase requisition record.
- [Referencing contracts on purchase requisitions](#)
You can reference a contract on a purchase requisition to benefit from pre-arranged pricing with a specific vendor.
- [Creating, associating, and modifying terms](#)
You can create terms and conditions for records and you can associate existing terms with records. You can also modify how the sequence of terms displays for a record .
- [Distributing purchasing line item costs](#)
You can distribute the costs of a purchase order or desktop requisition line item across multiple GL accounts. For example, if your department ordered and received a new laser printer that the packaging department is also to use, you can specify two GL accounts for the printer, one for each department.

Records related to purchase requisitions

If you have records that are associated with purchase requisitions, such as invoices, contracts, and requests for quotations, you can view these records. You can obtain a comprehensive look at all of the data that are related to purchase requisitions.

To see all of the records related to a particular purchase requisition, select the View Related Records action.

To view the transactions and the records that are specific to a purchase requisition line, click the View Related Records icon at the end of the purchase requisition line. In the View Related Records window, you can click the identifier for an invoice, a purchase order, a contract, and a request for quotation to access that record in the relevant application.

Changing the status of a list of records

You can change the status of multiple records in applications.

Procedure

1. In the Work Order application, on the List tab of an application, filter the records so that less than 200 records are displayed.
2. Scroll down the bottom of the screen and select the Select Records check box.
The screen refreshes and each row now has a check box.
3. Select the check boxes for the work orders whose status you want to change.
4. Click the Change Status action and enter the information in the dialog box.
5. Click OK to close the Change Status window.

Creating purchase requisitions

You create purchase requisitions to identify items or services you need.

About this task

You can create two types of purchase requisitions:

- Internal purchase requisitions requesting the transfer of materials from another company storeroom
- External purchase requisitions requesting the purchase of the necessary materials from an outside vendor

After the purchase requisition is approved, the line items can be placed on one or more purchase orders and sent to the appropriate vendors. You can also create purchase requisitions from the Inventory application using the Reorder Items action, which you specify in the Purchasing options in the Organizations application.

Procedure

1. From the toolbar of the Purchase Requisitions application, click New Purchase Requisition.
2. Optional: Modify the value in the PR field.
3. In the Description field, type a description.
4. Fill the remaining required fields.
5. Click the PR Lines tab and add lines to the purchase requisition.
6. Click the Ship To/Bill To tab. Ship-to information defaults from the Person record, as defined in the People application. If there is no default ship-to information associated with the Person record, the product copies the ship-to information from your organization.
7. In the Ship To field, type a value or click Select Value to choose from the list. Fill the remaining Ship To information.
8. In the Bill To field, type a value or click Select Value to choose from the list. Fill the remaining Bill To information.
9. Click Save Purchase Requisition.

- [Adding lines to purchase requisitions](#)
You use the Purchase Requisitions application to add lines to purchase requisitions.
- [Viewing contract items](#)
When adding lines to purchase requisitions, you can view a list of the items under contract with a specified vendor.

Adding lines to purchase requisitions

You use the Purchase Requisitions application to add lines to purchase requisitions.

Before you begin

The purchase requisition must be approved before you can assign its line items to one or more purchase requisitions. The status of the purchase requisition must be WAPPR (Waiting for approval). A purchase requisition can be closed when all its line items have been assigned to a purchase requisition.

About this task

You can add a purchase requisitions line for any of the following:

- Item from inventory
- Material not from inventory
- Tool
- Service
- Standard service
- Special order (if your administrator makes this option available).

Procedure

1. In the Purchase Requisitions application, create or display a purchase requisition.
2. Click the PR Lines tab. In the PR Lines table window, click New Row.
3. Fill the remaining required fields:
 - For the Item or Tool line types, if an item is not associated with a unit price, you must enter information in the following fields:
 - Quantity
 - Unit Cost
 - Specify information for one of the following fields:
 - Storeroom
 - Work Order
 - Location
 - Asset
 - GL Debit Account
 - For the Material line types, specify information for the following fields:
 - Description
 - Quantity
 - Unit Cost
 - Specify information for one of the following fields:
 - Work Order
 - Location
 - Asset
 - GL Debit Account - If your organization requires general ledger account validation for transactions, this field must be populated before the approval of the purchase requisition.
 - For the Service line types, specify information for the following fields:
 - Description
 - Quantity
 - Unit Cost or Line Cost
 - Specify information for one of the following fields:
 - Work Order
 - Location
 - Asset
 - GL Debit Account - If your organization requires general ledger account validation for transactions, this field must be populated before the approval of the purchase requisition.
 - For the Standard Service line types, specify information for the following fields:
 - Item
 - Quantity
 - Unit Cost or Line Cost
 - Specify information for one of the following fields:
 - Work Order
 - Location
 - Asset
 - GL Debit Account - If your organization requires general ledger account validation for transactions, this field must be populated before the approval of the purchase requisition.
4. Enter or modify other purchase requisition line information as needed.
5. Optional: Choose one of the following options:

Option	Description
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Option	Description
Vendor Items	You can choose from a list of items associated with this vendor.
Contract Items	You can choose from a list of items that appear on contracts with this vendor.
Select Spare Parts	You can choose from a list of spare parts for a particular asset.
Vendor Analysis	You can view vendor history, such as past performance.
View Contracts	You can view all contracts associated with that item.
Distribute Costs	You can distribute the cost of the line item to multiple general ledger debit accounts.
New Row	You can add another line to the purchase requisition.

6. Click Save Purchase Requisition.

- **Creating units of measure**

You can create a unit of measure to describe the quantity used to measure an item, tool, or a service. You use a unit of measure to measure the items and services that you order, issue, and transfer in the asset management system. Examples of units of measure include EACH, CASE, IN (inches), and ROLL.

- **Creating conversion factors**

You can create a conversion factor to define the numeric value or ratio that the asset management system uses to relate one unit of measure to another. The conversion factor is an alternate value that is used to represent a unit of measure. You can use this alternate value to define an item order or transfer quantity and storeroom balance.

Creating units of measure

You can create a unit of measure to describe the quantity used to measure an item, tool, or a service. You use a unit of measure to measure the items and services that you order, issue, and transfer in the asset management system. Examples of units of measure include EACH, CASE, IN (inches), and ROLL.

About this task

A unit of measure works with a conversion factor. The conversion factor represents the numeric value or ratio that the asset management system uses to relate one unit of measure to another. You can create units of measure and conversion factors in many applications:

- Assets
- Purchase Orders
- Purchase Requisitions
- Receiving
- Item Master
- Meters
- Service Items
- Tools
- Stocked Tools
- Inventory

You can delete a unit of measure only when it is not used in a conversion, on a specification template, or on a meter record.

Procedure

1. Open an application.
2. Select the Unit of Measure and Conversion > Add/Modify Units of Measure action.
3. Insert a row.
4. In the Unit of Measure field, specify an identifier for the unit of measure.
5. Optional: Enter values in the following fields:
 - Abbreviation
 - Description

The abbreviation value along with an asset classification is used to create descriptions for assets, locations, and items.
6. Click OK.

Creating conversion factors

You can create a conversion factor to define the numeric value or ratio that the asset management system uses to relate one unit of measure to another. The conversion factor is an alternate value that is used to represent a unit of measure. You can use this alternate value to define an item order or transfer quantity and storeroom balance.

Before you begin

You must define the units of measure before you can create conversion ratios.

About this task

You can create units of measure and conversion factors in the following applications:

- Purchase Orders

- Purchase Requisitions
- Receiving
- Item Master
- Service Items
- Tools
- Stocked Tools
- Inventory

Procedure

1. Open an application.
2. Select the Unit of Measure and Conversion > Add/Modify Conversions action.
3. Click New Row.
4. Enter values in the following fields:

Option	Description
From Unit of Measure	The original unit of measure value that you are converting from in the conversion factor calculation.
To Unit of Measure	The unit of measure value that you are changing or replacing in the conversion factor calculation.
Conversion Factor	The ratio that is applied to relate one unit of measure to another.

5. Optional: In the Item Number field, enter the item number that is associated to the conversion.
6. Click OK.

Viewing contract items

When adding lines to purchase requisitions, you can view a list of the items under contract with a specified vendor.

Before you begin

A purchase requisition record must have a vendor defined in order to be able to view contract items.

About this task

Depending on the settings of the referenced contract, you might be able to change the quantity or price of the contract item on the purchase requisition line. On the referenced contract, if the Change Quantity on Use or the Change Price on Use check boxes are selected, you can change the quantity or price or both on the purchase requisition line. If the check boxes are cleared on the referenced contract record, you cannot change the quantity or price.

Procedure

1. From the Purchase Requisitions application, display a purchase requisition record.
2. Click the PR Lines tab and click Contract Items.
3. In the Contract Items window, select the check box next to the contract items you want to copy to the purchase requisition.
You can filter the contract items by entering values in any of the fields in the first row of the table and clicking Filter Table.
4. Click OK to copy the items onto the PR Lines tab, including information about contract references and pricing in the purchase requisition line details.
5. Click Save Purchase Requisition.

Creating purchase orders from purchase requisitions

You can create a purchase order from within a purchase requisition record.

Before you begin

The purchase requisition must have at least one line item that has not been assigned to a purchase order. You must have authorization from your system administrator to use the Create PO action.

About this task

Your system administrator might require that purchase requisitions be approved before you can assign line items to purchase orders. If so and the current purchase requisition is not approved, the product displays an error message. Your system administrator might also specify that the status of the purchase requisition is changed to Closed when all line items have been assigned to purchase orders. If so, the purchase requisition becomes a history record and cannot be modified after all line items are assigned to a purchase order.

Procedure

1. From the Purchase Requisitions application, display the purchase requisition that you want to convert to a purchase order.
2. Select the Create PO action.
3. In the PO field, type a purchase order number or click Autonumber to generate a number automatically.
4. Optional: Edit the Description field.

5. Fill the required fields.
6. Click OK.

All unassigned line items that have not been flagged as Copy to RFQ or Copy to Contract for this purchase requisition are copied to the purchase order.

Referencing contracts on purchase requisitions

You can reference a contract on a purchase requisition to benefit from pre-arranged pricing with a specific vendor.

About this task

You can reference a contract on a purchase requisition in multiple ways:

- Reference a contract on the purchase requisition header.
- Reference a contract when there is a vendor.
- Reference a contract when there is not a vendor.

Procedure

1. In the Purchase Requisitions application, click New Purchase Requisition.
2. Depending on how you want to reference a contract, do one of the following:
 - To reference a contract on the purchase requisition header:
 - In the Contract Reference field, type a value or click Select Value to choose one from the list.
 - Click the PR Lines tab and click Contract Items to select from items that are listed on the referenced contract.
 - Enter or modify information as needed.
 - To reference a contract on a purchase requisition when there a vendor is specified:
 - In the Company field, type the name of the vendor. Enter or modify other information as needed.
 - Click the PR Lines tab. In the PR Lines table window, click New Row.
 - Do one of the following:
 - Click Contract Items to select from items that are listed on the referenced contract.
 - In the Item field, specify a value or click Detail Menu to choose an option. After you select an item, the product checks to see if there is a contract for this vendor/item combination. If so, several fields on the PR Lines table window are populated.
 - Type or modify other information as needed.
 - To reference a contract on a purchase requisition when there is not a vendor specified:
 - In the Company field, type the name of the vendor.
 - Enter or modify other information as needed.
 - Click the PR Lines tab. In the PR Lines table window, click New Row.
 - In the Item field, type a value or click Detail Menu to choose an option. After you select an item, the product checks to see if there is a contract for this vendor/item combination. If so, several fields on the PR Lines table window are populated.
 - If multiple contracts are available for this item, click View Contracts in the PR Lines table window. Select a contract from the View Contracts window.
 - Type or modify other information as needed.
3. Click Save Purchase Requisition.

Creating, associating, and modifying terms

You can create terms and conditions for records and you can associate existing terms with records. You can also modify how the sequence of terms displays for a record .

- **Creating terms**
You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.
- **Associating existing terms with records**
You can associate terms and conditions with records to define the rules that your company and your vendors must follow on purchase order and contract transactions.
- **Modifying the sequence of terms for records**
You can change the order in which the terms for a record display. You can modify the sequence to display a more logical order, or to list certain terms sequentially.
- **Creating terms**
You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.
- **Associating existing terms with records**
You can associate terms and conditions with records to define the rules that your company and your vendors must follow on purchase order and contract transactions.
- **Modifying the sequence of terms for records**
You can change the order in which the terms for a record display. You can modify the sequence to display a more logical order, or to list certain terms sequentially.

Creating terms

You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.

Before you begin

Terms and conditions can only be added to purchasing or contracts records set at statuses in progress or waiting on approval.

Procedure

1. In a purchasing or contract application, display the record for which you want to create a term.
2. On the Terms and Conditions tab, click New Row.
3. Specify the sequence and term.
4. Optional: Select the Send to Vendor check box.
5. Save the record.

What to do next

You can set default term and condition values according to site and contract type in the Organizations application. When you create a contract record in a contracts application, the contract inherits the default term and condition values that you assigned to the selected contract type in the Organizations application.

Associating existing terms with records

You can associate terms and conditions with records to define the rules that your company and your vendors must follow on purchase order and contract transactions.

About this task

The Terms and Conditions application maintains a library of terms and conditions with which you and your vendors must comply. You can select terms from this library to apply to contract and purchasing records.

Procedure

1. In a purchasing or contract application, display the record for which you want to select a term.
2. On the Terms and Conditions tab, click Select Terms.
3. Select the Select Record check box next to each term that you want to associate with the record.
4. Click OK.
5. Optional: Select the term in the Terms and Conditions table window and select the Send to Vendor check box.
6. Save the record.

Modifying the sequence of terms for records

You can change the order in which the terms for a record display. You can modify the sequence to display a more logical order, or to list certain terms sequentially.

Procedure

1. In the appropriate Purchasing or Contract application, display the record with which you want to associate a term.
2. Click the Terms and Conditions tab.
3. In the Terms and Conditions table window, locate the rows for which you want to change the sequence.
4. In the Sequence column for the appropriate rows, specify a value. You can enter any integer up to 9999. The product defaults the sequence numbers to multiples of 10. You can rearrange the order without renumbering the entire sequence.
5. Click Save.

Distributing purchasing line item costs

You can distribute the costs of a purchase order or desktop requisition line item across multiple GL accounts. For example, if your department ordered and received a new laser printer that the packaging department is also to use, you can specify two GL accounts for the printer, one for each department.

Before you begin

If you want to distribute line item costs, the purchasing and desktop requisition records must meet the following conditions:

- The line item is a direct issue item or service
- None of the items have been received
- The service line is not prorated

Procedure

1. In a purchasing or the Desktop Requisitions application, display the direct issue record that you want to update.
2. In the line item table window, click New Row.
3. Enter values in the following fields:
 - Item
 - Line Cost
4. Enter a value in one of the following fields:
 - Work Order
 - WO Task ID
 - Location
 - Asset
 - GL Debit Account
5. Click Distribute Costs.
6. Click New Row.
7. Enter values in the following fields:
 - Percentage
 - Line Cost
 - GL Debit Account

If you enter a percentage, the line cost representing that percentage is displayed. If you enter a portion of the line cost, the percentage for that cost is displayed. The first row in the Distribute Costs table displays the percentage and the total line cost of the line item that you entered. You must edit this row to be able to distribute costs for the line item.
8. Continue to enter rows until one of the following conditions is met:
 - The sum of the percentage fields is equal to a value of 100%
 - The sum of the loaded cost fields are equal the total unit cost of the current line item
9. Click OK.
10. Click Save record.

Purchase Orders

You use the Purchase Orders application to create purchase orders and to change existing purchase orders. You can create purchase orders and reuse the data and vendor information while applying consistent terms and contracts.

You can also use this application to generate internal purchase orders from a storeroom. A storeroom-to-storeroom purchase order is like a transfer order or an internal purchase order. You use the Purchase Orders application and the Inventory Usage application to track the internal movement of items.

When you have records that are associated with purchase orders, such as invoices, contracts, and requests for quotations, you can view these records. You can obtain a comprehensive look at all of the data that is related to purchase orders.

You can also view the transactions and the records that are specific to a purchase order line.

- [Purchase orders overview](#)
A purchase order is an authorized order from a purchasing agent or department to an internal supplier or external vendor. The purchase order lists items or services.
- [Working with purchase orders](#)
You can create purchase orders that reuse data and vendors and apply consistent terms and contracts. You can create purchase orders from purchase requisitions, material requests, and requests for quotations.

Purchase orders overview

A purchase order is an authorized order from a purchasing agent or department to an internal supplier or external vendor. The purchase order lists items or services.

You can create purchase orders using any of the following methods:

- From the Purchase Orders application
- From the Purchase Requisition (PR) application
- From a Request for Quotation (RFQ) in the Request for Quotations application
- From the Inventory application using the inventory reorder actions
- From the Purchase Contracts application by creating a release
- [Purchasing process](#)
The steps in the purchasing process include creating purchase requisitions, creating purchase orders, receiving services and items, and recording vendor invoices.
- [Purchase order statuses](#)
You can change the status of purchase orders. Changing the status of purchase orders can impact access to actions, and whether you can modify field values.
- [Approval of purchase orders](#)
To approve a purchase order, a monetary approval limit must be set that is equal to or greater than the total cost of the purchase order. Your system administrator sets monetary limits for each user, and can specify that purchase requisitions be approved before any of their items can be assigned to purchase orders.

- **Purchase record attributes**
Attributes are used to categorize items. For example, the purchasing record for a computer can have the attributes of memory, disk space, and speed. When you create a purchase order, you can use the Classifications feature to search for items based on attributes.
- **Conditions for the distribution of costs on purchase orders**
You can distribute the cost of a purchase order line item among several general ledger accounts. For example, two departments in your organization are purchasing ten items, and you want the cost to be shared by the two departments.
- **Attachments to purchase orders**
You can attach documents to purchase orders from different applications. You can also attach documents that you created, and documents
- **Revision of purchase orders**
You revise purchase orders when you want to change information, such as the quantity or the vendor, on a purchase order.
- **Vendor analysis data**
You can determine which vendor to use for an item. Information about vendors is calculated from the past performance of the vendor for the selected item. When you review vendor analysis data, you can select a primary vendor for an item. You can also choose the storerooms that use the primary vendor when ordering an item.
- **Tax-exempt status**
The tax-exempt option indicates whether an item, a tool, or a service is taxable. You might want to set the tax-exempt status, depending on where an item or a service is acquired, and how an item or a service is used.
- **Terms and conditions**
You can create and maintain a library of terms and conditions that your company and your vendors must follow on purchase order and contract transactions. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.
- **Currency conversions**
When you specify a foreign currency on a purchase requisition or purchase order, two values are calculated: the total cost that is expressed in the foreign currency, and the total base cost that is expressed in the base currency or your company currency.

Purchasing process

The steps in the purchasing process include creating purchase requisitions, creating purchase orders, receiving services and items, and recording vendor invoices.

The following example illustrates the purchasing process from requisitioning through invoicing.

Step 1: Create the purchase requisition

You can create and approve a purchase requisition 98074 for the following services and related materials:

- Two contract programmers (1,000 hours each)
- Two personal computers
- A software package
- Rental furniture (desks, chairs)

Step 2: Create the purchase orders

You can create the following purchase orders, one for each vendor by using the Copy PR Line Items to PO action in the Purchase Orders application:

- Purchase order 98105 that contains two contract programmers (1,000 hours each)
- Purchase order 98106 that contains two personal computers
- Purchase order 98107 that contains a software package
- Purchase order 98108 that contains rental furniture (desks, chairs)

Step 3: Receive the services and items

When you record receipts from each vendor, you must use the appropriate receipts tab in the Receiving application and the Select Ordered Services and Select Ordered Items actions.

Step 4: Record vendor invoices

After you purchase materials and services, your company receives bills, or invoices, from the vendors. You use the Invoices application to record vendor invoices as you receive them. When you create invoice records you can list purchase order details on the invoice when it is appropriate.

You use the Copy PO Lines action to copy lines from either the receipts or the purchase order to the Invoice Lines tab. You can also view lines that are not on the invoice for items or services received, and add the lines to the invoice.

Purchase order statuses

You can change the status of purchase orders. Changing the status of purchase orders can impact access to actions, and whether you can modify field values.

Status	Description
Approved (APPR)	Available only if the current purchase order status is Waiting for Approval (WAPPR), In Progress (INPRG), or Pending Revision (PNDREV).

Status	Description
Canceled (CAN)	Available if the purchase order status is Waiting for Approval (WAPPR), Approved (APPR), In Progress (INPRG), or Pending Revision (PNDREV). A Cancel PO transaction is sent to the supplier upon cancellation of a purchase order. An approved purchase order cannot be canceled if any of the following conditions exist: <ul style="list-style-type: none"> • One or more purchase order line items were received. • The supplier sent notification of delivery of items using an ASN transaction. • The supplier rejected the purchase order cancellation. • There is a pending revision for the purchase order.
Closed (CLOSE)	Indicates that all of the line items for a purchase order were received. After a purchase order is closed, it is stored as a history record that cannot be modified. The Closed (CLOSE) status is not available if the purchase order is in Pending Revision (PNDREV) status.
Hold (HOLD)	Indicates that a purchase order is being revised, and the associated receipts and invoices are not to be processed. The HOLD status remains until the revision to the purchase order is approved.
In Progress (INPRG)	Indicates that a purchase order is being created and is not ready for approval.
Pending Revision (PNDREV)	Indicates that a purchase order is being revised. A purchase order can be revised only if the status of the purchase order is Approved (APPR) or In Progress (INPRG). The PNDREV status is automatically assigned to a purchase order that is being revised. You can have one revision of a purchase order in PNDREV status at a time. If the cost and tax adjustments option is enabled, the unit cost, the line cost, and the tax cost for purchase order line items can be modified. The purchase order must be in PNDREV status.
Revised (REVISD)	Indicates that a purchase order was revised. When a purchase order is approved, the status of the previous version of the purchase order is set to Revised (REVISD). The previous version becomes a history record that cannot be changed.
Waiting for Approval (WAPPR)	The default status for a purchase order when you create it. Some default fields are read-only in this status.

Approval of purchase orders

To approve a purchase order, a monetary approval limit must be set that is equal to or greater than the total cost of the purchase order. Your system administrator sets monetary limits for each user, and can specify that purchase requisitions be approved before any of their items can be assigned to purchase orders.

Your system administrator can specify bypassing the validation of revisions to contracts that are associated with purchase orders. If the system administrator sets this option, purchase orders can be approved by any person in that group. If the Bypass Contract Revision on PO Approval check box does not show on the PO tab of the Purchase Orders application, contact your system administrator.

After a purchase order is approved, most of the fields cannot be edited. You can create a revision of the purchase order and edit the fields in the revision.

Purchase record attributes

Attributes are used to categorize items. For example, the purchasing record for a computer can have the attributes of memory, disk space, and speed. When you create a purchase order, you can use the Classifications feature to search for items based on attributes.

Attributes are set up in the Classifications application and are then associated with individual items in the Item Master application. When you view a purchasing record, you can see any attributed associated with the line item on the Specifications tab.

When you add line items to a purchase order, you can search for items by attribute. If your inventory has many types of similar items, using Classifications can help you locate the exact type of item that you want to add.

Conditions for the distribution of costs on purchase orders

You can distribute the cost of a purchase order line item among several general ledger accounts. For example, two departments in your organization are purchasing ten items, and you want the cost to be shared by the two departments.

A purchase order line item must meet the following conditions if you want to distribute its costs:

- The purchase order line item must be a direct issue item or service.
- None of the items or services for the purchase order were received.
- The type for the purchase order must be either REL (Release) or STD (Standard).
- The status of the purchase order must be WAPPR (Waiting for Approval).
- None of the service lines for the purchase order are prorated.

Attachments to purchase orders

You can attach documents to purchase orders from different applications. You can also attach documents that you created, and documents

You can attach documents to purchase orders from the following applications:

Companies

Attach documents to suppliers on a purchase order.

Purchase Orders

Attach documents to purchase order header information.

Inventory

Attach documents to items on a purchase order.

Purchase Requisitions

Attach documents to the requisition lines on a purchase order.

Revision of purchase orders

You revise purchase orders when you want to change information, such as the quantity or the vendor, on a purchase order.

A purchase order must be in a status of Approved (APPR) or In Progress (INPRG) before it can be revised. You select the Revise PO action to create a revision of the purchase order. Each time that you create a purchase order, a revision number is generated, starting with 0. When you revise a purchase order, the purchase order number does not change. You can make numerous changes to the same purchase order. Changes that are made to a purchase order affect future transactions only. The changes do not apply to existing receipt lines or to existing invoice lines. You cannot revise internal purchase orders.

Vendor analysis data

You can determine which vendor to use for an item. Information about vendors is calculated from the past performance of the vendor for the selected item. When you review vendor analysis data, you can select a primary vendor for an item. You can also choose the storerooms that use the primary vendor when ordering an item.

The following table provides a description of the values in the fields. All values are for a selected item, for a selected vendor, and where the manufacturer, model number, and catalog numbers are the same.

Field	Data calculation
Promised Lead Time (Days)	The promised delivery time (lead time) for this item from the vendor.
Last Delivery Time	The amount of elapsed time, in days, between the purchase order date and the date of receipt for the most recent order of this item and vendor combination.
Average Delivery Time	The average amount of elapsed time between the order dates and the dates of receipt. This value is calculated by dividing the total of all the delivery times by the total number of purchase order lines for this item and vendor combination.
Percent on Time	The percentage of receipts, where the date of receipt was on or before the delivery date for the vendor. This value is calculated by dividing the number of on-time receipts by the total number of receipts for this item and vendor combination.
Total # of Complete POs	The number of completed purchase orders where item, vendor, manufacturer, model number, and catalog number match this record.
Quantity Received	The total number of order units received for this item and vendor combination.
Quantity Received YTD	The total number of order units received since the beginning of the current calendar year for this item and vendor combination.
Quantity Rejected	The total number of order units rejected for this item and vendor combination.
Quantity Rejected YTD	The total number of order units rejected since the beginning of the current calendar year for this item and vendor combination.
Percent Rejected	The percentage of order units rejected for this item and vendor combination. This value is calculated by dividing the amount rejected by the total of all received and rejected order units for this item and vendor combination.
Percent Rejected YTD	The percentage of order units rejected since the beginning of the current calendar year for this item and vendor combination. This value is calculated by dividing the amount rejected by the total of all received and rejected order units for this item and vendor combination since the beginning of the calendar year.

Tax-exempt status

The tax-exempt option indicates whether an item, a tool, or a service is taxable. You might want to set the tax-exempt status, depending on where an item or a service is acquired, and how an item or a service is used.

The situations under which items or services are tax-exempt vary depending upon your location, and upon current tax regulations. For example, the storeroom for an item might be in a location where sales taxes are not collected. In some cases, if an item becomes part of a product, that item can be tax-exempt. If the item is used as a stand-alone item, then the item is taxable. The buyer for your organization determines the tax-exempt status of items, of tools, and of services.

You can override the tax-exempt status for items, for tools, and for services in the following applications:

- Purchase Requisitions
- Purchase Orders
- Invoices

When you specify the tax-exempt status, you can apply the status at the organization level and at the vendor level.

Terms and conditions

You can create and maintain a library of terms and conditions that your company and your vendors must follow on purchase order and contract transactions. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.

You can create a library of term and condition values in the Terms and Conditions application. You use the library to look up and associate terms and conditions to purchase order and contract records. The library is accessible in the Purchase Orders and contracts applications.

You can set default term and condition values according to site and contract type in the Organizations application. When you create a contract record in a contracts application, it inherits the default term and condition values that you assigned to the selected contract type in the Organizations application.

Currency conversions

When you specify a foreign currency on a purchase requisition or purchase order, two values are calculated: the total cost that is expressed in the foreign currency, and the total base cost that is expressed in the base currency or your company currency.

Example of currency conversion

Your base currency is US\$ (US dollar). You enter a purchase requisition for gaskets to be ordered from a French company. On the PR tab, select **EUR** (Euro) in the Currency field. On the PR Lines tab you enter 25 in the Quantity field, and 3.14 in the Unit Cost field. Using the active exchange rate of 1.17726 for the **EUR**, two values are calculated and displayed on the PR tab:

- Total Cost: $(25 \times 3.14 \text{ Euro}) = 78.50 \text{ Euro}$
- Total Base Cost: $(78.50 \text{ Euro} \times 1.17726 \text{ exchange rate}) = 92.41 \text{ US dollars}$

Working with purchase orders

You can create purchase orders that reuse data and vendors and apply consistent terms and contracts. You can create purchase orders from purchase requisitions, material requests, and requests for quotations.

- **[Creating purchase orders](#)**
You can create purchase orders and reuse the data and vendor information while applying consistent terms and contracts. You can combine multiple purchase requisitions for the same vendor on a single purchase order.
- **[Creating units of measure](#)**
You can create a unit of measure to describe the quantity used to measure an item, tool, or a service. You use a unit of measure to measure the items and services that you order, issue, and transfer in the asset management system. Examples of units of measure include EACH, CASE, IN (inches), and ROLL.
- **[Creating conversion factors](#)**
You can create a conversion factor to define the numeric value or ratio that the asset management system uses to relate one unit of measure to another. The conversion factor is an alternate value that is used to represent a unit of measure. You can use this alternate value to define an item order or transfer quantity and storeroom balance.
- **[Creating commodity groups](#)**
You can create a commodity group to identify a grouping of items, tools, or services. A commodity group contains a grouping of individual commodity codes. Classifying items, tools, services with commodity groups and commodity codes provides a way for you to analyze spending by product type. You first define a commodity group and then add and associate individual commodity codes to the group.
- **[Creating contracts from purchasing records](#)**
You can use the Create Contract action to create a contract from a purchase order, purchase requisition, request for quotation, or an invoice. You can create contracts based on the information contained on records in the purchasing module applications.
- **[Creating, associating, and modifying terms](#)**
You can create terms and conditions for records and you can associate existing terms with records. You can also modify how the sequence of terms displays for a record.

Creating purchase orders

You can create purchase orders and reuse the data and vendor information while applying consistent terms and contracts. You can combine multiple purchase requisitions for the same vendor on a single purchase order.

Procedure

1. In the Purchase Orders application, click New Purchase Order.
2. Specify a description of your purchase order and fill the required fields.
3. On the PO Lines tab, click New Row to add line items to the purchase order.
4. On the Ship To/Bill To tab, provide the shipping information.
5. In the Bill To field, specify a value, and provide the billing information.

6. Click Save Purchase Order.

What to do next

To print a purchase order you must create a request page. Go to the Reports Administration application and click the Generate Request Pages button.

- [Adding lines to purchase orders](#)
You can add lines to an existing purchase order for each item, material, service, or tool to be purchased.
- [Adding contract items to purchase orders](#)
When adding lines to purchase orders, you can add items that are under contract with a specified vendor.
- [Distributing purchasing line item costs](#)
You can distribute the costs of a purchase order or desktop requisition line item across multiple GL accounts. For example, if your department ordered and received a new laser printer that the packaging department is also to use, you can specify two GL accounts for the printer, one for each department.
- [Specifying delivery of materials to storerooms](#)
After you create a purchase order, you can specify that the materials be sent to an inventory storeroom.
- [Specifying delivery of materials to work locations](#)
After you create a purchase order, you can specify that the materials be sent to a work location. A direct issue item is an item that is sent directly to a work location.
- [Completing receipts](#)
You can manually complete the receipts on a line to complete a purchase order. You perform this action when all lines are not received and no further receipts are expected.

Adding lines to purchase orders

You can add lines to an existing purchase order for each item, material, service, or tool to be purchased.

Before you begin

The status of the purchase order must be either Waiting for Approval (WAPPR) or Pending Revision (PNDREV).

About this task

The first time that you create an item or a service in the Item Master application, you can specify the percentage of items or services that can be received over the amount that is ordered in the initial agreement. The percentage value is applied to the organization level and to the vendor level for an item or a service.

When you add lines to a purchase order, you can modify the percentage of items or services that can be received over the amount that is ordered in the initial agreement. You can also choose to specify either a quantity or an amount, instead of a percentage.

Procedure

1. In the Purchase Orders application, display a purchase order.
2. Click the PO Lines tab.
3. In the PO Lines table, click New Row.
4. Fill the remaining required fields.
Tip: If you are entering a series of items with similar information, fill one or more of the fields in the Default Table Data section.
5. Optional: Specify or modify other purchase order line information as needed.
6. Save the purchase order.

Adding contract items to purchase orders

When adding lines to purchase orders, you can add items that are under contract with a specified vendor.

Before you begin

You must specify a vendor on the purchase order.

About this task

You might be able to change the quantity or the price of the contract item on the purchase order line, depending on the settings of the referenced contract. If, on the referenced contract, the Change Quantity on Use or the Change Price on Use check boxes are selected, you can change the quantity or the price on the purchase order line. If the check boxes are cleared on the referenced contract record, you cannot change the quantity or the price.

Procedure

1. In the Purchase Orders application, display the purchase order record to which you want to add contract items.
2. Click the PO Lines tab.

3. Click Contract Items.
4. In the Contract Items window, select the check box next to the contract items that you want to copy to the purchase order. You can filter the contract items by specifying values in any of the fields in the first row of the table and by clicking Filter.
5. Click OK.

Distributing purchasing line item costs

You can distribute the costs of a purchase order or desktop requisition line item across multiple GL accounts. For example, if your department ordered and received a new laser printer that the packaging department is also to use, you can specify two GL accounts for the printer, one for each department.

Before you begin

If you want to distribute line item costs, the purchasing and desktop requisition records must meet the following conditions:

- The line item is a direct issue item or service
- None of the items have been received
- The service line is not prorated

Procedure

1. In a purchasing or the Desktop Requisitions application, display the direct issue record that you want to update.
2. In the line item table window, click New Row.
3. Enter values in the following fields:
 - Item
 - Line Cost
4. Enter a value in one of the following fields:
 - Work Order
 - WO Task ID
 - Location
 - Asset
 - GL Debit Account
5. Click Distribute Costs.
6. Click New Row.
7. Enter values in the following fields:
 - Percentage
 - Line Cost
 - GL Debit Account

If you enter a percentage, the line cost representing that percentage is displayed. If you enter a portion of the line cost, the percentage for that cost is displayed. The first row in the Distribute Costs table displays the percentage and the total line cost of the line item that you entered. You must edit this row to be able to distribute costs for the line item.
8. Continue to enter rows until one of the following conditions is met:
 - The sum of the percentage fields is equal to a value of 100%
 - The sum of the loaded cost fields are equal the total unit cost of the current line item
9. Click OK.
10. Click Save record.

Specifying delivery of materials to storerooms

After you create a purchase order, you can specify that the materials be sent to an inventory storeroom.

Procedure

1. In the Purchase Orders application, display the purchase order for which you want to specify delivery of materials to a storeroom.
2. Click the PO Lines tab.
3. In the Item field, and in the Storeroom field, specify values. If an item does not exist in the storeroom, you can add a storeroom by typing a valid storeroom value in the Storeroom field. The inventory record is created when the item is received.
4. In the PO Lines table window, click New Row.
5. Optional: Specify other values as needed.
6. Click Save Purchase Order.

Specifying delivery of materials to work locations

After you create a purchase order, you can specify that the materials be sent to a work location. A direct issue item is an item that is sent directly to a work location.

Procedure

1. In the Purchase Orders application, display the purchase order for which you want to specify delivery of materials to work locations.
2. Click the PO Lines tab.
3. In the Item field, specify a value.
4. In the PO Lines window, click New Row.
5. In the Work Order field, the Asset field, or the Location field, specify a value. The Issue on Receipt check box is selected, and the Storeroom field becomes null and read-only.
6. Optional: Specify other values as needed.
7. Click Save Purchase Order.

Completing receipts

You can manually complete the receipts on a line to complete a purchase order. You perform this action when all lines are not received and no further receipts are expected.

Before you begin

You must have authorization to use the Complete Receipts window. The Complete Receipts option does not display if you are not authorized to use it.

About this task

You cannot close a purchase order until you receive all the line items on a purchase order.

Procedure

1. In the Purchase Orders application, display the purchase order record for which you want to complete receipts.
2. Click the PO Lines tab.
3. Select the Complete Receipts action.
4. In the Complete Receipts window, select the check boxes for the rows for which you want to complete receipts.
5. Click OK.
On the PO Lines tab, the Receipts Complete check box for each line with complete receipts is selected. If all lines have complete receipts, the Receipts field on the PO tab reads COMPLETE.

Creating units of measure

You can create a unit of measure to describe the quantity used to measure an item, tool, or a service. You use a unit of measure to measure the items and services that you order, issue, and transfer in the asset management system. Examples of units of measure include EACH, CASE, IN (inches), and ROLL.

About this task

A unit of measure works with a conversion factor. The conversion factor represents the numeric value or ratio that the asset management system uses to relate one unit of measure to another. You can create units of measure and conversion factors in many applications:

- Assets
- Purchase Orders
- Purchase Requisitions
- Receiving
- Item Master
- Meters
- Service Items
- Tools
- Stocked Tools
- Inventory

You can delete a unit of measure only when it is not used in a conversion, on a specification template, or on a meter record.

Procedure

1. Open an application.
2. Select the Unit of Measure and Conversion > Add/Modify Units of Measure action.
3. Insert a row.
4. In the Unit of Measure field, specify an identifier for the unit of measure.
5. Optional: Enter values in the following fields:
 - Abbreviation
 - DescriptionThe abbreviation value along with an asset classification is used to create descriptions for assets, locations, and items.
6. Click OK.

Creating conversion factors

You can create a conversion factor to define the numeric value or ratio that the asset management system uses to relate one unit of measure to another. The conversion factor is an alternate value that is used to represent a unit of measure. You can use this alternate value to define an item order or transfer quantity and storeroom balance.

Before you begin

You must define the units of measure before you can create conversion ratios.

About this task

You can create units of measure and conversion factors in the following applications:

- Purchase Orders
- Purchase Requisitions
- Receiving
- Item Master
- Service Items
- Tools
- Stocked Tools
- Inventory

Procedure

1. Open an application.
2. Select the Unit of Measure and Conversion \gt Add/Modify Conversions action.
3. Click New Row.
4. Enter values in the following fields:

Option	Description
From Unit of Measure	The original unit of measure value that you are converting from in the conversion factor calculation.
To Unit of Measure	The unit of measure value that you are changing or replacing in the conversion factor calculation.
Conversion Factor	The ratio that is applied to relate one unit of measure to another.

5. Optional: In the Item Number field, enter the item number that is associated to the conversion.
6. Click OK.

Creating commodity groups

You can create a commodity group to identify a grouping of items, tools, or services. A commodity group contains a grouping of individual commodity codes. Classifying items, tools, services with commodity groups and commodity codes provides a way for you to analyze spending by product type. You first define a commodity group and then add and associate individual commodity codes to the group.

About this task

Once you have defined commodities you can associate them with company, contract, and item records. You can also associate commodities with individual purchase order or requisition lines for items, service items, or tools that do not have commodity codes assigned to them, including special order materials or services.

You can create commodity groups and codes in the following asset management system applications:

- Companies
- Item Master
- Purchase Orders
- Service Items
- Tools

Procedure

1. Open an application.
2. Select the Add/Modify Commodity Codes action.
3. In the Commodity Groups table window, click New Row.
4. In the Commodity Group field, enter an identifier for the commodity group.
5. Specify whether you want a service type item or service level agreement to use this commodity group.

Option	Service
Use commodity group	Selected
Do not use commodity group	Cleared

6. In the Commodity Codes for Commodity Group table window, click New Row.
7. In the Commodity Code field, enter an identifier for the commodity.

8. Specify whether you want a service type item or service level agreement to use this commodity code.

Option	Service
Use commodity code	Selected
Do not use commodity code	Cleared

9. Click OK.

Creating contracts from purchasing records

You can use the Create Contract action to create a contract from a purchase order, purchase requisition, request for quotation, or an invoice. You can create contracts based on the information contained on records in the purchasing module applications.

Procedure

1. In a purchasing application, display the record from which you want to create a contract.
2. Select the Create Contract action.
3. In the Contract field, enter an identifier for the contract.
4. In the Contract Type field, enter a value to identify the type of contract that you want to create.
5. Click OK.

Results

The asset management system creates a contract record that you can now access in a contracts application.

Creating, associating, and modifying terms

You can create terms and conditions for records and you can associate existing terms with records. You can also modify how the sequence of terms displays for a record .

- **[Creating terms](#)**
You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.
- **[Associating existing terms with records](#)**
You can associate terms and conditions with records to define the rules that your company and your vendors must follow on purchase order and contract transactions.
- **[Modifying the sequence of terms for records](#)**
You can change the order in which the terms for a record display. You can modify the sequence to display a more logical order, or to list certain terms sequentially.
- **[Creating terms](#)**
You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.
- **[Associating existing terms with records](#)**
You can associate terms and conditions with records to define the rules that your company and your vendors must follow on purchase order and contract transactions.
- **[Modifying the sequence of terms for records](#)**
You can change the order in which the terms for a record display. You can modify the sequence to display a more logical order, or to list certain terms sequentially.

Creating terms

You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.

Before you begin

Terms and conditions can only be added to purchasing or contracts records set at statuses in progress or waiting on approval.

Procedure

1. In a purchasing or contract application, display the record for which you want to create a term.
2. On the Terms and Conditions tab, click New Row.
3. Specify the sequence and term.
4. Optional: Select the Send to Vendor check box.
5. Save the record.

What to do next

You can set default term and condition values according to site and contract type in the Organizations application. When you create a contract record in a contracts application, the contract inherits the default term and condition values that you assigned to the selected contract type in the Organizations application.

Associating existing terms with records

You can associate terms and conditions with records to define the rules that your company and your vendors must follow on purchase order and contract transactions.

About this task

The Terms and Conditions application maintains a library of terms and conditions with which you and your vendors must comply. You can select terms from this library to apply to contract and purchasing records.

Procedure

1. In a purchasing or contract application, display the record for which you want to select a term.
2. On the Terms and Conditions tab, click Select Terms.
3. Select the Select Record check box next to each term that you want to associate with the record.
4. Click OK.
5. Optional: Select the term in the Terms and Conditions table window and select the Send to Vendor check box.
6. Save the record.

Modifying the sequence of terms for records

You can change the order in which the terms for a record display. You can modify the sequence to display a more logical order, or to list certain terms sequentially.

Procedure

1. In the appropriate Purchasing or Contract application, display the record with which you want to associate a term.
2. Click the Terms and Conditions tab.
3. In the Terms and Conditions table window, locate the rows for which you want to change the sequence.
4. In the Sequence column for the appropriate rows, specify a value. You can enter any integer up to 9999. The product defaults the sequence numbers to multiples of 10. You can rearrange the order without renumbering the entire sequence.
5. Click Save.

Receiving

In a large enterprise, you can have a centralized purchasing department for several sites. Each site receives its own materials and services. You use the Receiving application to receive materials and services. You use this application to record materials and services to the database when they are delivered to a site. You can also return materials to vendors.

You can perform the following tasks using the Receiving application:

- Add a conversion factor, for example, from case to each, to the database.
- Add a unit of measure, for example, feet or gallons, to the database.
- Approve the receipt of an item that requires inspection.
- Bookmark a record so that you can view it at a later time.
- Enter asset numbers and other asset data when receiving rotating items.
- Modify a conversion factor.
- Modify a unit of measure.
- Void receipts for transactions that occurred in error.
- Return items, rotating assets, and services.
- Choose to accept or to return materials or services that are received in excess of the ordered quantity.
- Run reports.

- [Receipts overview](#)

Purchase order line items such as materials or items are received at a site. Items are inspected, serialized or both before transferring them to the appropriate storeroom, updating details, and issuing receipts.

- [Working with received items](#)

You can receive materials and services from purchase orders and record the delivery to a site. Items that require inspection, serialization, or both can be transferred to a holding location for inspection. Once approved, you can update details before issuing material or service receipts. Partial deliveries or incorrect deliveries can also be managed.

Receipts overview

Purchase order line items such as materials or items are received at a site. Items are inspected, serialized or both before transferring them to the appropriate storeroom, updating details, and issuing receipts.

- **[Purchasing process](#)**
The steps in the purchasing process include creating purchase requisitions, creating purchase orders, receiving services and items, and recording vendor invoices.
- **[Holding locations](#)**
Items that require inspection, serialization, or both go into a holding location before they can be transferred to the appropriate storeroom (or into a direct issue location). Each site can have only one holding location.
- **[Material receipts](#)**
Material receipts refer to data, such as quantities and lot numbers, associated with items that are used for work done on-site by your employees.
- **[Service receipts](#)**
Service receipts refer to data associated with any service, such as repairs to assets, that are provided by a vendor or a contractor.
- **[Rules for voiding receipt transactions](#)**
You can void a transaction that was applied to a purchase order in error. A void is a reversal that brings the receipt back to its former state. A voided receipt is similar to a return, with the exception that a voided receipt cannot be considered for use on a credit invoice.
- **[Return of assets to vendors](#)**
You can return rotating assets and direct-issue items to vendors. For example, if a rotating asset has a defect, you can return the asset.
- **[Records related to receipts](#)**
If you have records that are associated with receipts, such as invoices, purchase orders, and requests for quotations, you can view these records. You can obtain a comprehensive look at all of the data that are related to receipts.

Purchasing process

The steps in the purchasing process include creating purchase requisitions, creating purchase orders, receiving services and items, and recording vendor invoices.

The following example illustrates the purchasing process from requisitioning through invoicing.

Step 1: Create the purchase requisition

You can create and approve a purchase requisition 98074 for the following services and related materials:

- Two contract programmers (1,000 hours each)
- Two personal computers
- A software package
- Rental furniture (desks, chairs)

Step 2: Create the purchase orders

You can create the following purchase orders, one for each vendor by using the Copy PR Line Items to PO action in the Purchase Orders application:

- Purchase order 98105 that contains two contract programmers (1,000 hours each)
- Purchase order 98106 that contains two personal computers
- Purchase order 98107 that contains a software package
- Purchase order 98108 that contains rental furniture (desks, chairs)

Step 3: Receive the services and items

When you record receipts from each vendor, you must use the appropriate receipts tab in the Receiving application and the Select Ordered Services and Select Ordered Items actions.

Step 4: Record vendor invoices

After you purchase materials and services, your company receives bills, or invoices, from the vendors. You use the Invoices application to record vendor invoices as you receive them. When you create invoice records you can list purchase order details on the invoice when it is appropriate.

You use the Copy PO Lines action to copy lines from either the receipts or the purchase order to the Invoice Lines tab. You can also view lines that are not on the invoice for items or services received, and add the lines to the invoice.

Holding locations

Items that require inspection, serialization, or both go into a holding location before they can be transferred to the appropriate storeroom (or into a direct issue location). Each site can have only one holding location.

The status of the receipt line item is WINSP (Waiting for Inspection) or WASSET (Waiting for Serialization). The status of the item changes to COMP (Complete) after the item is inspected, serialized, or both. A transfer transaction is created, where the item is moved from the holding location to its appropriate storeroom or to its direct issue location.

- **[Inspection statuses](#)**
When an inspection is required upon receipt of an item or a service, the inspection statuses describe where a line item is in the inspection process.

Inspection statuses

When an inspection is required upon receipt of an item or a service, the inspection statuses describe where a line item is in the inspection process.

The following statuses pertain to items or services that require an inspection:

Waiting for Inspection (WINSP)

Indicates that the line item is in the process of being received, but has not yet been entered into inventory. The line item is in a holding location, where it stays until an inspection is completed. After inspection, the line item status will change to either WASSET or COMP status, depending on whether it is a rotating item.

Waiting for Serialization (WASSET)

Indicates that the line item is a rotating item that is waiting to have an asset number assigned to it. If the line item requires inspection, the inspection has already taken place if its status is WASSET. The item is still in the holding location; it has not yet been sent to its appropriate storeroom or to its direct issue location. After the item has been serialized, its status will be changed to COMP (Complete).

Complete (COMP)

Indicates that the line item has been received, and if necessary, inspected and serialized. When the status of the line item changes to COMP, a transfer transaction is created. The transaction transfers the item to its appropriate storeroom or to its direct issue location. If the line item is not rotating and does not require inspection, its status is COMP upon receipt.

Material receipts

Material receipts refer to data, such as quantities and lot numbers, associated with items that are used for work done on-site by your employees.

When you receive inventory items against a purchase order, the quantities are updated in inventory and an inventory transaction is generated. You can also receive materials not tracked in inventory, but which require a purchase order.

For example, a catered lunch or a new desk is not stored in inventory or tracked by an item number. You would, however, track the costs on purchase orders and receipts.

Service receipts

Service receipts refer to data associated with any service, such as repairs to assets, that are provided by a vendor or a contractor.

The service can be performed on-site or off site. You specify service purchases either in terms of quantities and unit costs, or as a single lump sum amount. You use the same terms on the receipt transaction as those terms used on the service purchase order.

Rules for voiding receipt transactions

You can void a transaction that was applied to a purchase order in error. A void is a reversal that brings the receipt back to its former state. A voided receipt is similar to a return, with the exception that a voided receipt cannot be considered for use on a credit invoice.

The following rules apply to the voiding of receipt transactions:

- If a line item has been received and invoiced, you cannot void the line item.
- You can void both rotating items and non-rotating items.
- You can void line items and services that are in WINSP (Waiting for Inspection) status.
- You can void receipt lines for items and services that have not been inspected.
- You cannot void receipts for serialized assets (that is, in COMP (Complete) status).
- You cannot void returned items.
- You cannot void receipts that have been partially or fully returned.

Return of assets to vendors

You can return rotating assets and direct-issue items to vendors. For example, if a rotating asset has a defect, you can return the asset.

The following restrictions apply to the return of rotating assets and items to vendors:

- The asset must be located in the same storeroom where it was received.
- The inventory cost for the asset must be equal to the cost of the line being reversed.
- A direct-issue item cannot be returned if it was moved.

Records related to receipts

If you have records that are associated with receipts, such as invoices, purchase orders, and requests for quotations, you can view these records. You can obtain a comprehensive look at all of the data that are related to receipts.

To view the transactions and the records that are specific to either material receipt lines or to service receipt lines, click the View Related Records icon at the end of the line. In the View Related Records window, you can click the identifier for an invoice, a purchase order, a contract, and a request for quotation to access that record in the relevant application.

Working with received items

You can receive materials and services from purchase orders and record the delivery to a site. Items that require inspection, serialization, or both can be transferred to a holding location for inspection. Once approved, you can update details before issuing material or service receipts. Partial deliveries or incorrect deliveries can also be managed.

- **[Receiving materials](#)**
You can record information about items received on an approved purchase order. When vendors ship materials to your company, you record the materials received against the purchase order. If you receive a line item that is damaged, you can receive the full shipment amount and return the rejected quantity.
- **[Receiving services](#)**
If your company requires receipts for services, you can record the services received against an approved purchase order. You can copy all the purchase order line items if all services have been received, or you can enter partial receipts. You record total or partial receipts of a service on a purchase order the same way that you record the receipt of materials.
- **[Receiving rotating items](#)**
Each rotating item is received into inventory with an item number. You can enter line items for rotating items. You can specify asset identifiers for rotating assets, or autonumber all the rotating items. You also might need to change information when recording the receipt of materials.
- **[Receiving partial shipments](#)**
You can receive part of the items on a purchase order to record a partial shipment or to record damaged goods.
- **[Returning items](#)**
You can select items that were already received that you want to return. For example, you can select a damaged item to return it. When you apply this action to each selected item, a negative receipt is displayed for each item.
- **[Returning rotating assets](#)**
You can select rotating assets that were already received that you want to return. For example, you can select a damaged rotating asset to return it.
- **[Returning services](#)**
You can return services that were already received. For example, you can select a service to return it. When you apply this action to each selected service, a negative receipt is shown for each service.
- **[Selecting receipts to void](#)**
You can void a transaction that was applied to a purchase order in error. A void is a reversal that returns the receipt back to its former state. For example, you saved the wrong line item to the purchase order, and you want to remove the line item from the purchase order.

Receiving materials

You can record information about items received on an approved purchase order. When vendors ship materials to your company, you record the materials received against the purchase order. If you receive a line item that is damaged, you can receive the full shipment amount and return the rejected quantity.

Before you begin

To create receipts, the status of the purchase order must be either In Progress (INPRG) or Approved (APPR).

About this task

A receipt tolerance quantity or amount may have been set for a line item in the purchase order. If the quantity or the amount of a line item received exceeds the receipt tolerance set for that line item, you can choose to receive part of the order or to receive the tolerance amount or quantity set. If you cannot receive any items in excess of the ordered quantity, you must modify or delete the associated line item.

Procedure

1. On the List tab of the Receiving application, select the purchase order for which you want to receive materials.
 2. On the Material Receipts tab, select Select Ordered Items.
 3. In the Select Ordered Items window, select the check box for each line item that you want to receive. To select all the items on the purchase order, select the check box in the table header.
 4. Click OK.
 5. Optional: Modify the line item information, such as the quantity, in the Material Receipts window.
When you save the receipt, the fields on the Material Receipts window become read-only.
 6. Click Save Receipt.
- **[Receiving materials that require inspection](#)**
Some materials require inspection before they can be entered into inventory. Upon receipt, these materials are stored in a holding location until an inspection is performed and the inspection status is changed.
 - **[Receiving materials with changes](#)**
You can change information when receiving materials.

Receiving materials that require inspection

Some materials require inspection before they can be entered into inventory. Upon receipt, these materials are stored in a holding location until an inspection is performed and the inspection status is changed.

Before you begin

To create receipts, the status of the purchase order must be either INPRG (In Progress) or APPR (Approved).

Procedure

1. On the List tab of the Receiving application, select the purchase order for which you want to receive materials that require inspection.
2. On the Material Receipts tab, click Select Ordered Items.
3. In the Select Ordered Items window, click the check box for each item that you want to receive. To select all the items on the purchase order, select the check box in the table header.
4. Click OK.
The line items you selected appear in the Material Receipts window of the Material Receipts tab. If the item requires inspection, its status is WINSP (Waiting for Inspection).
5. Optional: In the Material Receipts window, change the selected material information, such as the quantity.
6. Click Save Receipt.
7. Perform the inspection and change the inspection status as follows:
 - If the item is a rotating item that requires serialization, change the status to WASSET (Waiting for Serialization).
 - If the item does not require serialization, change the status to COMP (Complete). The item is transferred from the holding location to either its storeroom or to its direct issue location.
8. Optional: If you want to reject items, type the number of items you want to reject in the Quantity Rejected field. Provide a reason in the Reject Code field to represent, for example, damaged goods. A return transaction is created for any items that you rejected.
9. If the item requires serialization, receive the rotating item.
10. Click Save Receipt.

Receiving materials with changes

You can change information when receiving materials.

Before you begin

To create receipts, the status of the purchase order must be either INPRG (In Progress) or APPR (Approved).

About this task

If you are receiving a line item that is not a rotating item, but that is damaged, receive the full shipment amount and then return the rejected quantity. Use the Select Items for Return window to return materials.

Procedure

1. On the List tab of the Receiving application, select the purchase order for which you want to receive materials.
2. On the Material Receipts tab, select Select Ordered Items.
3. In the Select Ordered Items window, select the check box for each line item that you want to receive. To select all the items on the purchase order, select the check box in the table header.
4. Click OK.
5. In the Material Receipts window, click View Details on the material receipt line that you want to change.
6. Click Save Receipt. Once you save the receipt, the fields on the Material Receipts tab become read-only.

Receiving services

If your company requires receipts for services, you can record the services received against an approved purchase order. You can copy all the purchase order line items if all services have been received, or you can enter partial receipts. You record total or partial receipts of a service on a purchase order the same way that you record the receipt of materials.

Before you begin

To create receipts, the status of the purchase order must be either INPRG (In Progress) or APPR (Approved).

About this task

A receipt tolerance quantity or amount may have been set for a line item in the purchase order. If the quantity or the amount of a line item received exceeds the receipt tolerance set for that line item, you can choose to receive part of the order or to receive the tolerance amount or quantity set. If you cannot receive any items in excess of the ordered quantity, you must modify or delete the associated line item.

Procedure

1. On the List tab of the Receiving application, select the purchase order for which you want to receive a service.
2. On the Service Receipts tab, click Select Ordered Services.
3. In the Select Ordered Services window, select the check box for each service that you want to receive. To select all the services on the purchase order, select the check box in the table header.
4. Click OK.
5. Optional: Change the selected services information, such as the quantity, in the Service Receipts table window. When you save the receipt, these fields become read-only.
6. Click Save Receipt.

- **Receiving services that require inspection**

Some services require inspection before they can be entered into inventory. Upon receipt, these materials are stored in a holding location until an inspection is performed and the inspection status is changed.

Receiving services that require inspection

Some services require inspection before they can be entered into inventory. Upon receipt, these materials are stored in a holding location until an inspection is performed and the inspection status is changed.

Before you begin

To create receipts, the status of the purchase order must be either In Progress (INPRG) or Approved (APPR).

Procedure

1. From the List tab of the Receiving application, select the purchase order for which you want to receive services.
2. From the Service Receipts tab, click Select Ordered Services.
3. In the Select Ordered Services window, select the check box for each service that you want to receive. To select all the services on the purchase order, select the check box in the table header.
4. Click OK.
The services you selected are shown in the Service Receipts table window. If the service requires inspection, its status is WINSP (Waiting for Inspection).
5. Optional: Change the information, such as the quantity, in the Service Receipts table window.
6. Click Save Receipt.
7. Optional: If you want to reject services, type a number in the Quantity Rejected field, and provide a reason code in the Reject Code field.
8. Change the inspection status of the service. The status of the service is now Complete (COMP). A return transaction is created for any services that you rejected.
9. Click Save Receipt.

Receiving rotating items

Each rotating item is received into inventory with an item number. You can enter line items for rotating items. You can specify asset identifiers for rotating assets, or autonumber all the rotating items. You also might need to change information when recording the receipt of materials.

Before you begin

To create receipts, the status of the purchase order must be either In Progress (INPRG) or Approved (APPR).

About this task

If the rotating item requires inspection (WINSP), perform the inspection and change the inspection status. After changing the inspection status, the status of the rotating item is WASSET. The rotating item is also tracked in the Assets application with an asset number.

Procedure

1. On the List tab of the Receiving application, select the purchase order for which you want to receive a service.
2. On the Material Receipts tab, click Select Ordered Items.
3. In the Select Ordered Items window, select the check box for each service that you want to receive. To select all the items on the purchase order, select the check box in the table header.
4. Click OK. If the item requires inspection, its status is WINSP (Waiting for Inspection). If the item does not require inspection, its status is WASSET (Waiting for Serialization).
5. Optional: Change the Quantity field to change the quantity received.
6. Click Save Receipt.

7. Select the Receive Rotating Items action.
8. To specify asset numbers for the line items, complete either of the following actions:
 - Specify a value in the Asset field for each line item.
 - Click Autonumber to have the product assign numbers to the items.
9. You can assign a serial number in the Serial # field for each asset. The serial number appears on the asset record in the Assets application. You can also enter the serial number in the Assets application.
10. Optional: Apply an item assembly structure to each asset.
11. Click OK.

An asset record is created and the status of the line item is changed from WASSET to COMP (Complete) for each item that you received. If you received a rotating item that required inspection, a transfer transaction is created. In this transaction, the item is transferred from the holding location to either its storeroom or to its direct issue location.

- [Applying item assembly structures to rotating items](#)

When you receive rotating items, you can apply an item assembly structure to each item.

Applying item assembly structures to rotating items

When you receive rotating items, you can apply an item assembly structure to each item.

Procedure

1. From the List tab of the Receiving application, select the purchase order for which you would like to receive rotating items.
2. Click the Material Receipts tab and select the Receive Rotating Items action.
3. In the Receive Rotating Items window, click Apply IAS in the row of the asset to which you want to apply an item assembly structure.
4. In the Apply Item Assembly table window, the first level of the item assembly structure for that asset is listed. To assign an asset number to each asset in the subassembly, click the row for that asset and perform one of the following actions:
 - In the Asset field, specify a value.
 - Click Autonumber All to have asset numbers assigned to each asset. Asset numbers are assigned to the items in the first level of the hierarchy, and all of the child items.
5. Click Detail Menu in the Item field for the selected item and select Move To to move down to the next level in the item assembly structure hierarchy. The item is moved to the Current Asset field, and its child items display in the table.
6. If you manually entered values for the top level items in the item assembly structure, you can either autonumber the items in the lower levels of the hierarchy or assign values to each item individually.
To move back up the hierarchy, in the Belongs To field, click Detail Menu and select Move To. The parent moves up to the Current Asset field, and its child items display in the table.
7. Click OK.
8. Click Save Receipt.

Receiving partial shipments

You can receive part of the items on a purchase order to record a partial shipment or to record damaged goods.

Before you begin

To create receipts, the status of the purchase order must be either INPRG (In Progress) or APPR (Approved).

Procedure

1. On the List tab of the Receiving application, select the purchase order for which you want to create receipts.
2. On the Material Receipts tab, click Select Ordered Items.
3. In the Select Ordered Items window, select the check box for each line item that you want to receive. To select all the items on the purchase order, select the check box in the table header.
4. Click OK.
5. In the Material Receipts window, click View Details on the material receipt line that you want to change.
6. Change the receipt line as needed. Change the Quantity field to reflect a partial shipment. When you save the receipt, the fields on the Material Receipts window become read-only.
7. Click Save Receipt.

Returning items

You can select items that were already received that you want to return. For example, you can select a damaged item to return it. When you apply this action to each selected item, a negative receipt is displayed for each item.

Procedure

1. On the List tab of the Receiving application, select the approved purchase order record that contains the items that you want to return.

2. On the Material Receipts tab, click Select Items for Return.
The Select Items for Return window displays only items that are available to return.
3. Perform either of the following actions:
 - To return the received quantity of an item, select the check box for the item that you want to return.
 - To return a partial quantity of an item, select the check box for the item, and specify a value in the Quantity to Return field. If you want to return all the items, select the check box in the table header.
4. Click OK.
A return transaction is created for the specified item. In the Material Receipts table window, the Quantity field for each item you selected to return displays a negative value.
5. Optional: To enter codes for each returned item, click View Details on the material receipt line and then type a code in the Reject Code field.
6. Click Save Receipt.

Returning rotating assets

You can select rotating assets that were already received that you want to return. For example, you can select a damaged rotating asset to return it.

Before you begin

The status of the purchase order must be in APPR (Approved) status.

About this task

When you return a rotating asset, a negative receipt shows for each selected asset. The transaction shows a type of RETURN. When you expand the line that contains the return transaction, the rotating asset number shows for the asset that was returned.

Procedure

1. On the List tab of the Receiving application, select the approved purchase order record that contains the assets that you want to return.
2. On the Material Receipts tab, click Select Assets for Return.
The Select Assets for Return window displays only the rotating assets that are available to return.
3. To return the received quantity of a rotating asset, select the check box for the asset that you want to return.
4. Click OK.
5. Save the receipt record.

Returning services

You can return services that were already received. For example, you can select a service to return it. When you apply this action to each selected service, a negative receipt is shown for each service.

Before you begin

The status of the purchase order must be in either APPR (Approved) status or in INPRG (In Progress) status.

Procedure

1. On the List tab of the Receiving application, select the approved purchase order record that contains the services that you want to return.
2. On the Service Receipts tab, click Select Services for Return.
The Select Services for Return window displays only services that are available to return.
3. Perform one of the following actions:
 - To return the received quantity of a service, select the check box for the service that you want to return.
 - To return a partial quantity of a service, select the check box for the service, and specify a value in the Quantity to Return field. If you want to return the entire service, select the check box in the table header.
 - To return a service by its cost, specify a value in the Cost to Return field.
4. Click OK.
A return transaction is created for the specified service. In the Service Receipts window, the Quantity field for each service that you selected to return displays a negative value.
5. Optional: To enter codes for each returned service, click View Details on the service receipt line and then type a code in the Reject Code field.
6. Click Save Receipt.

Selecting receipts to void

You can void a transaction that was applied to a purchase order in error. A void is a reversal that returns the receipt back to its former state. For example, you saved the wrong line item to the purchase order, and you want to remove the line item from the purchase order.

Before you begin

The line item from the purchase order must have been received.

About this task

A receipt that is voided is similar to a return, with the exception that a receipt that is voided cannot be considered for use on a credit invoice. Any costs associated with a voided transaction are removed from the receipt cost calculation. Receipt transactions that are voided are not included on invoices. Balance updates and inventory cost calculations against storerooms are reversed, and reversal transactions are created for the specified items.

Procedure

1. On the List tab of the Receiving application, select the approved purchase order record that contains the items that you want to void.
2. On the Material Receipts tab, click Select Receipts to Void.
The Select Receipts to Void window shows only items that are available to void.
3. Select the check box for the line item that you want to void.
4. Click OK.
5. Click Save Receipt.

Shipment Receiving

In a large organization, you can transfer inventory items or tools between storerooms within the same site or across sites and organizations and track their delivery. You create shipment receipt records to acknowledge the receipt of transferred items and update inventory balances at the destination storeroom.

You create shipment receipt records to log information such as the quantity of items that were received, the date the items were received, and the destination storeroom for the shipment.

When the shipped items are received, the storeroom balance is updated for the inventory records at the destination site. The quantity of received items is also verified to determine whether the number of shipped items satisfies the requirement at the destination site. The shipment is considered to be complete or partial based on this requirement, and the inventory usage record is updated according to this status.

- [Shipment inspection statuses](#)
A site or organization can specify that an inspection is required upon receipt of inventory items. The inspection status indicates the stage of inspection that applies to the shipment item.
- [Rules for voiding shipment receipts](#)
You can void a shipment receipt transaction that was created in error. When you void a shipment receipt, the record returns to its former state and storeroom balances are resolved.

Shipment inspection statuses

A site or organization can specify that an inspection is required upon receipt of inventory items. The inspection status indicates the stage of inspection that applies to the shipment item.

The following statuses apply to shipment items that undergo an inspection:

Status	Description
Waiting for Inspection (WINSPI)	Indicates that the item is in the process of being received, but is not entered into inventory. The item is in a holding location, where it stays until the inspection is complete. After inspection, the item status changes to either Waiting for Serialization or Complete, depending on whether it is a rotating item.
Waiting for Serialization (WASSET)	Indicates that the item is a rotating item and that review and acceptance of the asset numbers in the receipt is required. If the item requires inspection, the inspection has already occurred. The item is still in the holding location; it has not been sent to its destination storeroom or to its direct issue location. After the item is serialized, the status is changed to Complete.
Complete (COMP)	Indicates that the item was received, and if necessary, inspected and serialized. When the status of the item changes to Complete, a transfer transaction is created. The item is transferred to the appropriate storeroom or to a direct issue location. If the item is not rotating and does not require inspection, its status is Complete when it is received.

Rules for voiding shipment receipts

You can void a shipment receipt transaction that was created in error. When you void a shipment receipt, the record returns to its former state and storeroom balances are resolved.

A voided receipt has the same effect on storeroom balances as a return, but a voided receipt cannot be used on a credit invoice.

The following conditions apply to voiding shipment receipts:

- You can void non-rotating items.
- You can void shipment line items that are in Waiting for Inspection (WINSPI) status.
- You can void shipment line items that have been inspected but not returned.

Invoices

You use the Invoices application to record vendor invoices as you receive them. You can also record debit and credit notes from vendors, and match invoice details against purchase orders and receipts. You can reverse approved or paid invoices, credit memos, or debit memos. Items that are part of the consignment inventory can be invoiced when the items are used.

Entering invoices lets you match the invoice information against purchase orders and receipts of materials and services. The invoice can then be approved and routed to Accounts Payable.

You create invoices that can represent one of the following invoice types:

An invoice related to a single purchase order

You enter information such as the invoice number, and the corresponding purchase order number on the Invoice tab. Any receipts recorded for the purchase order can be invoiced on the Invoice Lines tab. If the same purchase order number exists for multiple sites, then you can select the site for the purchase order.

An invoice related to many purchase orders for a single vendor

You enter general invoice data on the Invoice tab, including the vendor, then list the related purchase orders on the Invoice Lines tab.

An invoice without a related purchase order for a single vendor

Typically, such an invoice represents a bill for which there is no purchase requisition or purchase order. You enter invoice-specific information about the Invoice tab. This type of invoice might be appropriate if, for example, you receive an invoice for rent or for a telephone bill.

An invoice with purchase order sites that are different from the site from which the invoice is generated

The invoice must be associated with the same organization as the purchase order sites.

An invoice for items that are created as consignment items

A consignment payment invoice can be generated, either manually or automatically, for financial transactions that occur when consignment items are consumed from a storeroom.

- [Invoices overview](#)

You can record vendor invoices as you receive them, record debit and credit notes from vendors, and match invoice details against purchase orders and receipts. You can also create invoices for which there are no purchase order numbers.

- [Working with invoices](#)

You can record invoices as well as debit and credit notes from vendors. You can match invoice details against purchase orders and receipts. You can create invoices for which there are no purchase orders. You can also create consignment payment invoices that are generated when consignment items are used.

Invoices overview

You can record vendor invoices as you receive them, record debit and credit notes from vendors, and match invoice details against purchase orders and receipts. You can also create invoices for which there are no purchase order numbers.

- [Purchasing process](#)

The steps in the purchasing process include creating purchase requisitions, creating purchase orders, receiving services and items, and recording vendor invoices.

- [Invoice statuses](#)

After an invoice is created, you use the invoice status to indicate where it is in the processing cycle. Changing statuses on invoices has implications, depending on the status being changed.

- [Quantity field and automatic matches](#)

On invoices for materials, when you enter a number in the Quantity field of the Invoice Lines tab, a search is performed for matching material receipts. In seeking a match between an invoice quantity and a receipt quantity, a match is made to either a single quantity in a receipt line item or to the total quantity for a receipt.

- [Receipt tolerances and invoice lines](#)

A receipt tolerance sets a limit for the quantity or the amount that can be invoiced for a service line item or a standard service line item. The receipt tolerance is set for an item in the Item Master application. The receipt tolerance can be modified in the purchase order.

- [Consignment payment invoices](#)

Consignment payment invoices can be generated, either manually or automatically, for financial transactions that occur when consignment items are used.

- [Reversal of invoices](#)

When an original invoice contains errors, such as unit cost mistakes, you can replace the original invoice by reversing it. The replacement for the original invoice contains the updated information. You can reverse an invoice without creating a return transaction.

- [Tax-exempt status](#)

The tax-exempt option indicates whether an item, a tool, or a service is taxable. You might want to set the tax-exempt status, depending on where an item or a service is acquired, and how an item or a service is used.

- [Terms and conditions](#)

You can create and maintain a library of terms and conditions that your company and your vendors must follow on purchase order and contract transactions. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.

- [Automatic allocation of standard service costs](#)

If your site does not use the Invoices application, services are prorated upon purchase order approval in the Purchase Orders application. If your site uses the Invoices application to manage invoices, services are prorated or allocated in Invoices.

- [How invoice variances affect the average costs of items](#)

When calculating the average cost of an inventory item, the cost and currency variances are used to update inventory costs. This action occurs when the Update Cost/Currency Variances on Inventory Costs check box is selected. If the check box is cleared, the variance costs are not used to update inventory costs but are written to variance accounts instead.

- [Records related to invoices](#)

If you have records that are associated with invoices, such as purchase orders, contracts, and requests for quotations, you can view these records. You can

obtain a comprehensive look at all of the data that are related to invoices.

Purchasing process

The steps in the purchasing process include creating purchase requisitions, creating purchase orders, receiving services and items, and recording vendor invoices.

The following example illustrates the purchasing process from requisitioning through invoicing.

Step 1: Create the purchase requisition

You can create and approve a purchase requisition 98074 for the following services and related materials:

- Two contract programmers (1,000 hours each)
- Two personal computers
- A software package
- Rental furniture (desks, chairs)

Step 2: Create the purchase orders

You can create the following purchase orders, one for each vendor by using the Copy PR Line Items to PO action in the Purchase Orders application:

- Purchase order 98105 that contains two contract programmers (1,000 hours each)
- Purchase order 98106 that contains two personal computers
- Purchase order 98107 that contains a software package
- Purchase order 98108 that contains rental furniture (desks, chairs)

Step 3: Receive the services and items

When you record receipts from each vendor, you must use the appropriate receipts tab in the Receiving application and the Select Ordered Services and Select Ordered Items actions.

Step 4: Record vendor invoices

After you purchase materials and services, your company receives bills, or invoices, from the vendors. You use the Invoices application to record vendor invoices as you receive them. When you create invoice records you can list purchase order details on the invoice when it is appropriate.

You use the Copy PO Lines action to copy lines from either the receipts or the purchase order to the Invoice Lines tab. You can also view lines that are not on the invoice for items or services received, and add the lines to the invoice.

Invoice statuses

After an invoice is created, you use the invoice status to indicate where it is in the processing cycle. Changing statuses on invoices has implications, depending on the status being changed.

The following table lists and describes the statuses for invoices.

Status of invoice	Description
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Status of invoice	Description
Approved (APPR)	<p>Available only if the current invoice status is Entered, Waiting for Approval, or Hold. If you change the status directly to Paid without first approving the invoice, the invoice is validated for approval criteria. An approved invoice is stored as a history record; for invoices in history, you can change only the Check Code field, the Check # field, and the Paid Date field.</p> <p>If the Close PO check box is selected on the Change Status window for the invoice, and you change the status to Approved, all purchase orders associated with the invoice are closed.</p> <p>An invoice must meet the following conditions before it can be approved:</p> <ul style="list-style-type: none"> • If the invoice is to be paid in foreign currency, there must be an active exchange rate for that currency (in the Currency application) on the date of approval. If not, the invoice cannot be approved. (If the exchange rate has changed since you created the invoice, the product updates the Total Base Cost field upon approval.) • The prices on the invoice must fall within a specified range of the prices on the purchase order. Your system administrator can define the amount by which the invoice price can vary from the purchase order price and still be approved. This task is done using the Limits and Tolerances tab in the Security Groups application. • Standard service costs added to the invoice (such as freight charges or installation fees) must fall within limits set by your administrator. This task is set using the Limits and Tolerances tab in the Security Groups application. • Tax costs added to the invoice must fall within limits set by your administrator (also set with the Limits and Tolerances tab in the Security Groups application). • Line items that must be received before the invoice is approved are checked to ensure that the receipts have been entered into the system. <p>When the conditions are met, the price difference between the invoice and the purchase order is calculated. Price differences can be due to a change in the active exchange rate, to a difference between what the vendor charged and the original purchase order price, or to both. Price differences are handled in one of two ways:</p> <ul style="list-style-type: none"> • For issue on receipt items (that is, those items not purchased for inventory), the price difference is always applied to the work order, to the location, to the equipment, to the general ledger account specified on the purchase order, or in the Invoice Lines tab. • For inventory items, the Average Cost field is updated. <p>You cannot change the status of an original approved invoice to Paid if that invoice has a Pending Reversal invoice associated with it. You must first cancel the Pending Reversal invoice.</p>
Cancel (CANCEL)	Available only on the Change Status window if the current invoice status is Entered, Waiting for Approval, or Hold. You cannot cancel an approved invoice. A canceled invoice is stored as a history record and cannot be modified.
Entered (ENTERED)	The default status when you create an invoice. A newly entered invoice has some fields completed by default; some of these fields are read-only. An invoice with the status of Entered can be edited. Once the status of an invoice is changed from Entered using the Change Status window, the Entered status is no longer available.
Hold (HOLD)	Available only if the current invoice status is Entered or Waiting on Approval (WAPPR). If the invoice must not be approved or paid, you can change the invoice to Hold status. For example, if you received an invoice but have not received the items, or if there is a discrepancy between the invoice and the receipts, you can place the invoice on Hold status. An invoice in Hold can be edited.
Paid (PAID)	Available only if the current invoice status is Entered, Waiting for Approval, Approved, or Hold. If you change the status directly to Paid without first approving the invoice, the product approves the invoice. A paid invoice is stored as a history record and cannot be modified.
Pending Reversal (PENDREV)	<p>Available only if the original invoice, the original credit memo, or the original debit memo status is Approved or Paid. Indicates that the invoice is in the process of being reversed. For example, if an error was made on the unit cost on the original invoice, you can reverse the invoice without having to create a return transaction. You can change the status of a Pending Reversal invoice to Cancel or to Approved. When you approve a Pending Reversal invoice, any details created in the original invoice are reversed. All records related to the original invoice are updated with the new information, such as inventory records. Documents that were attached to the original invoice are added to the reversed invoice.</p> <p>The following constraints apply to invoices that are in Pending Reversal status:</p> <ul style="list-style-type: none"> • You cannot duplicate the invoice. • You cannot allocate services to the invoice. • You cannot distribute costs to the invoice. • You cannot change the vendor for the invoice. • You cannot copy lines from a purchase order to the invoice.
Reversed (REVERSED)	Indicates that an approved or a paid invoice, credit memo, or debit memo has been reversed. A reversed document is stored as a history record that cannot be modified. You cannot duplicate an invoice that has been reversed.
Scheduled (SCHED)	Indicates that the invoice is part of a payment schedule, set up for a specific contract. Invoices with this status can be created only from the Contracts applications. An invoice with a status of Scheduled can be changed to any status except Entered.
Waiting on Approval (WAPPR)	Available only if the current invoice status is Entered or Hold. You use this status to indicate that invoice information has been entered. The invoice is ready for review and approval by the appropriate level of staff. An invoice waiting for approval can be edited.

Quantity field and automatic matches

On invoices for materials, when you enter a number in the Quantity field of the Invoice Lines tab, a search is performed for matching material receipts. In seeking a match between an invoice quantity and a receipt quantity, a match is made to either a single quantity in a receipt line item or to the total quantity for a receipt.

The search for a match is performed according to the following criteria:

- If you enter an invoice quantity that equals a receipt quantity, the invoice is matched with the receipt.
- If you enter an invoice quantity that is less than a receipt quantity, the invoice is matched with the receipt.

In any of the following cases, you receive a warning and the invoice is not matched with the receipt:

- You specify a purchase order and a purchase order line item. The invoice quantity exceeds either the quantity that has not been invoiced or the order quantity.
- You specify a purchase order and a purchase order line item. The invoice quantity causes an invoice total exceeding the total cost of the purchase order.
- You specify a purchase order on which the Receipt Required check box is selected, and you enter a quantity that does not match the receipts.

Receipt tolerances and invoice lines

A receipt tolerance sets a limit for the quantity or the amount that can be invoiced for a service line item or a standard service line item. The receipt tolerance is set for an item in the Item Master application. The receipt tolerance can be modified in the purchase order.

If the quantity or the amount of the line item received exceeds the receipt tolerance set for that item, you can invoice the item up to the receipt tolerance amount or up to the quantity set. If you cannot receive any service line items in excess of the ordered quantity, you must modify or delete the associated line item.

Consignment payment invoices

Consignment payment invoices can be generated, either manually or automatically, for financial transactions that occur when consignment items are used.

When you create an item in the Item Master application, you can specify the item as a consignment item. Consignment items become part of the consignment inventory.

Purchase order lines for consumption items can only be invoiced upon usage of the item.

Consignment payment invoices can be generated in any of the following ways:

Individual Consumption

Each consumption transaction (either positive or negative) of a consignment item creates a single line on a consignment invoice.

Frequency

If invoices are based on a frequency, then the product-provided cron task (ConsignmentInvoiceCronTask) evaluates consignment items to be processed. The frequency and units specified for the inventory record are used to determine the next invoice date. The cron task is set to run daily, unless you specify another value. A single invoice that contains up to the maximum number of lines is created for each vendor. You use the Organizations application to set the maximum number of lines on consignment invoices.

Manual

You can generate a consignment invoice manually. You select the Consignment Payment invoice type, and choose from the list of available consumption transactions to include on the invoice lines.

Reversal of invoices

When an original invoice contains errors, such as unit cost mistakes, you can replace the original invoice by reversing it. The replacement for the original invoice contains the updated information. You can reverse an invoice without creating a return transaction.

The status of the invoice, the credit memo, or the debit memo that is being reversed must be Approved or Paid. When reversing an invoice, the user default insert site does not have to be the same site as the site specified on the original invoice. If the user default insert site is different from the original invoice site, then the reverse invoice uses the site specified on the original invoice. However, the user default insert site must belong to the same organization as the original invoice.

When you approve the reversal or the pending reversal of an invoice, any details that were part of the original invoice are reversed. All records that are related to the original invoice are updated with the new information, such as unit cost. Documents that were attached to the original invoice are added to the replacement invoice. The original invoice becomes a history record.

Tax-exempt status

The tax-exempt option indicates whether an item, a tool, or a service is taxable. You might want to set the tax-exempt status, depending on where an item or a service is acquired, and how an item or a service is used.

The situations under which items or services are tax-exempt vary depending upon your location, and upon current tax regulations. For example, the storeroom for an item might be in a location where sales taxes are not collected. In some cases, if an item becomes part of a product, that item can be tax-exempt. If the item is used as a stand-alone item, then the item is taxable. The buyer for your organization determines the tax-exempt status of items, of tools, and of services.

You can override the tax-exempt status for items, for tools, and for services in the following applications:

- Purchase Requisitions
- Purchase Orders
- Invoices

When you specify the tax-exempt status, you can apply the status at the organization level and at the vendor level.

Terms and conditions

You can create and maintain a library of terms and conditions that your company and your vendors must follow on purchase order and contract transactions. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.

You can create a library of term and condition values in the Terms and Conditions application. You use the library to look up and associate terms and conditions to purchase order and contract records. The library is accessible in the Purchase Orders and contracts applications.

You can set default term and condition values according to site and contract type in the Organizations application. When you create a contract record in a contracts application, it inherits the default term and condition values that you assigned to the selected contract type in the Organizations application.

Automatic allocation of standard service costs

If your site does not use the Invoices application, services are prorated upon purchase order approval in the Purchase Orders application. If your site uses the Invoices application to manage invoices, services are prorated or allocated in Invoices.

Upon invoice approval, the standard service costs are prorated across all invoice line items if the standard service can be allocated. That is, if the Prorate Service check box is selected either in the PO Lines tab or in the Invoice Lines tab).

If the Add Standard Service Costs to Direct Issue Items Only check box (available in the Organizations application) is selected, the standard services are allocated to only those invoice line items that have the Issue On Receipt check box selected. The percentage of the cost that is prorated to each line item is based on the line cost of the line item, as shown in the following example.

Example

There are two standard services entered on the invoice. The Prorate Service check box is selected for each. The line costs of the standard services are:

- Standard Service 1: \$100
- Standard Service 2: \$200
- Total: \$300

There are four item invoice lines that generated the standard services. Their line costs are:

- Line 1: \$300
- Line 2: \$400[®]
- Line 3: \$50
- Line 4: \$250
- Total: \$1000

When the invoice is approved, the standard service total of \$300 is prorated as follows:

Table 1. Cost Calculations

Line	Line Cost	% of Service Total Added	Total Prorated Cost	Loaded Cost
Line 1	\$300	30%	\$90	\$390
Line 2	\$400	40%	\$120	\$520
Line 3	\$50	5%	\$15	\$65
Line 4	\$250	25%	\$75	\$325
Totals	\$1000	100%	\$300	\$1300

In the preceding example, if Standard Service 1 cannot be allocated, then only \$200 would be prorated among the four lines.

How invoice variances affect the average costs of items

When calculating the average cost of an inventory item, the cost and currency variances are used to update inventory costs. This action occurs when the Update Cost/Currency Variances on Inventory Costs check box is selected. If the check box is cleared, the variance costs are not used to update inventory costs but are written to variance accounts instead.

The Update Cost/Currency Variances on Inventory Costs option is available from the Inventory Defaults window of the Organizations application.

For any transaction involving movement of items, the change of value in inventory must equal the transaction cost. In any case where this condition is not true, additional transactions must record the difference.

The product uses a perpetual average (or moving average) method for maintaining inventory value.

The primary features of the perpetual average method are the following:

- Inventory is valued at the average cost of the items in stock.
- The average cost is updated each time an item is received into the storeroom.
- Each transaction is considered individually for its effect on the average cost.
- Items are sold or issued at the average cost at the time of the sale or issue.
- Each transaction must balance credit and debit accounts.

Variances must be recorded if transactions affecting an inventory control account do not have an equal effect on inventory value.

Calculation of average cost for invoice variance

When invoice quantity is less than or equal to inventory balance, the average cost is calculated as follows:

- Average cost = cost / quantity

When invoice quantity is greater than inventory balance, the average cost is calculated as follows:

- Average cost = (current average cost * inventory current balance) + cost/inventory current balance + quantity

In either case, the remaining invoice variance is recorded in the invoice transactions (INVOICETRANS) table.

Example with invoice variance

- Storeroom before invoice approval (after receipts):
 - Balance = 8
 - Average Cost = 10.00
 - Value = 80.00
- Receipt Line (to be matched to the invoice):
 - Quantity = 4
 - Cost = 11.00
- Invoice line (actual invoice):
 - Quantity = 4
 - Cost = 11.10
- Receipt update:
 - Quantity = 0
 - Cost = 0.40
- Storeroom after invoice approval:
 - Balance = 8
 - Average Cost = 10.05
 - Value = 80.40

Example without invoice variance (balance is less than or equal to invoice quantity):

- Storeroom before invoice approval (after receipts and issues):
 - Balance = 1
 - Average Cost = 10.00
 - Value = 10.00
- Receipt Line (to be matched to the invoice):
 - Quantity = 4
 - Cost = 11.00
- Invoice line (actual invoice):
 - Quantity = 4
 - Cost = 11.10 [total variance is 0.40: $4 * (11.10 - 11.00)$]
- Receipt update:
 - Quantity = 0
 - Cost = 0.10 [applied to inventory: $1 * (11.10 - 11.00)$]
- Invoice variance:
 - Quantity = 0
 - Cost = 0.30 [applied as invoice variance: $(4 - 1) * (11.10 - 11.00)$]
- Storeroom after invoice approval:
 - Balance = 1
 - Average Cost = 10.10
 - Value = 10.10

Records related to invoices

If you have records that are associated with invoices, such as purchase orders, contracts, and requests for quotations, you can view these records. You can obtain a comprehensive look at all of the data that are related to invoices.

To see all of the records related to a particular invoice, select the View Related Records action.

To view the transactions and the records that are specific to an invoice line, click the View Related Records icon at the end of the invoice line. In the View Related Records window, you can click the identifier for a purchase order, a purchase requisition, a contract, and a request for quotation to access that record in the relevant application.

Working with invoices

You can record invoices as well as debit and credit notes from vendors. You can match invoice details against purchase orders and receipts. You can create invoices for which there are no purchase orders. You can also create consignment payment invoices that are generated when consignment items are used.

- [Creating invoices](#)
When you create an invoice, you match the invoice information with the purchase orders and the receipt of materials and services. You can also invoice items for which there are no purchase orders. You can also create invoices for consignment items that are held in inventory, and that do not require payment upon receipt.
- [Working with invoice lines](#)
You can copy purchase order line items, material receipt line items, or service receipt line items to an invoice.
- [Creating and modifying the sequence of terms](#)
You can associate specific terms and conditions with contracts and records. You can modify how the sequence of terms displays.
- [Adjusting payment schedules](#)
In the Invoices application, you can adjust the payment schedule set up for a specific contract.

Creating invoices

When you create an invoice, you match the invoice information with the purchase orders and the receipt of materials and services. You can also invoice items for which there are no purchase orders. You can also create invoices for consignment items that are held in inventory, and that do not require payment upon receipt.

Before you begin

You can create an invoice with purchase orders whose sites are different from the site where the invoice is generated. However, the invoice must be associated with the same organization as the purchase order sites. You must have security privileges to the same organization to which the purchase order sites belong. The purchase order must be in Approved, In Progress, or in Closed status.

Before you can create a consignment invoice and add line items to the invoice, the items must first be created as consignment items.

About this task

You can create vendor invoices as you receive them, record debit and credit notes from vendors, and create consignment invoices. Consignment invoices are different from other types of invoices. Consignment invoices are generated only when the consignment items in inventory are used, rather than when the items are received.

Procedure

1. From the toolbar of the Invoices application, click New Invoice.
2. In the Type field, select the type of invoice you are creating.
3. Specify information in the fields of the Invoice tab.
4. If the invoice is associated with a purchase order, in the PO field, type the purchase order number. Lines specific only to that purchase order can be copied to the invoice.
5. If the invoice is not associated with a purchase order, leave the PO field blank, and specify the vendor in the Company field. This step also applies if you want to create an invoice with purchase orders whose sites are different from the site where the invoice is generated.
6. In the G/L Posting Date field, specify a date for the general ledger financial period. If your system administrator specified that the invoice date is used, the G/L Posting Date field is populated with the date from the Invoice Date field. If the value specified is not valid, the value is updated to the start date of the next open financial period. You can specify a different value.
7. On the Invoice Lines tab, click New Row, and add line items as needed. If you manually enter a purchase order line item number, the fields pertaining to that purchase order line item are filled.
8. If you are creating an invoice for consignment items, click Select Consignment Transactions.
9. In the Select Consignment Transactions window, select the transactions that you want to invoice for the vendor that is replenishing the consignment items, and click OK.
10. Save the invoice.

What to do next

After you create an invoice and add line items, the invoice can then be approved and routed to Accounts Payable.

- [Changing the status of invoices](#)
You can change the status of an invoice as it moves towards completion.
- [Creating invoices with multiple vendors](#)
You can enter company branches into the system and associate multiple company records with a parent record. You can then use the remit-to information of the parent company on an invoice.
- [Receiving invoices electronically](#)
You can configure the product to receive invoices electronically and, optionally, have the receipt initiate a workflow process. Suppliers can send an invoice transaction, containing the final payment and cost information, each time a purchase order line item is shipped.

Changing the status of invoices

You can change the status of an invoice as it moves towards completion.

Before you begin

You must have authorization through the Security Groups application to change the status of an invoice.

About this task

When you create an invoice, its status is automatically set to Entered. When you change the status of an invoice to Approved, if the Close PO check box is selected, all purchase orders that are associated with the invoice (for which all receipts are complete and approved) are closed. The system administrator sets purchase order options in the Organizations application.

Procedure

1. In the Invoices application, display the invoice record for which you want to change the status.
2. Select the Change Status action.
3. In the New Status field of the Change Status window, click the drop-down arrow to select a status.
4. Optional: Change the Status Date and specify information about the status change in the Memo field.
5. Optional: Click the Close PO check box to close all purchase orders associated with the invoice for which all receipts are complete and approved. Or, you can clear the Close PO check box if you do not want to close all associated purchase orders for which receipts are complete and approved.
6. Click OK to save your changes.

What to do next

If the invoice has an inspection-required line item, the inspection status of the line item must be complete in the Receiving application before the invoice can be approved.

Creating invoices with multiple vendors

You can enter company branches into the system and associate multiple company records with a parent record. You can then use the remit-to information of the parent company on an invoice.

Before you begin

When you create an invoice specifying a parent company, the look-up list from the PO field contains all the purchase orders for the parent company and for its branch companies. If the PO field in the Invoices application contains a purchase order, the lines of the invoice include the lines from the current purchase order only. If the purchase order has company information, the vendor information from the parent company does not overwrite the vendor information of the purchase order.

Procedure

1. Create a company record for each branch and associate it with the parent record as follows:
 - a. In the Companies application, click New Company.
 - b. In the Parent field, click Detail Menu to select the parent company.
 - c. Click Save Company.
2. Create purchase orders for the parent and branch companies associated with the parent company as follows:
 - a. In the Purchase Orders application, click New Purchase Order.
 - b. In the Company field, click Detail Menu to select either the branch or the parent company.
 - c. On the PO Lines tab, specify line items for the purchase order.
 - d. Click Change Status and change the status of the purchase order to approved (APPR).
 - e. Click Save Purchase Order.
3. Create an invoice that references the parent company as follows:
 - a. In the Invoices application, click New Invoice.
 - b. In the Company field, click Detail Menu to select the parent company.
 - c. On the Invoice Lines tab, click Copy PO Lines. The Copy PO lines window lists line items from all approved purchase orders for the parent company and for its children.
 - d. In the Copy PO lines window, on the PO Lines tab, select the check box next to the line item that you want to copy over to the invoice. You can copy more than one line item at a time.
You can also select line items from approved purchase orders for the parent company and for its children. To select lines from approved purchase orders, click New Row on the Invoice Lines tab. Type or select a purchase order in the PO field.
 - e. Click OK.
 - f. Click Save Invoice.

Receiving invoices electronically

You can configure the product to receive invoices electronically and, optionally, have the receipt initiate a workflow process. Suppliers can send an invoice transaction, containing the final payment and cost information, each time a purchase order line item is shipped.

About this task

An invoice transaction can only reference one purchase order. When a transaction is received, it is copied to the Invoice table.

Procedure

1. In the Companies application, display the company record from which you want to receive electronic invoices.
2. Select the Vendor Sends Invoice check box.
3. Click Save Company.

Working with invoice lines

You can copy purchase order line items, material receipt line items, or service receipt line items to an invoice.

- **Copying purchase order line items to invoices**
When you create an invoice for a single purchase order, or for multiple purchase orders for a single vendor, you can copy line items to the invoice. You can copy line items for invoices with purchase orders whose sites are different from the site for the invoice. You can also view lines for services or items received that are not on the invoice.
- **Specifying multiple purchase orders on invoices**
You can use the Invoices application to specify multiple purchase orders and their line items on a single invoice. For example, you might have used separate purchase orders to order items from a vendor, and you received all the items in a single shipment with a single invoice from the vendor. You can also specify purchase orders with sites that are different from the site for the invoice.
- **Distributing costs of line items**
You can distribute the costs of an invoice line item across multiple general ledger accounts. For example, suppose your department paid for a laser printer that the packaging department uses. You can specify two general ledger accounts for the printer, one for your department and one for the packaging department.

Copying purchase order line items to invoices

When you create an invoice for a single purchase order, or for multiple purchase orders for a single vendor, you can copy line items to the invoice. You can copy line items for invoices with purchase orders whose sites are different from the site for the invoice. You can also view lines for services or items received that are not on the invoice.

Before you begin

Before copying purchase order line items to an invoice, the following conditions must be met:

- If you are copying line items from purchase orders whose sites are different from the site of the invoice, the organization must be the same for both the purchase orders and the invoice. Additionally, on the Invoice tab, the PO field must be blank, and a vendor must be identified in the Company field in the Remit To section.
- The status of the invoice must be Entered, Waiting for Approval, or Hold.
- If you are copying line items from a single purchase order, either an approved purchase order must be identified in the PO field of the Invoice tab, or a vendor must be identified in the Company field in the Remit To section.
- If the Receipt Required check box is selected on any of the purchase order line items, then the item must be received before the invoice can be approved.

About this task

The default for viewing lines for services or materials is View all lines. This option shows both lines that are invoiced and lines that are not invoiced. When you select this option, the Uninvoiced Qty field and the Uninvoiced Cost field contain a zero for lines that are invoiced. To view lines that are not invoiced, select that option, then click Refresh.

Procedure

1. In the Invoices application, display the invoice record to which you want to copy purchase order lines.
2. In the Invoice Lines tab, click Copy PO Lines. If you identified a purchase order number on the invoice header, the Copy PO Lines window shows line items for that purchase order. If you identified a vendor on the Invoice tab, all purchase order lines on all purchase orders for that vendor display, unless the purchase orders are waiting for approval or are canceled.
3. From the tab window for the type of line item, select the check box for each item that you want to copy.
4. Click View lines that are not invoiced to see the quantity and the cost for lines that are not invoiced. You can view lines in the PO Lines tab, in the Materials tab, and in the Services tab. You can add the uninvoiced lines to the invoice by selecting the check box for those lines.
5. Click OK.
6. Optional: On the Invoice Lines tab, edit line item information fields, such as Quantity or Unit Cost. Additionally, in the Tax Exempt check box, you can override the tax-exempt status that was set for the item or for the service.
7. In the Default Table Data section, specify information for one or more of the fields.
8. Save the invoice.

Specifying multiple purchase orders on invoices

You can use the Invoices application to specify multiple purchase orders and their line items on a single invoice. For example, you might have used separate purchase orders to order items from a vendor, and you received all the items in a single shipment with a single invoice from the vendor. You can also specify purchase orders with sites that are different from the site for the invoice.

About this task

In most cases, you can enter the vendor on the Invoice tab, then use Copy PO Lines on the Invoice Lines tab to copy lines from multiple purchase orders for that vendor. You can also enter invoice lines for line items from multiple purchase orders manually.

Procedure

1. In the Invoices application, display the invoice to which you want to add multiple purchase orders.
2. In the Company field, specify the vendor or click Detail Menu to select a vendor.
3. On the Invoice Lines tab, click New Row.
4. In the PO field, type a valid purchase order number. The same purchase order number might apply to multiple sites.
5. In the remaining fields, specify line item information pertinent to this purchase order. If the purchase order has multiple line items, add a row for each line item.
6. Repeat steps 3 to 5 for each additional purchase order that you want to include on the invoice.
7. Click Save Invoice.

Distributing costs of line items

You can distribute the costs of an invoice line item across multiple general ledger accounts. For example, suppose your department paid for a laser printer that the packaging department uses. You can specify two general ledger accounts for the printer, one for your department and one for the packaging department.

About this task

An invoice line item must be a direct issue item or service item in order to distribute its costs. You cannot distribute costs on purchase order lines that are associated with a storeroom.

Procedure

1. In the Invoices application, display the invoice record for which you want to distribute costs.
2. On the Invoice Lines tab, copy the appropriate purchase order lines to the invoice and click Distribute Costs.
3. In the Distribute Costs window, click New Row.
4. Specify a value in the Percentage field or in the Line Cost field.
If you type a percentage, the line cost representing that percentage is displayed. If you specify a portion of the line cost, the percentage for that cost displays.
5. In the GL Debit Account field, specify a value or click Select Value to choose from the list.
The first row in the Distribute Costs table displays the percentage (100%) and the total line cost of the line item that you specified. If you want to distribute costs for the line item, you must edit this row.
6. Continue to enter rows until the sum of the Percentage fields equal 100%.
7. Click OK.
8. Click Save Invoice.
The Distributed check box is selected to indicate that the record contains line items with distributed costs.

Creating and modifying the sequence of terms

You can associate specific terms and conditions with contracts and records. You can modify how the sequence of terms displays.

- **Creating terms**
You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.
- **Modifying the sequence of terms for records**
You can change the order in which the terms for a record display. You can modify the sequence to display a more logical order, or to list certain terms sequentially.

Creating terms

You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.

Before you begin

Terms and conditions can only be added to purchasing or contracts records set at statuses in progress or waiting on approval.

Procedure

1. In a purchasing or contract application, display the record for which you want to create a term.
2. On the Terms and Conditions tab, click New Row.
3. Specify the sequence and term.
4. Optional: Select the Send to Vendor check box.
5. Save the record.

What to do next

You can set default term and condition values according to site and contract type in the Organizations application. When you create a contract record in a contracts application, the contract inherits the default term and condition values that you assigned to the selected contract type in the Organizations application.

Modifying the sequence of terms for records

You can change the order in which the terms for a record display. You can modify the sequence to display a more logical order, or to list certain terms sequentially.

Procedure

1. In the appropriate Purchasing or Contract application, display the record with which you want to associate a term.
2. Click the Terms and Conditions tab.
3. In the Terms and Conditions table window, locate the rows for which you want to change the sequence.
4. In the Sequence column for the appropriate rows, specify a value. You can enter any integer up to 9999. The product defaults the sequence numbers to multiples of 10. You can rearrange the order without renumbering the entire sequence.
5. Click Save.

Adjusting payment schedules

In the Invoices application, you can adjust the payment schedule set up for a specific contract.

Before you begin

The invoice record must have a status of Scheduled (SCHED).

About this task

Invoices with a status of Scheduled can be created only from the Contracts application. An invoice with a status of Scheduled can be changed to any status except Entered.

Procedure

1. In the Invoices application, display the invoice record containing the payment schedule that you want to change.
2. From the toolbar, change the status of the invoice to Waiting on Approval (WAPPR).
3. Click the Invoice tab, and change the due date, the invoice cost information, the quantity, and other details, as needed. You can also add terms and conditions to the invoice from the Terms and Conditions tab.
4. Click Save Invoice.

Request for Quotations

You use the Request for Quotations application to create requests for quotations and to store the quotations. Based on the quotations, you can assess the vendor who best meets your needs.

A Request for Quotations is a request that you send out to one or more potential vendors. To list a vendor on the Request for Quotations, the vendor must have a record in the Companies application. In the Request for Quotations application, you can specify line items, required delivery dates, and other conditions that you want the vendor to meet for the delivery of an item or a service.

You can create an Request for Quotations for any of the following conditions:

- The stock count of an item drops below a certain level, and you must place another bulk order.
- A requisition is received for an item or for a service that requires a quotation each time because of item price or other requirements.
- Someone at your site requests a quote for an item or for a service. It can be for a stocked item or for a non-stocked item, such as a special order.
- You need to do commodity bulk buying for a certain period of time. This is typically for many items with common commodity codes. The quotation might not be copied to a purchase order immediately, but the pricing is set.

When you receive the quotations from the vendors, you insert them into the Request for Quotations record one line at a time. At the end of the process, you review the quotations and award one quotation for each line. The quotations are then converted to one or more purchase orders or contracts, depending on the

procurement flow within your organization.

- [Request for quotations overview](#)
Creating requests for quotations (RFQs) is the first step in the purchasing process. You can specify line items, required delivery dates, and other conditions that you want the vendor to meet for the delivery of an item or a service.
- [Working with requests for quotations](#)
A Request for Quotations is a request that you send out to one or more potential vendors. You receive the quotations from the vendors, record the quotations they provide, review the quotations, and award one quotation for each line item. Quotations are converted into one or more purchase orders or contracts.

Request for quotations overview

Creating requests for quotations (RFQs) is the first step in the purchasing process. You can specify line items, required delivery dates, and other conditions that you want the vendor to meet for the delivery of an item or a service.

- [Purchasing process](#)
The steps in the purchasing process include creating purchase requisitions, creating purchase orders, receiving services and items, and recording vendor invoices.
- [Request for Quotations statuses](#)
Changing statuses on Request for Quotations affects both field functionality and access to various action pages.
- [Terms and conditions](#)
You can create and maintain a library of terms and conditions that your company and your vendors must follow on purchase order and contract transactions. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.

Purchasing process

The steps in the purchasing process include creating purchase requisitions, creating purchase orders, receiving services and items, and recording vendor invoices.

The following example illustrates the purchasing process from requisitioning through invoicing.

Step 1: Create the purchase requisition

You can create and approve a purchase requisition 98074 for the following services and related materials:

- Two contract programmers (1,000 hours each)
- Two personal computers
- A software package
- Rental furniture (desks, chairs)

Step 2: Create the purchase orders

You can create the following purchase orders, one for each vendor by using the Copy PR Line Items to PO action in the Purchase Orders application:

- Purchase order 98105 that contains two contract programmers (1,000 hours each)
- Purchase order 98106 that contains two personal computers
- Purchase order 98107 that contains a software package
- Purchase order 98108 that contains rental furniture (desks, chairs)

Step 3: Receive the services and items

When you record receipts from each vendor, you must use the appropriate receipts tab in the Receiving application and the Select Ordered Services and Select Ordered Items actions.

Step 4: Record vendor invoices

After you purchase materials and services, your company receives bills, or invoices, from the vendors. You use the Invoices application to record vendor invoices as you receive them. When you create invoice records you can list purchase order details on the invoice when it is appropriate.

You use the Copy PO Lines action to copy lines from either the receipts or the purchase order to the Invoice Lines tab. You can also view lines that are not on the invoice for items or services received, and add the lines to the invoice.

Request for Quotations statuses

Changing statuses on Request for Quotations affects both field functionality and access to various action pages.

The following statuses apply to Requests for Quotations:

In Progress (INPRG)

The default status when you create a Request for Quotations. The Request for Quotations must remain in INPRG status until you have specified all information and line items. In this status, you can modify most tabs and fields on the Request for Quotations, except for the Quotation Lines table. The Request for Quotations must be saved as INPRG before changing it to another status. The status INPRG is always available (except in COMPLETE and CLOSED status) to allow you to edit the Request for Quotations.

Ready to be Sent (READY)

Indicates that the Request for Quotations is ready to be sent to the vendors. In this status, you cannot change the Request for Quotations. All tabs are read-only.

Sent to the Vendor (SENT)

Indicates that the Request for Quotations has been sent to the vendors. The SENT status causes fields on the RFQ tab and on the RFQ Lines tab to be read-only. Fields on the Vendors tab can be modified. You can also modify the fields on the Quotations tab, and on the Terms and Conditions tab.

Completed (COMP)

Indicates that all quotations have been received from the vendors. In this status, all fields, except for the fields on the Quotation Lines tab, and the fields on the Terms and Conditions tab, are read-only.

Canceled (CANCEL)

Indicates a canceled Request for Quotations. You use this status to cancel a Request for Quotations, or to cancel a selected set of Requests for Quotations. You can cancel a Request for Quotations only if no quotations have been awarded. The CANCEL status is not available after a quotation has been converted to a purchase order. A canceled Request for Quotations is stored as a history record and cannot be modified.

Closed (CLOSE)

Indicates a closed Request for Quotations. The Request for Quotations must be one whose quotation lines have been awarded. Once a Request for Quotations is closed, it is stored as a history record and cannot be modified.

Terms and conditions

You can create and maintain a library of terms and conditions that your company and your vendors must follow on purchase order and contract transactions. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.

You can create a library of term and condition values in the Terms and Conditions application. You use the library to look up and associate terms and conditions to purchase order and contract records. The library is accessible in the Purchase Orders and contracts applications.

You can set default term and condition values according to site and contract type in the Organizations application. When you create a contract record in a contracts application, it inherits the default term and condition values that you assigned to the selected contract type in the Organizations application.

Working with requests for quotations

A Request for Quotations is a request that you send out to one or more potential vendors. You receive the quotations from the vendors, record the quotations they provide, review the quotations, and award one quotation for each line item. Quotations are converted into one or more purchase orders or contracts.

- [Creating Requests for Quotations](#)
You create a Request for Quotations when you want potential vendors to provide quotations for items or services.
- [Copying line items from purchase requisitions to Requests for Quotations](#)
You can copy one or more line items from a purchase requisition to a Request for Quotations. This action provides a quick way to enter line items without manually entering all the detail information.
- [Creating, associating, and modifying terms](#)
You can create terms and conditions for records and you can associate existing terms with records. You can also modify how the sequence of terms displays for a record.
- [Creating units of measure](#)
You can create a unit of measure to describe the quantity used to measure an item, tool, or a service. You use a unit of measure to measure the items and services that you order, issue, and transfer in the asset management system. Examples of units of measure include EACH, CASE, IN (inches), and ROLL.
- [Creating conversion factors](#)
You can create a conversion factor to define the numeric value or ratio that the asset management system uses to relate one unit of measure to another. The conversion factor is an alternate value that is used to represent a unit of measure. You can use this alternate value to define an item order or transfer quantity and storeroom balance.

Creating Requests for Quotations

You create a Request for Quotations when you want potential vendors to provide quotations for items or services.

About this task

Quotations supplied by vendors must provide you with pricing and other line- item-specific information, such as manufacturer and delivery time. When you have quotations in hand, you can add them to the Quotation Lines table on the Quotations tab. You can then compare the quotations before awarding line items to vendors and before creating purchase orders.

When you create a Request for Quotations, the status defaults to INPRG (In Progress).

Procedure

1. Click New RFQ.
2. If the RFQ field is empty, specify a value. If the RFQ field contains an identifier, you can modify the value.

3. Optional: Type a description.
4. Specify Request for Quotations details, such as dates, terms, ship to information, and reply to information.
5. Click Save RFQ.

- **[Creating Requests for Quotations from purchase requisitions](#)**

You can create a Request for Quotations from a purchase requisition. The lines from the purchase requisition appear as line items in the Request for Quotations.

- **[Adding Request for Quotations line items](#)**

You can add line items to Requests for Quotations.

- **[Adding vendors to Requests for Quotations](#)**

When you create a Request for Quotations, you list the vendors to whom you will send the Request for Quotations.

- **[Adding quotation lines](#)**

After you receive the responses from vendors from whom you requested quotations, you can add the quotations into the record. Adding the quotation lines provides a complete record of the quotations from all of the vendors. You can then compare the quotations and award the line items based on the comparisons.

- **[Associating terms with vendors](#)**

In the Request for Quotations, you can associate terms from the Terms and Conditions library with a specific vendor. The library contains terms and conditions with which you and your vendors must comply.

Creating Requests for Quotations from purchase requisitions

You can create a Request for Quotations from a purchase requisition. The lines from the purchase requisition appear as line items in the Request for Quotations.

Procedure

1. From the toolbar of the Request for Quotations application, click New RFQ.
2. Select the Copy PR Line Items to RFQ action. Purchase requisition line items that have not been copied to purchase orders or contracts, and are not indicated as Copy to Contract appear in this window. Use the search fields to filter the line items you want to see. For example, you can enter a purchase requisition number in the PR field and click Find, to show only the line items from that purchase requisition.
3. Select one or more rows on the Copy PR Line Items to RFQ window.
4. Click OK.
5. Optional: Specify more Request for Quotations line items. You can modify the lines copied from the purchase requisition.
6. Click Save RFQ.

Adding Request for Quotations line items

You can add line items to Requests for Quotations.

Before you begin

You can add line items if the Request for Quotations has a status of In Progress (INPRG).

Procedure

1. From the Request for Quotations application, display the record to which you want to add lines.
2. Click the RFQ Lines tab.
3. Click New Row.
4. Specify a value in the Item field, or click the Detail Menu to select an option. If the line item is for a service, type a description and select the Service check box.
5. Type line item information in the fields.
6. Click Done.
7. Optional: Click New Row to add additional line items and follow steps 4 to 6.
8. Click Save RFQ.

Adding vendors to Requests for Quotations

When you create a Request for Quotations, you list the vendors to whom you will send the Request for Quotations.

Before you begin

If you want to add quotations from vendors on the Quotations tab, you must first specify the vendors before changing the status to SENT. Additionally, to add vendors, the status of the Request for Quotations must be INPRG (In Progress).

Procedure

1. From the Request for Quotations application, display the Request for Quotations to which you want to add a vendor.
2. Click the Vendors tab.
3. Perform the following steps for all vendors that you want to add:
 - a. Click New Row.
 - b. To select a vendor, specify a value in the Vendor field.
 - c. Modify vendor information to make it specific to this Request for Quotations. Any changes to vendor information you type do not change the record for the vendor in the Companies application. To change vendor information permanently, edit the company information in the Companies application.
 - d. In the Terms and Conditions for Vendor table window, select terms for the vendor.
4. Click Done, and click Save RFQ.

Adding quotation lines

After you receive the responses from vendors from whom you requested quotations, you can add the quotations into the record. Adding the quotation lines provides a complete record of the quotations from all of the vendors. You can then compare the quotations and award the line items based on the comparisons.

Before you begin

You can add quotation lines only if the status of the Request for Quotations is either SENT (Sent to the Vendor) or COMP (Completed).

About this task

You can specify quotation information for a line on either the Vendor tab or on the Item tab. However, you can initially add the quotation lines only by using the Select RFQ Lines button on the Vendor sub tab.

A quotation from a vendor shows in the currency of the vendor. The cost of the quotation line also shows in the base currency. You can then compare the cost of the item from all vendors from whom you received quotations. When you change the currency of a line, the unit cost, the line cost, and the tax amount display in the base currency.

Procedure

1. From the Request for Quotations application, display the record that you want to edit.
2. Click the Quotations tab.
3. On the Vendors sub tab, select the vendor whose quotations you want to add.
4. Click Select RFQ Lines. The Select RFQ Lines window shows all lines that have not been copied to the Quotations for Vendor table for the currently selected vendor.
5. Select one or more lines to copy, or select the topmost check box to select all lines.
6. Click OK.

Associating terms with vendors

In the Request for Quotations, you can associate terms from the Terms and Conditions library with a specific vendor. The library contains terms and conditions with which you and your vendors must comply.

Procedure

1. From the Request for Quotations application, display the record to which you want to associate terms.
2. Click the Vendors tab.
3. In the RFQ Vendors table window, click View Details for the vendor with whom you want to associate terms.
4. In the Row Details window, click Select Terms.
5. Select the check boxes next to the terms that you want to associate with the record and click OK.
6. Click Save RFQ.

Copying line items from purchase requisitions to Requests for Quotations

You can copy one or more line items from a purchase requisition to a Request for Quotations. This action provides a quick way to enter line items without manually entering all the detail information.

Before you begin

The Request for Quotations must be in INPRG (In Progress) status before you can add line items to it from a purchase requisition.

About this task

If a vendor is associated with a line that is copied, the vendor is added to the list of vendors for that Request for Quotations.

Procedure

1. From the Request for Quotations application, display the Request for Quotations to which you want to add line items.
2. Select the Copy PR Line Items to RFQ action. Purchase requisition line items that have not been copied to purchase orders or contracts, and are not indicated as Copy to Contract appear in this window.
3. From the Copy PR Line Items to RFQ window, select the check box for each line item that you want to copy.
4. Click OK.
5. Specify more Request for Quotations line items. You can modify the lines copied from the purchase requisition.
6. Click Save RFQ.

- [Copying lines for selected vendors](#)

You can copy any Request for Quotations lines or all Request for Quotations lines for selected vendors.

- [Awarding quotation lines](#)

You can award quotation line items to different vendors. You can also award all quoted line items to a single vendor.

- [Deleting quotation lines from Requests for Quotations](#)

You can delete quotation lines from Requests for Quotations.

- [Creating purchase orders for quotation lines](#)

After you award quotation lines to a vendor, you can create a purchase order for that vendor for those line items.

Copying lines for selected vendors

You can copy any Request for Quotations lines or all Request for Quotations lines for selected vendors.

Before you begin

You can copy quotation lines only if the Request for Quotations has a status of SENT (Sent to Vendor) or COMP (Completed).

About this task

A quotation from a vendor shows in the currency of the vendor. The cost of the quotation line also shows in the base currency. You can then compare the cost of the item from all vendors from whom you received quotations. When you change the currency of a line, the unit cost, the line cost, and the tax amount display in the base currency.

Procedure

1. From the Request for Quotations application, display the record to which you want to copy quotation lines.
2. Click the Quotations tab.
3. In the Vendor field on the Vendor sub tab, click the name of the vendor for whom you want to insert one or more quotations.
4. Click Select RFQ Lines. The Select RFQ Lines window opens. The window shows all lines that have not been copied to the Quotations for Vendor table for the selected vendor.
5. In the Select RFQ Lines window, select the check box for one or more lines to copy, or select the topmost check box to select all of the lines.
6. Click OK.
7. Provide quotation information, such as unit cost and manufacturer, for the copied lines. You can also award quotation lines.

Awarding quotation lines

You can award quotation line items to different vendors. You can also award all quoted line items to a single vendor.

Before you begin

To add vendors, the Request for Quotations status must be INPRG (In Progress). To enter quotations from vendors in the future, you must first specify the vendors on the Vendors tab before changing the status to SENT (Sent to Vendor).

Procedure

1. From the Request for Quotations application, display the Request for Quotations to which you want to award quotation lines.
2. Click the Quotations tab.
3. Depending on how you want to reference a contract, do one of the following:
 - To award individual line items to a vendor:
 - On the Vendor sub tab, click the name of the vendor to whom you want to award one or more quotation lines.
 - In the Quotations for Vendor table, click the line item that you want to award to the vendor.
 - Select the Awarded check box to award that line item to the vendor.
 - Specify the unit cost of the line item.
 - Click Save RFQ.
 - To award all quoted line items to a vendor:
 - On the Vendor sub tab, click the name of the vendor to whom you want to award all quoted lines.
 - In the Quotations for Vendor table, click Award All. Clicking Award All awards all line items quoted by the vendor that have not already been awarded to another vendor. This action does not award all line items on the Request for Quotations.

- Specify the unit cost of each of the line items.
- Click Save RFQ.

Deleting quotation lines from Requests for Quotations

You can delete quotation lines from Requests for Quotations.

About this task

You cannot delete quotation lines if either of the following conditions exists:

- The quotation lines have been copied to a purchase order.
- The Request for Quotations has a CLOSED status.

Procedure

1. From the Request for Quotations application, display the record that you want to edit.
2. Click the Quotations tab.
3. On the Vendors sub tab, in the Quotations for Vendor table window, click Mark Row for Delete for the quotation line that you want to delete.
4. Optional: Repeat step 3 for each quotation line for each vendor.
5. Click Save RFQ.

Creating purchase orders for quotation lines

After you award quotation lines to a vendor, you can create a purchase order for that vendor for those line items.

Before you begin

Requests for Quotations must be either in SENT (Sent to the Vendor) status or in COMP (Completed) status. You can then award quotation lines and create a purchase order.

Procedure

1. From the Request for Quotations application, display the Request for Quotations for whom you want to create a purchase order.
2. Click the Quotations tab.
3. Perform the following steps for each vendor for whom you want to create a purchase order:
 - a. On the Vendor sub tab, click View Details next to the vendor name.
 - b. Optional: Award quotation lines to the selected vendor. Each line you award must have a unit cost.
 - c. Click Create PO.
 - d. Specify a purchase order number, or click Autonumber.
 - e. Optional: Type a description.
 - f. Click OK.

Creating, associating, and modifying terms

You can create terms and conditions for records and you can associate existing terms with records. You can also modify how the sequence of terms displays for a record .

- **Creating terms**
You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.
- **Associating existing terms with records**
You can associate terms and conditions with records to define the rules that your company and your vendors must follow on purchase order and contract transactions.
- **Modifying the sequence of terms for records**
You can change the order in which the terms for a record display. You can modify the sequence to display a more logical order, or to list certain terms sequentially.
- **Creating terms**
You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.
- **Associating existing terms with records**
You can associate terms and conditions with records to define the rules that your company and your vendors must follow on purchase order and contract transactions.
- **Modifying the sequence of terms for records**
You can change the order in which the terms for a record display. You can modify the sequence to display a more logical order, or to list certain terms sequentially.

Creating terms

You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.

Before you begin

Terms and conditions can only be added to purchasing or contracts records set at statuses in progress or waiting on approval.

Procedure

1. In a purchasing or contract application, display the record for which you want to create a term.
2. On the Terms and Conditions tab, click New Row.
3. Specify the sequence and term.
4. Optional: Select the Send to Vendor check box.
5. Save the record.

What to do next

You can set default term and condition values according to site and contract type in the Organizations application. When you create a contract record in a contracts application, the contract inherits the default term and condition values that you assigned to the selected contract type in the Organizations application.

Associating existing terms with records

You can associate terms and conditions with records to define the rules that your company and your vendors must follow on purchase order and contract transactions.

About this task

The Terms and Conditions application maintains a library of terms and conditions with which you and your vendors must comply. You can select terms from this library to apply to contract and purchasing records.

Procedure

1. In a purchasing or contract application, display the record for which you want to select a term.
2. On the Terms and Conditions tab, click Select Terms.
3. Select the Select Record check box next to each term that you want to associate with the record.
4. Click OK.
5. Optional: Select the term in the Terms and Conditions table window and select the Send to Vendor check box.
6. Save the record.

Modifying the sequence of terms for records

You can change the order in which the terms for a record display. You can modify the sequence to display a more logical order, or to list certain terms sequentially.

Procedure

1. In the appropriate Purchasing or Contract application, display the record with which you want to associate a term.
2. Click the Terms and Conditions tab.
3. In the Terms and Conditions table window, locate the rows for which you want to change the sequence.
4. In the Sequence column for the appropriate rows, specify a value. You can enter any integer up to 9999. The product defaults the sequence numbers to multiples of 10. You can rearrange the order without renumbering the entire sequence.
5. Click Save.

Creating units of measure

You can create a unit of measure to describe the quantity used to measure an item, tool, or a service. You use a unit of measure to measure the items and services that you order, issue, and transfer in the asset management system. Examples of units of measure include EACH, CASE, IN (inches), and ROLL.

About this task

A unit of measure works with a conversion factor. The conversion factor represents the numeric value or ratio that the asset management system uses to relate one unit of measure to another. You can create units of measure and conversion factors in many applications:

- Assets
- Purchase Orders
- Purchase Requisitions
- Receiving
- Item Master
- Meters
- Service Items
- Tools
- Stocked Tools
- Inventory

You can delete a unit of measure only when it is not used in a conversion, on a specification template, or on a meter record.

Procedure

1. Open an application.
2. Select the Unit of Measure and Conversion >>> Add/Modify Units of Measure action.
3. Insert a row.
4. In the Unit of Measure field, specify an identifier for the unit of measure.
5. Optional: Enter values in the following fields:
 - Abbreviation
 - DescriptionThe abbreviation value along with an asset classification is used to create descriptions for assets, locations, and items.
6. Click OK.

Creating conversion factors

You can create a conversion factor to define the numeric value or ratio that the asset management system uses to relate one unit of measure to another. The conversion factor is an alternate value that is used to represent a unit of measure. You can use this alternate value to define an item order or transfer quantity and storeroom balance.

Before you begin

You must define the units of measure before you can create conversion ratios.

About this task

You can create units of measure and conversion factors in the following applications:

- Purchase Orders
- Purchase Requisitions
- Receiving
- Item Master
- Service Items
- Tools
- Stocked Tools
- Inventory

Procedure

1. Open an application.
2. Select the Unit of Measure and Conversion >>> Add/Modify Conversions action.
3. Click New Row.
4. Enter values in the following fields:

Option	Description
From Unit of Measure	The original unit of measure value that you are converting from in the conversion factor calculation.
To Unit of Measure	The unit of measure value that you are changing or replacing in the conversion factor calculation.
Conversion Factor	The ratio that is applied to relate one unit of measure to another.
5. Optional: In the Item Number field, enter the item number that is associated to the conversion.
6. Click OK.

Companies

The Companies application maintains detailed information about vendors, manufacturers, and other companies.

Vendors can have parent companies. There can be multiple vendor locations for a single company. Using reports, you can determine total year-to-date expenditures with a single organization, regardless of its location. Company information must be entered in the Companies application first so that other modules, such as Inventory and Purchasing, can access the information.

With the Companies application, you can perform the following tasks:

- You can associate commodity codes with a vendor.
- You can add a commodity group to the database.
- You can add or modify a commodity code in a commodity group.
- You can bookmark a record so that I can view it at a later time.
- You can create a company record.
- You can delete a record.
- You can duplicate a record.
- You can view contract information related to the company.
- [Companies overview](#)
You can maintain detailed information about vendors, manufacturers, and other companies such as associating branches with companies, disqualifying vendors, and deleting company records.
- [Working with companies](#)
You can create company records detailing purchasing and payment details, associate branches, and associate commodities for vendor, manufacturing, and other companies.

Companies overview

You can maintain detailed information about vendors, manufacturers, and other companies such as associating branches with companies, disqualifying vendors, and deleting company records.

- [Company branches](#)
Your company might purchase products or services through a national vendor with local offices. If your company has locations in different cities, each location might purchase goods from the local office of the vendor.
- [Vendor disqualification](#)
If your company decides no longer to do business with a vendor, you can mark the record to indicate that the vendor is disqualified.
- [Deletion of company records](#)
You can delete a company record in the Companies application.

Company branches

Your company might purchase products or services through a national vendor with local offices. If your company has locations in different cities, each location might purchase goods from the local office of the vendor.

You can create branch records for a vendor company so that you can track purchasing either at the branch level, or with the vendor as a whole.

Branch hierarchies

The branch hierarchy can only be one level deep, with a parent company record and child branch records. Child records cannot be parents of other records. Parent records cannot be children of other records.

Vendor disqualification

If your company decides no longer to do business with a vendor, you can mark the record to indicate that the vendor is disqualified.

After you disqualify a vendor, you can no longer create new purchase requisitions, purchase orders, requests for quotations, or invoices for the vendor.

A disqualified vendor affects only those records created after you disqualified the vendor.

Deletion of company records

You can delete a company record in the Companies application.

The following rules apply to the deletion of company records:

- Company records that have been referenced in other applications (such as Purchase Orders, Invoices, and Contracts) might not be deleted.
- Company records that have associated branch records might not be deleted. To delete a company record with associated branch records, you must first sever all the branch associations with that company record.

By deleting a branch from a company record, you are removing the association of the branch with the company record. The branches that you delete remain in the database.

Working with companies

You can create company records detailing purchasing and payment details, associate branches, and associate commodities for vendor, manufacturing, and other companies.

- **[Creating company records](#)**
A company record contains organization-specific information about vendors, such as contact names and addresses.
- **[Creating commodity groups](#)**
You can create a commodity group to identify a grouping of items, tools, or services. A commodity group contains a grouping of individual commodity codes. Classifying items, tools, services with commodity groups and commodity codes provides a way for you to analyze spending by product type. You first define a commodity group and then add and associate individual commodity codes to the group.
- **[Associating commodities with company records](#)**
Classifying items, tools, services with commodity groups and commodity codes provides a way for you to analyze spending by product type. Associating commodity groups and codes with a company record helps you to analyze spending by company.
- **[Copying company records](#)**
You can duplicate an existing company record. Upon duplication, a copy of the existing record is created with the same values except for the Company field that is left blank.
- **[Associating branches with company records](#)**
You can associate branches with a company record. You can also specify whether you want payment information from the parent record to be used on invoices created against the branch.

Creating company records

A company record contains organization-specific information about vendors, such as contact names and addresses.

About this task

If a company has multiple locations, you can create separate records for each branch location and associate the records with a parent company record. Company information must be entered in the Companies application first so that other applications, such as Inventory and Purchasing, can access the information.

Procedure

1. On the toolbar of the Companies application, click New Company. If the Company field is empty, specify a value.
2. If the company has a parent, specify a value in the Parent field or click Detail Menu to select an option and retrieve a value.
Adding a name to the Parent field associates the company with the parent.
3. In the Description field, type a description of your company.
4. In the Company Type field, specify the type of company.
The company types are the following:
 - Courier - transit company
 - Manufacturer - manufacturer of items or assets
 - Vendor - vendor of items or assets
 - Internal - an entity within your organization that provides items or services within your organization.
5. Specify the currency that the company uses.
6. Optional: Specify details about the purchasing and payment.
7. Click Save Company.

Creating commodity groups

You can create a commodity group to identify a grouping of items, tools, or services. A commodity group contains a grouping of individual commodity codes. Classifying items, tools, services with commodity groups and commodity codes provides a way for you to analyze spending by product type. You first define a commodity group and then add and associate individual commodity codes to the group.

About this task

Once you have defined commodities you can associate them with company, contract, and item records. You can also associate commodities with individual purchase order or requisition lines for items, service items, or tools that do not have commodity codes assigned to them, including special order materials or services.

You can create commodity groups and codes in the following asset management system applications:

- Companies
- Item Master
- Purchase Orders
- Service Items
- Tools

Procedure

1. Open an application.
2. Select the Add/Modify Commodity Codes action.
3. In the Commodity Groups table window, click New Row.
4. In the Commodity Group field, enter an identifier for the commodity group.
5. Specify whether you want a service type item or service level agreement to use this commodity group.

Option	Service
Use commodity group	Selected
Do not use commodity group	Cleared

6. In the Commodity Codes for Commodity Group table window, click New Row.
7. In the Commodity Code field, enter an identifier for the commodity.
8. Specify whether you want a service type item or service level agreement to use this commodity code.

Option	Service
Use commodity code	Selected
Do not use commodity code	Cleared

9. Click OK.

Associating commodities with company records

Classifying items, tools, services with commodity groups and commodity codes provides a way for you to analyze spending by product type. Associating commodity groups and codes with a company record helps you to analyze spending by company.

Procedure

1. In the Companies application, display the record with which you want to associate commodities.
2. Select the Associate Commodities action.
3. In the Associate Commodities window, perform one of the following actions to select commodities:

Option	Description
To select multiple commodities	Click Select Commodities Groups or Select Commodity Codes. Select the commodities you want and click OK.
To select a single commodity	Click New Row in either the Commodity Groups section or in the Commodity Codes for Company Group section. In the Commodity Group/Commodity Code field, type an existing identifier or click Select Value.

4. Click OK.

Copying company records

You can duplicate an existing company record. Upon duplication, a copy of the existing record is created with the same values except for the Company field that is left blank.

About this task

If your system administrator selected the Automatically Add Companies to Company Master check box in the Sets application, you can duplicate an existing company record in the Companies application. If not, use the Company Master application to duplicate the record. Selecting the Automatically Add Companies to Company Master check box also creates a company master record each time you duplicate an existing company record.

Procedure

1. In the Companies application, display the record you want to duplicate.
2. Select the Duplicate Company action.
3. In the Company field, type an identifier.
4. Optional: Modify other fields.
5. Click Save Company.

Associating branches with company records

You can associate branches with a company record. You can also specify whether you want payment information from the parent record to be used on invoices created against the branch.

Procedure

1. Display the record to which you want to add branches. Click the Branches tab.
2. In the Branches table window, type a company name.
Adding a name to the Parent field associates the company with the parent.
3. Select the Use Parent Remit To check box if you want the payment information from the parent record to be used on invoices created against the branch.
4. Click Save Company.

Company Master

You use the Company Master application to create company master records that belong to a particular company set. You can also use the Company Master application to associate a company master record with an organization.

Company master records contain information pertaining to companies, such as the default contact person for the company. Company master records also contain purchasing details and payment details for the company.

With the Company Master application, you can perform the following tasks:

- Add a company master record to an organization
- Bookmark a record so that you can view it at a later time
- Create a company master record
- Delete a record

Note that if a company master record is associated with an organization, you cannot delete the record.

All company master records in the database belong to a company set. With company sets, you can share information about companies between multiple organizations. Each organization is associated with a company set.

- [Creating company master records](#)
Company master records maintain detailed information about companies that belong to a particular company set. Company master records contain information such as contact information for the company, the purchasing details, and payment details.
- [Adding company master records to organizations](#)
After you have created a company master record, you must add the record to one or more organizations. You cannot delete a company master record that is already associated with an organization.

Creating company master records

Company master records maintain detailed information about companies that belong to a particular company set. Company master records contain information such as contact information for the company, the purchasing details, and payment details.

Procedure

1. From the toolbar of the Company Master application, click New Company Master. If the Company field is empty, specify a value.
2. Specify a description of the company.
3. Specify the type of company.
4. Specify the currency that the company uses.
5. Optional: In the Customer # field, specify a number to be used by outside companies to uniquely identify your company.
6. In the Company Type field, specify a value or click Select Value.
7. Specify the contact information, such as phone, fax, and e-mail.
8. Specify the contact address information and remit-to-company address information.
9. Click Save Company Master.

What to do next

After you have created a company master record, you need to add the record to one or more organizations.

Adding company master records to organizations

After you have created a company master record, you must add the record to one or more organizations. You cannot delete a company master record that is already associated with an organization.

Procedure

1. From the Company Master application, display the record to which you want to add to an organization.
2. Select the Add Company Master to Organization action.
After a company master record has been added to an organization, that organization will not be listed in the Add Company Master to Organizations window the next time you access it with the same company master record selected. In other words, for any company master record, only those organizations that use the same company set and have not had that master record added to them are displayed.
3. Select the check box for each organization to which you want to add the record.
4. Click OK.

Terms and Conditions

You use the Terms and Conditions application to specify and to maintain a library of terms and conditions. You can add the terms and conditions to a purchasing document or to a contract. Terms can contain information such as liability concerns, shipping and handling details, and delivery time expectations.

The terms entered in the Terms and Conditions application are available from tabs in the purchasing and contract applications. From the tabs, you can select a term from the library to associate with a purchasing record or with a contract record.

- [Terms and conditions overview](#)
Terms and conditions can contain information such as liability concerns, shipping and handling details, and delivery time expectations. You can create term types which can be associated with terms and conditions.
- [Working with terms and conditions](#)
You can define and delete terms and conditions that can be used in the purchasing and contracts applications. You can associate terms and conditions with purchase order and contract records to determine the rules that your company and your vendors must follow on purchase order and contract transactions.
- [Terms and conditions overview](#)
Terms and conditions can contain information such as liability concerns, shipping and handling details, and delivery time expectations. You can create term types which can be associated with terms and conditions.
- [Working with terms and conditions](#)
You can define and delete terms and conditions that can be used in the purchasing and contracts applications. You can associate terms and conditions with purchase order and contract records to determine the rules that your company and your vendors must follow on purchase order and contract transactions.

Terms and conditions overview

Terms and conditions can contain information such as liability concerns, shipping and handling details, and delivery time expectations. You can create term types which can be associated with terms and conditions.

- [Terms and conditions](#)
You can create and maintain a library of terms and conditions that your company and your vendors must follow on purchase order and contract transactions. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.
- [Term types](#)
A term type is a user-defined value that is associated with a term in the Terms and Conditions application. The term type allows you to filter all records in the Terms and Conditions library by searching on the Type field. Defining a term type is optional.
- [Terms and conditions](#)
You can create and maintain a library of terms and conditions that your company and your vendors must follow on purchase order and contract transactions. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.
- [Term types](#)
A term type is a user-defined value that is associated with a term in the Terms and Conditions application. The term type allows you to filter all records in the Terms and Conditions library by searching on the Type field. Defining a term type is optional.

Terms and conditions

You can create and maintain a library of terms and conditions that your company and your vendors must follow on purchase order and contract transactions. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.

You can create a library of term and condition values in the Terms and Conditions application. You use the library to look up and associate terms and conditions to purchase order and contract records. The library is accessible in the Purchase Orders and contracts applications.

You can set default term and condition values according to site and contract type in the Organizations application. When you create a contract record in a contracts application, it inherits the default term and condition values that you assigned to the selected contract type in the Organizations application.

Term types

A term type is a user-defined value that is associated with a term in the Terms and Conditions application. The term type allows you to filter all records in the Terms and Conditions library by searching on the Type field. Defining a term type is optional.

Working with terms and conditions

You can define and delete terms and conditions that can be used in the purchasing and contracts applications. You can associate terms and conditions with purchase order and contract records to determine the rules that your company and your vendors must follow on purchase order and contract transactions.

- [Defining terms](#)
You use the Terms and Conditions application to define terms that apply to purchase orders.
- [Creating and deleting terms](#)
You can create terms and conditions for contracts and records. You can delete terms when they are no longer needed.
- [Associating existing terms with records](#)
You can associate terms and conditions with records to define the rules that your company and your vendors must follow on purchase order and contract transactions.
- [Modifying terms](#)
You use the Terms and Conditions application to modify the terms of a purchase order.

- [Modifying the sequence of terms for records](#)
You can change the order in which the terms for a record display. You can modify the sequence to display a more logical order, or to list certain terms sequentially.
- [Setting default terms](#)
You use the Terms and Condition application to specify that certain terms default on all purchase orders that are created.
- [Sorting terms by type](#)
You use the Terms and Conditions application to sort terms by type.
- [Defining terms](#)
You use the Terms and Conditions application to define terms that apply to purchase orders.
- [Creating and deleting terms](#)
You can create terms and conditions for contracts and records. You can delete terms when they are no longer needed.
- [Associating existing terms with records](#)
You can associate terms and conditions with records to define the rules that your company and your vendors must follow on purchase order and contract transactions.
- [Modifying terms](#)
You use the Terms and Conditions application to modify the terms of a purchase order.
- [Modifying the sequence of terms for records](#)
You can change the order in which the terms for a record display. You can modify the sequence to display a more logical order, or to list certain terms sequentially.
- [Setting default terms](#)
You use the Terms and Condition application to specify that certain terms default on all purchase orders that are created.
- [Sorting terms by type](#)
You use the Terms and Conditions application to sort terms by type.

Defining terms

You use the Terms and Conditions application to define terms that apply to purchase orders.

Procedure

1. In the Organization table window, select the organization for which you want to define a term.
2. Click New Row.
3. Specify a value in the Term field. The value must be unique.
4. Type a description
5. Optional: Specify a value in the Type field. The value you define can be used to filter the Terms and Conditions library. For example, you might have defined a type as PURCHASE, in which all the corresponding records contain information applicable to purchase orders. You could then search on PURCHASE and find only the relevant terms.
6. To be able to edit the term when it is associated with records in other applications, select the Editable check box. Otherwise, clear the check box.
7. To have the term appear as a default on all future purchase orders, select the Default on PO check box. Otherwise, clear the check box.
8. Click Save Terms and Conditions.

Creating and deleting terms

You can create terms and conditions for contracts and records. You can delete terms when they are no longer needed.

- [Creating terms](#)
You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.
- [Deleting terms](#)
You use the Terms and Conditions application to delete terms.
- [Creating terms](#)
You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.
- [Deleting terms](#)
You use the Terms and Conditions application to delete terms.

Creating terms

You can create terms and conditions that can later be associated with a contract or purchasing record. Terms and conditions can contain information such as: liability concerns, shipping and handling details, and delivery time expectations.

Before you begin

Terms and conditions can only be added to purchasing or contracts records set at statuses in progress or waiting on approval.

Procedure

1. In a purchasing or contract application, display the record for which you want to create a term.
2. On the Terms and Conditions tab, click New Row.
3. Specify the sequence and term.
4. Optional: Select the Send to Vendor check box.
5. Save the record.

What to do next

You can set default term and condition values according to site and contract type in the Organizations application. When you create a contract record in a contracts application, the contract inherits the default term and condition values that you assigned to the selected contract type in the Organizations application.

Deleting terms

You use the Terms and Conditions application to delete terms.

Procedure

1. In the Terms and Conditions application, in the Organization table window, select the organization to which the term belongs.
2. Click the Mark Row for Delete icon. To undo the delete before saving, click the Mark Row for Delete icon once more.
3. Click Save Terms and Conditions.

Associating existing terms with records

You can associate terms and conditions with records to define the rules that your company and your vendors must follow on purchase order and contract transactions.

About this task

The Terms and Conditions application maintains a library of terms and conditions with which you and your vendors must comply. You can select terms from this library to apply to contract and purchasing records.

Procedure

1. In a purchasing or contract application, display the record for which you want to select a term.
2. On the Terms and Conditions tab, click Select Terms.
3. Select the Select Record check box next to each term that you want to associate with the record.
4. Click OK.
5. Optional: Select the term in the Terms and Conditions table window and select the Send to Vendor check box.
6. Save the record.

Modifying terms

You use the Terms and Conditions application to modify the terms of a purchase order.

About this task

Modifying a term does not update records that reference the term. The modifications only affect future instances.

Procedure

1. In the Terms and Conditions application, in the Organization table window, select the organization to which the term you want to edit belongs.
2. Click View Details.
3. In the Details table window, edit the term information
4. Click Save Terms and Conditions.

Modifying the sequence of terms for records

You can change the order in which the terms for a record display. You can modify the sequence to display a more logical order, or to list certain terms sequentially.

Procedure

1. In the appropriate Purchasing or Contract application, display the record with which you want to associate a term.
2. Click the Terms and Conditions tab.
3. In the Terms and Conditions table window, locate the rows for which you want to change the sequence.
4. In the Sequence column for the appropriate rows, specify a value. You can enter any integer up to 9999. The product defaults the sequence numbers to multiples of 10. You can rearrange the order without renumbering the entire sequence.
5. Click Save.

Setting default terms

You use the Terms and Condition application to specify that certain terms default on all purchase orders that are created.

About this task

Modifying a term does not update records that reference the term. The modifications only affect future instances.

Procedure

1. In the Terms and Conditions application, in the Organization table window, select the organization to which the term you want to edit belongs.
2. Click View Details.
3. In the Details table window, select the Default on PO check box.
4. Click Save Terms and Conditions.

Sorting terms by type

You use the Terms and Conditions application to sort terms by type.

About this task

Only terms associated with one organization can be viewed at one time.

Procedure

1. In the Terms and Conditions application, in the Organization table window, select the organization to which the term you want to sort by type belongs.
2. In the Terms and Conditions table window for that site, click the Type column title. The terms are sorted by type.

Release module

You use the Activities and Tasks application to plan, review, and manage activities and tasks. When you create an activity, you initiate the work process and create a historical record of the work being performed.

- **Activities and Tasks**
You use the Activities and Tasks application to plan, to review, and to manage activities and tasks. An activity initiates the work process and creates a historical record of the work being performed. Activities are created in the Incidents and Problems applications. A task is a specific unit of work on a work order.

Activities and Tasks

You use the Activities and Tasks application to plan, to review, and to manage activities and tasks. An activity initiates the work process and creates a historical record of the work being performed. Activities are created in the Incidents and Problems applications. A task is a specific unit of work on a work order.

An activity is a type of work order. A task can be created as part of an activity or part of another work order.

You can use the Activities and Tasks application to perform the following functions:

- Change the status of activities and tasks
- Take ownership of activities or tasks
- Assign ownership of activities and tasks to individuals or to workgroups
- Modify activities and tasks to reflect changes
- View related preventive maintenance and scheduling information
- Categorize the activities and tasks using classifications and attributes to simplify their management and retrieval
- Specify, view, and modify job tasks and the labor, material, services, and tool requirements for work plans
- View, add, and delete work orders and tickets that are related to an activity or to a task
- View follow-up records for an activity or a task
- View and create a work log and communication entries about a record

- [Activities and tasks overview](#)
An activity specifies the tasks, and the labor, materials, services, and tools needed to complete the task. Activities are created to document the required work, which can then be delegated to the individuals responsible for completing the work.
- [Working with activities](#)
Activities are created in the Incidents and Problems applications. Tasks are created as part of activities and other work orders. You can manage and modify activities and tasks in the Activities and Tasks application. For example, you can change the ownership or status of an activity or task.

Activities and tasks overview

An activity specifies the tasks, and the labor, materials, services, and tools needed to complete the task. Activities are created to document the required work, which can then be delegated to the individuals responsible for completing the work.

- [Record ownership](#)
The owner of a record is the person or person group that is in charge of the record from an administrative perspective.
- [Activity statuses](#)
The status of an activity indicates its position in the processing cycle. The status determines which actions can be performed on the activity. For example, if the activity is approved (APPR), then the tasks can start.
- [Measurement points](#)
When you inspect an asset or a location, you can record and view the meter readings that correspond to measurement points in the job plan of the associated work order. You can also insert measurement points on an activity until the activity or task is closed.
- [Service level agreements](#)
A service level agreement (SLA) typically is a written agreement that outlines the commitment between a service provider and its customers. A commitment is a service level that all parties have agreed to, such as asset reliability or availability.
- [Record relationships](#)
Relationships between records, such as tickets and work orders, help simplify record management. You can create record relationships manually, or relationships might be created automatically when you take certain actions.
- [Costs on tickets and work orders](#)
You can view the estimated and actual costs for a single work order or ticket, including costs for labor, material, tools, and services. You can also view total costs for the current record and all the records below it in its hierarchy.
- [Work plan removal](#)
Under certain circumstances, you can remove a work plan from an activity by using the Remove Work Plan action.
- [Deletion rules for activities](#)
For auditing purposes, you cannot always delete activities. If you cannot delete a specific activity, you can stop all action on an activity by changing the status to canceled.
- [Rules for modifying archived activities](#)
Closed and canceled activities are archived, and become historical records. You might be able to add additional information to a historical record by using the Edit History Activity action.

Record ownership

The owner of a record is the person or person group that is in charge of the record from an administrative perspective.

The owner of a record keeps the customer updated and acts as the point person for any issues involving the work. You can use the Select Owner action to assign record ownership to a person or person group, or you can use the Take Ownership action if you want to take administrative ownership of the record yourself. You can take ownership for more than one application.

Keep in mind the following points regarding record ownership:

- A record can have many different owners during its life cycle.
- You can select an owner or owner group until the record's status is CLOSED.
- To view the ownership history of a record, select View History.
- A workflow or an escalation process may assign ownership, if appropriate.

If the Persons tab on your Select Owner dialog box displays a Person Group field and a Date field, then you can filter the list of persons by the values in these fields. For example, suppose the Person Group field and the Date fields are empty when you open the dialog box. You specify a person group and a date and time, and click Refresh. The system displays only the persons in the specified group who are available on the specified day and time.

Activity statuses

The status of an activity indicates its position in the processing cycle. The status determines which actions can be performed on the activity. For example, if the activity is approved (APPR), then the tasks can start.

When you change the status of an activity, the status of any applicable child activity that uses the inherit status option also changes. If you change the status of global activities, the same status change is automatically applied to all globally related records. In addition, the status of an activity can be automatically changed. For example, after you assign an owner to an activity, the status of that activity automatically changes to queued.

A follow-up record can change the status of the originating activity, which results in automatic routing or notification of the status change.

WAPPR

The activity is waiting for approval. WAPPR is the default status for records created in the Work Order Tracking, Changes, Releases, and Activities and Tasks applications.

APPR

The activity is approved and the work can begin. Work plan items on an approved activity are reserved in inventory, and cost and rate data are recorded. Rates can be changed in the Inventory application, Labor application, or Tools application. If the rates are changed in any application, the work plan reflects the rates in effect when the activity was approved.

WSCH

The activity is waiting to be scheduled. WSCH is the default status for records created in the Preventive Maintenance application.

WMATL

Materials must arrive before the work can be performed.

WPCOND

The work can be performed only when the condition of the plant is suitable. For example, certain work might require the shutdown of the plant.

INPRG

The work is in progress. INPRG is the default status for records created in the Quick Reporting application.

COMP

The physical work is completed. If you want to move or change an asset on an activity, the move or change occurs when the status is changed to complete.

CLOSE

The activity is finalized. Inventory reservations for items not used in the activity are removed and the activity is made into a history record.

CAN

The work is canceled. You cannot cancel an activity if the work has already been initiated or if actuals have already been reported. You can use this status when you want to delete an activity and deleting is not allowed.

Measurement points

When you inspect an asset or a location, you can record and view the meter readings that correspond to measurement points in the job plan of the associated work order. You can also insert measurement points on an activity until the activity or task is closed.

The product copies the measurement point number to the job plan when there is a three-way match between the following items:

- The measurement point name on the job plan listed on the activity.
- The measurement point name on the asset or the location listed on the activity.
- A measurement point number for the measurement point name.

If you specify a measurement for a measurement point, the measurement and measurement date are added to the Measurements table. If you specify a measurement without a measurement point, the measurement data is saved with the activity.

You use the Observation field to record visual inspection data. You use the Inspector field to record the name of the person performing the inspection. You can edit these fields until the activity is closed. Once the activity is closed, you can add or modify operations by selecting the Edit History Activity action.

Service level agreements

A service level agreement (SLA) typically is a written agreement that outlines the commitment between a service provider and its customers. A commitment is a service level that all parties have agreed to, such as asset reliability or availability.

The SLA describes one or more commitments and the escalation actions or notifications associated with each commitment. Escalation actions or notifications might be associated with an SLA to ensure that commitments are met. An escalation process can monitor all activities and send notifications or perform other activities to ensure that commitments are met.

The types of records to which service level agreements can be applied include tickets, such as service requests, and work-based records, such as work orders. Before you can apply an SLA to a record, the record must have a site defined.

A service level agreement can be associated with a record in several ways:

- An SLA might automatically be applied to a record from within a workflow or escalation process, or from another SLA.
- You can select an action to apply an SLA, which applies the best match automatically.
- You can view SLAs and select an action to select or clear the SLAs that you want to manually apply to the record.

When you apply a service level agreement to a record, the following events occur:

- The SLA Applied check box on the main tab of the record is selected to document the action.
- Any escalations that are associated with the SLA are activated.
- The Target Start, Target Finish, and Contact values for the record might be calculated automatically as follows:

Automatically calculated values
When an SLA is applied that includes a response commitment, the response commitment date populates the Target Start date field of the record.
When an SLA is applied that includes a resolution commitment, the resolution commitment date populates the Target Finish date field of the record.
When an SLA is applied that includes a contact commitment, the contact commitment date populates the Target Contact date field of the record.

Record relationships

Relationships between records, such as tickets and work orders, help simplify record management. You can create record relationships manually, or relationships might be created automatically when you take certain actions.

The types of relationships that can exist between records include:

- Related relationship, which is an informal association of tickets that is used for informational purposes.
- Originator and Follow-up, which keep costs hierarchies separate while still creating a relationship between the tickets.
- Related to Global, which creates a relationship in which the tickets are related to a global issue, which affects many users.

Related records

Using any ticket or work-based application, you can view similar records and relate tickets and work orders to the current record. A related relationship between records is an informal relationship that is for informational purposes only.

A related relationship does not affect status inheritance, affect workflow, or follow a set of business rules. Related relationships can be many-to-many, and do not represent record hierarchies. By relating records informally, you can navigate to related records, view related information for similar records, and view open tickets that are associated with a field. You can create an informal record relationship in the following ways:

- Use the Related Records tab of the application. This tab provides an easy way to create relationships and to view and navigate among informally related records.
- Use the Show Similar Tickets action in any ticket application. The similar ticket search results only include the service requests, incidents, and problems that have the same classification as the current ticket. Global records and history records are not included in the results. Your system administrator might add more restrictions to the search results.

Originator and follow-up tickets and work orders

You can relate tickets and work orders to a record more directly when you create a follow-up record from the ticket using one of the Create actions on the ticket. The ticket you create the follow-up record from is the originator. A follow-up record can be a ticket or a work order. In some cases, a follow-up ticket or work order might be able to change the status of its originating ticket. An originating ticket cannot change the status of a follow-up work order, nor can a follow-up ticket change the status of the originator if there is more than one follow-up. These options are configured by the system administrator.

Globally related tickets

A global ticket is an incident or problem relating to an issue that affects many users. You can relate tickets, including service requests, to a global ticket, which creates a RELATEDTOGLOBAL relationship. This relationship lets you manage the tickets by using the global ticket. When you change the status of the global ticket, the system changes the status of all globally related tickets.

If your administrator has set up automated notifications of status changes, the system changes the status of the tickets related to the global issue. For example, all the initial requestors reporting the same issue are notified of its resolution. On the global ticket, you can also view a list of related records and view the work and communication logs for all related records.

- [Deletion of record relationships](#)
On the Related Records tab, you can delete the relationship between a change and any related work orders or tickets.
- [Global records](#)
A global record is a ticket that is a root cause of other issues or that affects many users, such as computer network failures or flooding in a building. After you mark a record as global, you can relate multiple tickets and then manage all tickets using the global record.

Costs on tickets and work orders

You can view the estimated and actual costs for a single work order or ticket, including costs for labor, material, tools, and services. You can also view total costs for the current record and all the records below it in its hierarchy.

When you view the costs of a ticket or work order, the data is displayed in two tables:

- The Totals table displays the costs for a single ticket or work order.
- The View Hierarchy Grand Totals table displays the costs for the current ticket or work order and all records under its hierarchy.

Each table presents the same information, which is shown in the following table.

Column	Explanation
Current Estimate	Displays read-only calculated values for the current totals from the Labor, Materials, Standard Services, and Tools tabs of the Plans tab for the ticket or work order.
Estimate at Approval	Is set to zero until the work order is approved, then the values are copied from the Current Estimate column and are read-only. If the work order status changes from approved to unapproved, then these fields are cleared. The estimated costs at approval are not affected by the change in status from in progress to completed or closed.
Actual	Displays the read-only values from the Labor (for approved labor only), Materials, and Tools tabs of the Actuals tab. If the status of the record changes from approved, then these fields are not cleared.

Rolling up maintenance costs

After you close a work order that is associated with an asset, you can calculate your maintenance costs by rolling up costs that you incur for labor, materials, tools, and services to the top-level asset in the hierarchy that the asset belongs to.

Costs can be rolled up manually or automatically. By default, cost rollups are manual. If you want costs to be calculated and rolled up automatically when a work order is closed, you must set the `mxe.workorder.rollupMaintenanceCosts` system property to 1. After you configure the system property for automatic rollups, all subsequent costs that are associated with work orders are rolled up automatically. However, any unprocessed maintenance costs that existed before the configuration are not automatically rolled up. You must roll up any preexisting, unprocessed maintenance costs manually.

To calculate the maintenance cost of your assets, use the Roll Up Maintenance Costs action in the Assets application.

If you upgrade to Maximo® Manage 8.5, run the Asset Cost Rollup Report to roll up pending maintenance costs before the upgrade.

Work plan removal

Under certain circumstances, you can remove a work plan from an activity by using the Remove Work Plan action.

When you remove a work plan, all information in the Resources tab, except for non-task children, is removed. Also, if the work plan has a job plan, the job plan identifier is removed.

If any task in the work plan cannot be removed based on the deletion rules for changes, you cannot use the Remove Work Plan action. You can still delete labor, material, services, and tools information, as well as any tasks that do meet the deletion rules.

Deletion rules for activities

For auditing purposes, you cannot always delete activities. If you cannot delete a specific activity, you can stop all action on an activity by changing the status to canceled.

The activity and its children must meet the following criteria to be deleted:

- Have a status of waiting for approval
- Not have any transactions registered against it, except for status changes
- Not have any actuals reported against it
- Not have any labor assignments associated with it
- Not have been generated for a purchase order or receipt
- It must not have any failures reported against it.
- Not be in a workflow or have ever been in a workflow
- Not have any measurements or meter readings taken against it
- Cannot be or have follow-up work

To delete an activity, use the Delete Activity action.

Rules for modifying archived activities

Closed and canceled activities are archived, and become historical records. You might be able to add additional information to a historical record by using the Edit History Activity action.

When you modify an archived activity, the following rules apply:

- New costs that were incurred during the edit history must be added to the inventory cost, if it is defined as charge to store.
- You can add actual labor, but you cannot change approved transactions.
- You can add actual materials and actual tools, but you cannot change them.
- You can add or delete child records, whether or not the child records are tasks.
- You can attach documents.
- You cannot change planned labor, materials, and tools.
- You cannot change information in the following fields:
 - Asset.
 - Location.
 - GL Account.
 - Charge to Store.
 - Status.
 - Status Date

Working with activities

Activities are created in the Incidents and Problems applications. Tasks are created as part of activities and other work orders. You can manage and modify activities and tasks in the Activities and Tasks application. For example, you can change the ownership or status of an activity or task.

- [Planning activities and tasks](#)

After you associate a task with an activity, you can specify estimates for labor, craft, materials, services, and tools for each task on the activity or for the

activity as a whole.

- [Reporting actuals for activities and tasks](#)
As work progresses on an approved activity or task, you can report the actual labor hours, materials, services, and tools used.
- [Applying service level agreements to records](#)
You can apply a service level agreement (SLA) to a record to define the agreement and formal commitments between a service provider and a customer. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.
- [Swapping assets](#)
You can swap assets associated with a work order. The swap action applies to the work order and all of the assets, locations, and configuration items on its child work orders. The term "work order" can refer to a work order, change, release, or activity record.
- [Relating work orders or tickets to activities or to tasks](#)
You can link work orders and tickets to an activity or task. When you link a record to a work order, its relationship type is RELATED.
- [Classifying activity records](#)
To simplify the process of finding and managing activity records, you can classify the records. Categorizing an activity involves classifying it and adding and modifying attributes to further group the classification.
- [Setting up work process flows](#)
Work process flows use relationships between work orders and tasks to automate the flow of status changes. You set relationships between work orders and tasks so that when a task is completed, the next task in the flow can be initiated.
- [Changing the status of activities or tasks](#)
You can change the status of an activity to indicate the position of the activity as it moves toward completion.

Planning activities and tasks

After you associate a task with an activity, you can specify estimates for labor, craft, materials, services, and tools for each task on the activity or for the activity as a whole.

- [Creating work plans](#)
A work plan describes the labor, materials, tools, services, and tasks you need to complete an activity or task. You can create a work plan manually.
- [Planning work for activities and tasks](#)
You use the Activities and Tasks application to insert, view, or edit planned labor information or planned craft information.
- [Creating tasks for activities](#)
You use the Activities and Task application to create additional tasks or to edit the existing tasks for an activity. After you create a task, you can plan its labor, materials, services, and tools.

Creating work plans

A work plan describes the labor, materials, tools, services, and tasks you need to complete an activity or task. You can create a work plan manually.

Procedure

1. In the Activities and Tasks application, display the record for which you want to create a plan.
2. Make one of the following selections:

Option	Description
If the record is an activity	Click the Plans tab.
If the record is a task	Click the Resources tab, then click the Plans sub tab.

3. Specify work plan data, such as tasks, labor, materials, tools, and services using the sub tabs.
4. Save the record.

- [Creating work plans using job plans](#)
A work plan describes the labor, materials, tools, services, and tasks you need to complete an activity. You can select a job plan, and modify it to your needs.

Creating work plans using job plans

A work plan describes the labor, materials, tools, services, and tasks you need to complete an activity. You can select a job plan, and modify it to your needs.

Procedure

1. In the Activities and Tasks application, display the record for which you want to create a work plan from a job plan.
2. Make one of the following selections:

Option	Description
If the record is an activity	Click the Plans tab.
If the record is a task	Click the Resources tab, then click the Plans sub tab.

3. In the Job Plan field, click Detail Menu and select an option to retrieve a value. When you associate a job plan with a work order, the product copies the labor, the materials, the services, and the tools to the work order plan. If the job plan has a default safety plan for the selected work asset, the product also copies the safety plan to the work order.
4. Optional: Edit the fields to modify any of the information. Changes you make to the work plan do not affect the original job plan.

5. Save the record.

Planning work for activities and tasks

You use the Activities and Tasks application to insert, view, or edit planned labor information or planned craft information.

Procedure

1. Display the activity or task for which you want to plan labor.
2. Make one of the following selections:

Option	Description
If the record is an activity	Click the Plans tab.
If the record is a task	Click the Resources tab, then click the Plans sub tab.

3. Enter the details of the planned work on the following subtabs:

Option	Description
Labor	Add hours for labor or select crafts.
Materials	Add materials, search catalogs, or add spare parts.
Services	Add services.
Tools	Add tools.

4. Save the record.

Creating tasks for activities

You use the Activities and Task application to create additional tasks or to edit the existing tasks for an activity. After you create a task, you can plan its labor, materials, services, and tools.

Procedure

1. Display the activity for which you want to create planned tasks.
2. In the Tasks table window on the Plans tab, click New Row.
3. Specify a unique value in the Task field.
4. To have the tasks performed in a specific order, enter the appropriate value in the Sequence field.
5. Type the amount of time needed to complete the task in the Estimated Duration field.
6. Use the Labor, Materials, Services, and Tools subtabs to plan for the task.
7. Save the activity.

Reporting actuals for activities and tasks

As work progresses on an approved activity or task, you can report the actual labor hours, materials, services, and tools used.

Procedure

1. Display the activity or task for which you want to report actuals.
2. Make one of the following selections:

Option	Description
If the record is an activity	Click the Plans tab.
If the record is a task	Click the Resources tab, then click the Plans sub tab.

3. Enter the details for the actuals on the following subtabs:

Option	Description
Labor	Report hours for labor, copy labor from the work plan, or select planned labor.
Materials	Select materials, select reserved items, and select spare parts.
Services	Select services or standard services.
Tools	Select tools, copy tool data from the work plan, or select tools that were issued.

4. Save the record.

Applying service level agreements to records

You can apply a service level agreement (SLA) to a record to define the agreement and formal commitments between a service provider and a customer. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.

About this task

When you apply an service level agreement to work orders, the SLA is applied only to the work order, not to its tasks. If you want to apply a service level agreement to a task, you must display the task as the current record and then apply the SLA.

You can apply service level agreements to tickets and work orders.

Procedure

1. Open an application and display the record that you want to update.
2. Select the Apply SLA action.
3. Click OK.

Results

The SLA Applied check box on the main tab of the selected application is selected. The target start, target finish, and contact values are calculated for the selected record.

Removing service level agreements from records

To maintain accurate records, it might be necessary to remove an invalid or erroneous service level agreement to disassociate it from the record.

Procedure

1. Display the record for which you want to remove a service level agreement.
2. Select the Select/Deselect SLA action.
3. Click Mark Row for Delete for each service level agreement that you want to remove from the record.
4. Click OK.
5. Save the record.

Swapping assets

You can swap assets associated with a work order. The swap action applies to the work order and all of the assets, locations, and configuration items on its child work orders. The term "work order" can refer to a work order, change, release, or activity record.

Before you begin

You can execute the swap immediately, or you can save the swap as a plan. If you save the swap as a plan, the changes will apply when the status for the work order is COMP (Complete). When the status of a work order is COMP, you swap assets only using the Execute Now option. When you select Execute Now on any tab, the system executes the changes on all tabs.

When you duplicate a work order that has a planned swap to its assets or locations, the planned action does not get copied to the duplicate work order. Also, when you create a release, or change, or work order from a record using the Select Action menu option, the planned action is not copied to the follow-up record.

Procedure

1. Select the Move/Swap/Modify action.
2. Click the Move/Swap tab.
3. Select the Is this an Asset Swap checkbox.
4. In the Swap Assets section, select the row for the asset you want to swap.
5. To move the asset to a parent or location, type a value in the appropriate field, or click Select Value to retrieve a value.
6. In the Replacement Asset field, specify an asset, or click Select Value to retrieve a value.
7. Perform one of the following actions:
 - To swap the assets immediately, click Execute Now.
 - To swap the assets when the status for the work order is COMP (Complete), click Save as Plan.

Relating work orders or tickets to activities or to tasks

You can link work orders and tickets to an activity or task. When you link a record to a work order, its relationship type is RELATED.

Procedure

1. In the Activities and Tasks application, display the record to which you want to add related records.
2. On the Related Records tab, perform either of the following actions:
 - To relate a work order to the current record, in the Related Work Orders table window, click Add Row.

- To relate a ticket to the current record, in the Related Tickets table window, click Add Row.
3. Type or select a work order in the Work Order field, or specify a ticket in the Related Record Key field.
 4. Optional: You can enter a class.
 5. Save the activity.

- **Assigning a parent to a work order**

You can assign a parent to a work order and assign tasks to that parent. When you assign work order records to a parent, they become child work orders records of the parent record.

- **Removing relationships between records**

You can remove the relationship between an activity or a task and its related work orders or tickets.

Assigning a parent to a work order

You can assign a parent to a work order and assign tasks to that parent. When you assign work order records to a parent, they become child work orders records of the parent record.

About this task

You cannot assign parent records to closed work order records. If the parent has a value in the Priority field, and the child or children work order records do not, the child or children work order records inherit the parent priority value.

Procedure

1. Open an application and display the work order record that you want to update.
2. On the List tab, select the task that you want to update.
3. Select the Assign To New Parent action.
4. Select the work order record that you want as the new parent.
The asset management system displays the parent work order number in the Parent WO field.
5. Click Save record.

Removing relationships between records

You can remove the relationship between an activity or a task and its related work orders or tickets.

Before you begin

You can remove the relationship between records only if the ticket or the work order has a type of RELATED.

About this task

To delete relationships with work orders of other relationship types, such as FOLLOWUP or ORIGINATOR, delete the work order in any of the following applications:

- Work Order Tracking
- Activities and Tasks
- Changes
- Releases

To delete relationships with tickets of other relationship types, you must go to the tickets applications.

Procedure

1. In the Activities and Tasks application, display the record with the related relationship that you want to delete.
2. On the Related Records tab, select the record in the Related Work Orders table window.
3. Click the Mark Row for Delete icon. You can mark more than one row.
4. Click Save Activity.

Classifying activity records

To simplify the process of finding and managing activity records, you can classify the records. Categorizing an activity involves classifying it and adding and modifying attributes to further group the classification.

About this task

For example, you might classify an activity as a notebook. The notebook classification might have the attributes of memory, speed, and disk space associated with it, which are copied to the record upon classification. As needed, you can add attributes such as operating system and power, change the attribute values, and

remove attributes associated with the record.

Procedure

1. In the Activities and Tasks application, display the activity record that you want to categorize.
2. Select a classification for the activity in one of the following ways:

Choice	Description
Use the Classification field	In the Classification field of the main application tab or on the Activities and Tasks tab, click Detail Menu and then select Classify to produce a classification hierarchy tree that you can drill down through and select a classification.
Use the Class Description field	In the Class Description field of the main application tab or on the Activities and Tasks tab, you can hasten the classification search as follows: <ol style="list-style-type: none">a. Click the Select Value icon next to the Class Description field and enter a keyword or a word string, such as <i>Operating System</i> into the Description field of the window. All classification values that contain the keyword or word string are retrieved.b. Click a value from the resulting list to select the classification.

3. Optional: You can view the attributes that are associated with the selected classification in the Attributes table window. You can also add, delete, and change the values of the attributes in the row details.
4. Save the activity.
The full classification path appears in the Classification field, where you can view all nodes of the classification.

Setting up work process flows

Work process flows use relationships between work orders and tasks to automate the flow of status changes. You set relationships between work orders and tasks so that when a task is completed, the next task in the flow can be initiated.

Before you begin

To set the process flow for individual tasks, you must select Under Flow Control at the header level for the work order.

About this task

The best practice for consistently using the flow feature is to set up the process flow as a work template at the job plan level.

Procedure

1. Open the work order.
2. Select Under Flow Control.
3. On the Plans tab, display the details for the task.
4. In the Scheduling Information section, next to the Predecessors field, click the Detail Menu icon.
5. Select the tasks that must be completed before this task is initiated.
6. Save the work order.

- **Defining flow actions**

A flow action is used in a work process flow to define certain actions that should occur while work is being done. Actions or action groups can be applied to any work order, task, or job plan task.

- **Removing work process flow from work orders or job plans**

You can remove work process flow for a work order, a job plan, or task records that have it defined. You can do this at the header level, which will remove it for all the associated tasks as well, or you can remove it at the task level.

- **Suspending work process flows**

You can suspend the work process flow for work order or task records that have it defined. For example, if you want to start a work order or task manually, you could suspend the flow control on that record. The flow remains suspended until you remove the suspension.

- **Stopping workflow processes**

You can stop a workflow process for a record. You use the Workflow Administration application to view and stop workflow processes.

Defining flow actions

A flow action is used in a work process flow to define certain actions that should occur while work is being done. Actions or action groups can be applied to any work order, task, or job plan task.

About this task

You can determine whether the action takes place automatically, or if the action only takes place when it is initiated manually. When automatic, the action takes place as soon as the work order or task status is changed to an in progress (INPRG) status value by work process flow. When manual, you must initiate the flow action by running the automation or processing scripts or placing an action button on the target application. Actions and action groups are defined in the Actions application.

Procedure

1. In an application that supports flow action, display the record for which you want to define a flow action.
2. Perform one of the following actions:
 - For a work order, change, release, or job plan record, enter a value in the Flow Action field on the application tab.
 - For a work order or job plan task, enter a value in the Flow Action field in the Task table window. The Tasks table window is found on the main tab of the Job Plans application, or the Plans tab of the Work Order Tracking, Changes, and Releases applications.

The defined action runs when the work order or task status value is changed to INPRG.

3. Specify whether you want the flow action to be automatically run:

Option	Flow Action Assist
Automatically run the flow action	Cleared
Manually run the flow action	Selected

4. Click Save record.

Removing work process flow from work orders or job plans

You can remove work process flow for a work order, a job plan, or task records that have it defined. You can do this at the header level, which will remove it for all the associated tasks as well, or you can remove it at the task level.

About this task

If work process flow is removed at the header level, it will automatically be removed on individual tasks on the record. You cannot retain work process flow for a task that does not have it set at the header level.

Procedure

1. In an application that supports flow action, display the record that you want to remove from work process flow.
2. On the main application tab, clear the Flow Controlled check box. The system removes the work order or the job plan, and all of its tasks from work process flow.
3. Click Save Record.

Suspending work process flows

You can suspend the work process flow for work order or task records that have it defined. For example, if you want to start a work order or task manually, you could suspend the flow control on that record. The flow remains suspended until you remove the suspension.

Before you begin

Removing the suspension restarts the flow. Any successor work orders or tasks with completed predecessors continue the process. Work orders and tasks without predecessors continue the process at the same time as the parent record. The last completed child under a parent rolls its completion up to the parent.

Procedure

1. In an application that supports flow action, display the record on which you want to suspend flow control.
2. On the main application tab, at the header level, select the Suspend Flow Control check box. The system suspends the work process flow on the work order and on all of its tasks.
3. To retain flow control for individual tasks, display the tasks in the Tasks table window, and clear the Suspend Flow Control check box at the task level. Flow control remains in place at the task level. This action does not affect the suspension at the work order header level. You can find the Tasks table window on the Plans tab.
4. Click Save Record.

Example

You generally suspend a set of tasks, often under the same parent. For example, you can delay the automatic starting of one whole phase of work until a certain condition has been met. You can also delay starting a phase of work to make changes to the tasks, such as inserting tasks, deleting tasks, and changing the precedence logic.

Changing the status of activities or tasks

You can change the status of an activity to indicate the position of the activity as it moves toward completion.

Procedure

1. In the Service Requests, in the Problems, or in Incidents application that corresponds to the type of record you are managing, display the record whose status you want to change.
2. Select the Change Status action.

3. In the New Status field, choose a status from the pull-down menu.
4. Click OK to change the status.

What to do next

If you change a ticket to a RESOLVED status, and you are the designated owner of that ticket, you might want to stop the timer or otherwise report the time that you spent resolving the issue.

Security module

You use the applications in the Security module to implement and manage security for users and groups.

- **Security Groups**
You use the Security Groups application to set up and to manage security privileges for users.
 - **Users**
In the Users application, you can manage certain information in user records. New user records are created in Maximo Application Suite and can be synchronized to Maximo Manage. User records contain user names and security profiles that determine the applications, options, and data that a user can access.
-

Security Groups

You use the Security Groups application to set up and to manage security privileges for users.

You can assign users to groups from both the Security Groups application and from the Users application:

- In the Security Groups application, you assign users to groups.
- In the Users application, you assign groups to users.

You can view the security privileges for a user using the Security Profile tab in the Users application.

Upon implementation, the Security Groups application has the following groups:

- MAXDEFLTREG - This group allows users to change their password if it expires. The group contains no other rights. When you create a user record, the user is placed in this default group. You can specify a different group to be the default using the Security Controls action. If you want new user security profiles to start with more rights, you can change the MAXDEFLTREG group to include these rights.
- MAXADMIN - This group provides enough access to add users and groups.
- MAXREG - This group allows users to self register. You can use the MAXREG group to initiate a workflow process by which an administrator is alerted to assign new users to the appropriate security groups.
- MAXEVERYONE - This group is used for global settings that apply to all users in the system.

When you delete users and security groups on the Lightweight Directory Access Protocol (LDAP), the users and security groups are not deleted in the system. This restriction is for audit purposes for clients in regulated industries.

Multisite implementation

If your company has multiple sites, you can create groups to reflect these sites. You can then combine the site groups with functional groups to create fine-grained sets of security privileges. For example, if you have sites in Toronto and Montreal, you can name two groups TORONTO and MONTREAL. You can then add groups to reflect functional units, such as finance, administration, maintenance, electrical, and so on.

Application server

If implementation uses an application server to authenticate with an external directory, some functions are performed in the directory and synchronized into the system. These functions include adding users (including self-registration), adding security groups, associating users with security groups, and managing passwords. In addition, when you delete users in the directory, those users are not automatically deleted in the system; you must manually delete them.

Users

In the Users application, you can manage certain information in user records. New user records are created in Maximo® Application Suite and can be synchronized to Maximo Manage. User records contain user names and security profiles that determine the applications, options, and data that a user can access.

User records must have associated person records. A user record can be associated with only one person record and a person record can be associated with only one user record. You can associate a labor record and a user record with the same person record.

The following table describes the database tables that are updated when a user is synchronized to Maximo Manage.

Table 1. Database tables that are updated for user records

Database table	Description
MAXUSER	<ul style="list-style-type: none">• Updates with new user data.

Database table	Description
PERSON	<ul style="list-style-type: none"> Updates with new person data (if a person record needs to be created for the new user).
PHONE	<ul style="list-style-type: none"> Stores all user phone number information, including home phone number, work phone number, cell phone number, pager number, and so on. Indicates primary phone number.
EMAIL	<ul style="list-style-type: none"> Stores all user email addresses, including home email address, work email address, and alternate email addresses Indicates primary email address
GROUPUSER	<ul style="list-style-type: none"> Updates the relationship between security groups and the user.
USERPURGL	<ul style="list-style-type: none"> Stores the default purchasing general ledger account for the new user. This data is optional.
GRPREENASSIGNAUT H	<ul style="list-style-type: none"> Stores the name of the user as a person with authority to add users to a security group This data is optional.
MAXUSERSTATUS	<ul style="list-style-type: none"> Shows the status for the user. Stores the history of user status changes.

Self Service module

Self-Service users (with proper permissions) can register themselves in the system and use the applications in the Self-Service modules (Desktop Requisitions and Service Requests) to create records without the assistance of an administrator or a service desk agent.

See each module for a description of its applications.

- [Desktop Requisitions](#)
 As a self-service user, you use the applications in the Desktop Requisitions module (within the Self Service module) to create and to view purchase requisitions. You also can use the applications to create template requisitions for repeat orders and create lists of items that you order frequently. You can also check the status of your orders.
- [Service Requests](#)
 As a self-service user, you use the applications in the Service Requests module (within the Self Service module) to create and view a service request for equipment repair or configuration, and to request and search for information. You can choose a template to best suit your specific request type.

Desktop Requisitions

As a self-service user, you use the applications in the Desktop Requisitions module (within the Self Service module) to create and to view purchase requisitions. You also can use the applications to create template requisitions for repeat orders and create lists of items that you order frequently. You can also check the status of your orders.

- [Create Requisition](#)
 In the Create Requisition application, you create a desktop requisition to search for and order items and services from either an internal source, such as a company storeroom, or an external vendor.
- [View Requisition](#)
 You use the View Requisition application to search for, view, and change the status of your existing desktop requisitions.
- [View Drafts](#)
 You use the View Drafts application to manage your draft desktop requisitions.
- [View Templates](#)
 You use the View Templates application to view requisition templates. A requisition template is a requisition that you can reuse. These templates contain information about shipping, charge accounts, and line items.

Create Requisition

In the Create Requisition application, you create a desktop requisition to search for and order items and services from either an internal source, such as a company storeroom, or an external vendor.

In addition, you can create templates for requisitions for repeat orders, create a list of favorite items that you order frequently, and check the status of your order.

To create a desktop requisition, you must complete three steps:

- Create a requisition
- Add requisition lines
- Review and submit a requisition

- [Desktop requisitions overview](#)
 You can set email notifications for desktop requisitions, and delete requisition lines.
- [Working with desktop requisitions](#)
 You can create desktop requisitions, add lines to requisitions, set default information, and distribute purchasing line item costs.

Desktop requisitions overview

You can set email notifications for desktop requisitions, and delete requisition lines.

- [Deletion rules for requisition lines](#)
As your business needs change, you can delete requisition lines from a desktop requisition.

Deletion rules for requisition lines

As your business needs change, you can delete requisition lines from a desktop requisition.

You can delete a requisition line if a requisition meets one of these conditions:

- You have not submitted the requisition.
- The requisition is a draft.
- The requisition is not an approved purchase order.

Working with desktop requisitions

You can create desktop requisitions, add lines to requisitions, set default information, and distribute purchasing line item costs.

- [Creating desktop requisitions](#)
You create a desktop requisition to search for and order items and services from either an internal source, such as a company storeroom, or an external vendor.
- [Adding requisition lines for desktop requisitions](#)
You create a desktop requisition to search for and order items and services from either an internal source, such as a company storeroom, or an external vendor. In this step, you specify line item information for the items and services that you need.
- [Setting default information on requisitions](#)
When you create a requisition, default information is filled in as you proceed through the steps. The default information is from your profile, which may have been created for you, or which you created as a result of registering. You can review and modify the information in your profile.
- [Distributing purchasing line item costs](#)
You can distribute the costs of a purchase order or desktop requisition line item across multiple GL accounts. For example, if your department ordered and received a new laser printer that the packaging department is also to use, you can specify two GL accounts for the printer, one for each department.

Creating desktop requisitions

You create a desktop requisition to search for and order items and services from either an internal source, such as a company storeroom, or an external vendor.

About this task

This is the first step to create a desktop requisition.

Procedure

1. Open the Create Requisition application to create a desktop requisition.
2. Optional: Complete the following steps to provide additional information:
 - a. Change the automatically generated requisition number.
 - b. Provide a description of the requisition.
 - c. Specify a template for a repeat order.
 - d. Specify values for the date the items or services are needed, for who is requesting the items or services, and for whom the items and services are being requested.
 - e. Change the priority value.
3. Specify the shipping information for the items.
4. Optional: If the items or services are being charged to a general ledger account, a work order, a location, or an asset, specify the values for this information.
5. Optional: If you are using a credit card to make the purchase, provide the number of the credit card, the card type, and the expiration date.
6. Click Continue to add requisition lines.

Adding requisition lines for desktop requisitions

You create a desktop requisition to search for and order items and services from either an internal source, such as a company storeroom, or an external vendor. In this step, you specify line item information for the items and services that you need.

Before you begin

Before you complete this step, you must complete the first step, creating desktop requisitions.

Procedure

1. In the Create Requisition application, access the requisition to which you want to add line items.
2. To specify a line item, click New Row or select materials, favorite items, spare parts, existing requisitions, or a supplier's catalog.
3. Specify a line type and the additional information required for that line type.
4. Optional: Distribute the cost of the line item across more than one general ledger account.
5. Optional: Add the line item to your list of favorite items.
6. Click Continue to submit the requisition.

Setting default information on requisitions

When you create a requisition, default information is filled in as you proceed through the steps. The default information is from your profile, which may have been created for you, or which you created as a result of registering. You can review and modify the information in your profile.

Before you begin

Default information can consist of such data as shipping information, the default storeroom, and credit card (PCard) details. Shipping information may appear by default on requisitions even if it does not appear in the profile. Unless otherwise specified, default shipping information for your site is used.

Procedure

1. From any screen in the system, click Profile from the menu bar.
2. From the Profile menu, select one of the following:
 - Default Information: to change your default insert site or storeroom
 - Personal Information: to change your Ship To address or procurement card information
3. Edit or add information in the window.
4. Click OK.

Distributing purchasing line item costs

You can distribute the costs of a purchase order or desktop requisition line item across multiple GL accounts. For example, if your department ordered and received a new laser printer that the packaging department is also to use, you can specify two GL accounts for the printer, one for each department.

Before you begin

If you want to distribute line item costs, the purchasing and desktop requisition records must meet the following conditions:

- The line item is a direct issue item or service
- None of the items have been received
- The service line is not prorated

Procedure

1. In a purchasing or the Desktop Requisitions application, display the direct issue record that you want to update.
2. In the line item table window, click New Row.
3. Enter values in the following fields:
 - Item
 - Line Cost
4. Enter a value in one of the following fields:
 - Work Order
 - WO Task ID
 - Location
 - Asset
 - GL Debit Account
5. Click Distribute Costs.
6. Click New Row.
7. Enter values in the following fields:
 - Percentage
 - Line Cost
 - GL Debit Account

If you enter a percentage, the line cost representing that percentage is displayed. If you enter a portion of the line cost, the percentage for that cost is displayed. The first row in the Distribute Costs table displays the percentage and the total line cost of the line item that you entered. You must edit this row to be able to distribute costs for the line item.

8. Continue to enter rows until one of the following conditions is met:

- The sum of the percentage fields is equal to a value of 100%
 - The sum of the loaded cost fields are equal the total unit cost of the current line item
9. Click OK.
 10. Click Save record.

View Requisition

You use the View Requisition application to search for, view, and change the status of your existing desktop requisitions.

In the View Requisition application, you can perform the following functions:

- View requisition details, history, and workflow information.
- Create a template of the requisition that you can use to create requisitions.
- Cancel a desktop requisition that you submitted, provided the requisition is not an approved purchase order.

The default restriction for View Requisition application is based on the user hierarchy. You can view requisitions that you created and requisitions that are assigned to you. You can also view requisitions that are assigned to, or created by, users below you in the hierarchy. For example, as a supervisor, you can view the requisitions assigned to, or created by, your employees.

- [Status of desktop requisitions](#)
To manage desktop requisitions, you can change their status to canceled, draft, waiting on approval, and approved.
- [Viewing details of purchases associated with desktop requisitions](#)
To manage your desktop requisitions, you can view the details of associated purchase orders, purchase requisitions, or request for quotations.

Status of desktop requisitions

To manage desktop requisitions, you can change their status to canceled, draft, waiting on approval, and approved.

If you are changing the status to approved, you must have a monetary approval limit equal to or greater than the total cost of the requisition. Your system administrator sets approval limits for each user.

When you change the status of a requisition from approved to waiting for approval, the requisition becomes a draft requisition. You can view the requisition in the View Drafts application.

Viewing details of purchases associated with desktop requisitions

To manage your desktop requisitions, you can view the details of associated purchase orders, purchase requisitions, or request for quotations.

Procedure

1. In the View Requisitions application, search for and select the requisition for which you want to view purchasing details.
2. Click the History tab.
3. In the appropriate table window, select the relevant application to view the purchasing details.
For example, in the PR field in the Purchase Requisitions Status History table window, go to the Purchase Requisitions application to view purchasing details for the record that selected.
4. Return to the View Requisition application.

View Drafts

You use the View Drafts application to manage your draft desktop requisitions.

You can perform the following functions in the View Drafts application:

- Change a draft requisition.
- Create a template requisition that you can reuse.

The default restriction for the View Drafts application is based on the user hierarchy. You can view draft requisitions that you created and draft requisitions that are assigned to you. You can also view draft requisitions that are assigned to, or created by, users below you in the hierarchy. For example, a supervisor can view the draft requisitions assigned to, or created by, their employees.

- [Completing draft desktop requisitions](#)
To manage your desktop requisitions, you can complete draft requisitions.

Completing draft desktop requisitions

To manage your desktop requisitions, you can complete draft requisitions.

Procedure

1. Select the draft desktop requisition that you want to complete.
2. Click Create/Edit Requisition.
The draft requisition is displayed in the Create Requisition application.
3. Make necessary changes.
4. Click Submit.

View Templates

You use the View Templates application to view requisition templates. A requisition template is a requisition that you can reuse. These templates contain information about shipping, charge accounts, and line items.

In the View Templates application, you can also change the template requisitions and create requisitions from the templates. You create requisition templates in the View Requisitions application and View Drafts application.

The default restriction for View Templates application is based on the user hierarchy. You can view templates that you created and templates that are assigned to you. You can also view templates that are assigned to, or created by, users below you in the hierarchy. For example, as a supervisor, you can view the templates assigned to, or created by, your employees.

- [Creating desktop requisitions from templates](#)
To save time, you can use a requisition template to create a requisition.

Creating desktop requisitions from templates

To save time, you can use a requisition template to create a requisition.

Procedure

1. Select the requisition template.
2. Click Copy to New Requisition.
The new requisition is displayed in the Create Requisition application.
3. Optional: Make any necessary changes.
4. Click Submit.

Service Requests

As a self-service user, you use the applications in the Service Requests module (within the Self Service module) to create and view a service request for equipment repair or configuration, and to request and search for information. You can choose a template to best suit your specific request type.

You can view existing requests and drafts. The resulting requests (tickets) can be viewed and processed by a service desk agent using the Service Request application in the Service Desk module.

- [Create Service Request](#)
You use the Create Service Request application to request a repair or change to your service. You can create the request for yourself or on behalf of another person.
- [View Service Requests](#)
You use the View Service Requests application to view and print details about the service requests you created. You can also add or view attachments, such as documents or Web pages, and view solutions applied to the service requests. In addition, you can view and update the Service Request log, which contains communications to and from the service desk agent who is handling the service requests.

Create Service Request

You use the Create Service Request application to request a repair or change to your service. You can create the request for yourself or on behalf of another person.

When you submit a service request it is sent to a service desk agent. The agent takes the appropriate action and can communicate with you about ongoing activities or a resolution. The Create Service Request application works in combination with the View Service Request application.

- [Creating a service request](#)
You create a service request when you cannot find a solution to an issue.

Creating a service request

You create a service request when you cannot find a solution to an issue.

Procedure

1. Open the Create Service Request application.
2. Optional: If you are reporting on behalf of another person, edit the Affected User field.
3. Complete as many fields as possible.
4. Classify your service request using the Detail menu on the Classifications field.
Classifying a service request makes it easier for the service desk agent to resolve your problem.
5. Optional: Attach documents such as images, text documents, or web pages that could be useful to the service desk agent.
6. Submit the service request.
7. To view the status of your service request, open the View Service Requests application.

View Service Requests

You use the View Service Requests application to view and print details about the service requests you created. You can also add or view attachments, such as documents or Web pages, and view solutions applied to the service requests. In addition, you can view and update the Service Request log, which contains communications to and from the service desk agent who is handling the service requests.

- [Viewing service request details](#)
To monitor the progress of your service requests and add information to them, you can view and update the requests using the View Service Requests application. The details you can view and modify include attachments, Web pages, solutions, and information in the Service Request communication log.

Viewing service request details

To monitor the progress of your service requests and add information to them, you can view and update the requests using the View Service Requests application. The details you can view and modify include attachments, Web pages, solutions, and information in the Service Request communication log.

Procedure

1. Display the record for which you want to display details.
2. In the View Service Requests table window, open the service request.
3. To add attachments, in the Attachments table window, either click Attach File or Attach Web Page. To view attachments, click the underlined record ID.
4. To add information to the Service Request log, click Update Service Request and enter information in the Summary and Details fields.

Service Desk module

You use the applications in the Service Desk module to manage customer requests for help, information, and services.

Specifically, you can create and manage service requests (a type of ticket), manage activities (a class of work order) and tasks to describe general work that needs to be done on a ticket record. You can also create a ticket template (standard model) to hasten ticket data-entry time.

- [Activities and Tasks](#)
You use the Activities and Tasks application to plan, to review, and to manage activities and tasks. An activity initiates the work process and creates a historical record of the work being performed. Activities are created in the Incidents and Problems applications. A task is a specific unit of work on a work order.
- [Service Requests](#)
You use the Service Requests application to manage requests for services that involve an asset or location in your enterprise. For example, you might receive a request to upgrade the computer software on the notebook for a user, or for all users at certain locations.
- [Ticket Templates](#)
Applying standardized templates to common and high-volume tickets saves time by letting the system populate values from the template into fields on the ticket. You create and manage templates using the Ticket Templates application.

Activities and Tasks

You use the Activities and Tasks application to plan, to review, and to manage activities and tasks. An activity initiates the work process and creates a historical record of the work being performed. Activities are created in the Incidents and Problems applications. A task is a specific unit of work on a work order.

An activity is a type of work order. A task can be created as part of an activity or part of another work order.

You can use the Activities and Tasks application to perform the following functions:

- Change the status of activities and tasks
- Take ownership of activities or tasks
- Assign ownership of activities and tasks to individuals or to workgroups
- Modify activities and tasks to reflect changes
- View related preventive maintenance and scheduling information
- Categorize the activities and tasks using classifications and attributes to simplify their management and retrieval
- Specify, view, and modify job tasks and the labor, material, services, and tool requirements for work plans
- View, add, and delete work orders and tickets that are related to an activity or to a task
- View follow-up records for an activity or a task
- View and create a work log and communication entries about a record
- **Activities and tasks overview**
An activity specifies the tasks, and the labor, materials, services, and tools needed to complete the task. Activities are created to document the required work, which can then be delegated to the individuals responsible for completing the work.
- **Working with activities**
Activities are created in the Incidents and Problems applications. Tasks are created as part of activities and other work orders. You can manage and modify activities and tasks in the Activities and Tasks application. For example, you can change the ownership or status of an activity or task.

Activities and tasks overview

An activity specifies the tasks, and the labor, materials, services, and tools needed to complete the task. Activities are created to document the required work, which can then be delegated to the individuals responsible for completing the work.

- **Record ownership**
The owner of a record is the person or person group that is in charge of the record from an administrative perspective.
- **Activity statuses**
The status of an activity indicates its position in the processing cycle. The status determines which actions can be performed on the activity. For example, if the activity is approved (APPR), then the tasks can start.
- **Measurement points**
When you inspect an asset or a location, you can record and view the meter readings that correspond to measurement points in the job plan of the associated work order. You can also insert measurement points on an activity until the activity or task is closed.
- **Service level agreements**
A service level agreement (SLA) typically is a written agreement that outlines the commitment between a service provider and its customers. A commitment is a service level that all parties have agreed to, such as asset reliability or availability.
- **Record relationships**
Relationships between records, such as tickets and work orders, help simplify record management. You can create record relationships manually, or relationships might be created automatically when you take certain actions.
- **Costs on tickets and work orders**
You can view the estimated and actual costs for a single work order or ticket, including costs for labor, material, tools, and services. You can also view total costs for the current record and all the records below it in its hierarchy.
- **Work plan removal**
Under certain circumstances, you can remove a work plan from an activity by using the Remove Work Plan action.
- **Deletion rules for activities**
For auditing purposes, you cannot always delete activities. If you cannot delete a specific activity, you can stop all action on an activity by changing the status to canceled.
- **Rules for modifying archived activities**
Closed and canceled activities are archived, and become historical records. You might be able to add additional information to a historical record by using the Edit History Activity action.

Record ownership

The owner of a record is the person or person group that is in charge of the record from an administrative perspective.

The owner of a record keeps the customer updated and acts as the point person for any issues involving the work. You can use the Select Owner action to assign record ownership to a person or person group, or you can use the Take Ownership action if you want to take administrative ownership of the record yourself. You can take ownership for more than one application.

Keep in mind the following points regarding record ownership:

- A record can have many different owners during its life cycle.
- You can select an owner or owner group until the record's status is CLOSED.
- To view the ownership history of a record, select View History.
- A workflow or an escalation process may assign ownership, if appropriate.

If the Persons tab on your Select Owner dialog box displays a Person Group field and a Date field, then you can filter the list of persons by the values in these fields. For example, suppose the Person Group field and the Date fields are empty when you open the dialog box. You specify a person group and a date and time, and click Refresh. The system displays only the persons in the specified group who are available on the specified day and time.

Activity statuses

The status of an activity indicates its position in the processing cycle. The status determines which actions can be performed on the activity. For example, if the activity is approved (APPR), then the tasks can start.

When you change the status of an activity, the status of any applicable child activity that uses the inherit status option also changes. If you change the status of global activities, the same status change is automatically applied to all globally related records. In addition, the status of an activity can be automatically changed. For example, after you assign an owner to an activity, the status of that activity automatically changes to queued.

A follow-up record can change the status of the originating activity, which results in automatic routing or notification of the status change.

WAPPR

The activity is waiting for approval. WAPPR is the default status for records created in the Work Order Tracking, Changes, Releases, and Activities and Tasks applications.

APPR

The activity is approved and the work can begin. Work plan items on an approved activity are reserved in inventory, and cost and rate data are recorded. Rates can be changed in the Inventory application, Labor application, or Tools application. If the rates are changed in any application, the work plan reflects the rates in effect when the activity was approved.

WSCH

The activity is waiting to be scheduled. WSCH is the default status for records created in the Preventive Maintenance application.

WMATL

Materials must arrive before the work can be performed.

WPCOND

The work can be performed only when the condition of the plant is suitable. For example, certain work might require the shutdown of the plant.

INPRG

The work is in progress. INPRG is the default status for records created in the Quick Reporting application.

COMP

The physical work is completed. If you want to move or change an asset on an activity, the move or change occurs when the status is changed to complete.

CLOSE

The activity is finalized. Inventory reservations for items not used in the activity are removed and the activity is made into a history record.

CAN

The work is canceled. You cannot cancel an activity if the work has already been initiated or if actuals have already been reported. You can use this status when you want to delete an activity and deleting is not allowed.

Measurement points

When you inspect an asset or a location, you can record and view the meter readings that correspond to measurement points in the job plan of the associated work order. You can also insert measurement points on an activity until the activity or task is closed.

The product copies the measurement point number to the job plan when there is a three-way match between the following items:

- The measurement point name on the job plan listed on the activity.
- The measurement point name on the asset or the location listed on the activity.
- A measurement point number for the measurement point name.

If you specify a measurement for a measurement point, the measurement and measurement date are added to the Measurements table. If you specify a measurement without a measurement point, the measurement data is saved with the activity.

You use the Observation field to record visual inspection data. You use the Inspector field to record the name of the person performing the inspection. You can edit these fields until the activity is closed. Once the activity is closed, you can add or modify operations by selecting the Edit History Activity action.

Service level agreements

A service level agreement (SLA) typically is a written agreement that outlines the commitment between a service provider and its customers. A commitment is a service level that all parties have agreed to, such as asset reliability or availability.

The SLA describes one or more commitments and the escalation actions or notifications associated with each commitment. Escalation actions or notifications might be associated with an SLA to ensure that commitments are met. An escalation process can monitor all activities and send notifications or perform other activities to ensure that commitments are met.

The types of records to which service level agreements can be applied include tickets, such as service requests, and work-based records, such as work orders. Before you can apply an SLA to a record, the record must have a site defined.

A service level agreement can be associated with a record in several ways:

- An SLA might automatically be applied to a record from within a workflow or escalation process, or from another SLA.
- You can select an action to apply an SLA, which applies the best match automatically.
- You can view SLAs and select an action to select or clear the SLAs that you want to manually apply to the record.

When you apply a service level agreement to a record, the following events occur:

- The SLA Applied check box on the main tab of the record is selected to document the action.

- Any escalations that are associated with the SLA are activated.
- The Target Start, Target Finish, and Contact values for the record might be calculated automatically as follows:

Automatically calculated values	
When an SLA is applied that includes a response commitment, the response commitment date populates the Target Start date field of the record.	
When an SLA is applied that includes a resolution commitment, the resolution commitment date populates the Target Finish date field of the record.	
When an SLA is applied that includes a contact commitment, the contact commitment date populates the Target Contact date field of the record.	

Record relationships

Relationships between records, such as tickets and work orders, help simplify record management. You can create record relationships manually, or relationships might be created automatically when you take certain actions.

The types of relationships that can exist between records include:

- Related relationship, which is an informal association of tickets that is used for informational purposes.
- Originator and Follow-up, which keep costs hierarchies separate while still creating a relationship between the tickets.
- Related to Global, which creates a relationship in which the tickets are related to a global issue, which affects many users.

Related records

Using any ticket or work-based application, you can view similar records and relate tickets and work orders to the current record. A related relationship between records is an informal relationship that is for informational purposes only.

A related relationship does not affect status inheritance, affect workflow, or follow a set of business rules. Related relationships can be many-to-many, and do not represent record hierarchies. By relating records informally, you can navigate to related records, view related information for similar records, and view open tickets that are associated with a field. You can create an informal record relationship in the following ways:

- Use the Related Records tab of the application. This tab provides an easy way to create relationships and to view and navigate among informally related records.
- Use the Show Similar Tickets action in any ticket application. The similar ticket search results only include the service requests, incidents, and problems that have the same classification as the current ticket. Global records and history records are not included in the results. Your system administrator might add more restrictions to the search results.

Originator and follow-up tickets and work orders

You can relate tickets and work orders to a record more directly when you create a follow-up record from the ticket using one of the Create actions on the ticket. The ticket you create the follow-up record from is the originator. A follow-up record can be a ticket or a work order. In some cases, a follow-up ticket or work order might be able to change the status of its originating ticket. An originating ticket cannot change the status of a follow-up work order, nor can a follow-up ticket change the status of the originator if there is more than one follow-up. These options are configured by the system administrator.

Globally related tickets

A global ticket is an incident or problem relating to an issue that affects many users. You can relate tickets, including service requests, to a global ticket, which creates a RELATEDTOGLOBAL relationship. This relationship lets you manage the tickets by using the global ticket. When you change the status of the global ticket, the system changes the status of all globally related tickets.

If your administrator has set up automated notifications of status changes, the system changes the status of the tickets related to the global issue. For example, all the initial requestors reporting the same issue are notified of its resolution. On the global ticket, you can also view a list of related records and view the work and communication logs for all related records.

- [Deletion of record relationships](#)
On the Related Records tab, you can delete the relationship between a change and any related work orders or tickets.
- [Global records](#)
A global record is a ticket that is a root cause of other issues or that affects many users, such as computer network failures or flooding in a building. After you mark a record as global, you can relate multiple tickets and then manage all tickets using the global record.

Costs on tickets and work orders

You can view the estimated and actual costs for a single work order or ticket, including costs for labor, material, tools, and services. You can also view total costs for the current record and all the records below it in its hierarchy.

When you view the costs of a ticket or work order, the data is displayed in two tables:

- The Totals table displays the costs for a single ticket or work order.
- The View Hierarchy Grand Totals table displays the costs for the current ticket or work order and all records under its hierarchy.

Each table presents the same information, which is shown in the following table.

Column	Explanation
Current Estimate	Displays read-only calculated values for the current totals from the Labor, Materials, Standard Services, and Tools tabs of the Plans tab for the ticket or work order.

Column	Explanation
Estimate at Approval	Is set to zero until the work order is approved, then the values are copied from the Current Estimate column and are read-only. If the work order status changes from approved to unapproved, then these fields are cleared. The estimated costs at approval are not affected by the change in status from in progress to completed or closed.
Actual	Displays the read-only values from the Labor (for approved labor only), Materials, and Tools tabs of the Actuals tab. If the status of the record changes from approved, then these fields are not cleared.

Rolling up maintenance costs

After you close a work order that is associated with an asset, you can calculate your maintenance costs by rolling up costs that you incur for labor, materials, tools, and services to the top-level asset in the hierarchy that the asset belongs to.

Costs can be rolled up manually or automatically. By default, cost rollups are manual. If you want costs to be calculated and rolled up automatically when a work order is closed, you must set the `mxe.workorder.rollupMaintenanceCosts` system property to 1. After you configure the system property for automatic rollups, all subsequent costs that are associated with work orders are rolled up automatically. However, any unprocessed maintenance costs that existed before the configuration are not automatically rolled up. You must roll up any preexisting, unprocessed maintenance costs manually.

To calculate the maintenance cost of your assets, use the Roll Up Maintenance Costs action in the Assets application.

If you upgrade to Maximo® Manage 8.5, run the Asset Cost Rollup Report to roll up pending maintenance costs before the upgrade.

Work plan removal

Under certain circumstances, you can remove a work plan from an activity by using the Remove Work Plan action.

When you remove a work plan, all information in the Resources tab, except for non-task children, is removed. Also, if the work plan has a job plan, the job plan identifier is removed.

If any task in the work plan cannot be removed based on the deletion rules for changes, you cannot use the Remove Work Plan action. You can still delete labor, material, services, and tools information, as well as any tasks that do meet the deletion rules.

Deletion rules for activities

For auditing purposes, you cannot always delete activities. If you cannot delete a specific activity, you can stop all action on an activity by changing the status to canceled.

The activity and its children must meet the following criteria to be deleted:

- Have a status of waiting for approval
- Not have any transactions registered against it, except for status changes
- Not have any actuals reported against it
- Not have any labor assignments associated with it
- Not have been generated for a purchase order or receipt
- It must not have any failures reported against it.
- Not be in a workflow or have ever been in a workflow
- Not have any measurements or meter readings taken against it
- Cannot be or have follow-up work

To delete an activity, use the Delete Activity action.

Rules for modifying archived activities

Closed and canceled activities are archived, and become historical records. You might be able to add additional information to a historical record by using the Edit History Activity action.

When you modify an archived activity, the following rules apply:

- New costs that were incurred during the edit history must be added to the inventory cost, if it is defined as charge to store.
- You can add actual labor, but you cannot change approved transactions.
- You can add actual materials and actual tools, but you cannot change them.
- You can add or delete child records, whether or not the child records are tasks.
- You can attach documents.
- You cannot change planned labor, materials, and tools.
- You cannot change information in the following fields:
 - Asset.
 - Location.
 - GL Account.
 - Charge to Store.
 - Status.
 - Status Date

Working with activities

Activities are created in the Incidents and Problems applications. Tasks are created as part of activities and other work orders. You can manage and modify activities and tasks in the Activities and Tasks application. For example, you can change the ownership or status of an activity or task.

- [Planning activities and tasks](#)
After you associate a task with an activity, you can specify estimates for labor, craft, materials, services, and tools for each task on the activity or for the activity as a whole.
- [Reporting actuals for activities and tasks](#)
As work progresses on an approved activity or task, you can report the actual labor hours, materials, services, and tools used.
- [Applying service level agreements to records](#)
You can apply a service level agreement (SLA) to a record to define the agreement and formal commitments between a service provider and a customer. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.
- [Swapping assets](#)
You can swap assets associated with a work order. The swap action applies to the work order and all of the assets, locations, and configuration items on its child work orders. The term "work order" can refer to a work order, change, release, or activity record.
- [Relating work orders or tickets to activities or to tasks](#)
You can link work orders and tickets to an activity or task. When you link a record to a work order, its relationship type is RELATED.
- [Classifying activity records](#)
To simplify the process of finding and managing activity records, you can classify the records. Categorizing an activity involves classifying it and adding and modifying attributes to further group the classification.
- [Setting up work process flows](#)
Work process flows use relationships between work orders and tasks to automate the flow of status changes. You set relationships between work orders and tasks so that when a task is completed, the next task in the flow can be initiated.
- [Changing the status of activities or tasks](#)
You can change the status of an activity to indicate the position of the activity as it moves toward completion.

Planning activities and tasks

After you associate a task with an activity, you can specify estimates for labor, craft, materials, services, and tools for each task on the activity or for the activity as a whole.

- [Creating work plans](#)
A work plan describes the labor, materials, tools, services, and tasks you need to complete an activity or task. You can create a work plan manually.
- [Planning work for activities and tasks](#)
You use the Activities and Tasks application to insert, view, or edit planned labor information or planned craft information.
- [Creating tasks for activities](#)
You use the Activities and Task application to create additional tasks or to edit the existing tasks for an activity. After you create a task, you can plan its labor, materials, services, and tools.

Creating work plans

A work plan describes the labor, materials, tools, services, and tasks you need to complete an activity or task. You can create a work plan manually.

Procedure

1. In the Activities and Tasks application, display the record for which you want to create a plan.
2. Make one of the following selections:

Option	Description
If the record is an activity	Click the Plans tab.
If the record is a task	Click the Resources tab, then click the Plans sub tab.

3. Specify work plan data, such as tasks, labor, materials, tools, and services using the sub tabs.
4. Save the record.

- [Creating work plans using job plans](#)
A work plan describes the labor, materials, tools, services, and tasks you need to complete an activity. You can select a job plan, and modify it to your needs.

Creating work plans using job plans

A work plan describes the labor, materials, tools, services, and tasks you need to complete an activity. You can select a job plan, and modify it to your needs.

Procedure

1. In the Activities and Tasks application, display the record for which you want to create a work plan from a job plan.

2. Make one of the following selections:

Option	Description
If the record is an activity	Click the Plans tab.
If the record is a task	Click the Resources tab, then click the Plans sub tab.

3. In the Job Plan field, click Detail Menu and select an option to retrieve a value. When you associate a job plan with a work order, the product copies the labor, the materials, the services, and the tools to the work order plan. If the job plan has a default safety plan for the selected work asset, the product also copies the safety plan to the work order.
4. Optional: Edit the fields to modify any of the information. Changes you make to the work plan do not affect the original job plan.
5. Save the record.

Planning work for activities and tasks

You use the Activities and Tasks application to insert, view, or edit planned labor information or planned craft information.

Procedure

1. Display the activity or task for which you want to plan labor.
2. Make one of the following selections:

Option	Description
If the record is an activity	Click the Plans tab.
If the record is a task	Click the Resources tab, then click the Plans sub tab.

3. Enter the details of the planned work on the following subtabs:

Option	Description
Labor	Add hours for labor or select crafts.
Materials	Add materials, search catalogs, or add spare parts.
Services	Add services.
Tools	Add tools.

4. Save the record.

Creating tasks for activities

You use the Activities and Task application to create additional tasks or to edit the existing tasks for an activity. After you create a task, you can plan its labor, materials, services, and tools.

Procedure

1. Display the activity for which you want to create planned tasks.
2. In the Tasks table window on the Plans tab, click New Row.
3. Specify a unique value in the Task field.
4. To have the tasks performed in a specific order, enter the appropriate value in the Sequence field.
5. Type the amount of time needed to complete the task in the Estimated Duration field.
6. Use the Labor, Materials, Services, and Tools subtabs to plan for the task.
7. Save the activity.

Reporting actuals for activities and tasks

As work progresses on an approved activity or task, you can report the actual labor hours, materials, services, and tools used.

Procedure

1. Display the activity or task for which you want to report actuals.
2. Make one of the following selections:

Option	Description
If the record is an activity	Click the Plans tab.
If the record is a task	Click the Resources tab, then click the Plans sub tab.

3. Enter the details for the actuals on the following subtabs:

Option	Description
Labor	Report hours for labor, copy labor from the work plan, or select planned labor.
Materials	Select materials, select reserved items, and select spare parts.
Services	Select services or standard services.
Tools	Select tools, copy tool data from the work plan, or select tools that were issued.

4. Save the record.

Applying service level agreements to records

You can apply a service level agreement (SLA) to a record to define the agreement and formal commitments between a service provider and a customer. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.

About this task

When you apply an service level agreement to work orders, the SLA is applied only to the work order, not to its tasks. If you want to apply a service level agreement to a task, you must display the task as the current record and then apply the SLA.

You can apply service level agreements to tickets and work orders.

Procedure

1. Open an application and display the record that you want to update.
2. Select the Apply SLA action.
3. Click OK.

Results

The SLA Applied check box on the main tab of the selected application is selected. The target start, target finish, and contact values are calculated for the selected record.

Removing service level agreements from records

To maintain accurate records, it might be necessary to remove an invalid or erroneous service level agreement to disassociate it from the record.

Procedure

1. Display the record for which you want to remove a service level agreement.
2. Select the Select/Deselect SLA action.
3. Click Mark Row for Delete for each service level agreement that you want to remove from the record.
4. Click OK.
5. Save the record.

Swapping assets

You can swap assets associated with a work order. The swap action applies to the work order and all of the assets, locations, and configuration items on its child work orders. The term "work order" can refer to a work order, change, release, or activity record.

Before you begin

You can execute the swap immediately, or you can save the swap as a plan. If you save the swap as a plan, the changes will apply when the status for the work order is COMP (Complete). When the status of a work order is COMP, you swap assets only using the Execute Now option. When you select Execute Now on any tab, the system executes the changes on all tabs.

When you duplicate a work order that has a planned swap to its assets or locations, the planned action does not get copied to the duplicate work order. Also, when you create a release, or change, or work order from a record using the Select Action menu option, the planned action is not copied to the follow-up record.

Procedure

1. Select the Move/Swap/Modify action.
2. Click the Move/Swap tab.
3. Select the Is this an Asset Swap checkbox.
4. In the Swap Assets section, select the row for the asset you want to swap.
5. To move the asset to a parent or location, type a value in the appropriate field, or click Select Value to retrieve a value.
6. In the Replacement Asset field, specify an asset, or click Select Value to retrieve a value.
7. Perform one of the following actions:
 - To swap the assets immediately, click Execute Now.
 - To swap the assets when the status for the work order is COMP (Complete), click Save as Plan.

Relating work orders or tickets to activities or to tasks

You can link work orders and tickets to an activity or task. When you link a record to a work order, its relationship type is RELATED.

Procedure

1. In the Activities and Tasks application, display the record to which you want to add related records.
 2. On the Related Records tab, perform either of the following actions:
 - To relate a work order to the current record, in the Related Work Orders table window, click Add Row.
 - To relate a ticket to the current record, in the Related Tickets table window, click Add Row.
 3. Type or select a work order in the Work Order field, or specify a ticket in the Related Record Key field.
 4. Optional: You can enter a class.
 5. Save the activity.
- [Assigning a parent to a work order](#)
You can assign a parent to a work order and assign tasks to that parent. When you assign work order records to a parent, they become child work orders records of the parent record.
 - [Removing relationships between records](#)
You can remove the relationship between an activity or a task and its related work orders or tickets.

Assigning a parent to a work order

You can assign a parent to a work order and assign tasks to that parent. When you assign work order records to a parent, they become child work orders records of the parent record.

About this task

You cannot assign parent records to closed work order records. If the parent has a value in the Priority field, and the child or children work order records do not, the child or children work order records inherit the parent priority value.

Procedure

1. Open an application and display the work order record that you want to update.
2. On the List tab, select the task that you want to update.
3. Select the Assign To New Parent action.
4. Select the work order record that you want as the new parent.
The asset management system displays the parent work order number in the Parent WO field.
5. Click Save record.

Removing relationships between records

You can remove the relationship between an activity or a task and its related work orders or tickets.

Before you begin

You can remove the relationship between records only if the ticket or the work order has a type of RELATED.

About this task

To delete relationships with work orders of other relationship types, such as FOLLOWUP or ORIGINATOR, delete the work order in any of the following applications:

- Work Order Tracking
- Activities and Tasks
- Changes
- Releases

To delete relationships with tickets of other relationship types, you must go to the tickets applications.

Procedure

1. In the Activities and Tasks application, display the record with the related relationship that you want to delete.
2. On the Related Records tab, select the record in the Related Work Orders table window.
3. Click the Mark Row for Delete icon. You can mark more than one row.
4. Click Save Activity.

Classifying activity records

To simplify the process of finding and managing activity records, you can classify the records. Categorizing an activity involves classifying it and adding and modifying attributes to further group the classification.

About this task

For example, you might classify an activity as a notebook. The notebook classification might have the attributes of memory, speed, and disk space associated with it, which are copied to the record upon classification. As needed, you can add attributes such as operating system and power, change the attribute values, and remove attributes associated with the record.

Procedure

1. In the Activities and Tasks application, display the activity record that you want to categorize.
2. Select a classification for the activity in one of the following ways:

Choice	Description
Use the Classification field	In the Classification field of the main application tab or on the Activities and Tasks tab, click Detail Menu and then select Classify to produce a classification hierarchy tree that you can drill down through and select a classification.
Use the Class Description field	In the Class Description field of the main application tab or on the Activities and Tasks tab, you can hasten the classification search as follows: <ol style="list-style-type: none">a. Click the Select Value icon next to the Class Description field and enter a keyword or a word string, such as <i>Operating System</i> into the Description field of the window. All classification values that contain the keyword or word string are retrieved.b. Click a value from the resulting list to select the classification.

3. Optional: You can view the attributes that are associated with the selected classification in the Attributes table window. You can also add, delete, and change the values of the attributes in the row details.
4. Save the activity.
The full classification path appears in the Classification field, where you can view all nodes of the classification.

Setting up work process flows

Work process flows use relationships between work orders and tasks to automate the flow of status changes. You set relationships between work orders and tasks so that when a task is completed, the next task in the flow can be initiated.

Before you begin

To set the process flow for individual tasks, you must select Under Flow Control at the header level for the work order.

About this task

The best practice for consistently using the flow feature is to set up the process flow as a work template at the job plan level.

Procedure

1. Open the work order.
2. Select Under Flow Control.
3. On the Plans tab, display the details for the task.
4. In the Scheduling Information section, next to the Predecessors field, click the Detail Menu icon.
5. Select the tasks that must be completed before this task is initiated.
6. Save the work order.

- **Defining flow actions**

A flow action is used in a work process flow to define certain actions that should occur while work is being done. Actions or action groups can be applied to any work order, task, or job plan task.

- **Removing work process flow from work orders or job plans**

You can remove work process flow for a work order, a job plan, or task records that have it defined. You can do this at the header level, which will remove it for all the associated tasks as well, or you can remove it at the task level.

- **Suspending work process flows**

You can suspend the work process flow for work order or task records that have it defined. For example, if you want to start a work order or task manually, you could suspend the flow control on that record. The flow remains suspended until you remove the suspension.

- **Stopping workflow processes**

You can stop a workflow process for a record. You use the Workflow Administration application to view and stop workflow processes.

Defining flow actions

A flow action is used in a work process flow to define certain actions that should occur while work is being done. Actions or action groups can be applied to any work order, task, or job plan task.

About this task

You can determine whether the action takes place automatically, or if the action only takes place when it is initiated manually. When automatic, the action takes place as soon as the work order or task status is changed to an in progress (INPRG) status value by work process flow. When manual, you must initiate the flow action by running the automation or processing scripts or placing an action button on the target application. Actions and action groups are defined in the Actions application.

Procedure

1. In an application that supports flow action, display the record for which you want to define a flow action.
2. Perform one of the following actions:
 - For a work order, change, release, or job plan record, enter a value in the Flow Action field on the application tab.
 - For a work order or job plan task, enter a value in the Flow Action field in the Task table window. The Tasks table window is found on the main tab of the Job Plans application, or the Plans tab of the Work Order Tracking, Changes, and Releases applications.The defined action runs when the work order or task status value is changed to INPRG.
3. Specify whether you want the flow action to be automatically run:

Option	Flow Action Assist
Automatically run the flow action	Cleared
Manually run the flow action	Selected
4. Click Save record.

Removing work process flow from work orders or job plans

You can remove work process flow for a work order, a job plan, or task records that have it defined. You can do this at the header level, which will remove it for all the associated tasks as well, or you can remove it at the task level.

About this task

If work process flow is removed at the header level, it will automatically be removed on individual tasks on the record. You cannot retain work process flow for a task that does not have it set at the header level.

Procedure

1. In an application that supports flow action, display the record that you want to remove from work process flow.
2. On the main application tab, clear the Flow Controlled check box. The system removes the work order or the job plan, and all of its tasks from work process flow.
3. Click Save Record.

Suspending work process flows

You can suspend the work process flow for work order or task records that have it defined. For example, if you want to start a work order or task manually, you could suspend the flow control on that record. The flow remains suspended until you remove the suspension.

Before you begin

Removing the suspension restarts the flow. Any successor work orders or tasks with completed predecessors continue the process. Work orders and tasks without predecessors continue the process at the same time as the parent record. The last completed child under a parent rolls its completion up to the parent.

Procedure

1. In an application that supports flow action, display the record on which you want to suspend flow control.
2. On the main application tab, at the header level, select the Suspend Flow Control check box. The system suspends the work process flow on the work order and on all of its tasks.
3. To retain flow control for individual tasks, display the tasks in the Tasks table window, and clear the Suspend Flow Control check box at the task level. Flow control remains in place at the task level. This action does not affect the suspension at the work order header level. You can find the Tasks table window on the Plans tab.
4. Click Save Record.

Example

You generally suspend a set of tasks, often under the same parent. For example, you can delay the automatic starting of one whole phase of work until a certain condition has been met. You can also delay starting a phase of work to make changes to the tasks, such as inserting tasks, deleting tasks, and changing the precedence logic.

Changing the status of activities or tasks

You can change the status of an activity to indicate the position of the activity as it moves toward completion.

Procedure

1. In the Service Requests, in the Problems, or in Incidents application that corresponds to the type of record you are managing, display the record whose status you want to change.
2. Select the Change Status action.
3. In the New Status field, choose a status from the pull-down menu.
4. Click OK to change the status.

What to do next

If you change a ticket to a RESOLVED status, and you are the designated owner of that ticket, you might want to stop the timer or otherwise report the time that you spent resolving the issue.

Service Requests

You use the Service Requests application to manage requests for services that involve an asset or location in your enterprise. For example, you might receive a request to upgrade the computer software on the notebook for a user, or for all users at certain locations.

Service requests include requests that are communicated to you directly from a user, for example from a phone call, e-mail message, or direct contact. You also receive service requests from self-service users who create requests using the Create Service Request application. Other service requests might originate from an automated workflow process.

The owner of a service request is responsible for managing the ticket to completion. You can assign the ownership of a service request to another person or a workgroup. If you are the logged-in user, you can take ownership of the request and complete it yourself. You, or the assigned owner, can update the service request as more details are known about it.

For example, you can identify who the service affects and what priority it has. You can specify who the service request might be escalated to if issues arise and change the status of the request as it moves toward completion. You can apply service level agreements to the service request so that related legal and contact information is readily available. All communication that pertains to the service request can be stored in the log of the service request to provide a clear history of its lifecycle.

Example of a service request that involve multiple assets and locations

A service request might involve a high-level task, such as installing graphic software on all the notebooks that belong to Product Managers. To complete this task, a service technician needs to know who the product managers are and where their notebooks are located. You can identify all this information using the features on the Service Request tab.

For example, you can identify `Project Managers' Notebooks` as the primary affected asset using the Service Request Details section. You can then identify each Product Manager and the location and details of each notebook using the Multiple Assets, Locations, and CIs section.

- [Service requests overview](#)
A service request record captures information about a request, including the type of service, who needs it, where, when, and why. You use the Service Requests application to manage requests for services that involve an asset or location in your enterprise.
- [Working with service requests](#)
You can create service requests either in the Service Requests application or as records related to other tickets or work orders. You can apply service level agreements, categorize requests, create relationships with other records, assign and record labor activities, and log actions and communications.

Service requests overview

A service request record captures information about a request, including the type of service, who needs it, where, when, and why. You use the Service Requests application to manage requests for services that involve an asset or location in your enterprise.

- [Service request management](#)
A service request captures information about the service being requested by a user, including the type of service that is needed, when it is needed, and why it is needed. Managing service requests involves creating, updating, assigning, escalating, and resolving requests for service on an asset or a location in your enterprise.
- [Service request templates](#)
A service request template contains predefined data that you can insert in common, high-volume service request records. Applying templates can significantly reduce the amount of time needed to create service requests.
- [Service level agreements](#)
A service level agreement (SLA) typically is a written agreement that outlines the commitment between a service provider and its customers. A commitment is a service level that all parties have agreed to, such as asset reliability or availability.
- [Record relationships](#)
Relationships between records, such as tickets and work orders, help simplify record management. You can create record relationships manually, or relationships might be created automatically when you take certain actions.
- [Service request categorization](#)
To simplify the task of retrieving and managing service requests, you can categorize the requests using classifications. Most classifications have attributes associated with them that group the classification further. You can add, change, or delete the attributes at any time, or you can reclassify the request to obtain a new set of attributes.

- **Ticket statuses**
Every ticket has a status that indicates its position as it moves toward completion. Changes to the ticket status can happen automatically or manually.
- **Costs on tickets and work orders**
You can view the estimated and actual costs for a single work order or ticket, including costs for labor, material, tools, and services. You can also view total costs for the current record and all the records below it in its hierarchy.
- **Linear segment details**
You use the Linear Segment Details section to locate a linear segment or point on a linear asset. The Linear Segment Details section, which displays on tabs in several applications, appears only if you are working with a linear asset.
- **Restrictions on deleting tickets**
You can delete a ticket only when it has a certain status and only when transactions have not been recorded for it.

Service request management

A service request captures information about the service being requested by a user, including the type of service that is needed, when it is needed, and why it is needed. Managing service requests involves creating, updating, assigning, escalating, and resolving requests for service on an asset or a location in your enterprise.

A service request can be created and managed in several ways.

Method of service request creation	Description
Service Requests application	Used by service desk agents or users in a similar role, who are authorized to create and manage service requests.
Create Service Request application	Used by self-service users who are requesters who can register themselves on the system without the assistance of an agent, and create a service request. The request is then managed by an agent using the Service Requests application. Self-service users also can use the View Service Request application to view the status of their service request as it progresses toward completion.
Automatic	Your system administrator can configure the system to create service requests from sources such as e-mail, system monitoring tools, or external applications, and assign them to people or work groups for resolution.

Service request templates

A service request template contains predefined data that you can insert in common, high-volume service request records. Applying templates can significantly reduce the amount of time needed to create service requests.

If you select and apply a template to a service request record, it overwrites existing data in the record. If there is data in a Service Request field but no data in the corresponding field on the template, the template does not delete the existing data. You can modify the applied information until the service request is in a resolved or closed status.

Service level agreements

A service level agreement (SLA) typically is a written agreement that outlines the commitment between a service provider and its customers. A commitment is a service level that all parties have agreed to, such as asset reliability or availability.

The SLA describes one or more commitments and the escalation actions or notifications associated with each commitment. Escalation actions or notifications might be associated with an SLA to ensure that commitments are met. An escalation process can monitor all activities and send notifications or perform other activities to ensure that commitments are met.

The types of records to which service level agreements can be applied include tickets, such as service requests, and work-based records, such as work orders. Before you can apply an SLA to a record, the record must have a site defined.

A service level agreement can be associated with a record in several ways:

- An SLA might automatically be applied to a record from within a workflow or escalation process, or from another SLA.
- You can select an action to apply an SLA, which applies the best match automatically.
- You can view SLAs and select an action to select or clear the SLAs that you want to manually apply to the record.

When you apply a service level agreement to a record, the following events occur:

- The SLA Applied check box on the main tab of the record is selected to document the action.
- Any escalations that are associated with the SLA are activated.
- The Target Start, Target Finish, and Contact values for the record might be calculated automatically as follows:

Automatically calculated values
When an SLA is applied that includes a response commitment, the response commitment date populates the Target Start date field of the record.
When an SLA is applied that includes a resolution commitment, the resolution commitment date populates the Target Finish date field of the record.
When an SLA is applied that includes a contact commitment, the contact commitment date populates the Target Contact date field of the record.

Record relationships

Relationships between records, such as tickets and work orders, help simplify record management. You can create record relationships manually, or relationships might be created automatically when you take certain actions.

The types of relationships that can exist between records include:

- Related relationship, which is an informal association of tickets that is used for informational purposes.
- Originator and Follow-up, which keep costs hierarchies separate while still creating a relationship between the tickets.
- Related to Global, which creates a relationship in which the tickets are related to a global issue, which affects many users.

Related records

Using any ticket or work-based application, you can view similar records and relate tickets and work orders to the current record. A related relationship between records is an informal relationship that is for informational purposes only.

A related relationship does not affect status inheritance, affect workflow, or follow a set of business rules. Related relationships can be many-to-many, and do not represent record hierarchies. By relating records informally, you can navigate to related records, view related information for similar records, and view open tickets that are associated with a field. You can create an informal record relationship in the following ways:

- Use the Related Records tab of the application. This tab provides an easy way to create relationships and to view and navigate among informally related records.
- Use the Show Similar Tickets action in any ticket application. The similar ticket search results only include the service requests, incidents, and problems that have the same classification as the current ticket. Global records and history records are not included in the results. Your system administrator might add more restrictions to the search results.

Originator and follow-up tickets and work orders

You can relate tickets and work orders to a record more directly when you create a follow-up record from the ticket using one of the Create actions on the ticket. The ticket you create the follow-up record from is the originator. A follow-up record can be a ticket or a work order. In some cases, a follow-up ticket or work order might be able to change the status of its originating ticket. An originating ticket cannot change the status of a follow-up work order, nor can a follow-up ticket change the status of the originator if there is more than one follow-up. These options are configured by the system administrator.

Globally related tickets

A global ticket is an incident or problem relating to an issue that affects many users. You can relate tickets, including service requests, to a global ticket, which creates a RELATEDTOGLOBAL relationship. This relationship lets you manage the tickets by using the global ticket. When you change the status of the global ticket, the system changes the status of all globally related tickets.

If your administrator has set up automated notifications of status changes, the system changes the status of the tickets related to the global issue. For example, all the initial requestors reporting the same issue are notified of its resolution. On the global ticket, you can also view a list of related records and view the work and communication logs for all related records.

- **Deletion of record relationships**
On the Related Records tab, you can delete the relationship between a change and any related work orders or tickets.
- **Global records**
A global record is a ticket that is a root cause of other issues or that affects many users, such as computer network failures or flooding in a building. After you mark a record as global, you can relate multiple tickets and then manage all tickets using the global record.

Global records

A global record is a ticket that is a root cause of other issues or that affects many users, such as computer network failures or flooding in a building. After you mark a record as global, you can relate multiple tickets and then manage all tickets using the global record.

The following features, conditions, and restrictions pertain to using and managing global records:

- When you display a global record, and select the Show Similar Tickets action in the toolbar, you can view all tickets that are related to the global record. You also can select tickets and relate them to the global ticket.
- A record can be a global ticket or related to a global ticket, but not both.
- You can view the work and communication logs for all related records from the global record.
- If you change the status of a global record, the statuses of all globally related tickets change accordingly.
- Records that are created as follow-up records from the global record cannot be related to it as a global record.
- You cannot manage follow-up records from the global record.
- You cannot relate any record to a global record that is archived as a history record.
- You cannot designate a record as global if it is already related to a global record or it is a history record.
- You can remove the global flag from a global record that has tickets related to it, but you must first remove the value in the Related to Global ID field for each ticket that is related to the global record. You can do so using the Related Records tab of the global record.

Service request categorization

To simplify the task of retrieving and managing service requests, you can categorize the requests using classifications. Most classifications have attributes associated with them that group the classification further. You can add, change, or delete the attributes at any time, or you can reclassify the request to obtain a new set of attributes.

For example, a service request might involve first classifying the request by technical area, such as hardware, software, or network. If a user selects the software classifications, further classifications might allow the specification of the exact software type and version.

You can specify values for the attributes. Classifying service requests also supports the integration of service requests with related workflow processes, escalations, and service level agreements.

Ticket statuses

Every ticket has a status that indicates its position as it moves toward completion. Changes to the ticket status can happen automatically or manually.

If you change the status of a global ticket, then the same status change is automatically made to all related tickets.

Status changes can happen automatically as the result of workflows. For example, you can create a workflow that changes the status to QUEUED automatically when a ticket is assigned to an owner for resolution. Workflows can also result in tickets being automatically routed, escalated, reported to another party, or closed.

In some cases, such as that of related records, changing the status of a follow-up record might change the status of its originating record. The service desk administrator configures these options.

Your system administrator can add, remove, or change the names of the basic statuses.

NEW

The default status that is applied when a ticket is created or inserted. You cannot return a ticket to this status after you change it.

QUEUED

The ticket is in the queue and work can begin on it.

INPROG

Work on the ticket is ongoing.

PENDING

The ticket is pending an action. For example, work cannot continue until a part is received.

RESOLVED

Information was gathered and routed, service was restored, or a solution was provided. When the status of a record changes to RESOLVED, the status of all the activities in that record changes to COMPLETE.

CLOSE

A closed record is a historical archive and you cannot change its status. You can, however, change editable fields of the archived record. When the status of a record changes to CLOSED, the system changes the status of all activities in that record to CLOSED.

Costs on tickets and work orders

You can view the estimated and actual costs for a single work order or ticket, including costs for labor, material, tools, and services. You can also view total costs for the current record and all the records below it in its hierarchy.

When you view the costs of a ticket or work order, the data is displayed in two tables:

- The Totals table displays the costs for a single ticket or work order.
- The View Hierarchy Grand Totals table displays the costs for the current ticket or work order and all records under its hierarchy.

Each table presents the same information, which is shown in the following table.

Column	Explanation
Current Estimate	Displays read-only calculated values for the current totals from the Labor, Materials, Standard Services, and Tools tabs of the Plans tab for the ticket or work order.
Estimate at Approval	Is set to zero until the work order is approved, then the values are copied from the Current Estimate column and are read-only. If the work order status changes from approved to unapproved, then these fields are cleared. The estimated costs at approval are not affected by the change in status from in progress to completed or closed.
Actual	Displays the read-only values from the Labor (for approved labor only), Materials, and Tools tabs of the Actuals tab. If the status of the record changes from approved, then these fields are not cleared.

Rolling up maintenance costs

After you close a work order that is associated with an asset, you can calculate your maintenance costs by rolling up costs that you incur for labor, materials, tools, and services to the top-level asset in the hierarchy that the asset belongs to.

Costs can be rolled up manually or automatically. By default, cost rollups are manual. If you want costs to be calculated and rolled up automatically when a work order is closed, you must set the `mxe.workorder.rollupMaintenanceCosts` system property to 1. After you configure the system property for automatic rollups, all subsequent costs that are associated with work orders are rolled up automatically. However, any unprocessed maintenance costs that existed before the configuration are not automatically rolled up. You must roll up any preexisting, unprocessed maintenance costs manually.

To calculate the maintenance cost of your assets, use the Roll Up Maintenance Costs action in the Assets application.

If you upgrade to Maximo® Manage 8.5, run the Asset Cost Rollup Report to roll up pending maintenance costs before the upgrade.

Linear segment details

You use the Linear Segment Details section to locate a linear segment or point on a linear asset. The Linear Segment Details section, which displays on tabs in several applications, appears only if you are working with a linear asset.

For example, if you specify a linear asset in the Asset field on a preventive maintenance record, the PM tab displays a Linear Segment Details section. If you enter a point asset, the PM tab does not display this section. The Linear Segment Details section includes fields for both the start point and the end point. If you locate a point, such as a stop sign, the start and the end points are the same.

The following terms are associated with linear segments:

Measure

The absolute distance from the start of a linear asset. You can specify a measure manually. The measure is calculated for you if you enter a reference point and a reference point offset. In the example, using Mile Post 27 and an offset of -528, the calculated measure is 26.9 miles (528 feet = .1 mile).

Offset

A measure from a previously defined reference point. The possible kinds of offsets are the following:

Reference Point Offset

The distance before or after the reference point. Specify an offset value if the segment start or end is before or after the reference point. The value can be negative (before) or positive (after). For example, if the start of the segment is 528 feet before Mile Post 27, type -528.

You cannot specify an offset that, when combined with the reference point, yields a measure that is outside the boundaries of the linear asset. For example, if reference point Mile Post 1 is at 1.0 miles on a linear asset that begins at 0.0 miles, you cannot enter an offset of -2 miles.

Y-Offset

A distance perpendicular to the direction of the linear asset. For example, a speed limit sign is located 10 feet from the right edge of the road. "Right" is positive and "left" is negative. Therefore, the Y offset is 10.

Z-Offset

A distance above a linear asset or below a linear asset. For example, an exit sign is located 18 feet above the surface of the road, and a culvert is 4 feet below the surface of the road. The Z offset for the sign is 18, and the Z Offset for the culvert is -4.

Reference point

A feature instance that you can use as a starting point or as an ending point for a linear segment. A reference point is a means of communicating a work location. For example, it can be more useful to workers to say that roadside plowing on Route 96 begins at the intersection of Routes 96 and 75, and ends at Exit 34. It would be less useful to say the work begins at Mile 27.85 and ends at Mile 33.8.

The use of reference points varies according to department practices and to individual variation among linear assets. Some roads might have accurate and persistent mile post markers and workers can rely on them to locate work. Other roads might have few markers or no accurate markers, and users can rely on reference points. Use labels that maintenance workers in the field can easily identify.

Click Select Value to select the reference point.

Y Reference

The point from which the Y Offset is measured.

The system administrator creates the set of Y Reference values by creating a domain in the Domains application. For roads, some common examples include midline, outer pavement edge, and inner pavement edge. For example, a stop sign is located not just 20 feet from a road, but 20 feet from the midline of a road.

Z Reference

The point from which the Z Offset is measured.

The system administrator creates the set of Z Reference values by creating a domain in the Domains application. For roads, some common examples include road surface and road bed. For example, an exit sign is located 18 feet above the road surface, or a culvert is 12 feet below the road bed.

Restrictions on deleting tickets

You can delete a ticket only when it has a certain status and only when transactions have not been recorded for it.

Status-related restrictions

You can delete a ticket only if it has one of the following statuses:

- NEW.
- QUEUED.

Transaction and record restrictions

You cannot delete a ticket that has the following types of transactions or records associated with it:

- Labor transactions
- Workflow history
- Child activities, although you can delete the activities and then delete the record
- Related records
- Is related to another record
- Is the originating record for another record
- Work log entries

Working with service requests

You can create service requests either in the Service Requests application or as records related to other tickets or work orders. You can apply service level agreements, categorize requests, create relationships with other records, assign and record labor activities, and log actions and communications.

- [Creating service requests](#)
You create a service request to capture information about a request, including the type of service, who needs it, where, when, and why.
- [Relating records to other records](#)
You can relate records to each other in a ticket or work order application. For example, you can select a work order and relate it to a service request. Relating records creates a relationship type of RELATED between the records.
- [Changing the status of a list of records](#)
You can change the status of multiple records in applications.
- [Changing archived tickets](#)
After a ticket is closed, it is archived. To ensure that important information is maintained on historical records, you can open an archived record and change the editable fields.

Creating service requests

You create a service request to capture information about a request, including the type of service, who needs it, where, when, and why.

Procedure

1. In the Service Requests application, click the New Service Request icon.
 2. Specify the details of the service request.
 3. Save the record.
- [Applying service level agreements to records](#)
You can apply a service level agreement (SLA) to a record to define the agreement and formal commitments between a service provider and a customer. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.
 - [Removing service level agreements from records](#)
To maintain accurate records, it might be necessary to remove an invalid or erroneous service level agreement to disassociate it from the record.
 - [Classifying records](#)
You can apply a classification to a record to structure it into an organized hierarchy. You can use classifications and attributes to locate records, and help to ensure that records are not duplicated unintentionally.
 - [Adding activities to service requests](#)
You add activities to service requests to specify the work needed to resolve the service request. These work activities are typically performed by another internal group or by a vendor, while overall management of the service request is maintained elsewhere.
 - [Creating records from existing records](#)
To create a relationship between two records, you can create a record from an existing record. The record from which you create a change has a relationship type of ORIGINATOR, and the new record has a relationship type of FOLLOWUP.

Applying service level agreements to records

You can apply a service level agreement (SLA) to a record to define the agreement and formal commitments between a service provider and a customer. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.

About this task

When you apply an service level agreement to work orders, the SLA is applied only to the work order, not to its tasks. If you want to apply a service level agreement to a task, you must display the task as the current record and then apply the SLA.

You can apply service level agreements to tickets and work orders.

Procedure

1. Open an application and display the record that you want to update.
2. Select the Apply SLA action.
3. Click OK.

Results

The SLA Applied check box on the main tab of the selected application is selected. The target start, target finish, and contact values are calculated for the selected record.

Removing service level agreements from records

To maintain accurate records, it might be necessary to remove an invalid or erroneous service level agreement to disassociate it from the record.

Procedure

1. Display the record for which you want to remove a service level agreement.
2. Select the Select/Deselect SLA action.
3. Click Mark Row for Delete for each service level agreement that you want to remove from the record.
4. Click OK.
5. Save the record.

Classifying records

You can apply a classification to a record to structure it into an organized hierarchy. You can use classifications and attributes to locate records, and help to ensure that records are not duplicated unintentionally.

About this task

You can create one or more classification hierarchies in the Classifications application. You can apply classifications to many record types.

Procedure

1. Open an application and select the record that you want to update.
2. In the Classification field, select Detail Menu > Classify.
3. Click a classification category.
You can open additional levels of the classification until you find the desired classification category.
4. Click Select Record to return a value to the Classification field.
5. Click Save record.

Adding activities to service requests

You add activities to service requests to specify the work needed to resolve the service request. These work activities are typically performed by another internal group or by a vendor, while overall management of the service request is maintained elsewhere.

Procedure

1. In the Service Requests application, display the service request to which you want to add an activity.
 2. In the Time Tracking table window, click New Row.
 3. Select an activity work order.
 4. Save the record.
- [Reporting labor time for activities on tickets](#)
You can manually record the labor time that you spend resolving individual activities that are identified on a ticket.
 - [Reporting labor time using the Start and Stop timers](#)
You can use the automatic time-tracking features of the system to help you report the time spent working on a ticket or work record.
 - [Classifying records](#)
You can apply a classification to a record to structure it into an organized hierarchy. You can use classifications and attributes to locate records, and help to ensure that records are not duplicated unintentionally.
 - [Selecting labor for activities on tickets](#)
To record the labor resources assigned to each activity on a ticket, you can select labor for each activity and create a labor transaction.

Reporting labor time for activities on tickets

You can manually record the labor time that you spend resolving individual activities that are identified on a ticket.

Procedure

1. Display the ticket that contains the activity for which you want to record labor time.
2. On the Service Request tab, in the Time Tracking table window, select the activity for which you want to add a time entry.
3. Specify the details.
4. Save the record.

Reporting labor time using the Start and Stop timers

You can use the automatic time-tracking features of the system to help you report the time spent working on a ticket or work record.

Procedure

1. Open the record.
2. On the toolbar, click the Start Timer button.
3. To stop the timer, click the Stop Timer button.
4. Optional: If necessary, you can edit the finish date, finish time, or hours.
5. Click OK.

Classifying records

You can apply a classification to a record to structure it into an organized hierarchy. You can use classifications and attributes to locate records, and help to ensure that records are not duplicated unintentionally.

About this task

You can create one or more classification hierarchies in the Classifications application. You can apply classifications to many record types.

Procedure

1. Open an application and select the record that you want to update.
2. In the Classification field, select Detail Menu > Classify.
3. Click a classification category.
You can open additional levels of the classification until you find the desired classification category.
4. Click Select Record to return a value to the Classification field.
5. Click Save record.

Selecting labor for activities on tickets

To record the labor resources assigned to each activity on a ticket, you can select labor for each activity and create a labor transaction.

Procedure

1. Display the record that contains the activities for which you want to select labor.
2. On the main tab of the application, in the Time Tracking table window, select the activity for which you want to select labor.
3. Specify the details of the labor you are adding.
4. Save the record.

Creating records from existing records

To create a relationship between two records, you can create a record from an existing record. The record from which you create a change has a relationship type of ORIGINATOR, and the new record has a relationship type of FOLLOWUP.

Procedure

1. Display the record from which you want to create the related record.
2. Select the Create > Record Type action where Record Type is the type of related record you want to create.
3. Save the record.

Relating records to other records

You can relate records to each other in a ticket or work order application. For example, you can select a work order and relate it to a service request. Relating records creates a relationship type of RELATED between the records.

- **Relating ticket and work order records**
To help simplify record management, you can relate tickets or work orders to other tickets or work-related records using the Related Records tab of a ticket or work order application
- **Deleting relationships**
When you determine that the record you are managing is no longer related to other tickets or work-related records, you can remove the relationship using the Related Records tab.
- **Removing global issue flags**
If you have erroneously marked a record as global and then related tickets to the global record, you can remove the global flag on the record only after you remove the identifier for the global record in all related records.

Relating ticket and work order records

To help simplify record management, you can relate tickets or work orders to other tickets or work-related records using the Related Records tab of a ticket or work order application

Procedure

1. Display the record to which you want to relate other tickets and work orders.
2. On the Related Records tab, in the Related Tickets section, select the tickets that you want to relate to the current record.
3. In the Related Work Orders section, select the work orders that you want to relate to the current record.
4. Save the record.

Deleting relationships

When you determine that the record you are managing is no longer related to other tickets or work-related records, you can remove the relationship using the Related Records tab.

Procedure

1. Display the record that has the relationship that you want to delete.
2. Click the Related Records tab, and then delete the ticket.
3. Save the record.

Removing global issue flags

If you have erroneously marked a record as global and then related tickets to the global record, you can remove the global flag on the record only after you remove the identifier for the global record in all related records.

Procedure

1. Display the record for which you want to remove the global flag.
2. Click the Related Records tab.
3. For each related record, click the Detail Menu icon and select *Go To Application* where *Application* is the application for that type of record.
4. Remove the value in the Related to Global ID field.
5. Save the record.
6. After removing the relationship from all relevant records, display the global record and clear the Global Issue check box.
7. Save the record.

Changing the status of a list of records

You can change the status of multiple records in applications.

Procedure

1. In the Work Order application, on the List tab of an application, filter the records so that less than 200 records are displayed.
2. Scroll down the bottom of the screen and select the Select Records check box.
The screen refreshes and each row now has a check box.
3. Select the check boxes for the work orders whose status you want to change.
4. Click the Change Status action and enter the information in the dialog box.
5. Click OK to close the Change Status window.

Changing archived tickets

After a ticket is closed, it is archived. To ensure that important information is maintained on historical records, you can open an archived record and change the editable fields.

Procedure

1. Display the record whose history you want to edit.
2. Select the Edit History action.

3. Change the ticket.
4. Save the record.

Ticket Templates

Applying standardized templates to common and high-volume tickets saves time by letting the system populate values from the template into fields on the ticket. You create and manage templates using the Ticket Templates application.

For other users to apply a ticket template, the template must be in an ACTIVE status, and the template class must match the ticket class. In addition, you can specify a site on a ticket template when you create it. The template is then included in the list of available templates for organizations associated with that site. The list also includes templates that do not have an organization defined.

Example

For example, an IT service provider receives a large quantity of requests to set up a home virtual private network (VPN) with a cable modem. As an administrator, you create a ticket template to handle these common VPN service requests.

When Sandra in Support receives a call for VPN information, she creates a service request and applies the VPN ticket template to the record. The system automatically categorizes the ticket, sets the internal priority, and supplies any other predefined values in the fields of the record.

A series of predefined steps always occurs to support access to the VPN. You can create these activities or include existing job plans on your template. The system automatically generates these activities when Sandra applies the template, including any materials, time, labor, and services from a job plan.

- [Ticket templates overview](#)
Standardized ticket templates save time and make service desk operations more efficient. Applying a ticket template to a record results in data automatically appearing in some fields on the ticket .
- [Working with ticket templates](#)
You can create ticket templates in the Ticket Templates application. After a template is created, you must change the status to ACTIVE to allow other users to use the template.

Ticket templates overview

Standardized ticket templates save time and make service desk operations more efficient. Applying a ticket template to a record results in data automatically appearing in some fields on the ticket .

- [Ticket classes](#)
When you create a template in the Ticket Templates application, you classify the type by choosing from one of three classes of tickets. The class of the ticket defines the purpose of the ticket.
- [Ticket template activities](#)
To document the work activities that are required to complete a service request or resolve a ticket, you can create a ticket template. You can then manually add activities to the template. Optionally, you can add a job plan to the template to use an existing set of activities.
- [Ticket template statuses](#)
When you create a ticket template, the template is given a status of DRAFT. You can use the Change Status action to change the ticket template status to ACTIVE or INACTIVE to manage the accessibility of ticket templates.

Ticket classes

When you create a template in the Ticket Templates application, you classify the type by choosing from one of three classes of tickets. The class of the ticket defines the purpose of the ticket.

Service Request

A service request (SR) is generally a request for information, help, or service. It acts as a mechanism for capturing requests and assigning work. Some service desk organizations might choose to open an SR for all incoming requests, whereas others might open incident or problem records directly from a call.

Problem

A problem is an issue with an unknown cause. After the cause of a problem is identified, any new tickets that a user creates for the same problem can be flagged as a "known problem."

Incident

An incident is a disruption to normal service. When an incident ticket is created, the goal is to restore normal service as soon as possible.

Example

The notebook of an employee fails. The employee calls IT to report the failure, and a user opens a service request ticket to document the request. After the service request is assigned to an owner, who then creates an incident ticket. The Incident ticket specifies the replacement of the notebook, which reinstates normal service as soon as possible. Next, the service request owner creates a problem ticket to diagnose the problem with the notebook, and finally a change work order to repair it.

Ticket template activities

To document the work activities that are required to complete a service request or resolve a ticket, you can create a ticket template. You can then manually add activities to the template. Optionally, you can add a job plan to the template to use an existing set of activities.

When you apply a template to a ticket, the system automatically generates the following work orders:

- Generates child activity work order for each activity defined in the template.
- If a job plan is defined, then a child activity work order is generated that is based on attributes defined in the job plan.

Example

Your organization needs a ticket template that users can apply to a service request when a new employee is hired. You create a ticket template called New Employee for the owner group HR. You assign this ticket template to the IT service group. You include in the template four activities that need to be performed, in the proper sequence:

Sequence	Description
10	Create a security badge
20	Create IT accounts
30	Issue PC
40	Issue cell phone

If you have a job plan that already includes these four activities, you can add the single job plan. You can only reference job plans that have a status of ACTIVE.

Ticket template statuses

When you create a ticket template, the template is given a status of DRAFT. You can use the Change Status action to change the ticket template status to ACTIVE or INACTIVE to manage the accessibility of ticket templates.

A ticket template can have one of the following statuses:

Ticket template status	Description
DRAFT	When you create a ticket template, the system sets the status of the ticket template to DRAFT. Use this status while you are in the process of creating or finalizing the new template. Once you move the template out of DRAFT status, you cannot set it back to DRAFT.
ACTIVE	When you are ready for the template to be available to other users, change the status to ACTIVE. Only templates with an ACTIVE status can be applied by other users to a ticket record.
INACTIVE	Change the template status to INACTIVE for reasons such as: <ul style="list-style-type: none">• You do not want users to have access to the template.• You are currently not using the template.• You want to keep a record of for historical purposes.

Working with ticket templates

You can create ticket templates in the Ticket Templates application. After a template is created, you must change the status to ACTIVE to allow other users to use the template.

- [Creating ticket templates](#)
You can create a template and apply it to a ticket as a quick way to add repetitive information to common or high-volume tickets, rather than entering this data manually.
- [Classifying ticket templates](#)
When you classify ticket templates, you group related templates into classes, which makes it easier to find ticket templates. You can classify and modify the classification of a ticket template until the status of the ticket template is set to closed.
- [Categorizing ticket template activities with classifications and attributes](#)
Categorizing activities involves classifying them and might involve adding and modifying attributes to further group the classification. For example, you can classify an activity by functional area, such as IT, facilities, or telecommunications. You can add attributes, change the attribute values, and remove attributes associated with the activity.
- [Duplicating ticket templates](#)
When you duplicate a template, the system copies all the information from the existing template but inserts a new template ID and sets the status to draft. Duplicating a ticket template is useful when you want to create a new template that is similar to an existing template.

Creating ticket templates

You can create a template and apply it to a ticket as a quick way to add repetitive information to common or high-volume tickets, rather than entering this data manually.

Procedure

1. In Ticket Templates application, click New Template icon.
2. In the Class field, specify the class of ticket for which this template is intended, such as Service Request, Problem, or Incident.
3. Specify the details for the template.
4. Save the template.

What to do next

To use the new template, you must change the status of the template to ACTIVE.

Classifying ticket templates

When you classify ticket templates, you group related templates into classes, which makes it easier to find ticket templates. You can classify and modify the classification of a ticket template until the status of the ticket template is set to closed.

Procedure

1. In the Ticket Templates application, open the ticket template that you want to classify.
2. In the Classification field, click the Details Menu icon, and then select Classify.
3. Locate the correct classification.
4. Save the record.

Categorizing ticket template activities with classifications and attributes

Categorizing activities involves classifying them and might involve adding and modifying attributes to further group the classification. For example, you can classify an activity by functional area, such as IT, facilities, or telecommunications. You can add attributes, change the attribute values, and remove attributes associated with the activity.

Procedure

1. In the Ticket Templates application, display the record that contains the activity you want to categorize.
2. If the Classification field is empty, specify a type of class to associate with the record.
3. In the Activities table window, select the activity.
4. Specify a classification path.
5. Optional: On the Specifications tab, you can add attributes, delete attributes, and change the values of the attributes in the row details.
6. Save the record.

Duplicating ticket templates

When you duplicate a template, the system copies all the information from the existing template but inserts a new template ID and sets the status to draft. Duplicating a ticket template is useful when you want to create a new template that is similar to an existing template.

Procedure

1. In the Ticket Templates application, display the template that you want to duplicate.
2. Select the Duplicate Template action.
3. Modify the ticket template.
4. Save the record.

Service Level module

You use the Service Level module to create and manage service level agreements which document the commitments between service providers and customers. You can also create a service group for each type of service that you provide or procure.

- **[Service Level Agreements](#)**
In the Service Level Agreements application, you create and manage service level agreements. Service level agreements document the commitments between service providers and customers. Services consist of tasks that service providers complete to fulfill customer needs. Commitments are responsibilities that service providers must meet to fulfill service level agreements.
- **[Service Groups](#)**
You use the Service Groups application to define all services that you provide or procure. You create a service group for each type of service that you define.

Service Level Agreements

In the Service Level Agreements application, you create and manage service level agreements. Service level agreements document the commitments between service providers and customers. Services consist of tasks that service providers complete to fulfill customer needs. Commitments are responsibilities that service providers must meet to fulfill service level agreements.

Service level agreements exist at the system level. However, you can restrict service level agreements to the organization or site level. If you do not specify values for organization and site, anyone can view the service level agreement and users from any site with the proper permissions can apply the service level agreement. If you specify values for organization or site field, users can only view or apply that service level agreement within the specified organization or site.

When you create a service level agreement, you can perform these functions:

- Rank service level agreements according to precedence, which determines which service level agreement to apply
- Set effective start date, end date, and review date for a service level agreement, which you can use to drive a workflow process
- Associate contracts with a service level agreement
- Associate related service level agreements with the current service level agreement
- Associate assets and locations with a service level agreement
- Create key performance indicators, or metrics, for a service level agreement
- Create escalations to support the commitments in a service level agreement

Service level agreements and other applications

Users can apply valid service level agreements to records from other applications.

Other application example

In a service desk environment, a user with the proper permissions can apply a service level agreement from any of the Ticket applications or Work Order applications.

Service level agreements and escalations

You can use the Service Level Agreements application and escalation functionality to manage and meet the commitments in a service level agreement. An escalation is a function that automatically monitors critical processes. A service level agreement can have one or more commitments, each having their own escalation points.

Escalations example

You have a service level agreement with a customer. The service level agreement has two commitments with an escalation point for each. The first commitment is to respond to all incidents that are related to the e-mail server within two hours. The escalation point for the first commitment is to notify a supervisor if no response has been given after one hour.

The second commitment is to resolve all incidents that are related to the e-mail server within four hours. The escalation point for the second commitment checks the status of the incident at the two-hour point. If the incident is still open, ownership of the incident is reassigned to the supervisor. The supervisor can take the appropriate actions to meet the service level agreement commitments.

- [Service level agreements overview](#)
Service level agreements document the commitments between service providers and customers. You can define commitment types, associate assets and locations, rank service level agreements, set calendars, create associated key performance indicators, and define escalations.
- [Managing service level agreements](#)
After you create a service level agreement, you can associate contracts, create escalations, change the service level agreement, change the status, and create key performance indicators.

Service level agreements overview

Service level agreements document the commitments between service providers and customers. You can define commitment types, associate assets and locations, rank service level agreements, set calendars, create associated key performance indicators, and define escalations.

- [Types of service level agreements](#)
When you create a service level agreement, you must assign a type. The type enables you to sort or search for service level agreements by type.
- [Key performance indicators associated with service level agreements](#)
In the Service Level Agreements application, you manage key performance indicators that are associated with a service level agreement. A key performance indicator is a metric that tracks critical performance variables over time. In this case, you track the performance of a service desk organization and its compliance with service level agreements.
- [Ranking system for service level agreements](#)
In the Service Level Agreements application, there is a ranking system that uses a ranking value to select one or more service level agreements to apply to a record. Depending on your configuration, you can either apply one or multiple service level agreements to a record. You set these options at the site level.
- [Automatic matching of service level agreements to records](#)
Matching logic is used to automatically match service level agreements to records. The matching logic compares the completed fields in the service level agreements to the same fields in the record to which you are applying the service level agreement.
- [Calendars for service level agreements](#)
When you create service level agreements, you can use two different types of calendars: an applies to calendar or a calculation calendar. The applies to

calendar specifies the business hours for a particular shift for an organization. The calculation calendar sets the target contact, start date, and finish date on a record.

- [Associated service level agreements](#)

In the Service Level Agreements application, you associate service level agreements that are related to one another. You can create either an associated service level agreement that is a parent or a child. Parent service level agreements are supported by a specific service level agreement. Child service level agreements support a specific service level agreement.

- [Escalations and service level agreements](#)

Escalations monitor processes to ensure that service providers meet the commitments in service level agreements. When you create an escalation for a service level agreement, the escalation is applied to the business object (such as service request or incident) that is used in the service level agreement.

- [Status of service level agreements](#)

To control how service level agreements are used, you can change the status of a service level agreement to draft, active, or inactive.

- [Changes to service level agreements](#)

As your business needs change, you use the Service Level Agreements application to change service level agreements.

- [Deletion of service level agreements](#)

In the Service Level Agreements application, you delete service level agreements that you no longer. When you delete a service level agreement, the associated escalation is deleted also.

Types of service level agreements

When you create a service level agreement, you must assign a type. The type enables you to sort or search for service level agreements by type.

The following list describes the three predefined types for service level agreements:

- A customer service level agreement is an agreement between you and an external customer. For example, a facilities manager provides maintenance services for various customers.
- An internal service level agreement is an agreement between you and an internal customer (such as another organization, site, or department). For example, you are the facilities manager and provide maintenance services for the departments in your company.
- A vendor service level agreement is an agreement between you and the vendor. For example, you hired a vendor to support notebook services. If you have a contract with another vendor that supports your commitments to a customer, you can associate the contract to a vendor service level agreement.

The three types of service level agreements can support each other. For example, you have an internal service level agreement to provide hardware services to support internal departments. You also have a vendor service level agreement for notebook support.

- [Commitments for service level agreements](#)

When you create a service level agreement, you specify the commitments that you agreed to fulfill for external or internal customers. A commitment is a level of service that is agreed upon between the service provider and the customer that can be measured in a qualitative or quantitative way.

- [Assets and locations associated with service level agreements](#)

In the Service Level Agreements application, you associate specific assets, asset types, and locations to a service level agreement. After you activate a service level agreement and the associated escalation, the service level agreement is applied to any listed assets, asset types, and locations.

- [Service level agreements and other applications](#)

To ensure compliance with service level agreements, you can apply valid service level agreements to records from other applications.

Commitments for service level agreements

When you create a service level agreement, you specify the commitments that you agreed to fulfill for external or internal customers. A commitment is a level of service that is agreed upon between the service provider and the customer that can be measured in a qualitative or quantitative way.

Escalations and service level agreements

In the Service Level Agreements application, you can create an escalation to ensure that you comply with a service level agreement. One escalation is created per service level agreement, and you can add individual escalation points for each commitment that exists in a service level agreement. The values for the escalation points are defaulted from the values that you specified in the commitment. You can view and change the escalation point conditions on the Escalation tab.

Vendor service level agreements

For vendor service level agreements, an external vendor fulfills commitments for you.

Predefined commitment types

The following table describes the predefined commitment types.

Commitment Type	Applies to	Description
Contact	Ticket applications	<ul style="list-style-type: none">• Set the target contact date for a ticket when a service desk agent applies a service level agreement• A measure of time
Response	Ticket and Work Order applications	<ul style="list-style-type: none">• Set the target start date for a ticket or work order when a service desk agent applies a service level agreement• A measure of time

Commitment Type	Applies to	Description
Resolution	Ticket and Work Orders	<ul style="list-style-type: none"> Set the target finish date for a ticket or work order when a service desk agent applies a service level agreement A measure of time
Other	All objects	<ul style="list-style-type: none"> Apply to any business object Possible synonyms for other include availability, reliability, and downtime No business rules are associated with this type A value + a unit of measure + a time period

You can implement other commitment types to suit the needs of your business environment.

Except for the commitment type Other, you can add only one of each commitment type to a service level agreement. Three attributes are used to define the commitment types: value, unit of measure, and time period (in days). When you choose a type, the attributes are editable or read-only, as needed. For example, if you set the type to Response, the Value field and Unit of Measure field are editable. If you set the type to Other, the three attribute fields are editable.

Assets and locations associated with service level agreements

In the Service Level Agreements application, you associate specific assets, asset types, and locations to a service level agreement. After you activate a service level agreement and the associated escalation, the service level agreement is applied to any listed assets, asset types, and locations.

To associate assets, the service level agreement must have a draft or inactive status. When you associate assets and locations to service level agreements, the following rules apply:

- You can only associate assets or locations to a service level agreement if the service level agreement applies to a ticket, work order, asset, or location.
- You can only associate an asset type to a service level agreement if the service level agreement applies to a ticket, work order, or asset.
- When you restrict a service level agreement to a specific organization or site, only the available assets, asset types, and locations for that organization or site are displayed.
- When you make a service level agreement and the associated escalation active, the service level agreement is applied to any listed assets, asset types, and locations.
- When you use the Apply SLA action from another application, the asset, asset type, or location values are used as part of the matching logic.

In the Service Level Agreements application, you associate assets, asset types, and locations on the Assets and Locations tab.

Examples of service level agreements

You have a service level agreement with an outside vendor to provide service for a specific brand of servers. The agreement that you establish is specific to the servers, and each asset in the agreement is associated with the service level agreement. When a ticket is opened that lists one of these assets in the Asset field, the service level agreement for the servers is applied to the ticket.

You have a service level agreement that states that e-mail server 001 must be available 85% of the time in location B5. On the Assets and Locations tab in the Service Level Agreements application, you can associate the specific asset and location being referenced in the service level agreement.

You have a service level agreement that states that 15 servers must be available 90% of the time. Instead of adding the 15 serialized assets to the service level agreement, you can associate the asset type. When you associate the asset type, all individual assets that are classified under that type are automatically associated with the service level agreement.

Service level agreements and other applications

To ensure compliance with service level agreements, you can apply valid service level agreements to records from other applications.

There are two ways to apply service level agreements to records:

- In a service desk environment, you can apply a service level agreement from any of the Ticket applications or Work Order applications.
- You can use the Service Level Agreements application and escalation functionality to manage the commitments in a service level agreement. An escalation is a function that automatically monitors critical processes. A service level agreement can have one or more commitments, each having their own escalation points.

Example

You have a service level agreement with a customer. The service level agreement has two commitments with an escalation point for each. The first commitment is to respond to all incidents that are related to the e-mail server within two hours. The escalation point for the first commitment is to notify a supervisor if no response has been given after one hour.

The second commitment is to resolve all incidents that are related to the e-mail server within four hours. The escalation point for the second commitment checks the status of the incident at the two-hour point. If the incident is still open, ownership of the incident is reassigned to the supervisor. The supervisor can take the appropriate actions to meet the service level agreement commitments.

Key performance indicators associated with service level agreements

In the Service Level Agreements application, you manage key performance indicators that are associated with a service level agreement. A key performance indicator is a metric that tracks critical performance variables over time. In this case, you track the performance of a service desk organization and its compliance with service level agreements.

Key performance indicators are created in the Key Performance Manager application. For key performance indicators, you can perform the following actions:

- Define the value to be calculated (response time, resolution time, and so on)
- Select a calculation type (percentage or decimal)
- Define the time you want calculated (day, week, month, and so on)
- Define the thresholds that define the red, yellow, and green limits on the key performance indicator display
- Define the degree to which users can drill down through the key performance indicator to get more information, such as response time by department

Graphs for key performance indicators

The following list describes the color code for the graphs for key performance indicators:

- The gray arrow represents the number in the Target field.
- The orange arrow represents the number of records found for the query.
- The green area represents the target zone.
- The yellow area represents the warning zone.
- The red area represents the alert or danger zone.

In the Service Level Agreements application, you use the KPIs tab to create and associate key performance indicators with service level agreements.

To view the graphs for key performance indicators, you must use either the KPI Manager application or add the key performance indicator portlets to your start center.

Example of key performance indicator

A service level agreement with a customer states that you must meet the following criteria:

- Respond to all incident tickets within one hour and resolve the incidents within three hours
- Maintain a monthly average of a one-hour response time, or pay financial penalties

To ensure that you are aware of your average response time for all incident tickets for this customer, you create a key performance indicator for this service level agreement, and make the key performance indicator accessible to the appropriate managers. Using the key performance indicator, you can take necessary proactive measures to avoid the financial penalties associated with noncompliance.

Ranking system for service level agreements

In the Service Level Agreements application, there is a ranking system that uses a ranking value to select one or more service level agreements to apply to a record. Depending on your configuration, you can either apply one or multiple service level agreements to a record. You set these options at the site level.

Service level agreements are ranked in the following ways:

- If application of one service level agreement is allowed, and more than one service level agreement matches a record, the value in the Ranking field is used to select a service level agreement. The matching service level agreement with the highest ranking (the lowest number in the Ranking field) is applied.
- If application of more than one service level agreement is allowed, all matching service level agreements are applied. If more than one service level agreement is allowed, all matching service level agreements are applied. The service level agreement that calculates target dates either is the service level agreement with the highest ranking or the service level agreement with the most stringent commitment time. Your system administrator determines this setting.

Automatic matching of service level agreements to records

Matching logic is used to automatically match service level agreements to records. The matching logic compares the completed fields in the service level agreements to the same fields in the record to which you are applying the service level agreement.

Matching rules

The following rules apply when service level agreements are matched to records:

- Depending on system configuration, you might be able to apply one service level agreement or multiple service level agreements to a record:
 - If you can apply only one service level agreement to a record and there are multiple valid service level agreements for that record, the service level agreement with the highest rank is applied to calculate the contact, response, and resolution dates.
 - If you can apply multiple service level agreements to a record, the system administrator must choose whether to prioritize the service level agreements based on a numerical rank or commitment stringency. If prioritization is based on commitment stringency, the commitment types across all valid service level agreements are compared, and the most stringent commitment from each type is used to set the values on the ticket or work order.
- If there are multiple service level agreements with the same rank that can apply to a record, the first matching service level agreement that is found is used.

Matching fields

The following fields are used to match service level agreements to records:

- Additional Criteria field
- Asset field
- Asset Type field
- Calendar field (in the applies to calendar)
- Classification field
- Location field
- Organization field
- Service field
- Service Group field
- Shift field (in the applies to calendar)
- Site field
- Vendor field

When one of the following conditions is met in these fields, a match is made:

- When the value in the field in the service level agreement matches the value in that field in the record
- There is a null value in the field in the service level agreement and a null value in that field in the record
- There is a null value in the field in the service level agreement and any value in that field in the record

Matching with Boolean operators

The Boolean operators AND and OR are used to match a service level agreement to a record. The operator AND is used between all fields, with the exception of the Asset field, Location field, and Type field. These three fields are treated as one field, and the operator OR is used between these fields. A match occurs when any of the values in these three fields in a record matches the corresponding field in the service level agreement. Combinations of the three fields are not treated as a match.

Examples of matching logic

The Service Group field, Service field, and Classification field are used for matching.

For the Service Group field and Service field, service level agreements and records are matched using the following logic:

- If the service level agreement has a value in the Service Group field, such as IT, and a null value in the Service field, then the record must have the same value in the Service Group field to be a match; the Service field can contain any value (such as PC or e-mail) or a null value.
- If the service level agreement has a value in the Service Group field and a value in the Service field, such as e-mail, then the record must have the same values in both fields to be a match. If only one of the values is the same, the service level agreement does not apply to this record.
- If the service level agreement has a null value in both the Service Group field and Services field, then the record can have any value in either field, including null, and be a match.

Calendars for service level agreements

When you create service level agreements, you can use two different types of calendars: an applies to calendar or a calculation calendar. The applies to calendar specifies the business hours for a particular shift for an organization. The calculation calendar sets the target contact, start date, and finish date on a record.

If you leave the values for both calendars blank, time or shifts are not used as record matching criteria. When a service level agreement is applied to a record, the commitment values from the service level agreement are added to the reported date value and are used to populate the target dates on the ticket or work order.

The applies to calendar is used when service level agreements are applied to tickets and work orders.

Applies to calendar

The following rules apply when you use an applies to calendar:

- You can specify the calendar and shift to use on the tickets and work orders to which the service level agreement is applied. The organization value in the applies to calendar is matched to the organization value in the ticket or work order to which the service level agreement is applied. If the two organization values are the same, the associated calendar and shift are applied.
- If you do not specify values in the applies to calendar fields, the service level agreement does not restrict business hours to a certain time or shift.
- When you use the Apply SLA action for a ticket or work order, the reported date on the record is compared to the combination of calendar and shift attributes within service level agreements. Service level agreements that can be applied to the record must meet one of the following criteria:
 - Have a reported date that occurs within the service level agreement's calendar and shift availability
 - Have an undefined calendar and shift

Example of applies to calendar

For example, you have a record with a reported date of Tuesday at 8:00 PM, and the service desk hours specified in the applies to calendar table of a service level agreement are Monday through Friday, 9:00 AM to 5:00 PM. This service level agreement is not applicable to the record because the reported date does not occur within the hours specified in the applies to calendar. However, if the reported date of a record is at 4:50 PM, and you use the Apply SLA action at 5:10 PM, the service level agreement can still be applied.

Calculation calendar

You use the calculation calendar to calculate the target contact date, start date, and finish date on a ticket or work order to which the service level agreement is applied. After the SQL conditions and applies to calendar values are used to match service level agreements with records, the values for organization, calendar, and shift are used to set the times on the target records. If these fields are blank, the values from the applies to calendar are used to set the target contact date, start date, and finish date.

Examples using both calendars

You create a service level agreement with the values in the applies to calendar and calculation calendar set to Monday through Friday, 9:00 AM to 5:00 PM. The service level agreement response commitment is set to four hours, and the resolution commitment is set to 24 hours. When you use the Apply SLA action against a ticket with a reported date of 4:00 PM on Friday, the service level agreement is applied and the target start date is set to noon on Monday and the finish date is set to 4:00 PM on Wednesday.

You create a service level agreement with the values in the applies to calendar set to 24 hours a day, seven days a week. You set the values in the calculation calendar to Monday through Friday, 8:00 AM to 8:00 PM. The service level agreement response commitment is set to three hours, and the resolution commitment is set to 8 hours. When you use the Apply SLA action against a ticket with a reported date of 9:00 PM on Tuesday, the service level agreement is applied and the target start date is set to 11:00 AM on Wednesday and the finish date is set to 4:00 PM on Wednesday.

Associated service level agreements

In the Service Level Agreements application, you associate service level agreements that are related to one another. You can create either an associated service level agreement that is a parent or a child. Parent service level agreements are supported by a specific service level agreement. Child service level agreements support a specific service level agreement.

In the Service Level Agreements application, you use the SLAs That This SLA Supports sub tab and the Related SLAs tab to create associated service level agreements.

Parent service level agreements

Parent service level agreements are service level agreements that a specific service level agreement supports. For example, you can associate a selected service level agreement with other service level agreements that are needed to remain in compliance.

Parent service level agreements are service level agreements that another service level agreement supports. For example, a parent service level agreement is a specific service level agreement is needed for other service level agreements to remain in compliance.

Child service level agreements

Child service level agreements are service level agreements that support a specific service level agreement. For example, child service level agreements are other service level agreement that are needed to keep a specific service level agreement in compliance.

Associating service level agreements

The following rules apply to associated service level agreements:

- When you select service level agreements to associate with a specific service level agreement, the commitments of the service level agreements that you are trying to associate are validated and you are notified if there are any conflicting or less stringent commitments.
- You cannot associate the same service level agreement as both a child and a parent of another service level agreement.
- You can deactivate a service level agreement that supports another service level agreement.

Example of service level agreement

You are an outside facilities service provider with a customer service level agreement with a company to resolve all elevator outages within 24 hours of being reported. To keep this commitment to the customer, you also have a vendor service level agreement with a third-party elevator vendor to resolve any issues that you report within 12 hours. In the Service Level Agreements application, you access the parent (customer) service level agreement, click the Related SLAs tab, and associate the child (vendor) service level agreement on the Supporting SLAs sub tab.

Escalations and service level agreements

Escalations monitor processes to ensure that service providers meet the commitments in service level agreements. When you create an escalation for a service level agreement, the escalation is applied to the business object (such as service request or incident) that is used in the service level agreement.

Each service level agreement has a one-to-one relationship with an escalation, and each commitment in a service level agreement maps to an escalation point in the corresponding escalation.

Escalation rules

The following rules apply when you create escalations in the Service Level Agreements application:

- You can create service level agreements at the site, organization, or system level. If you specify an organization or site, the service level agreement's associated escalation is restricted to that site or organization. If you do not specify an organization or site, the escalation is available to all sites and

- organizations.
- When you create a service level agreement, the status of the service level agreement is set to draft. When you create an escalation for a draft service level agreement, the associated escalation is set to inactive.
- After you set a service level agreement to active, the associated escalation is activated, if the escalation contains one escalation point and action or notification.
- If you create an escalation for an active service level agreement, you must use the Escalation „>„ Activate/Deactivate Escalation action to activate the escalation.

Escalation points

An escalation comprises of escalation points that represent a monitored condition or threshold, such as measuring elapsed time. An escalation is triggered when records that meet the condition or threshold that is defined in the escalation points.

After you define commitments for a service level agreement, you can create escalation points for each commitment row. The values from the commitment row are used in the escalation point to define the conditions that trigger an escalation. You can associate each escalation point with actions and notifications. You can also specify an organization, organization calendar, and shift to determine how the escalation points are calculated.

The following are typical uses for escalation points:

- Measuring elapsed time against an attribute (time period from now to an event in the past), such as how many hours an assignment has been untouched in someone's inbox
- Measuring time until lapse (time period from now to an event in the future), such as how many days until a contract expires
- Using for a standalone condition without a time measurement, such as using to automatically accept or reject an assignment in a workflow process

Example of escalation point

An escalation point can measure elapsed time against an attribute. If you want to measure elapsed time for a specific attribute of an object, specify a value for the elapsed time attribute to choose a date-related or time-related attribute that you want to measure. Then schedule how often or when to check the object. For example, if the service level agreement applies to incident records, specify TARGETSTART as the elapsed time attribute with an associated value of -15.00 minutes. If the condition for the escalation point is met, the associated action or notification is triggered 15 minutes before the target start time for the incident record.

Actions and notifications

An action is an event, such as changing a status, and a notification is an e-mail. You can associate actions and notifications to an escalation point. You must associate at least one action or notification to an escalation before you can activate the escalation.

- [Actions and notifications associated with escalation points](#)
When records meet the conditions in an escalation, an action or notification is triggered. An action is an event, such as changing status, and a notification is an e-mail message. Escalation points are the component of an escalation that represent a monitored condition or threshold, such as measuring elapsed time.
- [Escalation validation](#)
In the Service Level Agreements application, you can validate an escalation that is associated with a service level agreement. The validation process ensures that all structured query language (SQL) statements are syntactically and semantically correct.
- [Escalation activation](#)
You use escalations to ensure that the service provider complies with the commitments specified in a service level agreement. To trigger the conditions specified in an escalation, you activate the escalation. When you no longer want to trigger these conditions, you deactivate the escalation.
- [Communication templates and service level agreements](#)
In the Service Level Agreements application, you use communication templates to create e-mail notifications. Communication templates provide a mechanism to communicate outbound information in a uniform manner.

Actions and notifications associated with escalation points

When records meet the conditions in an escalation, an action or notification is triggered. An action is an event, such as changing status, and a notification is an e-mail message. Escalation points are the component of an escalation that represent a monitored condition or threshold, such as measuring elapsed time.

To activate an escalation, you must associate at least one action or notification.

Actions

An action is an event that is triggered when records meet the conditions that are defined in an escalation point. When you associate multiple actions, you can assign a preexisting action a sequence number. Default values for the description and the action type are provided based on the record and the action that you chose. You can also use the Actions application to create an action to use with an escalation point.

Action types define categories of actions. You can use a predefined action type, such as set owner, status change, and create ticket, or you can create an action type.

When you associate actions in the Escalations application, action groups can be created automatically or you can add action groups in the Actions application. Action groups are predefined sets of actions that are grouped in a specific sequence. Escalations are associated with actions through the action group. If you associate a predefined action, an action group is created for that action, and the predefined action becomes a member of that action group. Only the action group with the escalation point is associated, not the action itself.

Notifications

A notification is an e-mail message that you want to send when records that meet the condition defined in the escalation are found. You can create two types of notifications: free-form notifications or template-based notifications. Free-form notifications require that you define only a role or recipient, subject, and message. You can also use communication templates to add or create a predefined, template-based notification for an escalation point.

For example, if you do not respond to an assignment within two hours, the assignment is escalated to your supervisor and an e-mail notification is sent to your supervisor.

Escalation validation

In the Service Level Agreements application, you can validate an escalation that is associated with a service level agreement. The validation process ensures that all structured query language (SQL) statements are syntactically and semantically correct.

When you set the status of a service level agreement to active, any SQL is validated in the following order:

1. Any SQL that is in the Additional SLA Criteria table window is validated.
2. On the Escalation tab, any SQL that is in the Condition field and Escalation Point Condition field is validated.

If both the service level agreement condition and any associated escalation conditions validate successfully, you can change the status of the service level agreement to active. Actions and notifications are not validated.

You can also select the Escalation >> Validate Escalation action to validate conditions. You correct any errors in the validation results table. If the error was found in the condition for an escalation point, the rows that contain the errors are highlighted.

Escalation activation

You use escalations to ensure that the service provider complies with the commitments specified in a service level agreement. To trigger the conditions specified in an escalation, you activate the escalation. When you no longer want to trigger these conditions, you deactivate the escalation.

The following rules apply to activating and deactivating escalations:

- When you change the status of a service level agreement from draft to active, the associated escalation is activated.
- When you create an escalation for an active service level agreement, you must use the Activate/Deactivate Escalation action to activate the escalation.
- When you change the status of a service level agreement to inactive, you are prompted to deactivate the associated escalation.

To deactivate or activate an escalation, you use the Escalation >> Activate/Deactivate Escalation action.

Communication templates and service level agreements

In the Service Level Agreements application, you use communication templates to create e-mail notifications. Communication templates provide a mechanism to communicate outbound information in a uniform manner.

A notification includes a template ID, the role or recipient name, the subject of the notification, and the message.

You can create the following two types of notifications:

- Free-form notification that uses a few features of a communication template
- Template-based notification that can use all the communication template features, including attached documents

If you create a free-form notification, a template ID is generated. However, this notification is not saved for reuse in the Communication Templates application.

If you create a notification with an existing template, the remaining fields are defaulted from the communication template that you chose and are read only. You cannot change the attributes associated with a communication template from the Escalations tab of this application.

If you have information that is sent out repeatedly, you can create a communication template and attach it as a notification on an escalation.

Substitution variables

Free-form notifications and template-based notifications are associated with the object to which they apply. This association allows the placement of substitution variables for the object that is specified in the escalation.

If you create a template-based notification in an escalation, the Subject field and Message field could be populated with substitution variables. For example, if the Subject line reads:

Expiration Notice: Contract :contractnum

then :contractnum is replaced with the actual contract number that is obtained from the contract object associated with the template and notification.

Status of service level agreements

To control how service level agreements are used, you can change the status of a service level agreement to draft, active, or inactive.

To change the status of a service level agreement, you use the Change Status action. You can change the status to one of the following three options:

- **Draft** - When you create a service level agreement, the status is set to draft. You can leave the service level agreement in draft status until it is ready for approval or use. Once you set a draft service level agreement to active or inactive, you cannot reset it to draft. When a service level agreement is in draft status, the associated escalation is set to inactive.
- **Active** - You set a service level agreement to active when you are ready for the service level agreement to be used. Other users can only apply active service level agreements to a record. When a service level agreement is active, the associated escalation also is set to active.
- **Inactive** - You set a service level agreement to inactive if you do not want users to be able to apply the service level agreement to a record.

Changes to service level agreements

As your business needs change, you use the Service Level Agreements application to change service level agreements.

When a service level agreement is in draft or inactive status, you can change information that is on the Service Level Agreement tab, Assets and Locations tab, and Escalation tab. When a service level agreement is in active status, you can change information about the Related SLAs tab and KPIs tab. If you need to change the status of a service level agreement, use the Change Status action.

If you change the values in a commitment line in a service level agreement that has related service level agreements, you are warned of any conflicting or less stringent commitments. One level up and one level down from the current record are validated, and all direct parents and all direct children of the changed service level agreement are checked.

Deletion of service level agreements

In the Service Level Agreements application, you delete service level agreements that you no longer. When you delete a service level agreement, the associated escalation is deleted also.

You use the Delete SLA action to delete a service level agreement.

In the following cases, you cannot delete a service level agreement:

- If the service level agreement is active.
- If the service level agreement is applied to any record. In this case, you can set the status of the service level agreement to inactive to prevent it from being used in the future.
- If the service level agreement supports another service level agreement. In this case, you can set the status of the service level agreement to inactive to prevent it from being used in the future.

Managing service level agreements

After you create a service level agreement, you can associate contracts, create escalations, change the service level agreement, change the status, and create key performance indicators.

- **[Creating service level agreements](#)**
You use the Service Level Agreements application to create service level agreements to document the commitments between service providers and customers. Services consist of tasks that service providers complete to fulfill customer needs. Commitments are responsibilities that service providers must meet to fulfill service level agreements.
- **[Associating contracts with service level agreements](#)**
To manage your service level agreements, you can associate specific vendor service level agreements with contracts. You use one of the contracts applications to create contracts.
- **[Creating escalations for service level agreements](#)**
You use escalations to monitor critical processes to ensure that service providers meet the commitments in service level agreements.

Creating service level agreements

You use the Service Level Agreements application to create service level agreements to document the commitments between service providers and customers. Services consist of tasks that service providers complete to fulfill customer needs. Commitments are responsibilities that service providers must meet to fulfill service level agreements.

Procedure

1. From the Service Level Agreement application, click New SLA.
2. In the SLA field, specify a value for the service level agreement.
3. Optional: Provide a description of the service level agreement.
4. In the Applies To field, specify a value for what the service level agreement applies to.
For example, you can apply the service level agreement to an incident or service request.
5. Specify the type of service level agreement.

6. Optional: To restrict the service level agreement, specify values for organization or site.
7. Optional: Provide the following information for the service level agreement:
 - Values for ranking, administrator, vendor, customer or vendor contact, classification, service group, and service
 - Values for start date, end date, and review date
 - Additional criteria
8. To create commitments for the service level agreement, complete these steps:
 - a. In the Commitments table window, click New Row.
 - b. Optional: Specify a value for the commitment and provide a description.
 - c. Specify the type of commitment.
 - d. Specify the value for the number that sets the time or quantity that you want to measure.
 - e. Specify the unit of measure by which the commitment is measured.
9. Save your changes.

What to do next

The service level agreement is created as a draft. You use the Change Status action to activate the service level agreement.

Associating contracts with service level agreements

To manage your service level agreements, you can associate specific vendor service level agreements with contracts. You use one of the contracts applications to create contracts.

About this task

After you associate a contract to a vendor service level agreement, you must first remove the contract before you can change the service level agreement to any other type.

Procedure

1. In the Service Level Agreements application, select the service level agreement with which you want to associate contracts.
2. Select the Associate Contracts action.
3. In the Associate Contracts window, complete one the following steps to associate a contract:
 - a. To associate a new contract, click New Row and specify a value in the Contracts field.
 - b. To associate multiple contracts, click Select Contracts.
4. Click OK.

What to do next

To remove contracts from a service level agreement, you use the Associate Contracts action.

Creating escalations for service level agreements

You use escalations to monitor critical processes to ensure that service providers meet the commitments in service level agreements.

Procedure

1. In the Service Level Agreements application, select the service level agreement for which you want to create an escalation.
2. In the Commitments table window, select Define Escalation for a commitment row.
On the Escalation tab, the information in the Escalation, and Escalation Points table windows are populated from the service level agreement.
3. Optional: Change the default schedule to reflect how often you want records searched.
4. Optional: Change the condition statement that was obtained from the commitment line in the service level agreement.
The condition identifies the set of records that you want the escalation to target.
5. Optional: In the Escalation Points section, change or delete the values for the calculation calendar if you want to use a different organization, calendar, or shift in the calculations.
6. Optional: Define an action for the service level agreement, complete these steps:
 - a. On the Actions tab, click New Row.
 - b. Specify a value for the action.
The Description field, Sequence field, and Type field are populated based on the action that you specified.
7. Optional: To define a notification, complete these steps:
 - a. On the Notifications sub tab, click New Row.
 - b. Complete one of these steps to create a notification:

Option	Description
To create a free-form notification	Specify values for role or recipient, subject, and message

Option	Description
To create a template-based notification	Specify a value for the template. The Subject field and Message field are populated based on the template that you select. These fields could be populated with substitution variables. For example, a subject line reads: <i>Expiration Notice:contract:contractnum. :contractnum</i> is replaced with the actual contract number.

8. Select the Escalation table window to validate the SQL conditions.
9. Optional: Expand the Validation Results table window to review and correct any validation errors.
10. Save your changes to associate the escalation to the service level agreement.

- [Creating actions for service level agreements](#)

You use actions to trigger events, such as changing status, in a service level agreement that were defined in the escalation process.

- [Creating notifications for service level agreements](#)

You use notifications to communicate about conditions in a service level agreement that were defined in the escalation process. You can create two types of notifications: free-form or template-based. Free-form notifications require that you define a role or recipient, subject, and message. Template-based notifications use a predefined communication template.

Creating actions for service level agreements

You use actions to trigger events, such as changing status, in a service level agreement that were defined in the escalation process.

Procedure

1. In the Service Level Agreements application, select the service level agreement for which you want to create an action.
2. In the Commitments table window, select Define Escalation for a commitment row.
On the Escalation tab, the information in the Escalation, and Escalation Points table windows are populated from the service level agreement.
3. On the Actions sub tab, click New Row.
4. Specify a value for the action.
The Description field, Sequence field, and Type field are populated based on the action that you specified.
5. Save your changes.

Creating notifications for service level agreements

You use notifications to communicate about conditions in a service level agreement that were defined in the escalation process. You can create two types of notifications: free-form or template-based. Free-form notifications require that you define a role or recipient, subject, and message. Template-based notifications use a predefined communication template.

Procedure

1. In the Service Level Agreements application, select the service level agreement for which you want to create a notification.
2. On the Escalation tab, click the Notifications sub tab.
3. Click New Row.
4. In the Template field, complete one of these steps to create a notification:
 - a. To create a free-form notification, specify values for role and recipient, subject, and message.
 - b. To create a template-based notification, specify a value for the template.
The Subject field and Message field are populated based on the template that you select. These fields could be populated with substitution variables. For example, a subject line reads: *Expiration Notice:contract:contractnum. :contractnum* is replaced with the actual contract number.
5. Optional: Specify a value for role and recipient.
6. Save your changes.

Service Groups

You use the Service Groups application to define all services that you provide or procure. You create a service group for each type of service that you define.

You can group tickets, work orders, and contracts by service group or by individual service. You can create service level agreements for a service group or for a service group and service combination. You can also associate a specific asset, asset type, or location with a service or service group. In the Service Groups application, you can view the relationships that exist between these records and a particular service group or service.

- [Deletion rules for services and service groups](#)

As your business needs change, you can delete services and service groups.

- [Working with services and service groups](#)

You can create service groups, create services, view relationships between services and service groups, and associate assets and locations with services and service groups.

Deletion rules for services and service groups

As your business needs change, you can delete services and service groups.

To delete a service group, use the Delete Service Group action in the Service Groups application. To delete a service, use the Mark Row for Delete function.

You can delete a service group that is referenced by another record, such as ticket or work order, and the service reference remains on that record. Before you can delete a service group, you must delete the services in that group.

Working with services and service groups

You can create service groups, create services, view relationships between services and service groups, and associate assets and locations with services and service groups.

- [Creating service groups](#)
You use the Service Groups application to create a service group for the types of service that you define.
- [Creating services for service groups](#)
You use the Service Groups application to create services. When you create a service, the default service type is the parent service group. The contact and contact group information is determined by the service group to the service record.
- [Associating assets with services and service groups](#)
In the Service Groups application, you can simplify the management of services by associating assets with specific services and service groups in your organization.

Creating service groups

You use the Service Groups application to create a service group for the types of service that you define.

About this task

You must create a service group before you can create services.

Procedure

1. In the Service Groups application, click New Service Group.
 2. Specify a service group.
 3. Optional: Specify the contact, the contact group, and the type of service.
You can sort service groups by the type of service.
 4. Optional: Create services for the group.
 5. Save your changes.
- [Viewing records that are related to service groups](#)
To help manage the services in your organization, you use the Service Groups application to view records that are related to a specific service. Related records can include tickets, work orders, assets, locations, asset types, service level agreements, or contracts that are associated with the service.
 - [Removing assets from service groups](#)
As your business needs change, you can remove assets that are associated with a service.
 - [Removing asset types from service groups](#)
As your business needs change, you can remove asset types that are associated with a service group.
 - [Removing locations from service groups](#)
As your business needs change, you can remove locations that are associated with a service group.

Viewing records that are related to service groups

To help manage the services in your organization, you use the Service Groups application to view records that are related to a specific service. Related records can include tickets, work orders, assets, locations, asset types, service level agreements, or contracts that are associated with the service.

Before you begin

You associate a ticket, work order, service level agreement, or contract with a service from the respective applications.

Procedure

1. In the Service Groups application, select the appropriate service group.
2. Select the View Related Records action.
3. In the View Related Records for Service Group dialog box, select one of the following options to view related records:

Option	Description
View Related Records for the Service Group	This is the default view, and shows only those records that are associated at the group level.
View Related Records for the Service Group and Services	This view shows the records that are associated at the group level and the records that are associated with a specific service in that group.

4. Click Refresh, and click the tabs to view the different types of related records.
5. Optional: To relate a ticket to the service, select the ticket on the Tickets tab, and complete one of the following options:

- a. To relate the selected ticket to a global ticket, click **Relate Record to Global Issue**. This option is available only if the current ticket is a global ticket. Relating tickets to a global issue establishes a RELATEDTOGLOBAL relationship between the tickets.
 - b. Click **Relate Records**.
Relating records establishes a RELATED relationship between the records.
6. Optional: On the **Work Orders** tab, select the work order that you want to relate to the current record, and click **Relate Records**.
Relating records establishes a RELATED relationship between the records.
 7. Click **OK**.

Removing assets from service groups

As your business needs change, you can remove assets that are associated with a service.

Procedure

1. In the **Service Groups** application, select the appropriate service group.
2. Select the **Associate Assets/Locations** action.
3. On the **Assets and Locations** tab in the **Associate Assets and Locations** dialog box, delete the row for the asset that you want to remove.
4. Click **OK**.

Removing asset types from service groups

As your business needs change, you can remove asset types that are associated with a service group.

Procedure

1. In the **Service Groups** application, select the appropriate service group.
2. Select the **Associate Assets/Locations** action.
3. On the **Assets** tab in the **Associate Assets and Locations** dialog box, delete the row for the asset type that you want to remove.
4. Click **OK**.

Removing locations from service groups

As your business needs change, you can remove locations that are associated with a service group.

Procedure

1. In the **Service Groups** application, select the appropriate service group.
2. Select the **Associate Assets/Locations** action.
3. On the **Assets and Locations** tab in the **Associate Assets and Locations** dialog box, delete the row for the location that you want to remove.
4. Click **OK**.

Creating services for service groups

You use the **Service Groups** application to create services. When you create a service, the default service type is the parent service group. The contact and contact group information is determined by the service group to the service record.

Before you begin

You must create a service group before you can create services.

Procedure

1. In the **Service Groups** application, select the service group for which you are creating a service.
2. Click **New Row**.
3. Specify the service.
4. Optional: Specify the contact, the contact group, and the type.
5. Save your changes.

- **Viewing records that are related to services**

To help manage the services in your organization, you use the **Service Groups** application to view records that are related to a specific service. Related records can include tickets, work orders, assets, locations, asset types, service level agreements, or contracts that are associated with the service.

- **Removing assets from services**

As your business needs change, you can remove assets that are associated with a service.

- [Removing asset types from services](#)
As your business needs change, you can remove asset types that are associated with a service.
- [Removing locations from services](#)
As your business needs change, you can remove locations that are associated with a service.

Viewing records that are related to services

To help manage the services in your organization, you use the Service Groups application to view records that are related to a specific service. Related records can include tickets, work orders, assets, locations, asset types, service level agreements, or contracts that are associated with the service.

Before you begin

You associate a ticket, work order, service level agreement, or contract with a service from the respective applications.

Procedure

1. In the Service Groups application, select the appropriate service group.
2. In the Service field for which you want to view related records, select View Related Records for Service.
3. In the View Related Records for Service Group dialog box, click the tabs to view the different types of related records.
4. Optional: To relate a ticket to the service, select the ticket on the Tickets tab, and complete one of the following options:
 - a. To relate the selected ticket to a global ticket, click Relate Record to Global Issue. This option is available only if the current ticket is a global ticket. Relating tickets to a global issue establishes a RELATEDTOGLOBAL relationship between the tickets.
 - b. Click Relate Records.
Relating records establishes a RELATED relationship between the records.
5. Optional: On the Work Orders tab, select the work order that you want to relate to the current record, and click Relate Records.
Relating records establishes a RELATED relationship between the records.
6. Click OK.

Removing assets from services

As your business needs change, you can remove assets that are associated with a service.

Procedure

1. In the Service Groups application, select the appropriate service group.
2. Select the service from which you want to remove assets.
3. Select the Associate Assets/Locations action.
4. On the Assets and Locations tab in the Associate Assets and Locations dialog box, delete the row for the asset that you want to remove.
5. Click OK.

Removing asset types from services

As your business needs change, you can remove asset types that are associated with a service.

Procedure

1. In the Service Groups application, select the appropriate service group.
2. Select the service from which you want to remove asset types.
3. Select the Associate Assets/Locations action.
4. On the Assets tab in the Associate Assets and Locations dialog box, delete the row for the asset type that you want to remove.
5. Click OK.

Removing locations from services

As your business needs change, you can remove locations that are associated with a service.

Procedure

1. In the Service Groups application, select the appropriate service group.
2. Select the service from which you want to remove locations.
3. From the Select Action menu, select Associate Assets/Locations.
4. On the Assets and Locations tab in the Associate Assets and Locations dialog box, delete the row for the location that you want to remove.

5. Click OK.

Associating assets with services and service groups

In the Service Groups application, you can simplify the management of services by associating assets with specific services and service groups in your organization.

Procedure

1. In the Service Groups application, select the service or service group with which you want to associate assets.
2. Select the Associate Assets/Locations action.
3. On the Assets and Locations tab in the Associate Assets and Locations dialog box, click Select Assets.
4. In the Select Assets dialog box, select the assets that you want to associate with the service or service group, and click OK.
5. Click OK.
6. Save your changes.

- [Associating asset types with services and service groups](#)

In the Service Groups application, you can simplify the management of service by associating asset types with specific services and service groups in your organization.

- [Associating locations with services and service groups](#)

In the Service Groups application, you can simplify the management of service by associating locations with specific services and service groups in your organization.

Associating asset types with services and service groups

In the Service Groups application, you can simplify the management of service by associating asset types with specific services and service groups in your organization.

Procedure

1. In the Service Groups application, select the service or service group with which you want to associate asset types.
2. Select the Associate Assets/Locations action.
3. On the Asset Types tab in the Associate Assets and Locations dialog box, click New Row and specify a value for the asset type.
4. Optional: Provide a description of the asset type.
5. Click OK.
6. Save your changes.

Associating locations with services and service groups

In the Service Groups application, you can simplify the management of service by associating locations with specific services and service groups in your organization.

Procedure

1. In the Service Groups application, select the service or service group with which you want to associate locations.
2. Select the Associate Assets/Locations action.
3. On the Assets and Locations tab in the Associate Assets and Locations dialog box, click Select Locations.
4. In the Select Locations dialog box, select the locations that you want to associate with the service or service groups, and click OK.
5. Click OK.
6. Save your changes.

System Configuration module

The System Configuration module contains the Platform Configuration module and the Migration module.

You use the applications in the Platform Configuration module to perform numerous tasks, such as managing systems properties and domains. You use the applications in the Migration module to migrate configuration content from one environment to another.

- [Platform Configuration](#)

You use the applications in the Platform Configuration module (within the System Configuration module) to perform numerous tasks, such as managing system properties and domains. Also, you can use the applications for tasks done once, such as the initial configuration after an installation.

- [Migration](#)

You use the applications in the Migration module (within the System Configuration module) to migrate configuration content from one environment to another.

Platform Configuration

You use the applications in the Platform Configuration module (within the System Configuration module) to perform numerous tasks, such as managing system properties and domains. Also, you can use the applications for tasks done once, such as the initial configuration after an installation.

- **[System Properties](#)**
You use the System Properties application to manage system properties and the values of the system properties that various components use. A system property is a key-value pair that is used at a system level.
- **[Logging](#)**
You use the Logging application to create and to manage log files that contain informational, warning, or error messages about the system.
- **[Domains](#)**
Administrators can use the Domains application to add or modify domains to fit with your business practices. Domains are used throughout the product. They validate entered field values, provide lookup lists from which users can select field values, and can copy data sets or values to fields.
- **[Database Configuration](#)**
You use the Database Configuration application to create or change objects and attributes, and to customize the database. An object is a self-contained software entity that consists of both data and functions to manipulate data. Most applications are associated with one main object and other related objects.
- **[Communication Templates](#)**
You use the Communication Templates application to create and manage communication templates. These templates can be used to standardize frequently used email communications (which are also known as notifications).
- **[Actions](#)**
In the Actions application, you manage actions and action groups that are used with escalation, service level agreement, and workflow processes.
- **[Roles](#)**
You use the Roles application to manage role records that can be used as part of a communication template, escalation, service level agreement (SLA), or workflow process. When you use a role a process, the process is routed to the correct individual based on information associated with the role record.
- **[Escalations](#)**
You use the Escalations application to automatically monitor critical processes in your enterprise. You can either create an escalation or customize a predefined escalation to suit your business needs.
- **[Workflow Designer](#)**
You use the Workflow Designer application to create, to view, to modify, and to delete workflow process records that reflect your business processes.
- **[Workflow Administration](#)**
You use the Workflow Administration application to view and to manage active instances of workflow processes.
- **[Cron Task Setup](#)**
You use the Cron Task Setup application to create cron tasks and cron task instances, and to remove cron tasks or cron task instances. You can also change cron task parameters and statuses, and adjust the schedule of a cron task.
- **[E-mail Listeners](#)**
In the E-mail Listeners application, you can receive and process service request and other types of tickets using e-mail messages. You can create or update tickets. You can also indicate whether the status is changed or queried based on specified criteria.
- **[Database Information](#)**
The Database Information application provides information and access for database objects and attributes. You can make limited changes to data structures, such as associating a domain with an attribute, making an attribute required, or changing the search type.
- **[Web Services Library](#)**
You can use the Web Services Library application to create and deploy web services for all service types, object structure, enterprise, and standard services. By deploying web services, external applications can make SOAP-based calls to retrieve or update business object data. The application generates the XML schema and Web Services Description Language (WSDL) files for all of your web services.
- **[Launch in Context](#)**
You use the Launch in Context application to create and modify launch entry records which open an external application in the same or a different browser session. You can open applications independently or as part of an application integration scenario.
- **[Automation Scripts](#)**
With the Automation Scripts application, you can create scripts to automate tasks that are based on the events or attributes of a business object, or based on actions or custom conditions. You can create a script in any of several supported scripting languages, and run the script without having to recompile Java™ files or restart the server.

System Properties

You use the System Properties application to manage system properties and the values of the system properties that various components use. A system property is a key-value pair that is used at a system level.

The System Properties application lists all the system properties with their descriptions.

Example

The key mail.smtp.host represents a system property that is used to set up email. The value for the property is SMTP mail server.

Logging

You use the Logging application to create and to manage log files that contain informational, warning, or error messages about the system.

- **[Troubleshooting Maximo Manage](#)**
Maximo® Manage provides tools that you can use to help you troubleshoot and resolve issues with the application.

Troubleshooting Maximo Manage

Maximo® Manage provides tools that you can use to help you troubleshoot and resolve issues with the application.

- [Manage Monitoring Information](#)
The Manage Monitoring Information (MMI) application provides information about the current state of a Manage deployment. You can use this information for troubleshooting purposes.
- [JDOM upgrade](#)
JDOM upgrade in Maximo Manage 8.5 is recommended.
- [Debugging Maximo Manage with Eclipse](#)
Debug Maximo Manage by using the Eclipse debugger.
- [Enabling debugging for Maximo Manage](#)
It is possible to remotely debug Maximo Manage by connecting to the Liberty server.

Manage Monitoring Information

The Manage Monitoring Information (MMI) application provides information about the current state of a Manage deployment. You can use this information for troubleshooting purposes.

The application displays the following information about the server bundle pods that are deployed:

System information

- Database information
- Maximo® business object (MBO) count
- Memory
- Java™ (JVM) information
- Threads
- Operating System information

Integration information

- Queues
- OS cache
- Global directory
- Event topic tree

Other information

- User information
- Class information
- Cron tasks
- Appservices

The monitoring information is provided by a set of REST APIs.

MMI uses JavaScript Object Notation (JSON) as the data format for representing the collected state information. All MMI requests are HTTP GET requests, and MMI request handlers are not intended to modify the state of the system.

- [Manage Monitoring Information APIs](#)
Manage Monitoring Information (MMI) APIs provide information that is related to the state of a Maximo Manage deployment.
- [Scenario: Running MMI APIs to gather diagnostic information](#)
XYZ Corporation experiences an issue in the Maximo Manage environment and the system administrator opens a Problem Management Report (PMR) with IBM® Technical Support. IBM Technical Support and Development determine that there is a need to gather diagnostic information for particular resources from the customer's environment.

Manage Monitoring Information APIs

Manage Monitoring Information (MMI) APIs provide information that is related to the state of a Maximo® Manage deployment.

A list of available MMI APIs is in the Monitor Environment Information dialog of the Logging application.

Before you can collect information from the Maximo Manage environment by using the APIs, you must specify the URL path for the API in the `mxe.oslc.webappurl` system property. You can choose one of the following options for the path:

- `<Maximo Manage URL>/maximo/api/members/<memberid>/<api>`
For example:

`https://my_instance.manage.7203.apps.my_company.com/maximo/api/members/<memberid>/mbocount`

Use this option when you have an API key.

- `https://<host>:<port>/maximo/oslc/members/<memberid>/<api>`
For example:

`https://<host>:<port>/maximo/oslc/members/<memberid>/mbocount`

Use this option when you already have an open, authenticated session.

In the preceding examples, specify the Maximo Manage server bundle for the <memberid>.

All MMI APIs can be protected by using signature options. The signature options must be associated with the Logging application. To specify a signature option for an API, open the Monitor Environment Information dialog in the Logging application, locate the API, and select a value in the Signature Option field.

Table 1. Manage Monitoring Information APIs

API	Description	URL path Note: You can also use the OSLC URL if you have an authenticated session.
apimetrics	API Metrics handler	/maximo/api/members/<memberid>/apimetrics
appservices	AppService information	/maximo/api/members/<memberid>/appservices
args	JVM arguments information	/maximo/api/members/<memberid>/args
browseMessages	Browse JMS messages	/maximo/api/members/<memberid>/browseMessages
childdirs	Child directory information	/maximo/api/members/<memberid>/childdirs
classinfo	Java™™ class information	/maximo/api/members/<memberid>/classinfo
clouddbstatistics	Cloud Database Storage	/maximo/api/members/<memberid>/clouddbstatistics
clouddbstorage	Cloud Database Storage	/maximo/api/members/<memberid>/clouddbstorage
cron	Cron task information	/maximo/api/members/<memberid>/cron
cronthread	Concurrent cron task thread count and peak thread count Counts the total cron threads running at this instant in the current server process. It also provides the peak count of cron threads on that server	/maximo/api/members/<memberid>/cronthread
dbconn	Database connection creation trace	/maximo/api/members/<memberid>/dbconn
dbinfo	Database information Provides information about the database that is used by the application, including information about the database version, vendor information, and driver information. Also provides links to the database connection pool details.	/maximo/api/members/<memberid>/dbinfo
dbmanager	Database connection pool information	/maximo/api/members/<memberid>/dbmanager
errcountmetrics	Error count metrics handler Provides the total count of MXApplicationException and MXSystemException exceptions that are created.	/maximo/api/members/<memberid>/errcountmetrics
eventtree	EventTopicTree information Provides information about the event subscription tree. The resource describes information about event topics, such as add asset or update work order, and the listeners that are associated with those topics.	/maximo/api/members/<memberid>/eventtree
formula	Formula information	/maximo/api/members/<memberid>/formula
globaldir	Integration global directory information	/maximo/api/members/<memberid>/globaldir
heapdump	Generate heapdump (currently for the IBM® JDK only)	/maximo/api/members/<memberid>/heapdump
http	Ping an HTTP or HTTPS URL	/maximo/api/members/<memberid>/http
interfaces	Java class interface information	/maximo/api/members/<memberid>/interfaces
iotervices	IoT services	/maximo/api/members/<memberid>/iotervices
jaxp	Java API for XML Processing (JAXP) provider information Provides information about the JAXP providers on the server.	/maximo/api/members/<memberid>/jaxp
jvm	Java virtual machine (JVM) information Provides information about the JVM that is hosting the application, including information about the start time, the JVM vendor, and the JVM version. You can also drill down, by using links, to provide information about the JVM system properties and the JVM arguments.	/maximo/api/members/<memberid>/jvm
ldapsearch	LDAP search	/maximo/api/members/<memberid>/ldapsearch
loggers	Application logger state information Provides information about the state of a logger. The logger name can be provided to the API by using the oslc.where query parameter. An example of a parameter is oslc.where=oslc:shortId="maximo.script". Provides information about the automation script logger. API consumers specify the logger name by using the oslc:shortId property for this API to provide information about the logger, which includes the log level, and active state.	/maximo/api/members/<memberid>/loggers

API	Description	URL path Note: You can also use the OSLC URL if you have an authenticated session.
mbocount	MBO count information Provides MBO count information. Also provides links to the MBO and the MboSet class. This class can be useful when you are trying to resolve out of memory (OOM) or performance issues.	/maximo/api/members/<memberid>/mbocount
memory	JVM memory information Provides information about the server heap and nonheap memory usage. All units are in Megabytes (MB).	/maximo/api/members/<memberid>/memory
mifwebservices	Web service information	/maximo/api/members/<memberid>/mifwebservices
msgproviders	Validate message provider connectivity	/maximo/api/members/<memberid>/msgproviders
objexchanged	Object Exchanged Count Provides the number of integration and UI objects that are exchanged per minute on each server.	/maximo/api/members/<memberid>/objexchanged
opsystem	Operating system information Provides information about the operating system that is used for the run time, including information about the OS type, version, architecture, and the number processors that are available.	/maximo/api/members/<memberid>/opsystem
oscache	Object structure cache Provides information about the object structure cache. It identifies cases where invalid entries in the Object Structure tables might cause cache corruption.	/maximo/api/members/<memberid>/oscache
oslcstablecache	OSLC stable cache information	/maximo/api/members/<memberid>/oslcstablecache
pingcos	Ping Cloud Object Storage (Cloud Object Storage) Provides the response time for connecting to Cloud Object Storage and the status for Cloud Object Storage connectivity.	/maximo/api/members/<memberid>/pingcos
pingdb	Ping DB Checks the database connection and calculates the average response time that is required to run 10 recent queries. These queries are obtained from the system tables. The queries are run on Oracle and Db2® databases.	/maximo/api/members/<memberid>/pingdb
pingkafka	Kafka ping handler Provides the response time for connecting to Kafka and the status for Kafka connectivity.	/maximo/api/members/<memberid>/pingkafka
queues	Integration queues information Provides information about state of an integration queue. The resource allows consumers of the API to test the connectivity/read/write to the queue and to browse messages in the queue spi:browseMessage property. By default the API shows only the first five messages in the queue. You can control that number by using the query string oslc.where=spi:count=10. This query shows the first 10 messages in the queue. Note: Browsing messages is a costly call and browsing too many messages simultaneously can cause memory or performance issues in the server.	/maximo/api/members/<memberid>/queues
report	Collects report metrics Provides the following report metrics: <ul style="list-style-type: none"> Total number of reports that ran in the preceding hour Total accumulated time in seconds that reports are run in a particular day Information about the concurrent report usage and daily runtime of reports 	/maximo/api/members/<memberid>/report
resources	Resources in OSLC stable cache	/maximo/api/members/<memberid>/resources
servletstats	Collects servlet statistics Provides request and response information about the OSLCServlet, RESTServlet, and UIServlet for each application that is deployed. The response time is measured in milliseconds.	/maximo/api/members/<memberid>/servletstats
sessionstatsinfo	Session stats information for IBM WebSphere® Application Server Liberty Provides information on total sessions, active sessions, and live sessions.	/maximo/api/members/<memberid>/sessionstatsinfo
sysprops	Java virtual machine (JVM) system properties information	/maximo/api/members/<memberid>/sysprops
tablesize	Collect the five database tables with the largest size Provides information about the five database tables that have the largest table size per day. The table size is measured in MB per day.	/maximo/api/members/<memberid>/tablesize
testProviderConnection	Test connection to JMS provider	/maximo/api/members/<memberid>/testProviderConnection
testReadMessage	Test read JMS message	/maximo/api/members/<memberid>/testReadMessage
testWriteMessage	Test write JMS message	/maximo/api/members/<memberid>/testWriteMessage
threaddump	Thread dump	/maximo/api/members/<memberid>/threaddump
threadpoolinfo	Thread pool information for the IBM WebSphere Application Server Liberty profile Counts total thread pool size and total active thread pool count.	/maximo/api/members/<memberid>/threadpoolinfo

API	Description	URL path Note: You can also use the OSLC URL if you have an authenticated session.
threads	JVM thread information Provides information about the threads in the JVM, such as the current thread count, peak thread count, and whether there are any deadlocks. Also provides a link to enumerate the threads in the system at that instant. The API consumer can check for thread states and lock information about each thread. Provides runtime thread count information that includes concurrent thread count and deadlocked thread counts.	/maximo/api/members/<memberid>/threads

Scenario: Running MMI APIs to gather diagnostic information

XYZ Corporation experiences an issue in the Maximo® Manage environment and the system administrator opens a Problem Management Report (PMR) with IBM® Technical Support. IBM Technical Support and Development determine that there is a need to gather diagnostic information for particular resources from the customer's environment.

IBM Technical Support and Development review the available resources in the Monitor Environment Information dialog of the Logging application and determine that the system administrator should run a particular MMI API. In some cases, if an API that is needed to collect the information is not readily available, IBM development might provide a script that can collect the needed information.

IBM instructs the system administrator to run the API in a web browser by entering a URL similar to `http://<host>:<port>/maximo/api/members/<memberid>/<api>`. The system administrator submits the resulting diagnostic output with the PMR for analysis by IBM.

API output

When the system administrator runs the MMI API by entering the required URL in the browser, the output is displayed directly in the browser.

The output is not formatted or easily readable unless the browser has a JSON viewer add-on or extension installed. JSON viewers are available for the Mozilla Firefox and Google Chrome browsers.

The system administrator saves the output in the browser to a text file and submits the file with the PMR for analysis by IBM.

Writing scripts

If a system administrator who meets several prerequisite skills chooses to write a script without the help of IBM Technical Support and Development, the following sample script can be used as a template.

Attention: Do not write scripts unless you meet the prerequisite skills or are instructed to do so by IBM.

Prerequisite skills

To write scripts for resources that are outside the scope of the provided scripts, the following skills are required.

- System administrator level
- Experience with calling the REST API
- Programming and script language skills

Sample script

A system administrator wants to determine how many listeners are associated with each object event type. The system administrator wants to analyze the listener data to investigate a possible performance issue that might be related to listeners on particular assets. This goal requires a way to access the event topic tree in the Maximo Manage server and search for the specified topic, Object event type, and then find out the number of associated listeners. The following Jython script addresses this requirement.

```
from psdi.server import MXServer
if request.getWhere() is not None and request.getWhere().get("topic") is not None:
    eventTopicToFind = request.getWhere().get("spi:topic")[0]

    eventTopic = MXServer.getMXServer().getEventTopicTree().findEventTopic(eventTopicToFind)

    listenerCount = eventTopic.getListenerCount()
    br.setProperty("listenerCount", listenerCount)
```

The MMI framework includes several variables in the script.

- request - The MMI API request object. The script uses the request object to determine the object event type that the user is interested in.
- br - The response that the API returns to the user.

The script uses the request object to determine the object event type by using the Where parameter in `eventTopicToFind = request.getWhere().get("topic")[0]`.

The br parameter has a simple `setProperty(string,any)` interface that is used by the script to gather the information it will send back to the user. The script uses the br `setProperty` API to set the listenerCount integer to the br object. This object is used to format the response to the API consumer.

The script can be added to the MMI by opening the Monitor Environment Information dialog in the Logging application, selecting New Row, and specifying the script name in the Class or Script Name field. The script must be specified in the qualified notation, `script:<script name>`, for example, `script:LISTENERS`.

The script is run by using the URL syntax `http://<host>:<port>/maximo/api/members/<memberid>/<event topic context>?oslc.where=spi:topic="maximo.asset.add"`.

Example URL: `http://127.0.0.1/maximo/api/members/OS4zMi4yMS4xMzcwTVhTZXJ2ZXI-/eventtopic?oslc.where=topic="maximo.asset.add"`

JDOM upgrade

JDOM upgrade in Maximo® Manage 8.5 is recommended.

Problem

In Maximo Manage 8.5, JDOM was susceptible to a service denial. This JDOM vulnerability does not apply to Maximo Application Suite but affects Maximo Manage. In Maximo Manage 8.5, by sending a specially-crafted HTTP request, a remote attacker could use the JDOM vulnerability to block the service. The service denial is caused by an XXE issue in SAXBuilder. Affected platforms are JDOM JDOM 2.0.5 and JDOM JDOM 2.0.6.

Solution

The issue has been addressed in Maximo Manage 8.5.

Note: The JDOM upgrade may cause compatibility issues with your existing code. It is recommended to recompile your code with the new JDOM provided with Maximo Manage 8.5 to resolve any compilation issues.

For more information, see [National Vulnerability Database](#).

Debugging Maximo Manage with Eclipse

Debug Maximo® Manage by using the Eclipse debugger.

Prerequisites

The local machine where you install Eclipse must have the following tools:

- Red Hat® OpenShift® Container Platform command-line interface. For more information, see [Getting started with the CLI](#).
- Kubernetes command line tool. For more information, see [Install Tools](#).

Creating a stand-alone server deployment

1. In the Red Hat OpenShift Container Platform console, go to Workloads > Deployments and locate the existing all or ui deployment.
2. View the YAML, then copy the `spec.template.spec` section.
Note: You might find it easier to download the YAML first.
3. Select Create Deployment and assign a unique name. For example, `manageddebug`. Update the following:
 - a. Replace the `spec.template.spec` section with the copied spec.
 - b. Set the replicas to 1.
 - c. Add metadata:name as `manageddebug`. Make sure make sure `spec.selector.matchLabels:app` is set to `manageddebug`.

```
kind: Deployment
apiVersion: apps/v1
metadata:
  name: manageddebug
  namespace: mas-debug-manage
spec:
  replicas: 1
  selector:
    matchLabels:
      app: manageddebug
```

4. Locate the ports section and add port 7777.

```
ports:
- containerPort: 9080
  protocol: TCP
- containerPort: 9443
  protocol: TCP
- containerPort: 7777
  protocol: TCP
```

5. Update cmd args for the Maximo Manage server. Replace `/tmp/startwlp.sh`; with `/tmp/genJDBCTruststore.sh`; `/opt/ibm/wlp/bin/server debug defaultServer`;

```
image: >-
  image-registry.openshift-image-registry.svc:5000/mas-sb1-manage/sb1-masdev-
  all@sha256:6e6891b03d9237e64b6a3c4c41fd8dc331da74cf4cb2393a3ba70588599c600f
args:
- >-
  echo generateKeyStore...; openssl pkcs12 -export -in
  /etc/ssl/certs/internal-manage-tls/tls.crt -inkey
```

```

/etc/ssl/certs/internal-manage-tls/tls.key -out ${java_keystore}
-password pass:${java_keystore_password};
/tmp/genJDBCTruststore.sh; /opt/ibm/wlp/bin/server debug

```

Save the deployment and wait a moment for the pod to be created. Note down the pod name.

Note: The WebSphere® Application Server Liberty waits for the debugger to attach before it starts. Currently, the Logs tab displays the following:

```
generateKeyStore...
```

```
Listening for transport dt_socket at address: 7777
```

Configuring port forwarding

1. From the Red Hat OpenShift Container Platform console, copy the login command.
2. On the local Eclipse machine, open a PowerShell for Windows command and paste the copied login command.
3. If it is necessary, use the **oc project** command to switch to the appropriate project.
4. Locate the name of the manageddebug pod.
5. Enter **kubectl port-forward <podname> 7777:7777**.
6. Wait for the forwarding messages:

```
kubectl port-forward manageddebug-57d79d4dfc-q82vn 7777:7777
```

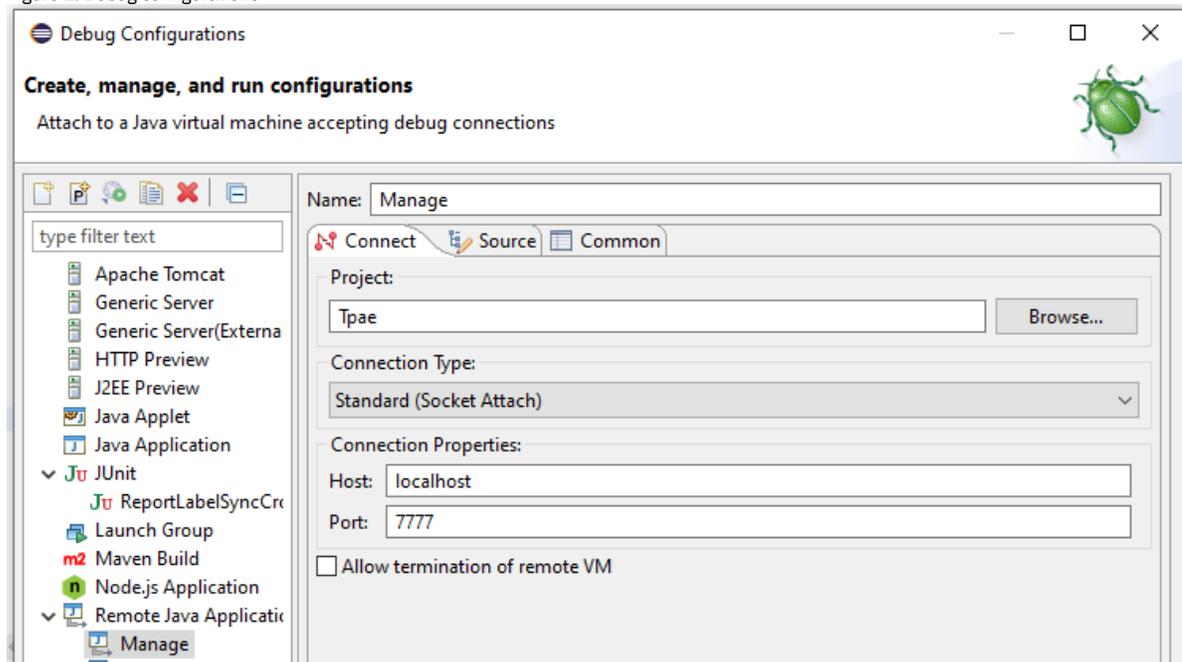
```
Forwarding from `127.0.0.1:7777 -> 7777`
```

```
Forwarding from `[::1]:7777 -> 7777`
```

Creating the remote debug configuration

1. From the Eclipse debug view, create a Java Remote Application.
2. Attach an appropriate source code project, and attach the Java Remote Application to port 7777.
3. Set the Host field in the debug configuration to localhost.

Figure 1. Debug configurations



Connecting the remote debugger to the listener

Launch the debug configuration. Once the debugger connects, the console displays, "Handling connection...".

```
Forwarding from `127.0.0.1:7777 -> 7777`
```

```
Forwarding from `[::1]:7777 -> 7777`
```

```
Handling connection for 7777
```

You can watch the server start progress in the pod's Logs tab.

Defining remote access to the debug server

1. In Networking > Services, create a new service for the deployment.
2. Follow the port mapping from the existing server bundles.
3. Set spec.selector to **app: manageddebug**.

```
selector:  
  app: manageddebug
```

4. After the service is created, select the Pods tab to confirm that the labels are correctly defined and the service is applied to the debug pod.
5. In Networking > Routes, create a route for the new service, by following the existing all or ui route.
6. Use the new route location to go to the Maximo Manage application.
7. Add /maximo to the route to access the debug server.

Enabling debugging for Maximo Manage

It is possible to remotely debug Maximo® Manage by connecting to the Liberty server.

Configuring debug mode

1. When you deploy Maximo Manage, in the Maximo Application Suite user interface, set the debugMode to "up" and save the configuration.

Figure 1. Set debug Mode in Maximo Application Suite user interface



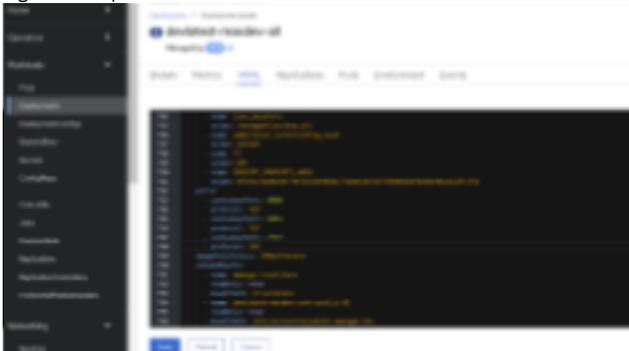
Or, you can set up the serverbundle property in your instance from the ManageWorkspace CustomResourceDefinitions (CRD).

Figure 2. Set debugMode in CRD



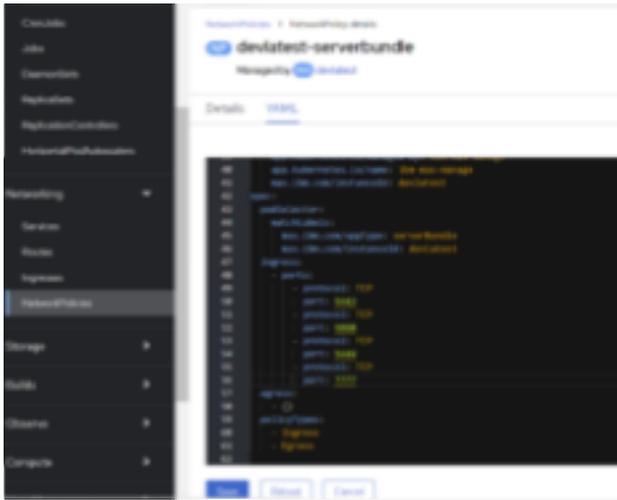
2. Go to Workloads > Deployments and make sure to scale down the ibm-mas-manage-operator deployment and entitymgr-ws deployment to '0'.
3. Go to Deployments > serverbundle and edit the YAML file to add port 7777 in the serverbundle container.

Figure 3. Set port



4. Go to Networking > NetworkPolicies and adjust the serverbundle network policy to allow port 7777.

Figure 4. Adjust network policy



- Update the cmd args for the Maximo Manage server by replacing `/tmp/startwlp.sh;` with `/tmp/genJDBCTruststore.sh; /opt/ibm/wlp/bin/server debug defaultServer;`

```
image: >-
  image-registry.openshift-image-registry.svc:5000/mas-devlatest-manage/devlatest-masdev-
  all@sha256:362ce629e6abaa52750e5d5499e07c3626d75810d033b14d7bcea42fcae16998
  args:
  - >-
    echo copy additional jvm options is exists; cp
    /opt/ibm/wlp/usr/servers/defaultServer/manage/jvmoptions/jvm.options
    /opt/ibm/wlp/usr/servers/defaultServer/configDropins/overrides/.;
    echo generateKeyStore...; openssl pkcs12 -export -in
    /etc/ssl/certs/internal-manage-tls/tls.crt -inkey
    /etc/ssl/certs/internal-manage-tls/tls.key -out ${java_keystore}
    -password pass:${java_keystore_password};
    /tmp/genJDBCTruststore.sh; /opt/ibm/wlp/bin/server debug
    defaultServer;
```

- Save the deployment and wait for the pod to be created. Note down the pod name.
- Wait for the debugger to attach before it starts.
- Check that the Logs tab displays the following lines:

Figure 5. Logs tab



Configuring port forwarding

- From the Red Hat® OpenShift® Container Platform console, copy the login command.
- On the local Eclipse system, open a PowerShell for Windows command and paste the copied login command.
- If it is necessary, use the `oc project` command to switch to the appropriate project.
- Locate the name of the newly created all or ui serverbundle pod. For example, `devlatest-masdev-all-7bd96d9cb-hb6cm`.
- Run the command `kubectl port-forward <podname> 7777:7777`.
- Wait for the forwarding messages:

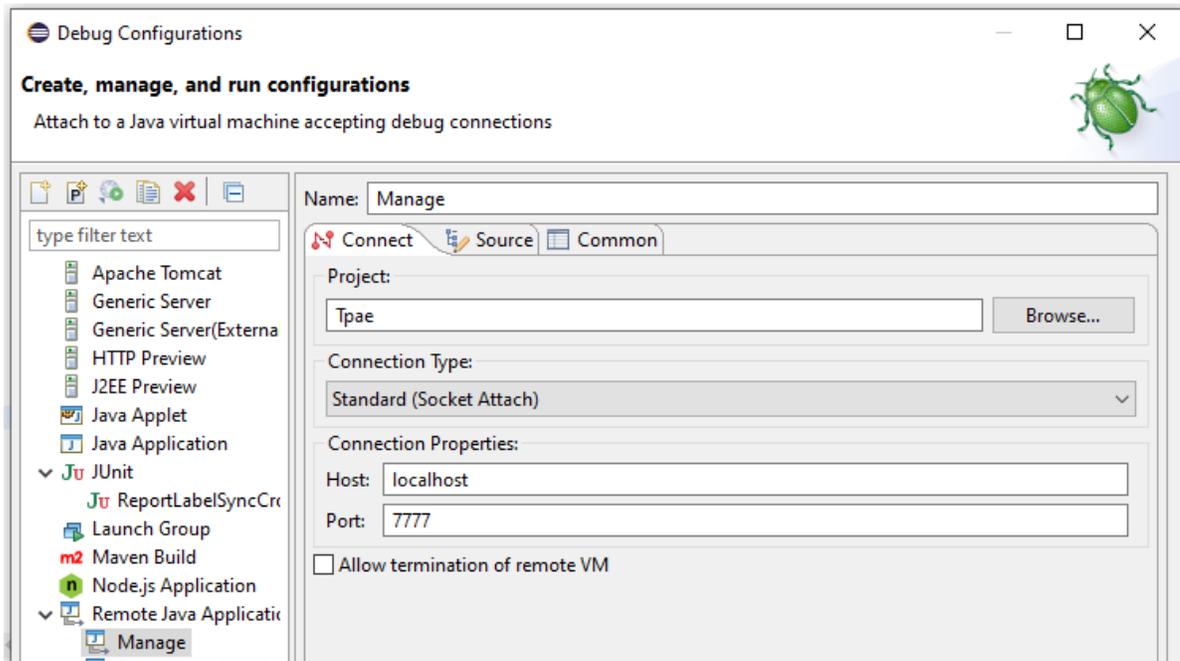
```
kubect1 port-forward devlatest-masdev-all-7bd96d9cb-hb6cm 7777:7777

Forwarding from `127.0.0.1:7777 -> 7777`
Forwarding from `[::1]:7777 -> 7777`
```

Creating the remote debug configuration

- From the Eclipse debug view, create a Java™ Remote Application.
- Attach an appropriate source code project, and attach the Java Remote Application to port 7777.
- Set the Host field in the debug configuration to localhost.

Figure 6. Debug configurations



Connecting the remote debugger to the listener

Launch the debug configuration. Once the debugger connects, the console displays, "Handling connection...".

```
Forwarding from `127.0.0.1:7777 -> 7777`
Forwarding from `[::1]:7777 -> 7777`
Handling connection for 7777
```

You can watch the server start progress in the pod's Logs tab.

Checking pods and accessing debug server

1. In Networking > Services, check the existing service for all or ui serverbundle pod. Select the Pods tab to confirm that the labels are correctly defined, the service is applied to the debug pod, and the pod is visible in the Pods tab.
2. In Networking > Routes, click the existing all or ui route to go to the Maximo Manage application and add /maximo to the route to access the debug server.

Domains

Administrators can use the Domains application to add or modify domains to fit with your business practices. Domains are used throughout the product. They validate entered field values, provide lookup lists from which users can select field values, and can copy data sets or values to fields.

In the Domains application, you can add or modify domains. Modify domains by adding more values.

Adding a domain in the Domains application is only part of the process of adding a working domain to the system. After you add domains, more tasks might be required, depending on the domain and how you want the system to display it. You can use the Classifications application, the Database Configuration application, and the Application Designer application to complete these tasks.

ALN domains can be specified on classification attributes in the Classifications application. Further configuration in the Database Configuration application is not required.

Database Configuration

You use the Database Configuration application to create or change objects and attributes, and to customize the database. An object is a self-contained software entity that consists of both data and functions to manipulate data. Most applications are associated with one main object and other related objects.

When you use the Database Configuration application, you interact at the business object level. Internally, the application determines the actions to take on the database tables to support the needs of business objects.

A database table can store several objects, each object having different business rules. For example, the TICKET table defines Incident, Problem, and Ticket business objects, which are defined as database views. In addition, a business object (view) can span more than one database table. Views represent objects that can span multiple tables.

With the business object layer, the system tables that must not be modified are not editable on the user interface but you, an administrator, can view them.

When changing the database, for example, when creating or deleting objects, attributes, or indexes, changes are stored in secondary tables. The changes do not take effect until you configure the database. It is important to back up your data before configuring the database.

- [Database configuration formulas](#)
Database configuration formulas are used to automatically calculate the value of Maximo® Business Objects or Maximo Business Object attributes. Formulas use input variables and mathematical expressions to calculate values.
- [Operators and functions in database configuration formulas](#)
Database configuration formulas can use most mathematical operators and commonly used functions to automatically calculate attribute values.

Database configuration formulas

Database configuration formulas are used to automatically calculate the value of Maximo® Business Objects or Maximo Business Object attributes. Formulas use input variables and mathematical expressions to calculate values.

Attribute formulas

Attribute formulas can be applied to both persistent and nonpersistent attributes. For example, you can create a nonpersistent asset attribute called *overbudgetcost* to track the amount that the year-to-date cost of an asset surpasses the budgeted cost. You can then add the following attribute formula to automatically calculate the value of the *overbudgetcost* attribute: `ytdcost-budgetcost`. In this example, whenever the year-to-date cost or the budget cost changes, the value for the *overbudgetcost* attribute is updated. If *overbudgetcost* is a persistent attribute, the formula calculates the value at the save point of the asset.

Object formulas

Object formulas are associated directly to a Maximo Business Object and their values can be used as an input for other formulas. With object formulas, you do not have to create an attribute just to store a calculation. For example, you can define *overbudgetcost* as an object formula and then use that value in other formulas with the following expression: `exp$overbudgetcost`.

For more information on commonly-used formulas, see the [formula documentation on IBM® Community](#).

Operators and functions in database configuration formulas

Database configuration formulas can use most mathematical operators and commonly used functions to automatically calculate attribute values.

The following operators can be used in database configuration formulas:

Table 1. Operators that can be used in database configuration formulas

Operator	Description	Example
+	Addition	<code>purchaseprice+tax</code>
-	Subtraction	<code>enddate-startdate</code>
*	Multiplication	<code>unitcost*quantity</code>
/	Division	<code>totalcost/quantity</code>
%	Remainder	<code>a%b</code>
^	Power ^o	<code>a^2</code>
&&	Logical and	<code>IF (a>10 && b<20, x,y)</code>
||	Logical or	<code>IF (a>10 || b<20, x,y)</code>
>, >=	Greater than, greater than or equal to	<code>IF (a>=10 && b<20, x,y)</code>
<, <=	Less than, less than or equal to	<code>IF (a>=10 || b<20, x,y)</code>
=, ==	Equals comparison	<code>IF (a=10 || b=c,x,y)</code>
!=, <>	Not equals	<code>IF (a<> 10 && b!=c,x,y)</code>

The following functions can be used in database configuration formulas:

Table 2. Functions that can be used in database configuration formulas

Function	Number of parameters	Description	Example
IF	3	Used for if/then conditions.	<code>IF (a>10 || b<20, x,y)</code>
MAX, MIN	2	Calculates the minimum and maximum values between two numbers.	<code>MAX(a,b)</code> or <code>MAX(a, MAX(b,c))</code>
ABS	1	Calculates the absolute value of a number.	<code>ABS (a)</code>
DATE	3	Indicates a date in the following format: yyyy, mm, dd.	<code>DATE (2015, 10, 21)</code>
DATETIME	6	Indicates a date and time in the following format: yyyy, mm, dd, hr, min, sec. DATETIME uses a 24-hour clock.	<code>DATETIME (2015, 10, 21, 14, 0, 0)</code>
DURATION	6	Indicates the duration of a time in the following format: yyyy, mm, dd, hr, min, sec.	<code>DURATION (0, 0, 3, 2, 0, 0)</code>
ROUND	2	Rounds a value to a specified decimal value.	<code>ROUND (linecost, 2)</code>

Function	Number of parameters	Description	Example
NVL	2	Returns the alternate value if one value is null.	NVL (a,b)
PCT	2	Calculates the percentage of the first parameter based on the second parameter.	PCT (Val, total)
FLOOR, CEILING	1	Calculates the largest or smallest whole number value.	FLOOR (3.2)
SQRT, SIN, LOG, LOG10. TAN, COS, ASIN, ACOS, ATAN, SINH, COSH, TANH, RAD, DEG	1	Calculate basic math functions.	SQRT (4)

Communication Templates

You use the Communication Templates application to create and manage communication templates. These templates can be used to standardize frequently used email communications (which are also known as notifications).

You can use communication templates in the following ways:

- You can add file attachments or document folders to communication templates. When an email communication is sent, the attachments are included in the email communication, either in a folder or in an attachment.
- You can use communication templates with the workflow process. For example, you might have a workflow process for purchase requisitions that uses a communication template. When a user submits a request for a notebook, the purchase request enters the workflow and must be approved by an immediate supervisor. When the purchase request is approved, the status is set to approved. An email communication is then sent out using the communication template to the user who submitted the request.
- You can use communication templates with the escalation process. For example, when a service desk agent does not complete assignments within six hours, you can create an escalation configuration that uses communication templates. The assignment is escalated to the supervisor, and the supervisor receives an email communication.
- Service desk agents can create and send email communications from the ticket applications (the Service Requests application, the Incidents application, and the Problems application). These email communications are sent by using standardized information from communication templates. The recipients of the email communications can respond. The service desk agents can view the two-way dialog in the communication log in the ticket applications.

Actions

In the Actions application, you manage actions and action groups that are used with escalation, service level agreement, and workflow processes.

You can create actions to perform the following tasks:

- Initiate an application action
- Execute a custom class or specified executable program
- Set the value of a field on a record
- [Actions overview](#)
An action is a task that is performed whenever it is invoked by a user interface event, workflow process, or an escalation point.
- [Working with actions](#)
You can create different types of actions that can be used in escalations, service level agreements, or workflow processes.

Actions overview

An action is a task that is performed whenever it is invoked by a user interface event, workflow process, or an escalation point.

- [Types of actions](#)
In the Actions application, you can create different types of actions. The action type determines the type of action that is activated when the action is encountered in a process, such as an escalation point, service level agreement, or workflow process.
- [Deletion rules for actions](#)
You can delete an action record if it is no longer needed and if it is not being used by specific records or elements.

Types of actions

In the Actions application, you can create different types of actions. The action type determines the type of action that is activated when the action is encountered in a process, such as an escalation point, service level agreement, or workflow process.

When you click New Action, you can create the following types of actions:

Type of Action	Description
----------------	-------------

Type of Action	Description
Application action	<p>You use an application action to specify that an application action is activated.</p> <p>When you create an application action, you can specify one of the following actions, if it is available for the specified object:</p> <ul style="list-style-type: none"> • Use APPLYSLA to apply the specified service level agreement. • Use CREATECHANGE to create a change work order. • Use CREATEINCIDENT to create an incident ticket. • Use CREATEPROBLEM to create a problem ticket. • Use CREATERELEASE to create a release work order. • Use CREATESR to create a service request ticket. • Use CREATEWO to create a work order. <ul style="list-style-type: none"> • Use REVERSEINVOICE to create a reverse invoice from a workflow process or from an escalation. You can specify a status for the reverse invoice of either APPR (Approved) or PENDREV (Pending Reversal). • Use WFACCEPT to create a workflow auto-accept that accepts the record, and routes it to the positive path in the workflow process. • Use WFREJECT to create a workflow auto-reject that rejects the record, and routes it to the negative path in the workflow process. • Use WFESCALATE to escalate the record in the workflow process, and change the assignment to its escalation role. • Use WFINITIATE to initiate a workflow process.
Change status action	You use a change status action to specify that the status of the record is changed. You define the outcome of the status change in the Value field.
Custom class action	You use a custom class action to specify that a custom class file is executed. You define the name and path of the class file in the Value field.
Command line executable action	You use a command line executable action to run the program that you define in the Value field.
Action group	You use an action group to specify that a sequence of actions is executed.
Set value	You use a set value action to specify that the value of a specified field is set.

You can change an action, delete an action, or copy an action. Actions are not copied when a workflow process instance is created. Changing an action affects all process instances that use the action, including existing process instances.

Deletion rules for actions

You can delete an action record if it is no longer needed and if it is not being used by specific records or elements.

You cannot delete an action record if it is being used with any of the following records or workflow elements:

- Escalations
- Negative connection lines
- Positive connection lines
- Service level agreements

Working with actions

You can create different types of actions that can be used in escalations, service level agreements, or workflow processes.

- [Creating action records](#)
You can create action records that can be used as part of an escalation, a service level agreement, or a workflow process. You can create different types of actions.
- [Creating action groups](#)
You can create a GROUP type of action that contains two or more action records. When the actions in the group are activated, you can specify a sequence to use for those actions.
- [Creating actions specific to workflow](#)
You can create actions that are associated with a workflow process. Workflow processes use actions to move records through a process and to trigger events, such as status changes.
- [Creating actions specific to escalations](#)
You can create actions that are associated with an escalation record. An escalation is a mechanism to monitor time-sensitive records, which can take actions or send notifications when a record reaches a defined escalation point.

Creating action records

You can create action records that can be used as part of an escalation, a service level agreement, or a workflow process. You can create different types of actions.

Procedure

1. In the Actions application, click New Action.
2. In the Action field, a number is assigned to the action. You can also specify a name for the action.
3. Type a description of the action, or click Long Description to specify additional information.

4. In the Value field, select a value that specifies the type of action to initiate.
 - If you are creating an APPACTION type of action, click Detail Menu to select from the list of available actions. For this type of action, a value is required in the Object field.
 - If you are creating a CHANGESTATUS type of action, type a status for the specified object. For this type of action, a value is required in the Object field.
 - If you are creating a CUSTOM type of action, type the name and path of a class file in the Maximo® directory.
 - If you are creating an EXECUTABLE type of action, type the name and path of an executable file that exists on the server.
 - If you are creating a GROUP type of action, the Value field is read-only.
 - If you are creating a SETVALUE type of action, type the value to which you want the field set. You can click Detail Menu to use the SQL Expression Builder. For this type of action, values are required in the Object and Parameter/Attribute fields.
5. If you are creating an APPACTION, a CHANGESTATUS, a CUSTOM, or a SETVALUE type of action, specify a value in the Object field. Specifying an Object is optional for GROUP and for EXECUTABLE type actions.
6. If you are creating a REVERSEINVOICE type of action, specify a value in the Parameter/Attribute field. You can specify a status for the reverse invoice of either APPR (Approved) or PENDREV (Pending Reversal). A number is automatically assigned to the reverse invoice when it is created.
7. If you are creating a SETVALUE type of action, specify a value in the Parameter/Attribute field. The Parameter/Attribute field contains a relationship tree containing relationships associated with the main object.
8. In the Type field, select a value from the menu of action types. The value in the Type field determines which fields on the action record you can edit, which fields are required, and the values that can be entered in those fields.
9. Optional: If you are creating a CHANGESTATUS type of action, you can use the Memo field to add remarks regarding the status change.
10. Optional: If you are creating an action specifically for use with escalations or workflow, specify a value in the Accessible From field.
11. Click Save Action.

Creating action groups

You can create a GROUP type of action that contains two or more action records. When the actions in the group are activated, you can specify a sequence to use for those actions.

About this task

The following rules apply to action groups:

- If you specify an object for the group, all members of the action group must be for the same object.
- Group type actions cannot be members of an action group.

When you create a GROUP type of action, the Value field, the Parameter/Attribute field, and the Memo field are all read-only.

Procedure

1. On the toolbar of the Actions application, click New Action. If the Action field is empty, type a name for the role.
2. In the Action Description field, type a description, or click Long Description to type additional information.
3. Optional: In the Object field, type a value.
4. In the Type field, select GROUP from the menu of action types.
5. For actions created specifically for use with escalations or workflow, specify a value for the Accessible From field.
6. Click Select Members. You see a list of actions that exist for the specified object. If you do not specify an object, you see a list of action records that do not have a specified object.
 - a. To select an action, select the Select Row check box. You can select more than one action.
 - b. Click OK.
7. Optional: Modify the Sequence field to change the order in which the actions are initiated.
8. Click Save Action.

Creating actions specific to workflow

You can create actions that are associated with a workflow process. Workflow processes use actions to move records through a process and to trigger events, such as status changes.

About this task

You define actions once, and then reuse the actions when you create multiple workflow processes. You use actions when you create and configure the following workflow processes: escalations, negative connection lines, and positive connection lines.

Procedure

1. In the Actions application, click New Action.
2. Optional: Provide a description of the action.
3. Optional: Specify a value for object.
4. Specify the type of action that you are creating.
5. In the Accessible From field, select Workflow.
6. Save your changes.

Creating actions specific to escalations

You can create actions that are associated with an escalation record. An escalation is a mechanism to monitor time-sensitive records, which can take actions or send notifications when a record reaches a defined escalation point.

Procedure

1. In the Actions application, click New Action.
2. Optional: Provide a description of the action.
3. Optional: Specify a value for object.
4. Specify the type of action that you are creating.
5. In the Accessible From field, select Escalation.
6. Save your changes.

Roles

You use the Roles application to manage role records that can be used as part of a communication template, escalation, service level agreement (SLA), or workflow process. When you use a role a process, the process is routed to the correct individual based on information associated with the role record.

A role is a function or position in a business, and can represent a specific job title, such as a department manager. You also can use a role to represent a specific person or a group of people.

- [Roles overview](#)
You use the Roles application to manage role records that can be used as part of communication templates and escalations. You can also manage role records that can be used as a part of a service level agreement (SLA) or workflow processes.
- [Working with roles](#)
You can create different types of role records. Role records can be used as part of a communication template, an escalation, a service level agreement (SLA), or a workflow process

Roles overview

You use the Roles application to manage role records that can be used as part of communication templates and escalations. You can also manage role records that can be used as a part of a service level agreement (SLA) or workflow processes.

- [Types of roles](#)
In the Roles application, you can use a role to represent different functions or positions. When you create role records, you specify a type of role to help determine how the role is resolved when it is encountered in a process.
- [Deletion rules for role records](#)
To help simplify management of role records, you can delete role records as your business needs change.

Types of roles

In the Roles application, you can use a role to represent different functions or positions. When you create role records, you specify a type of role to help determine how the role is resolved when it is encountered in a process.

The following table describes the types of roles that you can specify when you create a role record.

Type of role	Description
Person	<ul style="list-style-type: none">• You use person type route a record to a specific individual.• To create a role record that is a person type, specify Person as the value for the type.
Person group	<ul style="list-style-type: none">• You use the person group type to route a record to one or all members of a person group.• To create a role record that is a person group type, specify Person Group as the value for the type.• If the broadcast option is selected, then assignments and notifications are sent to all members of the group. If this option is not selected, then the assignment or notification is sent to either the first available group member based on calendar and shift, or to the individual who is the default group assignee.
User data	<ul style="list-style-type: none">• You use the user data type to route a record based on a specific field in the person record. You can also route a record based on a field in a related or child record.• To create a role record that is a user data type, specify A set of data related to the login user as the value for the type.
Data set	<ul style="list-style-type: none">• You use the data set type to route a record based on a specific field in a record, or on a field in a related record or child record.• To create a role record that is a data set type, specify A set of data related to the record as the value for the type.• The record is routed to one or more persons based on the value that you specified in the Value field.

Type of role	Description
Custom class	<ul style="list-style-type: none"> You use the custom class type to resolve one or more people. Custom classes are Java™ programs that are written to perform a specific data management process. To create a role record that is a custom class type, provide the name and the path of a class file that you sourced into the system class path as the value for the type. The class must implement the interface psdi.common.role.CustomRoleInterface. The record is routed to one or more persons based on the data that the custom class returns.
E-mail address	<ul style="list-style-type: none"> You use the e-mail address type to notify e-mail addresses. To create a role record that is an e-mail address type, specify Email address as the value for the type. Because e-mail addresses can represent individuals who have person records, these addresses can be used for notifications, but not for assignments.

Deletion rules for role records

To help simplify management of role records, you can delete role records as your business needs change.

Make sure that the role you want to delete is not being used with any of the following records or workflow elements:

- Communication templates
- Escalations
- Service level agreements
- Workflow negative connection lines
- Workflow positive connection lines
- Workflow Manual input nodes
- Workflow Task nodes
- Workflow Wait nodes

Working with roles

You can create different types of role records. Role records can be used as part of a communication template, an escalation, a service level agreement (SLA), or a workflow process

- **Creating role records**
You use the Roles application to create role records that can be used as part of a communication template, an escalation, a service level agreement (SLA), or a workflow process. You can create different types of roles.

Creating role records

You use the Roles application to create role records that can be used as part of a communication template, an escalation, a service level agreement (SLA), or a workflow process. You can create different types of roles.

Procedure

1. On the toolbar, click New Role. If the Role field is empty, type a name for the role.
2. Specify a description or click Long Description to type additional information.
3. Perform one of the following steps:
 - If you are creating a DATASET type of role, specify a value in the Object field.
 - Leave the Object field blank if you are creating any other role type.
4. In the Type field, select a value from the menu. The value in the Type field determines which fields on the role record can be edited, and the values that can be entered in those fields.
5. In the Value field, type a value that specifies how to resolve the role at run time.
 - If Type = CUSTOM, type the name and path of a class file that is in the Maximo directory.
 - If Type = DATASET, click Select Value to select a field from the object specified in the **Object** field.
 - If Type = EMAILADDRESS, type one or more e-mail addresses.
 - If Type = PERSONGROUP, specify a value.
 - If Type = PERSON, specify a value.
 - If Type = USERDATA, specify a value.
6. Perform one or more of the following steps depending on the type of role you are creating:
 - CUSTOM type role: In the Parameter field, specify a parameter to be used with or passed to the custom class.
 - DATASET or USERDATA type role: Select the E-mail check box to indicate that the data set consists of e-mail addresses for individuals who might not have person records.
 - PERSONGROUPID, CUSTOMCLASS, DATASET, or USERDATA type role: Select the Broadcast check box to indicate that assignments and notifications should be sent to all members in a group.
7. Click Save Role.

Escalations

You use the Escalations application to automatically monitor critical processes in your enterprise. You can either create an escalation or customize a predefined escalation to suit your business needs.

You can create escalations at the site, organization, or system level. If you specify an organization or a site, the escalation is restricted to that site or organization. If you leave do not specify an organization or a site, the escalation is available to all sites and organizations. You can restrict escalations to occur for a specified calendar organization, calendar, and shift. You can also build and validate inactive escalations incrementally, and activate the escalations after validation.

The product includes several predefined escalations, but you can modify them or create your own escalations. For example, you can create an escalation to approve or cancel a record, or reassign a task assignment. An escalation might generate a reminder notification to the assignee regarding the task assignment. An escalation could also send a notification to a supervisor that the assignee did not complete the assignment yet.

The following list describes the most frequent uses for escalations:

- Service desk management - Service level agreements (SLA) are contracts between a service provider and the recipient of the services. You can use escalations to determine how incidents, problems, and service requests are handled. You can also use escalations to ensure that you remain compliant with any SLA by solving problems in a timely manner.
- Information technology (IT) Asset Management - You can use escalations to monitor IT contracts, procurement, and inventory. Defining an escalation to alert supervisors thirty days before a lease contract expires enables the supervisors to effectively manage leases. Defining an escalation also helps to avoid penalties or costly lease extensions.
- Workflow processes - You can use escalations to escalate assignments before they timeout in the inbox of the recipient. In a workflow process, when you assign specific steps to an employee, these assignments display in the inbox of that employee. If the assignments are not completed promptly they timeout in the inbox. An escalation can assign the tasks to other people.

Workflow Designer

You use the Workflow Designer application to create, to view, to modify, and to delete workflow process records that reflect your business processes.

An active workflow process defines the different paths that a record can take as it moves through a business process. The workflow process also specifies the actions and notifications that can take place at different points in a process.

Creating a workflow process involves the following phases:

- Designing the process
- Creating the workflow process
- Validating the process
- Enabling the process
- Activating the process

You create each workflow process record for a business object. An object is a self-contained software entity that consists of both data and functions for manipulating data. Every application is associated with an object. You can create a workflow process either for a main object or for an object with its own applications.

When you specify an object on a process record, the appropriate actions, the communication templates, the escalations, the conditional expressions, and the roles are filtered and displayed as you create the process. The object association also determines which records can be routed through a completed process.

The Workflow Designer application requires a Java™ Virtual Machine (JVM) on the client workstation. If you do not have a JVM installed, the product cannot display the Workflow canvas.

Workflow Administration

You use the Workflow Administration application to view and to manage active instances of workflow processes.

The Workflow Administration application contains a window that displays a row for each active instance of a workflow process. A record can show up multiple times if it is controlled by multiple workflow instances. You can see which version of a revised process was used to create each instance, the person identifier of the individual who routed each record into Workflow, and the date and time that the process was initiated.

The recordkey (for example, the work order number or the purchase order number) displays with the site identifier in the Owner Description field.

Cron Task Setup

You use the Cron Task Setup application to create cron tasks and cron task instances, and to remove cron tasks or cron task instances. You can also change cron task parameters and statuses, and adjust the schedule of a cron task.

Cron tasks have definitions that consist of a name, a class name, an access level, and a description.

You can reschedule cron tasks and change parameter values without stopping and restarting the server.

E-mail Listeners

In the E-mail Listeners application, you can receive and process service request and other types of tickets using e-mail messages. You can create or update tickets. You can also indicate whether the status is changed or queried based on specified criteria.

The E-mail Listeners application can poll multiple e-mail accounts to retrieve messages. Each account is checked at periodic intervals that you establish. Based on the subject line of an e-mail message or the contents of the e-mail message body, an e-mail listener can determine if the e-mail is new or is an updated service request, incident, or problem. An e-mail listener can also determine if an e-mail is a query for information about any business object.

The E-mail Listeners application supports the following features:

- Saving secured embedded elements as attachments
- Embedded and normal message attachments
- Saving and maintaining placement of unsecured embedded images, such as JPEG, PNG, or GIF images
- Processing normal message attachments as attachments
- Supporting POP3 and IMAP e-mail protocols

The E-mail Listeners application cannot process encrypted or digitally signed e-mail messages.

E-mail processing

E-mail processing uses a predefined workflow process. Various steps in the workflow process create, update, or change the status of service requests, incidents or problems. Other steps in the workflow process execute queries and return query results to the originator of the e-mail. You can customize the workflow process or create workflow processes to suit your needs.

All communications from the originators of the e-mail messages are captured in the service request, incident, or problem communication log. Similarly, generated communications sent to the originator of an e-mail message are captured in communication logs.

You can configure the appropriate log levels to get detailed processing and error information from the system log file regarding the E-mail Listeners application processing of e-mails.

- [E-mail Listeners overview](#)

The E-mail Listeners application can poll multiple e-mail accounts to retrieve messages. Each account is checked at periodic intervals that you establish. Based on the subject line of an e-mail message or the contents of the e-mail message body, an e-mail listener can determine if the e-mail is new or is an updated service request, incident, or problem. An e-mail listener can also determine if an e-mail is a query for information on any business object.

- [Working with E-mail Listeners](#)

You use e-mail listeners to receive and process incoming e-mail messages. The E-mail Listeners application can monitor multiple e-mail accounts to retrieve messages. It also supports embedded and normal message attachments.

E-mail Listeners overview

The E-mail Listeners application can poll multiple e-mail accounts to retrieve messages. Each account is checked at periodic intervals that you establish. Based on the subject line of an e-mail message or the contents of the e-mail message body, an e-mail listener can determine if the e-mail is new or is an updated service request, incident, or problem. An e-mail listener can also determine if an e-mail is a query for information on any business object.

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You can configure the appropriate log levels to generate detailed processing and error information from the system log file regarding how the E-mail Listeners application processes e-mails.

- [Email listeners components](#)

The Email Listeners application works together with a CRON task and a workflow process to provide full functionality.

- [E-mail listeners process](#)

Using e-mail listener definitions, the E-mail Listeners application polls the mail server for incoming messages and sends e-mail messages in response. The response e-mail messages confirm that a desired operation was performed on behalf of the user. The e-mail messages also notifies you if there was an error performing the operation.

- [Security settings for e-mail listeners](#)

As you can create, update, query, and change the status of tickets, you can configure security settings for e-mail listeners. Using these settings, you can ensure that only authorized users can execute these functions using e-mail messages.

- [Communication templates for e-mail listeners](#)

To generate standardized e-mail notifications, the E-mail Listeners application uses communication templates to generate notifications that are sent to

- users and administrators. The types of notifications include confirmations, validation or processing errors, and system errors.
- [Preprocessors for e-mail listeners](#)
A preprocessor determines whether incoming e-mails messages are new requests for help or updates to existing service requests.
- [E-mail messages](#)
In the E-Mail Listeners application, you can manage your e-mail messages.

Email listeners components

The Email Listeners application works together with a CRON task and a workflow process to provide full functionality.

The following table lists and describes the Email Listeners components.

Table 1. Email Listeners components

Component	Purpose
Email Listeners application	The application used to create, modify, and delete email listener configurations.
Email listener cron task	A component that runs continuously on the application server and uses the CRON task infrastructure. This role is performed by the LSNRCRON cron task. This component encapsulates a staging process that processes inbound email through a staging table.
Workflow process	A workflow process that parses email information from the staging table and processes it according to the subject and contents of each message.

For these components to work correctly, you must first configure your mail servers and email accounts.

E-mail listeners process

Using e-mail listener definitions, the E-mail Listeners application polls the mail server for incoming messages and sends e-mail messages in response. The response e-mail messages confirm that a desired operation was performed on behalf of the user. The e-mail messages also notifies you if there was an error performing the operation.

When the mail server receives an incoming e-mail message, the following events occur:

- The mail server polls for incoming e-mail messages from the designated e-mail account.
- The E-mail Listeners application verifies that the senders of the incoming e-mail messages have person records. If the sender has a person record, the e-mail message is processed. If the sender does not have a person record, the e-mail message is ignored.
- A preprocessor determines whether the e-mail messages are new or updates to existing communications.
- The e-mail messages are staged, which includes the following events:
 - Processing the e-mail message body to locate the content IDs of embedded images.
 - Extracting content from the e-mail messages, including attachments.
 - Storing content in staging tables and attached document tables.
 - Launching the e-mail processing workflow process.
 - If the e-mail listener was configured to use Java™ Messaging Service (JMS) queues, placing e-mail messages in the JMS queue indicating that a new e-mail message needs to be processed. A messaging component picks up this e-mail message from the queue and launches the workflow.
- Using the predefined workflow process, the following events occur:
 - Flagging an e-mail message as new or as an update to an existing service request, incident, or problem
 - For new e-mail messages, creating a service request, incident, or problem, and creating an associated communication log
 - For existing e-mail messages, updating the service request, incident, or problem, and creating an entry in the communication log
- [Predefined workflow process for e-mail listeners](#)
You use workflow processes to create steps to guide records for your business process. The E-mail Listener application has a predefined workflow, Listener Business Process (LSNRBP), that is used with the E-mail Listeners application.
- [E-mail listeners definitions](#)
As your business needs change, you can change, copy, or deactivate your e-mail listener definitions.

Predefined workflow process for e-mail listeners

You use workflow processes to create steps to guide records for your business process. The E-mail Listener application has a predefined workflow, Listener Business Process (LSNRBP), that is used with the E-mail Listeners application.

By default, the LSNRBP process is enabled and active. To meet your business needs, you can revise the process or create a process in the Workflow Designer application.

When you associate the LSNRBP workflow process to a configuration, the e-mail listener submits each record in the staging table to the LSNRBP process. The LSNRBP process performs the following functions based on the contents of the e-mail message:

- Changes the status of an existing ticket or other business object
- Updates an existing ticket
- Creates a ticket
- Queries any business object and return results

The LSNRBP process generates response e-mail messages at various points during e-mail processing. For example, a response containing the service request number is sent to the originator of an e-mail message whenever the application creates a service request. Response e-mail messages are also generated whenever an update is made to an existing ticket or when queries are performed.

E-mail listeners definitions

As your business needs change, you can change, copy, or deactivate your e-mail listener definitions.

Deactivation of definitions

In the E-mail Listeners application, you can deactivate an e-mail listener definition to help simplify e-mail management. For example, you can deactivate an e-mail listener definition to migrate to a new mail server or to perform routine system maintenance. To deactivate an e-mail listener definition, use the Activate/Deactivate Listener action. When you deactivate an e-mail listener definition, messages on the mail server are not monitored and service requests are not created.

Changes to definitions

You can change the attributes of an e-mail listener definition. You can change all values, except for the e-mail address, cron task name, cron task instance, and last time run. You must deactivate an e-mail listener definition before you can change it.

If you need to change the format of the e-mail address on an account, you must create an e-mail definition. For example, if you want to change help@company.com to customer_service@company.com. To create a definition, use the Duplicate Listener action in the E-mail Listeners application.

Duplication of definitions

You can duplicate an e-mail listener definition to simplify the management of e-mail records. When you duplicate an e-mail listener definition, you can specify new account information.

When you duplicate an e-mail listener definition, the following points apply:

- Some mail servers are case-sensitive.
- The case of the e-mail address that you specify is preserved.
- You cannot save an e-mail listener definition if it has an e-mail address with the same name and case as an existing e-mail address on the mail server.

Security settings for e-mail listeners

As you can create, update, query, and change the status of tickets, you can configure security settings for e-mail listeners. Using these settings, you can ensure that only authorized users can execute these functions using e-mail messages.

For the sender of an e-mail message, security authorizations are checked against the security configuration for the system. This check establishes the ability of the sender to run each specific function.

The person record is a basic requirement to be able to process e-mail messages. Additional processing of e-mail messages only occurs after the person record associated with the e-mail address of the sender has been located.

The following points apply to security settings for e-mail listeners:

- If a person record is active, the corresponding user record is found.
- If a person record does not exist or is inactive, the e-mail message is not processed. An error e-mail message is sent to the sender and the administrator.
- If a user record is found, the associated authorizations are applied when the E-mail Listeners application performs security checks on incoming e-mail messages.
- If a user record is not found, the **Run As user** of the cron task instance for the e-mail listener is used.

To specify security settings for e-mail listeners, you can use the Select Security Settings action in the E-mail Listeners application. The settings identify business objects supported by each e-mail listeners workflow process. The settings also identify the corresponding applications that must be used to determine security restrictions on incoming e-mail messages. To assign the appropriate authorizations to the users who send formatted e-mail messages, configure security settings you can use the Security Groups application.

Scenarios of security authorization

The following table describes the two security authorization scenarios that are supported when a user ID exists.

Table 1. Security authorization scenarios that are supported when a user ID exists

Scenario	Support
The user exists and has authorization to perform the operation specified in the e-mail message.	<ul style="list-style-type: none">• The e-mail listener performs the security check based on the sender of an incoming e-mail message.• When the user record for the sender is located, the e-mail listener builds a security profile of the user to determine authorizations.• If the user has authorization to perform add, update and change status operations, the e-mail message is processed accordingly.

Scenario	Support
The user exists but does not have authorization to perform the operation specified in the e-mail message.	<ul style="list-style-type: none"> The user can update or query only records that the user created.

Communication templates for e-mail listeners

To generate standardized e-mail notifications, the E-mail Listeners application uses communication templates to generate notifications that are sent to users and administrators. The types of notifications include confirmations, validation or processing errors, and system errors.

When the E-mail Listeners application successfully processes an incoming e-mail message, a confirmation notification is generated.

The following table lists the templates that are used for confirmation notifications.

Table 1. Templates for confirmation notifications

Templates	Confirmation situation	Recipients
LSNRBPCBSR	Confirms the creation of a service request based on an incoming free-form e-mail message.	Sender of original e-mail message.
LSNRBPCHST	Confirms the status change of records based on an incoming e-mail message.	Sender of original e-mail message.
LSNRBPQRY	Response e-mail message containing details of query results from an incoming e-mail message.	Sender of original query e-mail message.
LSNRBPUBSR	Confirms the update of a service request based on an incoming free-form e-mail message.	Sender of original e-mail message.
LSNRBPUBJ	Confirms the update of a specified object based on an incoming e-mail message.	Sender of original e-mail message.
LSNRBPCOBJ	Confirms the creation of a specified object based on an incoming e-mail message.	Sender of original e-mail message.

A validation or processing error notification is generated when the E-mail Listeners application cannot process an incoming e-mail message. This error could be because of incorrect formatting or incomplete or invalid information in the incoming e-mail message. You must review the error in the log file or in the e-mail to resolve the error.

The following table lists the templates that are used for the validation or processing of error notifications.

Table 2. Templates for validation or processing error notifications

Template used for validation or processing error notification	Error situation	Corrective action	Recipients
LSNRAUTH	Validation error notification The sender does not have authorization to perform the operation specified in the incoming e-mail message.	Authorize the user for the specified application.	Sender of original e-mail message and system administrator.
LSNRBPAUTO	Processing error notification The e-mail listener cannot create an auto key for an attribute that was declared as auto key in the incoming e-mail message.	Verify that the attribute is declared as an auto key. If the attribute is declared as an auto key, check the logs.	Sender of original e-mail message.
LSNRBPDATE	Validation error notification The sender did not specify a properly formatted date or date time value for an attribute that was specified in the incoming e-mail message.	Provide a valid formatted date.	Sender of original e-mail message and system administrator.
LSNRBPINV	Processing error notification The sender specified an update operation for an existing record in the incoming e-mail, message, but the record does not exist.	Provide a valid record.	Sender of original e-mail message.
LSNRBPUACN	Processing error notification The sender specified an invalid action in the incoming e-mail message.	Provide a valid action.	Sender of original e-mail message.
LSNRBPUNOB	Processing error notification The sender specified an object in the incoming e-mail message that the E-mail Listeners application does not support.	Provide a valid object name. There are only 3 valid objects for create and update action: service requests, problems, and incidents.	Sender of original e-mail message.
LSNRFNKEY	Processing error notification The sender did not provide all of the primary keys for a record that was specified in the incoming e-mail message.	Provide input for the mandatory key fields.	Sender of original e-mail message.
LSNRFNREQ	Processing error notification The sender did not provide all of the required attributes for a record that the sender specified in the incoming e-mail message.	Provide input for all mandatory fields.	Sender of original e-mail message.
LSNRINVM	Validation error notification The incoming e-mail message contains a blank subject line or a subject line that exceeds the allowed length (this error occurs only in free-form e-mail messages).	Enter a subject or reduce the length of the subject.	Sender of original e-mail message.
LSNRNOPER	Validation error notification The sender of the incoming e-mail message does not have a corresponding person record.	Sender of the e-mail must be defined as a person.	Sender of original e-mail message and system administrator.
LSNRSECAPP	Validation error notification The sender of the incoming e-mail message does not have the requisite authorizations to perform the operation on the object specified in the e-mail message.	Provide the authorizations needed for the object in the Security Settings window of the E-mail Listener application.	Sender of original e-mail message and system administrator.

Template used for validation or processing error notification	Error situation	Corrective action	Recipients
LSNRWFMT	Processing error notification The incoming e-mail message has invalid formatted content.	Format the content of the e-mail correctly.	Sender of original e-mail message and system administrator.

If a system error occurs when the E-mail Listeners application polls or processes an incoming e-mail message, a system error notification is generated.

The following table lists the templates that are used for system error notifications.

Table 3. Templates for system error notifications

Templates used for system error notifications	Error situation	Recipients
LSNRBPEX	Processing the incoming e-mail message.	System administrator. To ensure that the sender of the original email also receives the error notification, set the <code>mxe.lsnr.notifyusererror</code> property to 1.
LSNRBPQERR	Placing information about an incoming e-mail message into JMS queue.	System administrator
LSNRCFGERR	Using the listener configuration to connect to an e-mail account.	System administrator
LSNRCONNF	Connecting to the mail server to access the configured e-mail account.	System administrator
LSNRERROR	Processing the incoming e-mail message.	Depending on the error, sender of the original e-mail message or system administrator.
LSNRINBF	Staging the contents of the incoming e-mail message in the internal staging table.	System administrator
LSNRJMSCF	Connecting to the configured JMS queue because the queue connection factory information for the queue is incorrect.	System administrator
LSNRJMSF	Connecting to the configured JMS queue.	System administrator
LSNRJMS	Connecting to the configured JMS queue because the queue information is incorrect.	System administrator
LSNRJMMSSYN	Connecting to the configured JMS queue, and further processing of e-mail message is performed without the JMS queue.	System administrator
LSNRMAILER	Retrieving e-mail message from the configured e-mail account.	System administrator

Preprocessors for e-mail listeners

A preprocessor determines whether incoming e-mails messages are new requests for help or updates to existing service requests.

The preprocessor is a Java™ component of the e-mail listener that runs on the server when the e-mail listener recognizes a new e-mail message. The preprocessor parses the subject line of any incoming e-mail message to determine whether the message is a new request for help or an update to an existing service request. By default, a built-in preprocessor parses incoming e-mail messages. The default preprocessor value is: `psdi.common.emailstner.Preprocessor`. In the E-mail Listeners application, this value displays in the Preprocessor field on the Listener tab.

The preprocessor class extracts the string that is bounded by the object key delimiter characters, which identifies an existing service request. If a string is recognized, the preprocessor stores the string in the object key column in the e-mail listener staging table. If no string is recognized, the preprocessor leaves the object key column blank.

Customized preprocessors

The base preprocessor Java class implements a standard Java interface called the `LSNRPreprocessor`. Custom preprocessor implementations must include an implementation of the `LSNRPreprocessor` interface.

The preprocessor interface provided with the system includes the following public methods:

- Boolean `isNewEmail` (String del, String subject)
- String `getObjectKey` (String del, String subject)

In the custom Java class, you can implement both methods. Each method accepts two parameters: the delimiter string and the subject line string.

Table 1. Methods

Method	Description	Base preprocessor implementation	Custom implementation
<code>isNewEmail()</code>	Returns a Boolean value indicating whether the e-mail is for a new or for an existing ticket	Checks whether the Object Key Delimiter string occurs exactly twice in the subject line string	Might provide different logic to determine the new or existing ticket
<code>getObjectKey()</code>	<ul style="list-style-type: none"> • Returns a string that represents the Ticket ID • Returns null, if no ID is found 	Extracts the substring between the first and last occurrences of the delimiter string in the subject line	Might provide different logic to determine the Ticket ID

- [Object key delimiters](#)
The E-mail Listeners application uses an object key delimiter to identify the incoming e-mail message as an existing ticket.
- [Logging](#)
You can use logging to create and to manage log files that contain informational, warning, or error messages regarding the processing of e-mail messages.

Object key delimiters

The E-mail Listeners application uses an object key delimiter to identify the incoming e-mail message as an existing ticket.

Object key delimiters specify characters on either side of the service request key in the subject line of incoming e-mail messages. The default value in the Object Key Delimiter field is `##`. For example, service request number 1009 is represented as `##1009##`, with no spaces before or after the service request key.

You can change the default value, and replace the value before and after the ticket ID with other characters. There are no restrictions regarding the characters that you can use. However, the delimiter must be unique. Choose characters or symbols that are not frequently used. For example, you use `+` as the object key delimiter, and a user sends an e-mail message with the subject line: `+1003+`

Having problems with printer + network. The preprocessor cannot identify the substring because the object key delimiter symbol occurs multiple times in the subject line.

When you send e-mail messages that reference existing service requests, place the characters that you choose as the object key delimiter before and after the service request key. The preprocessor class extracts the string that is bounded by the object key delimiter characters, which identifies an existing service request. If a string is recognized, the preprocessor stores it in the object key column in the e-mail listener staging table. If no string is recognized, the preprocessor leaves the object key column blank.

Object key identifier

An object key identifier is the ID of a record. The object key identifier can be a sequence that is generated. For example, object key identifiers can be 1001, 1002, and so on.

Logging

You can use logging to create and to manage log files that contain informational, warning, or error messages regarding the processing of e-mail messages.

You use the Logging application to create and to manage log files.

E-mail messages

In the E-Mail Listeners application, you can manage your e-mail messages.

- [Polling of mail servers for email messages](#)
Using email listener definitions, the email Listeners application uses a dedicated cron task to poll the mail server for incoming messages. Cron tasks are Java™ components that you can set to run automatically and on a fixed schedule. For each email listener definition that you create, a specific instance of the cron task is created and associated with the email listener.
- [Status of e-mail records](#)
Every e-mail record in the staging table has an associated status. These statuses reflect the sequence of actions that the e-mail listener performs on an e-mail record in the staging table.
- [E-mail attachments](#)
The E-mail Listeners application stores attachments from incoming e-mail on the application server. You can view attachments in the E-mail Processing tab of the E-mail Listeners application.
- [Message thresholds](#)
If the number of messages waiting to be processed exceeds the high message threshold that you set, the application server limits the addition of new messages in the processing queues.
- [E-mail formats for e-mail listeners](#)
The E-mail Listeners application can process free form e-mail messages or formatted e-mails. You can configure a system property to determine how some alternative e-mail formats are processed.

Polling of mail servers for email messages

Using email listener definitions, the email Listeners application uses a dedicated cron task to poll the mail server for incoming messages. Cron tasks are Java™ components that you can set to run automatically and on a fixed schedule. For each email listener definition that you create, a specific instance of the cron task is created and associated with the email listener.

The scheduling value determines the polling frequency. The polling frequency is stored as an attribute of each cron task instance. Specify different schedules for different email accounts. By default, the schedule for the polling frequency is set to every 5 minutes.

The cron task polls the mail server at the set frequency and performs the following actions:

Table 1. Cron task actions

Condition	Mail server action
For new email messages on the mail server	The mail server: <ul style="list-style-type: none"> • Extracts the header and message body • Extracts any attachments • Moves the email to e-mail staging • Marks the email message as read
For email messages marked as read on the mail server	The mail server determines whether read email messages are deleted: <ul style="list-style-type: none"> • If an email message is to be deleted, it marks the email message as deleted • If an email message is not to be deleted, it keeps the email message on the server

For email messages processed from a POP-based mail account, the Email Listener determines whether an email is already processed or is new.

- **Queues**

A queue is an application server component that can facilitate parallel processing. Associating a queue with an e-mail listener can speed up the sequential processing of incoming e-mails, especially when they are arriving in high volume.

- **Staging e-mail messages**

Using an e-mail listener cron task, the E-mail Listeners application stages e-mail messages to a staging table. When staging an e-mail message, the application saves all information that is required to process the e-mail message and initiate the workflow process. Cron tasks are behind-the-scene jobs that run automatically and on a fixed schedule.

Queues

A queue is an application server component that can facilitate parallel processing. Associating a queue with an e-mail listener can speed up the sequential processing of incoming e-mails, especially when they are arriving in high volume.

The E-mail Listeners application processes incoming e-mail messages in a sequential manner. The sequence of processing includes polling the mail server, staging the mail into the database, and launching workflow processing on the staged mail record. In situations where high volumes of e-mail messages must be processed efficiently, this sequential processing can be time-consuming. This means that e-mail messages are not always processed as quickly as possible. Therefore, it can be beneficial to switch the e-mail listener to a parallel processing mode. To perform this switch, you can configure a queue and associate the queue with the listener. The system uses Java™ Messaging Service (JMS) queues, provided by the underlying Java application server.

Once a message is placed in a queue, the message processing component can pick the message up in an asynchronous manner. In the Java application server, the processing components are called message-driven beans (MDBs). You can configure the application server to provide multiple MDBs that process multiple messages in parallel. This increases the speed at which the E-mail Listeners application processes e-mails.

Once you set up the queues, you can modify or create an e-mail listener definition to specify queue-based processing, the queue name, and the queue connection factory name.

Staging e-mail messages

Using an e-mail listener cron task, the E-mail Listeners application stages e-mail messages to a staging table. When staging an e-mail message, the application saves all information that is required to process the e-mail message and initiate the workflow process. Cron tasks are behind-the-scene jobs that run automatically and on a fixed schedule.

A staging table stores the attributes of an incoming e-mail message, including the recipients, the sender, the subject, and the message. The staging process creates a record, and the workflow process determines how to process the record.

If an incoming e-mail message generates a ticket, details of the e-mail message are stored as the initial entry in the communication log of the ticket. Any further correspondence is stored, based on the key of the ticket. Graphics, whether they are embedded in or attached to the e-mail message, are also visible in the communication log. You can view communication logs from the Log tab of the Service Request application.

Errors found during staging

If the E-mail Listeners application finds any errors while staging e-mail records, the e-mail listener can write error information in the log file on the server. You use the Logging application to enable logging for the E-mail Listeners application.

In addition, you can receive error notifications if the E-mail Listeners application encounters errors during staging. To receive the error notifications, you must provide a valid e-mail address in the Administrator E-mail field. The notification that is sent to the e-mail address for the administrator contains a detailed description of the errors.

Status of e-mail records

Every e-mail record in the staging table has an associated status. These statuses reflect the sequence of actions that the e-mail listener performs on an e-mail record in the staging table.

The possible statuses for e-mail records are described in the following table.

Table 1. Statuses of e-mail records

Status	Description
New	<ul style="list-style-type: none"> If an e-mail message is received with a subject, an e-mail record for the e-mail message is created in the staging table. The status of the e-mail record is set to new. The e-mail record is separated into discrete components (such as to, from, cc, subject, and message). Any attachments are extracted and stored on the file system where the system server resides. Attachments are linked to new attached documents records The records are linked to the e-mail record in the staging table.
In process	<ul style="list-style-type: none"> During the processing of a new e-mail record, the status of the e-mail record is set to in process.
Workflow	<ul style="list-style-type: none"> When the workflow process is initiated, the status of the e-mail record is set to workflow. The workflow process either creates a new service request and communication log, or updates an existing service request.
Invalid	<ul style="list-style-type: none"> If an e-mail message is received without a subject, an e-mail record for the e-mail message is created in the staging table. The status of the e-mail record is set to invalid. The e-mail record remains in the staging table. The e-mail record is not processed further That is, the e-mail record does not enter the workflow process. An administrator can use the resubmit function to correct an e-mail record with an invalid status. When an e-mail is resubmitted, the status is changed to new. The e-mail record is processed as a new e-mail message.
Error	<ul style="list-style-type: none"> If an error is encountered during the staging of e-mail records, the status of the e-mail record is set to error. An error notification is sent to the administrator specified during the configuration of the e-mail listener. If an e-mail address for the administrator was not specified and if logging is enabled, an error is written to the <code>Maximo.log</code> file. If an e-mail record has an error status, that e-mail record is not processed until the error is resolved. An administrator can use the resubmit function to correct an e-mail record with an error status. When an e-mail is resubmitted, the status is changed to new. The e-mail record is processed as a new e-mail message.
Complete	<ul style="list-style-type: none"> Once the workflow process completes successfully, the status of the e-mail record in the staging table is set to complete.

E-mail attachments

The E-mail Listeners application stores attachments from incoming e-mail on the application server. You can view attachments in the E-mail Processing tab of the E-mail Listeners application.

The mail server can control the size of the attachment. You can contact your mail server administrator to discuss these controls, and to determine the file types allowed on the E-mail Listeners mail server.

You can configure the `mx.listener.process.cidimages` property to determine how images that are embedded in free-form e-mails are processed in the E-mail Listeners application. By default, the property is set to 1, and images are embedded as a hyperlink in the long description of the service request and also added as individual attachments to the service request. If the property is set to 0, images are added as an attachment to the service request but are not embedded in the long description. Supported image formats include JPEG, PNG, and GIF.

The E-mail Listeners application does not modify the display size of the image when it is embedded into the long description of the service request.

Example

In the following example, the `mx.listener.process.cidimages` property is set to 1.

Sally tries to print a file and receives an indecipherable error message. She sends a free-form e-mail that describes the problem to `help@support.com`, the company site for service desk e-mail requests. In the middle of her e-mail, Sally embeds a JPEG image of the error message. The E-mail Listener application retrieves the message from Sally and creates a service request with identifier 123.

Frank, a service desk agent, reviews service request #123. He can click the link that is embedded in the long description of the service request to view the error message. Frank searches the knowledge base and finds a solution. He opens the Communications Log containing the initial e-mail from Sally, creates a communication with the solution, and sends it to her.

All details of the interaction between Frank and Sally are stored in the Communications Log for service request #123.

Message thresholds

If the number of messages waiting to be processed exceeds the high message threshold that you set, the application server limits the addition of new messages in the processing queues.

Depending on your message requirements, you might want to type a higher message threshold value. To determine an optimal message threshold setting, you can monitor the messaging in/out queues and the impact of the message threshold setting on system performance. For example, you can lower the threshold value if a higher value is degrading system performance.

If you decide to change the high message threshold setting after the initial configuration, you must open the Additional Properties menu in the administrative console. You can then change the threshold value for each child configuration.

- **Bounced e-mail messages**

Bounced e-mail messages are outbound e-mail messages that cannot be delivered. Large volumes of bounced e-mail messages create excess network traffic and affect the processing of legitimate tickets.

- [Deletion of e-mails from the mail server](#)

You can manage your e-mail message by specifying a set of rules to mark e-mail messages on the mail server for deletion. You can delete e-mail records with statuses of complete, error, or invalid. When you delete e-mail records in the E-mail Listeners application, the e-mail records are completely removed and cannot be retrieved.

Bounced e-mail messages

Bounced e-mail messages are outbound e-mail messages that cannot be delivered. Large volumes of bounced e-mail messages create excess network traffic and affect the processing of legitimate tickets.

The mail server generates and returns bounced e-mail messages to the e-mail listener account that was specified in the Send From field. The e-mail listener treats these messages as service requests.

You can use the following approach to address bounced e-mail messages:

- To preserve the integrity of the primary e-mail listener account, you can create a dedicated e-mail account for bounced e-mail notifications.
- You can base any outbound e-mail notifications on communication templates in which the Send From field in the template specifies the dedicated bounced e-mail account. An e-mail message is then generated and sent to the address in the Send From field.

Deletion of e-mails from the mail server

You can manage your e-mail message by specifying a set of rules to mark e-mail messages on the mail server for deletion. You can delete e-mail records with statuses of complete, error, or invalid. When you delete e-mail records in the E-mail Listeners application, the e-mail records are completely removed and cannot be retrieved.

You can use the E-mail Deleted option to manage the deletion of e-mails, or delete e-mails manually:

- If you use the E-mail Deleted option, the age threshold value and age unit of measure value are used to mark e-mail messages for deletion at set intervals on the mail server. The default value of the age threshold is seven. The default value of the age unit of measure is days.
- If you do not use the E-mail Deleted option, read e-mail messages remain on the mail server, regardless of how long messages have been there. In this case, your mail administrator must manage the deletion of e-mail messages from the mail server.

Example

If the age threshold is set to seven and the age unit of measure is days, any read e-mail message that have been on the mail server for seven days are deleted. If you set the age threshold value to zero, any read e-mail marked is deleted from the mail server immediately.

E-mail formats for e-mail listeners

The E-mail Listeners application can process free form e-mail messages or formatted e-mails. You can configure a system property to determine how some alternative e-mail formats are processed.

Typically, an e-mail contains only plain text, only HTML text, or both HTML and plain text. An e-mail that contains both HTML and plain text is a multipart alternative e-mail. You can configure the `mxe.listener.multipart.alternative.html` property to determine how multipart alternative e-mails are processed. When the property is set to 1, the HTML version of the e-mail message body is used. When the property is set to 0, the plain text version of the e-mail message body is used.

Free form e-mails

Free form e-mails do not follow any specific structure. The E-mail Listeners application first extracts the subject line and body of free form e-mails. Then, it uses the subject line or body to either create a service request or to update an existing ticket.

Free form e-mails are always processed as service requests. If you plan to support other types of tickets, use formatted messages only.

Formatted e-mails

Formatted e-mails use specific structure in the message body to instruct the E-mail Listeners application to manipulate various types of tickets and business objects. Formatted e-mails can be composed using XML tags or text typed in the form of attribute-value pairs. They can perform specific actions, such as changing the status of a business object or querying the business object based on criteria. QUERY, CREATE or UPDATE, and CHANGE STATUS e-mails are all types of formatted e-mails.

However, if the `mxe.listener.multipart.alternative.html` property is set to 1, only the non-XML `Key=Value` format type can be used in the message body. If the `mxe.listener.multipart.alternative.html` property is set to 0, both XML and non-XML format types can be used.

To support other business objects, you can create your own workflow process and associated processing logic. A built-in workflow process that supports various types of ticket objects is shipped.

- [Formatted e-mail keywords](#)

Formatted e-mails must be carefully composed to ensure that the e-mail listener successfully processes e-mails and that the system performs the necessary actions. You can use specific keywords in the body of the e-mail message to compose a correctly formatted e-mail.

- [Rules for formatted e-mail messages with attribute-value pairs](#)
You can use attribute-value pairs to compose formatted e-mail messages.
- [Examples of formatted e-mail messages using change status function](#)
You can compose formatted e-mail messages that use the change status function. You compose these messages using attribute-value pairs or XML tags.
- [Examples of formatted e-mail messages using create and update functions](#)
You can compose formatted e-mail messages that use the create and update functions. You compose these messages using XML tags or attribute-value pairs.
- [Examples of formatted e-mail messages using query function](#)
You can compose formatted e-mail messages that use the query function. You compose these messages using attribute-value pairs or XML tags.

Formatted e-mail keywords

Formatted e-mails must be carefully composed to ensure that the e-mail listener successfully processes e-mails and that the system performs the necessary actions. You can use specific keywords in the body of the e-mail message to compose a correctly formatted e-mail.

There are two sets of keywords that you can use, depending on whether you want to implement attribute-value pair formatting or XML formatting. The following table specifies the keywords that apply when using attribute-value pairs or XML.

Table 1. Keywords for formatted e-mails

Keyword	Format type	Required	Purpose
#MAXIMO_EMAIL_BEGIN	Attribute-value pairs	Yes	The keyword marks the beginning of formatted e-mail content in an e-mail message.
#MAXIMO_EMAIL_END	Attribute-value pairs	Yes	The keyword marks the end of formatted e-mail content in an e-mail.
LSNRAPPLIESTO	Both	Yes	A value must be provided. The value represents a business object upon which an operation is performed.
LSNRACTION	Both	Yes	A value must be provided. The value can be CREATE, UPDATE, CHANGESTATUS or QUERY. The value specifies the operation to be performed on the business object.
LSNRWHERECONDITION	Both	No	The keyword is used only in e-mails that query a business object. The value represents a valid SQL where condition that is to be applied on the business object.
LSNRRESULTCOLUMNS	Both	No	The keyword is used only in e-mails that query a business object. The value represents one or more columns from the business object. The values are returned in the response e-mail to the query.
&AUTOKEY&	Both	No	The keyword is used as a value for an attribute or an XML tag for e-mail messages that are intended to create business objects. If this keyword is used, the particular attribute is autokeyed using standard system.
&SYSDATE&	Both	No	The keyword is used as a value for an attribute or an XML tag for e-mail messages that are intended to create business objects. If this keyword is used, the value for the particular attribute is a standardized date format as derived from the underlying system database.
<MAXIMOEMAILCONTENT> </MAXIMOEMAILCONTENT>	XML	Yes	This tag is used only in XML formatted e-mails to specify the contents of the e-mail message. This tag serves as the root of the XML document being composed in the e-mail message.

Rules for formatted e-mail messages with attribute-value pairs

You can use attribute-value pairs to compose formatted e-mail messages.

The following rules apply when you use attribute-value pairs to compose a formatted e-mail message:

- Formatted e-mail messages must contain the `#MAXIMO_EMAIL_BEGIN` keyword and `#MAXIMO_EMAIL_END` keyword. If these keywords are not included in the e-mail message, the e-mail message is not processed and an error response e-mail message is sent to the originator of the e-mail message.
- All of the attribute-value pairs specified in the e-mail message must occur together. The e-mail listener ignores any other text typed in the e-mail message. Demarcate the attribute-value pairs in the e-mail message with the `#MAXIMO_EMAIL_BEGIN` keyword and the `#MAXIMO_EMAIL_END` keyword. You must place these keywords on a separate line and end with a new line.
- An e-mail message must contain both the `#MAXIMO_EMAIL_BEGIN` and `#MAXIMO_EMAIL_END` keywords for the e-mail to be treated as a formatted e-mail. If one or both of the `#MAXIMO_EMAIL_BEGIN` and `#MAXIMO_EMAIL_END` keywords are excluded, the e-mail message is treated as free-form text.
- The syntax for the attribute-value pairs is: `Field Title#Attribute Name=Value`.
- You must place the semi colon character on a new line by itself. This character serves as the separator between one field-value pair and the next field-value pair.
- The field title represents the title for the field as displayed in applications. The attribute name represents the attribute name as specified in the MAXATTRIBUTE table. Typically, this name is the same as the database column name.
- An incoming e-mail message can contain both the field title and the attribute name separated by `#`, only the field title, or only the attribute name. If only the field title is provided, the e-mail listener attempts to map the field title to the appropriate attribute name before processing the e-mail message. If the e-mail listener cannot map the title or resolve the attribute name, the e-mail message is not processed and an error response e-mail message is sent to the originator of the e-mail message.
- You can place inline attachments before or after the `#MAXIMO_EMAIL_BEGIN` keyword and `#MAXIMO_EMAIL_END` keyword.

Examples of formatted e-mail messages using change status function

You can compose formatted e-mail messages that use the change status function. You compose these messages using attribute-value pairs or XML tags.

Examples

The following table contains examples of formatted e-mail messages that use the change status function. These examples were composed with attribute-value pair and XML tags. You can use these examples as reference or as a template to create formatted e-mail messages in the E-mail Listeners application.

Table 1. Examples of formatted e-mail messages that use the change status function

Description	Example
Attribute-value pair change status function	
Change the status of an existing service request	<pre>#MAXIMO_EMAIL_BEGIN LSNRACTION=CHANGESTATUS ; LSNRAPPLIESTO=SR ; CLASS=SR ; TICKETID=SRNUM ; STATUS=INPROG ; #MAXIMO_EMAIL_END</pre>
XML change status function	
Change the status of an existing service request	<pre><MAXIMOEMAILCONTENT> <LSNRACTION>CHANGESTATUS</LSNRACTION> <LSNRAPPLIESTO>SR</LSNRAPPLIESTO> <STATUS>QUEUED</STATUS> <TICKETID><SRNUM></TICKETID> <CLASS>SR</CLASS> <SITEID>BEDFORD</SITEID> </MAXIMOEMAILCONTENT></pre>

Examples of formatted e-mail messages using create and update functions

You can compose formatted e-mail messages that use the create and update functions. You compose these messages using XML tags or attribute-value pairs.

Examples

The following table contains examples of formatted e-mail messages that use the create and update functions. These examples were composed with attribute-value pair and XML tags. You can use these examples as reference or as a template to create formatted e-mail messages in the E-mail Listeners application.

Table 1. Examples of formatted e-mail messages that use attribute-value pair create or update functions

Attribute-value pair create or update function	Example
Create a service request	<pre>#MAXIMO_EMAIL_BEGIN LSNRACTION=CREATE ; LSNRAPPLIESTO=SR ; TICKETID=&AUTOKEY& ; CLASS=SR ; DESCRIPTION= My SR Attribute - value pairs creation TEST ; #MAXIMO_EMAIL_END</pre>
Update specific attributes of an existing service request	<pre>#MAXIMO_EMAIL_BEGIN LSNRACTION=UPDATE ; LSNRAPPLIESTO=SR ; TICKETID=SRNUM ; CLASS=SR ; DESCRIPTION=Update reported by, priority and classification test. ; REPORTEDPRIORITY=2 ; CLASSTRUCTUREID=1087 ; #MAXIMO_EMAIL_END</pre>

Table 2. Examples of formatted e-mail messages that use XML create or update functions

XML create or update function	Example
Create a service request	<pre><MAXIMOEMAILCONTENT> <LSNRACTION>CREATE</LSNRACTION> <LSNRAPPLIESTO>SR</LSNRAPPLIESTO> <TICKETID><![CDATA[&AUTOKEY&]]></TICKETID> <CLASS>SR</CLASS> <DESCRIPTION>My XML SR creation e-mail test</DESCRIPTION> </MAXIMOEMAILCONTENT></pre>

XML create or update function	Example
Update an existing service request	<pre> <MAXIMOEMAILCONTENT> <LSNRACTION>UPDATE</LSNRACTION> <LSNRAPPLIESTO>SR</LSNRAPPLIESTO> <TICKETID>SRNUM</TICKETID> <CLASS>SR</CLASS> <COMMODITYGROUP>IT</COMMODITYGROUP> <COMMODITY>PC</COMMODITY> <DESCRIPTION>My XML update of service group, service, and site field</DESCRIPTION> <SITEID>BEDFORD</SITEID> </MAXIMOEMAILCONTENT> </pre>

Examples of formatted e-mail messages using query function

You can compose formatted e-mail messages that use the query function. You compose these messages using attribute-value pairs or XML tags.

Examples

The following table contains examples of formatted e-mail messages that use the query function. These examples were composed with attribute-value pair and XML. You can use these examples as reference or as a template to create formatted e-mail messages in the E-mail Listeners application.

Table 1. Examples of formatted e-mail messages that use the query function

Description	Example
Attribute-value pair query function	
Query a single record with criteria (LSNRWHERECONDITION keyword)	<pre> #MAXIMO_EMAIL_BEGIN LSNRACTION=QUERY ; LSNRAPPLIESTO=SR ; LSNRRESULTCOLUMNS=TICKETID,DESCRIPTION, REPORTEDBY,COMMODITYGROUP ; LSNRWHERECONDITION=TICKETID='1001' AND SITIED ='BEDFORD' ; #MAXIMO_EMAIL_END </pre>
Query a single record without criteria (LSNRWHERECONDITION keyword)	<pre> #MAXIMO_EMAIL_BEGIN LSNRACTION=QUERY ; LSNRAPPLIESTO=SR ; TICKETID=1002 ; LSNRRESULTCOLUMNS=TICKETID,DESCRIPTION, REPORTEDBY,COMMODITYGROUP ; #MAXIMO_EMAIL_END </pre>
Query multiple records and return selected columns	<pre> #MAXIMO_EMAIL_BEGIN LSNRACTION=QUERY ; LSNRAPPLIESTO=SR ; LSNRRESULTCOLUMNS=TICKETID,DESCRIPTION, REPORTEDBY,INTERNALPRIORITY, REPORTDATE ; LSNRWHERECONDITION=STATUS ='CLOSED' ; #MAXIMO_EMAIL_END </pre>
Query multiple records and return all columns	<pre> #MAXIMO_EMAIL_BEGIN LSNRACTION=QUERY ; LSNRAPPLIESTO=INCIDENT ; LSNRRESULTCOLUMNS=* ; LSNRWHERECONDITION=REPORTEDBY='LIBERI' ; #MAXIMO_EMAIL_END </pre>
XML query function	
Query a single record with criteria (LSNRWHERECONDITION tag)	<pre> <MAXIMOEMAILCONTENT> <LSNRACTION>QUERY</LSNRACTION> <LSNRAPPLIESTO>PROBLEM</LSNRAPPLIESTO> <LSNRRESULTCOLUMNS>ticketid,description, reportedby,affectedperson,commoditygroup </LSNRRESULTCOLUMNS> <LSNRWHERECONDITION>ticketid in ('1001') <LSNRWHERECONDITION> </MAXIMOEMAILCONTENT> </pre>

Description	Example
Query without criteria	<pre><MAXIMOEMAILCONTENT> <LSNRACTION>QUERY</LSNRACTION> <LSNRAPPLIESTO>PROBLEM</LSNRAPPLIESTO> <TICKETID>1003</TICKETID> <LSNRRESULTCOLUMNS>ticketid,description, reportedby,affectedperson,commoditygroup </LSNRRESULTCOLUMNS> </MAXIMOEMAILCONTENT></pre>
Query multiple records and return selected columns	<pre><MAXIMOEMAILCONTENT> <LSNRACTION>QUERY</LSNRACTION> <LSNRAPPLIESTO>PROBLEM</LSNRAPPLIESTO> <LSNRRESULTCOLUMNS>ticketid,description, reportedby,affectedperson,commoditygroup </LSNRRESULTCOLUMNS> <LSNRWHERECONDITION>AFFECTEDPERSON = 'RAMSDALE' AND STATUS = 'QUEUED' </LSNRWHERECONDITION> </MAXIMOEMAILCONTENT></pre>
Query multiple records and return all columns	<pre><MAXIMOEMAILCONTENT> <LSNRACTION>QUERY</LSNRACTION> <LSNRAPPLIESTO>INCIDENT</LSNRAPPLIESTO> <LSNRRESULTCOLUMNS>*</LSNRRESULTCOLUMNS> <LSNRWHERECONDITION>AFFECTEDPERSON = 'SMITH' AND STATUS = 'QUEUED' </LSNRWHERECONDITION> </MAXIMOEMAILCONTENT></pre>

Working with E-mail Listeners

You use e-mail listeners to receive and process incoming e-mail messages. The E-mail Listeners application can monitor multiple e-mail accounts to retrieve messages. It also supports embedded and normal message attachments.

- [Purging e-mail records from the staging table](#)**
 As your business needs change, you can purge staging records. If errors are found during the staging process, you can deactivate the listener, purge the staging records, and reactivate the listener to remove the error.
- [Customizing the e-mail listener preprocessor](#)**
 You can customize the e-mail listener preprocessor to suit your business needs. The preprocessor determines whether incoming e-mail messages are new requests for help or are updates to existing service requests.
- [Changing the object key delimiter](#)**
 The object key delimiter value identifies an incoming e-mail as an existing ticket. You can select other characters to represent the object key delimiter other than the default (##).
- [Working with e-mail listeners definitions](#)**
 The E-mail Listeners application uses definitions to poll the mail server for incoming messages and to send e-mail messages in response. The response e-mail messages confirm that a desired operation was performed on behalf of the user.
- [Activating workflow processes for e-mail listeners](#)**
 You configure Java™ Messaging Service (JMS) queues to manage high volumes of e-mail messages that must be processed quickly. Activating the e-mail listener workflow process to use an e-mail listener as a JMS queue is part of configuring JMS queues for e-mail listeners.
- [Creating communications for e-mail messages](#)**
 You can create communications that pertain to e-mail records. The communication that you create is sent as an e-mail notification to the recipients that you choose.

Purging e-mail records from the staging table

As your business needs change, you can purge staging records. If errors are found during the staging process, you can deactivate the listener, purge the staging records, and reactivate the listener to remove the error.

Before you begin

Before you can purge e-mail records from the staging table, you must deactivate the associated e-mail listener definition.

Procedure

- In the E-mail Listeners definition, select the e-mail listener for which you want to purge e-mail records.
- Click the E-mail Processing tab to view the e-mail records, and select the Activate/Deactivate Listener action.
- Save your changes to deactivate the e-mail listener.
- Select the Purge Staging Records action.
- Click Yes to confirm the deletion of the e-mail records.
- Select the Activate/Deactivate Listener action to reactivate the e-mail listener.
- Save your changes.

Example

If you change your mail server implementation or the e-mail address of an e-mail account, you can purge the staging records associated with each account. Alternatively, after initial testing of the application and configurations, you can purge the staging table of any e-mail records before you enable e-mail listener functionality in a production environment.

Customizing the e-mail listener preprocessor

You can customize the e-mail listener preprocessor to suit your business needs. The preprocessor determines whether incoming e-mail messages are new requests for help or are updates to existing service requests.

About this task

Java™ requires that you declare the custom implementation at the beginning of the file. For example: `public class MyPreprocessor implements LSNRPreprocessor.`

Procedure

1. Place the Java class source file in the appropriate Java package where you manage custom Java code.
2. Build your custom Java code into corresponding class files.
3. Build the Enterprise Archive (EAR).
4. Deploy the EAR into the application server to have your code changes take effect.

Changing the object key delimiter

The object key delimiter value identifies an incoming e-mail as an existing ticket. You can select other characters to represent the object key delimiter other than the default (##).

About this task

The ID of the record is called the object key identifier. The object key identifier can be a sequence that the system generates. For example, 1001, 1002, and so on.

Procedure

1. Replace the value with other characters.
There are no restrictions. However the delimiter must be unique. Choose infrequently used characters or symbols for delimiters.
2. Place the delimiter before and after the ticket ID (example: SR 1009 is represented as ##1009##).

Example

If + is the delimiter, a user could send an e-mail with the subject line: `+1003+ Having problems with printer + network.`

The base preprocessor cannot identify the substring because the delimiter symbol occurs multiple times within the subject line. In these circumstances, you must develop your own preprocessor that contains logic to recognize the new delimiter used with e-mails in your business environment.

Working with e-mail listeners definitions

The E-mail Listeners application uses definitions to poll the mail server for incoming messages and to send e-mail messages in response. The response e-mail messages confirm that a desired operation was performed on behalf of the user.

- [Creating e-mail listener definitions](#)
When you create an e-mail listener definition, the mail server polls the account that you specify in the e-mail listener definition for incoming e-mail messages. These e-mail messages are processed according to their content.
- [Deleting e-mail listener definitions](#)
You can delete e-mail listener definitions to help simplify e-mail management.

Creating e-mail listener definitions

When you create an e-mail listener definition, the mail server polls the account that you specify in the e-mail listener definition for incoming e-mail messages. These e-mail messages are processed according to their content.

Procedure

1. In the E-mail Listener application, click New Listener Definition.

2. Specify a value for the e-mail address.
3. Optional: Provide a description of the e-mail address.
4. Specify values for the e-mail password, the mail server, the e-mail folder on the mail server that will contain the e-mail messages, and the mail protocol used with the mail server.
The port value is provided based on the protocol value. You can change the port value, if necessary.
5. Specify a value for the workflow process to use for the definition.
6. Specify a value for the schedule to set how often you want the server to be polled for incoming e-mail messages. The default frequency is every five minutes. The default values for preprocessor, object key delimiter, cron task name, and cron task instance are provided.
7. Optional: Complete the following steps:
 - To have e-mail messages deleted from the server after they are processed, select the E-mail Deleted option.
 - Specify a value for the Age Threshold field for the length of time that an e-mail message remains on the mail server before being deleted.
 - Specify a value for the age unit of measure.
 - If you configured a Java™ Messaging Service (JMS) queue to facilitate processing of e-mail messages, select the Queue Based Processing check box.
 - If necessary for your configuration, specify a value for the queue connection factory. Specify a value that represents the Java Name and Directory Interface (JNDI) name of the Java component that provides a connection to a queue.
 - If necessary for your configuration, specify a value for the processing queue. Specify a value that represents the name of the queue that is to be used to process e-mail messages for this account.
8. Save the e-mail listener definition.

What to do next

You must activate the e-mail listener definition for incoming e-mail messages to be polled on the mail server. To activate the e-mail listener definition, use the Activate/Deactivate Listener action.

Deleting e-mail listener definitions

You can delete e-mail listener definitions to help simplify e-mail management.

Before you begin

Before you delete an e-mail listener definition, purge the e-mail records from the staging table for that account.

About this task

You can delete e-mail listener definitions with a status of incomplete, invalid, or error. When you delete an e-mail listener definition, the cron task instance associated with that definition is also deleted.

Procedure

1. In the E-mail Listeners application, select the e-mail listener definition that you want to delete.
2. Select the Activate/Deactivate Listener action.
3. Save the configuration.
The e-mail listener definition is deactivated.
4. Select the Delete Listener action.
5. Save the configuration.
The e-mail listener definition and the associated cron task instance are deleted.

Activating workflow processes for e-mail listeners

You configure Java™ Messaging Service (JMS) queues to manage high volumes of e-mail messages that must be processed quickly. Activating the e-mail listener workflow process to use an e-mail listener as a JMS queue is part of configuring JMS queues for e-mail listeners.

Procedure

1. In the Workflow Designer application, select the LSNRBP workflow process.
2. Select the Enable Process action to validate and enable the workflow process.
3. Select the Activate Process action.
4. Select the IBEP workflow process.
5. Select the Enable Process action to validate and enable the workflow process.
6. Select the Activate Process action.

What to do next

After you activate the workflow process for the e-mail listener, you can configure the e-mail listener to use as a JMS queue.

- [Configuring e-mail listeners to use Java Messaging Service queues](#)
To use an email listener as a Java Messaging Service (JMS) queue, you must configure the email listener. You configure JMS queues to manage high volumes

of email messages that must be processed quickly.

Configuring e-mail listeners to use Java Messaging Service queues

To use an email listener as a Java™ Messaging Service (JMS) queue, you must configure the email listener. You configure JMS queues to manage high volumes of email messages that must be processed quickly.

Procedure

1. In the E-mail Listeners application, create an email listener definition.
2. On the Listener tab, provide the necessary information, including email address, email password, mail server, protocol, email folder, preprocessor, object key delimiter, workflow process, and schedule.
3. In the E-mail Processing Frequency section, select the queue-based processing option.
4. Specify `jms/maximo/lsnr/lsnrqcf` as the value for the queue connection factory.
5. Specify `jms/maximo/lsnr/qin` as the value for the processing queue.
6. Select the Security Settings action.
7. In the Select Security Settings window, click New Row and specify the following information:
 - a. Specify SR as the value for the Maximo® business object.
 - b. Specify CREATSR as the value for the Maximo application.

Note: Secured images that are embedded in the email body gets added as an attachment in the service request created by email listener.
8. Click OK.
9. Select the Activate/Deactivate Listener action.

Creating communications for e-mail messages

You can create communications that pertain to e-mail records. The communication that you create is sent as an e-mail notification to the recipients that you choose.

Procedure

1. On the E-mail Processing tab in the E-mail Listeners application, select the e-mail record for which you want to create a communication.
2. Click Create Communication to open the Create Communication window.

Based on the e-mail record that you selected, the default values for the recipient, the subject, and the message are provided. You can change these values.
3. Add an attached file.
4. Send the communication to the recipient that you specified.

Database Information

The Database Information application provides information and access for database objects and attributes. You can make limited changes to data structures, such as associating a domain with an attribute, making an attribute required, or changing the search type.

You configure changes in the application in the nonproduction environment. Apply the changes or configure changes in Admin mode. The following table contains information about the differences between applying changes and configuring with Admin mode:

Table 1. Configuration options

Option	Description	Actions
Apply Changes	Full live configuration. Use only when few users are logged in and no transactions are expected.	Applies changes without logging users out of the system. Cache is deleted and re-created, so if transactions occur while the cache is being changed, the transactions can be lost.
Manage Admin Mode	Allows you to turn on Admin mode and specify a number of minutes after which users are logged out. In Admin mode, partial live configuration is turned on. No transactions can occur during Admin mode. To receive email reports, set the mail.smtp.host property. When configuration is complete, turn off Admin mode.	Logs users out of the system with exception of the administrator with permission to log in during Admin mode. Suspends cron tasks and disables event listeners. If an affected table cannot be changed with data in it, table data is backed up first.

After you configure your changes, you export the updated configuration to a .json file with the Application Export action. Then import that file to your production environment with the Application Import action in that environment.

When you import changed files from the nonproduction to the production environment, be aware of data dependencies. Import data in order of fewest dependencies first. For example, if you were to add a domain, associate the domain with an extra field, and then add the extra field to a presentation, you import the exported files in this order:

1. .json file for the domain change
2. .json file for the database information change
3. .xml file for the application presentation

Web Services Library

You can use the Web Services Library application to create and deploy web services for all service types, object structure, enterprise, and standard services. By deploying web services, external applications can make SOAP-based calls to retrieve or update business object data. The application generates the XML schema and Web Services Description Language (WSDL) files for all of your web services.

Launch in Context

You use the Launch in Context application to create and modify launch entry records which open an external application in the same or a different browser session. You can open applications independently or as part of an application integration scenario.

The launch entry record can utilize the following options in the Application Designer to open an external application:

- Select action menu items
- Hyperlinks
- Buttons

You use the Launch in Context application to create and update launch entries. A launch entry defines a URL that opens a console for an external application. The launch entry can pass data, referred to as context, from the application to the external console. You can configure a console URL for any application with a web-based console. Additionally, you can configure console URLs for consoles that use Java™ Web Start. You cannot use a launch entry to open applications that are not enabled for the web. You can configure a launch point from any application.

Automation Scripts

With the Automation Scripts application, you can create scripts to automate tasks that are based on the events or attributes of a business object, or based on actions or custom conditions. You can create a script in any of several supported scripting languages, and run the script without having to recompile Java™ files or restart the server.

Migration

You use the applications in the Migration module (within the System Configuration module) to migrate configuration content from one environment to another.

- **Object structures**
An object structure is the common data layer that the integration framework components use for outbound and inbound application message processing. An object structure consists of one or more related business objects that define the content of an XML or JSON message (schema).

Object structures

An object structure is the common data layer that the integration framework components use for outbound and inbound application message processing. An object structure consists of one or more related business objects that define the content of an XML or JSON message (schema).

An object structure provides the message content for channels and services and enables application-based import and export. In addition, an object structure, on its own, can be called as a service, supporting the Create, Update, Delete, Sync, and Query operations.

Note: Use the object structures that are provided with your Manage system whenever possible, instead of creating a new or duplicate object structure. If the outbound integration messages are in the JSON format, you can modify which data is shared from that object structure by creating a message template for the object structure.

- **Identification of object structure data**
If you are adding or modifying object structures, identification of the data to include requires some understanding of the applications and their associated objects. Review the data model of an application to determine which objects, database tables, and views contain the data to transfer to and from an external system.
- **Alternate keys**
Inbound message processing relies on the key field(s) of an object to find an existing record in the system to support updates and deletes. The default processing relies on the primary key to retrieve existing records. Sometimes a primary key is unknown to an external application and an alternate key (known by the external system) is defined to support the updating and deleting of records by the external system.
- **Object fields**
The integration framework and the external system exchange a subset of the data columns in the objects within the object structure. Subject to certain restrictions, you can control the content of the object fields within the message by including persistent and nonpersistent columns of individual objects.
- **Interface table and flat file considerations**
If you use an object structure for exchanging data with interface tables or flat files, you must ensure that the object structure does not contain duplicate column names.
- **Modification of a predefined object structure**
There are certain restrictions if you modify a predefined object structure.

- [Configuring an object structure](#)
You can create new object structures and during that process you can generate schema files, include or exclude fields, and resolve alias conflicts. You can also specify inbound setting restrictions, set advanced configuration properties, configure application authorization, and configure message templates for outbound integration messages.
- [Message templates that specify outbound data](#)
Message templates are an additional option for editing the structure of an outbound message. You use message templates to limit which data from the associated object structure is included in the message.

Task Management module

The Task Management module contains the Activities and Tasks application, which you use to plan, review, and manage activities and tasks. When you create an activity, you initiate the work process and create a historical record of work being performed.

See the help topics for the application for more information.

- [Activities and Tasks](#)
You use the Activities and Tasks application to plan, to review, and to manage activities and tasks. An activity initiates the work process and creates a historical record of the work being performed. Activities are created in the Incidents and Problems applications. A task is a specific unit of work on a work order.

Activities and Tasks

You use the Activities and Tasks application to plan, to review, and to manage activities and tasks. An activity initiates the work process and creates a historical record of the work being performed. Activities are created in the Incidents and Problems applications. A task is a specific unit of work on a work order.

An activity is a type of work order. A task can be created as part of an activity or part of another work order.

You can use the Activities and Tasks application to perform the following functions:

- Change the status of activities and tasks
- Take ownership of activities or tasks
- Assign ownership of activities and tasks to individuals or to workgroups
- Modify activities and tasks to reflect changes
- View related preventive maintenance and scheduling information
- Categorize the activities and tasks using classifications and attributes to simplify their management and retrieval
- Specify, view, and modify job tasks and the labor, material, services, and tool requirements for work plans
- View, add, and delete work orders and tickets that are related to an activity or to a task
- View follow-up records for an activity or a task
- View and create a work log and communication entries about a record
- [Activities and tasks overview](#)
An activity specifies the tasks, and the labor, materials, services, and tools needed to complete the task. Activities are created to document the required work, which can then be delegated to the individuals responsible for completing the work.
- [Working with activities](#)
Activities are created in the Incidents and Problems applications. Tasks are created as part of activities and other work orders. You can manage and modify activities and tasks in the Activities and Tasks application. For example, you can change the ownership or status of an activity or task.

Activities and tasks overview

An activity specifies the tasks, and the labor, materials, services, and tools needed to complete the task. Activities are created to document the required work, which can then be delegated to the individuals responsible for completing the work.

- [Record ownership](#)
The owner of a record is the person or person group that is in charge of the record from an administrative perspective.
- [Activity statuses](#)
The status of an activity indicates its position in the processing cycle. The status determines which actions can be performed on the activity. For example, if the activity is approved (APPR), then the tasks can start.
- [Measurement points](#)
When you inspect an asset or a location, you can record and view the meter readings that correspond to measurement points in the job plan of the associated work order. You can also insert measurement points on an activity until the activity or task is closed.
- [Service level agreements](#)
A service level agreement (SLA) typically is a written agreement that outlines the commitment between a service provider and its customers. A commitment is a service level that all parties have agreed to, such as asset reliability or availability.
- [Record relationships](#)
Relationships between records, such as tickets and work orders, help simplify record management. You can create record relationships manually, or relationships might be created automatically when you take certain actions.
- [Costs on tickets and work orders](#)
You can view the estimated and actual costs for a single work order or ticket, including costs for labor, material, tools, and services. You can also view total costs for the current record and all the records below it in its hierarchy.

- [Work plan removal](#)
Under certain circumstances, you can remove a work plan from an activity by using the Remove Work Plan action.
- [Deletion rules for activities](#)
For auditing purposes, you cannot always delete activities. If you cannot delete a specific activity, you can stop all action on an activity by changing the status to canceled.
- [Rules for modifying archived activities](#)
Closed and canceled activities are archived, and become historical records. You might be able to add additional information to a historical record by using the Edit History Activity action.

Record ownership

The owner of a record is the person or person group that is in charge of the record from an administrative perspective.

The owner of a record keeps the customer updated and acts as the point person for any issues involving the work. You can use the Select Owner action to assign record ownership to a person or person group, or you can use the Take Ownership action if you want to take administrative ownership of the record yourself. You can take ownership for more than one application.

Keep in mind the following points regarding record ownership:

- A record can have many different owners during its life cycle.
- You can select an owner or owner group until the record's status is CLOSED.
- To view the ownership history of a record, select View History.
- A workflow or an escalation process may assign ownership, if appropriate.

If the Persons tab on your Select Owner dialog box displays a Person Group field and a Date field, then you can filter the list of persons by the values in these fields. For example, suppose the Person Group field and the Date fields are empty when you open the dialog box. You specify a person group and a date and time, and click Refresh. The system displays only the persons in the specified group who are available on the specified day and time.

Activity statuses

The status of an activity indicates its position in the processing cycle. The status determines which actions can be performed on the activity. For example, if the activity is approved (APPR), then the tasks can start.

When you change the status of an activity, the status of any applicable child activity that uses the inherit status option also changes. If you change the status of global activities, the same status change is automatically applied to all globally related records. In addition, the status of an activity can be automatically changed. For example, after you assign an owner to an activity, the status of that activity automatically changes to queued.

A follow-up record can change the status of the originating activity, which results in automatic routing or notification of the status change.

WAPPR

The activity is waiting for approval. WAPPR is the default status for records created in the Work Order Tracking, Changes, Releases, and Activities and Tasks applications.

APPR

The activity is approved and the work can begin. Work plan items on an approved activity are reserved in inventory, and cost and rate data are recorded. Rates can be changed in the Inventory application, Labor application, or Tools application. If the rates are changed in any application, the work plan reflects the rates in effect when the activity was approved.

WSCH

The activity is waiting to be scheduled. WSCH is the default status for records created in the Preventive Maintenance application.

WMATL

Materials must arrive before the work can be performed.

WPCOND

The work can be performed only when the condition of the plant is suitable. For example, certain work might require the shutdown of the plant.

INPRG

The work is in progress. INPRG is the default status for records created in the Quick Reporting application.

COMP

The physical work is completed. If you want to move or change an asset on an activity, the move or change occurs when the status is changed to complete.

CLOSE

The activity is finalized. Inventory reservations for items not used in the activity are removed and the activity is made into a history record.

CAN

The work is canceled. You cannot cancel an activity if the work has already been initiated or if actuals have already been reported. You can use this status when you want to delete an activity and deleting is not allowed.

Measurement points

When you inspect an asset or a location, you can record and view the meter readings that correspond to measurement points in the job plan of the associated work order. You can also insert measurement points on an activity until the activity or task is closed.

The product copies the measurement point number to the job plan when there is a three-way match between the following items:

- The measurement point name on the job plan listed on the activity.
- The measurement point name on the asset or the location listed on the activity.
- A measurement point number for the measurement point name.

If you specify a measurement for a measurement point, the measurement and measurement date are added to the Measurements table. If you specify a measurement without a measurement point, the measurement data is saved with the activity.

You use the Observation field to record visual inspection data. You use the Inspector field to record the name of the person performing the inspection. You can edit these fields until the activity is closed. Once the activity is closed, you can add or modify operations by selecting the Edit History Activity action.

Service level agreements

A service level agreement (SLA) typically is a written agreement that outlines the commitment between a service provider and its customers. A commitment is a service level that all parties have agreed to, such as asset reliability or availability.

The SLA describes one or more commitments and the escalation actions or notifications associated with each commitment. Escalation actions or notifications might be associated with an SLA to ensure that commitments are met. An escalation process can monitor all activities and send notifications or perform other activities to ensure that commitments are met.

The types of records to which service level agreements can be applied include tickets, such as service requests, and work-based records, such as work orders. Before you can apply an SLA to a record, the record must have a site defined.

A service level agreement can be associated with a record in several ways:

- An SLA might automatically be applied to a record from within a workflow or escalation process, or from another SLA.
- You can select an action to apply an SLA, which applies the best match automatically.
- You can view SLAs and select an action to select or clear the SLAs that you want to manually apply to the record.

When you apply a service level agreement to a record, the following events occur:

- The SLA Applied check box on the main tab of the record is selected to document the action.
- Any escalations that are associated with the SLA are activated.
- The Target Start, Target Finish, and Contact values for the record might be calculated automatically as follows:

Automatically calculated values
When an SLA is applied that includes a response commitment, the response commitment date populates the Target Start date field of the record.
When an SLA is applied that includes a resolution commitment, the resolution commitment date populates the Target Finish date field of the record.
When an SLA is applied that includes a contact commitment, the contact commitment date populates the Target Contact date field of the record.

Record relationships

Relationships between records, such as tickets and work orders, help simplify record management. You can create record relationships manually, or relationships might be created automatically when you take certain actions.

The types of relationships that can exist between records include:

- Related relationship, which is an informal association of tickets that is used for informational purposes.
- Originator and Follow-up, which keep costs hierarchies separate while still creating a relationship between the tickets.
- Related to Global, which creates a relationship in which the tickets are related to a global issue, which affects many users.

Related records

Using any ticket or work-based application, you can view similar records and relate tickets and work orders to the current record. A related relationship between records is an informal relationship that is for informational purposes only.

A related relationship does not affect status inheritance, affect workflow, or follow a set of business rules. Related relationships can be many-to-many, and do not represent record hierarchies. By relating records informally, you can navigate to related records, view related information for similar records, and view open tickets that are associated with a field. You can create an informal record relationship in the following ways:

- Use the Related Records tab of the application. This tab provides an easy way to create relationships and to view and navigate among informally related records.
- Use the Show Similar Tickets action in any ticket application. The similar ticket search results only include the service requests, incidents, and problems that have the same classification as the current ticket. Global records and history records are not included in the results. Your system administrator might add more restrictions to the search results.

Originator and follow-up tickets and work orders

You can relate tickets and work orders to a record more directly when you create a follow-up record from the ticket using one of the Create actions on the ticket. The ticket you create the follow-up record from is the originator. A follow-up record can be a ticket or a work order. In some cases, a follow-up ticket or work order might be able to change the status of its originating ticket. An originating ticket cannot change the status of a follow-up work order, nor can a follow-up ticket change the status of the originator if there is more than one follow-up. These options are configured by the system administrator.

Globally related tickets

A global ticket is an incident or problem relating to an issue that affects many users. You can relate tickets, including service requests, to a global ticket, which creates a RELATEDTOGLOBAL relationship. This relationship lets you manage the tickets by using the global ticket. When you change the status of the global ticket, the system changes the status of all globally related tickets.

If your administrator has set up automated notifications of status changes, the system changes the status of the tickets related to the global issue. For example, all the initial requestors reporting the same issue are notified of its resolution. On the global ticket, you can also view a list of related records and view the work and communication logs for all related records.

- **Deletion of record relationships**

On the Related Records tab, you can delete the relationship between a change and any related work orders or tickets.

- **Global records**

A global record is a ticket that is a root cause of other issues or that affects many users, such as computer network failures or flooding in a building. After you mark a record as global, you can relate multiple tickets and then manage all tickets using the global record.

Costs on tickets and work orders

You can view the estimated and actual costs for a single work order or ticket, including costs for labor, material, tools, and services. You can also view total costs for the current record and all the records below it in its hierarchy.

When you view the costs of a ticket or work order, the data is displayed in two tables:

- The Totals table displays the costs for a single ticket or work order.
- The View Hierarchy Grand Totals table displays the costs for the current ticket or work order and all records under its hierarchy.

Each table presents the same information, which is shown in the following table.

Column	Explanation
Current Estimate	Displays read-only calculated values for the current totals from the Labor, Materials, Standard Services, and Tools tabs of the Plans tab for the ticket or work order.
Estimate at Approval	Is set to zero until the work order is approved, then the values are copied from the Current Estimate column and are read-only. If the work order status changes from approved to unapproved, then these fields are cleared. The estimated costs at approval are not affected by the change in status from in progress to completed or closed.
Actual	Displays the read-only values from the Labor (for approved labor only), Materials, and Tools tabs of the Actuals tab. If the status of the record changes from approved, then these fields are not cleared.

Rolling up maintenance costs

After you close a work order that is associated with an asset, you can calculate your maintenance costs by rolling up costs that you incur for labor, materials, tools, and services to the top-level asset in the hierarchy that the asset belongs to.

Costs can be rolled up manually or automatically. By default, cost rollups are manual. If you want costs to be calculated and rolled up automatically when a work order is closed, you must set the `mxe.workorder.rollupMaintenanceCosts` system property to 1. After you configure the system property for automatic rollups, all subsequent costs that are associated with work orders are rolled up automatically. However, any unprocessed maintenance costs that existed before the configuration are not automatically rolled up. You must roll up any preexisting, unprocessed maintenance costs manually.

To calculate the maintenance cost of your assets, use the Roll Up Maintenance Costs action in the Assets application.

If you upgrade to Maximo® Manage 8.5, run the Asset Cost Rollup Report to roll up pending maintenance costs before the upgrade.

Work plan removal

Under certain circumstances, you can remove a work plan from an activity by using the Remove Work Plan action.

When you remove a work plan, all information in the Resources tab, except for non-task children, is removed. Also, if the work plan has a job plan, the job plan identifier is removed.

If any task in the work plan cannot be removed based on the deletion rules for changes, you cannot use the Remove Work Plan action. You can still delete labor, material, services, and tools information, as well as any tasks that do meet the deletion rules.

Deletion rules for activities

For auditing purposes, you cannot always delete activities. If you cannot delete a specific activity, you can stop all action on an activity by changing the status to canceled.

The activity and its children must meet the following criteria to be deleted:

- Have a status of waiting for approval
- Not have any transactions registered against it, except for status changes

- Not have any actuals reported against it
- Not have any labor assignments associated with it
- Not have been generated for a purchase order or receipt
- It must not have any failures reported against it.
- Not be in a workflow or have ever been in a workflow
- Not have any measurements or meter readings taken against it
- Cannot be or have follow-up work

To delete an activity, use the Delete,⌘_Activity action.

Rules for modifying archived activities

Closed and canceled activities are archived, and become historical records. You might be able to add additional information to a historical record by using the Edit History Activity action.

When you modify an archived activity, the following rules apply:

- New costs that were incurred during the edit history must be added to the inventory cost, if it is defined as charge to store.
- You can add actual labor, but you cannot change approved transactions.
- You can add actual materials and actual tools, but you cannot change them.
- You can add or delete child records, whether or not the child records are tasks.
- You can attach documents.
- You cannot change planned labor, materials, and tools.
- You cannot change information in the following fields:
 - Asset.
 - Location.
 - GL Account.
 - Charge to Store.
 - Status.
 - Status Date

Working with activities

Activities are created in the Incidents and Problems applications. Tasks are created as part of activities and other work orders. You can manage and modify activities and tasks in the Activities and Tasks application. For example, you can change the ownership or status of an activity or task.

- **[Planning activities and tasks](#)**
After you associate a task with an activity, you can specify estimates for labor, craft, materials, services, and tools for each task on the activity or for the activity as a whole.
- **[Reporting actuals for activities and tasks](#)**
As work progresses on an approved activity or task, you can report the actual labor hours, materials, services, and tools used.
- **[Applying service level agreements to records](#)**
You can apply a service level agreement (SLA) to a record to define the agreement and formal commitments between a service provider and a customer. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.
- **[Swapping assets](#)**
You can swap assets associated with a work order. The swap action applies to the work order and all of the assets, locations, and configuration items on its child work orders. The term "work order" can refer to a work order, change, release, or activity record.
- **[Relating work orders or tickets to activities or to tasks](#)**
You can link work orders and tickets to an activity or task. When you link a record to a work order, its relationship type is RELATED.
- **[Classifying activity records](#)**
To simplify the process of finding and managing activity records, you can classify the records. Categorizing an activity involves classifying it and adding and modifying attributes to further group the classification.
- **[Setting up work process flows](#)**
Work process flows use relationships between work orders and tasks to automate the flow of status changes. You set relationships between work orders and tasks so that when a task is completed, the next task in the flow can be initiated.
- **[Changing the status of activities or tasks](#)**
You can change the status of an activity to indicate the position of the activity as it moves toward completion.

Planning activities and tasks

After you associate a task with an activity, you can specify estimates for labor, craft, materials, services, and tools for each task on the activity or for the activity as a whole.

- **[Creating work plans](#)**
A work plan describes the labor, materials, tools, services, and tasks you need to complete an activity or task. You can create a work plan manually.
- **[Planning work for activities and tasks](#)**
You use the Activities and Tasks application to insert, view, or edit planned labor information or planned craft information.
- **[Creating tasks for activities](#)**
You use the Activities and Task application to create additional tasks or to edit the existing tasks for an activity. After you create a task, you can plan its labor,

materials, services, and tools.

Creating work plans

A work plan describes the labor, materials, tools, services, and tasks you need to complete an activity or task. You can create a work plan manually.

Procedure

1. In the Activities and Tasks application, display the record for which you want to create a plan.
2. Make one of the following selections:

Option	Description
If the record is an activity	Click the Plans tab.
If the record is a task	Click the Resources tab, then click the Plans sub tab.

3. Specify work plan data, such as tasks, labor, materials, tools, and services using the sub tabs.
4. Save the record.

- [Creating work plans using job plans](#)

A work plan describes the labor, materials, tools, services, and tasks you need to complete an activity. You can select a job plan, and modify it to your needs.

Creating work plans using job plans

A work plan describes the labor, materials, tools, services, and tasks you need to complete an activity. You can select a job plan, and modify it to your needs.

Procedure

1. In the Activities and Tasks application, display the record for which you want to create a work plan from a job plan.
2. Make one of the following selections:

Option	Description
If the record is an activity	Click the Plans tab.
If the record is a task	Click the Resources tab, then click the Plans sub tab.

3. In the Job Plan field, click Detail Menu and select an option to retrieve a value. When you associate a job plan with a work order, the product copies the labor, the materials, the services, and the tools to the work order plan. If the job plan has a default safety plan for the selected work asset, the product also copies the safety plan to the work order.
4. Optional: Edit the fields to modify any of the information. Changes you make to the work plan do not affect the original job plan.
5. Save the record.

Planning work for activities and tasks

You use the Activities and Tasks application to insert, view, or edit planned labor information or planned craft information.

Procedure

1. Display the activity or task for which you want to plan labor.
2. Make one of the following selections:

Option	Description
If the record is an activity	Click the Plans tab.
If the record is a task	Click the Resources tab, then click the Plans sub tab.

3. Enter the details of the planned work on the following subtabs:

Option	Description
Labor	Add hours for labor or select crafts.
Materials	Add materials, search catalogs, or add spare parts.
Services	Add services.
Tools	Add tools.

4. Save the record.

Creating tasks for activities

You use the Activities and Task application to create additional tasks or to edit the existing tasks for an activity. After you create a task, you can plan its labor, materials, services, and tools.

Procedure

1. Display the activity for which you want to create planned tasks.
2. In the Tasks table window on the Plans tab, click New Row.
3. Specify a unique value in the Task field.
4. To have the tasks performed in a specific order, enter the appropriate value in the Sequence field.
5. Type the amount of time needed to complete the task in the Estimated Duration field.
6. Use the Labor, Materials, Services, and Tools subtabs to plan for the task.
7. Save the activity.

Reporting actuals for activities and tasks

As work progresses on an approved activity or task, you can report the actual labor hours, materials, services, and tools used.

Procedure

1. Display the activity or task for which you want to report actuals.
2. Make one of the following selections:

Option	Description
If the record is an activity	Click the Plans tab.
If the record is a task	Click the Resources tab, then click the Plans sub tab.

3. Enter the details for the actuals on the following subtabs:

Option	Description
Labor	Report hours for labor, copy labor from the work plan, or select planned labor.
Materials	Select materials, select reserved items, and select spare parts.
Services	Select services or standard services.
Tools	Select tools, copy tool data from the work plan, or select tools that were issued.

4. Save the record.

Applying service level agreements to records

You can apply a service level agreement (SLA) to a record to define the agreement and formal commitments between a service provider and a customer. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.

About this task

When you apply an service level agreement to work orders, the SLA is applied only to the work order, not to its tasks. If you want to apply a service level agreement to a task, you must display the task as the current record and then apply the SLA.

You can apply service level agreements to tickets and work orders.

Procedure

1. Open an application and display the record that you want to update.
2. Select the Apply SLA action.
3. Click OK.

Results

The SLA Applied check box on the main tab of the selected application is selected. The target start, target finish, and contact values are calculated for the selected record.

Removing service level agreements from records

To maintain accurate records, it might be necessary to remove an invalid or erroneous service level agreement to disassociate it from the record.

Procedure

1. Display the record for which you want to remove a service level agreement.
2. Select the Select/Deselect SLA action.
3. Click Mark Row for Delete for each service level agreement that you want to remove from the record.
4. Click OK.

5. Save the record.

Swapping assets

You can swap assets associated with a work order. The swap action applies to the work order and all of the assets, locations, and configuration items on its child work orders. The term "work order" can refer to a work order, change, release, or activity record.

Before you begin

You can execute the swap immediately, or you can save the swap as a plan. If you save the swap as a plan, the changes will apply when the status for the work order is COMP (Complete). When the status of a work order is COMP, you swap assets only using the Execute Now option. When you select Execute Now on any tab, the system executes the changes on all tabs.

When you duplicate a work order that has a planned swap to its assets or locations, the planned action does not get copied to the duplicate work order. Also, when you create a release, or change, or work order from a record using the Select Action menu option, the planned action is not copied to the follow-up record.

Procedure

1. Select the Move/Swap/Modify action.
2. Click the Move/Swap tab.
3. Select the Is this an Asset Swap checkbox.
4. In the Swap Assets section, select the row for the asset you want to swap.
5. To move the asset to a parent or location, type a value in the appropriate field, or click Select Value to retrieve a value.
6. In the Replacement Asset field, specify an asset, or click Select Value to retrieve a value.
7. Perform one of the following actions:
 - To swap the assets immediately, click Execute Now.
 - To swap the assets when the status for the work order is COMP (Complete), click Save as Plan.

Relating work orders or tickets to activities or to tasks

You can link work orders and tickets to an activity or task. When you link a record to a work order, its relationship type is RELATED.

Procedure

1. In the Activities and Tasks application, display the record to which you want to add related records.
2. On the Related Records tab, perform either of the following actions:
 - To relate a work order to the current record, in the Related Work Orders table window, click Add Row.
 - To relate a ticket to the current record, in the Related Tickets table window, click Add Row.
3. Type or select a work order in the Work Order field, or specify a ticket in the Related Record Key field.
4. Optional: You can enter a class.
5. Save the activity.

- [Assigning a parent to a work order](#)

You can assign a parent to a work order and assign tasks to that parent. When you assign work order records to a parent, they become child work orders records of the parent record.

- [Removing relationships between records](#)

You can remove the relationship between an activity or a task and its related work orders or tickets.

Assigning a parent to a work order

You can assign a parent to a work order and assign tasks to that parent. When you assign work order records to a parent, they become child work orders records of the parent record.

About this task

You cannot assign parent records to closed work order records. If the parent has a value in the Priority field, and the child or children work order records do not, the child or children work order records inherit the parent priority value.

Procedure

1. Open an application and display the work order record that you want to update.
2. On the List tab, select the task that you want to update.
3. Select the Assign To New Parent action.
4. Select the work order record that you want as the new parent.

The asset management system displays the parent work order number in the Parent WO field.
5. Click Save record.

Removing relationships between records

You can remove the relationship between an activity or a task and its related work orders or tickets.

Before you begin

You can remove the relationship between records only if the ticket or the work order has a type of RELATED.

About this task

To delete relationships with work orders of other relationship types, such as FOLLOWUP or ORIGINATOR, delete the work order in any of the following applications:

- Work Order Tracking
- Activities and Tasks
- Changes
- Releases

To delete relationships with tickets of other relationship types, you must go to the tickets applications.

Procedure

1. In the Activities and Tasks application, display the record with the related relationship that you want to delete.
2. On the Related Records tab, select the record in the Related Work Orders table window.
3. Click the Mark Row for Delete icon. You can mark more than one row.
4. Click Save Activity.

Classifying activity records

To simplify the process of finding and managing activity records, you can classify the records. Categorizing an activity involves classifying it and adding and modifying attributes to further group the classification.

About this task

For example, you might classify an activity as a notebook. The notebook classification might have the attributes of memory, speed, and disk space associated with it, which are copied to the record upon classification. As needed, you can add attributes such as operating system and power, change the attribute values, and remove attributes associated with the record.

Procedure

1. In the Activities and Tasks application, display the activity record that you want to categorize.
2. Select a classification for the activity in one of the following ways:

Choice	Description
Use the Classification field	In the Classification field of the main application tab or on the Activities and Tasks tab, click Detail Menu and then select Classify to produce a classification hierarchy tree that you can drill down through and select a classification.
Use the Class Description field	In the Class Description field of the main application tab or on the Activities and Tasks tab, you can hasten the classification search as follows: <ol style="list-style-type: none">a. Click the Select Value icon next to the Class Description field and enter a keyword or a word string, such as <code>Operating System</code> into the Description field of the window. All classification values that contain the keyword or word string are retrieved.b. Click a value from the resulting list to select the classification.

3. Optional: You can view the attributes that are associated with the selected classification in the Attributes table window. You can also add, delete, and change the values of the attributes in the row details.
4. Save the activity.
The full classification path appears in the Classification field, where you can view all nodes of the classification.

Setting up work process flows

Work process flows use relationships between work orders and tasks to automate the flow of status changes. You set relationships between work orders and tasks so that when a task is completed, the next task in the flow can be initiated.

Before you begin

To set the process flow for individual tasks, you must select Under Flow Control at the header level for the work order.

About this task

The best practice for consistently using the flow feature is to set up the process flow as a work template at the job plan level.

Procedure

1. Open the work order.
2. Select Under Flow Control.
3. On the Plans tab, display the details for the task.
4. In the Scheduling Information section, next to the Predecessors field, click the Detail Menu icon.
5. Select the tasks that must be completed before this task is initiated.
6. Save the work order.

- **Defining flow actions**

A flow action is used in a work process flow to define certain actions that should occur while work is being done. Actions or action groups can be applied to any work order, task, or job plan task.

- **Removing work process flow from work orders or job plans**

You can remove work process flow for a work order, a job plan, or task records that have it defined. You can do this at the header level, which will remove it for all the associated tasks as well, or you can remove it at the task level.

- **Suspending work process flows**

You can suspend the work process flow for work order or task records that have it defined. For example, if you want to start a work order or task manually, you could suspend the flow control on that record. The flow remains suspended until you remove the suspension.

- **Stopping workflow processes**

You can stop a workflow process for a record. You use the Workflow Administration application to view and stop workflow processes.

Defining flow actions

A flow action is used in a work process flow to define certain actions that should occur while work is being done. Actions or action groups can be applied to any work order, task, or job plan task.

About this task

You can determine whether the action takes place automatically, or if the action only takes place when it is initiated manually. When automatic, the action takes place as soon as the work order or task status is changed to an in progress (INPRG) status value by work process flow. When manual, you must initiate the flow action by running the automation or processing scripts or placing an action button on the target application. Actions and action groups are defined in the Actions application.

Procedure

1. In an application that supports flow action, display the record for which you want to define a flow action.
2. Perform one of the following actions:
 - For a work order, change, release, or job plan record, enter a value in the Flow Action field on the application tab.
 - For a work order or job plan task, enter a value in the Flow Action field in the Task table window. The Tasks table window is found on the main tab of the Job Plans application, or the Plans tab of the Work Order Tracking, Changes, and Releases applications.

The defined action runs when the work order or task status value is changed to INPRG.

3. Specify whether you want the flow action to be automatically run:

Option	Flow Action Assist
Automatically run the flow action	Cleared
Manually run the flow action	Selected

4. Click Save record.

Removing work process flow from work orders or job plans

You can remove work process flow for a work order, a job plan, or task records that have it defined. You can do this at the header level, which will remove it for all the associated tasks as well, or you can remove it at the task level.

About this task

If work process flow is removed at the header level, it will automatically be removed on individual tasks on the record. You cannot retain work process flow for a task that does not have it set at the header level.

Procedure

1. In an application that supports flow action, display the record that you want to remove from work process flow.
2. On the main application tab, clear the Flow Controlled check box. The system removes the work order or the job plan, and all of its tasks from work process flow.
3. Click Save Record.

Suspending work process flows

You can suspend the work process flow for work order or task records that have it defined. For example, if you want to start a work order or task manually, you could suspend the flow control on that record. The flow remains suspended until you remove the suspension.

Before you begin

Removing the suspension restarts the flow. Any successor work orders or tasks with completed predecessors continue the process. Work orders and tasks without predecessors continue the process at the same time as the parent record. The last completed child under a parent rolls its completion up to the parent.

Procedure

1. In an application that supports flow action, display the record on which you want to suspend flow control.
2. On the main application tab, at the header level, select the Suspend Flow Control check box. The system suspends the work process flow on the work order and on all of its tasks.
3. To retain flow control for individual tasks, display the tasks in the Tasks table window, and clear the Suspend Flow Control check box at the task level. Flow control remains in place at the task level. This action does not affect the suspension at the work order header level. You can find the Tasks table window on the Plans tab.
4. Click Save Record.

Example

You generally suspend a set of tasks, often under the same parent. For example, you can delay the automatic starting of one whole phase of work until a certain condition has been met. You can also delay starting a phase of work to make changes to the tasks, such as inserting tasks, deleting tasks, and changing the precedence logic.

Changing the status of activities or tasks

You can change the status of an activity to indicate the position of the activity as it moves toward completion.

Procedure

1. In the Service Requests, in the Problems, or in Incidents application that corresponds to the type of record you are managing, display the record whose status you want to change.
2. Select the Change Status action.
3. In the New Status field, choose a status from the pull-down menu.
4. Click OK to change the status.

What to do next

If you change a ticket to a RESOLVED status, and you are the designated owner of that ticket, you might want to stop the timer or otherwise report the time that you spent resolving the issue.

Work Orders module

You use the Work Orders module to track the work that has been performed in the past, and future work that is being planned.

A work order is a request for work to be performed. The information that is contained on a work order includes the following:

- The tasks that were performed
- The labor hours involved in performing the work
- The services used, if any
- The materials used, if any
- The tools required to do the work
- The assets worked on
- The locations where the work was performed
- [Work Order Tracking](#)
In the Work Order Tracking application, you create and manage work orders for assets and locations. A work order specifies a particular task, and the labor, materials, services, and tools needed to complete the task.
- [Labor Reporting](#)
You use the Labor Reporting application to report the type and the total number of hours of work that external contractors or internal employees performed.
- [Quick Reporting](#)
You use the Quick Reporting application to plan, to review, and to approve work orders for assets and locations. When you create a work order, you initiate the maintenance process and create a historical record of the work being performed.

- [Assignment Manager](#)
You use the Assignment Manager application to dispatch labor and schedule work for your organization.
- [Service Requests](#)
You use the Service Requests application to manage requests for services that involve an asset or location in your enterprise. For example, you might receive a request to upgrade the computer software on the notebook for a user, or for all users at certain locations.
- [Work Orders application](#)
The Work Orders application is a modernized, simplified version of the Work Order Tracking application that contains the most important actions and information for work orders. It also contains workflow assignment integration, a new status bar, the ability to organize work orders into custom views, and productivity features, such as type-ahead search.
- [Workflow Assignments application](#)
You can use the Workflow Assignments application to monitor your workflow assignments and take advantage of time-saving features.

Work Order Tracking

In the Work Order Tracking application, you create and manage work orders for assets and locations. A work order specifies a particular task, and the labor, materials, services, and tools needed to complete the task.

When you create a work order, you initiate the maintenance management process and create a historical record of the work requested and performed.

You can create work orders in applications other than Work Order Tracking. These applications include the Changes application, Condition Monitoring application, Incidents application, Preventive Maintenance application, Problems application, Quick Reporting application, Releases application, and Service Requests application.

- [Work orders overview](#)
A work order specifies a particular task and the labor, materials, services, and tools required to complete the task.
- [Working with work orders](#)
Work orders initiate the maintenance process and create a historical record of the work that is performed.

Work orders overview

A work order specifies a particular task and the labor, materials, services, and tools required to complete the task.

- [Work order management plans](#)
After you create a work order, you can use the Plans tab to specify estimates for labor, craft, materials, services, and tools. You also can add child work orders and create tasks for the work order.
- [Work orders](#)
A work order specifies the asset, location, and the work required. You can apply service level agreements and assign ownership. The status of the work order changes as it moves through processing cycle. Duplicating a work order can save time when you need to create a work order with similar information.
- [Work packages](#)
When you create a work package, you group existing work orders under a new parent work order. A work package can be useful, for example, when you have a work order with 100 separate tasks and 90 of the tasks have been completed. You can group the remaining 10 tasks into a work package with a new parent work order. The 10 tasks become tasks under the new work order, and any work orders that are not tasks become children of the new work order.
- [Actuals on work orders](#)
As work progresses on the work order, you can report the actual labor hours, materials, services, and tools used.
- [Record relationships and work orders](#)
Relationships between records, such as work orders and tickets, help to simplify record management. You can create record relationships manually or relationships can be created automatically when you take certain actions.
- [Failure analysis](#)
Failure data enables you to record and view asset and location problems, causes, and remedies associated with work orders. This data enables you to identify trends and isolate probable causes of breakdowns.
- [Measurement points for work assets on work orders](#)
Work assets on a work order can have measurement points, which allow you to track the usage and condition of your assets. You can add measurement points to a work order until the work order is closed.
- [Preventive maintenance alerts](#)
Preventive maintenance alerts notify you of preventive maintenance work that is due for an asset. You can also be alerted about preventive maintenance that is due for a location. You can use preventive maintenance alerts to help reduce asset downtime and perform maintenance more regularly and efficiently.
- [Work record approval](#)
When work records, such as work orders, changes, and releases, have a status of Waiting on Approval, you can change the status to Approved.
- [Rules for changes to archived work orders](#)
Closed and canceled work orders are archived and become historical records. You can add information to a closed record by using the Edit History Work Order action.
- [Deletion rules for work orders](#)
For auditing purposes, you cannot always delete work orders. If you cannot delete a specific work order, you can stop all action on a work order by changing the status to canceled.

Work order management plans

After you create a work order, you can use the Plans tab to specify estimates for labor, craft, materials, services, and tools. You also can add child work orders and create tasks for the work order.

Job plans

An easy way to add a work plan to a work order is to associate a job plan with the work order. When you insert an identifier in the Job Plan field, the system copies the job plan, called a work plan, to the work order. You can also add a job plan by using another application to generate a work order that already has a job plan.

The system can also add a safety plan to the work order, if the job plan and its assets or locations have a safety plan. Changes you make to the work plan or safety plan in an individual work order do not affect the original job plan or safety plan.

Task plans

You can insert or edit work plan tasks on the Plans tab. You can also add inspection data for the work asset.

If a current work plan is based on a job plan, the system copies all task and plan data from the job plan. The job plan serves as a template for the work plan. Changes you make to the work plan on the work order do not affect the original job plan.

You can add or edit plan tasks until the work order is closed. You cannot delete tasks if the work order is approved or has actuals reported for the task.

After you close the work order, you can use the Edit History Work Order action to add or modify tasks.

- [Safety plans](#)
In the Work Order Tracking application, you can associate a safety plan with a work order. Safety plans help ensure that the work is performed safely. Until the work order is approved, you can remove or change the associated safety plan.
- [Safety hazards associated with work orders](#)
You associate hazards with safety-related assets for the asset or location listed on a work order by adding hazards to the safety plan.
- [Work plan removal](#)
Under certain circumstances, you can remove a work plan from a work order by using the Remove Work Plan action.

Safety plans

In the Work Order Tracking application, you can associate a safety plan with a work order. Safety plans help ensure that the work is performed safely. Until the work order is approved, you can remove or change the associated safety plan.

A work order can have only one associated safety plan. If a work order already has an associated safety plan, you must first remove the existing safety plan before associating a new one. When you change the safety plan information in a work order, the original safety plan in the Safety Plans application remains unchanged.

A safety plan can be automatically associated with a work order in the following cases:

- A job plan is added to a work order.
- A work order is generated by a condition monitoring or preventive maintenance record that has an associated job plan.

When the work order is in the status specified in the Organizations application, you cannot change the associated safety plan.

Safety hazards associated with work orders

You associate hazards with safety-related assets for the asset or location listed on a work order by adding hazards to the safety plan.

The association between the asset or location on the work order and their related assets and hazards must exist on the asset record or location record. Safety-related assets might have safety hazards that affect the work environment for the current work order.

You use the Select Safety Hazards action to add safety hazards. Safety hazards include the following information:

- Whether the asset or location can have tag outs.
- Whether the asset or location can have hazardous materials.
- Whether the asset or location can have precautions.

If you enter any item also identified as hazardous material, information for the hazard is automatically added in the Safety Plan tab.

Work plan removal

Under certain circumstances, you can remove a work plan from a work order by using the Remove Work Plan action.

When you remove a work plan, all information in the Plans tab, except for non-task children, is removed. Also, if the work plan has a job plan, the job plan identifier is removed.

If any task in the work plan cannot be removed based on the deletion rules for work orders, you cannot use the Remove Work Plan action. You can still delete labor, material, services, and tools information, as well as any tasks that do meet the deletion rules.

Work orders

A work order specifies the asset, location, and the work required. You can apply service level agreements and assign ownership. The status of the work order changes as it moves through processing cycle. Duplicating a work order can save time when you need to create a work order with similar information.

- **Service level agreements**
A service level agreement (SLA) typically is a written agreement that outlines the commitment between a service provider and its customers. A commitment is a service level that all parties have agreed to, such as asset reliability or availability.
- **Ownership of work orders**
You can designate an individual or a group as the owner of a work order or ticket. Ownership means that the person or group has administration responsibility for that record. Assigning ownership does not change that person or group's availability to work or to have ownership of additional records.
- **Work order statuses**
The status of a work order indicates its position in the processing cycle. The status determines which actions can be performed on the work order. For example, if the work order is approved, it has a status of APPR and the tasks can begin.
- **Duplication of work orders**
To save time, you can create a copy of a work order that includes information from the original work order. You can duplicate a work order with its tasks, without its tasks, or with its hierarchy. When you duplicate the work order hierarchy, the child tasks are also duplicated.

Service level agreements

A service level agreement (SLA) typically is a written agreement that outlines the commitment between a service provider and its customers. A commitment is a service level that all parties have agreed to, such as asset reliability or availability.

The SLA describes one or more commitments and the escalation actions or notifications associated with each commitment. Escalation actions or notifications might be associated with an SLA to ensure that commitments are met. An escalation process can monitor all activities and send notifications or perform other activities to ensure that commitments are met.

The types of records to which service level agreements can be applied include tickets, such as service requests, and work-based records, such as work orders. Before you can apply an SLA to a record, the record must have a site defined.

A service level agreement can be associated with a record in several ways:

- An SLA might automatically be applied to a record from within a workflow or escalation process, or from another SLA.
- You can select an action to apply an SLA, which applies the best match automatically.
- You can view SLAs and select an action to select or clear the SLAs that you want to manually apply to the record.

When you apply a service level agreement to a record, the following events occur:

- The SLA Applied check box on the main tab of the record is selected to document the action.
- Any escalations that are associated with the SLA are activated.
- The Target Start, Target Finish, and Contact values for the record might be calculated automatically as follows:

Automatically calculated values
When an SLA is applied that includes a response commitment, the response commitment date populates the Target Start date field of the record.
When an SLA is applied that includes a resolution commitment, the resolution commitment date populates the Target Finish date field of the record.
When an SLA is applied that includes a contact commitment, the contact commitment date populates the Target Contact date field of the record.

Ownership of work orders

You can designate an individual or a group as the owner of a work order or ticket. Ownership means that the person or group has administration responsibility for that record. Assigning ownership does not change that person or group's availability to work or to have ownership of additional records.

Ownership can change hands throughout the course of the record life cycle. You can change ownership until the record has a status of CLOSE.

You use the View History action to see the ownership and status history of a record. Record ownership is not required for a work order or ticket.

You can assign ownership in the following ways:

- Use the Select Owner action to choose a person or owner.
- Use the Take Ownership action if you want to be responsible for that record.

Work order statuses

The status of a work order indicates its position in the processing cycle. The status determines which actions can be performed on the work order. For example, if the work order is approved, it has a status of APPR and the tasks can begin.

WAPPR

The work order is waiting for approval. WAPPR is the default status for work orders that are created in the Work Order Tracking, Changes, Releases, and Activities applications.

APPR

The work order is approved and the work can begin.

WSCH

The work order is waiting to be scheduled. WSCH is the default status for work orders that are created in the Preventive Maintenance application.

WMATL

- Materials must arrive before the work can be performed.
- WPCOND**
The work can be performed only when the condition of the plant is suitable. For example, certain work might require that the plant is shut down.
- INPRG**
The work is in progress. INPRG is the default status for work orders that are created in the Quick Reporting application.
- COMP**
The physical work is completed.
- CLOSE**
The work order is closed. Inventory reservations for items that were not used for the work listed on the work order are removed, and the work order becomes a history record.
- CAN**
The work order is canceled. You cannot cancel a work order if the work is already in progress or if actuals are already reported.
- HISTEDIT**
The work order was edited in history.

Effects of changing work order statuses

Work orders can be controlled by a workflow process, which can lead to automatic status changes.

Child work orders can inherit status changes from their parent. Inheritance of status changes is controlled by the Inherit Status Changes check box.

If you are using process flow control, you can ensure that the status is inherited from the parent work order to the child work order. To allow status inheritance, you must activate the `mxe.app.wo.flowControlStatusInheritance` setting in the System Properties application. Two statuses can never be inherited with process flow control; the Flow Start and Flow Complete statuses. Flow Start and Flow Complete are INPRG and COMP, by default. You can change the default status settings in the Organizations application, by selecting Work Order Options, > Work Type and specifying values for the start status and the complete status.

The following table shows the effects of changing the status of a work order.

Change to status	Effects
APPR (Approved)	<ul style="list-style-type: none"> • The work plan items are reserved in the Inventory application and in the cost and rate data. • Rates can be changed in the Inventory application, the Labor application, or the Tools application. If the rates change, the work plan reflects the rates in effect when the work order was approved. • You can no longer delete the work order.
CAN (Canceled)	<ul style="list-style-type: none"> • Work orders that are not started are canceled. • Work orders that have no actuals reports are also canceled. • Canceled work order become history records.
CLOSE (Closed)	<ul style="list-style-type: none"> • The work order is finalized. • Inventory reservations for unused items on the work order are removed. • The work order becomes a history record.
COMP (Completed)	<ul style="list-style-type: none"> • All physical work that is associated with a work order is finished. • If you planned to move or modify an asset on the work order, the move or modification occurs when the status is changed to COMP.
INPRG (In Progress)	<ul style="list-style-type: none"> • Physical work on the work order is currently in progress.

Allowed changes to work order statuses

The following table shows the possible changes to the status of a standard work order. However, process flow control can restrict which status changes are possible.

Status	New status options
WAPPR	<ul style="list-style-type: none"> • INPRG • CAN • WMATL • COMP • WPCOND • APP • CLOSE
APPR	<ul style="list-style-type: none"> • INPRG • WMATL • COMP • WPCOND • WAPPR • CAN • CLOSE

Status	New status options
WSCH	<ul style="list-style-type: none"> • INPRG • WMATL • COMP • WPCOND • WAPPR • CAN • CLOSE
WPCOND	<ul style="list-style-type: none"> • INPRG • WMATL • COMP • WPCOND • WAPPR • CAN • CLOSE
WMATL	<ul style="list-style-type: none"> • INPRG • COMP • WPCOND • WAPPR • CAN • CLOSE
INPRG	<ul style="list-style-type: none"> • WMATL • COMP • WAPPR • CLOSE
COMP	CLOSE
CAN	None.
CLOSE	HISTEDIT

Related reference

- [Workflow properties](#)

Duplication of work orders

To save time, you can create a copy of a work order that includes information from the original work order. You can duplicate a work order with its tasks, without its tasks, or with its hierarchy. When you duplicate the work order hierarchy, the child tasks are also duplicated.

To duplicate a work order, use the Duplicate Work Order action. If a work order that you are duplicating has a job plan or a safety plan, these plans are copied to the duplicate work order. Work actuals, failure reports, and planned moves or modifications are not copied to the duplicate work order.

Work packages

When you create a work package, you group existing work orders under a new parent work order. A work package can be useful, for example, when you have a work order with 100 separate tasks and 90 of the tasks have been completed. You can group the remaining 10 tasks into a work package with a new parent work order. The 10 tasks become tasks under the new work order, and any work orders that are not tasks become children of the new work order.

To create work packages, select the work orders, then use the Create Work Package action.

Actuals on work orders

As work progresses on the work order, you can report the actual labor hours, materials, services, and tools used.

- [Actual labor hours for work orders](#)
To track the actual labor hours that were required to complete the work, you use the Labor subtab on the Actuals tab in the Work Order Tracking application.
- [Actual material use for work orders](#)
To track the actual quantities, locations, and costs for items used on an approved work order you use the Materials subtab on the Actuals tab in the Work Order Tracking application. You can copy data from an existing plan, modify this data to reflect actual events, or insert new data.
- [Actual tool use for work orders](#)
To track the actual quantities, hours, and rates for tools used on an approved work order, you use the Tools subtab on the Actuals tab in the Work Order Tracking application.
- [Costs on tickets and work orders](#)
You can view the estimated and actual costs for a single work order or ticket, including costs for labor, material, tools, and services. You can also view total costs for the current record and all the records below it in its hierarchy.

Actual labor hours for work orders

To track the actual labor hours that were required to complete the work, you use the Labor subtab on the Actuals tab in the Work Order Tracking application.

You can specify and change actual hours for labor only on an approved work order. You can copy data from an existing plan and you can modify the data to reflect actual events. You can specify labor and crafts until you close the work order.

You can report actual labor hours in the following ways:

- Report hours for multiple types of labor at the same time.
- Copy labor from the work plan.
- Report labor individually.
- Select planned labor.

Actual material use for work orders

To track the actual quantities, locations, and costs for items used on an approved work order you use the Materials subtab on the Actuals tab in the Work Order Tracking application. You can copy data from an existing plan, modify this data to reflect actual events, or insert new data.

When you issue an item to a work order and it is not currently a spare part of the asset on the work order, the system might automatically add it to the spare parts list of the asset. The Add as Spare Part check box must be selected for the record in the Item Master application for the spare part list. You can insert new rows until you close the record, but can edit information only until you save the record.

You can report actual material use in the following ways:

- Select multiple items at once.
- Select items reserved in the inventory, based on the work plan.
- Select spare parts for the asset.
- Report materials individually.

Actual tool use for work orders

To track the actual quantities, hours, and rates for tools used on an approved work order, you use the Tools subtab on the Actuals tab in the Work Order Tracking application.

You can copy data from an existing plan, and delete from, add to, or change this data to reflect actual events. Work orders must be approved before you can report actuals. You can insert new rows until you close the record, but can edit information only before you save the record.

You can report actual tool use in the following ways:

- Select tools from the database.
- Copy tool data from the work plan.
- Select tools that were issued to the work order.
- Report individual tool use.

Costs on tickets and work orders

You can view the estimated and actual costs for a single work order or ticket, including costs for labor, material, tools, and services. You can also view total costs for the current record and all the records below it in its hierarchy.

When you view the costs of a ticket or work order, the data is displayed in two tables:

- The Totals table displays the costs for a single ticket or work order.
- The View Hierarchy Grand Totals table displays the costs for the current ticket or work order and all records under its hierarchy.

Each table presents the same information, which is shown in the following table.

Column	Explanation
Current Estimate	Displays read-only calculated values for the current totals from the Labor, Materials, Standard Services, and Tools tabs of the Plans tab for the ticket or work order.
Estimate at Approval	Is set to zero until the work order is approved, then the values are copied from the Current Estimate column and are read-only. If the work order status changes from approved to unapproved, then these fields are cleared. The estimated costs at approval are not affected by the change in status from in progress to completed or closed.
Actual	Displays the read-only values from the Labor (for approved labor only), Materials, and Tools tabs of the Actuals tab. If the status of the record changes from approved, then these fields are not cleared.

Rolling up maintenance costs

After you close a work order that is associated with an asset, you can calculate your maintenance costs by rolling up costs that you incur for labor, materials, tools, and services to the top-level asset in the hierarchy that the asset belongs to.

Costs can be rolled up manually or automatically. By default, cost rollups are manual. If you want costs to be calculated and rolled up automatically when a work order is closed, you must set the `mxe.workorder.rollupMaintenanceCosts` system property to 1. After you configure the system property for automatic rollups, all subsequent costs that are associated with work orders are rolled up automatically. However, any unprocessed maintenance costs that existed before the configuration are not automatically rolled up. You must roll up any preexisting, unprocessed maintenance costs manually.

To calculate the maintenance cost of your assets, use the Roll Up Maintenance Costs action in the Assets application.

If you upgrade to Maximo® Manage 8.5, run the Asset Cost Rollup Report to roll up pending maintenance costs before the upgrade.

Record relationships and work orders

Relationships between records, such as work orders and tickets, help to simplify record management. You can create record relationships manually or relationships can be created automatically when you take certain actions.

The following types of relationships can exist between records:

- Related
- Originator and follow-up
- Related to global

Related records

Using the Work Order Tracking application, you can view records and relate work orders to the current record. You relate work orders informally for information purposes and to create a relationship between records. A related relationship does not determine status inheritance, affect workflow, or follow a set of business rules. Related relationships can be many-to-many, and do not represent record hierarchies.

You use the Related Records tab of the Work Order Tracking application to create relationships to other work orders and tickets. Relationships that you create on the Related Records tab have a relationship type of Related.

When you create relationships between records, you can take the following actions:

- Modify related records.
- View related information for similar records.
- View open tickets that are associated with a specific field in the Work Order Tracking application.

Originator and follow-up work orders

From the current work order, you can create another related record by selecting the Create action. When you create a work order or a ticket from an existing work order, the new record has a status of Follow-up. The original work order has a status of Originator.

You create follow-up work orders to associate work orders and tickets with each other and keep them in separate hierarchies. The costs of the follow-up work orders in separate hierarchies do not roll up to the same parent. For example, you can create a follow-up work order when you complete a job and observe that additional work is needed on the same asset or location.

A follow-up work order can determine the status of its originating ticket. An originating ticket cannot change the status of a follow-up work order. A follow-up ticket cannot change the status of the originator ticket if there is more than one follow-up. Your system administrator can configure these options.

When you create follow-up work orders, the asset, location, and general ledger account are copied from the originating work order to the follow-up work order.

You can view follow-up work orders on the Related Records tab of the originating record.

Globally related tickets

A global record is a ticket (a service request, a problem, or an incident record) that outlines an issue that affects many users. To make a ticket a global record, you must select the Global Issue check box on the ticket. You can then select the Show Similar Tickets action in the toolbar to select tickets to relate to the global ticket, creating a RELATEDTOGLOBAL relationship.

You can use this relationship type to manage all tickets that are included in the global ticket. For example, when you change the status of the global ticket, the system changes the status of all globally related tickets.

If your administrator has set up automated notifications of status changes, then the system changes the status of the tickets related to the global issue. All of the initial requesters reporting the same issue are notified of its resolution.

On the global ticket, you can view a list of related records and view the work and communication logs for all related records.

You cannot designate a record as global if it is already related to a global record or if it is a history record.

Failure analysis

Failure data enables you to record and view asset and location problems, causes, and remedies associated with work orders. This data enables you to identify trends and isolate probable causes of breakdowns.

You can use failure data to conduct failure analysis to review the history of asset and location failures over time. For example, you review issues such as breakdown trends or mean time between failures. You can correlate this failure information with other data such as preventive maintenance schedules to develop ways to reduce or limit asset and location failures.

In the Work Order Tracking application, you view the failure data information in the Failure Reporting tab. Failure data must belong to one or more failure hierarchies, which you create in the Failure Codes application. When you report failures, you use failure hierarchies.

A failure hierarchy is an organized set of data on problems, causes, and remedies related to assets and locations. The failure hierarchy is identified by a top-level failure code, called a failure class. If the asset or location on a work order is associated with a failure class, the default failure class value is the associated failure class.

Measurement points for work assets on work orders

Work assets on a work order can have measurement points, which allow you to track the usage and condition of your assets. You can add measurement points to a work order until the work order is closed.

Measurement points are copied to work plans when the following items are matched:

- The measurement point name on the job plan that is listed on the work order.
- The measurement point name on the asset that is listed on the work order.
- A measurement point number for the measurement point name.

If you add a value for a measurement point, the new measurement and measurement date are copied to the MEASUREMENT database table. If you add a measurement without adding a value for the measurement point, the measurement data is saved with the work order. When you save a work order with measurement point data, the Measurement Point field becomes read-only.

Preventive maintenance alerts

Preventive maintenance alerts notify you of preventive maintenance work that is due for an asset. You can also be alerted about preventive maintenance that is due for a location. You can use preventive maintenance alerts to help reduce asset downtime and perform maintenance more regularly and efficiently.

Preventive maintenance alerts are triggered when either of the following criteria are met:

- The system date is on or after the estimated next due date minus the number of days that is specified in the Alert Lead (Days) field.
- The current meter reading for the asset or location is greater than the next meter reading projection minus the number of units that is specified in the Alert Lead field.

Work record approval

When work records, such as work orders, changes, and releases, have a status of Waiting on Approval, you can change the status to Approved.

Keep in mind the following system behavior that pertains to work record approval:

- When you approve a work record, the system reserves the work plan items in Inventory and records cost and rate data. If rates change in Inventory, Labor, or Tools, the work plan reflects the rates in effect when the change was approved.
- An approved record cannot be deleted.
- When you approve a work record, the tasks on the record are also approved.
- If you approve a work record that has child work orders with their Inherit Status Changes check box selected, the applicable child work orders are also approved.
- You can change the status of multiple work orders at the same time using the Select Records checkbox on the List tab to select the records, or you can change the status of a displayed record.

Rules for changes to archived work orders

Closed and canceled work orders are archived and become historical records. You can add information to a closed record by using the Edit History Work Order action.

When you change an archived work order, the following rules apply:

- New costs that were incurred during the edit history must be added to the inventory cost, if it is charged to store.
- You can add actual labor, but you cannot change approved transactions.
- You can add actual materials and actual tools, but you cannot change them.
- You can add or delete child work orders, whether the child work orders are tasks.
- You can add failure reports.
- You can attach documents.
- You cannot change safety information.

- You cannot change planned labor, materials, and tools.
- You cannot change information in the following fields:
 - Asset
 - Location
 - GL Account
 - Charge to Store
 - Status
 - Status Date

Deletion rules for work orders

For auditing purposes, you cannot always delete work orders. If you cannot delete a specific work order, you can stop all action on a work order by changing the status to canceled.

If you want to delete a work order and its child work orders, the work order and its children must meet the following criteria:

- Have a status of waiting for approval.
- Not have any transactions registered against it, except for status changes.
- Not have any actuals reported against it.
- Not have any labor assignments associated with it.
- Not have any measurements or meter readings taken against it.
- Not have been generated for a purchase order or receipt.
- Not have any failures reported against it.
- Not be in a workflow or have ever been in a workflow.
- Cannot have been created by a preventive maintenance generation.
- Cannot be follow-up work or have follow-up work.

To delete a work order, use the Delete_> Work Order action.

Working with work orders

Work orders initiate the maintenance process and create a historical record of the work that is performed.

- **[Creating work orders](#)**
A work order specifies the information about the work that must be performed for an asset, location, or configuration item. You can add work plans, job plans, or safety plans. You can also record actuals as the work progresses.
- **[Reporting actuals for work orders](#)**
As work progresses on an approved work order, you can report the actual labor hours, materials, services, and tools used.
- **[Rescheduling and unassigning work](#)**
You can reschedule work that has been assigned to labor resources to accommodate changes in priority or scheduling. You can reschedule multiple work records at the same time using the Reschedule Assignments window.
- **[Specifying meter readings on work orders](#)**
You can enter meter readings for the asset and the location on a work order. An asset can be set up to inherit the meter readings of its parent asset or its location.
- **[Enabling preventive maintenance alerts for work orders](#)**
You can use preventive maintenance alerts to notify you of pending preventive maintenance work that is scheduled for assets or locations in work order records.
- **[Reporting downtime for assets](#)**
You can report the start time and the end time of the downtime for an asset after it has occurred.
- **[Swapping assets](#)**
You can swap assets associated with a work order. The swap action applies to the work order and all of the assets, locations, and configuration items on its child work orders. The term "work order" can refer to a work order, change, release, or activity record.
- **[Categorizing work orders with classifications and attributes](#)**
To simplify the process of finding and managing records, you can categorize work orders. Classifications identify work orders as involving a type of item, such as a notebook. Attributes further identify the item by providing more details. For example, a notebook can have the attributes memory, speed, and disk space.
- **[Setting up work process flows](#)**
Work process flows use relationships between work orders and tasks to automate the flow of status changes. You set relationships between work orders and tasks so that when a task is completed, the next task in the flow can be initiated.
- **[Changing the status of a list of records](#)**
You can change the status of multiple records in applications.

Creating work orders

A work order specifies the information about the work that must be performed for an asset, location, or configuration item. You can add work plans, job plans, or safety plans. You can also record actuals as the work progresses.

Procedure

1. In the Work Order Tracking application, click the New Work Order icon in the toolbar.
2. Specify whether you are creating the work order for a location, asset, configuration item, or general ledger account.
If a selected location has a single associated asset, the asset value is copied to the record. If a selected asset is a linear asset, additional fields display.
3. Optional: Specify a type for the work order and the priority of the work order for scheduling purposes.
4. Specify any additional schedule information and responsibility information.
You can specify a job plan, safety plan, failure class, scheduling information, and planned labor, materials, tools, and services.
If you specify a job plan or job task that is related to an inspection form, that inspection form is automatically added to the Inspection Form field.
5. Save the work order.

- **[Associating safety plans with work orders](#)**

You can associate a safety plan with a work order to help ensure that the work is performed safely. You can associate a safety plan until the work order is approved. If a work order already has an associated safety plan, you must remove it before you can select another safety plan.

- **[Creating work plans for work orders](#)**

You can create a work plan for a work order. A work plan describes the labor, materials, tools, services, and tasks that are needed to complete a work order.

- **[Applying service level agreements to records](#)**

You can apply a service level agreement (SLA) to a record to define the agreement and formal commitments between a service provider and a customer. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.

- **[Applying routes to work orders](#)**

You can apply a route to a work order to define a list of related work assets. For example, you can define assets, locations, or a combination of both; each of which is considered to be a stop along the route. The work assets can be related by location, such as all pumps and motors in a room. Or they can be related by the type of asset, such as all fire extinguishers at a site.

- **[Creating related records](#)**

To save time and simplify work order management, you can create new records and relate them to your work order. You can associate other records with a work order, such as incidents, releases, service requests, and other work orders.

- **[Removing relationships between records](#)**

You can remove the relationship between a work order and its related work orders or tickets.

- **[Assigning a parent to a work order](#)**

You can assign a parent to a work order and assign tasks to that parent. When you assign work order records to a parent, they become child work orders records of the parent record.

Associating safety plans with work orders

You can associate a safety plan with a work order to help ensure that the work is performed safely. You can associate a safety plan until the work order is approved. If a work order already has an associated safety plan, you must remove it before you can select another safety plan.

Procedure

1. In the Work Order Tracking application, select the work order with which you want to associate a safety plan.
2. In the Job Details section of the Work Order tab, specify the details for the safety plan.
3. In the Select Value window, select one of the following options to view available safety plans:
 - To view all safety plans in the database, select Show All Safety Plans.
 - To view safety plans that are associated with the asset or location on the work order, select Show Safety Plans for the Current Work Order.
 - To view safety plans that are associated with the job plan on the work order, select Show Safety Plans for the Job Plan of the Current Work Order.
4. Save the work order.

Creating work plans for work orders

You can create a work plan for a work order. A work plan describes the labor, materials, tools, services, and tasks that are needed to complete a work order.

Procedure

1. In the Work Order Tracking application, select the work order for which you want to create a work plan.
2. On the Plans tab, provide the following information:

Option	Description
Work plan task information	In the Tasks for Work Order table window, add work plan information.
Labor information	On the Labor subtab, select existing labor or add labor.
Planned materials information	On the Materials subtab, provide information for planned materials or items for the work order.
Services information	On the Services subtab, select standard services or add services.
Tools information	On the Tools subtab, select tools or add tools.

3. Save the work plan.

- **[Associating work plans with work orders](#)**

You can associate an existing work plan with a work order. A work plan describes the labor, materials, tools, services, and tasks that are needed to complete a work order. Changes that you make to the associated work plan do not affect the original job plan.

- **[Adding work plan tasks to work orders](#)**

You can add or change work plan tasks until the work order is closed. However, you cannot delete work plan tasks from an approved work order or from a work order that has actuals reported for the work plan task.

- [Creating job plans from work plans](#)

You can create a job plan from the work plan instead of recreating the work plan each time that you need it. When you create a job plan from a work plan, the asset management system uses the current work order and its tasks, planned labor, materials, tools, and services to create the job plan.

Associating work plans with work orders

You can associate an existing work plan with a work order. A work plan describes the labor, materials, tools, services, and tasks that are needed to complete a work order. Changes that you make to the associated work plan do not affect the original job plan.

Procedure

1. In the Work Order Tracking application, select the work order with which you want to associate a work plan.
2. In the Job Plan field of the Work Order tab, specify the plan that you want to associate.
3. Save the work order.

Adding work plan tasks to work orders

You can add or change work plan tasks until the work order is closed. However, you cannot delete work plan tasks from an approved work order or from a work order that has actuals reported for the work plan task.

Procedure

1. In the Work Order Tracking application, select the work order to which you want to add work plan tasks.
2. In the Tasks for Work Order table window of the Plans tab, click New Row.
3. Specify the details of the task.
4. Save the work order.

Creating job plans from work plans

You can create a job plan from the work plan instead of recreating the work plan each time that you need it. When you create a job plan from a work plan, the asset management system uses the current work order and its tasks, planned labor, materials, tools, and services to create the job plan.

About this task

The asset management system does not copy child work orders, if any, to the job plan. If the work assets on the work order have an associated safety plan, the asset management system does not copy the safety plan to the job plan.

Procedure

1. In the Work Order Tracking application, display the work order that contains the plan that you want to use to create a job plan.
2. Select the Create Job Plan from Work Plan action.
3. If the Job Plan field is empty, enter a value, or click Autonumber to have the asset management system assign a number to the job plan.
4. Click OK.

Results

The asset management system creates a job plan record that you can now access in the Job Plans application.

Applying service level agreements to records

You can apply a service level agreement (SLA) to a record to define the agreement and formal commitments between a service provider and a customer. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.

About this task

When you apply an service level agreement to work orders, the SLA is applied only to the work order, not to its tasks. If you want to apply a service level agreement to a task, you must display the task as the current record and then apply the SLA.

You can apply service level agreements to tickets and work orders.

Procedure

1. Open an application and display the record that you want to update.
2. Select the Apply SLA action.
3. Click OK.

Results

The SLA Applied check box on the main tab of the selected application is selected. The target start, target finish, and contact values are calculated for the selected record.

Removing service level agreements from records

To maintain accurate records, it might be necessary to remove an invalid or erroneous service level agreement to disassociate it from the record.

Procedure

1. Display the record for which you want to remove a service level agreement.
2. Select the Select/Deselect SLA action.
3. Click Mark Row for Delete for each service level agreement that you want to remove from the record.
4. Click OK.
5. Save the record.

Applying routes to work orders

You can apply a route to a work order to define a list of related work assets. For example, you can define assets, locations, or a combination of both; each of which is considered to be a stop along the route. The work assets can be related by location, such as all pumps and motors in a room. Or they can be related by the type of asset, such as all fire extinguishers at a site.

About this task

Each route stop can have its own job plan, which the system copies to the child work order. You can apply a route to a work order in the Work Order Tracking and Quick Reporting applications.

Procedure

1. Open an application and display the work order record that you want to update.
2. Select the Apply Route action.
3. Select the route that you want to apply to the work order.
A message box opens and displays a list of child work orders that are created from the route.
4. Click Save Work Order.

Results

The created child work orders display as route stops on the Plans tab in the Work Order Tracking application.

Creating related records

To save time and simplify work order management, you can create new records and relate them to your work order. You can associate other records with a work order, such as incidents, releases, service requests, and other work orders.

Procedure

1. In the Work Order Tracking application, select the work order for which you want to create related records.
2. Select the Create > RecordType action where RecordType is one of the following types:
 - Work Order
 - Service Request
 - Incident
 - Problem
 - Change
 - Release
 - Communication

Removing relationships between records

You can remove the relationship between a work order and its related work orders or tickets.

Before you begin

You can remove the relationship between records only if the ticket or the work order has a type of RELATED.

About this task

To delete relationships with work orders that have other relationship types, such as FOLLOWUP or ORIGINATOR, you must delete the work order.

To delete relationships with tickets that have other relationship types, you must go to the ticket applications.

on the Related Records tab in the Work Order Tracking application.

Procedure

1. In the Work Order Tracking application, select the work order with the related relationship that you want to delete.
2. On the Related Records tab, select the record in the Related Work Orders table window.
3. Click the Mark Row for Delete icon. You can mark more than one row.
4. Save the record.

Assigning a parent to a work order

You can assign a parent to a work order and assign tasks to that parent. When you assign work order records to a parent, they become child work orders records of the parent record.

About this task

You cannot assign parent records to closed work order records. If the parent has a value in the Priority field, and the child or children work order records do not, the child or children work order records inherit the parent priority value.

Procedure

1. Open an application and display the work order record that you want to update.
2. On the List tab, select the task that you want to update.
3. Select the Assign To New Parent action.
4. Select the work order record that you want as the new parent.
The asset management system displays the parent work order number in the Parent WO field.
5. Click Save record.

Reporting actuals for work orders

As work progresses on an approved work order, you can report the actual labor hours, materials, services, and tools used.

Procedure

1. Display the work order for which you want to report actuals.
2. On the Actuals tab, enter the details on the following subtabs:

Option	Description
Labor	Report hours for labor, copy labor from the work plan, or select planned labor.
Materials	Select materials, select reserved items, and select spare parts.
Services	Select services or standard services.
Tools	Select tools, copy tool data from the work plan, or select tools that were issued to the work order.

3. Save the record.

Rescheduling and unassigning work

You can reschedule work that has been assigned to labor resources to accommodate changes in priority or scheduling. You can reschedule multiple work records at the same time using the Reschedule Assignments window.

About this task

You can reschedule all work that has been assigned over a certain time period, or to a certain person. You can reschedule multiple work records to the same labor record for a different time period, or you can unassign the work so that you can later assign it to someone else.

Procedure

1. On the Assignments tab of the Work Order Tracking application, display the work records that you want to reschedule.
2. Select the Reschedule Assignments action.
The Reschedule Assignments panel opens.
3. To reschedule assignments to the same labor records but with a new date, enter the new date in the Reschedule Date field, and ensure that the Reschedule the Assignments check box is selected.
Assignments with a status of ASSIGNED are rescheduled by labor availability, starting at the chosen date. Assignments with a status of WAITASGN, STARTED, or COMPLETE are not affected. Work records with no assignments or with assignments that are all in WAITASGN status receive new Scheduled Start and Scheduled Finish dates. Work records with a status of INTERRUPTED have their Scheduled Start dates cleared.
4. To unassign work without changing the Scheduled Start and Scheduled Finish dates on the work records, leave the Reschedule Date field blank and clear the Reschedule the Assignments check box.
All assignments with a status of ASSIGNED are changed to WAITASGN. Assignments with a status of STARTED or COMPLETE are not affected. Work records with no assignments or with assignments that are all in WAITASGN status are not affected.
5. To unassign work and update the Scheduled Start and Scheduled Finish dates on the work records, enter a date in the Reschedule Date field, and clear the Reschedule the Assignments check box.
All assignments with a status of ASSIGNED are changed to WAITASGN. and their work records receive new Scheduled Start and Scheduled Finish dates. Assignments with a status of STARTED or COMPLETE are not affected. Work orders with no assignments or with assignments that are all in WAITASGN status receive new Scheduled Start and Scheduled Finish dates. Work records with a status of INTERRUPTED have their Scheduled Start dates cleared.

Specifying meter readings on work orders

You can enter meter readings for the asset and the location on a work order. An asset can be set up to inherit the meter readings of its parent asset or its location.

About this task

To find out if an asset is inheriting meter readings, go to the asset record and check the value in the Accept Rolldown From field.

Procedure

1. Display the record for which you want to enter a reading.
2. From the Select Action menu, select Enter Meter Readings.
3. To enter a meter reading, select either of the following options:
 - To enter a meter reading for the asset, click the Asset Meter Readings tab.
 - To enter a meter reading for the location, click the Location Meter Readings tab. If the asset and location have meters, and the asset inherits the meter reading for the location, enter a reading for either the asset or the location. If the asset has child records that inherit meter readings, the meter readings for the child records are updated. If the location has assets that inherit meter readings for the location, the readings for the assets in that location are updated.
4. In the New Reading field, enter a value, or click Select Value. The system date and time display in the New Reading Date field. The log in name for the user displays in the Inspector field.
5. To change the inspector, specify a value, or click Detail Menu to retrieve a value.
6. To enter the reading and return to the record, click OK.

Enabling preventive maintenance alerts for work orders

You can use preventive maintenance alerts to notify you of pending preventive maintenance work that is scheduled for assets or locations in work order records.

About this task

The site that is listed on the work order must be configured to enable alerts. You configure preventive maintenance alerts for sites in the Organizations application.

Procedure

1. In the Organizations application, select the PM Options action and specify a status that work orders must reach to generate preventive maintenance alerts.
2. In the Preventive Maintenance application, create a preventive maintenance record for an asset or for a location.
3. In the Work Order Tracking application, create a work order that requires the same asset or location. Preventive maintenance alerts are shown when the status of the work order record reaches the status that you have specified.

Reporting downtime for assets

You can report the start time and the end time of the downtime for an asset after it has occurred.

About this task

You can create multiple downtime reports for a single work order.

Procedure

1. Display the record with the asset for which you want to report downtime.
2. Select the Report Downtime action.
3. In the Downtime Report section, select the Report Downtime option.
4. Specify the date the downtime began, or select one of the following options in the Start Date Default section:
 - Reported Date - the date and time the downtime for the asset was reported on the work order.
 - Actual Start Date - the date and time the downtime for the asset actually began.
 - None - no default start date and time.
5. Enter a date the downtime ended or will end.
6. In the Hours field, the system calculates the total downtime hours based upon the start date and the end date. This calculation considers the calendar for the asset. The calculation also considers the elapsed time between the start of downtime, and the end of downtime.
7. In the Downtime Code field, click Select Value to select a code.
8. In the Downtime Type section, select either of the following options:
 - Operational - if the down time occurred when the asset is normally in use
 - Non-Operational - if the down time occurred when the asset is normally not in use.
9. Click OK to report the downtime and return to the record.

Swapping assets

You can swap assets associated with a work order. The swap action applies to the work order and all of the assets, locations, and configuration items on its child work orders. The term "work order" can refer to a work order, change, release, or activity record.

Before you begin

You can execute the swap immediately, or you can save the swap as a plan. If you save the swap as a plan, the changes will apply when the status for the work order is COMP (Complete). When the status of a work order is COMP, you swap assets only using the Execute Now option. When you select Execute Now on any tab, the system executes the changes on all tabs.

When you duplicate a work order that has a planned swap to its assets or locations, the planned action does not get copied to the duplicate work order. Also, when you create a release, or change, or work order from a record using the Select Action menu option, the planned action is not copied to the follow-up record.

Procedure

1. Select the Move/Swap/Modify action.
2. Click the Move/Swap tab.
3. Select the Is this an Asset Swap checkbox.
4. In the Swap Assets section, select the row for the asset you want to swap.
5. To move the asset to a parent or location, type a value in the appropriate field, or click Select Value to retrieve a value.
6. In the Replacement Asset field, specify an asset, or click Select Value to retrieve a value.
7. Perform one of the following actions:
 - To swap the assets immediately, click Execute Now.
 - To swap the assets when the status for the work order is COMP (Complete), click Save as Plan.

Categorizing work orders with classifications and attributes

To simplify the process of finding and managing records, you can categorize work orders. Classifications identify work orders as involving a type of item, such as a notebook. Attributes further identify the item by providing more details. For example, a notebook can have the attributes memory, speed, and disk space.

Procedure

1. In the Work Order Tracking application, display the work order that you want to categorize.
 2. On the Specifications tab, specify a classification.
 3. Select the attributes.
 4. Save your changes.
- [Categorizing work order tasks with classifications and attributes](#)
To simplify the process of finding and managing records, you can categorize work order tasks. Categorizing work order tasks involves classifying and adding and changing attributes to further group the classification.

Categorizing work order tasks with classifications and attributes

To simplify the process of finding and managing records, you can categorize work order tasks. Categorizing work order tasks involves classifying and adding and changing attributes to further group the classification.

Procedure

1. In the Work Order Tracking application, display the work order with the task that you want to categorize.
2. In the Job Details section of the Plans tab, select the task that you want to categorize.
3. Specify the classification.
4. Optional: You can add attributes, delete attributes, and change the values of the attributes in the row details.
5. Save the work order.

Example

A work order task involves the classification of a notebook. The notebook classification has the attributes of memory, speed, and disk space, which are copied to the work order upon classification. As needed, you can add attributes such as operating system and power, change the attribute values, and remove attributes associated with the work order.

Setting up work process flows

Work process flows use relationships between work orders and tasks to automate the flow of status changes. You set relationships between work orders and tasks so that when a task is completed, the next task in the flow can be initiated.

Before you begin

To set the process flow for individual tasks, you must select Under Flow Control at the header level for the work order.

About this task

The best practice for consistently using the flow feature is to set up the process flow as a work template at the job plan level.

Procedure

1. Open the work order.
 2. Select Under Flow Control.
 3. On the Plans tab, display the details for the task.
 4. In the Scheduling Information section, next to the Predecessors field, click the Detail Menu icon.
 5. Select the tasks that must be completed before this task is initiated.
 6. Save the work order.
- [Defining flow actions](#)
A flow action is used in a work process flow to define certain actions that should occur while work is being done. Actions or action groups can be applied to any work order, task, or job plan task.
 - [Removing work process flow from work orders or job plans](#)
You can remove work process flow for a work order, a job plan, or task records that have it defined. You can do this at the header level, which will remove it for all the associated tasks as well, or you can remove it at the task level.
 - [Suspending work process flows](#)
You can suspend the work process flow for work order or task records that have it defined. For example, if you want to start a work order or task manually, you could suspend the flow control on that record. The flow remains suspended until you remove the suspension.
 - [Stopping workflow processes](#)
You can stop a workflow process for a record. You use the Workflow Administration application to view and stop workflow processes.

Defining flow actions

A flow action is used in a work process flow to define certain actions that should occur while work is being done. Actions or action groups can be applied to any work order, task, or job plan task.

About this task

You can determine whether the action takes place automatically, or if the action only takes place when it is initiated manually. When automatic, the action takes place as soon as the work order or task status is changed to an in progress (INPRG) status value by work process flow. When manual, you must initiate the flow action by running the automation or processing scripts or placing an action button on the target application. Actions and action groups are defined in the Actions application.

Procedure

1. In an application that supports flow action, display the record for which you want to define a flow action.
2. Perform one of the following actions:

- For a work order, change, release, or job plan record, enter a value in the Flow Action field on the application tab.
- For a work order or job plan task, enter a value in the Flow Action field in the Task table window. The Tasks table window is found on the main tab of the Job Plans application, or the Plans tab of the Work Order Tracking, Changes, and Releases applications.

The defined action runs when the work order or task status value is changed to INPRG.

3. Specify whether you want the flow action to be automatically run:

Option	Flow Action Assist
Automatically run the flow action	Cleared
Manually run the flow action	Selected

4. Click Save record.

Removing work process flow from work orders or job plans

You can remove work process flow for a work order, a job plan, or task records that have it defined. You can do this at the header level, which will remove it for all the associated tasks as well, or you can remove it at the task level.

About this task

If work process flow is removed at the header level, it will automatically be removed on individual tasks on the record. You cannot retain work process flow for a task that does not have it set at the header level.

Procedure

1. In an application that supports flow action, display the record that you want to remove from work process flow.
2. On the main application tab, clear the Flow Controlled check box. The system removes the work order or the job plan, and all of its tasks from work process flow.
3. Click Save Record.

Suspending work process flows

You can suspend the work process flow for work order or task records that have it defined. For example, if you want to start a work order or task manually, you could suspend the flow control on that record. The flow remains suspended until you remove the suspension.

Before you begin

Removing the suspension restarts the flow. Any successor work orders or tasks with completed predecessors continue the process. Work orders and tasks without predecessors continue the process at the same time as the parent record. The last completed child under a parent rolls its completion up to the parent.

Procedure

1. In an application that supports flow action, display the record on which you want to suspend flow control.
2. On the main application tab, at the header level, select the Suspend Flow Control check box. The system suspends the work process flow on the work order and on all of its tasks.
3. To retain flow control for individual tasks, display the tasks in the Tasks table window, and clear the Suspend Flow Control check box at the task level. Flow control remains in place at the task level. This action does not affect the suspension at the work order header level. You can find the Tasks table window on the Plans tab.
4. Click Save Record.

Example

You generally suspend a set of tasks, often under the same parent. For example, you can delay the automatic starting of one whole phase of work until a certain condition has been met. You can also delay starting a phase of work to make changes to the tasks, such as inserting tasks, deleting tasks, and changing the precedence logic.

Stopping workflow processes

You can stop a workflow process for a record. You use the Workflow Administration application to view and stop workflow processes.

Before you begin

The application associated with the workflow process record must be enabled for workflow.

Procedure

1. To stop a workflow process, complete one of the following steps:
 - In a Workflow-enabled application, display the record you want to remove from Workflow. Select the Stop Workflow action.
 - In the Workflow Administration application, select the active process that you want to stop. Click Stop Process on the assignment line.
2. Optional: Create an e-mail notification. The system defaults to the WFSTOP communication template. You can use the WFSTOP communication template to create the notification. You can also manually specify the subject, message, and role recipients.
3. Click OK. The system stops the workflow process. The system also sends any notifications.

Changing the status of a list of records

You can change the status of multiple records in applications.

Procedure

1. In the Work Order application, on the List tab of an application, filter the records so that less than 200 records are displayed.
2. Scroll down the bottom of the screen and select the Select Records check box.
The screen refreshes and each row now has a check box.
3. Select the check boxes for the work orders whose status you want to change.
4. Click the Change Status action and enter the information in the dialog box.
5. Click OK to close the Change Status window.

Labor Reporting

You use the Labor Reporting application to report the type and the total number of hours of work that external contractors or internal employees performed.

The Labor Reporting application contains a single window that displays labor transaction records. Use the Transactions table window to perform the following actions:

- Create labor transactions.
- Modify labor transactions.
- Delete labor transactions.
- Approve labor transactions.
- Invoice labor transactions.

You can also create labor transactions in other applications by using the ticket timer features.

- [Working with labor reports](#)
You use the Labor Reporting application to report the type and the total number of hours worked. You can create, modify, delete, approve, and invoice labor transactions.

Working with labor reports

You use the Labor Reporting application to report the type and the total number of hours worked. You can create, modify, delete, approve, and invoice labor transactions.

- [Creating labor transactions](#)
As work is done to complete a work order, you create labor transactions in the Labor Reporting application to record the work. You can enter labor transactions by labor, by vendor/contract, by work order, or by ticket.
- [Reporting work hours by work order](#)
You use the Labor Reporting application to specify work hours by work order. Reporting hours by work order is useful when you have a stack of work orders to report. You enter transactions for work orders whose status is not WAPPR (Waiting for Approval), CAN (Canceled), or CLOSE (Closed).
- [Reporting work hours by labor code](#)
Use the Labor Reporting application in the Work Orders module to specify work hours by labor code, tracking the time spent on specific tasks. You also can record daily attendance for each labor code.
- [Reporting work hours by ticket](#)
When you report labor hours, you can report them by ticket. You can specify a ticket and report all the labor transactions for that ticket. When you report labor hours by ticket, the asset, location, and start date are copied from the ticket.
- [Specifying labor transactions by contract/vendor](#)
When you have work performed by a vendor or by an outside contractor, you can specify labor transactions by vendor. The contract and vendor association are validated.
- [Recording daily attendance](#)
You can record daily attendance when you specify labor transactions by work order, by ticket, by labor, or by contract/vendor.
- [Creating invoices](#)
Your invoices can consolidate the labor transactions by work order or can list each transaction on its own line. When you create invoices for multiple labor transactions with different vendors, a separate invoice is created for each vendor.
- [Creating key performance indicators](#)
You create key performance indicators to track critical performance variables over time.

Creating labor transactions

As work is done to complete a work order, you create labor transactions in the Labor Reporting application to record the work. You can enter labor transactions by labor, by vendor/contract, by work order, or by ticket.

Procedure

1. In the Labor Reporting application, in the Transactions table window, click New Row.
2. Specify the details of the labor record.
3. Save the record.

Reporting work hours by work order

You use the Labor Reporting application to specify work hours by work order. Reporting hours by work order is useful when you have a stack of work orders to report. You enter transactions for work orders whose status is not WAPPR (Waiting for Approval), CAN (Canceled), or CLOSE (Closed).

Procedure

1. In the Labor Reporting application, select the Enter By Work Order action.
2. Specify the work order number.
3. Optional: Specify the task number.
4. Create a row for each labor transaction that was required for the work order.
5. Save the record.

Reporting work hours by labor code

Use the Labor Reporting application in the Work Orders module to specify work hours by labor code, tracking the time spent on specific tasks. You also can record daily attendance for each labor code.

Procedure

1. In the Labor Reporting application, select the Enter By Labor action.
2. In the Labor field, specify a value.
3. Specify the details for the hours worked.
4. Save the record.

Reporting work hours by ticket

When you report labor hours, you can report them by ticket. You can specify a ticket and report all the labor transactions for that ticket. When you report labor hours by ticket, the asset, location, and start date are copied from the ticket.

Procedure

1. In the Labor Reporting application, select the Enter By Ticket action.
2. Specify the ticket number.
3. Create a row for each labor transaction that was required for the ticket.
4. Specify the details for the transaction, including key fields such as the labor, craft, hours, and start and end dates.
5. Save the record.

Specifying labor transactions by contract/vendor

When you have work performed by a vendor or by an outside contractor, you can specify labor transactions by vendor. The contract and vendor association are validated.

Procedure

1. In the Labor Reporting application, select the Enter By Contract/Vendor action.
2. Specify either the vendor name or contract number.
3. Click New Row.
4. Specify the details of the labor transaction.

5. Save the record.

Recording daily attendance

You can record daily attendance when you specify labor transactions by work order, by ticket, by labor, or by contract/vendor.

Procedure

1. In the Labor Reporting application, select the Daily Attendance action.
2. In the Daily Attendance window, click New Row.
3. Select the labor or the craft whose attendance you want to record.
4. Specify the details for the attendance record.
5. Click OK.
6. Save the record.

Creating invoices

Your invoices can consolidate the labor transactions by work order or can list each transaction on its own line. When you create invoices for multiple labor transactions with different vendors, a separate invoice is created for each vendor.

Procedure

1. In the Labor Reporting application, in the Transactions table window, select the Select Records check box.
2. Select each labor transaction for which you want to create an invoice.
3. Select the Create Invoice action.
4. Enter the details for the invoice in the Create Invoice window.
5. Optional: Select or clear the Consolidate by Work Order check box for each transaction to either consolidate them or create separate invoices.
6. Click OK to create the invoice.

Creating key performance indicators

You create key performance indicators to track critical performance variables over time.

Procedure

1. In the Key Performance Manager application, click New KPI.
2. Provide a unique name for the key performance indicator.
3. Optional: Provide a description of the key performance indicator.
4. Specify either decimal or percentage as the calculation type.
5. Specify the selection criteria.
6. In the Query Details section, specify the KPI query.
7. To change the graph from green to yellow to red, in the KPI Parameters section, specify values in the Target field, Caution At field, and Alert At field.
If you want a low number, specify a low value in the Target field and a high value in the Alert At field. If you want a high number, specify a high value in the Target field and a low value in the Alert At field.
8. If you want everyone to have access to the KPI, select the Public? checkbox.
9. Optional: Specify values for linking the key performance indicator.
10. Save the key performance indicator.

What to do next

If you want to restrict who can see the KPI, from the Security tab, specify the security groups that have access to the KPI.

Quick Reporting

You use the Quick Reporting application to plan, to review, and to approve work orders for assets and locations. When you create a work order, you initiate the maintenance process and create a historical record of the work being performed.

You use the Quick Reporting application to perform the following additional functions:

- Create work orders, view work orders, and modify work orders.
- View preventive maintenance and scheduling information.
- See which job plan and safety plan are applied.
- Report actual labor, materials, and tool use.
- View and enter failure information.

- View the originating work order for a follow-up work order.
- **Quick reporting overview**
As work progresses on your work orders, you can change the status, report actuals, and enter failure information. You can also view costs and create relationships between records.
- **Working with quick reporting**
When you create a work order, you initiate the maintenance process and create a historical record of the work being performed.

Quick reporting overview

As work progresses on your work orders, you can change the status, report actuals, and enter failure information. You can also view costs and create relationships between records.

- **Costs on tickets and work orders**
You can view the estimated and actual costs for a single work order or ticket, including costs for labor, material, tools, and services. You can also view total costs for the current record and all the records below it in its hierarchy.
- **Work order statuses**
The status of a work order indicates its position in the processing cycle. The status determines which actions can be performed on the work order. For example, if the work order is approved, it has a status of APPR and the tasks can begin.
- **Record relationships**
Relationships between records, such as tickets and work orders, help simplify record management. You can create record relationships manually, or relationships might be created automatically when you take certain actions.
- **Preventive maintenance alert information**
The PM Alert message is a system-generated message that notifies you of pending preventive maintenance work when an asset is being repaired or a work order is generated against a location.
- **Rules for deleting work orders**
You use the Quick Reporting application to delete a work order under specific conditions. When you delete a work order, you can elect whether to delete the associated child work orders.

Costs on tickets and work orders

You can view the estimated and actual costs for a single work order or ticket, including costs for labor, material, tools, and services. You can also view total costs for the current record and all the records below it in its hierarchy.

When you view the costs of a ticket or work order, the data is displayed in two tables:

- The Totals table displays the costs for a single ticket or work order.
- The View Hierarchy Grand Totals table displays the costs for the current ticket or work order and all records under its hierarchy.

Each table presents the same information, which is shown in the following table.

Column	Explanation
Current Estimate	Displays read-only calculated values for the current totals from the Labor, Materials, Standard Services, and Tools tabs of the Plans tab for the ticket or work order.
Estimate at Approval	Is set to zero until the work order is approved, then the values are copied from the Current Estimate column and are read-only. If the work order status changes from approved to unapproved, then these fields are cleared. The estimated costs at approval are not affected by the change in status from in progress to completed or closed.
Actual	Displays the read-only values from the Labor (for approved labor only), Materials, and Tools tabs of the Actuals tab. If the status of the record changes from approved, then these fields are not cleared.

Rolling up maintenance costs

After you close a work order that is associated with an asset, you can calculate your maintenance costs by rolling up costs that you incur for labor, materials, tools, and services to the top-level asset in the hierarchy that the asset belongs to.

Costs can be rolled up manually or automatically. By default, cost rollups are manual. If you want costs to be calculated and rolled up automatically when a work order is closed, you must set the `mxe.workorder.rollupMaintenanceCosts` system property to 1. After you configure the system property for automatic rollups, all subsequent costs that are associated with work orders are rolled up automatically. However, any unprocessed maintenance costs that existed before the configuration are not automatically rolled up. You must roll up any preexisting, unprocessed maintenance costs manually.

To calculate the maintenance cost of your assets, use the Roll Up Maintenance Costs action in the Assets application.

If you upgrade to Maximo® Manage 8.5, run the Asset Cost Rollup Report to roll up pending maintenance costs before the upgrade.

Work order statuses

The status of a work order indicates its position in the processing cycle. The status determines which actions can be performed on the work order. For example, if the work order is approved, it has a status of APPR and the tasks can begin.

WAPPR

- The work order is waiting for approval. WAPPR is the default status for work orders that are created in the Work Order Tracking, Changes, Releases, and Activities applications.
- APPR
The work order is approved and the work can begin.
- WSCH
The work order is waiting to be scheduled. WSCH is the default status for work orders that are created in the Preventive Maintenance application.
- WMATL
Materials must arrive before the work can be performed.
- WPCOND
The work can be performed only when the condition of the plant is suitable. For example, certain work might require that the plant is shut down.
- INPRG
The work is in progress. INPRG is the default status for work orders that are created in the Quick Reporting application.
- COMP
The physical work is completed.
- CLOSE
The work order is closed. Inventory reservations for items that were not used for the work listed on the work order are removed, and the work order becomes a history record.
- CAN
The work order is canceled. You cannot cancel a work order if the work is already in progress or if actuals are already reported.
- HISTEDIT
The work order was edited in history.

Effects of changing work order statuses

Work orders can be controlled by a workflow process, which can lead to automatic status changes.

Child work orders can inherit status changes from their parent. Inheritance of status changes is controlled by the Inherit Status Changes check box.

If you are using process flow control, you can ensure that the status is inherited from the parent work order to the child work order. To allow status inheritance, you must activate the `mxe.app.wo.flowControlStatusInheritance` setting in the System Properties application. Two statuses can never be inherited with process flow control; the Flow Start and Flow Complete statuses. Flow Start and Flow Complete are INPRG and COMP, by default. You can change the default status settings in the Organizations application, by selecting Work Order Options_>Work Type and specifying values for the start status and the complete status.

The following table shows the effects of changing the status of a work order.

Change to status	Effects
APPR (Approved)	<ul style="list-style-type: none"> The work plan items are reserved in the Inventory application and in the cost and rate data. Rates can be changed in the Inventory application, the Labor application, or the Tools application. If the rates change, the work plan reflects the rates in effect when the work order was approved. You can no longer delete the work order.
CAN (Canceled)	<ul style="list-style-type: none"> Work orders that are not started are canceled. Work orders that have no actuals reports are also canceled. Canceled work order become history records.
CLOSE (Closed)	<ul style="list-style-type: none"> The work order is finalized. Inventory reservations for unused items on the work order are removed. The work order becomes a history record.
COMP (Completed)	<ul style="list-style-type: none"> All physical work that is associated with a work order is finished. If you planned to move or modify an asset on the work order, the move or modification occurs when the status is changed to COMP.
INPRG (In Progress)	<ul style="list-style-type: none"> Physical work on the work order is currently in progress.

Allowed changes to work order statuses

The following table shows the possible changes to the status of a standard work order. However, process flow control can restrict which status changes are possible.

Status	New status options
WAPPR	<ul style="list-style-type: none"> INPRG CAN WMATL COMP WPCOND APP CLOSE

Status	New status options
APPR	<ul style="list-style-type: none"> • INPRG • WMATL • COMP • WPCOND • WAPPR • CAN • CLOSE
WSCH	<ul style="list-style-type: none"> • INPRG • WMATL • COMP • WPCOND • WAPPR • CAN • CLOSE
WPCOND	<ul style="list-style-type: none"> • INPRG • WMATL • COMP • WPCOND • WAPPR • CAN • CLOSE
WMATL	<ul style="list-style-type: none"> • INPRG • COMP • WPCOND • WAPPR • CAN • CLOSE
INPRG	<ul style="list-style-type: none"> • WMATL • COMP • WAPPR • CLOSE
COMP	CLOSE
CAN	None.
CLOSE	HISTEDIT

Related reference

- [Workflow properties](#)

Record relationships

Relationships between records, such as tickets and work orders, help simplify record management. You can create record relationships manually, or relationships might be created automatically when you take certain actions.

The types of relationships that can exist between records include:

- Related relationship, which is an informal association of tickets that is used for informational purposes.
- Originator and Follow-up, which keep costs hierarchies separate while still creating a relationship between the tickets.
- Related to Global, which creates a relationship in which the tickets are related to a global issue, which affects many users.

Related records

Using any ticket or work-based application, you can view similar records and relate tickets and work orders to the current record. A related relationship between records is an informal relationship that is for informational purposes only.

A related relationship does not affect status inheritance, affect workflow, or follow a set of business rules. Related relationships can be many-to-many, and do not represent record hierarchies. By relating records informally, you can navigate to related records, view related information for similar records, and view open tickets that are associated with a field. You can create an informal record relationship in the following ways:

- Use the Related Records tab of the application. This tab provides an easy way to create relationships and to view and navigate among informally related records.
- Use the Show Similar Tickets action in any ticket application. The similar ticket search results only include the service requests, incidents, and problems that have the same classification as the current ticket. Global records and history records are not included in the results. Your system administrator might add more restrictions to the search results.

Originator and follow-up tickets and work orders

You can relate tickets and work orders to a record more directly when you create a follow-up record from the ticket using one of the Create actions on the ticket. The ticket you create the follow-up record from is the originator. A follow-up record can be a ticket or a work order. In some cases, a follow-up ticket or work order might be able to change the status of its originating ticket. An originating ticket cannot change the status of a follow-up work order, nor can a follow-up ticket change the status of the originator if there is more than one follow-up. These options are configured by the system administrator.

Globally related tickets

A global ticket is an incident or problem relating to an issue that affects many users. You can relate tickets, including service requests, to a global ticket, which creates a RELATEDTOGLOBAL relationship. This relationship lets you manage the tickets by using the global ticket. When you change the status of the global ticket, the system changes the status of all globally related tickets.

If your administrator has set up automated notifications of status changes, the system changes the status of the tickets related to the global issue. For example, all the initial requestors reporting the same issue are notified of its resolution. On the global ticket, you can also view a list of related records and view the work and communication logs for all related records.

- [Deletion of record relationships](#)

On the Related Records tab, you can delete the relationship between a change and any related work orders or tickets.

- [Global records](#)

A global record is a ticket that is a root cause of other issues or that affects many users, such as computer network failures or flooding in a building. After you mark a record as global, you can relate multiple tickets and then manage all tickets using the global record.

Preventive maintenance alert information

The PM Alert message is a system-generated message that notifies you of pending preventive maintenance work when an asset is being repaired or a work order is generated against a location.

The PM Alert message helps reduce downtime by letting you perform upcoming routine maintenance while performing non-routine repairs. In order for the PM Alert message to be displayed, the preventive maintenance must have its Alert check box selected and the site must be set up to display alerts.

When a corrective maintenance work order reaches the status specified in PM Options in the Organizations application and the asset or location has pending preventive maintenance, then the PM Alert window displays when either of the following criteria is met:

- The system date is on or after the Estimated Next Due Date minus the Alert Lead. For example, if the system date is May 25, and the Estimated Next Due Date is June 1 and the Alert Lead is 10 days, the PM Alert message displays. The message displays from May 23 through June 1.
- The current meter reading for the asset or the location is greater than the Next Meter Reading projection minus the Alert Lead. For example, if the last meter reading for the asset was 975 units, and the Next Meter Reading is 1,000 units and the Alert Lead is 50 units, the PM Alert message displays. The message displays when the meter reading is at least 950.

Rules for deleting work orders

You use the Quick Reporting application to delete a work order under specific conditions. When you delete a work order, you can elect whether to delete the associated child work orders.

If you want to delete a work order and its child work orders, then the work order and its children must meet the following criteria:

- They must have a status of Waiting for Approval (WAPPR).
- They must not have any transactions registered against them, except for Work Order Status (WOSTATUS).
- They must not have any actuals reported against them.
- They must not have any labor assignments associated with them.
- They must not have any measurements or meter readings taken against them.
- They must not have been generated for a purchase order or for a receipt.
- They must not have any failures reported against them.
- They must not be in Workflow, or ever have been in Workflow.
- They cannot have been created by a Preventive Maintenance generation.
- They cannot be in follow-up work or have follow-up work in progress.

Working with quick reporting

When you create a work order, you initiate the maintenance process and create a historical record of the work being performed.

- [Creating work orders for quick reporting](#)

You can use the Quick Reporting application to create a work order for a location, for an asset, or for a General Ledger account.

- [Applying routes to work orders](#)

You can apply a route to a work order to define a list of related work assets. For example, you can define assets, locations, or a combination of both; each of which is considered to be a stop along the route. The work assets can be related by location, such as all pumps and motors in a room. Or they can be related by the type of asset, such as all fire extinguishers at a site.

- [Reporting actuals for work orders](#)

As work progresses on an approved work order, you can report the actual labor hours, materials, services, and tools used.

- [Specifying meter readings on work orders](#)

You can enter meter readings for the asset and the location on a work order. An asset can be set up to inherit the meter readings of its parent asset or its

location.

- [Reporting downtime for assets](#)
You can report the start time and the end time of the downtime for an asset after it has occurred.
- [Swapping assets](#)
You can swap assets associated with a work order. The swap action applies to the work order and all of the assets, locations, and configuration items on its child work orders. The term "work order" can refer to a work order, change, release, or activity record.
- [Assigning a parent to a work order](#)
You can assign a parent to a work order and assign tasks to that parent. When you assign work order records to a parent, they become child work orders records of the parent record.
- [Changing the status of a list of records](#)
You can change the status of multiple records in applications.

Creating work orders for quick reporting

You can use the Quick Reporting application to create a work order for a location, for an asset, or for a General Ledger account.

Procedure

1. In the Quick Reporting application, click the New Work Order icon.
 2. If the work order is for a location, type its identifier in the Location field.
 3. If the work order is for an asset, type its identifier in the Asset field.
 4. To charge the work order to a General Ledger account, type its identifier in the GL Account field.
 5. Specify the details of the work order.
 6. Save the record.
- [Completing work orders](#)
You use the Quick Reporting application to change the status of one or more selected work orders to Completed (COMP) status. The Completed status indicates that all the physical work associated with a work order is finished.

Completing work orders

You use the Quick Reporting application to change the status of one or more selected work orders to Completed (COMP) status. The Completed status indicates that all the physical work associated with a work order is finished.

Procedure

1. In the Quick Reporting application, on the List tab, select the Select Records check box.
2. Select the records you want to complete.
3. Select the Change Status action.
4. Set the status to Completed.
5. Optional: Modify the date in the Status Date field, and add a note to the Memo field.
6. Click OK.

Applying routes to work orders

You can apply a route to a work order to define a list of related work assets. For example, you can define assets, locations, or a combination of both; each of which is considered to be a stop along the route. The work assets can be related by location, such as all pumps and motors in a room. Or they can be related by the type of asset, such as all fire extinguishers at a site.

About this task

Each route stop can have its own job plan, which the system copies to the child work order. You can apply a route to a work order in the Work Order Tracking and Quick Reporting applications.

Procedure

1. Open an application and display the work order record that you want to update.
2. Select the Apply Route action.
3. Select the route that you want to apply to the work order.
A message box opens and displays a list of child work orders that are created from the route.
4. Click Save Work Order.

Results

The created child work orders display as route stops on the Plans tab in the Work Order Tracking application.

Reporting actuals for work orders

As work progresses on an approved work order, you can report the actual labor hours, materials, services, and tools used.

Procedure

1. Display the work order for which you want to report actuals.
2. On the Actuals tab, enter the details on the following subtabs:

Option	Description
Labor	Report hours for labor, copy labor from the work plan, or select planned labor.
Materials	Select materials, select reserved items, and select spare parts.
Services	Select services or standard services.
Tools	Select tools, copy tool data from the work plan, or select tools that were issued to the work order.

3. Save the record.

Specifying meter readings on work orders

You can enter meter readings for the asset and the location on a work order. An asset can be set up to inherit the meter readings of its parent asset or its location.

About this task

To find out if an asset is inheriting meter readings, go to the asset record and check the value in the Accept Rolldown From field.

Procedure

1. Display the record for which you want to enter a reading.
2. From the Select Action menu, select Enter Meter Readings.
3. To enter a meter reading, select either of the following options:
 - To enter a meter reading for the asset, click the Asset Meter Readings tab.
 - To enter a meter reading for the location, click the Location Meter Readings tab. If the asset and location have meters, and the asset inherits the meter reading for the location, enter a reading for either the asset or the location. If the asset has child records that inherit meter readings, the meter readings for the child records are updated. If the location has assets that inherit meter readings for the location, the readings for the assets in that location are updated.
4. In the New Reading field, enter a value, or click Select Value. The system date and time display in the New Reading Date field. The log in name for the user displays in the Inspector field.
5. To change the inspector, specify a value, or click Detail Menu to retrieve a value.
6. To enter the reading and return to the record, click OK.

Reporting downtime for assets

You can report the start time and the end time of the downtime for an asset after it has occurred.

About this task

You can create multiple downtime reports for a single work order.

Procedure

1. Display the record with the asset for which you want to report downtime.
2. Select the Report Downtime action.
3. In the Downtime Report section, select the Report Downtime option.
4. Specify the date the downtime began, or select one of the following options in the Start Date Default section:
 - Reported Date - the date and time the downtime for the asset was reported on the work order.
 - Actual Start Date - the date and time the downtime for the asset actually began.
 - None - no default start date and time.
5. Enter a date the downtime ended or will end.
6. In the Hours field, the system calculates the total downtime hours based upon the start date and the end date. This calculation considers the calendar for the asset. The calculation also considers the elapsed time between the start of downtime, and the end of downtime.
7. In the Downtime Code field, click Select Value to select a code.
8. In the Downtime Type section, select either of the following options:
 - Operational - if the down time occurred when the asset is normally in use
 - Non-Operational - if the down time occurred when the asset is normally not in use.
9. Click OK to report the downtime and return to the record.

Swapping assets

You can swap assets associated with a work order. The swap action applies to the work order and all of the assets, locations, and configuration items on its child work orders. The term "work order" can refer to a work order, change, release, or activity record.

Before you begin

You can execute the swap immediately, or you can save the swap as a plan. If you save the swap as a plan, the changes will apply when the status for the work order is COMP (Complete). When the status of a work order is COMP, you swap assets only using the Execute Now option. When you select Execute Now on any tab, the system executes the changes on all tabs.

When you duplicate a work order that has a planned swap to its assets or locations, the planned action does not get copied to the duplicate work order. Also, when you create a release, or change, or work order from a record using the Select Action menu option, the planned action is not copied to the follow-up record.

Procedure

1. Select the Move/Swap/Modify action.
2. Click the Move/Swap tab.
3. Select the Is this an Asset Swap checkbox.
4. In the Swap Assets section, select the row for the asset you want to swap.
5. To move the asset to a parent or location, type a value in the appropriate field, or click Select Value to retrieve a value.
6. In the Replacement Asset field, specify an asset, or click Select Value to retrieve a value.
7. Perform one of the following actions:
 - To swap the assets immediately, click Execute Now.
 - To swap the assets when the status for the work order is COMP (Complete), click Save as Plan.

Assigning a parent to a work order

You can assign a parent to a work order and assign tasks to that parent. When you assign work order records to a parent, they become child work orders records of the parent record.

About this task

You cannot assign parent records to closed work order records. If the parent has a value in the Priority field, and the child or children work order records do not, the child or children work order records inherit the parent priority value.

Procedure

1. Open an application and display the work order record that you want to update.
2. On the List tab, select the task that you want to update.
3. Select the Assign To New Parent action.
4. Select the work order record that you want as the new parent.
The asset management system displays the parent work order number in the Parent WO field.
5. Click Save record.

Changing the status of a list of records

You can change the status of multiple records in applications.

Procedure

1. In the Work Order application, on the List tab of an application, filter the records so that less than 200 records are displayed.
2. Scroll down the bottom of the screen and select the Select Records check box.
The screen refreshes and each row now has a check box.
3. Select the check boxes for the work orders whose status you want to change.
4. Click the Change Status action and enter the information in the dialog box.
5. Click OK to close the Change Status window.

Assignment Manager

You use the Assignment Manager application to dispatch labor and schedule work for your organization.

Using the Assignment Manager application, you can view the requirements that were created from the work plan, as well as the unplanned work on a work order. You also can add new requirements to the work list.

You also can view work order assignments and associated craft, skill level, vendor, contract, and organization requirements. You can specify whether to view labor that applies to specific requirements, or to view work order requirements that fit the craft, skill level, vendor, contract, and organization requirements, calendar availability, or shift of displayed labor.

If a default labor query was selected in the Labor application, the labor list displays a filtered list of available labor codes. If there is no selected query, the Labor List displays all the labor in the database. To schedule labor codes, both a calendar and a shift must be specified on the person record in the People application.

To facilitate dispatching work assignments, the work list is color coded to indicate work requirements by priority. You can change the color choices and priority ranges to fit your business needs.

- [Work assignments overview](#)
Work assignments dispatch labor and schedule work for your organization. You create and reassign work assignments using the Assignment Manager application.
- [Working with work assignments](#)
Using the Assignment Manager application, you can view the requirements that were created from the work plan, as well as the unplanned work on a work order. You also can add new requirements to the work list.

Work assignments overview

Work assignments dispatch labor and schedule work for your organization. You create and reassign work assignments using the Assignment Manager application.

- [Status of work assignments](#)
In the Assignment Manager application, the status indicates the position of a work assignment within the work process flow.
- [Changes to labor availability for work assignments](#)
In the Assignment Manager application, you can change the availability of labor for work assignments.
- [Priority preferences for work assignments](#)
In the Assignment Manager application, you can manage the calculations for work priority and the response time for work priority for your work assignments.
- [Parameter preferences for work assignments](#)
In the Assignment Manager application, you can manage the parameters of work assignments. For example, you can decide whether labor transactions are created when an assignment is interrupted or finished.

Status of work assignments

In the Assignment Manager application, the status indicates the position of a work assignment within the work process flow.

The following statuses are used for work assignments:

WAITASGN

When a work assignment is created, the status is set to waiting for assignment.

ASSIGN

This status indicates that the assignment was assigned to a labor code. If you delete the labor code for this assignment, the status reverts to waiting for assignment.

STARTED

This status indicates that the laborer has begun work on the assignment and actual labor transactions can be recorded. A laborer can start assigned work assignments only. The status of the work order is changed to in progress.

INTERPT

This status indicates that an assignment that was started was interrupted before complete. Based on your preferences settings, actual labor transactions can be posted.

COMPLETE

This status indicates that the work assignment is complete. After all assignments on a work order are completed, the work order is either closed or completed, depending on your parameter settings. If the work order is closed, the assignments for that work order are deleted and the status of the work order is set to close. If the work order is completed, the status of the work order is changed to complete. Based on your preferences settings, actual labor transactions can be posted.

Unplanned work orders can have work assignments without a status. After you assign the work assignment to a labor code, an assignment with a status of assigned is created.

Changes to labor availability for work assignments

In the Assignment Manager application, you can change the availability of labor for work assignments.

To change the availability of labor for work assignments in the Assignment Manager application, click the Modify Availability icon for the labor code. The labor code must have an assigned calendar.

If a laborer is covering the shift for another laborer, you can add hours to the availability of the labor code. In addition, you can indicate when laborers are unavailable to be assigned to work.

Priority preferences for work assignments

In the Assignment Manager application, you can manage the calculations for work priority and the response time for work priority for your work assignments.

You use the Set Priority Preferences action to change the work priority calculation and the work priority response times. The settings that you select affect all Work Orders applications.

By default, the calculated priority is displayed to determine the priority of an assignment. In the Assignment Manager application, you can use the Set Priority Preferences action to change the criteria that is used to calculate work priority.

You also can specify how soon individuals must respond to work orders of a given priority. When you create a work order, the response time is calculated relative to the system date or time.

Parameter preferences for work assignments

In the Assignment Manager application, you can manage the parameters of work assignments. For example, you can decide whether labor transactions are created when an assignment is interrupted or finished.

Using the Set Parameter Preferences action in the Assignment Manager application, you can set the following preferences:

- How many rows are available in the Modify Availability window.
- Whether a labor transaction is created when an assignment is interrupted or finished.
- Whether to set the status of a finished assignment to close or complete.

If you change the status of a work order to close, all assignments for that work order are deleted. If you change the status of a work order to complete in another application, the status of assignments on that work order are changed to complete.

Working with work assignments

Using the Assignment Manager application, you can view the requirements that were created from the work plan, as well as the unplanned work on a work order. You also can add new requirements to the work list.

- [Adding work assignments](#)
To simplify the management of work assignments, you can add work assignments for your organization.
- [Specifying labor for work assignments](#)
You can assign labor for work assignments by calendar or by labor codes. Algorithms determine optimal time distribution. For example, an assignment requires six hours of labor. If the selected labor code has only four hours available on one day, the remaining hours are assigned on the next available day.
- [Reassigning work assignments](#)
To manage your work assignments, you can reassign planned work to a different labor code or a different time.
- [Assigning multiple work records to multiple labor codes](#)
You can use the Assignment Manager application to assign and schedule a group of work records to a group of labor records, or labor codes, in bulk.

Adding work assignments

To simplify the management of work assignments, you can add work assignments for your organization.

Procedure

1. In the Assignment Manager application, add a new row.
2. Specify the details of the assignment.
3. Save the work assignment.

Specifying labor for work assignments

You can assign labor for work assignments by calendar or by labor codes. Algorithms determine optimal time distribution. For example, an assignment requires six hours of labor. If the selected labor code has only four hours available on one day, the remaining hours are assigned on the next available day.

Procedure

1. In the Assignment Manager application, select the work order to which you want to assign labor.
2. In the Work List section, select the assignments to which you want to assign labor.
3. In the Labor List section, locate the labor code for the laborer and specify the details of the assignment.
4. Save the record.

Reassigning work assignments

To manage your work assignments, you can reassign planned work to a different labor code or a different time.

Procedure

1. In the Assignment Manager application, in the Labor List section, find the labor record that you want to reassign.
2. Click the Show Assignments icon for the labor record.
3. In the Show Assignments window, change the assignment, which can include the following options:
 - To assign the work to another laborer, specify a new labor code.
 - To reschedule the work, specify a new scheduled start date.
 - To change the labor hours, specify a new value for the hours.
4. Save the record.

Assigning multiple work records to multiple labor codes

You can use the Assignment Manager application to assign and schedule a group of work records to a group of labor records, or labor codes, in bulk.

About this task

You can assign multiple work records to a team of laborers in order to increase efficiency. For example, if you have several unplanned jobs you can schedule a group of unassigned people to complete them all. Assigning multiple work records to a team of laborers creates an ad hoc team, because all selected labor people work on all selected jobs together.

Procedure

1. In the Assignment Manager application, select the work records you want to assign to your labor team.
2. In the Work List table, select the records you want to assign out. Only work records with no status and with no craft associated with them can be assigned to more than one labor record at a time.
3. In the Labor List table, select the labor records to whom you want to assign the work.
4. Click Assign Labor. The work is assigned at the earliest possible date to all selected labor records. Or, to assign the work to be done on a certain day, click the date in the row for one of the labor records. If all selected labor records are not scheduled that day, the work is assigned to them on the next scheduled work day.
5. Click Save.
The work records are updated to reflect the new assignments. If you specify labor it is assigned for the duration of the work. If no duration exists, the labor is assigned for one hour.

Service Requests

You use the Service Requests application to manage requests for services that involve an asset or location in your enterprise. For example, you might receive a request to upgrade the computer software on the notebook for a user, or for all users at certain locations.

Service requests include requests that are communicated to you directly from a user, for example from a phone call, e-mail message, or direct contact. You also receive service requests from self-service users who create requests using the Create Service Request application. Other service requests might originate from an automated workflow process.

The owner of a service request is responsible for managing the ticket to completion. You can assign the ownership of a service request to another person or a workgroup. If you are the logged-in user, you can take ownership of the request and complete it yourself. You, or the assigned owner, can update the service request as more details are known about it.

For example, you can identify who the service affects and what priority it has. You can specify who the service request might be escalated to if issues arise and change the status of the request as it moves toward completion. You can apply service level agreements to the service request so that related legal and contact information is readily available. All communication that pertains to the service request can be stored in the log of the service request to provide a clear history of its lifecycle.

Example of a service request that involve multiple assets and locations

A service request might involve a high-level task, such as installing graphic software on all the notebooks that belong to Product Managers. To complete this task, a service technician needs to know who the product managers are and where their notebooks are located. You can identify all this information using the features on the Service Request tab.

For example, you can identify `Project Managers' Notebooks` as the primary affected asset using the Service Request Details section. You can then identify each Product Manager and the location and details of each notebook using the Multiple Assets, Locations, and CIs section.

- [Service requests overview](#)
A service request record captures information about a request, including the type of service, who needs it, where, when, and why. You use the Service Requests application to manage requests for services that involve an asset or location in your enterprise.

- [Working with service requests](#)

You can create service requests either in the Service Requests application or as records related to other tickets or work orders. You can apply service level agreements, categorize requests, create relationships with other records, assign and record labor activities, and log actions and communications.

Service requests overview

A service request record captures information about a request, including the type of service, who needs it, where, when, and why. You use the Service Requests application to manage requests for services that involve an asset or location in your enterprise.

- [Service request management](#)
A service request captures information about the service being requested by a user, including the type of service that is needed, when it is needed, and why it is needed. Managing service requests involves creating, updating, assigning, escalating, and resolving requests for service on an asset or a location in your enterprise.
- [Service request templates](#)
A service request template contains predefined data that you can insert in common, high-volume service request records. Applying templates can significantly reduce the amount of time needed to create service requests.
- [Service level agreements](#)
A service level agreement (SLA) typically is a written agreement that outlines the commitment between a service provider and its customers. A commitment is a service level that all parties have agreed to, such as asset reliability or availability.
- [Record relationships](#)
Relationships between records, such as tickets and work orders, help simplify record management. You can create record relationships manually, or relationships might be created automatically when you take certain actions.
- [Service request categorization](#)
To simplify the task of retrieving and managing service requests, you can categorize the requests using classifications. Most classifications have attributes associated with them that group the classification further. You can add, change, or delete the attributes at any time, or you can reclassify the request to obtain a new set of attributes.
- [Ticket statuses](#)
Every ticket has a status that indicates its position as it moves toward completion. Changes to the ticket status can happen automatically or manually.
- [Costs on tickets and work orders](#)
You can view the estimated and actual costs for a single work order or ticket, including costs for labor, material, tools, and services. You can also view total costs for the current record and all the records below it in its hierarchy.
- [Linear segment details](#)
You use the Linear Segment Details section to locate a linear segment or point on a linear asset. The Linear Segment Details section, which displays on tabs in several applications, appears only if you are working with a linear asset.
- [Restrictions on deleting tickets](#)
You can delete a ticket only when it has a certain status and only when transactions have not been recorded for it.

Service request management

A service request captures information about the service being requested by a user, including the type of service that is needed, when it is needed, and why it is needed. Managing service requests involves creating, updating, assigning, escalating, and resolving requests for service on an asset or a location in your enterprise.

A service request can be created and managed in several ways.

Method of service request creation	Description
Service Requests application	Used by service desk agents or users in a similar role, who are authorized to create and manage service requests.
Create Service Request application	Used by self-service users who are requesters who can register themselves on the system without the assistance of an agent, and create a service request. The request is then managed by an agent using the Service Requests application. Self-service users also can use the View Service Request application to view the status of their service request as it progresses toward completion.
Automatic	Your system administrator can configure the system to create service requests from sources such as e-mail, system monitoring tools, or external applications, and assign them to people or work groups for resolution.

Service request templates

A service request template contains predefined data that you can insert in common, high-volume service request records. Applying templates can significantly reduce the amount of time needed to create service requests.

If you select and apply a template to a service request record, it overwrites existing data in the record. If there is data in a Service Request field but no data in the corresponding field on the template, the template does not delete the existing data. You can modify the applied information until the service request is in a resolved or closed status.

Service level agreements

A service level agreement (SLA) typically is a written agreement that outlines the commitment between a service provider and its customers. A commitment is a service level that all parties have agreed to, such as asset reliability or availability.

The SLA describes one or more commitments and the escalation actions or notifications associated with each commitment. Escalation actions or notifications might be associated with an SLA to ensure that commitments are met. An escalation process can monitor all activities and send notifications or perform other activities to ensure that commitments are met.

The types of records to which service level agreements can be applied include tickets, such as service requests, and work-based records, such as work orders. Before you can apply an SLA to a record, the record must have a site defined.

A service level agreement can be associated with a record in several ways:

- An SLA might automatically be applied to a record from within a workflow or escalation process, or from another SLA.
- You can select an action to apply an SLA, which applies the best match automatically.
- You can view SLAs and select an action to select or clear the SLAs that you want to manually apply to the record.

When you apply a service level agreement to a record, the following events occur:

- The SLA Applied check box on the main tab of the record is selected to document the action.
- Any escalations that are associated with the SLA are activated.
- The Target Start, Target Finish, and Contact values for the record might be calculated automatically as follows:

Automatically calculated values
When an SLA is applied that includes a response commitment, the response commitment date populates the Target Start date field of the record.
When an SLA is applied that includes a resolution commitment, the resolution commitment date populates the Target Finish date field of the record.
When an SLA is applied that includes a contact commitment, the contact commitment date populates the Target Contact date field of the record.

Record relationships

Relationships between records, such as tickets and work orders, help simplify record management. You can create record relationships manually, or relationships might be created automatically when you take certain actions.

The types of relationships that can exist between records include:

- Related relationship, which is an informal association of tickets that is used for informational purposes.
- Originator and Follow-up, which keep costs hierarchies separate while still creating a relationship between the tickets.
- Related to Global, which creates a relationship in which the tickets are related to a global issue, which affects many users.

Related records

Using any ticket or work-based application, you can view similar records and relate tickets and work orders to the current record. A related relationship between records is an informal relationship that is for informational purposes only.

A related relationship does not affect status inheritance, affect workflow, or follow a set of business rules. Related relationships can be many-to-many, and do not represent record hierarchies. By relating records informally, you can navigate to related records, view related information for similar records, and view open tickets that are associated with a field. You can create an informal record relationship in the following ways:

- Use the Related Records tab of the application. This tab provides an easy way to create relationships and to view and navigate among informally related records.
- Use the Show Similar Tickets action in any ticket application. The similar ticket search results only include the service requests, incidents, and problems that have the same classification as the current ticket. Global records and history records are not included in the results. Your system administrator might add more restrictions to the search results.

Originator and follow-up tickets and work orders

You can relate tickets and work orders to a record more directly when you create a follow-up record from the ticket using one of the Create actions on the ticket. The ticket you create the follow-up record from is the originator. A follow-up record can be a ticket or a work order. In some cases, a follow-up ticket or work order might be able to change the status of its originating ticket. An originating ticket cannot change the status of a follow-up work order, nor can a follow-up ticket change the status of the originator if there is more than one follow-up. These options are configured by the system administrator.

Globally related tickets

A global ticket is an incident or problem relating to an issue that affects many users. You can relate tickets, including service requests, to a global ticket, which creates a RELATEDTOGLOBAL relationship. This relationship lets you manage the tickets by using the global ticket. When you change the status of the global ticket, the system changes the status of all globally related tickets.

If your administrator has set up automated notifications of status changes, the system changes the status of the tickets related to the global issue. For example, all the initial requestors reporting the same issue are notified of its resolution. On the global ticket, you can also view a list of related records and view the work and communication logs for all related records.

- [Deletion of record relationships](#)
On the Related Records tab, you can delete the relationship between a change and any related work orders or tickets.
- [Global records](#)

A global record is a ticket that is a root cause of other issues or that affects many users, such as computer network failures or flooding in a building. After you mark a record as global, you can relate multiple tickets and then manage all tickets using the global record.

Global records

A global record is a ticket that is a root cause of other issues or that affects many users, such as computer network failures or flooding in a building. After you mark a record as global, you can relate multiple tickets and then manage all tickets using the global record.

The following features, conditions, and restrictions pertain to using and managing global records:

- When you display a global record, and select the Show Similar Tickets action in the toolbar, you can view all tickets that are related to the global record. You also can select tickets and relate them to the global ticket.
- A record can be a global ticket or related to a global ticket, but not both.
- You can view the work and communication logs for all related records from the global record.
- If you change the status of a global record, the statuses of all globally related tickets change accordingly.
- Records that are created as follow-up records from the global record cannot be related to it as a global record.
- You cannot manage follow-up records from the global record.
- You cannot relate any record to a global record that is archived as a history record.
- You cannot designate a record as global if it is already related to a global record or it is a history record.
- You can remove the global flag from a global record that has tickets related to it, but you must first remove the value in the Related to Global ID field for each ticket that is related to the global record. You can do so using the Related Records tab of the global record.

Service request categorization

To simplify the task of retrieving and managing service requests, you can categorize the requests using classifications. Most classifications have attributes associated with them that group the classification further. You can add, change, or delete the attributes at any time, or you can reclassify the request to obtain a new set of attributes.

For example, a service request might involve first classifying the request by technical area, such as hardware, software, or network. If a user selects the software classifications, further classifications might allow the specification of the exact software type and version.

You can specify values for the attributes. Classifying service requests also supports the integration of service requests with related workflow processes, escalations, and service level agreements.

Ticket statuses

Every ticket has a status that indicates its position as it moves toward completion. Changes to the ticket status can happen automatically or manually.

If you change the status of a global ticket, then the same status change is automatically made to all related tickets.

Status changes can happen automatically as the result of workflows. For example, you can create a workflow that changes the status to QUEUED automatically when a ticket is assigned to an owner for resolution. Workflows can also result in tickets being automatically routed, escalated, reported to another party, or closed.

In some cases, such as that of related records, changing the status of a follow-up record might change the status of its originating record. The service desk administrator configures these options.

Your system administrator can add, remove, or change the names of the basic statuses.

NEW

The default status that is applied when a ticket is created or inserted. You cannot return a ticket to this status after you change it.

QUEUED

The ticket is in the queue and work can begin on it.

INPROG

Work on the ticket is ongoing.

PENDING

The ticket is pending an action. For example, work cannot continue until a part is received.

RESOLVED

Information was gathered and routed, service was restored, or a solution was provided. When the status of a record changes to RESOLVED, the status of all the activities in that record changes to COMPLETE.

CLOSE

A closed record is a historical archive and you cannot change its status. You can, however, change editable fields of the archived record. When the status of a record changes to CLOSED, the system changes the status of all activities in that record to CLOSED.

Costs on tickets and work orders

You can view the estimated and actual costs for a single work order or ticket, including costs for labor, material, tools, and services. You can also view total costs for the current record and all the records below it in its hierarchy.

When you view the costs of a ticket or work order, the data is displayed in two tables:

- The Totals table displays the costs for a single ticket or work order.
- The View Hierarchy Grand Totals table displays the costs for the current ticket or work order and all records under its hierarchy.

Each table presents the same information, which is shown in the following table.

Column	Explanation
Current Estimate	Displays read-only calculated values for the current totals from the Labor, Materials, Standard Services, and Tools tabs of the Plans tab for the ticket or work order.
Estimate at Approval	Is set to zero until the work order is approved, then the values are copied from the Current Estimate column and are read-only. If the work order status changes from approved to unapproved, then these fields are cleared. The estimated costs at approval are not affected by the change in status from in progress to completed or closed.
Actual	Displays the read-only values from the Labor (for approved labor only), Materials, and Tools tabs of the Actuals tab. If the status of the record changes from approved, then these fields are not cleared.

Rolling up maintenance costs

After you close a work order that is associated with an asset, you can calculate your maintenance costs by rolling up costs that you incur for labor, materials, tools, and services to the top-level asset in the hierarchy that the asset belongs to.

Costs can be rolled up manually or automatically. By default, cost rollups are manual. If you want costs to be calculated and rolled up automatically when a work order is closed, you must set the `mxe.workorder.rollupMaintenanceCosts` system property to 1. After you configure the system property for automatic rollups, all subsequent costs that are associated with work orders are rolled up automatically. However, any unprocessed maintenance costs that existed before the configuration are not automatically rolled up. You must roll up any preexisting, unprocessed maintenance costs manually.

To calculate the maintenance cost of your assets, use the Roll Up Maintenance Costs action in the Assets application.

If you upgrade to Maximo® Manage 8.5, run the Asset Cost Rollup Report to roll up pending maintenance costs before the upgrade.

Linear segment details

You use the Linear Segment Details section to locate a linear segment or point on a linear asset. The Linear Segment Details section, which displays on tabs in several applications, appears only if you are working with a linear asset.

For example, if you specify a linear asset in the Asset field on a preventive maintenance record, the PM tab displays a Linear Segment Details section. If you enter a point asset, the PM tab does not display this section. The Linear Segment Details section includes fields for both the start point and the end point. If you locate a point, such as a stop sign, the start and the end points are the same.

The following terms are associated with linear segments:

Measure

The absolute distance from the start of a linear asset. You can specify a measure manually. The measure is calculated for you if you enter a reference point and a reference point offset. In the example, using Mile Post 27 and an offset of -528, the calculated measure is 26.9 miles (528 feet = .1 mile).

Offset

A measure from a previously defined reference point. The possible kinds of offsets are the following:

Reference Point Offset

The distance before or after the reference point. Specify an offset value if the segment start or end is before or after the reference point. The value can be negative (before) or positive (after). For example, if the start of the segment is 528 feet before Mile Post 27, type -528.

You cannot specify an offset that, when combined with the reference point, yields a measure that is outside the boundaries of the linear asset. For example, if reference point Mile Post 1 is at 1.0 miles on a linear asset that begins at 0.0 miles, you cannot enter an offset of -2 miles.

Y-Offset

A distance perpendicular to the direction of the linear asset. For example, a speed limit sign is located 10 feet from the right edge of the road. "Right" is positive and "left" is negative. Therefore, the Y offset is 10.

Z-Offset

A distance above a linear asset or below a linear asset. For example, an exit sign is located 18 feet above the surface of the road, and a culvert is 4 feet below the surface of the road. The Z offset for the sign is 18, and the Z Offset for the culvert is -4.

Reference point

A feature instance that you can use as a starting point or as an ending point for a linear segment. A reference point is a means of communicating a work location. For example, it can be more useful to workers to say that roadside plowing on Route 96 begins at the intersection of Routes 96 and 75, and ends at Exit 34. It would be less useful to say the work begins at Mile 27.85 and ends at Mile 33.8.

The use of reference points varies according to department practices and to individual variation among linear assets. Some roads might have accurate and persistent mile post markers and workers can rely on them to locate work. Other roads might have few markers or no accurate markers, and users can rely on reference points. Use labels that maintenance workers in the field can easily identify.

Click Select Value to select the reference point.

Y Reference

The point from which the Y Offset is measured.

The system administrator creates the set of Y Reference values by creating a domain in the Domains application. For roads, some common examples include midline, outer pavement edge, and inner pavement edge. For example, a stop sign is located not just 20 feet from a road, but 20 feet from the midline of a road.

Z Reference

The point from which the Z Offset is measured.

The system administrator creates the set of Z Reference values by creating a domain in the Domains application. For roads, some common examples include road surface and road bed. For example, an exit sign is located 18 feet above the road surface, or a culvert is 12 feet below the road bed.

Restrictions on deleting tickets

You can delete a ticket only when it has a certain status and only when transactions have not been recorded for it.

Status-related restrictions

You can delete a ticket only if it has one of the following statuses:

- NEW.
- QUEUED.

Transaction and record restrictions

You cannot delete a ticket that has the following types of transactions or records associated with it:

- Labor transactions
- Workflow history
- Child activities, although you can delete the activities and then delete the record
- Related records
- Is related to another record
- Is the originating record for another record
- Work log entries

Working with service requests

You can create service requests either in the Service Requests application or as records related to other tickets or work orders. You can apply service level agreements, categorize requests, create relationships with other records, assign and record labor activities, and log actions and communications.

- [Creating service requests](#)
You create a service request to capture information about a request, including the type of service, who needs it, where, when, and why.
- [Relating records to other records](#)
You can relate records to each other in a ticket or work order application. For example, you can select a work order and relate it to a service request. Relating records creates a relationship type of RELATED between the records.
- [Changing the status of a list of records](#)
You can change the status of multiple records in applications.
- [Changing archived tickets](#)
After a ticket is closed, it is archived. To ensure that important information is maintained on historical records, you can open an archived record and change the editable fields.

Creating service requests

You create a service request to capture information about a request, including the type of service, who needs it, where, when, and why.

Procedure

1. In the Service Requests application, click the New Service Request icon.
 2. Specify the details of the service request.
 3. Save the record.
- [Applying service level agreements to records](#)
You can apply a service level agreement (SLA) to a record to define the agreement and formal commitments between a service provider and a customer. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.
 - [Removing service level agreements from records](#)
To maintain accurate records, it might be necessary to remove an invalid or erroneous service level agreement to disassociate it from the record.
 - [Classifying records](#)
You can apply a classification to a record to structure it into an organized hierarchy. You can use classifications and attributes to locate records, and help to ensure that records are not duplicated unintentionally.
 - [Adding activities to service requests](#)
You add activities to service requests to specify the work needed to resolve the service request. These work activities are typically performed by another internal group or by a vendor, while overall management of the service request is maintained elsewhere.
 - [Creating records from existing records](#)
To create a relationship between two records, you can create a record from an existing record. The record from which you create a change has a relationship type of ORIGINATOR, and the new record has a relationship type of FOLLOWUP.

Applying service level agreements to records

You can apply a service level agreement (SLA) to a record to define the agreement and formal commitments between a service provider and a customer. The agreement documents the service to be provided or received, the agreed upon service levels for the service, and the means of measuring or quantifying the level of service.

About this task

When you apply an service level agreement to work orders, the SLA is applied only to the work order, not to its tasks. If you want to apply a service level agreement to a task, you must display the task as the current record and then apply the SLA.

You can apply service level agreements to tickets and work orders.

Procedure

1. Open an application and display the record that you want to update.
2. Select the Apply SLA action.
3. Click OK.

Results

The SLA Applied check box on the main tab of the selected application is selected. The target start, target finish, and contact values are calculated for the selected record.

Removing service level agreements from records

To maintain accurate records, it might be necessary to remove an invalid or erroneous service level agreement to disassociate it from the record.

Procedure

1. Display the record for which you want to remove a service level agreement.
2. Select the Select/Deselect SLA action.
3. Click Mark Row for Delete for each service level agreement that you want to remove from the record.
4. Click OK.
5. Save the record.

Classifying records

You can apply a classification to a record to structure it into an organized hierarchy. You can use classifications and attributes to locate records, and help to ensure that records are not duplicated unintentionally.

About this task

You can create one or more classification hierarchies in the Classifications application. You can apply classifications to many record types.

Procedure

1. Open an application and select the record that you want to update.
2. In the Classification field, select Detail Menu > Classify.
3. Click a classification category.
You can open additional levels of the classification until you find the desired classification category.
4. Click Select Record to return a value to the Classification field.
5. Click Save record.

Adding activities to service requests

You add activities to service requests to specify the work needed to resolve the service request. These work activities are typically performed by another internal group or by a vendor, while overall management of the service request is maintained elsewhere.

Procedure

1. In the Service Requests application, display the service request to which you want to add an activity.
2. In the Time Tracking table window, click New Row.
3. Select an activity work order.
4. Save the record.

- [Reporting labor time for activities on tickets](#)
You can manually record the labor time that you spend resolving individual activities that are identified on a ticket.
- [Reporting labor time using the Start and Stop timers](#)
You can use the automatic time-tracking features of the system to help you report the time spent working on a ticket or work record.
- [Classifying records](#)
You can apply a classification to a record to structure it into an organized hierarchy. You can use classifications and attributes to locate records, and help to ensure that records are not duplicated unintentionally.
- [Selecting labor for activities on tickets](#)
To record the labor resources assigned to each activity on a ticket, you can select labor for each activity and create a labor transaction.

Reporting labor time for activities on tickets

You can manually record the labor time that you spend resolving individual activities that are identified on a ticket.

Procedure

1. Display the ticket that contains the activity for which you want to record labor time.
2. On the Service Request tab, in the Time Tracking table window, select the activity for which you want to add a time entry.
3. Specify the details.
4. Save the record.

Reporting labor time using the Start and Stop timers

You can use the automatic time-tracking features of the system to help you report the time spent working on a ticket or work record.

Procedure

1. Open the record.
2. On the toolbar, click the Start Timer button.
3. To stop the timer, click the Stop Timer button.
4. Optional: If necessary, you can edit the finish date, finish time, or hours.
5. Click OK.

Classifying records

You can apply a classification to a record to structure it into an organized hierarchy. You can use classifications and attributes to locate records, and help to ensure that records are not duplicated unintentionally.

About this task

You can create one or more classification hierarchies in the Classifications application. You can apply classifications to many record types.

Procedure

1. Open an application and select the record that you want to update.
2. In the Classification field, select Detail Menu > Classify.
3. Click a classification category.
You can open additional levels of the classification until you find the desired classification category.
4. Click Select Record to return a value to the Classification field.
5. Click Save record.

Selecting labor for activities on tickets

To record the labor resources assigned to each activity on a ticket, you can select labor for each activity and create a labor transaction.

Procedure

1. Display the record that contains the activities for which you want to select labor.
2. On the main tab of the application, in the Time Tracking table window, select the activity for which you want to select labor.
3. Specify the details of the labor you are adding.
4. Save the record.

Creating records from existing records

To create a relationship between two records, you can create a record from an existing record. The record from which you create a change has a relationship type of ORIGINATOR, and the new record has a relationship type of FOLLOWUP.

Procedure

1. Display the record from which you want to create the related record.
2. Select the *Create_Record Type* action where *Record Type* is the type of related record you want to create.
3. Save the record.

Relating records to other records

You can relate records to each other in a ticket or work order application. For example, you can select a work order and relate it to a service request. Relating records creates a relationship type of RELATED between the records.

- **Relating ticket and work order records**
To help simplify record management, you can relate tickets or work orders to other tickets or work-related records using the Related Records tab of a ticket or work order application
- **Deleting relationships**
When you determine that the record you are managing is no longer related to other tickets or work-related records, you can remove the relationship using the Related Records tab.
- **Removing global issue flags**
If you have erroneously marked a record as global and then related tickets to the global record, you can remove the global flag on the record only after you remove the identifier for the global record in all related records.

Relating ticket and work order records

To help simplify record management, you can relate tickets or work orders to other tickets or work-related records using the Related Records tab of a ticket or work order application

Procedure

1. Display the record to which you want to relate other tickets and work orders.
2. On the Related Records tab, in the Related Tickets section, select the tickets that you want to relate to the current record.
3. In the Related Work Orders section, select the work orders that you want to relate to the current record.
4. Save the record.

Deleting relationships

When you determine that the record you are managing is no longer related to other tickets or work-related records, you can remove the relationship using the Related Records tab.

Procedure

1. Display the record that has the relationship that you want to delete.
2. Click the Related Records tab, and then delete the ticket.
3. Save the record.

Removing global issue flags

If you have erroneously marked a record as global and then related tickets to the global record, you can remove the global flag on the record only after you remove the identifier for the global record in all related records.

Procedure

1. Display the record for which you want to remove the global flag.
2. Click the Related Records tab.
3. For each related record, click the Detail Menu icon and select *Go To Application* where *Application* is the application for that type of record.
4. Remove the value in the Related to Global ID field.
5. Save the record.

6. After removing the relationship from all relevant records, display the global record and clear the Global Issue check box.
7. Save the record.

Changing the status of a list of records

You can change the status of multiple records in applications.

Procedure

1. In the Work Order application, on the List tab of an application, filter the records so that less than 200 records are displayed.
2. Scroll down the bottom of the screen and select the Select Records check box.
The screen refreshes and each row now has a check box.
3. Select the check boxes for the work orders whose status you want to change.
4. Click the Change Status action and enter the information in the dialog box.
5. Click OK to close the Change Status window.

Changing archived tickets

After a ticket is closed, it is archived. To ensure that important information is maintained on historical records, you can open an archived record and change the editable fields.

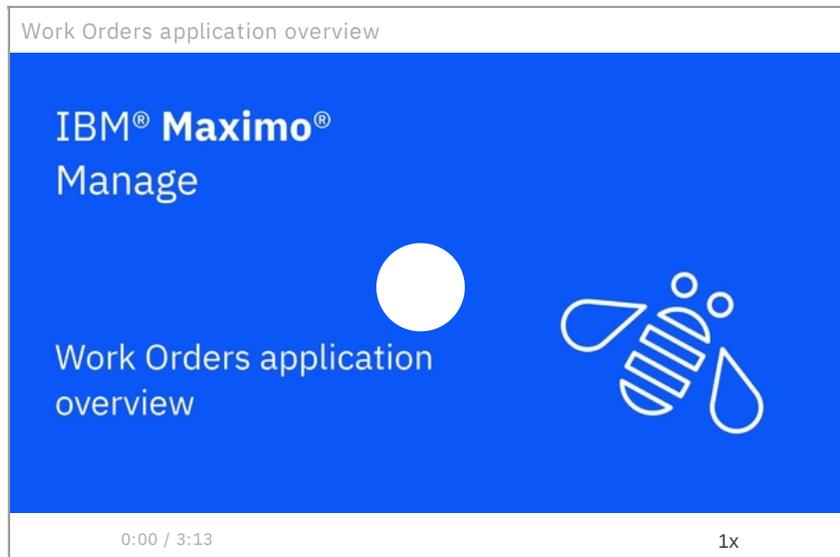
Procedure

1. Display the record whose history you want to edit.
2. Select the Edit History action.
3. Change the ticket.
4. Save the record.

Work Orders application

The Work Orders application is a modernized, simplified version of the Work Order Tracking application that contains the most important actions and information for work orders. It also contains workflow assignment integration, a new status bar, the ability to organize work orders into custom views, and productivity features, such as type-ahead search.

Overview



Similar to the Work Order Tracking application, you can use the Work Orders application to:

- Create work orders.
- Create follow-up work orders.
- View information about each work order, such as its long description, related records, work log, attachments, and history.
- Change the status of a work order.
- Change the owner or owner group of a work order.

The Work Orders application is also integrated with the workflow process. If a workflow is available for a work order, you can start the workflow on the Work orders list page or from the Actions menu or the Workflow assignments section of the work order details page.

You can also see the status of each work order in the status bar and organize your work orders into custom views. For more information, see [Status bar](#) and [Custom views](#). You can also save time with features like type-ahead search.

- [Status bar](#)
The status bar on each work order's summary page provides a visual timeline of the work order's status history. You can see the dates and times of past statuses and future steps that must still be completed before the work order can be closed.
- [Custom views](#)
A view is a subset of information that can be displayed by applying filters or sorting. When you open the Work orders page, the unique mix of columns, filters, and search terms that you see is a view. If you change this configuration, such as by selecting different columns or entering search or filter criteria, you can save it as a custom view. You can then return to that configuration with one click, without having to manually change your settings every time.

Status bar

The status bar on each work order's summary page provides a visual timeline of the work order's status history. You can see the dates and times of past statuses and future steps that must still be completed before the work order can be closed.

The Work Orders application provides the same statuses out of the box as the Work Order Tracking application. For more information, see [Work order statuses](#).

You can create custom statuses for your company by using [synonym domains](#) of existing statuses. For more information, see [Creating synonyms of internal values](#).

You can also delete custom statuses. For more information, see [Deleting synonyms of internal domain values](#).

Custom views

A view is a subset of information that can be displayed by applying filters or sorting. When you open the Work orders page, the unique mix of columns, filters, and search terms that you see is a view. If you change this configuration, such as by selecting different columns or entering search or filter criteria, you can save it as a custom view. You can then return to that configuration with one click, without having to manually change your settings every time.

You can create custom views for yourself or your organization. To create a custom view, change the Work orders page to the configuration that you want to save and then in the View list, click Save as new view.

Views can be public or private. Public views are visible to everyone in your organization, but private views are visible only on your account. To create a public view, click the Public view checkbox. To create a private view, clear the Public view checkbox.

You can also manage and delete views after they are created. To change the name of a view, select or remove it as your default view, change whether a view is public or private, or delete a view, in the View list, click Manage views. To save changes to an existing view without creating a new view, in the View list, click Save changes.

Workflow Assignments application

You can use the Workflow Assignments application to monitor your workflow assignments and take advantage of time-saving features.

The Workflow Assignments application shows all of the workflow assignments that are assigned to you. You can use the KPIs on the list page to easily track:

- Whether you have any overdue assignments.
- How many assignments are due this week.
- How many assignments are Priority 1.
- How many work orders your assignments are associated with.

In addition to being tracked on the Overdue tile, overdue assignments in the table are marked by a red icon.

The Workflow Assignments application supports both singular and bulk actions. Select a single assignment to route it or select multiple assignments to accept, reject, or reassign them all at once.

You can click any assignment to open it in the application in which it was created. You can also organize your assignments into custom views. For more information, see [Custom views](#).

Monitoring

You can enable monitoring for applications in Red Hat® OpenShift® Container Platform.

- [Configuring monitoring and metrics](#)
Configure monitoring and metrics using Red Hat OpenShift Container Platform.
- [Creating config map](#)
Create a config map by using an YAML.
- [Creating service](#)
Create a service.

- [Querying metrics](#)
You can search for metrics in Maximo Manage.
- [Setting up Grafana](#)
Follow the steps to set up Grafana.

Configuring monitoring and metrics

Configure monitoring and metrics using Red Hat® OpenShift® Container Platform.

Procedure

1. Monitoring: <https://docs.openshift.com/container-platform/4.6/monitoring/enabling-monitoring-for-user-defined-projects.html#enabling-monitoring-for-user-defined-projects>
 2. Metrics: <https://docs.openshift.com/container-platform/4.6/monitoring/managing-metrics.html#managing-metrics>
-

Creating config map

Create a config map by using an YAML.

Procedure

1. Go to project: `openshift-monitoring`.
2. Go to Config Maps and create a config map using the following YAML.
 - a. Set the `enableUserWorkload` setting to "true" under `data/config.yaml`
3. Save the file to apply the changes. It creates a new operator and prometheus instance in the `openshift-monitoring-user-workload` namespace, and this instance is able to monitor `servicemonitor` kinds in the namespace.

YAML:

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: cluster-monitoring-config
data:
  config.yaml: |
    enableUserWorkload: true
```

```
$ oc -n
openshift-user-workload-monitoring get
pod
```

NAME	READY	STATUS	RESTARTS	AGE
prometheus-operator-6f7b748d5b-t7nbg	2/2	Running	0	3h
prometheus-user-workload-0	5/5	Running	1	3h
prometheus-user-workload-1	5/5	Running	1	3h
thanos-ruler-user-workload-0	3/3	Running	0	3h
thanos-ruler-user-workload-1	3/3	Running	0	3h

Creating service

Create a service.

Procedure

1. Go to Manage project : `mas-<instanceid>-manage`
2. Create service `<instanceid>-<workspaceid>-<bundlename>-monitoringagent` YAML. Replace `instanceid`, `workspaceid`, and `bundlename` in the following example:

```
apiVersion: v1
kind: Service
metadata:
  labels:
    app: <instanceid>-<workspaceid>-<bundlename>
    name: <instanceid>-<workspaceid>-<bundlename>-monitoragent
    namespace: mas-<instanceid>-manage
spec:
  ports:
    - name: 9080-tcp
      protocol: TCP
      port: 9080
      targetPort: 9080
    - name: https
      protocol: TCP
      port: 9444
```

```
targetPort: 9444
selector:
  app: <instanceid>-<workspaceid>-<bundlename>
type: ClusterIP
```

Querying metrics

You can search for metrics in Maximo® Manage.

Procedure

- Go to Monitoring > Metrics. The following queries are available:

Table 1. List of queries

Query	Description
maximo_mbo_count	Business object count
maximo_heap_memory_max_count	Maximum heap
maximo_heap_memory_used_count	Used heap
maximo_thread_pool_size	Thread pool size
maximo_thread_deadlock	Deadlock threads
maximo_thread_count	Thread count
maximo_thread_pool_active_count	Thread pool active count
maximo_thread_pool_active_count	Thread pool active count
maximo_thread_peak_count	Thread pool peak count
maximo_db_connection_free_count	Free number of DB connections
maximo_db_connection_used_count	Used number of DB connections
maximo_db_connection_total_count	Total number of DB connections
maximo_session_stats_active_count	Count of active sessions
maximo_session_stats_live_count	Count of live sessions
maximo_session_stats_create_count	Count of session stats created on Liberty

- Click the detail icon to get the list of queries.

Figure 1. Maximo queries

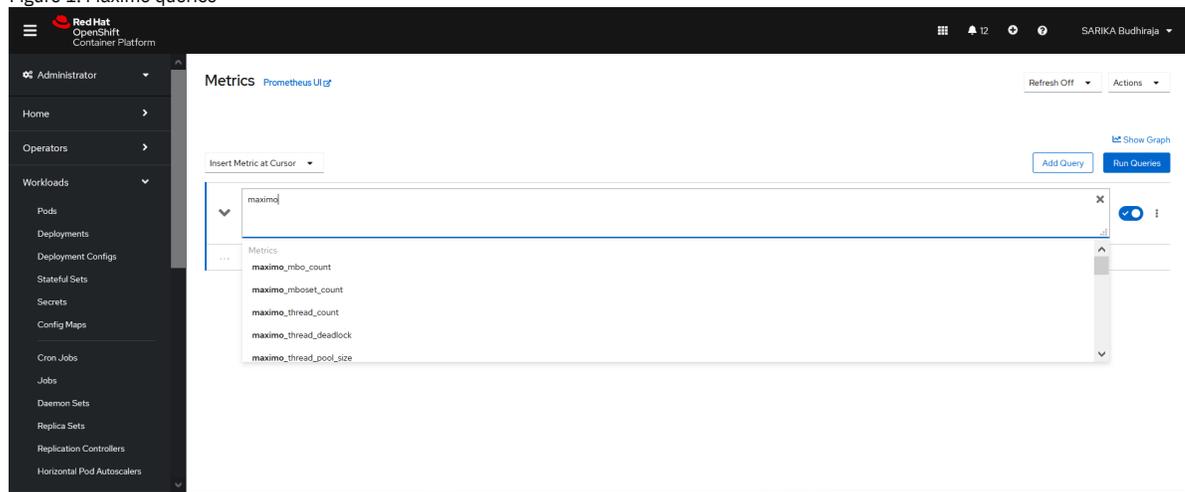
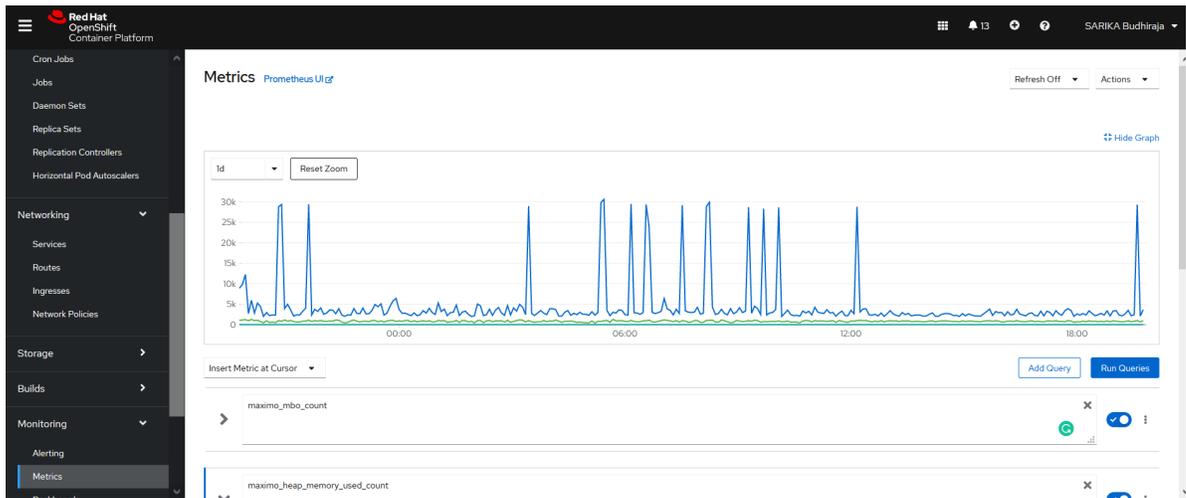


Figure 2. Sample graph



Setting up Grafana

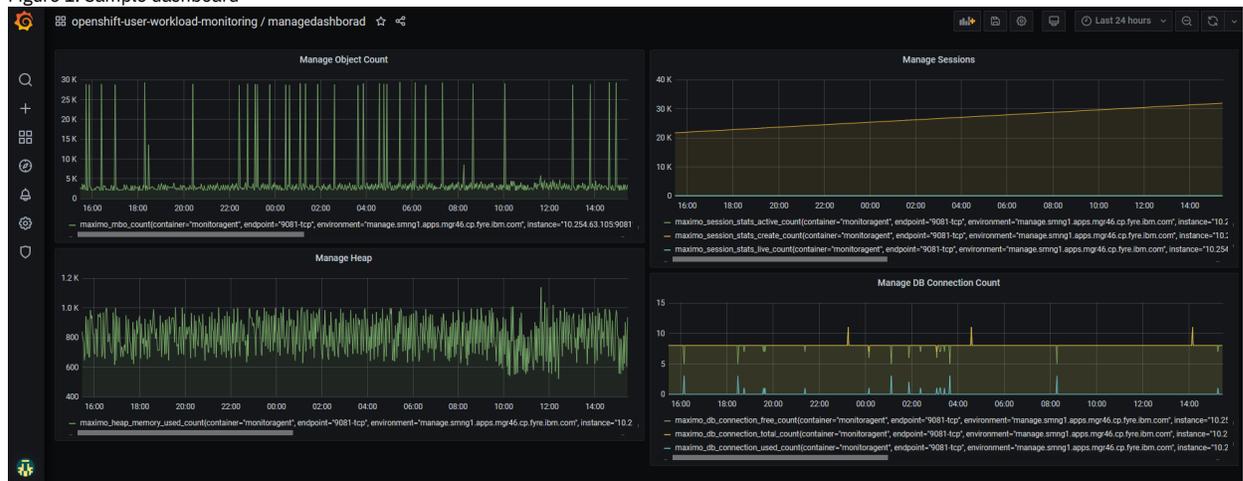
Follow the steps to set up Grafana.

Procedure

Use the following link to setup Grafana.

<https://github.com/ibm-watson-iot/iot-docs/tree/master/monitoring#3-grafana-setup>

Figure 1. Sample dashboard



Troubleshooting Maximo Manage

Maximo® Manage provides tools that you can use to help you troubleshoot and resolve issues with the application.

- [Manage Monitoring Information](#)
The Manage Monitoring Information (MMI) application provides information about the current state of a Manage deployment. You can use this information for troubleshooting purposes.
- [JDOM upgrade](#)
JDOM upgrade in Maximo Manage 8.5 is recommended.
- [Debugging Maximo Manage with Eclipse](#)
Debug Maximo Manage by using the Eclipse debugger.
- [Enabling debugging for Maximo Manage](#)
It is possible to remotely debug Maximo Manage by connecting to the Liberty server.

Manage Monitoring Information

The Manage Monitoring Information (MMI) application provides information about the current state of a Manage deployment. You can use this information for troubleshooting purposes.

The application displays the following information about the server bundle pods that are deployed:

- System information
 - Database information
 - Maximo® business object (MBO) count
 - Memory
 - Java™ (JVM) information
 - Threads
 - Operating System information
- Integration information
 - Queues
 - OS cache
 - Global directory
 - Event topic tree
- Other information
 - User information
 - Class information
 - Cron tasks
 - Appservices

The monitoring information is provided by a set of REST APIs.

MMI uses JavaScript Object Notation (JSON) as the data format for representing the collected state information. All MMI requests are HTTP GET requests, and MMI request handlers are not intended to modify the state of the system.

- [Manage Monitoring Information APIs](#)
Manage Monitoring Information (MMI) APIs provide information that is related to the state of a Maximo Manage deployment.
- [Scenario: Running MMI APIs to gather diagnostic information](#)
XYZ Corporation experiences an issue in the Maximo Manage environment and the system administrator opens a Problem Management Report (PMR) with IBM® Technical Support. IBM Technical Support and Development determine that there is a need to gather diagnostic information for particular resources from the customer's environment.

Manage Monitoring Information APIs

Manage Monitoring Information (MMI) APIs provide information that is related to the state of a Maximo® Manage deployment.

A list of available MMI APIs is in the Monitor Environment Information dialog of the Logging application.

Before you can collect information from the Maximo Manage environment by using the APIs, you must specify the URL path for the API in the mxo.oslc.webappurl system property. You can choose one of the following options for the path:

- `<Maximo Manage URL>/maximo/api/members/<memberid>/<api>`
For example:
`https://my_instance.manage.7203.apps.my_company.com/maximo/api/members/<memberid>/mbocount`
Use this option when you have an API key.
- `https://<host>:<port>/maximo/oslc/members/<memberid>/<api>`
For example:
`https://<host>:<port>/maximo/oslc/members/<memberid>/mbocount`
Use this option when you already have an open, authenticated session.

In the preceding examples, specify the Maximo Manage server bundle for the `<memberid>`.

All MMI APIs can be protected by using signature options. The signature options must be associated with the Logging application. To specify a signature option for an API, open the Monitor Environment Information dialog in the Logging application, locate the API, and select a value in the Signature Option field.

Table 1. Manage Monitoring Information APIs

API	Description	URL path Note: You can also use the OSLC URL if you have an authenticated session.
apimetrics	API Metrics handler	/maximo/api/members/<memberid>/apimetrics
appservices	AppService information	/maximo/api/members/<memberid>/appservices
args	JVM arguments information	/maximo/api/members/<memberid>/args
browseMessages	Browse JMS messages	/maximo/api/members/<memberid>/browseMessages
childdirs	Child directory information	/maximo/api/members/<memberid>/childdirs

API	Description	URL path Note: You can also use the OSLC URL if you have an authenticated session.
classinfo	Java™™ class information	/maximo/api/members/<memberid>/classinfo
clouddbstatistics	Cloud Database Storage	/maximo/api/members/<memberid>/clouddbstatistics
clouddbstorage	Cloud Database Storage	/maximo/api/members/<memberid>/clouddbstorage
cron	Cron task information	/maximo/api/members/<memberid>/cron
cronthread	Concurrent cron task thread count and peak thread count Counts the total cron threads running at this instant in the current server process. It also provides the peak count of cron threads on that server	/maximo/api/members/<memberid>/cronthread
dbconn	Database connection creation trace	/maximo/api/members/<memberid>/dbconn
dbinfo	Database information Provides information about the database that is used by the application, including information about the database version, vendor information, and driver information. Also provides links to the database connection pool details.	/maximo/api/members/<memberid>/dbinfo
dbmanager	Database connection pool information	/maximo/api/members/<memberid>/dbmanager
errcountmetrics	Error count metrics handler Provides the total count of MXApplicationException and MXSystemException exceptions that are created.	/maximo/api/members/<memberid>/errcountmetrics
eventtree	EventTopicTree information Provides information about the event subscription tree. The resource describes information about event topics, such as add asset or update work order, and the listeners that are associated with those topics.	/maximo/api/members/<memberid>/eventtree
formula	Formula information	/maximo/api/members/<memberid>/formula
globaldir	Integration global directory information	/maximo/api/members/<memberid>/globaldir
heapdump	Generate heapdump (currently for the IBM® JDK only)	/maximo/api/members/<memberid>/heapdump
http	Ping an HTTP or HTTPS URL	/maximo/api/members/<memberid>/http
interfaces	Java class interface information	/maximo/api/members/<memberid>/interfaces
iotervices	IoT services	/maximo/api/members/<memberid>/iotervices
jaxp	Java API for XML Processing (JAXP) provider information Provides information about the JAXP providers on the server.	/maximo/api/members/<memberid>/jaxp
jvm	Java virtual machine (JVM) information Provides information about the JVM that is hosting the application, including information about the start time, the JVM vendor, and the JVM version. You can also drill down, by using links, to provide information about the JVM system properties and the JVM arguments.	/maximo/api/members/<memberid>/jvm
ldapsearch	LDAP search	/maximo/api/members/<memberid>/ldapsearch
loggers	Application logger state information Provides information about the state of a logger. The logger name can be provided to the API by using the oslc.where query parameter. An example of a parameter is oslc.where=oslc:shortId="maximo.script". Provides information about the automation script logger. API consumers specify the logger name by using the oslc:shortId property for this API to provide information about the logger, which includes the log level, and active state.	/maximo/api/members/<memberid>/loggers
mbocount	MBO count information Provides MBO count information. Also provides links to the MBO and the MboSet class. This class can be useful when you are trying to resolve out of memory (OOM) or performance issues.	/maximo/api/members/<memberid>/mbocount
memory	JVM memory information Provides information about the server heap and nonheap memory usage. All units are in Megabytes (MB).	/maximo/api/members/<memberid>/memory
mifwebservices	Web service information	/maximo/api/members/<memberid>/mifwebservices
msgproviders	Validate message provider connectivity	/maximo/api/members/<memberid>/msgproviders
objexchanged	Object Exchanged Count Provides the number of integration and UI objects that are exchanged per minute on each server.	/maximo/api/members/<memberid>/objexchanged
opsystem	Operating system information Provides information about the operating system that is used for the run time, including information about the OS type, version, architecture, and the number processors that are available.	/maximo/api/members/<memberid>/opsystem

API	Description	URL path Note: You can also use the OSLC URL if you have an authenticated session.
oscache	Object structure cache Provides information about the object structure cache. It identifies cases where invalid entries in the Object Structure tables might cause cache corruption.	/maximo/api/members/<memberid>/oscache
oslstablecache	OSLC stable cache information	/maximo/api/members/<memberid>/oslstablecache
pingcos	Ping Cloud Object Storage (Cloud Object Storage) Provides the response time for connecting to Cloud Object Storage and the status for Cloud Object Storage connectivity.	/maximo/api/members/<memberid>/pingcos
pingdb	Ping DB Checks the database connection and calculates the average response time that is required to run 10 recent queries. These queries are obtained from the system tables. The queries are run on Oracle and Db2® databases.	/maximo/api/members/<memberid>/pingdb
pingkafka	Kafka ping handler Provides the response time for connecting to Kafka and the status for Kafka connectivity.	/maximo/api/members/<memberid>/pingkafka
queues	Integration queues information Provides information about state of an integration queue. The resource allows consumers of the API to test the connectivity/read/write to the queue and to browse messages in the queue spi:browseMessage property. By default the API shows only the first five messages in the queue. You can control that number by using the query string oslc.where=spi:count=10. This query shows the first 10 messages in the queue. Note: Browsing messages is a costly call and browsing too many messages simultaneously can cause memory or performance issues in the server.	/maximo/api/members/<memberid>/queues
report	Collects report metrics Provides the following report metrics: <ul style="list-style-type: none"> Total number of reports that ran in the preceding hour Total accumulated time in seconds that reports are run in a particular day Information about the concurrent report usage and daily runtime of reports 	/maximo/api/members/<memberid>/report
resources	Resources in OSLC stable cache	/maximo/api/members/<memberid>/resources
servletstats	Collects servlet statistics Provides request and response information about the OSLCServlet, RESTServlet, and UIServlet for each application that is deployed. The response time is measured in milliseconds.	/maximo/api/members/<memberid>/servletstats
sessionstatsinfo	Session stats information for IBM WebSphere® Application Server Liberty Provides information on total sessions, active sessions, and live sessions.	/maximo/api/members/<memberid>/sessionstatsinfo
sysprops	Java virtual machine (JVM) system properties information	/maximo/api/members/<memberid>/sysprops
tablesize	Collect the five database tables with the largest size Provides information about the five database tables that have the largest table size per day. The table size is measured in MB per day.	/maximo/api/members/<memberid>/tablesize
testProviderConnection	Test connection to JMS provider	/maximo/api/members/<memberid>/testProviderConnection
testReadMessage	Test read JMS message	/maximo/api/members/<memberid>/testReadMessage
testWriteMessage	Test write JMS message	/maximo/api/members/<memberid>/testWriteMessage
threaddump	Thread dump	/maximo/api/members/<memberid>/threaddump
threadpoolinfo	Thread pool information for the IBM WebSphere Application Server Liberty profile Counts total thread pool size and total active thread pool count.	/maximo/api/members/<memberid>/threadpoolinfo
threads	JVM thread information Provides information about the threads in the JVM, such as the current thread count, peak thread count, and whether there are any deadlocks. Also provides a link to enumerate the threads in the system at that instant. The API consumer can check for thread states and lock information about each thread. Provides runtime thread count information that includes concurrent thread count and deadlocked thread counts.	/maximo/api/members/<memberid>/threads

Scenario: Running MMI APIs to gather diagnostic information

XYZ Corporation experiences an issue in the Maximo® Manage environment and the system administrator opens a Problem Management Report (PMR) with IBM® Technical Support. IBM Technical Support and Development determine that there is a need to gather diagnostic information for particular resources from the customer's environment.

IBM Technical Support and Development review the available resources in the Monitor Environment Information dialog of the Logging application and determine that the system administrator should run a particular MMI API. In some cases, if an API that is needed to collect the information is not readily available, IBM

development might provide a script that can collect the needed information.

IBM instructs the system administrator to run the API in a web browser by entering a URL similar to `http://<host>:<port>/maximo/api/members/<memberid>/<api>`. The system administrator submits the resulting diagnostic output with the PMR for analysis by IBM.

API output

When the system administrator runs the MMI API by entering the required URL in the browser, the output is displayed directly in the browser.

The output is not formatted or easily readable unless the browser has a JSON viewer add-on or extension installed. JSON viewers are available for the Mozilla Firefox and Google Chrome browsers.

The system administrator saves the output in the browser to a text file and submits the file with the PMR for analysis by IBM.

Writing scripts

If a system administrator who meets several prerequisite skills chooses to write a script without the help of IBM Technical Support and Development, the following sample script can be used as a template.

Attention: Do not write scripts unless you meet the prerequisite skills or are instructed to do so by IBM.

Prerequisite skills

To write scripts for resources that are outside the scope of the provided scripts, the following skills are required.

- System administrator level
- Experience with calling the REST API
- Programming and script language skills

Sample script

A system administrator wants to determine how many listeners are associated with each object event type. The system administrator wants to analyze the listener data to investigate a possible performance issue that might be related to listeners on particular assets. This goal requires a way to access the event topic tree in the Maximo Manage server and search for the specified topic, Object event type, and then find out the number of associated listeners. The following Jython script addresses this requirement.

```
from psdi.server import MXServer
if request.getWhere() is not None and request.getWhere().get("topic") is not None:
    eventTopicToFind = request.getWhere().get("spi:topic")[0]

    eventTopic = MXServer.getMXServer().getEventTopicTree().findEventTopic(eventTopicToFind)

    listenerCount = eventTopic.getListenerCount()
    br.setProperty("listenerCount", listenerCount)
```

The MMI framework includes several variables in the script.

- request - The MMI API request object. The script uses the request object to determine the object event type that the user is interested in.
- br - The response that the API returns to the user.

The script uses the request object to determine the object event type by using the Where parameter in `eventTopicToFind = request.getWhere().get("topic")[0]`.

The br parameter has a simple `setProperty(string,any)` interface that is used by the script to gather the information it will send back to the user. The script uses the br `setProperty` API to set the listenerCount integer to the br object. This object is used to format the response to the API consumer.

The script can be added to the MMI by opening the Monitor Environment Information dialog in the Logging application, selecting New Row, and specifying the script name in the Class or Script Name field. The script must be specified in the qualified notation, `script:<script name>`, for example, `script:LISTENERS`.

The script is run by using the URL syntax `http://<host>:<port>/maximo/api/members/<memberid>/<event topic context>?oslc.where=spi:topic="maximo.asset.add"`.

Example URL: `http://127.0.0.1/maximo/api/members/OS4zM4yMS4xMzcvTVhTZXJ2ZXI-/eventtopic?oslc.where=topic="maximo.asset.add"`

JDOM upgrade

JDOM upgrade in Maximo® Manage 8.5 is recommended.

Problem

In Maximo Manage 8.5, JDOM was susceptible to a service denial. This JDOM vulnerability does not apply to Maximo Application Suite but affects Maximo Manage. In Maximo Manage 8.5, by sending a specially-crafted HTTP request, a remote attacker could use the JDOM vulnerability to block the service. The service denial is caused by an XXE issue in SAXBuilder. Affected platforms are JDOM JDOM 2.0.5 and JDOM JDOM 2.0.6.

Solution

The issue has been addressed in Maximo Manage 8.5.

Note: The JDOM upgrade may cause compatibility issues with your existing code. It is recommended to recompile your code with the new JDOM provided with Maximo Manage 8.5 to resolve any compilation issues.
For more information, see [National Vulnerability Database](#).

Debugging Maximo Manage with Eclipse

Debug Maximo® Manage by using the Eclipse debugger.

Prerequisites

The local machine where you install Eclipse must have the following tools:

- Red Hat® OpenShift® Container Platform command-line interface. For more information, see [Getting started with the CLI](#).
- Kubernetes command line tool. For more information, see [Install Tools](#).

Creating a stand-alone server deployment

1. In the Red Hat OpenShift Container Platform console, go to Workloads > Deployments and locate the existing all or ui deployment.
2. View the YAML, then copy the spec.template.spec section.
Note: You might find it easier to download the YAML first.
3. Select Create Deployment and assign a unique name. For example, manageddebug. Update the following:
 - a. Replace the spec.template.spec section with the copied spec.
 - b. Set the replicas to 1.
 - c. Add metadata:name as manageddebug. Make sure make sure spec.selector:matchLabels:app is set to manageddebug.

```
kind: Deployment
apiVersion: apps/v1
metadata:
  name: manageddebug
  namespace: mas-debug-manage
spec:
  replicas: 1
  selector:
    matchLabels:
      app: manageddebug
```

4. Locate the ports section and add port 7777.

```
ports:
- containerPort: 9080
  protocol: TCP
- containerPort: 9443
  protocol: TCP
- containerPort: 7777
  protocol: TCP
```

5. Update cmd args for the Maximo Manage server. Replace `/tmp/startwlp.sh;` with `/tmp/genJDBCTruststore.sh;`
`/opt/ibm/wlp/bin/server debug defaultServer;`

```
image: >-
  image-registry.openshift-image-registry.svc:5000/mas-sb1-manage/sb1-masdev-
  all@sha256:6e6891b03d9237e64b6a3c4c41fd8dc331da74cf4cb2393a3ba70588599c600f
args:
- >-
  echo generateKeyStore...; openssl pkcs12 -export -in
  /etc/ssl/certs/internal-manage-tls/tls.crt -inkey
  /etc/ssl/certs/internal-manage-tls/tls.key -out ${java_keystore}
  -password pass:${java_keystore_password};
  /tmp/genJDBCTruststore.sh; /opt/ibm/wlp/bin/server debug
```

Save the deployment and wait a moment for the pod to be created. Note down the pod name.

Note: The WebSphere® Application Server Liberty waits for the debugger to attach before it starts. Currently, the Logs tab displays the following:

```
generateKeyStore...
```

```
Listening for transport dt_socket at address: 7777
```

Configuring port forwarding

1. From the Red Hat OpenShift Container Platform console, copy the login command.
2. On the local Eclipse machine, open a PowerShell for Windows command and paste the copied login command.
3. If it is necessary, use the **oc project** command to switch to the appropriate project.
4. Locate the name of the manageddebug pod.
5. Enter **kubect1 port-forward <podname> 7777:7777**.
6. Wait for the forwarding messages:

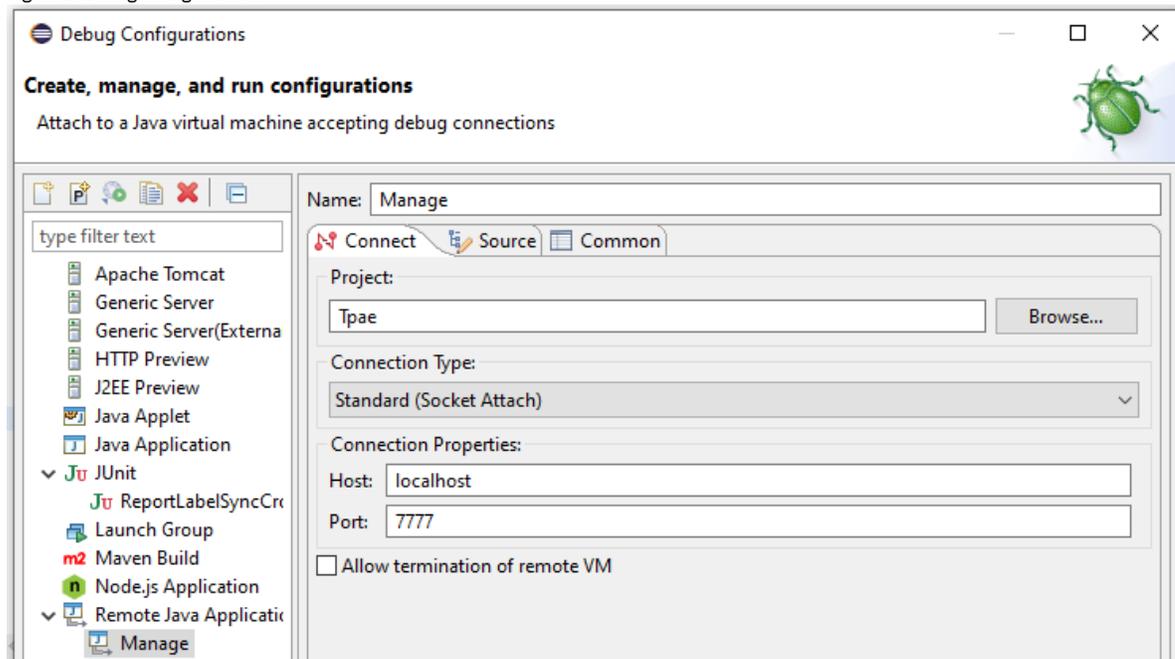
```
kubect1 port-forward manageddebug-57d79d4dfc-q82vn 7777:7777
```

```
Forwarding from `127.0.0.1:7777 -> 7777`
Forwarding from `[::1]:7777 -> 7777`
```

Creating the remote debug configuration

1. From the Eclipse debug view, create a Java Remote Application.
2. Attach an appropriate source code project, and attach the Java Remote Application to port 7777.
3. Set the Host field in the debug configuration to localhost.

Figure 1. Debug configurations



Connecting the remote debugger to the listener

Launch the debug configuration. Once the debugger connects, the console displays, "Handling connection...".

```
Forwarding from `127.0.0.1:7777 -> 7777`  
Forwarding from `[::1]:7777 -> 7777`  
Handling connection for 7777
```

You can watch the server start progress in the pod's Logs tab.

Defining remote access to the debug server

1. In Networking > Services, create a new service for the deployment.
2. Follow the port mapping from the existing server bundles.
3. Set spec.selector to `app: manageddebug`.

```
selector:  
  app: manageddebug
```

4. After the service is created, select the Pods tab to confirm that the labels are correctly defined and the service is applied to the debug pod.
5. In Networking > Routes, create a route for the new service, by following the existing all or ui route.
6. Use the new route location to go to the Maximo Manage application.
7. Add /maximo to the route to access the debug server.

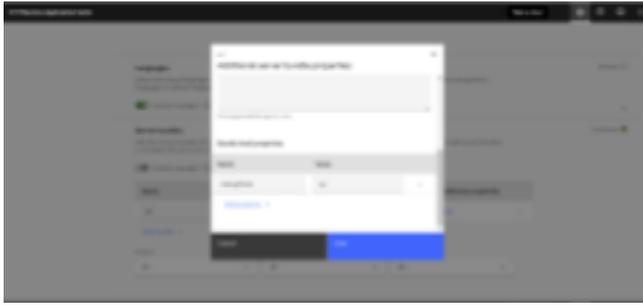
Enabling debugging for Maximo Manage

It is possible to remotely debug Maximo® Manage by connecting to the Liberty server.

Configuring debug mode

1. When you deploy Maximo Manage, in the Maximo Application Suite user interface, set the debugMode to "up" and save the configuration.

Figure 1. Set debug Mode in Maximo Application Suite user interface



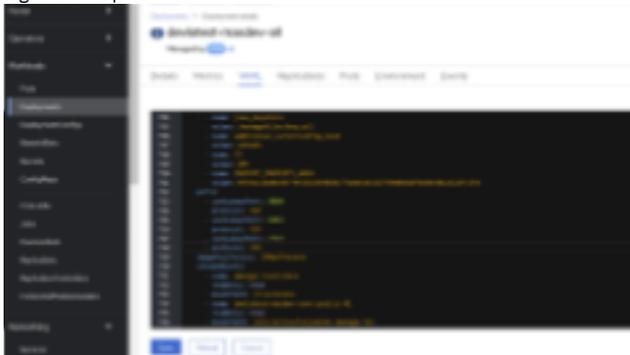
Or, you can set up the serverbundle property in your instance from the ManageWorkspace CustomResourceDefinitions (CRD).

Figure 2. Set debugMode in CRD



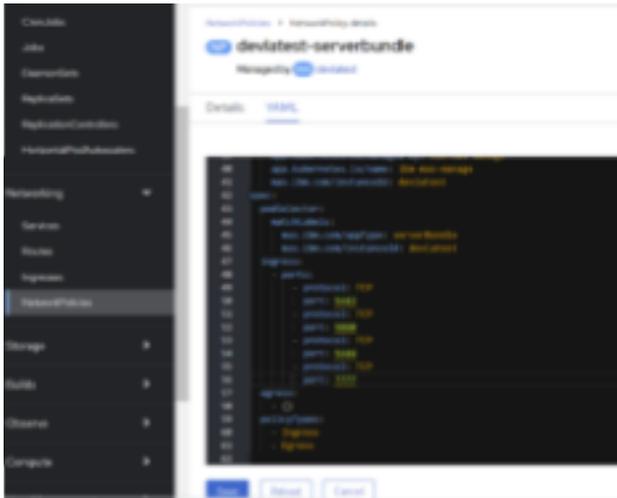
2. Go to Workloads > Deployments and make sure to scale down the ibm-mas-manage-operator deployment and entitymgr-ws deployment to '0'.
3. Go to Deployments > serverbundle and edit the YAML file to add port 7777 in the serverbundle container.

Figure 3. Set port



4. Go to Networking > NetworkPolicies and adjust the serverbundle network policy to allow port 7777.

Figure 4. Adjust network policy

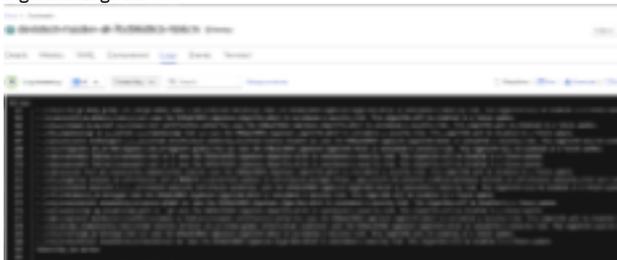


- Update the cmd args for the Maximo Manage server by replacing `/tmp/startwlp.sh;` with `/tmp/genJDBCTruststore.sh;`
`/opt/ibm/wlp/bin/server debug defaultServer;`

```
image: >-
  image-registry.openshift-image-registry.svc:5000/mas-devlatest-manage/devlatest-masdev-
  all@sha256:362ce629e6abaa52750e5d5499e07c3626d75810d033b14d7bcea42fcae16998
  args:
  - >-
    echo copy additional jvm options is exists; cp
    /opt/ibm/wlp/usr/servers/defaultServer/manage/jvmoptions/jvm.options
    /opt/ibm/wlp/usr/servers/defaultServer/configDropins/overrides/.;
    echo generateKeyStore...; openssl pkcs12 -export -in
    /etc/ssl/certs/internal-manage-tls/tls.crt -inkey
    /etc/ssl/certs/internal-manage-tls/tls.key -out ${java_keystore}
    -password pass:${java_keystore_password};
    /tmp/genJDBCTruststore.sh; /opt/ibm/wlp/bin/server debug
    defaultServer;
```

- Save the deployment and wait for the pod to be created. Note down the pod name.
- Wait for the debugger to attach before it starts.
- Check that the Logs tab displays the following lines:

Figure 5. Logs tab



Configuring port forwarding

- From the Red Hat® OpenShift® Container Platform console, copy the login command.
- On the local Eclipse system, open a PowerShell for Windows command and paste the copied login command.
- If it is necessary, use the `oc project` command to switch to the appropriate project.
- Locate the name of the newly created all or ui serverbundle pod. For example, `devlatest-masdev-all-7bd96d9cb-hb6cm`.
- Run the command `kubectl port-forward <podname> 7777:7777`.
- Wait for the forwarding messages:

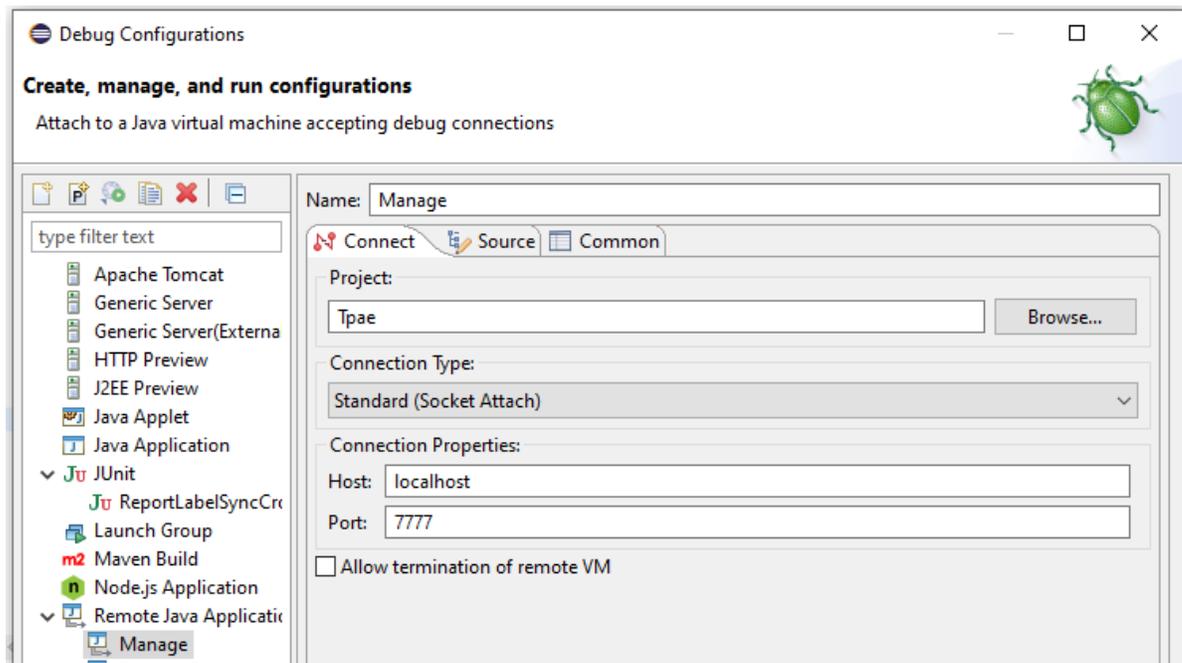
```
kubectl port-forward devlatest-masdev-all-7bd96d9cb-hb6cm 7777:7777

Forwarding from `127.0.0.1:7777 -> 7777`
Forwarding from `[::1]:7777 -> 7777`
```

Creating the remote debug configuration

- From the Eclipse debug view, create a Java™ Remote Application.
- Attach an appropriate source code project, and attach the Java Remote Application to port 7777.
- Set the Host field in the debug configuration to localhost.

Figure 6. Debug configurations



Connecting the remote debugger to the listener

Launch the debug configuration. Once the debugger connects, the console displays, "Handling connection...".

```
Forwarding from `127.0.0.1:7777 -> 7777`  
Forwarding from `[::1]:7777 -> 7777`  
Handling connection for 7777
```

You can watch the server start progress in the pod's Logs tab.

Checking pods and accessing debug server

1. In Networking > Services, check the existing service for all or ui serverbundle pod. Select the Pods tab to confirm that the labels are correctly defined, the service is applied to the debug pod, and the pod is visible in the Pods tab.
2. In Networking > Routes, click the existing all or ui route to go to the Maximo Manage application and add /maximo to the route to access the debug server.

Reference

Supplementary information is available to describe the features in Maximo® Manage.

- [Conditional user interface features](#)
Maximo Manage implements conditional user interface features in some applications. Conditional user interface features are available only when certain conditions are met.
- [Properties for workspace deployment](#)
The custom resource for the Maximo Manage workspace provides properties for activating the application.
- [System properties](#)
You can modify the default values for system properties to tailor the system to your needs.
- [Maximo Manage facts](#)

Conditional user interface features

Maximo Manage implements conditional user interface features in some applications. Conditional user interface features are available only when certain conditions are met.

The conditional user interface features are documented in the IBM® Support knowledge base: [Technotes about Conditional User Interface features](#)

Properties for workspace deployment

The custom resource for the Maximo® Manage workspace provides properties for activating the application.

Database

The following table describes the fields in the workspace custom resource that are used for database properties:

Table 1. Database properties

Field	Description	Additional information
dbSchema	The database schema that contains the Maximo Manage database tables.	Required field.
encryptionSecret	The encryption keys and algorithms that are used for Crypto and Cryptox encryption.	The following keys are supported: <ul style="list-style-type: none"> • MXE_SECURITY_CRYPTOX_ALGORITHM • MXE_SECURITY_CRYPTOX_KEY • MXE_SECURITY_OLD_CRYPTOX_KEY • MXE_SECURITY_CRYPTOX_MODE • MXE_SECURITY_CRYPTOX_MODULUS • MXE_SECURITY_CRYPTOX_PADDING • MXE_SECURITY_CRYPTOX_SPEC • MXE_SECURITY_CRYPTOX_ALGORITHM • MXE_SECURITY_CRYPTOX_KEY • MXE_SECURITY_OLD_CRYPTOX_KEY • MXE_SECURITY_CRYPTOX_MODE • MXE_SECURITY_CRYPTOX_MODULUS • MXE_SECURITY_CRYPTOX_PADDING • MXE_SECURITY_CRYPTOX_SPEC
tableSpace	The table space for the database.	This property is needed only for the initial deployment of the database. You do not have to provide it for upgrades.
indexSpace	The index space for the database.	This property is needed only for the initial deployment of the database. You do not have to provide it for upgrades.
demodata	Indicates whether to include demo data when the database is created. To include demo data, set the value to true.	The default is false. This property is needed only for the initial deployment of the database. You do not have to provide it for upgrades.
db2Vargraphic	Indicates whether the database uses the vargraphic data type. This field is provided for IBM® Db2®.	The default is true. If you use IBM Db2 and plan to install a language other than English for your base language or as additional languages, ensure that you set the value of this field to true.
bypassUpgradeVersionCheck	Indicates whether to bypass the upgrade version check when a database is installed.	Optional field. The default is false. If you experience failures when the database is installed, you can set this property to true, which allows the installation to complete regardless of the database version. You can then review the log files to evaluate the problem, and if necessary you can fix the installation issue.

Languages

The following table describes the fields in the workspace custom resource that are used for language properties:

Table 2. Language properties

Field	Description	Additional information
baseLang	The base language for the application.	Required field. The default is English. If you select English, you can specify a different base language when you redeploy the application. However, if you specify a language other than English, you cannot change that base language when you redeploy the application.
secondaryLangs	The secondary languages for the application.	Optional field. By default, no secondary language is specified. If you work directly in the YAML file for the workspace custom resource, be aware that quotation marks are required if you specify Norwegian for your language, for example 'NO'. If you do not add the quotation marks, NO is interpreted as the Boolean NO instead of an ISO language code.

Generated images

The following table describes the fields in the workspace custom resource that are used for generating images to an external registry:

Table 3. Generated images properties

Field	Description	Additional information
registryForGeneratedImages:registryPath	The URL that points to the location of the external registry.	Optional field.
registryForGeneratedImages:secretName	The name of the secret that was created for the external registry credentials.	Optional field.

Server bundles

The following table describes the fields in the workspace custom resource that are used for server bundle properties:

Table 4. Server bundle properties

Field	Description	Additional information
name	The user-defined name for the server bundle.	Required field.

Field	Description	Additional information
isDefault	Indicates whether the default route points to this server bundle in the Manage application workspace.	Required for one of the server bundles in the group. Only one server bundle can be set as the default. You can set isDefault to true only for the following bundle types: <ul style="list-style-type: none"> all ui If you create only one server bundle and no value is specified in the isDefault field, the server bundle is selected as the default server bundle. If you specify multiple server bundles and no value is specified for the isDefault field, a server bundle with a bundle type of all is selected as the default.
isUserSyncTarget	Indicates whether this server bundle is used for synchronizing Maximo Application Suite users with Manage.	Required for one server bundle. Only one server bundle can be used for user synchronization. You can set isUserSyncTarget to true only for the following bundle types: <ul style="list-style-type: none"> all mea If you do not specify a user sync target, the default server bundle is used for synchronization.
isMobileTarget	Indicates whether this server bundle can be used for the Maximo Mobile application.	Optional field. Only one server bundle can be used for this application. You can set isMobileTarget to true only for the following bundle types: <ul style="list-style-type: none"> all ui
replica	The number of pods that you want to create for this server bundle. If you enter a value of 0, no pod is deployed.	Required field.
routeSubDomain	The subdomain for the server bundle. This subdomain is added as a prefix to the main domain. For example, you can specify maximoui as a subdomain, and then your full domain is maximoui.workspaceid.manage.domain.com.	If you have multiple bundles of type ui or all, then you must specify a subdomain for each bundle in order to give users access to the bundle.
bundleLevelProperties	The Manage system properties that you want to apply only to a specific server bundle.	Optional field.
additionalServerConfig.secretName	The secret that contains the additional server.xml file that is applied to the Liberty application server.	Optional field.
jvmOptions	Specifies the JVM options for the Liberty application server for a server bundle. The values for the field must be specified in the format that is shown in the following example: -Xms4m\n-Xmx488m\n-XX:MaxPermSize=256m.	Optional field.

Customization

The following table describes the fields in the workspace custom resource that are used for customization properties:

Table 5. Customization properties

Field	Description	Additional information
customizationArchive	The URL that points to the location of the customization archive.	Optional field. The following URL protocols are supported: <ul style="list-style-type: none"> HTTP HTTPS FTP FTPS
customizationArchiveCredentials	The credentials that are required to access the customization archive.	Optional field.

Server mode

The following table describes the field in the workspace custom resource that is used for mode property for server deployment:

Table 6. Server mode property

Field	Description	Additional information
mode	The state of the Maximo Manage deployment. You can use the following values: <ul style="list-style-type: none"> up - The Maximo Manage servers are running. down - The Maximo Manage servers are not running. 	Required field. The default value is up.

Persistent volumes

The following table describes the fields in the workspace custom resource that are used for persistent volume properties:

Table 7. Persistent volume properties

Field	Description	Additional information
pvcName	The name of the persistent volume claim that requests storage.	
volumeName	The name of the storage volume that your administrator created.	
size	The amount of storage to claim from the volume storage.	
mountPath	The mount path for the storage volume within the Maximo Manage pod.	
storageClassName	Storage class that your administrator defined for the volume.	

Build tag

The following table describes the field in the workspace custom resource that is used for the build tag property:

Table 8. Build tag property

Field	Description	Additional information
buildTag	The build that is used for the deployment. By default, the latest build is used when applications are deployed. However, you can specify an earlier build if you do not want the latest build to be deployed.	Required field. The default is <code>latest</code> . Build images are tagged with a timestamp, as shown in the following example: <code>buildtag: 202011092887843</code>

Imported certificates

The following table describes the fields in the workspace custom resource that are used for imported certificates:

Table 9. Imported certificate properties

Field	Description	Additional information
alias	An alternative name for the certificate. The alias must be unique within the workspace.	The list of aliases and certificates represents a complete chain of trust for the host. The certificates are necessary only if the host presents a certificate signed by a certification authority that is not already trusted by Maximo Application Suite.
crt	A single certificate provided in PEM format.	

Sample Manage workspace custom resource (CR)

```
spec:
  bindings:
    jdbccfg: workspace-application # Manage-workspace level, required.
    #jdbccfg expects connection string, jdbc options, use SSL flag, username, password, certificate

  components: #?where do we provide the description of the component and get it translated? What displayed to the
    #end user are supposed to be description of the component, not necessarily the actual identifier on the CR
  managebase: # The components. It is a variable list. Value come from a predefined list. Some componnet have
  additional configuration
    # should it be a list or like that originall on the playbook
    version: 8.0.0
  nuclear:
    version: 8.0.0
  acm:
    version: 8.0.0
    bindings: #
      bdi: workspace-application # we expect bdi configuration is needed for acm and aviation.
      # how do we specify it is needed?
    version: latest # If latest, operator will choose the default version of the component. Where would be a possible
  list comfrom
    # Manage operator maintains a supporte version of add ons based on the manage base version in the
  admission
    # webhook.

  settings:
    lanaguges:
      baseLang: EN #optional base language
      secondaryLangs: #optional list of language codes, default empty
        - FR #?a code, a two leter standard? The list coming from the schema validation
        - IT
    customization:
      customizationArchive: https://company.com/customization.zip #optional customization archive that wget can obtained,
  no security
      customizationArchiveCredential: secretname #optional secret name and password for wget
      #only support http, https, ftp, ftps with password authentication for now. Aditonal method may be
  provided in the
      #future.

  db:
    dbSchema: maximo #optional, default to maximo, but typically need input ?should it be in jdbccfg?
    encryptionSecret: <workspaceid>-encryption-secret #?how to indicate this is a secret and have to be certain name?
  User enter properties, if not exist, generate default, should we use fixed name or allow user to specify secret?
    maxinst: # optional but typically the databata need to input. Cannot change after deploymet ?How to tell MAS about
  it?
    tableSpace: maxdata # only used when instantiate the DB, for a new database, customer has to specify it
    indexSpace: maxdata # only used when instantiate the DB, for a new database, customer has to specify it
    installDemoData: false # default no, n/a after DB initialized
```

```

    demodata: true # whether the demo data will be installed. Default false
    db2Vargraphic: true # option when db is installed, n/a after DB initialized, only applies if the DB is db2

deployment:
  buildTag: 202011092887843 # actual build number or "latest" as default. Specifying the actual build number most
  likely a modification after
  # initial deployment to prevent accidental change
  mode: up # up, down or adminmode
  persistentVolumes: # list of volumes
  - pvcName: forattachdoc the actual pvcname generated will be environment-workspaceid-pvcName, pass the generated
  name to ManageServerBundle CR
    volumeName: actual_volume_customer_created1 the valume customer created
    storageClass: nfs
    size: 50G
    mountPath: /dir #pass on to ManageServerBundle CR
  - pvcName: dropzone
    volumeName: actual_volume_customer_created2
    storageClass: nfs
    size: 10G
    mountPath: /dir2
  serverBundles:
  - name: "generic1" #name of the server, user input, no default ?required
    isDefault: true # default bundle, pointed from the luanch point of Manage.
    # There are some criteria that isDefault has to be set to a bundle with a certain type.
    isUserSyncTarget: true #There are some criteria that isDefault has to be set to a bundle with a certain type.
    replica: 3
    bundleType: all # one of the predefined types ui, all, report, etc
    routeSubDomain: generic1 # subdomain that prefix manage.workspaceid.mange.domain.com
    bundlelevelproperties: # let us know if a configmap or a section of properties . We just need to eventually
  produce a
    # content of a java properties file formatted configmap
    prop1: value1
    prop2: value2
    #bundleLevelProperties: bundlepropertiesconfigmap # optional configmap to specify bundle level maximo properties
  key value pair
    additionalServerConfig: serverxmlconfigmap # optional include secondary server.xml file
    # need ui for user to enter a freeform text, either recorded here or
  become a configmap
  - name: "mycronservers"
    replica: 2
    bundleType: cron
  - name: "reportonly"
    replica: 1
    bundleType: report
    route: dataloadserver

#service binding expected for instanceid, workspaceid, ImageRegistry, registry pull secret
#oauth client registration

# BDI CR spec

```

System properties

You can modify the default values for system properties to tailor the system to your needs.

- [Asset properties](#)
You can use system properties to help manage assets.
- [Attached document properties](#)
You can specify property values to control the use of attachments in the application.
- [Attachment properties for S3 storage](#)
You can configure the product so that it stores attachments in a Simple Storage Service (S3) cloud object storage.
- [Automation scripts properties](#)
You can use system properties to help manage automation scripts.
- [Bidirectional language properties](#)
You can use system properties to enable and manage bidirectional language support.
- [Bulletin board property](#)
You can use the property to track viewed and unviewed messages in the bulletin boards.
- [Calendar property](#)
You can use the property to specify the system base calendar.
- [Classification item properties](#)
You can use classification items (CI) properties to specify data set provider classes for CI and actual CI.
- [Communication template property](#)
You can use the property to specify whether bind variables are ignored in the communication templates.
- [Condition property](#)
You can use the property to list comma-separated table names that are excluded when the reference for a condition is checked.
- [Cron task properties](#)
You can use properties to manage cron tasks.
- [Database properties in IBM Maximo Manage](#)
You can use system properties to help manage the database for Maximo Manage.
- [Deployed assets property](#)
You can use the property to specify the data set provider class for deployed assets.

- [Drill-down system properties](#)
You can use system properties to enable the optional drill-down user interface and to control the number of objects that are returned when working with drill-down features.
- [Dynamic job plan property](#)
You can use the dynamic job plan property to give users the ability to create dynamic job plans.
- [Email interaction system properties](#)
The email interaction system properties define the behavior and characteristics of the emails.
- [Email listener properties](#)
You can use system properties to help manage email listener properties.
- [Environment properties](#)
You can use system properties to help manage the system environment.
- [Electronic signature properties](#)
Electronic signature authentication confirms that a person who modifies a record is the same person who logged in to the system. You can use the system properties to manage the electronic signature feature for your organization.
- [General ledger property](#)
You can use the property to control the use of the upper function for the GL account in QBE.
- [Guest login properties](#)
The guest login properties determine the characteristics of unauthenticated access by a guest user.
- [mxe.help properties](#)
The mxe.help system properties connect the user interface to the help system. Some of the properties are used to construct the link that opens the help system. To ensure that the help system is available, match the values in the mxe.help properties to the help system that you deploy.
- [Internet Explorer Java properties](#)
You use the Internet Explorer Java™ system properties to specify the version of the Java plug-in that Internet Explorer uses when running applets.
- [Inventory property](#)
You can use the property to set the maximum inventory usage line limit in an inventory usage document.
- [Issues and transfers property](#)
You can use the property to open the Long Operation window when an INVISSUE is saved and the processing time is long.
- [Lightweight Directory Access Protocol integration properties](#)
You can use system properties to manage Lightweight Directory Access Protocol (LDAP) integration.
- [Migration Manager properties](#)
You use Migration Manager to migrate configuration content from one product environment to another. You can use the properties to control the migration of the configuration content.
- [Reorder property](#)
You can use the reorder property to manage the reorder time out periods for your organization.
- [Report integration properties](#)
You can use report properties to control how reports are created and managed in IBM® Maximo Manage. You can identify most report properties if you specify `report` as a filter value in the Description field.
- [Server properties](#)
You can use the server properties to control how a server operates, such as specifying values for the administration user, for user registration, and email authentication.
- [Side navigation properties](#)
The side navigation system properties define the behavior and characteristics of how users navigate in the user interface.
- [User interface system properties](#)
The web client system properties define the behavior and characteristics of the user interface. To review or change system properties, filter for the term `webclient` in the System Properties application. System property values are preserved during upgrades.
- [Utilities for logging and testing](#)
To help you manage system performance, there are utilities that you can use for testing and debugging purposes. When you are satisfied with your deployment, you can disable these logging utilities.
- [Work order properties](#)
You can use system properties to help manage work orders.
- [Workflow properties](#)
You can use workflow properties to specify the email account of the administrator, control status inheritance for work items, and define the maximum number of loops that can occur between condition nodes.

Asset properties

You can use system properties to help manage assets.

Table 1. Asset properties

Property	Description	Default value
mxe.app.asset.delete AttributesAssetMovedBack	Deletes attributes when an asset is moved back to its original site. The default value is 0 which is no.	0
mxe.assettopology.depth	Represents the maximum depth that you can go in the asset topology.	5
mxe.assettopology.init	Indicates the initial depth for the asset topology.	2
mxe.assettopology.maxnodes	Specifies the maximum number of nodes that can be shown in the asset topology.	200
recon.engine. dataset.map.ASSET	Represents comma-separated data set names that can be reconciled against assets.	DEPLOYED ASSET
recon.engine. dataset.provider.ASSET	Represents the data set provider class for assets.	psdi.app.recontask. engine. dataset.AssetDataS et

Property	Description	Default value
mxeworkorder.rollupMaintenanceCosts	Specifies whether to automatically roll up maintenance costs for assets that are associated with a work order when the work order is closed.	0

Attached document properties

You can specify property values to control the use of attachments in the application.

Note: If you are configuring the product to store attachments in an S3 cloud object storage, refer to the related link at the end of this document.

Table 1. Attached document properties

Property	Description	Default value
mxedoclink.deleteOrphanDocument	Specifies whether to delete orphaned document information when deleting the last attached document record.	0
mxedoclink.docTypes.allowedFileExtensions	Specifies the type of attached document files that you can add to the persistent storage volume. When you complete the system property configurations, restart the server bundle pod to implement the changes.	pdf, zip, txt, doc, docx, dwg, gif, csv, xls, xlsx, ppt, xml, xsl, bmp, html, png, pptx, cfr, mp4, mov, odt, ods, odp, jpg, jpeg, rtf, wmv, wm, wma
mxedoclink.docTypes.topLevelPaths	Specifies the top-level attachments directory that stores all document folders in your persistent storage volume. The Default File Path value entered in the Manage All Documents Folder window must be a subdirectory of this value. This value cannot be null. When you complete the system property configurations, restart the server bundle pod to implement the changes.	The default location is the top level directory on the persistent storage volume. For example: \DOCLINKS.
mxedoclink.path01 through mxedoclink.path10	Specifies the HTTP server path to link documents that are attached to records. This property needs a live refresh only.	
mxedoclink.docTypes.defpath	Specifies the default path for the directory that you set up for attached documents on your persistent storage volume. Your documents are stored in this directory. This value must be configured before you can use the system and needs a live refresh only.	
mxedoclink.printURLAttachments	Specifies whether you can print URL attachments.	0
mxedoclink.maxfilesize	Represents the maximum file size in megabytes that you can add to the attached documents directory.	Use the default value of 10 MB (10 = 10 MB) or replace it with a lesser value. Do not set the maximum file size to a value that exceeds your system, network, or persistent volume capacity limits. If you do, a system error, OutOfMemory, occurs. To correct this error, change the value to less than 10 MB. If the value is set to 0, the system allows all file sizes to be uploaded. However, you might get OutOfMemory errors if you upload a large file size that exceeds system capacity. To correct this error, change the value to less than 10 MB.
mxedoclink.multipleaix.websphere	Does not apply.	False
mxedoclink.multiplehpux.websphere	Does not apply.	False
mxedoclink.multiplelinux.websphere	Does not apply.	False
mxedoclink.multiple solaris.websphere	Does not apply.	False
mxedoclink.multiple windows.websphere	Does not apply.	False
mxedoclink.defaultPrintDocumentReport	Specifies whether printable attachments are printed by default when you print a report.	True

Property	Description	Default value
mxe.doclink.useFilePrompt	Enables a browse icon to select file attachments that are not copied to the default location.	0
mxe.doclink.securedAttachment	To keep your documents secure, set this property to <code>true</code> to prevent the application from displaying the file path of attached documents. The application displays only the content root and the file name. Setting the property to <code>true</code> makes all attached document requests go through the Manage server instead of an HTTP web server and adds an additional layer of security to the stored documents. For Manage deployments on Red Hat® OpenShift®, set this property to <code>true</code> .	False
mxe.doclink.securedAttachmentDebug	Helps you to troubleshoot when you are using secured attachments to view the attachment file. When security for the attachments is active and you set the value for this property to <code>true</code> , the attached file name and file path are displayed in the server log.	False
mxe.doclink.FileValidationClass	Configure this parameter if you want to implement file type scanning when you upload an attached document. The class must be registered with this property in order to implement <code>com.ibm.tivoli.maximo.doclink.AbstractFileVerification</code> .	
proxy_hostname	Indicates the external host that enables direct printing.	
proxy_port	Indicates the external port that enables direct printing.	

The following table provides an example of properties for attached document paths and properties.

Table 2. Examples of values for attached document properties

Property	Sample value
mxe.doclink.maxfilesize	10
mxe.doclink.doctypes.defpath	Specify the default path for your persistent storage volume. For example, <code>C:\DOCLINKS\</code>
mxe.doclink.path01	Specify the path to the directory that you set up in your persistent storage volume. For example: Windows: <code>\doclinks</code> UNIX: <code>/d01/doclinks</code> <code>C:\Doclinks=http://documentserver/</code>

Related reference

- [Attachment properties for S3](#)

Attachment properties for S3 storage

You can configure the product so that it stores attachments in a Simple Storage Service (S3) cloud object storage.

Table 1. Properties for storing attachments in S3 cloud object storage

Property	Description	Value
mxe.cosaccesskey	The S3 access key.	Obtain this value from your S3 configuration.
mxe.cossecretkey	The S3 secret key.	Obtain this value from your S3 configuration.
mxe.cosendpointuri	The S3 endpoint URI that is used to access the S3 storage by the API. Check with the COS provider for the proper URI syntax. For example, for Amazon Simple Storage Service (S3), the value is <code>https://s3.region.amazonaws.com</code> . For IBM Cloud Object Storage, the value is <code>https://s3.us.cloud-object-storage.appdomain.cloud</code> .	Obtain this value from your S3 configuration.
mxe.cosbucketname	The name of the S3 storage bucket where attachments are stored, for example, <code>mxe.cosbucketname=maximoattachments</code> .	Obtain this value from your S3 configuration.
mxe.attachmentstorage	The class that implements the S3 storage protocol. The product provides an implementation of the S3 storage protocol.	Always set to <code>com.ibm.tivoli.maximo.oslc.provider.COSAttachmentStorage</code> .
mxe.doclink.securedAttachment	For security, this property hides the file path of documents that were added by the Attached Documents feature. Set this property to <code>true</code> so that the hyperlink for the attachment shows the application content root and the encrypted file name only.	Always set to <code>true</code> . If this property is not set to <code>true</code> , other attachment storage protocols do not function.
mxe.doclink.doctypes.defpath	The default path for the doclinks folder where the attachments are stored. This path is a fixed value.	Always set to <code>cos:doclinks\default</code> for S3.
mxe.doclink.doctypes.topLevelPaths	The path to the top-level directory for document folders. This path is a fixed value.	Always set to <code>cos:doclinks</code> for S3.

Property	Description	Value
mxe.doclink.path0 1	The HTTP server path to link documents that are attached to records. This path is a fixed value.	Set this to match the URL of your UI server. For example, <code>cos:doclinks=https://host/maximo/oslc/cosdoclinks.</code>

Automation scripts properties

You can use system properties to help manage automation scripts.

Table 1. Automation script properties

Property	Description	Default value
mxe.script.attributelevel	Represents the maximum relationship depth for a launch point variable with ATTRIBUTE binding type.	3
mxe.script.drivers	Represents a comma-separated list of script drivers that is useful when any custom, none JSR223 compliant, script engine needs to be plugged into the script framework.	com.ibm.tivoli.maximo.script.JSR223ScriptDriver
mxe.webclient.autoscript.uscriptide	Enables a rich text editor to edit your automation scripts. The editor has features, such as syntax highlighting and auto-completion, that improve usability.	1

Bidirectional language properties

You can use system properties to enable and manage bidirectional language support.

Table 1. Bidirectional language properties

Property	Description	Default value
mxe.bidi.support.on	Indicates whether bidirectional support is enabled. If the value is empty, illegal or 0, the bidirectional support code is not enabled. A value of 1 indicates that the bidirectional support is enabled.	
mxe.bidi.text.direction	When bidirectional support is enabled, this property indicates that the base text direction of text which appears on the GUI is enforced. The value which is enforced is stored in this property. This property is the system level property for base text direction. There is also a Maximo® business object and a Maximo business object attribute level for the base text direction property. The values for this property are: <i>LTR</i> , <i>RTL</i> , or contextual values.	

Bulletin board property

You can use the property to track viewed and unviewed messages in the bulletin boards.

The bulletin board property is PMBBISTRACKED. This property is used to set the global variable for bulletin boards to track viewed or unviewed messages. The default value is 1.

Calendar property

You can use the property to specify the system base calendar.

The calendar property is mxe.baseCalendar. This property indicates the type of calendar that is defined as the system base calendar. The default value is gregorian.

Classification item properties

You can use classification items (CI) properties to specify data set provider classes for CI and actual CI.

Table 1. Classification item properties

Property	Description	Default value
recon.engine.dataset.map.CI	Represents comma-separated data set names that can be reconciled against CI.	ACTUAL CI
recon.engine.dataset.provider.ACTUAL CI	Represents a data set provider class for actual CI.	psdi.app.recontask.engine.dataset.ActualCIDataSet
recon.engine.dataset.provider.CI	Represents a data set provider class for CI.	psdi.app.recontask.engine.dataset.CIDataSet

Communication template property

You can use the property to specify whether bind variables are ignored in the communication templates.

The communication template property is `mxe.comm.ignoreunresolvedbindings`. This property ignores unresolved bind variables in the communication templates. The default value is 0.

Condition property

You can use the property to list comma-separated table names that are excluded when the reference for a condition is checked.

The condition property is `mxe.condition.excludeCheckReference`. This property represents comma-separated table names that are excluded when the reference for a condition is checked. There is no default value.

Cron task properties

You can use properties to manage cron tasks.

Table 1. Cron task properties

Property	Description	Default value
<code>mxe.crontask.copoolsize</code>	Represents the cron task thread pool size for core threads.	20
<code>mxe.crontask.corethreadtimeout</code>	Sets the policy governing whether core threads may time out and terminate if no tasks arrive within the keep-alive time, being replaced if needed when new tasks arrive. When <code>mxe.crontask.corethreadtimeout</code> is set to 0, core threads are never terminated due to lack of incoming tasks. When <code>mxe.crontask.corethreadtimeout</code> is set to 1, the same keep-alive policy applies to both core and non-core threads. The setting for the <code>mxe.crontask.keepalivetime</code> property is used to determine how many seconds elapse before a thread times out.	0
<code>mxe.crontask.deleteBB</code>	Removes expired bulletin board records.	0
<code>mxe.crontask.donotrun</code>	Use ALL to exclude all cron tasks from running. To exclude a specific cron task from running, specify the <code>crontaskname.instanceName</code> instance.	
<code>mxe.crontask.dorun</code>	Indicates that all cron tasks should run.	
<code>mxe.crontask.historycleanuprate</code>	Determines how often, in minutes, the excessive cron task history records are removed. There is no action if the value is set to 0.	180
<code>mxe.cronTaskInitDelay</code>	Represents the cron task monitor initialization delay in seconds. After the system server starts, this property determines the amount of time before the server initializes the cron task.	60
<code>mxe.cronTaskMonitorInterval</code>	Determines the time intervals at which the cron task manager monitors the statuses of the cron tasks.	60
<code>mxe.crontask.keepalivetime</code>	Represents the cron task thread pool keep-alive time for inactive threads.	

Database properties in IBM Maximo Manage

You can use system properties to help manage the database for Maximo® Manage.

Table 1. Database properties

Property	Description	Default value
<code>mxe.db.closeLongConn</code>	A Boolean flag that indicates that the long running connection needs to be closed.	false
<code>mxe.db.DB2jdbcCollection</code>	Represents the DB2® Java™ database connectivity (JDBC) collection. The <code>NULLIDR1</code> value activates query optimization REOPT ONCE.	
<code>mxe.db.DB2LDTextCaseInsensitiveSearch</code>	When set to 1, the DB2 search on Long Description field is not case-sensitive. Might cause performance delay.	0
<code>mxe.db.detectLongConnInterval</code>	Checks the long running connection. The interval is reflected in minutes. A value of (0, 30] is treated as 30.	0

Property	Description	Default value
mxedb.disableservercursor	Used to disable the server cursor.	1
mxedb.fetchResultLogLimit	Determines the typical or largest fetch count for every object. A stack trace is created in the log file of the application server logs every time a multiple of the fetch log limit is reached. For example, if you set the property to 1000, the stack trace is logged at the 1000th record, the 2000th record, and so on.	5000
mxedb.fetchResultStopLimit	Represents the fetch stop limit used when checking that the fetch stop limit is enabled. The limit applies to all objects for which a specific fetch stop limit property is not specified. A value of -1 means that there is no limit.	5000
mxedb.fetchsize	Represents the size of the database fetch.	40
mxedb.fetchsizeuse	Represents the flag that indicates whether to use the fetch size.	1
mxedb.fetchStopExclusion	Provides a comma-separated list of object names. If an object name is in the list, the fetch stop limit check is disabled for the object. If an object name is in the list and the same object is specified in an mxedb.fetchResultStopLimit.OBJECTNAME property, the exclusion overrides the other property. The values are represented in a comma-separated object name list in the MAXOBJECT table.	
mxedb.fetchStopLimitEnabled	Enables or disables the checking of the fetch stop limit. Use 0 to disable and use 1 to enable.	1
mxedb.format.date	Determines the database date function. A value of none tells the system to pass through the date value. You cannot change this value.	
mxedb.format.nullvalue	Represents the database-specific format of the null value function.	<ul style="list-style-type: none"> For IBM® DB2, the value is <i>COALESCE</i>, and you cannot change the default value. For Oracle, the value is <i>NVL</i>, and you cannot change the default value. For SQL Server, the value must be set to <i>ISNULL</i>.
mxedb.format.time	Represents the database time function. A value of none indicates that the time value is passed through. You cannot change the default value.	
mxedb.format.timestamp	Represents the database time stamp function. A value of none indicates that the time stamp value is passed through. You cannot change the default value.	
mxedb.format.upper	Defines the database uppercase function for the system. You cannot change this value.	Upper
mxedb.initialConnections	Represents the number of database connections that are created when the application server is started.	8
mxedb.logCorrelationid	Disables database cursor sharing. You can add the correlation ID as an SQL comment. Use the property only in debug mode.	0
mxedb.logSQLPlan	Represents the log execution plan for full table scans.	0
mxedb.longrunTimeLimit	Indicates the time limit, in minutes, to close the long running connection.	180
mxedb.logSQLTimeLimit	Represents the log that contains the SQL operations that exceed the time limit in milliseconds.	1000

Property	Description	Default value
mxedb.lookupMaxRow	Represents the maximum number of records queried from database for lookups.	1000
mxedb.lookupMultiplier	Used in conjunction with the mxedb.lookupMaxRow property to show items.	5
mxedb.maxFreeConnections	Represents the maximum number of free database connections that are available in the connection pool.	8
mxedb.minFreeConnections	Represents the minimum number of free database connections that are available in the connection pool.	5
mxedb.MLQBELooseSearchWOJoin	Used for Oracle only. Do not use outer join for search on a multiple language enabled field.	0
mxedb.newConnectionCount	Represents the number of new connections to be created when the minimum free connections are available in the connection pool.	3
mxedb.optionnum	Represents the size of the option.	1000
mxedb.optionuse	Represents the flag that indicates whether to use the OPTION FAST feature for Microsoft SQL Server. You use this property with the mxedb.optionnum property, which specifies the number of rows that are quickly retrieved from the database.	1
mxedb.QueryTimeout	Represents the amount of time in seconds before the SQL query times out and is stopped.	300
mxedb.refcount	Represents the reference count for the connection log.	100
mxedb.resultsettype	<p>The constant indicates the type for a result set object with the following characteristics:</p> <ul style="list-style-type: none"> The cursor can move only forward. For example: <pre>TYPE_FORWARD_ONLY public static final int TYPE_FORWARD_ONLY</pre> The result set type that is scrollable, but not sensitive to changes that other users make. For example: <pre>TYPE_SCROLL_INSENSITIVE public static final int TYPE_SCROLL_INSENSITIVE</pre> The result set type that is scrollable and sensitive to changes that other users make. For example: <pre>TYPE_SCROLL_SENSITIVE public static final int TYPE_SCROLL_SENSITIVE</pre> 	TYPE_FAST_FORWARD
mxedb.retrydbconnection	Reconnects to the database when you start the application server.	0
mxedb.rowcount	Represents the SQL Server row count value.	0
mxedb.sqlinjection	Indicates whether the SQL injection check is enabled.	1
mxedb.sqlserverPrefetchRows	Represents the setting to reduce lock contention and is only for SQL Server. The optimal setting is 200 rows. Setting a value larger than 500 can degrade performance.	0
mxedb.sqlTableScanExclude	Indicates tables that should not have an execution plan logged.	
mxedb.systemdateformat	Represents the system date format.	<ul style="list-style-type: none"> For IBM DB2, the value is current timestamp For Oracle, the value is sysdate, and you cannot change the default value. For SQL Server, the value is getdate.

Property	Description	Default value
mxedb.transaction_isolation	The installation sets the value to: TRANSACTION_READ_COMMITTED. You cannot change this value.	TRANSACTION_READ_COMMITTED
mxedb.updateWithoutRowstamp	Indicates that you can allow updates on tables that do not contain a rowstamp column.	0
mxedb.UseSiteListInQuery	Represents the use literal list for site and organization restrictions.	0
mxedb.manager	References the Java class of the Maximo database manager. This property also requires that you specify the jdbc database connection string as the Oracle call interface (OCI) connection string, and that you make the OCI driver accessible to the system web component Java virtual machine (JVM).	The default value is <i>psdi.server.DBManager</i> . If you have an Oracle database that requires proxy authentication, set this property to <i>psdi.server.OracleProxyDBManager</i> .
mxedb.watchdog.adminemail	Represents the administrator email address used to send the database connection watchdog mail.	
mxedb.watchdog.logInterval	Represents the interval time in minutes between when each database connection watchdog log is created. The database connection watchdog log is written to the database connection logger.	10
mxedb.watchdog.mailinterval	Represents the interval in minutes before a watchdog email is sent to the administrator.	60

Deployed assets property

You can use the property to specify the data set provider class for deployed assets.

The deployed assets property is `recon.engine.dataset.provider.DEPLOYED_ASSET`. This property represents the data set provider class for deployed assets. The default value is `psdi.app.recon.task.engine.dataset.DPADataset`.

Drill-down system properties

You can use system properties to enable the optional drill-down user interface and to control the number of objects that are returned when working with drill-down features.

Table 1. Drill-down properties

Property	Description	Default value
mxewebclient.drilldown.fetchsize	Specifies the fetch size per node. Child objects are fetched in batches regardless of the type.	50
mxewebclient.drilldown.fetchlimit	Specifies the fetch limit per node type. For any node, the fetch limit specifies the maximum number of child objects that are fetched for each relationship. For example, by default a location node can have 50 child locations, 50 assets, 50 preventive maintenance records, and so on.	50
mxewebclient.extendedDrilldown	Enables an optional, extended drill-down user interface for assets and locations that displays a single, hierarchical view.	false

Dynamic job plan property

You can use the dynamic job plan property to give users the ability to create dynamic job plans.

The `dynamicjobplan` property is a system property that enables the creation of dynamic job plans. The default value is 0.

Email interaction system properties

The email interaction system properties define the behavior and characteristics of the emails.

Mail key properties

The @@MAILKEY@@ string specifies the appropriate signature string in the subject line of emails. For each configuration of email interaction, at least one of the following properties is included in the @@MAILKEY@@ property:

Property	Configuration type
mxe.mfmail.STSignatureSimple	Object status change with a simple email format
mxe.mfmail.STSignatureAdvanced	Object status change with an advanced email format
mxe.mfmail.WFSignatureSimple	Workflow assignment with a simple email format
mxe.mfmail.WFSignatureAdvanced	Workflow assignment with an advanced email format

Email body properties

The following system properties are specified in the body of the emails that are sent in email interaction:

Property	Description
mxe.mfmail.ValueListBegin	Marks the beginning of the prompt section
mxe.mfmail.ValueListEnd	Marks the end of the prompt section
mxe.mfmail.AssistMarker	Identifies the characters that precede the prompt numbers
mxe.mfmail.LineSize	Indicates the line size in the email. The default is 72.
mxe.mfmail.adminEmail	Indicates the email address of the administrator to notify when errors occur that require administrative action. This property is optional
mxe.email.convertToPlainText	Converts the email into plain text.

SMTP property

The mail.smtp.starttls.enable property affects all features that send email such as password changes.

Property	Description
mail.smtp.starttls.enable	Enables the use of the STARTTLS command if it is supported by the SMTP server. The default value is false.

Email listener properties

You can use system properties to help manage email listener properties.

Table 1. Email listener properties

Property	Description	Default value
mxe.listener.rfc822depth	Represents the number of levels required to retrieve attachments from a message file.	3
mxe.listener.rfc822extension	Represents the file extension for the message file that is downloaded.	
mxe.isnr.validateperson	Indicates whether a person needs to be validated in the Email Listener application.	1

Environment properties

You can use system properties to help manage the system environment.

Table 1. Environment properties

Property	Description	Default value
mxe.allowLocalObjects	In production environments, this property is set to true to improve system performance. You set this property to false for development work or for custom applications.	1
mxe.app.inventor.updateReservations	When material issues are not run by the Select Reserved Items action, this property updates the reservations.	0
mxe.enableConcurrentCheck	Allows multiple logins on the same user account. By default, the property has a value of 0. To change the value, specify 1 for the property when you configure bundle-level properties during the deployment process. You set this property to true (1) to prevent multiple logins on the same user account. Before you create users, set this property to 1.	0
mxe.isFederal	Hides the Federal notice when you log in.	0
mxe.isSaaSEnabled	Indicates that SaaS is enabled.	0
mxe.MLCacheLazyLoad	Represents the multiple-language metadata cache which loads 1 object at a time. You set this property to 1 to load all objects simultaneously for 1 language.	1
mxe.useAppServerSecurity	Represents the security that your configuration uses. By default, the security for the system is used. You set this property to true if your configuration uses security provided by an application server.	0

Property	Description	Default value
mxе.UserLicenseKey	Represents the product enabler (license key) that is used during installation. If the product enabler changes, you must update the value of this property.	

Electronic signature properties

Electronic signature authentication confirms that a person who modifies a record is the same person who logged in to the system. You can use the system properties to manage the electronic signature feature for your organization.

The following table shows the electronic signature properties and their default values:

Table 1. Electronic signature properties

Property	Description	Default value
mxе.allownativeesig	Specifies whether electronic signature authentication is enabled. This feature is enabled and enablement should not be changed.	1
mxе.esigresete-mailfrom	Specifies the email address that sends a message to inform users when their electronic signature key is reset.	None. Specify the email address that your organization uses to inform users when their electronic signature key is reset, for example system@example.com.

General ledger property

You can use the property to control the use of the upper function for the GL account in QBE.

The general ledger property is mxе.upperGLValues. This property controls the use of the upper function for the GL account in QBE. The default value is 0.

Guest login properties

The guest login properties determine the characteristics of unauthenticated access by a guest user.

Property name	Description	Default value
mxе.webclient.guestLoginEnabled	Enables unauthenticated access.	0
mxе.system.guestuser	Enables the guest user ID	Empty string
mxе.system.guestpassword	Enables the guest password	Empty string
mxе.webclient.guestLoginURL	The URL of the page to load when the user clicks the Login as Guest button	../login/guestlogin.jsp

mxе.help properties

The mxе.help system properties connect the user interface to the help system. Some of the properties are used to construct the link that opens the help system. To ensure that the help system is available, match the values in the mxе.help properties to the help system that you deploy.

Table 1. Help system properties

Property	Description	Default value
mxе.help.host	Represents the host name or IP address of the help system.	127.0.0.1
mxе.help.path	Represents the path that is inserted between the help system port and the topic when the link to the help system is constructed.	/help/
mxе.help.port	Represents the port of the help system.	9080
mxе.help.protocol	Represents the protocol of the information system (HTTP or HTTPS).	http

Internet Explorer Java properties

You use the Internet Explorer Java™ system properties to specify the version of the Java plug-in that Internet Explorer uses when running applets.

Property name	Description	Default value
mxе.javaApplet.ClassidNoMinimum	Identifies which minimum version of Java plug-in to use and instructs Internet Explorer to use the highest install version.	8AD9C840-044E-11D1-B3E9-00805F499D93
mxе.javaApplet.Classid	Identifies which minimum version of Java plug-in to use. This is an alternative form of the classid attribute where the minimum version of Java plug-in is specified.	CAFEEFAC-0017-0000-0000-ABCDEFEDCBA

Property name	Description	Default value
mx javaApplet.Co debase	Specifies where to download the Java SE Runtime Environment. This property value is prefixed with the protocol.	http://java.sun.com/update/1.7.0/jinstall-7-windows-i586.cab#Version=1,7,0,0
mx javaApplet.Co debaseNoProtocol	Specifies where to download the Java SE Runtime Environment. This property value is not prefixed with any protocol.	java.sun.com/update/1.7.0/jinstall-7-windows-i586.cab#Version=1,7,0,0
mx javaApplet.Ty pe	Specifies the applet type. Also specifies that a Java SE Runtime Environment with at least the specified update version provided by the value of jpi-version is invoked to run the applet.	application/x-java-applet;jpi-version=1.7+

Inventory property

You can use the property to set the maximum inventory usage line limit in an inventory usage document.

The inventory property is `mx.inventory.maxInvUseLineLimit`. This property represents the maximum inventory usage line limit in an inventory usage document. The default value is 250.

Issues and transfers property

You can use the property to open the Long Operation window when an INVISSUE is saved and the processing time is long.

The issues and transfers property is `mx.app.invi ssue.doLongOpOnSAVE`. This property opens the Long Operation window when an INVISSUE is saved. There are two values: 0 that opens the HourGlass or 1 that open the Long Operation window. The default value is 0.

Lightweight Directory Access Protocol integration properties

You can use system properties to manage Lightweight Directory Access Protocol (LDAP) integration.

Table 1. LDAP integration properties

Property	Description	Default value
mx.allowLDAPUsers	Indicates whether LDAP users are allowed into the system if they do not have a user record.	0
mx.ClientCountMinutes	Represents the interval in minutes for counting sessions.	15
mx.LDAPMaxErrors	Represents the maximum number of errors for LDAP or virtual machine manager (VMM) synchronization.	1000
mx.LDAPUserMgmt	Indicates whether LDAP owns user management when <code>mx.userAppServerSecurity = 1</code> .	1

Migration Manager properties

You use Migration Manager to migrate configuration content from one product environment to another. You can use the properties to control the migration of the configuration content.

Table 1. Migration Manager properties

Property	Description	Default value
mx.dm.autoapp rovepkgdef	Represents the Migration Manager auto approval of package definitions.	0
mx.dm.collvalid levels	Represents the maximum number of levels searched to find related records.	5
mx.dm.collvalid srcexclude	Specifies the source object, attribute, and value combinations that cannot be traversed to.	MAXINTOBJCOLSMAXINTOBJALIAS
mx.dm.collvalid tgtexclude	Specifies the target object and attribute combinations that cannot be traversed from during validation.	MAXINTOBJECT.USEWITH, MAXRELATIONSHIP.CARDINALITY, CRONTASKINSTANCE.SCHEDULE
mx.dm.continue onerror	Continues the Migration Manager deployment when an error is found.	0
mx.dm.dbserve r	Represents the database server name for Oracle 9.x.	
mx.dm.dmroot	Represents the name of the Migration Manager root folder that is on the application server computer. This folder stores Migration Manager package files. You must configure this property before using Migration Manager.	
mx.dm.dmsessi ontimeout	Represents the timeout value of the Migration Manager HTTP session in minutes. When a long-running Migration Manager task (such as package creation or package deployment) starts, the timeout value for the session of the user who is currently logged in changes to the value specified by this property.	120

Property	Description	Default value
mx.e.dm.dmstagecommit	Specifies the commit interval for records that are inserted into the staging table in the target environment for the Migration Manager. The value is specified in the source environment, and Migration Manager uses the value when distributing a package from the source database to the target database.	1 The default value indicates that the commit interval occurs for every (1) record.
mx.e.dm.importlimit	Represents the collection import limit.	100
mx.e.dm.previewfreememorythreshold	Represents the memory threshold in percentage before the preview operation stops.	20

Reorder property

You can use the reorder property to manage the reorder time out periods for your organization.

The reorder property is mx.e.reorder.previewtimeout. This property represents the reorder preview time out period in minutes. This property is similar to the web server session time out. The default value is 30 minutes.

Report integration properties

You can use report properties to control how reports are created and managed in IBM® Maximo® Manage. You can identify most report properties if you specify `report` as a filter value in the Description field.

Table 1. Report properties

Property	Description	Default value
mx.e.directprint.inherited.attachments	Specifies whether inherited documents are enabled for printing by using the Direct Print with Attachments function. Used for direct print with attachments.	0
mx.e.directprint.javaconsole.debug	Enables you to output to Java™ Console for troubleshooting.	0
mx.e.directprint.printtime.wait	Indicates the maximum duration in seconds the current print process waits before moving to the next process.	600
mx.e.report.AttachDoc.validateURL	Determines whether the URL of the attached document needs to be validated before printing the document. For Manage, set this property to 0.	1
mx.e.report.birt.aliaspattern	Pattern used to support using extended fields in the report where clause.	\b(inner|outer|left|right|join|on|where)\b
mx.e.report.birt.cancelreportinterval	Determines how frequently, in seconds, the server checks that reports are canceled on the database. Used in clustered environments where the report administrator might cancel a report on a different server from where the report is running.	20
mx.e.report.birt.disablequeuemanager	Defines whether the queue manager is enabled. If the queue manager is disabled (value set to 1), scheduled reports are not run on the server. Used for multi-server configurations, performance maintenance.	0
mx.e.report.birt.maxconcurrentrun	Manages the number of immediate and scheduled Business Intelligence Reporting (BIRT) reports that can be run concurrently Used for performance maintenance.	5
mx.e.report.birt.queueidletimeseconds	Frequency, in seconds, that the queue manager polls the queue for new report jobs. Used for performance maintenance.	60
mx.e.report.birt.PrintSeparateRecord	Enables you to print on both the front and back of a sheet of paper and to print each record separately.	0
mx.e.report.birt.viewerurl	For users with one or more BIRT Report Only Servers (BROS), specifies the network address of the BROS cluster. Use one of the following formats: http://host[:port]/web-context/report https://host[:port]/web-context/report For example: https://ibmhost/maximo/report	
mx.e.report.adhoc.editWithGroupAccess	Enables you to edit an ad hoc report when any security group has access to the report.	0

Property	Description	Default value
mxe.report.cognos.content.store.package.location	Represents the content store folder where the Cognos® package is published.	
mxe.report.cognos.datasource	Represents the Maximo data source name that is used by the Cognos adapter.	
mxe.report.cognos.db.schemaName	Represents the Maximo database schema name that is used by the Cognos adapter.	
mxe.report.cognos.db.sql.name	Represents the Maximo database name where the database type is SQL-Server.	
mxe.report.cognos.db.type	Represents the Maximo database type that is used by the Cognos adapter.	
mxe.report.cognos.maxappurl	The Maximo web application URL for Cognos users.	
mxe.report.cognos.namespace	Represents the Cognos namespace which holds information about users, security groups, and roles.	
mxe.report.cognos.serverURL	Represents the Cognos dispatcher/gateway URI. The property is used to launch Cognos reports or administration.	
mxe.report.custom.rptServerLogonPass	Represents the password used to log on to the external report server.	
mxe.report.custom.serverURL	Represents the URL for custom report applications.	
mxe.report.directprint.papersourceselection	Choose the paper source by PDF page size.	0
mxe.report.DisableHyperlinkExport	Disable hyperlinks from exported report contents in various file types including xls and pdf.	1
mxe.report.MaxReportLimits	Use the maximum value for report security limits when the user is in multiple security groups.	1
mxe.report.passDatabase	Pass the database information and password from Maximo to the report server.	1
mxe.report.passEncryptedWhere	Encrypt the value of the reporting where clause before passing to the report engine.	1
mxe.report.passMaximo	Pass the Maximo user's encrypted password from Maximo to the report server.	1
mxe.report.passSMTP	Pass the SMTP host name from Maximo to the report server.	1
mxe.report.reportsInAPage	Defines the number of reports that display in the Report window.	5
mxe.doclink.defaultPrintDocWithReport	Represents the default value for printing an attached document with report if printable type. Used for direct print with attachments.	True
webclient.hideUnauthorizedReports	Hide unauthorized reports.	0

Additional report properties

Depending on your external reporting system, you might need to specify additional property values. You can add properties in the System Properties application.

Server properties

You can use the server properties to control how a server operates, such as specifying values for the administration user, for user registration, and email authentication.

Table 1. Server properties

Property	Description	Default value
mail.mime.decodefilename	Represents the name of the JavaMail property that controls decoding of MIME file names.	true
mail.mime.decodetext.strict	Represents the JavaMail property that controls decoding of MIME encoded words.	false
mail.smtp.host	Represents the name of the host that runs the SMTP server. This name is needed for facilities that use email notifications, such as workflow notifications, email, and any error message notifications. Your network administrator can provide this address.	na.relay.ibm.com
mail.smtp.sendpartial	Indicates that partial emails are sent to valid email addresses.	1
mail.smtp.ssl.enable	Enables SSL over SMTP.	false
mail.smtp.starttls.enable	Enables STARTTLS over SMTP.	false
maximo_extended_host	Represents the Maximo® extended host.	
maximo_extended_host_protocol	Represents the Maximo extended host protocol.	
mxe.adminEmail	Represents the email address that is used if the user does not specify an email address in the labor record. This value is requested during installation.	
mxe.adminmode.logoutmin	Represents the number of minutes that users must log out before the application server is placed in Admin mode. Admin mode is used to configure the database (including the application of structural changes).	5
mxe.adminmode.numsessions	Represents the number of administrative sessions that are allowed after the application server is placed in Admin mode.	5
mxe.adminPasswd	Represents the password for the administrative user.	maxadmin

Property	Description	Default value
mx.adminPassword	Represents the password for the administrative user.	maxadmin, the system login ID of the administrative user.
mx.adminusercredential	Represents the credential of the administrative user.	
mx.adminuserid	Represents the administrative user. This user must have access to all sites. The server uses this property for administrative tasks and to run cron tasks.	maxadmin
mx.adminuserloginid	Represents the system login ID for the administrative user.	maxadmin
mx.com.port	Represents the com port.	
mx.convertloginid	This property identifies whether the login id that the user entered must be converted to uppercase before it is validated. For conversion, set the value to 1.	0 - do not convert
mx.email.charset	Represents the character set for email notifications that are sent. When this property is defined, the character set is used to encode the subject and the message when an email notification is sent. For non- English environments, you must set the UTF-8 character.	
mx.email.contentType	used to set the content type for all communications.	text/html
mx.hostname	Represents the name of the workstation and port that hosts the MXServer.	localhost:7001
mx.maxsequencecheck	Indicates whether to check for multiple sequence values before using.	0
mx.retainrecord	Retains the state of the application tab child tables during editing (less than retainreclimit).	1
mx.retainrecordlimit	Represents the maximum number of records for which the table can retain its state. A higher number can affect performance.	200
mx.smtp.connectiontimeout	Represents the socket connection timeout value in milliseconds.	180000
mx.smtp.password	Defines the password for email authentication. This property must be used with mx.smtp.user property.	Null - disables email authentication.
mx.smtp.timeout	Represents the socket I/O timeout value in milliseconds.	180000
mx.smtp.user	Defines the user ID for email authentication. This property must be used with mx.smtp.password property.	Null - disables email authentication.
mx.system.DomainFactoryNameProvider	Represents the class path that provides the DomainInfoFactory class names used when initializing domains.	psdi.mbo.DomainFactoryNameProvider
mx.system.IntegerQBEsearchCommaAsOr	Enables you to search for integers that are separated with a comma. If the property is disabled and you specify 1,234, only a value of 1234 is returned. To return the values 1 or 234, you must specify =1,=234. If the property is enabled and you specify 1,234, a value of 1 or 234 is returned.	0
mx.system.regpassword	Represents the user registration login password. This value is requested during installation.	maxreg
mx.system.reguser	Represents the user registration login name to register a user. The user name that is specified must have authorization to create new users. This value is requested during installation.	maxreg
mx.system.usingLoadBalancer	Indicates whether a load balancer is used.	0
mx.usermonitor.frequency	Indicates the sleep frequency.	60
mx.usermonitor.InactiveSessionTimeLimit	Represents the time that an inactive session remains in the MAXSESSION table.	120
mx.usermonitor.timeout	Represents the session timeout period, in minutes, on the server to clear the cache.	30
mx.userrestrictionlruCachesize	Manages the number of entries in the LRU cache that stores the restriction entries.	1000
WAS.LTAURL	Represents the URL used to start the Log and Trace Analyzer.	/ibm/action/launch?pageID=com.ibm.ac.lta.web.ui.LogAnalyzer&showNavArea=false
mx.server.enableCSRFBlocking	Enables checks for the CSRF security token.	1
mx.service.runlist	Represents comma-delimited services that must be run.	
mx.sessiontoken.timeoutseconds	Represents a token-based session timeout in seconds. This token is used when the user ID is being authenticated on the report server. The session token timeout setting code is generic and currently only BIRT Reporting uses this function. Used for BIRT Report Only Server (BROS) configuration	180 seconds

Side navigation properties

The side navigation system properties define the behavior and characteristics of how users navigate in the user interface.

Property name	Description	Default value
mxe.webclient.hideOnNavBar	Specifies a comma delimited list of events that are not allowed as navigation bar items. No property allows all.	NEXT, PREVIOUS, NAVHISTORY, STRELOCK
mxe.webclient.showOnToolBar	Specifies a comma delimited list of events that are allowed as toolbar items. No property allows all.	INSERT, SAVE ,CLEAR, PREVIOUS, NEXT, NAVHISTORY, STRELOCK
mxe.webclient.ShowQueriesInToolBar	Shows queries in a menu that is accessed from the toolbar.	0
mxe.webclient.showSelectActionInToolBar	Indicates whether the Select Action menu is shown in the toolbar.	0
mxe.webclient.systemNavBar	Set to 1 to display the side navigation menu.	1

User interface system properties

The web client system properties define the behavior and characteristics of the user interface. To review or change system properties, filter for the term **webclient** in the System Properties application. System property values are preserved during upgrades.

Property name	Description	Default value
mxe.webclient.503_retry-after	Specifies the number of seconds before a retry is attempted when an HTTP connection is not successful. The retry-after value is added to the header of the HTTP response for a 503 response error.	180
mxe.webclient.activitydashboard	A Boolean value that enables or disables activity dashboard monitoring. You might need to add this property before you enable it.	FALSE
mxe.webclient.allowURLDefinedUISessionID	Allows a launching URL to define the session ID for the UI state object that is created.	0
mxe.webclient.async	Indicates whether asynchronous data validation is enabled for the system. Asynchronous (or background) data validation is the default behavior but you can disable it if required.	1
mxe.webclient.asyncerrortooltipwaitbeforeopen	The number of seconds before an error tooltip displays when a user drags the mouse over an error icon.	2
mxe.webclient.asyncrendertimelimit	Specifies the maximum number of seconds between the responses that are sent to the user interface when processing multiple asynchronous validation requests.	15
mxe.webclient.asyncrequestsbeforerender	Specifies the maximum number of concurrent asynchronous validation requests that the user interface framework processes before rendering a response.	5
mxe.webclient.attachimage	Enables or disables the Attach Clipboard Image button when you create communications.	0
mxe.webclient.checkCSRFONLogout	If CSRF checks are enabled, checks the CSRF security token during the logout process.	0
mxe.webclient.ClientDataValidation	Enables client side browser data validation. The mxe.webclient.async property must also be set for this property to work.	1
mxe.webclient.ClientEventQueue.threshold	The maximum number of events in the client event queue before the queue is sent to the server.	2
mxe.webclient.ClientEventQueue.timeout	The maximum time in milliseconds the client event queue waits before the queue is sent to the server.	10000
mxe.webclient.depRequiredCheck	When this property is enabled, before saving data, a check is completed to verify that valid data was provided for all fields that require a value.	1
mxe.webclient.disablelongopquery	Indicates whether a longop query is disabled.	0
mxe.webclient.exitcontexttimeout	Context timeout on exiting.	0
mxe.webclient.goToButtonHeaders	Hides the Go To button when disabled. If this property is enabled and the home button property is disabled, the Go To button appears with the other buttons on the header and is less apparent.	1
mxe.webclient.homeButtonHeaders	Makes the Start Center and Go To buttons more apparent in the UI and separates them from the other header buttons. Disabling this property adds the buttons to the other header buttons and makes them less apparent. Disabling this property also moves the Go To button, even if the Go To button property is enabled.	1
mxe.webclient.isUpgrade	Indicates that an upgrade has occurred.	0
mxe.webclient.listtable.retainstate	When enabled, this property retains the state of the List tab for the user session. If disabled, when the user returns to the List tab after working in other tabs, the List tab is reset and any filters set are lost.	1

Property name	Description	Default value
mx.webclient.logging.CorrelationEnabled	A Boolean value to enable or disable the Correlation ID for tracking.	FALSE
mx.webclient.lossconnectionrecheckinterval	Specifies the interval in seconds to wait before rechecking the server to see if the connection is restored after a loss of connection.	2
mx.webclient.lossconnectionwarninginterval	Specifies the interval in seconds to wait before checking if the connection to server is lost.	15
mx.webclient.lossconnectionwarningonly	A Boolean value that enables or disables display of a server connection lost only warning.	FALSE
mx.webclient.maxNavbarQueryLimit	Sets the limit of query items that are displayed in the navigation bar.	20
mx.webclient.maxsessions	Specifies the maximum number of concurrent sessions configured for the server.	0
mx.webclient.maxsessionsend503	If enabled, the server sends a 503 error when the server reaches the maximum number of concurrent sessions, or when the user reaches the maximum number of UI sessions for an HTTP session.	1
mx.webclient.maxUISessionsPerHttpSession	Redirects you to the login error page when the user reaches the maximum number of UI sessions for an HTTP session. A setting below 1 is unlimited.	10
mx.webclient.outOfOrderReqTimeout	The number of seconds a client request waits for earlier sequenced requests to reach the server.	20
mx.webclient.simpledomaindownload	Allows you to automatically download simple domains.	1
mx.webclient.skin	Specifies the style that is used in the user interface.	MAS8
mx.webclient.tabBreadcrumbs	Enables subtabs to be suppressed when the List tab is visible and replaces the List tab with a button when deep in a record.	1
mx.webclient.searchMenubar	Hides the app menu bar when set to 0. The app menu bar is the menu above the List table and includes the Advanced Search button and the Save Query button.	0
mx.webclient.verticalLabels	Specifies the position of labels. When set to 0, labels appear beside the corresponding field. When set to 1, labels appear above the corresponding field. When set to 2, labels dynamically adjust to the left of the field or above the field as the interface increases or decreases in size.	2
mx.webclient.warningHandling	Enables applications to perform a check for all required fields that need a value when saving.	0
webclient.ResultSetQueryTimeout	Specifies the number of seconds that elapse before a query timeout occurs when it is initiated from a ResultsBean.	360
webclient.accessibilitymode	A Boolean value that enables or disables UI accessibility mode.	FALSE
webclient.addhyphenstobreak	If enabled, adds a hyphen to break words.	FALSE
webclient.allowinframe	Allows the Maximo® system to load within a frame (disable frame busting).	FALSE
webclient.canbreakwords	If enabled, breaks words for text rendering.	TRUE
webclient.changepwdapp	Change password application.	changepasswd
webclient.debug.console.group	Provides access to the debug console for the specified security group.	Null
webclient.debug.console.users	Provides access to the debug console for the specified users.	Null
webclient.debug.pgrade	Enable additional logging for debugging the screen upgrade process.	FALSE
webclient.defaultbutton	Disables default buttons globally for tables.	1
webclient.designer.group	Specifies the default security group that can add generic signature options and application authorizations for new applications in the Application Designer.	MAXADMIN
webclient.dojo.debug	A Boolean value that enables or disables debugging for the Dojo framework.	0
webclient.download.datetimestext	Sends data from a table download from Microsoft Excel in text or date and time format.	0
webclient.download.durationastext	Allows you to download the duration type as text in Microsoft Excel.	1

Property name	Description	Default value
webclient.downloadpreservewhitespace	Preserves text white space from Excel download.	1
webclient.emptylistonclear	If enabled, an empty table displays when a filter is cleared, or a Clear button is used.	TRUE
webclient.enabledoclinkonload	If enabled, the style of an attachments control can change to indicate whether there is a document attached.	FALSE
webclient.exitcontexttimeout	This property specifies the delay in seconds before closing a session after the user exits.	60
webclient.exitwarning	A Boolean value that enables or disables a warning whenever a user exits.	1
webclient.gcfilepath	The filepath for garbage collection.	C:\bea\user_projects\mydomain\
webclient.hideUnauthorizedFavoriteApps	Prevents a favorite application from showing if a user loses access to it.	1
webclient.leavecontexttimeout	The time that elapses after a user leaves a context, before the context times out.	60
webclient.listwarningthreshold	A Boolean value that enables or disables the display of a warning when the number of records to list exceeds the maximum number of records that can be shown on the page.	1
webclient.loginerrorpage	Specifies the location of the login error JSP page.	../webclient/login/loginerror.jsp
webclient.loginpage	Specifies the location of the login JSP page.	../webclient/login/login.jsp
webclient.logoutpage	Specifies the location of the log out JSP page.	../webclient/login/logout.jsp
webclient.longquerydialogwaitetime	If a longop query does not complete within the time specified (in ms), a dialog box opens.	3000
webclient.mask	Specifies the characters to show when a field is masked.	XXXXXX
webclient.maxdownloadrows	Specifies the maximum number of records to download in a table. Setting this value to -1 (minus one) downloads all rows of data.	-1
webclient.maxRecentApps	Specifies the number of applications that appear in the My Recent Applications list. Set to 0 to disable the list.	8
webclient.maxselectrows	Specifies the maximum number of rows that a user can select from a results (or list) table.	200
webclient.multibrowsersupport	Indicates whether a user can open applications in multiple tabs in a browser or in multiple browser windows.	TRUE
webclient.multisorttables	Indicates whether a user can sort multiple columns.	FALSE
webclient.needsave	A list of events that require save access.	addrow,toggledelaterow
webclient.no_xmlcache	Resets the browser cache.	FALSE
webclient.performancestatistics	Generates user interface performance statistics.	disabled
webclient.refreshKpiPortlet	Controls whether the KPI Portlets refresh on login.	1
webclient.richtext.blocknode	Sets the rich text editor block node for the enter key: BR, DIV, or P.	DIV
webclient.richtext.fontlist	The rich text editor uses default web fonts, such as serif, monospace, and sans-serif. Add a comma-separated list of custom fonts, if required.	null
webclient.savestartcentertemplates	If enabled, the labels in the Start Center are stored in the database for translation. If disabled, labels are not saved for translation.	TRUE
webclient.selectrow.async	If enabled, clicking on a check box will not change the row that is in focus. The user must click elsewhere on the row to move the focus to that row.	1
webclient.sessiontimeoutwarningtime	Specify the number of minutes that can elapse before a session timeout warning is shown.	2
webclient.smartfilter	If enabled, a user can enter partial data in a field and, if an exact match is found in the database, the field updates with this value. If multiple possible matches are found, the user can select from a list of possible matches to update the field.	ON
webclient.startapp	Specifies the application that loads on startup (if not using a start application).	startcntr
webclient.startpage	Specifies the page that loads on startup (if not using a start page).	
webclient.synchronousQueryFields	Forces synchronous validation on some fields. Must be kept in sync with the multitenancy async property.	0

Property name	Description	Default value
webclient.systemeventhandler	Specifies the system event handler.	psdi.webclient.system.controller.SystemEventHandler
webclient.useabbrrenderid	If enabled, shorter renderIds are used.	TRUE
webclient.useabsoluteimagepath	If enabled, applications must use an absolute path for images.	FALSE
webclient.useClientTimer	Adjusts the Current® Time according to how long the page is opened and not when the page was rendered.	1
webclient.webseal.eaiheader	The header name that is used to communicate External Authentication Information to the system.	am-eai-server-task
webclient.webseal.sessionidheader	The header name that is used to send the session id from webseal to the system.	user_session_id
webclient.webseal.terminatesession	Enables the termination of the webseal during a session timeout.	0
webclient.wfmapimageformat	Specifies the format of the WorkFlow Map image, which must be in .png or .gif format.	png
webclient.wraplength	Length to wrap	75
webclient.wrapreadonlycolumns	Wrap UI Columns	TRUE

Utilities for logging and testing

To help you manage system performance, there are utilities that you can use for testing and debugging purposes. When you are satisfied with your deployment, you can disable these logging utilities.

Utilities that track system performance

By default, the mbocount logging utility, the logSQLTimeLimit logging utility, and the fetchResultLogLimit logging utility are enabled in the properties file. By using these utilities, you can track the following possible system performance issues while you configure an initial system deployment:

- Excessive use of business objects
- Slow execution of SQL statements
- High number of records that are returned in a query result

To disable the logging utilities, change the debugging properties that are described in the table.

Table 1. Debugging properties

Property	Description	Default value
mail.debug	Used to troubleshoot email connectivity, configuration, and formatting problems. The property is a JavaMail API debug property. To enable, change the value to true.	false
mxe.mbocount	Displays the number of business objects that the server created. To disable, change the value of the property to 0.	1
mxe.db.logSQLTimeLimit	Represents the SQL statements that take longer than the specified time limit are logged. The time is measured in milliseconds. To disable, change the value of the property to 0.	1000
mxe.db.fetchResultLogLimit	When this property is enabled, a stack trace is printed in the log for every business object set that fetches beyond the set limit of rows. The stack trace log is also repeated for every multiple of such fetches. To disable, change the value of the property to 0.	1000 rows
mxe.db.logSQLPlan (Oracle only)	Setting this property to true logs the execution plan for all SQL statements that contain a full table scan. If you define mxe.db.sqlTableScanExclude, all tables, except for the ones you intentionally exclude, are logged. If you do not define mxe.db.sqlTableScanExclude, only the SQL statements that exceed the time limit that is set in mxe.dblogSQLTimeLimit are logged.	0

Property	Description	Default value
mxe.db.sqlTableScanExclude=ACTION,MAXROLE,SCCONFIG,MAXUSER (Oracle only)	You can define the table names that you want to exclude from the log. The table names must be uppercase. If you define mxe.db.sqlTableScanExclude, all tables, except for the ones that you list, are logged. If you do not define mxe.db.sqlTableScanExclude and you set mxe.db.logSQLPlan=true, only the SQL statements that exceed the time limit that is set in mxe.dblogSQLTimeLimit are logged.	0
mxe.logging.CorrelationEnabled	Represents the correlation ID that is logged if a percentage of the queue is specified in the logger layout.	1
mxe.logging.disableLoggingPropFile	Disables the logging.properties file for logging.	0
mxe.logging.rootfolder	Represents the default root folder to where Maximo® generated log files are written.	

Work order properties

You can use system properties to help manage work orders.

Table 1. Work order properties

Property	Description	Default value
mxe.msgLogFile	Represents the log file for work order generation.	
mxe.workorder.rollupMaintenanceCosts	Specifies whether to automatically roll up maintenance costs for assets that are associated with a work order when the work order is closed.	0

Workflow properties

You can use workflow properties to specify the email account of the administrator, control status inheritance for work items, and define the maximum number of loops that can occur between condition nodes.

Table 1. Workflow properties

Property	Description	Default value
mxe.workflow.admin	Represents the email address of the workflow administrator. The workflow is not impeded if you leave this value blank, but error messages that have communication templates associated with them might not be sent. Successful delivery of free-form notifications depends on the value set for this property.	N/A
mxe.app.workflowControlStatusInheritance	Allows status inheritance for work items that are under process flow control. You set this property to true (1) to ensure that the status is inherited from the parent work order to the child work order. The Flow Start and Flow Complete statuses are not inherited; they are INPRG and COMP, by default.	0
mxe.workflow.infiniteLoop	Defines the maximum number of loops that can occur between two condition nodes in a workflow process. This system property ensures that the workflow process cannot enter an infinite loop. 5000 is the both the default value and the minimum value. If you set a value lower than 5000, it will be ignored, and the workflow process will stop once it reaches 5000 loops.	5000

Maximo Manage facts

- The custom resource for the Maximo® Manage workspace provides properties for activating the application. For information about the custom resource, see [Properties for workspace deployment](#).
- One default IBM® Maximo Application Suite skin is available in Maximo Manage.
- The following items are not displayed in Maximo Manage:
 - `mxe.webclient.skin`. It is set to a Maximo Application Suite skin.
 - `mxe.webclient.dynamicFontSize.iot18`. It is set to 0, "false".
 - `mxe.webclient.verticalLabels`. It is set to 1, "vertical".
 - "Side navigation menu" option is user's "Default information" dialog. It is set to "Display".
- If the electronic signature feature is used, some changes are made due to the new authentication protocol. Refer to product documentation for the updated electronic signature functions.

Glossary

This glossary includes terms and definitions for Maximo Manage.

The following cross-references are used in this glossary:

- See refers you from a term to a preferred synonym, or from an acronym or abbreviation to the defined full form.
- See also refers you to a related or contrasting term.

A

- access collection
A group of objects that have data-level access control and to which users are granted role-based access.
- action
A defined task that an application performs on an object as a result of an event.
- actuals
The commodity (physical or service) that underlies a future or forward contract.
- alias
An alternative name used instead of a primary name.
- appender
A component that receives logging requests from a logger and writes log statements to a specified file or console. See also [logger](#).
- application
One or more computer programs or software components that provide a function in direct support of a specific business process or processes. See also [application server](#).
- application programming interface (API)
An interface that allows an application program that is written in a high-level language to use specific data or functions of the operating system or another program.
- application server
A server program in a distributed network that provides the execution environment for an application program. See also [application](#).
- application server authentication
User authentication that verifies a user's credentials based on an external authentication mechanism such as LDAP.
- archive
To copy programs, data, or files to another storage media, usually for long-term storage or security.
- argument
An independent variable or any value of an independent variable. Examples of arguments are a search key and a number identifying the location of an item in a table.
- asset
A manageable object that is either deployed or intended to be deployed in an operational environment. See also [configuration item](#).
- asset template
A record that specifies asset information that is shared by multiple asset records. An asset template can be applied to existing asset records or it can be used to generate multiple new asset records for similar assets, such as a fleet of vehicles.
- assignment
A labor requirement on a work order record that has been matched to an appropriate laborer.
- authentication
In computer security, verification of the identity of a user or process and the construction of a data structure that contains the privileges that were granted to the user or process.
- authority
The right to access objects, resources, or functions.
- authorization
In computer security, the right granted to a user to communicate with or make use of a computer system.
- autokey seed
The first number in an automatic numbering sequence for a keyfield. If an autonumbering sequence exists, the autokey seed is the next key value that is used for a new record.

B

- bandwidth
The capacity of a communication line, normally expressed in bits per second (bps).
- base currency
The currency that is used to calculate costs for an organization.
- BIRT
See [Business Intelligence and Reporting Tools](#).
- blanket agreement
A purchase contract that specifies a vendor, a total dollar amount to be spent, and the dates between which the agreement is valid.
- blanket contract
A contractual agreement to spend a predetermined amount of money with a specified vendor over a predefined period of time.
- Business Intelligence and Reporting Tools (BIRT)
An Eclipse-based open source reporting system for web applications.
- business object
A software entity that represents a business entity, such as an invoice. A business object includes persistent and nonpersistent attributes, actions that can be performed on the business object, and rules that the business object is governed by.
- business process
A defined set of business activities that represent the required steps to achieve a business objective. A business process includes the flow and use of information and resources.

C

- cache
A buffer that contains frequently accessed instructions and data; it is used to reduce access time.
- change order
An update to a purchase order that is already approved or printed and that changes information such as quantity or vendor.
- CI
See [configuration item](#).

claim

A request for reimbursement, replacement, or repair for an item or an asset that is under warranty.

clearance

The control and positioning of plant equipment for providing protection for personnel and equipment during work on plant devices.

clone

A copy of an application, created so that it can be customized while the original is retained.

CM item

See [configuration-managed item](#).

column

The vertical component of a database table. A column has a name and a particular data type (for example, character, decimal, or integer).

comparison rule

A component of a reconciliation task that is used to compare attributes of linked objects from two data sets. See also [link rule](#), [reconciliation task](#), [task filter](#).

compliance

A state of being in accordance with established software and security specifications on target computers, or the process of becoming so.

condition-enabled item

An item that has a value or worth that is assigned and tracked based on its physical condition.

configuration item (CI)

Any component of an information technology infrastructure that is under the control of configuration management. See also [asset](#).

configuration-managed item (CM item)

A specialized item type that represents a part number that is under configuration management control as part of the reference engineering data.

configuration management

The process of planning for, identifying, controlling, and verifying the configuration items within a service, recording and reporting their status and, in support of change management, assessing the potential impact of changing those items.

consignment

A classification type for inventory materials that are stored on-site but that are owned by an external vendor. The vendor retains ownership of the consignment items until they are used and paid for by the organization that is storing them.

cost center

An organizational element that contributes to the cost of a project.

craft

A work activity performed by a labor, for example, "plumbing."

cron task

A task that is set to run automatically at an appointed time.

crossover domain

A domain that returns a value from a field in one application to a field in another application.

crossover field

An application field that links to other fields, allowing a user to link data between certain applications.

D

data type

An attribute that is used for defining data as either numeric or character or both.

Data Universal Numbering System (DUNS)

A system in which internationally recognized nine-digit numbers are assigned and maintained by Dun & Bradstreet to uniquely identify worldwide businesses.

dead date

The date past the due date plus the grace period, at which point the component becomes inoperable.

deployed asset

A manageable object that exists in an IT environment, such that its presence can be verified (for example, by using a discovery tool).

device

A piece of equipment such as a workstation, printer, disk drive, tape unit, or remote system.

direct issue item

An ordered item that is issued immediately upon receipt to a work order, equipment, or location rather than stocked in the storeroom.

directory

In a hierarchical file system, a grouping of related files.

discovery tool

A program that scans computers and other devices connected to a network and records information about their installed hardware and software.

DNS

See [domain name server](#).

domain

A list of defined values from which users choose an appropriate value.

domain name server (DNS)

A server program that supplies name-to-address conversion by mapping domain names to IP addresses.

downtime

The time during which a functional unit cannot be used because of a fault within the functional unit or within the environment.

DUNS

See [Data Universal Numbering System](#).

dynamic segmentation

The ability to analyze a linear asset multiple ways without affecting its underlying geometry.

E

EAM

See [enterprise asset management](#).

EAR

See [enterprise archive](#).

EAR file

See [enterprise archive](#).

economic order quantity (EOQ)

The optimum reorder quantity of an item, in the specified units of order, to be used as the default or standard reorder amount. The economic order quantity is a calculation of the optimum reorder amount that balances the costs of keeping inventory in stock and the costs of reordering inventory items.

electronic signature (ESIG)

A stamp that is added to mail messages, fields, or sections that verifies that the person who originated the message is the author and that no one has tampered with the data.

email listener

An application that receives and processes incoming email messages.

enterprise archive (EAR)

A specialized type of JAR file, defined by the Java™ EE standard, used to deploy Java EE applications to Java EE application servers. An EAR file contains EJB components, a deployment descriptor, and web archive (WAR) files for individual web applications.

enterprise asset management (EAM)

The process of managing an organization's assets throughout their life cycle, from requisition to retirement.

enterprise service

A service that typically accesses one or more enterprise information systems.

EOQ

See [economic order quantity](#).

escalation

A course of action that runs when a task is not completed satisfactorily within a specific period of time.

escalation point

A condition or threshold that must be met in order to trigger an escalation.

ESIG

See [electronic signature](#).

exception

A condition or event that cannot be handled by a normal process.

export

To move information from one system or program to another.

expression

In programming languages, a combination of terms and operators that can be evaluated to a single value by using the rules of precedence for the given language.

external PO

See [external purchase order](#).

external purchase order (external PO)

A purchase order or request to an outside vendor. See also [internal purchase order](#).

F

failover

An automatic operation that switches to a redundant or standby system in the event of a software, hardware, or network interruption.

failure class

The highest level of a failure hierarchy.

failure hierarchy

A tree structure that shows relationships between identified problems, causes, and remedies for asset and operating location failures. Failure hierarchies are built from the top level, the failure class, down.

feature

A physical object, such as a guardrail or mile marker, that is associated with one or more linear assets, but which does not have a unique ID.

FIFO

See [first-in first-out](#).

firmware

Proprietary code that is usually delivered as microcode as part of an operating system.

first-in first-out (FIFO)

A queuing technique in which the next item to be retrieved is the item that has been in the queue for the longest time. See also [last-in first-out](#).

first-in first-out costing

A method of cost accounting that can be used to make an inventory valuation, based on actual receipt costs. First-in first-out costing uses the "first in" (oldest) item cost for inventory transactions. See also [last-in first-out costing](#).

FOB point

See [free on board point](#).

foreign key

In a relational database, a key in one table that references the primary key in another table. See also [primary key](#).

free on board point (FOB point)

The point where responsibility and liability for a shipped item are transferred. The FOB point is usually either the destination or the shipping point.

G

general ledger account (GL account)

An account that is used to track expenses for various entities within a company, such as assets, locations, or tools.

geographic information system (GIS)

A complex of objects, data, and applications that is used to create and analyze spatial information about geographic features.

GIS

See [geographic information system](#).

GL account

See [general ledger account](#).

H

handler

A software routine that controls a program's reaction to specific external events, such as an interrupt handler.

hard reservation

A firm request for items from a storeroom that is defined by the need for the items within a specific time frame. A hard reservation reduces the available balance of items. Hard reservations are prioritized and cannot be superseded by other reservation types. See also [soft reservation](#).

high availability

The ability of IT services to withstand all outages and continue providing processing capability according to some predefined service level. Covered outages include both planned events, such as maintenance and backups, and unplanned events, such as software failures, hardware failures, power failures, and disasters.

hot standby

A redundant server that, if the primary server or hub server fails, assumes the responsibilities of the failed server.

I

IAS

See [item assembly structure](#).

import

To bring information from one system or program into another.

incident

An event that is not part of the standard operation of a service and causes or can cause a disruption to or a reduction in the quality of services and customer productivity.

index

A set of pointers that is logically ordered by the values of a key. Indexes provide quick access to data and can enforce uniqueness of the key values for the rows in the table.

internal PO

See [internal purchase order](#).

internal purchase order (internal PO)

A purchase order or request to an internal vendor, such as a storeroom. See also [external purchase order](#).

inventory usage record

A record that contains information about the usage of inventory items, such as by issuing, transferring, or returning items to storeroom locations. An inventory usage record contains details such as quantity, storeroom location, and information about related records, such as assets and work orders.

invoice

The bill for services or products provided to a customer. The invoice includes all agreed to charges associated with the services or products provided.

issue

To release an item from a storeroom location and charge the cost to an asset, GL account, location, work order, location, or GL account.

issue unit

The quantity of an item that is considered a single item; for example, gloves are issued in pairs. The issue unit might be different from the order unit. See also [order unit](#).

item

Inventory that might be part of an asset, but which is not strictly monitored, and whose cost is less than an asset.

item assembly structure (IAS)

A list of individual items and subassemblies that are required to build a piece of equipment or define the requirements of an operating location.

item kit

A group of items that are issued as one single unit.

item record

A document that defines an item or material that is stocked in a storeroom. Item records are also used for purchasing.

J

Java Database Connectivity (JDBC)

An industry standard for database-independent connectivity between the Java platform and a wide range of databases. The JDBC interface provides a call level interface for SQL-based and XQuery-based database access.

JDBC

See [Java Database Connectivity](#).

JIT

See [just-in-time](#).

job plan

A detailed description of work to be performed for a work order. A job plan typically includes required tasks and lists of estimated labor, materials, services, and tools needed to complete the work.

join

An SQL relational operation in which data can be retrieved from two tables, typically based on a join condition specifying join columns.

just-in-time (JIT)

A production and inventory system in which parts are produced or delivered only as needed.

K

key performance indicator (KPI)

A measurable quantity against which specific performance criteria can be set when a service level agreement is written.

KPI

See [key performance indicator](#).

L

labor

A person who carries out a specific job (a labor performs a craft).

laborer

A human resource within a crew.

labor record

A document that contains information about a worker, such as craft, skill level, hours worked, and certifications. A labor record cannot exist without a corresponding person record. See also [person record](#).

last-in first-out (LIFO)

A queuing technique in which the next item to be retrieved is the item most recently placed on the queue. See also [first-in first-out](#).

last-in first-out costing

A method of cost accounting that can be used to make an inventory valuation, based on actual receipt costs. Last-in first-out costing uses the "last in" (newest) item cost for inventory transactions. See also [first-in first-out costing](#).

launch-in-context

An operation in which a user starts a secondary application from a primary application to perform a specific task. Using the parameters, navigation instructions, and user credentials that are supplied by the primary application, the secondary application opens to the specific place in which to complete the task.

lead time

The amount of time between placing an order and receiving the items.

license allocation

Resources such as assets, partitions, users, and locations that a license is assigned to. See also [license scope](#).

license scope

The breadth of a license in terms of enterprise, site, machine, or partition. If discovered software is found within the scope of a license, then that license might be used for that discovered instance. See also [license allocation](#).

LIFO

See [last-in first-out](#).

linear asset

An asset that is maintained in segments, such as a road, pipeline, or railroad track. Measurements are made along the linear asset to specify work, monitoring, metering, or placement of signs. See also [point asset](#).

linear referencing

Defining the location of a point along a linear asset.

linear referencing method (LRM)

A method of determining a position on a linear asset by using a known start point, a measure, a direction, and offset values.

linear segment

The span of a linear asset that is defined by a start and an end measure. The span can be the entire length of the linear asset or any continuous part of it.

line item

1. An item, material, service, or tool that is named on a contract, purchase requisition, purchase order, or invoice.
2. A queued task or service that is pending completion.

link rule

A required component of a reconciliation task that is used to link instances from two data sets based on one or more common attributes. See also [comparison rule](#), [reconciliation task](#), [task filter](#).

listener

A program that detects incoming requests and starts the associated channel.

LMO

See [logical management operation](#).

load balancing

The monitoring of application servers and management of the workload on servers. If one server exceeds its workload, requests are forwarded to another server with more capacity.

loaded cost

The total cost of the item, including taxes and service costs.

locale

A setting that identifies language or geography and determines formatting conventions such as collation, case conversion, character classification, the language of messages, date and time representation, and numeric representation.

location

A place where assets are operated, stored, or repaired.

logger

A component that prepares log statements to be written to console or log file. See also [appender](#).

logical management operation (LMO)

A generic function that is supported by a set of devices. For example, configuring an IP address on a network interface is a logical management operation supported by all operating systems. Although this is logically the same function, the steps for performing this function on each operating system are different. These steps are supported by provisioning workflows for that operating system.

LRM

See [linear referencing method](#).

M

manifest

An XML file that describes the content of an entire migration package and that facilitates the deployment of the package in a target Maximo environment.

measurement point

A record that defines the acceptable upper and lower conditions and performance limits for a point or place on a piece of equipment.

meter

A record that is used to record measurements.

N

namespace

In XML and XQuery, a uniform resource identifier (URI) that provides a unique name to associate with the element, attribute, and type definitions in an XML schema or with the names of elements, attributes, types, functions, and errors in XQuery expressions.

non-operational downtime

Downtime that occurs when an asset is not normally in use.

nonpersistent column

A temporary data field that an object uses for calculations or temporary storage. See also [persistent column](#).

O

offset

The number of measuring units from an arbitrary starting point to some other point.

operating location

A location type that indicates the presence of operating assets (as opposed to a storage or repair facility).

operational downtime

Downtime that occurs during a period in which equipment is normally in use, and that causes a work cell or production line to stop so that operational time is lost.

operational management product

A product in the IT environment that supplies information about configuration items to the discovery process.

operator

A symbol (such as +, -, or *) that represents an operation (in this case, addition, subtraction, multiplication).

order unit

The standard unit by which an item is ordered that can differ from the issue unit. See also [issue unit](#).

organization

A record that identifies a unique legal entity. The data set for an organization includes information that companies or other distinct legal entities might share, such as calendars, vendors, and financial information. An organization can contain one or more sites. See also [site](#).

overrun

A situation where a planned event takes longer to complete than was planned. For example, an overrun occurs when a rail locomotive was planned to be in the maintenance yard for 5 days but it actually takes 6 days.

P

parameter (parm)

A value or reference passed to a function, command, or program that serves as input or controls actions. The value is supplied by a user or by another program or process.

parm

See [parameter](#).

persistent column

A data field that an object uses to write data to a database table after processing. See also [nonpersistent column](#).

personalization

The process of enabling information to be targeted to specific users based on business rules and user profile information.

person record

A document that contains personal information about a worker and other general information such as workflow and purchasing information. See also [labor record](#).

planned downtime

Time when equipment is scheduled to be down and available for maintenance work. The calendar of an asset is used to calculate downtime.

PM

See [preventive maintenance record](#).

PM alert

A message that indicates that a preventive maintenance work order is about to become due for an asset or location. See also [preventive maintenance record](#).

PO

See [purchase order](#).

point asset

An asset whose length or measure is not integral to its maintenance, such as an airplane or a train car. See also [linear asset](#).

portlet

A reusable component that is part of a web application that provides specific information or services to be presented in the context of a portal.

PR

See [purchase requisition](#).

preventive maintenance record (PM)

A template for scheduled preventive maintenance work. PMs can contain job plan and corresponding safety plan information that the system copies to work orders. See also [PM alert](#).

primary key

In a relational database, a key that uniquely identifies one row of a database table. See also [foreign key](#).

problem

Unknown underlying cause of one or more incidents.

proxy server

A server that receives requests intended for another server and that acts on behalf of the client (as the client's proxy) to obtain the requested service. A proxy server is often used when the client and the server are incompatible for direct connection. For example, the client is unable to meet the security authentication requirements of the server but should be permitted some services.

purchase order (PO)

An authorized order to an external vendor or internal supplier.

purchase requisition (PR)

A written request that is issued internally to the purchasing department to purchase items, materials, or services.

Q

QBE

See [query by example](#).

query

A request for information from a database that is based on specific conditions: for example, a request for a list of all customers in a customer table whose balances are greater than USD1000.

query by example (QBE)

A query that is specified by entering sample data in the appropriate fields.

R

RDB

See [relational database](#).

read-only

Pertaining to data that can be read but cannot be modified.

reconciliation

A transaction that compares discovered assets to authorized assets.

reconciliation task

A scheduled task that uses a collection of rules and filters to link and compare data from two data sets. See also [comparison rule](#), [link rule](#), [task filter](#).

redundancy

The use of several identical functional units, such as several disk drives or power supply systems, within one computer system in order to provide data security and a certain degree of fault tolerance in case of hardware failures.

reference point

A feature instance that can be used as a start or end point for a linear segment.

reference point offset

A distance along the length of the asset measured from a previously defined reference point. For example, a speed sign is .2 miles from milepost 10.

relational database (RDB)

A database that can be perceived as a set of tables and manipulated in accordance with the relational model of data. Each database includes a set of system catalog tables that describe the logical and physical structure of the data, a configuration file containing the parameter values allocated for the database, and a recovery log with ongoing transactions and archivable transactions.

relational operator

An operator that compares two operands and yields a Boolean value.

release PO

See [release purchase order](#).

release purchase order (release PO)

A purchase order for a portion of the total amount or lines specified on an associated volume contract.

reorder point (ROP)

The point at which an inventory item should be reordered so that its in-stock balance does not fall below the level designated as safety stock during the lead time for the order.

requisition

A request for an asset, item, tool, or service. The requested entity can be procured from a vendor, or it can be acquired by an inter-departmental transfer.

reserved item

An item is placed on hold in a storeroom for a given work order, GL account, asset, or location.

ROP

See [reorder point](#).

rotating asset

A non-perishable asset that is tracked in inventory through its association with a specific rotating item.

rotating item

An inventory item for which each instance of the item is also tracked by its own asset number. Rotating items are typically repaired or refurbished, not discarded.

rotating tool

A tool for which each instance of the tool is also tracked by its own asset number.

S

safety stock

The minimum inventory level of an item that should always be available at the associated storeroom location.

schema

A collection of database objects such as tables, views, indexes, or triggers that define a database. A schema provides a logical classification of database objects.

script

A series of commands, combined in a file, that carry out a particular function when the file is run. Scripts are interpreted as they are run.

SDK

See [software development kit](#).

segment

A defined section of a linear asset.

serialized asset

See [rotating asset](#).

serialized item

See [rotating item](#).

server

A software program or a computer that provides services to other software programs or other computers.

service level agreement (SLA)
A contract between a customer and a service provider that specifies the expectations for the level of service with respect to availability, performance, and other measurable objectives.

service request
A request from a user for help, information, advice, or access to an IT service.

shared disk
A disk that is configured to serve more than one node. Shared disks are physically connected to multiple nodes.

shipment receipt record
A record that contains information about the receipt of materials at a location, for example, at a site or storeroom within an organization. A shipment receipt record contains details such as the quantity of items that are received, the date of receipt, and the locations of the source and destination storerooms.

shipment record
A record that contains information about the transfer of materials between source and destination storerooms, such as between two sites within an organization. A shipment record contains details such as the delivery method, the quantity of items, the date of the shipment, and the storeroom locations.

site
A work location, such as a plant or facility. See also [organization](#).

SLA
See [service level agreement](#).

slot
A sub-location within a maintenance location. For example, a railway depot or an aircraft hangar may be sub-divided into slots so that maintenance tasks can be allocated.

soft reservation
A request for items or tools that is not yet defined by the need for the items within a specific time frame. A soft reservation does not reduce the available balance. When a reservation is classified as soft, the item is available for eventual issue from the list of reservations. See also [hard reservation](#).

software development kit (SDK)
A set of tools, APIs, and documentation to assist with the development of software in a specific computer language or for a particular operating environment.

software item
Any version of any software product or component.

SQL
See [Structured Query Language](#).

standby node
A device that assumes the identity of a primary node if the primary node fails or is taken out of service. The standby node runs the primary node's workload until the primary node is back in service.

stocked tool
A tool that is available in a storeroom.

storeroom
A physical location where items are stored.

Structured Query Language (SQL)
A standardized language for defining and manipulating data in a relational database.

subassembly
An assembled unit that is incorporated with other units into a complete assembly. A subassembly is a child asset.

suspense account
An account that is used to store short-term funds or securities until a decision is made about their allocation.

T

table
In a relational database, a database object that consists of a specific number of columns and is used to store an unordered set of rows.

table window
A section of an application page or dialog box that displays multiple records from a database table simultaneously.

tag
A physical label that is applied to an asset to indicate the device, its position, and the controlling authority.

tag out procedure
The procedure for taking work assets out of service or placing them back in service to ensure a safe work environment.

task filter
A component of a reconciliation task that specifies a subset of objects to evaluate when a reconciliation task is executed. See also [comparison rule](#), [link rule](#), [reconciliation task](#).

technical record
A record that maintains information that is related to an externally published directive or bulletin, such as an airworthiness directive or a customer service notification. Technical records are used in highly regulated industries to ensure that all regulations are properly implemented.

ticket
A record, such as a service request, incident, or problem report, that can be routed and assigned a status.

time stamp
The value of an object that indicates the system time at some critical point in the object's history.

V

vendor
A person or company that supplies materials or services to another person or company.

volume contract
See [blanket contract](#).

W

WO

See [work order](#).

workflow

The structured sequence of activities and tasks that are used to implement a specific change, release, or other process, including automatic routing and tracking of records for approval and other tasks.

work order (WO)

A record that contains information about work that must be performed.

work plan

A list of the operations, labor, materials, and tools that are required to complete a work order.

Y

Y-offset

A distance perpendicular to the direction of the linear asset. For example, a speed limit sign is located 10 feet from the right edge of the road. "Right" is positive and "left" is negative. Therefore, the Y-offset is 10.

yorn

A field in which a user can enter Y (for "yes") or N (for "no").

Z

Z-offset

A distance above or below a linear asset. For example, an exit sign is located 18 feet above the surface of the road, and a culvert is 4 feet below the surface of the road. The Z-offset for the sign is 18, and the Z-offset for the culvert is -4.

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