



## **Cisco Process Orchestrator 3.5 User Guide**

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### **Americas Headquarters**

Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134-1706  
USA  
<http://www.cisco.com>  
Tel: 408 526-4000  
800 553-NETS (6387)  
Fax: 408 527-0883

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# Introduction

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## Understanding Service-Oriented Orchestration

Cisco Process Orchestrator 3.5 introduces a new set of features providing Service-Oriented Orchestration that enable a paradigm shift vs. traditional run-book automation and IT process automation. This shift enables automation to align to the high-level services provided by IT, and models how a high level service is supported by a topology of lower level services, systems, and devices.

Planning for services and their desired state are the initial focus of automation design. Focus then moves to defining process actions against these services, with implementation of specific process workflows that traverse these services to act on lower level elements as a final implementation step. This enables a declarative approach to automation, focusing primarily on *what* is desired instead of *how* it is achieved.



### Note

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The capabilities are additive and complimentary to traditional orchestration definitions and approaches, so Cisco Process Orchestrator provides both service-oriented and process-based orchestration. This means that you can still program Process Orchestrator as usual, so you can ease into the new concepts or not use them at all. This guide, however, will demonstrate the service-oriented orchestration approach.

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Cisco Process Orchestrator is an advanced orchestration engine belonging to the Run-Book Automation (RBA) or IT Process Automation (ITPA) class of products. Traditionally, tools in this category focus on a sequence of IT processes that achieve automation. The process is the focal point of automation. Processes act on lower-level IT elements such as devices, servers, or specific tools. The set of elements on which automation acts are typically delivered in the product and through adapters connecting to various layers of the IT technology stack. IT, on the other hand, is focused on services providing value to the business, which are much higher up the stack. The inability of RBA/ITPA tools to act on the business-level services in the environment becomes an inhibitor to delivery and creates a poor abstraction for users.

Service-Oriented Orchestration provides the agility to model and act on IT services. These features make creating orchestration active and dynamic, and allow for:

- Defining new, higher-level services in the system, and deploy new services quickly.
- In real-time, after these new types of services have been defined, creating real-time instances of those new services.
- Using events to watch for patterns in these services, enabling policy-driven automation.

Service-Oriented Orchestration combines several industry trends to synthesize a fresh approach to orchestration:

- Service modeling capabilities of a service catalog are now available in the orchestrator layer. Process Orchestrator provides fluid mechanisms to exchange service information with the Cisco Prime Service Catalog, advancing the integration of these systems.
- The feature delivers many of the capabilities of object-oriented design and programming into the RBA / ITPA world. The shift from traditional orchestration to Service-Oriented Orchestration is similar to the shift from procedural to object-oriented programming. Today, virtually all programming is done with object-oriented languages, and object-oriented design has transformed the industry to higher levels of productivity and quality. Service-Oriented Orchestration holds the same promise.
- The IT Infrastructure Library (ITIL) prescribes a service-centric approach for IT. Configuration Management Databases (CMDBs) model IT services and their relationship to other IT assets. Service-Oriented Automation allows automation to be driven through a model of current and potential IT services, aware of their relationships and interdependencies. In this aspect, the principles of service modeling in Process Orchestrator are essentially the same as modeling services within ITIL and CMDBs. While Process Orchestrator can integrate with an available CMDB, there is no requirement to have a CMDB to enable orchestration.
- The feature aligns to industry standards like the DMTF Common Information Model (CIM) and the Topology and Orchestration Specification for Cloud Applications (TOSCA).
- Model-based automation is becoming popular via script-based tools, especially in the configuration management space. Process Orchestrator combines the capability to model services with the openness to integrate with these tools to leverage their strengths. Moreover, the feature allows model-driven orchestration atop legacy tools to bring the full power of model-driven approaches to integrate with other IT tools.

## Key Benefits

Service-Oriented Orchestration allows automation to focus on higher level IT services, possibly specific to the customer's business and unknown by Cisco when the product is built. User interaction shifts to services on which to act and what you can do to them. The approach to defining automation shifts from having to first decompose automation into a sequence of *processes*, to decomposing high-level *services* into their components, and then defining actions that are possible on each of the component services.

This inversion in approach is simple, yet powerful. Cisco Services, partners, and customers can model services and extend others' services without coding. Extensions and automation can be packaged, shipped to customers or moved from development to test to production, versioned, and upgraded.

The approach delivers several key benefits:

- Greater ease of use in combining Process Orchestrator with Prime Service Catalog.  
The Prime Service Catalog adapter simplifies the exchange of service requests and service items to and from the orchestrator. It is easy to create targets from incoming service requests. Process Orchestrator helps push service items back to the catalog as needed by allowing users to pick the right moments in a flow to synchronize data. Using active catalog connection in the Prime Service Catalog adapters optimize user experience. The Prime Service Catalog adapter easily reads, writes, or creates service items, and is CP schema-aware. When a service item definition is created in the catalog, the desire is to set up integration rapidly. The property browser exposes the catalog definition to enhance ease of use. Get Service Item properties can be followed by Update Target to save properties in a single step. One can write directly through the Create Service Item or Update Service Item activities using property references.
- It allows simpler, more readable workflows.

- Data defines desired services, and the service instance drives automation to achieve the desired state. This separates the desired state from the implementation (the “what” from the “how”).
- It acts on the higher-level service rather than its technology elements. Services can span tools, and workflows can navigate service topologies to lower-level elements on which they act.
- It provides operational views of automation by service.
- It lets you monitor the environment vs. the service definition and bring them in line with policy.
- It provides federated storage, including push objects and relationships to and from Service Catalog, CMDB, and Service Assurance tools when needed.
- Automation becomes easier to extend and customize.

## Process Orchestrator Supports Service-Oriented Orchestration

Several features in Process Orchestrator combine to bring these capabilities:

- Service instances are **targets**. A **target type** allows you to define a new service; all new targets are created based on a target type. Target types can be based on the DMTF Common Information Model, but this is not required.

Target types are service definitions that allow Process Orchestrator to deliver service-oriented automation, where the *service*, not the process, is the focal point. In service-oriented automation, the *content*, not the Process Orchestrator platform, defines the solution models; the platform is open to any model you want to produce.

Some target types can be ‘abstract’, meaning they cannot be directly instantiated into targets but are only available for inheritance by other target types. In Process Orchestrator, these target types are marked as either ‘creatable’ or ‘not creatable’.

Target types support inheritance, which allows you to extend a general type for a specialized need. In Process Orchestrator, you can select a ‘base target type’ for a target type that specifies that the target type inherits from the base target type.

Target types have an extensible list of **properties** including field-customizable default values.

In these properties, data can be stored that might come from Process Orchestrator in terms of defining an order or a desired state, or might include data that is collected from the environment. For example, periodic network device discovery can store information such as the operating system, version, which line cards are installed, and so on. Network automation can use that information in its workflows.

- **Relationships** allow modeling of topologies of lower level services assembled to offer higher-level services; that is, relationships allow lower-level objects to be bound together to achieve a larger whole. Automation can navigate from a higher-level object, such as a service, to lower-level objects against which they can perform automation.
  - Relationships allow you to navigate from one object to another in a workflow.
  - Target types define the property that models the relationship.
  - Target instances provide the link to a specific instance.
  - Relationships support inheritance.
  - Relationships can be set in the northbound web service like any property.
- **Processes** provide actions that can be executed against targets. Process Orchestrator allows you to view a target to see what actions are possible, or what automation is being done against those targets. The target types that a process can accept define the services on which a process can act.

- Targets and target types have **events**. These can be internal process events or the open Advanced Message Queuing Protocol (AMQP) protocol. Triggering processes in response to patterns in underlying processes provides policy.
- **Extensible by services, partners, customers**. The content, not the platform, defines service models. The platform is open to model any IT service topology within automation content. For example, some types, actions, properties, etc. may come from the packaged product, some from team 1, some from team 2, some from a partner, and some from a customer. Using this capability you can assemble a complex solution from parts. Each author controls the version control and lifecycle of the elements they deliver so they can deliver upgrades.
- A **consistent API**, even if elements come from different authors. Users and automation pack authors (see [Automation Packs](#)) can control which target types are published to the NorthBound Web Service (NBWS; see the *Northbound Web Services Guide*). For published objects, Process Orchestrator exposes the type uniquely in the NBWS. As content teams, services, partners, or customers extend types, these APIs are maintained to provide a consistent format for APIs across all types of objects. However, each type of object is uniquely supported.
- Authors can also configure which properties are exposed in the NBWS as optional parameters in the per-type WSDL.

## Aligned to IT Standards

While Service-Oriented Automation is open, allowing any model, it aligns to IT best practices such as the IT Infrastructure Library (ITIL). ITIL prescribes a configuration management database (CMDB) as a central tenet which allows high level services to be decomposed into their supporting lower level services and ultimately to the lower level systems and devices. In ITIL, each element in the model is called a Configuration Item since it is a unit of configuration. This provides a mapping of how lower level elements support business services. Service-Oriented Orchestration allows automation to be driven through a model of current and desired IT services, aware of their relationships and interdependencies. In this aspect, the principles of service modeling are substantially the same as modeling services within ITIL and CMDBs.

However, the implementation bypasses many of the negatives and weight of typical CMDB implementations. Process Orchestrator can integrate with a CMDB if it is there. Targets provide a natural synchronization point to exchange data with a CMDB, and target events allow that synchronization to be externalized from other processes. However, Service-Oriented Orchestration does not require a CMDB; one does not have to have a CMDB to enable orchestration to function. Often orchestration needs a reduced model vs. what is in the CMDB, and it is therefore much easier to keep the smaller data set current. For example, resource management can be more efficient when externalized. Moreover, a CMDB typically represents actual elements and not potential elements, and since orchestration is often responsible for provisioning, the orchestrator may have data prior to its life in the CMDB, which it might write to the CMDB as it is instantiated. Even if Process Orchestrator service models leverage data in CMDBs, performance is improved by keeping this data in Process Orchestrator target properties to optimize queries. Process Orchestrator allows a local representation of only those services that relate to what you want to automate, so that the implementation is right-sized and lighter than complete CMDBs. Updates are more real time and targeted to the need of automation. A conceptual alignment to ITIL and CMDB principles creates the flexibility to right size the implementation and unify with CMDBs when needed.

Also, ITIL prescribes key process records such as alerts, incidents, and change requests that drive the IT operations process. Process Orchestrator provides a native representation for these concepts. This allows content to be abstracted from how these concepts are provided in a company. For example, content that detects an IT incident does not have to encode the specific service desk used by a particular customer.

Content that enriches incidents with further diagnostic data can also do so independent of tool selection. Process Orchestrator alerts, incidents, and change request records allow reusable content independent of tool selection and company-specific ITIL extensions. A separate body of content can integrate orchestrator incidents with a specific service desk like BMC Remedy. Processes can trigger when incidents are created or changed in general automation and push those changes to Remedy. Updates within Remedy such as incident closure trigger synchronization processes which update the Process Orchestrator incident. Processes in general automation can then proceed from incident resolution. For example, the incident can be verified to prove that the problematic behavior no longer manifests. Moreover, ITIL prescribes that these records have a relationship to the element which failed so one knows what services may be impacted. Process Orchestrator incidents provide a link to:

- The target defined by the target type for the service
- A secondary configuration item field to link arbitrary external CMDB references when a CMDB is present

## Related Service-Oriented Orchestration Terms and Concepts

The following table summarizes how Service-Oriented Automation blends aspects of these industry standards as well as common best practices like object-oriented programming. Users who are familiar with one of these domains might find it easiest to map the concepts with which they are familiar to Service-Oriented Orchestration features. As you can see, the feature synthesizes similar concepts that have very disparate terms across the industry. Process Orchestrator attempts to provide the most intuitive terms within orchestration, and especially with prior Process Orchestrator users.

**Table 1-1** *Service-Oriented Orchestration Terms and Concepts Comparison*

<b>Object-Oriented Programming</b>	<b>IT Infrastructure Library (ITIL)</b>	<b>Cisco Process Orchestrator</b>	<b>Cisco Prime Service Catalog</b>	<b>Common Information Model (CIM)</b>	<b>Topology and Orchestration Specification for Cloud Applications (TOSCA)</b>
Object Model	Service Configuration Item Hierarchy	Collection of related targets		Model	Service, Service Template, Topology Template
Class	Configuration Item type, or more loosely asset classes	Target Type	Service Item Definition, Service Standard Definition	Class	Node Type
Instance, object	Configuration Item, Service	Target	Service Item, Service Standard	Object derived from Managed Element	Node
Inheritance, Parent / child / ancestor / descendant Subclass / superclass, subtype / super-type	(loosely) Configuration Item categories and classification	Inheritance	Inheritance, Parent / child / ancestor / descendant	Inheritance (subclassing)	Inheritance, Parent / child / ancestor / descendant

Table 1-1 Service-Oriented Orchestration Terms and Concepts Comparison (continued)

Object-Oriented Programming	IT Infrastructure Library (ITIL)	Cisco Process Orchestrator	Cisco Prime Service Catalog	Common Information Model (CIM)	Topology and Orchestration Specification for Cloud Applications (TOSCA)
Attribute, field	Configuration Item attribute	Property	Attribute	Property	Property
	Relationship type	Future: Relationship Type (achievable through Target Types - see above)			Relationship type
Links and associations Pointers	Configuration Item relationship	Relationship	Relationship	Relationship, association	Relationship
Method, operation		Process From Target Type: Process Action	Action, Associated Services, Tasks	Method	Plan
Event or Message		Event From Process: Trigger from Event	Event Rules for “On Event” Some use of the term “Trigger”	Indication (stop, Alert, Threshold, and others)	
	Selection by Configuration Item Category	Target Group, Target Selection	... Rule		
	Event (related to Configuration Item)	Alert (Related to Target)			
	Incident (related to configuration item)	Incident (Related to Target)			
Change Request (related to configuration item)		Change Request (Related to Target)			
		Automation Pack			Cloud Service Archive (CSAR)
		Files in an Automation Pack			Artifact
Class Interface		No explicit term The collection of all processes that act on a Target Type, including their input and output parameters		Class Interface	Interface



**Table 1-1** *Service-Oriented Orchestration Terms and Concepts Comparison (continued)*

<b>Object-Oriented Programming</b>	<b>IT Infrastructure Library (ITIL)</b>	<b>Cisco Process Orchestrator</b>	<b>Cisco Prime Service Catalog</b>	<b>Common Information Model (CIM)</b>	<b>Topology and Orchestration Specification for Cloud Applications (TOSCA)</b>
“This” reference in a method		Process Target			
Abstract class		“Targets of this type can be created” check box on a Target Type			Abstract type
Dynamic binding, overriding, polymorphism		Achievable in processes			

## Service Definition Examples

The following sections provide some service definition examples.

### A Distributed Application and Product as a Service

An example of the usefulness of Service-Oriented Orchestration is the ability to model a distributed application and provide its provisioning and ongoing operations. To the business, an application and its elements are not important by themselves; the application is important for the service it provides to the business. For example, an application may provide customer support, order entry, or partner billing. Let's pick one of these, say customer support. The customer support service in this example is provided by a distributed application that consists of a number of web servers behind a load balancer, a database, a cluster of application servers, and an LDAP repository for user credentials. Each application server ultimately runs on a UCS blade, which is in turn related to a UCS Manager. Moreover, each of these topology nodes fit within some network, with each tier separated by firewalls, and these nodes require specific firewall configuration, so the application topology has relationships to a network topology. All of this combines to form the service topology.

In a Platform as a Service solution, the customer must enable not only provisioning but ongoing operations and eventually deprovisioning of services or applications, as opposed to IaaS where individual virtual machines are provisioned. The leap involves treating a service or a collection of virtual machines and their networks as a package. Applications or other services are provisioned and configured on these VMs and networks. It involves an ordering experience that allows customers to deploy and use those services.

To this end, there is a need to define service or application blueprints so they can model their services and make them orderable and support provisioning, operations, and de-provisioning of those services. These blueprints capture what the customer needs to deploy some application. Customers want to receive these blueprints from Cisco, or possibly from partners or a community. They also need to be able to build these blueprints themselves and move them from development to test to production.

Service-Oriented Orchestration allows one to define, package, ship, and receive these models, as well as to create instances of the service from that model. In this way, the company can drive a standardized deployment of the service across development, test, and production systems. For example, a target type could be created for a web server, while the specific web server target is an instance created from that web server target type. This might have a relationship to the Linux server that hosts the web server.

A level 1 help desk operator might not know or care what specific database or LDAP instance supports the customer support service, or what UCS blade actually runs a certain instance of the web server. They want to do things against the customer support service. Say they want to authorize a new user to access the customer support service and provision whatever they need. They would generally run an add-user process, acting on the customer support service.

A Build process that acts on the customer support service is responsible for provisioning of the whole of the service. This process might call the Build process for each target type in the topology, building the service up an element at a time. This process might use files, like an OVF for a server, to stand up the specific service element, or might invoke a tool such as Puppet or Chef.

Other examples of processes that act on the service or its elements are things like site disaster recovery, that may need to make changes to many parts of the customer support distributed application to move it to another site. These processes need to act on the customer support service as a whole, but leverage the topology and relationships to traverse to other actions, possibly calling similar processes that act on those elements. For example, a request to back up the overall service might invoke a backup of each server in the topology as well as the database.

Through Service-Oriented Orchestration, processes can act on the customer support service. As necessary, the process can traverse relationships to lower level infrastructure and tool elements on which it takes action. For example, a process that queries capacity might traverse to the database target, and perform Process Orchestrator activities against that database.

## A Cisco TelePresence Service

A TelePresence system has a number of components that automation can act on through SSH, stop, or a web service. Prior to Process Orchestrator 3.0, to act on a service, one was required to browse through all of the processes, filter by category or automation pack (see [Automation Packs](#)), then run a process and specify the terminal, stop, or web service target. One had to understand the underlying implementation to know what target to provide.

Now, using Service-Oriented Orchestration:

1. An external team provides an automation pack that defines a TelePresence target type, with:
  - Relationships defined for terminal, stop, and web service target types
  - Properties such as a phone number or escort name
  - Process actions for TelePresence systems
2. The automation pack can add properties such as a location property to the built-in network device target type.
3. The customer installs the automation pack and configures TelePresence service instances by calling a constructor process called **Create**.
4. The process not only creates the TelePresence target, but also creates the terminal, stop, and web service targets as well as the relationships that unify them into the model.
5. The end user can browse the target views or operations views and filter for targets with the TelePresence type. When they select a type, they can see:
  - All of the available user-startable actions (processes).

- All automation running against the TelePresence system. These results are filterable by a time range or by a specific process.
6. When the end user runs a process action, internally the workflow traverses the relationship to find the SSH, etc. target required by the action. The user sees this and other automation running against the TelePresence system.

## Process Orchestrator System Components

The topics in the following sections describe the major architectural elements of the Process Orchestrator.

### Process Orchestrator Console

The Process Orchestrator console is a Windows form-based UI that is intended for advanced users that will be defining processes, target types, activities, and so on.

The console contains the following workspaces, each of which contains a group of objects that perform specific actions within the application.

- **Operations**—Use the Operations workspace to monitor the orchestration that is executing or is scheduled to execute on various targets. You can also use this workspace to monitor the processes that are scheduled to execute, view processes that are currently running, and verify that processes have successfully completed.
- **Definitions**—Use the Definitions workspace to view and modify processes and other related configurations that are used in executing automation.
- **Administration**—Use the Administration workspace to perform administrative actions such as editing system-wide settings, managing security roles, configuring adapters and automation packs, and tuning database grooming and other settings.

### Web Console

The Process Orchestrator Web Console provides a web-based UI that is intended for occasional users. The vision is that while a broad set of users may be defining processes, pervasively everyone in IT and even non-IT individuals may need to interact with those processes. The web console focuses on this second group. It does not allow users to define processes but does allow them to start processes, monitor processes they started, or interact with human steps in processes called *tasks* (such as approvals). This interface is purposefully simplified to minimize the learning curve of occasional users.



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**Note**

The Web Console is typically not used when Process Orchestrator is used in conjunction with Cisco Prime Service Catalog. In these cases, end-user interaction occurs through the catalog rather than Process Orchestrator interfaces. The Web Console is typically only used in cases when Process Orchestrator is used independently.

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The web console runs on a Microsoft IIS web server. Process Orchestrator environments can span Process Orchestrator servers, so if a deployment scenario requires breaking up automation for security, organizational, geographic, or purpose (such as development or test), the Web Console can provide a single point of access for occasional users.

**Related Topics**

[Chapter 9, “Performing Basic Console Tasks”](#)

## Process Orchestrator Server (Process Engine)

At the core is the Process Orchestrator Server, which executes automated processes. This component is responsible for:

- Creating instances of running processes
- Orchestrating the execution of these processes
- Configuring multiple servers to work together for load balancing and in an active-active configuration to achieve high availability.

## Northbound Web Service Interface

Process Orchestrator provides a web service interface that allows external systems to invoke Process Orchestrator processes, check their results, and so on. Use the northbound web service interface when you:

- Have a need to integrate with or communicate between multiple Process Orchestrator environments
- Have your own support portal
- Use a service catalog
- Leverage Process Orchestrator underneath some other master orchestrator

For more information about the northbound web service interface, see the [Cisco Process Orchestrator Northbound Web Services Guide](#).

## REST Services Guide

Process Orchestrator provides a web service interface that allows external systems to invoke Process Orchestrator processes, check their results, and so on. Use the REST services guide when you:

- Have a need to integrate with or communicate between multiple Process Orchestrator environments
- Have your own support portal
- Use a service catalog
- Leverage Process Orchestrator underneath some other master orchestrator

For more information about the REST services guide, see the [Cisco Process Orchestrator REST Services Guide](#).

## Command Line Interface

The Process Orchestrator command line interface is based on Windows PowerShell. PowerShell is the emerging standard for CLI interfaces on the Microsoft platform. The CLI provides basic operations that are needed for integration, including the ability to:

- Export or import automation packs

- Start a process with input variables
- Check the status of a process
- Enable and disable processes and targets
- **Import automation pack patches**
- **Export/Import automation pack customizations**

## Databases

### Process Database (Configuration & Audit)

This database is closely associated with a Process Orchestrator high availability environment (that includes one or more servers) and stores process definitions and other configuration information. In this environment, the Process Orchestrator Server (Process Engine):

1. Loads process definitions and other configuration information at startup. Then, as appropriate, it starts instances of processes.
2. Stores the state of running process instances into the Process Database. This persistence allows resiliency across server restarts and supports load balancing and high availability in a multi-server environment.
3. Stores auditing data in the Process Database to record change as users interact with the system, (such as to make a configuration change or invoke a process manually).

### Reporting Database (Data Warehouse)

This second database stores data needed for longer-term retention and storage. This can include a copy of auditing data that can groom more slowly than the Process database, as well as summary information for each process that ran. This data is organized for reporting, with flat relational tables, and can be summarized. Automation content can also add data, such as performance measurements, to the reporting database.

#### Related Topics

[Reporting](#)

## Reporting

Process Orchestrator supports two reporting technologies:

- SAP BusinessObjects
- SQL Server Reporting Services

Report definitions are provided in the Process Orchestrator product and in some Cisco automation packs, and are imported into the chosen reporting platform.

#### Related Topics

[Managing the Report Database](#)

## Role-Based Access Control (RBAC)

Windows performs authentication of the user connecting to Process Orchestrator against Active Directory. The authentication is done prior to connection to the Process Orchestrator server, and the Process Orchestrator server simply relies on the results of that authentication. No special end-user account management is necessary for Process Orchestrator.

In Process Orchestrator, authorization is performed using a Role-Based Access Control System. Roles are a collection of permissions. Users are assigned to roles that give them the ability to perform the actions allowed by the role.

Typically, roles are defined according to a standardized job function within IT. Examples might include Level 1 Helpdesk, Level 2 Helpdesk, Cloud Technical Administrator, Network Configuration, SAP Basis Expert, and so on. Security groups already in the directory for the users in these job functions are then typically assigned to the roles.

## Adapters

Adapters are one of the extensibility mechanisms in the Process Orchestrator platform, and are only written by members of the Process Orchestrator product development team. The development team uses adapters to extend Process Orchestrator functionality to integrate with devices, environments, applications, or tools without undergoing core modification.

### Related Topics

- [Configuring Security](#)

## Automation Packs

Automation packs are the primary means of extending integrations in the field. Automation packs are prepackaged collections of process definitions, target types, variables, categories, targets, target groups, and other configurations needed to define a set of automated IT processes. Automation packs allow:

- Cisco or its partners to ship best practice automation to customers.
- Customers to get productive quickly, and to shift automation across systems, such as from a development system to a test system to production.
- Customers to export their own processes and share with each other in the community.
- The backup of process definitions and other product configuration.

Automation packs:

- Can be exported from one Process Orchestrator system and imported into another.
- Can ship separately from product releases.
- Are versioned and dependencies are recorded. Versions and dependencies are checked during import to ensure that the system will work after the import. For example, if your personal automation pack calls a process in “Sample Document A” automation pack v1.3, then you cannot import your automation pack into a system that has installed “Sample Document A” v1.2.

The Core automation pack is provided by Cisco Process Orchestrator and is a required prerequisite for all other automation packs included in the Cisco Process Orchestrator installation.

**Related Topics**

- [Managing Automation Packs](#)

## Advanced Message Queuing Protocol (AMQP)

The Advanced Message Queuing Protocol (AMQP) is an open standard application layer protocol for message-oriented middleware. It delivers message orientation, queuing, routing (including point-to-point and publish-and-subscribe), reliability and security. AMQP came out of the financial industry, and is proven highly scalable in demanding environments (see <http://www.amqp.org/>).

AMQP is the emerging standard for messaging and events in the cloud. For example:

- vCloud Director can publish vCloud Messages, also known as “blocking tasks,” “notifications,” or “call-outs,” related to different provisioning. An orchestrator can not only receive these events, but can also respond to them to delay execution.
- AMQP is supported with vCloud Orchestrator.
- OpenStack selected AMQP as the messaging technology for OpenStack.

AMQP is integrated with more than 70 developer platforms, providing a nice framework for event-oriented integrations.

AMQP enables event-driven capabilities of Enterprise Service Bus-style designs. It enables queuing, so automation can fetch messages when there is capacity. You can use asynchronous methods servicing requests as capacity allows when possible, and reserve real-time, synchronous methods only when absolutely needed. AMQP’s open platform is a natural choice for event and message design patterns

Process Orchestrator can trigger processes in response to messages placed on AMQP queues/exchanges. Processes can also read messages from queues/exchanges one at a time if they want to respond to messages one at a time rather than in parallel, to operate more as a queue. Processes can submit messages to queues/exchanges.

JMS is another possible integration enabled through AMQP. AMQP has providers to place JMS messages on queues/exchanges.

**Related Topics**

- [Integrating Using the Advanced Message Queuing Protocol \(AMQP\)](#)

## AMQP Exchange Types

The exchange type determines how AMQP processes and routes messages. There are several types of exchanges.

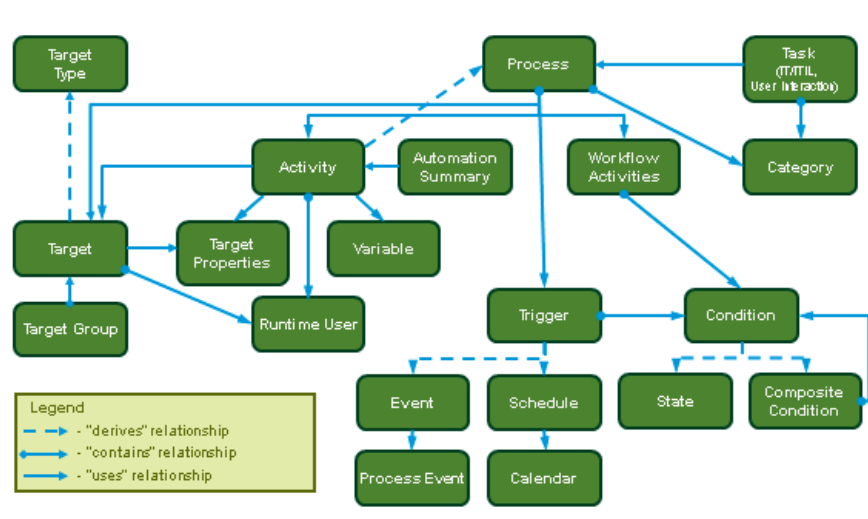
Exchange Type	Description
Default	<p>The default exchange is a direct exchange with no name (empty string) pre-declared by the broker. It has one special property that makes it very useful for simple applications: every queue that is created is automatically bound to it with a routing key which is the same as the queue name.</p> <p>For example, when you declare a queue with the name of "search-indexing-online", the AMQP broker will bind it to the default exchange using "search-indexing-online" as the routing key. Therefore, a message published to the default exchange with the routing key "search-indexing-online" will be routed to the queue "search-indexing-online". In other words, the default exchange makes it seem like it is possible to deliver messages directly to queues, even though that is not technically what is happening.</p>
Direct	Delivers messages to queues based on the message routing key. A direct exchange is ideal for the unicast routing of messages (although they can be used for multicast routing as well).
Fanout	Routes messages to all of the queues that are bound to it and the routing key is ignored. If N queues are bound to a fanout exchange, when a new message is published to that exchange a copy of the message is delivered to all N queues. Fanout exchanges are ideal for the broadcast routing of messages.
Topic	Routes messages to one or many queues based on matching between a message routing key and the pattern that was used to bind a queue to an exchange. The topic exchange type is often used to implement various publish/subscribe pattern variations. Topic exchanges are commonly used for the multicast routing of messages.
Headers	Routes messages based on multiple attributes that are more easily expressed as message headers than a routing key. Headers exchanges ignore the routing key attribute. Instead, the attributes used for routing are taken from the headers attribute. A message is considered matching if the value of the header equals the value specified upon binding.



# Process Orchestrator System Elements

The following diagram shows the major functional elements of the Process Orchestrator system. These elements are discussed in the sections that follow.

**Figure 1-1** Process Orchestrator Functional Model



## Activities

Activities are the steps in a process. They are customized to perform integration with some environment. For example, an stop trap send activity would have a very different UI and set of properties from an SAP ABAP call, and would have very different runtime characteristics as well.

Activities can be provided by adapters (binary components in Cisco Process Orchestrator) or by automation packs. Therefore both adapters and automation packs can contribute to a particular integration.

Workflow activities provide the logic or flow aspects of the process workflow. Workflow activities are exposed in the Logic tab of the toolbox in the Process Editor.

### Related Topics

- [Advanced Authoring Concepts](#)
- [Adapters](#)
- [Automation Packs](#)
- [Adding Logic Components to a Process](#)

## Automation Summaries

Technically, automation summaries are XML files that are published on a share or web server. The path or URL is then available to be linked from anywhere. This architecture makes them available for integration into virtually any context.

Automation Summaries are a key integration tool. For example, they can be placed in incidents in the Service Desk to reveal the analysis of the automation that was performed, or they can show how an incident was resolved.

## Conditions

Many workflow logic elements perform tests to control execution. Conditions implement these tests. For example, a Condition Branch can split execution to take one path if a condition exists, and another if it does not. A While Block can iterate execution while a condition exists.

Conditions can also be placed on a process trigger, allowing control of situations in which the process can run. For example, a scenario might require the process to run during two different time ranges, which would require two triggers: one trigger with an 8am-5pm condition and a totally different trigger with a 5pm-8am condition.

There are two basic types of conditions:

- State conditions

State conditions evaluate some state. The Process Orchestrator provides a number of state conditions that can be perceived as a part of the base product, but technically are part of the adapter. For example, it provides a test to see if a variable has some value.

- Composite conditions

A composite condition builds a compound condition from individual conditions. It allows combining conditions with AND logic, where all of the conditions must be TRUE for the composite condition to be TRUE, or OR logic, where any of the conditions can be TRUE for the composite condition to return TRUE.

Compound conditions can be used in other compound conditions to produce complex logic, such as ((X AND Y) OR (A AND B)).

## Processes

Use Process Orchestrator to automate an IT processes by defining a process, then running instances of the defined process.

An element of the process is the process workflow. The workflow defines the automation steps (activities), the logic or flow between these steps, and how to flow data from one step to the next.

The engine manages the state and lifecycle of a process, bringing it into existence, running its steps, and finally terminating it. During and (by default) after process execution, the engine retains information so that operators can view the status of their running processes.

### Related Topics

[Creating a Basic Process](#)

## Runtime Users

A runtime user record stores information about the user security context and passes this information to the adapters for activity execution, event monitoring, and some target operations (such as availability monitoring and discovery). Runtime user instances can be shared across targets and processes. For example, if a single set of credentials can be used to access a set of network devices, only one runtime

user instance must be created. When it is time to change the credentials, users can go to the runtime users list and edit the single instance to change the credentials. This greatly reduces the configuration load when credentials tend to change often in some environments.

**Note**

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Runtime user credentials can be used in a process, but no process can retrieve credentials. If your process must access credentials, use hidden string variables.

---

The runtime user concept allows the product to implement delegation. For example:

1. An IT help desk operator comes to Process Orchestrator to run a process.
2. This operator is presented with a list of processes that Process Orchestrator's role-based access control allows them to run. These processes might include activities that require a level of security permission that the operator does not natively have.
3. The operator can perform actions as a part of the established process that are not possible for them to perform manually.

This concept can also be leveraged to reveal where operators make changes outside of a process. By examining auditing logs such as Windows logs for things being done under the operator's credentials rather than the Process Orchestrator runtime user credentials, it is possible to determine how the operator is doing things outside of process and determine how to close things down. So a side effect of Process Orchestrator automation is that customers might be able to tighten security in their environment.

## Targets

Targets are *instances* created from a target type. For example:

- A terminal target allows SSH or telnet to some specific network device.
- A UCS Manager target allows connection to a specific UCS Manager in charge of a UCS system.
- A database target allows connection to specific supported databases.

A process or activity executes an action within some environment. The specifics of the definition of the connection to the environment are encompassed in the target. For example, a target for:

- An SSH command might be a specific UNIX system or network device.
- A database query might be a specific database
- An SAP ABAP activity might be a specific SAP system.

Processes can restrict the type of target which they can accept. For example, it is not appropriate to run a process to change a network device's configuration against a Windows computer.

A process workflow acts on a target. This allows the process workflow to perform actions against an external tool or environment. Although a default target instance can be specified directly by a process, more commonly it is associated to the process at run time.

Activities, which are the steps in a process (see [Activities](#)), can also specify a target. Typically, activities default to use the process target, but a step in a workflow might need to happen against a different system than the process target. For example, a process overall might deal with a network device, but a step in the process might need to update a database. Often workflows can determine the target on which an activity may act by using a relationship to the target for the process, or doing a query on some data such as a name to find a matching target instance.

**Related Topics**

- [Defining a Target](#)
- [Creating Triggers](#)

## Target Groups

Target groups are collections of targets. Often automation might need to run against all machines in a collection, or against one of the machines in a collection. Target groups provide this functionality.

Adapters can provide target groups to leverage grouping definitions where they exist. For example:

- **Active Directory OU**—Customers are frustrated when they must recode their grouping information into yet another product. The Active Directory adapter seeks grouping information where it is defined. For example, an Active Directory target group looks up computers in some organizational unit (OU) in the directory.
- **Target Type group**—Using queries of their attributes, the Process Orchestrator provides type-based groupings of targets. For example, use a target group to group all targets of a given type, or to perform additional filtering to pattern match against a field in the target definition.
- **Virtual group**—A target group can be a virtual group. Use a virtual group to specify an explicit list of targets, providing the capability to manually select targets and establish group membership. A virtual group can also allow the inclusion of other target groups so that group membership can be defined hierarchically. For example, a virtual group called “Production switches” might include all members of the “Houston data center switches” group as well as all members of the “London data center switches” group, but not members of the “Engineering lab switches.”

A default target for a process can specify a target group along with a target selection algorithm:

- Typically, a target selection algorithm chooses one or more members of a target group to specify the target instances on which the process will act.
- At runtime the target selection algorithm resolves the then-present members of the target group and selects a target.
- When a user, CLI, or northbound API call interactively runs a process ad-hoc (on demand), the user can accept the default target specified in the process or override it with a specific target.
- Where a target selection algorithm resolves to multiple target instances, the engine spins up separate process instances for each target. Thus at runtime, a process instance has a specific target on which it will act, against which the process workflow encodes actions.

**Related Topics**

[Defining a Target](#)

## Target Types

Target types provide a way to define a service or other IT element that is not represented by any target type provided by an adapter. A target type can:

- Extend an existing adapter-provided target type
- Extend another target type
- Define a completely new target type

All new targets are created based upon a target type. Some target types are ‘abstract’, meaning they cannot be directly instantiated into targets but are only available for inheritance by other target types. In Process Orchestrator, these target types are marked as either ‘creatable’ or ‘not creatable’.

A target type:

- Exposes (and inherits from its ancestor target types) properties and inter-target named relationships that can be read and set either manually or by an Update Target activity.
- Defines property default values.

## Tasks

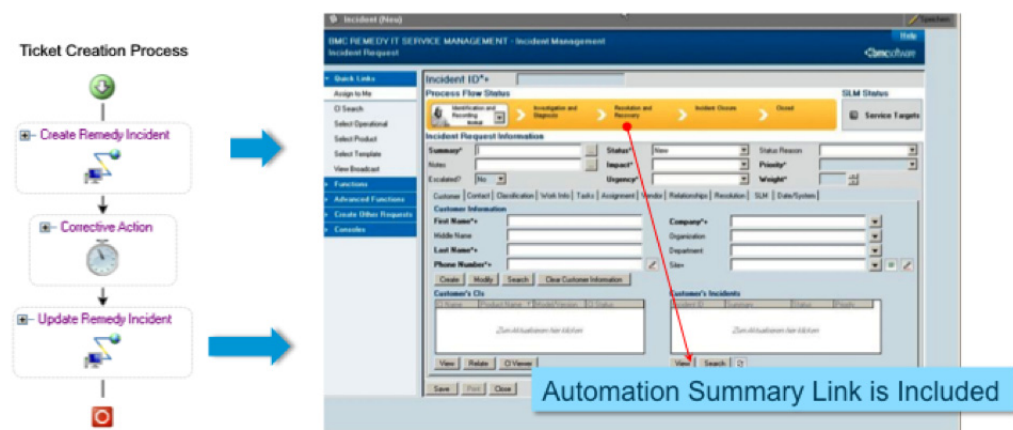
Tasks allow a process to create an IT record or perform human interaction, and provide ownership and lifecycle. Process Orchestrator provides a list of tasks in the operator console. Managers can then set or change assignments to those on their staff. Assignment changes, state changes, and all other changes are audited, so one can definitively tell exactly who did what in the system.

There are two types of tasks: IT process records and human interaction.

### IT Process Records

IT process records tasks include the alerts, incidents, and change requests. These records represent the core records within IT; they are the core ITIL (IT Infrastructure Library) records. While Process Orchestrator does provide a list of these records so that one can, for example, look at a list of alerts which automation created and manage their lifecycle, more often these records are used to synchronize the records out of Process Orchestrator to a separate tool.

For example, alerts typically need to be pushed to an enterprise event manager so that the alerts can be combined with others to present a view of IT system health. Incidents and change requests are typically the domain of service desks. Rather than managing these records in Process Orchestrator, many customers prefer to manage these records elsewhere.



This construct allows processes to be independent of the event manager or service desk. For example:

1. A process such as one in a network best practice automation pack simply creates an alert, incident, or change request.
2. Optionally, this process can block waiting on the task to enter a completed state.
3. Separately, a Remedy automation pack includes a process that triggers when a new incident task is created, and creates the corresponding entry in the Remedy system.

4. The Remedy automation pack can synchronize data between the systems and when the incident reaches a terminating state in the Remedy system, the incident in Process Orchestrator is then automatically synchronized.
5. When the incident in Process Orchestrator is closed, if the process in the network best practice automation pack blocked, it can continue. For example, the process might go on to prove that the problem that generated the incident in fact no longer manifests, closing the loop to prove that the remediation did in fact fix the problem.

With this abstraction, the network best practice automation pack does not need to be dependent on the specifics of which service desk is involved, and no dependency exists between the automation packs.

### Human Interactions

Human interaction tasks are steps in a workflow where a human needs to take action. They include the following types of tasks:

- Approval tasks consist of steps where the workflow needs someone's indication of what route to take. They may be simple yes or no questions, or they might give any arbitrary set of choices.
- Guided Operation tasks consist of steps in a workflow that someone must perform manually. For example, a step in a network automation workflow might be to replace a cable. While this step cannot be automated, it might be a small part of an overall workflow that can be automated.
- Review tasks allow the assignment of a document or automation summary review. When someone indicates the review is complete, the workflow can continue. Moreover, the person who indicated they completed the review is recorded in auditing. Many systems might send a notification to let someone know that they need to, for example, look at a report, but do not close the loop to see that the review actually occurred. Process Orchestrator allows closing the loop.
- Input Request tasks allow gathering data as the workflow executes.

## Task Rules

Task rules provide a list of rules that act on new tasks or task changes to handle cases such as assignments, changing alert or incident severities, or setting customer-specific categories on tasks. By defining a task rule, you can tune the content you receive to your specific company without having to edit processes in the automation pack. By performing these actions by rule, one change can affect tasks created by multiple processes. For example, you can assign all SAP Incidents to a single person with a single rule.

You can view default assignments, notifications, and properties to be updated according to the following defined rule types:

Task Rules	Example
Assign a task	A new user installs and runs the SAP Automation Packs. Automation Pack processes create alerts and incidents. The user needs to assign the alerts and incidents to individuals who own that specific area of SAP. It is difficult to anticipate every way the customer may have broken up their SAP management responsibilities within the team. Virtually every customer who uses Process Orchestrator for SAP customizes the product for assignments. The user can go to a list of Task Rules and create a rule to make the assignment. In this list, they can see what other assignments have been made.
Send a task notification	Beyond notifications, when an owner is assigned, often the same or separate people must be notified in response to incidents. For example, if a job fails that is a financial job, perhaps both the technical owner of SAP job management and someone in the financial team should be notified; ownership of the incident should not be assigned just to the financial team. Note that Cisco's implementation task rules set a "people to notify" property on the task. The Task Rule identifies who to notify and a process would send the actual email.
Change alert or incident severity	Cisco's SAP automation pack assigns the severity of each detected condition when it creates the alerts and incidents. However, customer environments and requirements are unpredictable. It is very common for customers to change the severity of their alerts and incidents to match the business importance of that issue relative to others in their systems.
Add a custom category to a task	If you need to see a certain type of review, alert, or incident within a restricted view, categories are a natural way to group these alerts. Default alert categories are established in the automation pack, but users might want to add their customized categories to Tasks generated by automation packs.

Whenever a task is created, Process Orchestrator goes through the settings and conditions of each task rule that is listed and enabled. If the conditions and settings in the rule are satisfied, the task rule is executed.



**Note**

Task rules are executed according to the order in which they are displayed in the list.

**When Task Rules Execute**

Task rules can not be manually run by the user. Task rules can only execute when a task is created within Process Orchestrator processes and rule conditions are met. If the task-created trigger (for any task type) and rule conditions are met, the action of the task rule is executed in the order in which it is listed in the Definitions > Task Rules view.

Any processes that are triggered based on a Task Created trigger will only execute after the appropriate task rules have executed.

### Notifications

In addition to notifications that occur when a user is assigned, often the same or other people must be notified in response to a task. The task rule notification identifies which person or group to notify and a process emails the notice.

Each task contains a list of notification recipients in addition to task assignees. The notification task rule adds to this list of notification recipients. A process can react to a task create event or task change event and then appropriately notify the notification recipients by email or any other mechanism.

### Automation Pack Rule Management

Task rules can be included in automation packs to easily transfer default task rules from one system to another, such as transferring task rules from a development system into a test or production system.

Some Cisco automation packs include not only processes that generate tasks, but also separate processes that handle notifications. You can create task rules to manage these objects without editing the process or task so that your customization to the tasks occurs before these notification processes run.

## Triggers

Process instances can come into existence in the following ways:

- A process can be invoked manually.
- A process can be invoked by another process.
- A trigger can fire, which initiates the process.
- A process can be invoked using the northbound web service.

Triggers are events and conditions in the system that determine how or when the process will be executed. Multiple triggers can be added that can be initiated when certain conditions are met.

Process Orchestrator supports two types of rule-based triggers: events and schedules.

### Events

The Process Orchestrator can monitor for events from the environment, and you can specify triggers that initiate processes when the subscribed event occurs. For example, an event might be an incoming stop trap or a fault on a UCS system.

### Schedules

Schedules allow triggering processes at some time by leveraging another object called a calendar. Calendars define which days something can occur. Calendars can be selected days or sequences of dates such as weekly or monthly, they can represent dates like fiscal quarter end, or they can be combined hierarchically. Schedules then associate a time with a calendar. When the day is in the calendar, the time is evaluated. Times can be explicit or repeating (for example, hourly).



## Variables

The variables feature provides a storage area for information that is used on a regular basis to avoid having to specify the same information in several places. Data stored in a variable can be altered to affect process execution behavior.

### Activity Configuration

One of the most common uses of variables is to define activity configuration. Any field in an activity can refer to a variable value rather than an explicit value. For example, you can use a variable to:

- Specify the target as the machine where an event occurred
- Specify the start date of the process' operations window as a parameter to an operating system command
- Specify a condition, such as a file that should not exist after a job is initially triggered by the arrival of that file where a prior activity should have deleted the file

### Process Control Components

Processes can use variables to define the control components. For example, you can use a variable to define:

- A Conditional activity to look at the exit code of a prior activity
- A While Loop activity to loop until a query fails or loop for a number of times corresponding to a number of objects pulled from a query

### Process Parameters

Variables can be parameterized so that a process definition can be vague enough to be reused in multiple places and the specifics can remain undefined so that they can be defined by the person or process that invokes the process or activity.

For example, a process called notify server owner might use a variable server for the name of the server that has a problem. The process retrieves the email address of the owner of the server and sends an email.

This process might be called from multiple places; a step in a server maintenance job fails, so the maintenance job populates the Server variable and invokes the notify server owner process. Another process might notify the server owner when a backup completes.

### Formulas as Variable Values

You can specify a formula anywhere a variable value is used. For example, an operating system command's parameter might be formed from concatenating two variables' values or from parsing the output of a prior command.

## Adapters No Longer Supported as of Cisco Process Orchestrator 3.5

The following adapters are no longer supported and therefore instructions on how to implement them has been removed from the Online help and the user guide.

- SAP ABAP Adapter
- SAP Java Adapter
- SAP Solution Manager Adapter

- IBM DB2 Database Adapter
- JMX Adapter
- OLAP Database Adapter



## Getting Started

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### Connecting to Your First Server/Environment

This section contains instructions for connecting the console to your first Process Orchestrator server.

#### Before You Begin

There are several user groups assigned to Process Orchestrator's built-in security roles. Before attempting to access the console, you must be a member of one of these user groups or another group to which your administrator has assigned custom role privileges. If you do not have access or the appropriate rights, please contact your local IT administrator.

- 
- Step 1** Choose **Start > Programs > Cisco > Cisco Process Orchestrator > Cisco Process Orchestrator Console**.
  - Step 2** In the Select Server dialog, select a server name and click **Connect to Server**.
  - Step 3** To configure the console server connection, choose **Tools > Options**, and update the parameters as necessary.
- 

### Understanding the User Interface

#### Process Orchestrator Console Components

The following topics describe the main components of the Process Orchestrator console:

- [Console Menus](#)
- [Toolbars](#)
- [Workspaces](#)
- [Results Pane](#)
- [Details Pane](#)
- [Process Viewer](#)
- [Process Editor Menus](#)

## Console Overview

The Cisco Process Orchestrator Console is the interface used to access and operate the application. The Console displays after completing the license check or updating your license. The default view is the Operations workspace.

After the initial access, the view on the Console is determined by the last item accessed before exiting the Console.

The Console consists of the following areas:

- **Menu Bar**  
Contains options used to access the tasks associated with the current item selected in the Navigation pane.
- **Toolbars**  
Provides shortcuts to general tasks within Cisco Process Orchestrator as well as specific tasks associated with the item currently selected in the Navigation pane.
- **Navigation Pane**  
The Navigation pane, located on the left side of the Console, displays several navigation workspaces, each containing a group of items that enable you to perform specific actions within the application. When a navigation view is selected, the available contents are displayed.  
The following is a list of the available views in the Navigation pane.
  - Operations Workspace
  - Definitions Workspace
  - Administration Workspace
  - Favorites Workspace
- **Results Pane**
- **Details Pane**

## Console Menus

The Process Orchestrator console menus provide general task items, such as feature customization options. These menus are displayed on the Console menu bar.

The following topics describe the contents of each of the Process Orchestrator Console menus.

### Using the File Menu

The File menu contains general actions related to the configuration of Process Orchestrator. The File menu contains the following items:

Menu Option	Description
Connect to Server	Opens the Select Server dialog box where you can specify the server to which to connect.  The Server drop-down list displays the list of previously connected servers to the Console. You can also enter the specific server address to be connected.
Recent Servers	Displays the most recent servers that have been connected to the Console.
Environment Properties	Displays the Environment Properties dialog box for the connected Process Orchestrator server.
Update License	Launches the Update License Wizard (see <a href="#">Updating the Product License</a> ) to enter your product license information.
Exit	Closes the Console

### Using the Edit Menu

The Edit menu contains the following items for modifying the configuration.



#### Note

The items enabled under the Edit menu depend on the objects selected in the navigation and detail panes of the Console.

Menu Option	Description
Undo	Reverses the last action by the user
Redo	Reinstates the previously reversed action
Copy	Copies the selected text or object to the clipboard
Paste	Pastes the previously copied item from the clipboard
Delete	Deletes the selected item
Select All	Selects all items on the dialog box or text field
Find	Launches the Find dialog box to locate specific text on a dialog box.

## Using the View Menu

The View menu contains items that determines how the information displays in the results pane. Select one of the following items to adjust the Console display:

Menu Option	Description
Large Icons	Displays large icons with the associated item
Small Icons	Displays small icons with the associated name
List	Displays icons with the associated name in list format
Details	Displays icons with the associated name and details in list format
Choose Columns	Opens the Choose Columns dialog box, which is used to customize the displayed columns and the order in which they display (see <a href="#">Configuring Columns</a> ).
Refresh	Updates the current view
Navigation Pane	Enables/disables the Navigation pane on the Console. When disabled, the Results pane and the detail pane, if selected, expand the width of the entire window
Detail Pane	Toggles the Details pane <i>On</i> or <i>Off</i>
Toolbars	Determines the toolbars ( <a href="#">Standard Toolbar</a> , <a href="#">Advanced Toolbar</a> , <a href="#">Configuring the Appearance of the Console</a> ) to display on the Console. The check mark to the left of the toolbar name indicates the toolbar is selected.
Status Bar	Enables/disables the status bar that appears at the bottom of the Console

## Using the Go Menu

The Go menu contains the following shortcuts that allow you to navigate from one view to another on the Console:

Menu Option	Description
Back	Returns to the previously selected view
Forward	Option is active if you have clicked Back to access a previous view. Use this option to navigate to the next navigation item in the list.
Go To	Displays all previously selected views to which you can return
Operations	Opens the Operations workspace
Definitions	Opens the Definitions workspace
Administration	Opens the Administration workspace
Folder List	Opens the Folder List workspace
Favorites	Opens the Favorites workspace

## Using the Tools Menu

The Tools menu contains the following items that configure the appearance of the Console:

Menu Option	Description
Customize	Launches the Customize dialog box. Use this dialog to change the fonts and colors that display in the Console (see <a href="#">Customizing the Fonts and Colors</a> ).
Options	Displays the Options dialog box. Use this dialog to modify basic server interface functions.


## Using the Actions Menu

The Actions menu contains items that perform specific actions associated with the selected item in the navigation pane.

The items that are available on the menu depend on the selected item on the Navigation pane. For example, the options available when the Processes view is selected are different from those that are available when Global Variables view is selected.

## Understanding the Help Menu

The Help menu contains the following items:

Menu Option	Description
Help	Displays dialog box-specific information in a separate pane to the left.  On the toolbar, click the <b>Help</b>  tool to display and remove the Help pane.
Contents	Displays the Table of Contents tab used to navigate and view the comprehensive help information.
Index	Displays the Index tab used to navigate and view the indexed help information.
Search	Displays the Search tab used to enter search criteria and locate specific information in the comprehensive help.
About Cisco Process Orchestrator	Displays the About Cisco Process Orchestrator dialog box, which contains the product version and license information.

## Toolbars

The Console has three toolbars ([Standard Toolbar](#), [Advanced Toolbar](#), [Configuring the Appearance of the Console](#)), which can be used to configure the selected navigation view, provide quick navigation between views, and perform item-specific actions.

**Figure 2-1 Console Toolbars**



\_\_\_\_\_ **Action Toolbar**  
 \_\_\_\_\_ **Advanced Toolbar**  
 \_\_\_\_\_ **Standard Toolbar**

To enable or disable a toolbar, choose **View > Toolbars**, then click the appropriate toolbar.

### Standard Toolbar

The Standard toolbar displays shortcuts to general actions and functions. The following icons appear on every view on the Console.





Icon	Name/Action
	Connect to Server—Connects to the server to which you were last connected
	Server Properties—Displays the properties for the connected server
	Refresh—Updates the current view with the latest information from the server
	Properties—Displays defined properties for the selected object. This icon is unavailable if the current selection does not support property pages.
	Cut—Cuts the selected text to the clipboard
	Copy—Copies the selected text to the clipboard
	Paste—Pastes the selected items to the location identified by the cursor
	Delete—Deletes the selected object
	Help—Displays or hides the Help pane

### Advanced Toolbar

The Advanced toolbar displays shortcuts to general navigation and Console configuration icons.

Icon	Name/Task
	Back—Permits you to select the page to be displayed from a drop-down list of the most recent history pages.
	Forward—Permits you to select the page to be displayed from a drop-down list of the most recent forward-history pages.



Icon	Name/Task
	Navigation Pane—Displays or hides the Navigation pane.
	Detail Pane—Displays or hides the Details pane.
	Status Bar—Displays or hides the Status Bar.
	Options—Displays the Options dialog box.

## Configuring the Appearance of the Console

You can configure options that modify the basic interface behavior of the console.



- 
- Step 1** From the Advanced toolbar, select **Options** to display the Options dialog box provides configuration options that modifies the basic interface behavior.
- Step 2** Click the **General** tab to configure the server connection startup behavior.
- Automatically select the group and item you most recently selected—At console startup, the group and item that are selected are the group and item that were last selected.
  - Always select the following group and item—Specify the starting group and item:
    - Group—The navigation group that is selected at console startup
    - Item—The navigation item that is selected at console startup
  - Remember the most recently used servers—Specify the number of recently accessed servers to display
- Step 3** Click the **Windows and Layout** tab to specify how the user is to be prompted when a process is launched and what is to be displayed after the process is launched.
- When starting a process—Select one of the following options to determine what action occurs when a process is launched:
    - Always Launch Immediately with Default Input Value—Launches the process immediately when the process has specified or default values without confirmation
    - Always Prompt to Confirm— Default option launches the Confirm Start Process dialog box to allow you to confirm whether the selected process should be launched or override the process start option
    - Only Prompt when Process has Inputs— Launches the Confirm Start Process dialog box if the process has input variables. If the process does not have input variables, starts the process immediately without confirmation.
  - After process is started—Choose one of the following options to determine what is displayed after a process begins:
    - None—Option does not display any process instances after the process has started
    - Show Instances—Displays the processes initiated in the Activities view on the Console
  - Reset User Preferences—Click this button to reset the saved settings (size and location of dialog boxes, selected property pages, visibility of toolbars and menu items, etc.) to the system default. Clicking this button automatically closes the Console and requires the application to restart.

- Step 4** Click the **Security** tab to configure the default owner when creating objects in Cisco Process Orchestrator.
- The current user—Select this radio button to use the user account that is currently logged in to assign the owner on any new objects created.
  - The specified user—Select this radio button and then click the browse button to launch the Select User or Group dialog box and specify the default user for objects.
- Step 5** Click **OK**.
- 

## Actions Toolbar

The Actions toolbar displays options that are associated with the selected item in the Navigation pane or Results pane. The available items on the Action toolbar depend on the item selected.

For example, the options available when the Processes item is selected are different from those that are available when Global Variables is selected.

Menu Option	Description
Start Process	Click to manually start any enabled process displayed in the Process View.
Enable	If a process is manually disabled, click <b>Enable</b> before executing.
Disable	Click to disable a selected process instance on the process view from executing.
	Unlock—If a process is manually locked, click to unlock it.
	Lock—If a process is manually unlocked, click to lock it.
Advanced	Click this button and select <b>Break Lock</b> if a process is locked by another user and you have Break Lock permissions.

## Workspaces

The Console contains the following workspaces. Each workspace contains a group of objects that perform specific actions within the application.

Workspace	Description
Operations	<p>The Operations workspace displays:</p> <ul style="list-style-type: none"> <li>• The status of processes that are scheduled to execute, view processes that are currently running, and verify that processes have successfully completed.</li> <li>• Alerts, incidents, and approvals relating to system event history for actions that have occurred within Cisco Process Orchestrator.</li> <li>• System messages about status and errors within the Process Orchestrator server or adapters.</li> </ul> <p>For more information, see <a href="#">Chapter 8, “Monitoring Operations.”</a></p>
Definitions	<p>The Definitions workspace displays all of the components that are used in defining and executing processes. The options provided by this workspace include:</p> <ul style="list-style-type: none"> <li>• <b>View Current Processes</b>—Displays the Definitions &gt; Processes view where you can view and manage defined processes. This view has two panes that display the execution progress of the process and activity instances. <p>From this view, you can view process properties, execute a process ad hoc, edit existing processes, and define new processes. From the Processes View, you can also execute processes and view the status of the process as it in progress.</p> <p>For additional information about monitor and manage processes, see <a href="#">Chapter 8, “Monitoring Operations.”</a></p> </li> <li>• <b>Create a New Process</b>—Launches the Process Editor, which you can use to view and define the properties for a new process as well as construct the process workflow. <p>For additional information about the Process Editor, see <a href="#">Accessing the Process Editor</a></p> </li> <li>• <b>View Operations</b>—Displays the Operations workspace that shows what processes are in progress, scheduled or have been completed. <p>For additional information about managing operations, see <a href="#">Chapter 8, “Monitoring Operations.”</a></p> </li> </ul>
Administration	<p>The Administration workspace displays all of the components that are used to manage administrative activities (such as security or database administration tasks).</p> <p>For more information, see <a href="#">Performing Administrative Actions</a>.</p>
Folder List	<p>The Folder List view displays a list of all the navigation items available from the Console. The items are sorted according to the view displayed on the Console. The Results pane displays the view associated with the selected item.</p>

Workspace	Description
Favorites	<p>The Favorites workspace displays shortcuts to user-selected navigation items. This view is used for quickly accessing navigation items that are frequently used. Any item in the Navigation pane can be added to the Favorites view.</p> <p>Click <b>Set Favorites</b> to display the Set Favorites dialog box. Check the appropriate items, then click <b>OK</b>.</p>

## Results Pane

When a navigation item is selected on the Navigation pane, the information associated with that item displays in the Results pane. By default, the information is presented in a details list view format. The columns that display depend on the selected navigation item.

## Details Pane

The Details pane provides additional information for a selected item in the Results pane. The links on each of the detail pages launch the property pages for the selected item.

## Process Viewer

The Process Viewer displays a graphical view of the process workflow after a process has been launched. The information displayed on this viewer is read-only.

The Process Viewer contains this information:

Pane	Description
Status Pane	Displays a flat list of all activity instances that were executed by the process instance.
Workflow Pane	Displays the graphical workflow of the selected process and its activities.
Properties Pane	<p>Displays the properties for the process and activity instances.</p> <p>To view the activity instance properties, select the activity instance in the Workflow pane. To return to viewing the process instance properties, click in the white space or use the menu.</p>

## Process Editor Menus

### Process Editor File Menu

The File menu contains the following items:

Menu Option	Description
Save	Saves the process workflow
Save Copy As	Saves a copy of the process workflow under a different name
	Verifies that the process follows the best practices

Menu Option	Description
Revert	Returns the workflow to the previous saved version
Print	Prints the contents of the workflow pane
Process Properties	If an activity properties pane is displayed, the option toggles to the process properties pane
Exit	Closes the editor

## Process Editor Edit Menu

The Edit menu contains items to be used for modifying the process in the workflow pane. For information about using this menu, refer to [Using the Edit Menu](#).

## Process Editor View Menu

The View menu contains the following items:

Menu Option	Description
Collapse All	Collapses all the activities in the workflow pane
Expand All	Expands all the activities in the workflow pane
Zoom In	Increases the size of the contents of the workflow pane
Zoom Out	Decreases the size of the contents of the workflow pane
Zoom Default	Resizes the contents of the workflow pane according to the default zoom value
Zoom Fit	Resizes the workflow to fit the size of the pane
Zoom Fit Selection	Resizes the selected item in the workflow pane to the size of the pane
Toolbar	Displays the Editor toolbar
Status Bar	Displays the status bar at the bottom of the Editor
Toolbox	Displays the toolbox pane
Properties	Displays the process properties pane

## Process Editor Tools Menu

The Tools menu contains the following items that allow you to configure the appearance and behavior of the editor.

Menu Option	Description
Customize	<p>Launches the Customize dialog box where users can change the fonts and colors that display in the editor.</p> <p>For information about using this dialog box, refer to <a href="#">Customizing the Fonts and Colors</a>.</p>

Menu Option	Description
Options	Launches the Options dialog box which is used to configure basic Process Orchestrator console behavior.
Regex Matcher	Launches the Match dialog box where users can match the specified source text against a specified regular expression.

## Process Editor Actions Menu

The Actions menu contains the following items that apply to a selected item in the workflow pane:








Menu Option	Description
Move Back	Moves the position of an activity in the workflow back one position at a time.
Move Forward	Moves the position of an activity in the workflow forward one position at a time.
Add Result Handler	Inserts a Condition Branch into the workflow. A Condition Branch is executed only if the specified condition is met.
Expand	Expands the selected activity
Collapse	Collapses the selected activity








## Process Editor Help Menu

The Help menu contains information that provides documentation assistance to work in Process Orchestrator. For information about using this menu, refer to [Understanding the Help Menu](#).



## Process Editor Toolbar

The toolbar displays icons to be used as shortcuts for performing actions in the workflow pane. To display the toolbar, choose **Toolbar** from the View menu.

Icon	Description
	Saves the process
	Starts the process
	Prints the contents of the Workflow pane
	Copies the selected information to the clipboard
	Pastes the selected information to the location identified by the cursor
	Deletes the selected item
	Collapses the contents of the workflow pane

Icon	Description
	Expands the contents of the workflow pane
	Resizes the contents of the workflow pane according to the default zoom value
	Increases the size of the contents of the workflow pane
	Decreases the size of the contents of the workflow pane
	Resizes the workflow to fit the size of the pane
	Resizes the selected item in the workflow pane to the size of the pane
	Displays or hides the Help pane

## Field Reference Icons

Icon	Description
	The Reference icon displayed next to a text field indicates that you can select a defined variable or reference an object within the process from the Insert Variable Reference dialog box.
	The Required Value icon displayed on a tab or page indicates that the field is required and is either missing a value or contains an invalid value.

## Defining a Target

Targets specify where certain processes, activities, or triggers will run. You can define a target once and then reuse it in multiple processes.



### Note

Not all targets can be created manually. Some targets are discovered automatically based on the information specified by other targets.

The Definitions > Targets view displays all the existing defined targets. You can also use this view to create new targets, modify the properties of a target, and delete targets.

- 
- Step 1** Choose **Definitions**, right-click **Targets**, choose **New > [Target]**, and select a target type from the drop-down list.
- Step 2** Run through the wizard, then click **Finish**.
-

## Defining Runtime Users

Runtime users hold the security credentials that are assigned to processes and activities. For more information about runtime users.

Use the Definitions > Runtime Users view to display the configured runtime users, add new runtime users to define new connection credentials, update runtime users such as to update a password, or delete runtime users.

- 
- Step 1** Choose **Definitions > Runtime Users**, right-click and choose **New > [Runtime User]** for the appropriate runtime user account.
- Step 2** Click the **General** tab and enter the appropriate runtime user-specific information. The property pages displayed depend on the type of runtime user selected.
- In the Owner field, you can click the browse button to display the Select Identity dialog box.
- From the **User Identity** tab, click **Add** to display the Select Identity dialog box.
- **Type**—From this list, select either User or Group to define the user assignments.
  - **Location**—Specify the user or group location. Click the browse button to display the Select Location dialog box.
  - **Filter**—Filter on the search results
  - **Search**—Click to search for the identity
  - **Results**—Displays search results
- Step 3** Search for the identity, select it, then click **OK**.
- The **Used By** tab displays objects that reference the runtime user. This tab will remain blank until the runtime user is used by an object.
- The **History** tab displays the history of actions taken against the runtime user. This tab remains blank until after the initial creation.
- Step 4** To view information about an object, highlight the object, right-click and choose **Properties**.
- Step 5** Click **OK** to close the property sheet.
- 

## Defining a Repository User

Use the following instructions define the user credentials required to access a repository. Use the Repository User dialog box to specify the credentials for a runtime user record to be used for configuring the repository.

Use the Definitions > Runtime Users view to display the configured runtime users, add new runtime users to define new connection credentials, update runtime users such as to update a password, or delete runtime users.

- 
- Step 1** Choose **Definitions > Runtime Users**, right-click and choose **New > [Repository User]** for the appropriate runtime user account.
- Step 2** Click the **General** tab and enter the appropriate runtime user-specific information, includes:
- **Display Name**—Enter the display name for the repository user.



- Owner—The owner of the object. This is typically the creator of the object.
- User name—The user name assigned to the user account.
- Password—Check the check box and then enter the password to be assigned to the user account.
- Email—Enter the valid email Id for the repository user.

In the Owner field, you can click the browse button to display the Select Identity dialog box.

- Type—From this list, select either User or Group or All to define the user assignments.
- Location—Specify the user or group location. Click the browse button to display the Select Location dialog box.
- Filter—Filter on the search results
- Search—Click to search for the identity
- Results—Displays search results

**Step 3** Search for the identity, select it, then click **OK**.

The **Used By** tab displays objects that reference the runtime user. This tab will remain blank until the runtime user is used by an object.

The **History** tab displays the history of actions taken against the runtime user. This tab remains blank until after the initial creation.

**Step 4** To view information about an object, highlight the object, right-click and choose **Properties**.

**Step 5** Click **OK** to close the property sheet.

---

## Selecting a Client Certificate

Use the Select Client Certificate dialog box to select certificate you want to assign to a runtime user.

To select a certificate:

---

**Step 1** On the Certificate property page, click **Browse**.

The Select Client Certificate dialog box displays.

**Step 2** Click the Certificate tab and specify the following properties about the selected Certificate.

- Issued to—User name or the owner of the certificate
- Issued by—User name of the certificate issuer
- Start date—The date and time the certificate became valid.
- Expiration date—The date and time the certificate will expire.
- Thumbprint—Specified parameters containing the client certificate thumbprint
- Has private key—Select to indicate the certificate is assigned a private key.

**Step 3** Browse to the appropriate certificate.

**Step 4** Enter the password for the certificate.

**Step 5** Click **OK** to close the dialog box.

---

# Configuring Security

## Creating a New Security Role

A security role is a list of permissions that enhances product use through logical groupings of powers and objects for reuse in multiple places. A security permission is a pairing of a scope that defines the objects and powers over those objects.

After a security role has been defined, it is available in a list of available security roles on the Administration > Security view.

- 
- Step 1** Choose **Administration > Security**, right-click and choose **New > Role**.
- Step 2** On the **New Role** property pages, define the properties.
- Step 3** Click the **Permissions** tab and add permissions as necessary.
- Step 4** On the Permissions tab, click **Add** to display the Permission "All" Over "All" Properties dialog box.
- Operations—Select the appropriate operations
  - Objects—Give permissions to act upon a specific object
- The property pages included in the Power are determined by the specific permission to be created.
- Step 5** Click the **User Assignments** tab and add user assignments as necessary.
- Step 6** Click **OK**. The new security role is displayed on the Administration > Security view.
- 

## Assigning Users Or Groups to Security Roles

- 
- Step 1** Choose **Administration > Security**, highlight the appropriate security role (see [Predefined Security Roles](#)), right-click and choose **Assign**.
- Step 2** On the Select User or Group dialog box, in the Enter the object name to select text field, enter the user name (domain\user name) or group, then click **Check Names**.



**Note** If there is a matching user name or group, it is displayed in the field. If there is not a match, an error message displays.

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- Step 3** On the Search Results pane, choose the appropriate user or group, then click **OK**.
-



## Managing Automation Packs

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Automation packs are collections of configuration definitions of process definitions, target types, variables, categories, target groups, and other system elements needed to define a set of automated IT processes. The out-of-the-box automation definitions in automation packs allow customers to get productive quickly.

Automation packs allow users with the appropriate rights to export their own processes and share them with other customers in the community. Users can customize third-party automation packs and move them from one environment to another. Automation pack authors have control over how end users can override their automation definitions. The purpose of this control is to improve the ease of:

- Consuming future upgrades. Customers naturally expect that some amount of work is involved in upgrades. During an upgrade, all properties customized by users will be preserved. If a workflow is customized, it will be preserved. Process Orchestrator does not merge workflows. If any part of the workflow has been customized, all of the workflow will be left intact (no updates will be made to a customized workflow).
- Consuming patches and hotfixes for content. Customers do not expect these to be difficult or dangerous to consume.

An automation pack is a single file (package) that contains:

- Configuration (processes, categories, knowledge base articles, and so on)
- An optional custom configuration user interface that presents a wizard used to configure essential elements of the automation pack. For example, a configuration UI for SAP performance management might ask the user importing the automation pack to define the SAP systems that Process Orchestrator will manage and provide credentials to reach those systems.
- Report Definition files. These files are extracted into a directory during automation pack import, and can then be imported by the customer into their chosen reporting system
- External management system configuration files such as those to define alerts in a health monitoring application such as Microsoft System Center Operations Manager or HP OpenView SPI Modules.
- Binaries that the customer installs in an external system that the automation pack might require. For example, in Cisco Intelligent Automation for Cloud, Process Orchestrator provides the elements that can be imported into Cloud Portal to order cloud services.

The Administration workspace includes an Automation Pack view that displays the list of automation packs that have been imported. From this view, automation pack authors can create and export their own automation packs and share them with others in the community. Users can also export the customizations that they have made to third-party automation packs.

This is the typical process you will want to follow when you create an automation pack:

1. Create the basic automation pack—See [Creating an Automation Pack](#)

- [Adding Automation Pack Objects](#)
  - [Creating an Automation Pack Patch](#)
  - [Applying an Automation Pack Patch](#)
  - [Removing Automation Pack Objects](#)
  - [Refreshing References in an Automation Pack](#)
  - [Viewing Automation Pack Properties](#)
  - [Archiving Process Instances in an Automation Pack](#)
2. Verify it—See [Validating Automation Packs](#)
  3. Modify its settings as necessary—See [Controlling the Customization of Automation Pack Elements](#)
  4. Review its dependencies—See:
    - [Executing a Circular Dependency Check](#)
    - [Reviewing Automation Pack Validation Rules](#)
    - [Selecting Automation Pack Dependencies](#)
  5. Export it—See [Exporting an Automation Pack](#)
  6. Customize it— See:
    - [Exporting Customization Packs](#)
    - [Importing Customization Packs](#)

## Creating an Automation Pack

Process Orchestrator Automation Package files include processes and other objects for Process Orchestrator. The defined automation packs included with the product are located in the install directory on the machine where the product was installed. Individual-created automation packs and customizations made to the third-party automation packs can be exported and reimported from one environment to another on an as-needed basis.

Each exportable object in Process Orchestrator supports at least two customization settings; you can tune these settings to control what customers can edit (see [Controlling the Customization of Automation Pack Elements](#)).

- No—The object is not customizable.
- Limited—Some object properties can be customized. The extent to which properties are customizable varies by object type; the controls for any non-customizable (immutable) property will be read-only. Most objects default to Limited.

Processes have three customization settings:

- No—Users have no process editing capabilities.
- Limited—This is the default setting, under which users can make the following changes:
  - Change the execution and archival option.
  - Change the default target and default runtime user.
  - Change the process input variable value. Users cannot add or create process variables (input or output), only the value of the input variables.
  - Add new triggers to the process.

- Enable/disable existing triggers. Users can remove only those triggers that they created from the process.
- Add category (assuming the category customization setting is set to limited).
- Remove category that is added by users (assuming the category customization setting is set to limited).
- Workflow—Users have near full control to edit processes with this setting. Under the Workflow setting, in addition to the above, users can make the following changes:
  - Edit the process workflow. If the process is shipped with some workflow, defined users can delete the existing workflow (activities).
  - Create process local or definition variables.
  - Delete process variables they have created.

Users cannot:

- Delete the process
- Change the input or output variables. Input and output variables are the API or the contract between parent and child process.
- Change the name, description, target type, or runtime user that the process can run against.

The best practice for authors, then, is to plan extension points. Most processes that an author ships in an automation pack would be locked down. Authors design specific points of extension, and embed calls to processes with workflow customization enabled for these extension points. The workflow for these extension point processes would be empty.



#### Note

You cannot export a process from an automation pack you do not own. Therefore, instead of creating your extension in the extension point itself, call a child process where you code the logic. In other words, the contents of an extension point should simply be an invocation of child processes, not activities within the extension point workflow. In this way, you can ship an automation pack with your extension. However, the call to this process must be coded into the extension point in each development, test, and production system.

#### Recommendations

- The functionality authored to extend the solution should be defined in terms of child processes, not activities within the workflow of the extension point.
- It should be exported separately from solution-packaged automation packs
- The functionality authored to extend the solution should be imported separately from solution-packaged content and stitched into the solution extension points.
- By passing target objects rather than specific parameters in to extension points, your automation becomes more extensible from a data perspective as well. For example, someone can come along and add more properties to some target type, and if the target is passed through to the extension point, this data is available.
- If XML is passed into a process request, it is a good idea to make this XML available to extension points as well, so that they are open to extension. Moreover, the child processes in the extension point can modify the target properties.

#### Before You Begin

You must have Process Orchestrator Administrator privileges to create an automation pack.

To create an automation pack:

**Step 1** Choose **Administration > Automation Pack**, right-click and choose **New > Automation Pack**.

**Step 2** If the automation pack file is a community automation pack, click the **About** tab, then check **Community Automation Pack**. This lets anyone modify and export this automation pack.



**Note** The Community Automation Pack check box is available only during automation pack creation, and cannot be turned on or off later. Use this feature with caution; it is mostly suitable if the author has no plans for maintaining and releasing new versions, and wants to post this automation pack as an “open source”.

**Step 3** On the **General** tab, enter the required information.

**Step 4** Click the **Objects** tab to add objects to the automation pack.

**Step 5** Click the **Dependencies** tab to review the list of automation packs and adapter information referenced and required by the objects in the automation pack.

The Referenced Objects dialog box displays the list of objects in an automation pack that depends on an object in different automation pack. This dialog box is launched when an entry on the Dependencies tab is right-clicked and the **View Referenced Objects** option is chosen.



**Note** The dependent automation pack and required adapter lists will be updated when the automation pack properties is first opened or when there is a change to the **Objects** page, such as adding or removing an object.

**Step 6** Click the **Import Custom Tasks** tab to view the list of custom tasks for the current automation pack. You can also add, edit, and remove the custom tasks from the property page.



**Note** The custom tasks is executed while importing an automation pack (.TAP).

Perform the following steps to add a custom task:

- a. Click **Add**, the **Import Custom Task** dialog box is displayed.
- b. Select task from the **Custom Task** drop-down list.
- c. Enter **Parameters**.



**Note** This is applicable only for custom tasks for which configurable parameters are available.

For example:

```
Execute PowerShell Script
```

You can enter the PowerShell Script in the parameters to configure this custom task.

- d. Click **OK** to save your changes.

Select the imported custom task and click **Edit**, the import custom task dialog box is displayed. Where you can edit the task.

Select the imported custom task and click **Remove** to remove the task from the list.

For certain custom tasks you need to enable the configuration settings. For more information, *see* [Setting Process Orchestrator Console Environment Properties](#).

- Step 7** Click the **Style Checker Selection** tab to select the rules you want to validate against an automation pack.
  - Step 8** Click the **Patches** tab to view the list of patches that are applied to the automation pack.
  - Step 9** Click **OK** to save your changes.
- 

## Viewing Automation Pack Properties

Use the Automation Packs Properties property sheet to view or modify the processes and objects in an automation pack.

To view automation pack properties:

- Step 1** Choose **Administration > Automation Pack**, highlight the appropriate automation pack, right-click and choose **Properties**.
  - Step 2** On the Automation Pack Properties property sheet, click the appropriate tab to review the properties.
- 

## Importing Automation Packs

Use the Automation Pack Import Wizard to import product objects that are required to create and manage processes. The wizard automatically launches after the installation is complete and the automation pack initialization is completed. The wizard does not fully launch until after the automation server has started.



### Note

Using the Automation Pack Import Wizard, you can only import an automation pack (.TAP). You cannot import a customization pack (.apc).

After the automation pack initialization is complete, the Select Automation Packs dialog box displays.

- Step 1** Check the check box to the left of each appropriate automation pack to be imported and click **OK**.  
The available automation packs for import are dependent upon the product license. The Core automation pack will be imported first.  
The Welcome to the Automation Pack Import Wizard panel displays.



### Note

If you do not want to display the Welcome panel the next time the wizard is launched, check the Do not show this page next time check box.

- Step 2** Click **Next** to continue to the General Information Panel.
- Step 3** Check the **Disable all imported processes** check box if you want all processes to be disabled after being imported.

- Step 4** On the Email Keystore Password panel, specify password for Keystore file containing email digital signatures.
- Step 5** On the Email Configuration panel, specify the default SMTP server and sender's email address to be used for email activities, then click **Next**.
- Default SMTP server—The name of the SMTP server that is used as the default server for sending emails. This server name can be changed when configuring email activities that require a different server.
  - Default SMTP port—The port number for the SMTP server. This field is automatically populated with port number 25 but can be changed if necessary.
  - Default sender—The email address of the sender that is designated as the default sender for email activities.

**Note**

The settings in this panel can be manually changed when configuring a specific email activity that requires a different SMTP server or sender email address.

- Step 6** On the Automation Summary Configuration panel, specify where the automation summary reports that are generated by activities are to be saved and how long the reports are to be retained, and click Next.
- Automation summary file share—Verify the default file path that the Cisco Process Orchestrator server will use when creating automation summary reports.

Click **Browse** to determine the file share location on the network where all the automation summary reports are stored or click the **Create a share on the current Orchestrator Server** link.

**Note**

Verify that the UNC share file path is on a network where the Cisco Process Orchestrator service account has write permissions.

- Credentials—Enter the credentials for Cisco Process Orchestrator Server to access the file share.
- Virtual directory mapping—Select the Enable Virtual Directory mapping check box if you want to map the automation summary to an IIS Virtual Directory. This allows end-users easier access to automation summaries using email or the Cisco Process Orchestrator Web Console.

In the Virtual directory path box, enter the name of the virtual directory or click the **Create a virtual directory on the current Orchestrator Server** link to manually create a virtual directory on the local machine.

**Note**

The file paths specified indicate the path that will be used when viewing the automation summary reports.

- Archiving Automation Summary Reports—Delete automation summary reports older than—Check this check box to limit the number of automation summary reports that are retained.
  - Enter the number of days that the reports should be retained in the text field.
  - Reports that have been retained for a period past the specified number of days will be deleted.

- Step 7** On the Data Extraction panel, under Specify the destination for the extracted data, verify the default location for where the Cisco Process Orchestrator-provided data files should be copied.

- Step 8** Under Select data to extract, check the appropriate check boxes to indicate which data files should be extracted.



**Note**

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Reports should be imported after the Automation Pack Import Wizard is completed.

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The Review Prerequisites panel displays.

- Name—Name of the prerequisite
- Status—Status shows whether the prerequisite was located on the computer
  - Passed—Correct item or version of item was on the computer
  - Failed—Correct item or version of item was not on the computer
- Complete—Percentage of computer checked when verifying prerequisite
- Description—Displays description of the prerequisite information or instructions to further requirements for the prerequisites to be installed.

The green check mark verifies that the prerequisite was located on the computer.

The red X determines that the prerequisite is not available on the computer. When this occurs, the import progress is stopped and cannot continue until all prerequisites have been met.

If you click **Cancel** during the import, the wizard will close and the automation pack will not be imported.

**Note**

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If all prerequisites are passed, the wizard automatically continues to the next panel which displays the status of the automation pack objects being imported.

---

After the objects have been imported, the importing of the Core automation pack is complete.

**Step 9**

If other automation packs were selected to be imported, the wizard will relaunch for the next automation pack, otherwise click **Close**.

**Note**

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If there is an existing object on the Cisco Process Orchestrator server, the Overwrite Objects dialog box displays. Click **Yes** or **Yes to All** to continue.

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**Related Topics**

[Importing from the Console](#)

## Importing from the Console

To use the Automation Pack Import Wizard from the Process Orchestrator console to import automation packs:

**Step 1**

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Choose **Administration > Automation Packs**, right-click and choose **Import**.

**Step 2**

Click **Add**, to select the automation packs to be imported and click **OK**.

- You can import multiple Cisco automation packs from the following directories:
  - From File Systems—Select the automation packs from your system to be imported to the console.

- From Repository—Select the repository name from the drop-down or click **New > Git Repository** to create a new repository or select the repository name and click **Properties** to modify the repository information. For more information to create a new repository, see [Creating a New Git Repository](#).
- Click **View Dependents TAPs**, to see the automation pack dependencies that has to be imported along with the selected TAPs.

The Automation Pack Import Wizard will verify that all of the dependent automation packs already exist in the database, or in the list of automation packs to import, before allowing the import to continue.

The automation packs that are available for import depend on the product license.

- Step 3** When the Welcome to the Automation Pack Import Wizard panel displays, click **Next**.
- Step 4** On the General Information Panel, you can optionally check **Disable all imported processes** to indicate that all processes from this tab should be disabled by default after being imported.
- Step 5** Review the information about the automation pack, then click **Next**.
- Step 6** Some automation packs might include additional steps in the wizard to configure elements of that automation pack. Follow the instructions to perform each configuration.
- A Warning dialog box indicates that the listed objects within the automation pack may be incompatible with the current release of the product.
- Step 7** Some automation packs might include supplemental files that ship in the automation pack. These files are typically used to configure external systems, such as report definitions, that can be imported into your chosen reporting technology. If the automation pack includes these elements, you will see a Data Extraction panel. On this panel:
- a. Verify the default location for where the Process Orchestrator-provided data files should be copied.
  - b. Under **Select data to extract**, check the appropriate check boxes to indicate which data files should be copied, then click **Next**.
- Step 8** The Review Prerequisites panel displays the status of each prerequisite:
- The green check mark verifies that the prerequisite was met on the computer.
  - The red X determines that the prerequisite is not met on the computer. When this occurs, the import progress is stopped and cannot continue until all prerequisites have been met.




---

**Note** If all prerequisites are passed, the wizard automatically continues to the next panel which displays the status of the automation pack objects being imported. After the objects have been imported, the importing of the automation pack is complete.

---

- Step 9** If other automation packs were selected to be imported, the wizard will relaunch for the next automation pack. Otherwise, a Finish page will display the information about the automation packs that were imported. Click **Close**.

#### Related Topics

- [Creating an Automation Pack](#)
- [Exporting an Automation Pack](#)
- *Cisco Process Orchestrator Installation Guide*

## Extracting Data Files

Data files are embedded in some Process Orchestrator-provided automation packs. By default, you can extract these data files during the automation pack import process. However, if you decide not to extract the files at that time, use the following steps to extract the files in the automation pack to a location on the computer.

- 
- Step 1** Choose **Administration > Automation Packs**, right-click and choose **Extract**.
  - Step 2** Highlight the appropriate automation pack, then click **Open**.
  - Step 3** In the Data Extraction dialog box, verify the default location for where the selected files are to be copied.
  - Step 4** Check the check box to the left of the appropriate data file to indicate that the data file should be extracted, then click **OK**.
- 

## Overwriting Existing Objects

Use the Overwrite Objects dialog box to confirm whether to overwrite existing objects that currently reside in Process Orchestrator. The Overwrite Objects dialog box displays only if both the following are true:

- The Cisco Process Orchestrator server contains existing objects with the same unique ID.
- The current user is the author of the object.

To overwrite the existing version of the object, check the check box to the left of the object, then click **OK**.

If the object belongs to a third-party automation pack, the object will be updated automatically. Any changed value of the object will be preserved.

## Deleting Automation Packs

If you import the wrong automation pack, use the following steps to delete it from Process Orchestrator.

**Note**

Automation packs that have objects with dependencies cannot be deleted. First delete the dependent objects, then return to try deleting the automation pack again.

---

- Step 1** Choose **Administration > Automation Pack**, highlight the appropriate automation pack, right-click and choose **Delete**.
- Step 2** On the Delete Confirmation dialog box, uncheck the **Select the checkbox to delete all member objects** check box to keep all member objects in the product.

**Note**

This check box is available *only* to the automation pack's authors. If this check box remains checked, all objects in the automation pack will also be deleted.

---

- Step 3** Click **OK** to delete the automation pack.
- 

## Working with Automation Pack Objects

### Adding Automation Pack Objects

Use this option to add more objects to an automation pack.

- Step 1** Choose **Administration > Automation Pack**, highlight the appropriate automation pack, right-click and choose **Properties**.
- Step 2** Click the **Objects** tab, then click **Add** to add objects to the automation pack.
- Step 3** In the Select Object dialog box, click the **Filter by Object Type** drop-down list and choose the appropriate object type to filter the list of objects.



**Note** Objects that already belong to an automation pack will be filtered from this dialog box.

---

- Step 4** Under Select Object, highlight the appropriate objects and click **OK**. Or click **New** to create an object to add to the automation pack.
- Step 5** Click **OK**.
- 

### Creating an Automation Pack Patch

After shipping the automation pack to the customers, you might sometimes want to add or modify an object in the automation pack and then ship the modified object to another environment.

Using the Create Automation Pack Patch Wizard, you can easily create a patch by adding the objects that exists in the current automation pack to a .pat file and then export this patch file to another environment.

You can create and manage multiple patches for a single automation pack.

The Create Patch option displays only if the current user is the author of the automation pack. The user must also have Process Orchestrator Administration Privileges.

- Step 1** Choose **Administration > Automation Pack**, highlight the appropriate automation pack, right-click and choose **Create a Patch**.



**Note** You need to be the author of the automation pack, otherwise the command will be grayed out (disabled).

---

- Step 2** On the Create Automation Pack Patch Wizard panel, click **Next**.
- Step 3** On the Add Objects to the Patch panel, click **Add**.
- Step 4** Under Select Object, highlight the appropriate objects and click **OK**.
- Step 5** On the Select a Location panel, verify the default location for where the patch file is to be saved or click Browse...to select the location.



---

**Note** The patch file is saved as a .pat file.

---

- Step 6** Verify the default version or specify the new version of the patch that is being created for the automation pack and then click **Next**.
- Step 7** Click **Close** to complete the create automation pack patch process.
- 

## Applying an Automation Pack Patch

Patches can sometimes have a dependency on another automation pack or objects. They might also have dependency on another patch created for the same automation pack. Before applying the patch, verify that all the dependent automation packs, objects, and patches exists in the environment.



---

**Note** You can apply a patch on the same version of the automation pack on another environment.

---

- Step 1** Choose **Administration > Automation Pack**.
- Step 2** Highlight the appropriate automation pack, right-click and choose **Apply a Patch**.



---

**Note** You need to be an administrator in order to apply a patch, otherwise the command will be grayed out (disabled).

---

- Step 3** Select the patch file that you want to apply and click **Open**.
- Step 4** On the Apply Automation Patch Wizard, click **Close** to apply the automation pack patch.
- 

## Viewing Patch Details

Using the View Patch Details wizard, you can view the version of the patch, the time when it was created, and the objects included in the patch.

- Step 1** Choose **Administration > Automation Pack**, highlight the appropriate automation pack, right-click and choose **Properties**.
- Step 2** Click the **Patches** tab, highlight the appropriate automation pack, and then click **View**.
-

## Removing Automation Pack Objects

Use this option to remove objects from an automation pack. Removing objects from the list of objects in the automation pack does not delete the object from the system.

- 
- Step 1** Choose **Administration > Automation Pack**, highlight the appropriate automation pack, right-click and choose **Properties**.
  - Step 2** Click the **Objects** tab, highlight the appropriate object and click **Remove**.
  - Step 3** Click **OK**.
- 

## Refreshing References in an Automation Pack

Use the following instructions to update list of objects in the Objects tab.

- 
- Step 1** Choose **Administration > Automation Pack**, highlight the appropriate automation pack, right-click and choose **Properties**.
  - Step 2** Click the **Objects** tab, then click **Refresh References** to update the list of references associated with the object, then click **OK**.
- 

## Archiving Process Instances in an Automation Pack

Use the Automation Packs Properties property sheet to archive instances of all processes in an automation pack. When this option is checked, it will override and *force* an archive, regardless of the individual process archival setting.

- 
- Step 1** Choose **Administration > Automation Pack**, highlight the appropriate automation pack, right-click and choose **Properties**.
  - Step 2** In the **General** tab, click **Always archive all process instances in this automation pack**, then click **OK**.
- 

## Validating Automation Packs

Automation pack authors are not always aware of best practices for creating content. In fact, the challenge is that the further removed one is from the product team, the less awareness there is of best practices.

Style checkers are sets of validation rules that run against an automation pack and its member objects to ensure that the automaton pack follows best practices. Some of the style checkers can be run against a process under development in the Process Editor. Some of the benefits that style checkers provide include:

- Automating best practice checks that QA performs on packaged content, including:
  - Ensuring that the content follows best practice guidelines.
  - Identifying issues with automation pack objects (broken references, missing required values).
- Raising the quality of packaged automation and automation created by Cisco Services, delivery partners, or customers.
- Tuning preferred checks per automation pack. Style checkers can be turned on or off based on need. For example, automation packs developed for in-house use might want to turn off some style checkers (such as target, or users included in automation pack).
- Embedded help for identified issues. Help topics notify users why a style check is added, and what the consequences might be if the warning is not resolved.

To run a style checker against an automation pack:

- 
- Step 1** Choose **Administration > Automation Pack**, highlight the appropriate automation pack, right-click and choose **Properties**.
- Step 2** Click the **Style Checker Selection** tab to select the rules you want to validate against an automation pack (see [Controlling the Customization of Automation Pack Elements](#)), then click **OK**.
- Step 3** To start the validation process, you can either:
- Right-click on the automation pack and choose **Validate** from the context menu.
  - On the Process Editor, choose **File > Validate** to display the Style Checkers Selection dialog box.
- Note that:
- The automation pack validation action can be run on-demand or at export.
  - This menu item is disabled if you click an automation pack that you did not create.
  - Validation of an automation pack could take several minutes.
- Step 4** Click **OK**. The process validator will start processing the selected validation rules against the current process.
- 

## Controlling the Customization of Automation Pack Elements

Use the Settings dialog box to define the customization settings for the objects included in an automation pack. These settings can only be modified by the automation pack author.



### Note

This functionality (the Settings dialog box and Customization settings) is not available on “Community” automation packs; anyone can modify objects in those types of automation packs. For more information, see [Creating an Automation Pack](#).

When the automation pack author imports a newer version of the automation pack, the objects in the automation pack will replace the objects in the database.

When a third-party user imports a newer version of the automation pack, the customization setting of an object will determine whether user-customized values will be preserved.

The following are instances where an object customization will be lost:

- The author of the object no longer allows users to customize the object. Any customization of the object will be lost on upgrade.

For example, the global variable customization level is set to *Limited*. Users change the variable value. However, in the updated automation pack, the author no longer allows users to change the variable value, because the automation pack must have a particular value. Therefore, the customization level is now set to *No*.

- The object customization level is unchanged, but the schema of the object is changed. The old object is now obsolete and needs to be replaced.

To change the customization of an object:

- 
- Step 1** Choose **Administration > Automation Pack**, highlight the appropriate automation pack, right-click and choose **Properties**.
- Step 2** Click the **Objects** tab, highlight the appropriate object, then click **Settings**.
- Step 3** In the **Settings** dialog box, click the **Customizable** drop-down list and choose the appropriate option, then click **OK**.
- 

## Executing a Circular Dependency Check

Use the Circular Dependency Check command to perform an automation pack circular dependency check on the selected automation pack.

### Before You Begin

- You can only run this test if you are the “author”.
- This command relies on the automation pack dependencies and their dependent automation packs dependencies (recursively) to be accurate. The command will not continue if it detects the automation pack or its dependent automation pack is not up to date.

To run this check, choose **Administration > Automation Packs**, highlight the appropriate automation pack (you must be the author), and choose **Circular Dependency Check**.

## Reviewing Automation Pack Validation Rules

Before you export an automation (see [Controlling the Customization of Automation Pack Elements](#)), you should review the adapter and automation pack dependencies.

To review automation pack dependencies:

- 
- Step 1** Choose **Administration > Automation Pack**, highlight the appropriate automation pack, right-click and choose **Properties**.
- Step 2** Click the **Dependencies** tab to view the dependent automation pack and required adapter lists for the automation pack.

The dependencies will be updated when the automation pack properties is first opened or when there is a change to the Objects tab, such as adding or removing an object.



- Step 3** Review the list of automation packs and adapter information referenced and required by the objects in the automation pack (see the Automation Pack Details and Required Adapters tables in [Controlling the Customization of Automation Pack Elements](#)), then click **OK**.
- 

## Selecting Automation Pack Dependencies

---

- Step 1** Choose **Administration > Automation Pack**, highlight the appropriate automation pack, right-click and choose **Properties**.
- Step 2** Click the **Style Checker Selection** tab to select the rules you want to validate against an automation pack (see [Controlling the Customization of Automation Pack Elements](#)).
- Step 3** Click **OK** to save your changes.
- 

## Exporting an Automation Pack

The automation definitions included in Process Orchestrator Automation Packs can be exported. Exporting automation definitions allows them to be moved from one environment to another, creates a backup of the automation definition, and allows automation to be shared with another organization.

Use the Automation Pack Export Wizard to export an automation pack file to a designated file path on your computer.

- 
- Step 1** Choose **Administration > Automation Packs**, highlight the appropriate automation pack, right-click and choose **Export**.
- Step 2** On the Welcome to the Automation Pack Export Wizard panel, click **Next**.
- Step 3** On the Objects to Export panel, review the list of objects associated with the process being exported, then click **Next**.
- Step 4** On the Dependencies panel, review the list of automation packs and adapter information referenced and required by the objects in the automation pack, then click **Next**.
- Step 5** On the Prerequisite Selection panel, review the additional prerequisite information used to export the automation pack. Click **Select All** to select all the objects to be included when this automation pack is imported. Click **Unselect All** to clear the objects from selection.
- Step 6** On the General Information panel, modify the version number for the automation pack, as necessary, and click **Next**.
- Step 7** On the Export Location panel, select the appropriate radio button for export location, then click **Next**.
- Remote repository—Select the repository from the drop-down or click **New > Repository** to create a new repository or select the repository name and click **Properties** to modify the repository information.
  - Local file name—Specify the name of the file and where the automation pack will be exported onto the computer.
- Step 8** On the Validate Objects panel, review the following information about the objects being validated, then click **Next**.

The Validate Objects panel displays progress of the object validation.

- Step 9** Click **Close** to complete the automation pack export process.
- 

## Automating Automation Pack Exports and Imports

You can use the automation pack export and import CLI to automate moving the self-authored or customization packs from development to test to production.

Use the PowerShell interface on the Process Orchestrator server (see [Using the PowerShell Snap-in CLI](#)) to get the syntax help for a command.

---

- Step 1** Enter the following command to list all of the available commands:

**Get-Command \*-Orchestrator\***

- Step 2** Enter the Get-Help command to view the syntax help for the automation pack export and import commands.

- To view the syntax for exporting self-authored automation packs, enter:  
**Get-Help Export-OrchestratorAutomationPack -full**
  - To view the syntax for importing self-authored automation packs, enter:  
**Get-Help Import-OrchestratorAutomationPackFile -full**
  - To view the syntax for exporting customization packs, enter:  
**Get-Help Export-OrchestratorCustomizationPack -full**
  - To view the syntax for importing customization packs, enter:  
**Get-Help Import-OrchestratorCustomizationPackFile -full**
- 

## Exporting Customization Packs

Automation Packs allow users to customize third-party processes and share them with other customers in the community. When you export a customized automation pack, the customized objects are exported to a customization pack and are saved with the extension .apc.

Use the Automation Pack Customization Export wizard to export the customized objects to a customization pack.

---

- Step 1** Choose **Administration > Automation Packs**, highlight the appropriate automation pack that is customized, right-click and choose **Export Customized Objects**.
- Step 2** On the Welcome to the Automation Pack Customization Export Wizard panel, click **Next**.
- Step 3** On the Objects to Export panel, review the list of objects associated with the process being exported, then click **Next**.

**Note**

Not all customized values are exported to the customization pack. For example, if you customize the target value of a target that doesn't exist in the automation pack, such referenced target value is not exported to the customization pack.

- Step 4** On the Customization Export Location panel, specify the location of the file and the password to encrypt data in the data file, then click **Next**.
- File name—Specify the name of the file and where the automation pack will be exported onto the computer.
  - Password to encrypt data in data file—Password used for encrypting data such as the password of the runtime user, target properties with the type secure string, and so on.
  - Confirm the Password—Re-enter the password
- Step 5** Click **Close** to complete the customized automation pack export process.

## Importing Customization Packs

Before importing the customization pack, make sure that the same version of the automation pack that you used to customize already exists in the environment. Also, verify that all the dependent automation packs already exist in Process Orchestrator.

The customizations made to the automation pack can be imported on the same version of the automation pack that you customized.

Use the Automation Pack Customization Import wizard to import the customization pack.

- Step 1** Choose **Administration > Automation Packs**, highlight the appropriate customization pack, right-click and choose **Import Customized Objects**.
- Step 2** Select the customization pack that you want to import and click **Open**.
- Step 3** On the Welcome to the Automation Pack Customization Import Wizard panel, click **Next**.
- Step 4** On the Decryption Password panel, enter the decryption password to decrypt the encrypted data.  
The decryption password is the same as the encryption password entered while exporting the customization pack.
- Step 5** Click **Close** to complete the customized automation pack import process.

## Using the Wizard

### Launching the Import Wizard

Launch the Wizard and follow the steps as instructed.

## Launching the Export Wizard

Launch the Wizard and follow the steps as instructed.



## Advanced Process Orchestrator Actions

---

The topics in the following sections provide information about managing the server connections for Process Orchestrator. You can launch multiple consoles, change your server connections, and modify the behavior of the server connection upon startup.

- [Launching Multiple Consoles with the Same Server](#)
- [Launching Multiple Consoles with Different Servers](#)
- [Connecting to a Different Server from the Current Console](#)
- [Managing Cisco Process Orchestrator Server Connections](#)
- [Configuring the Console Global Settings](#)
- [Collecting Process Orchestrator Diagnostics](#)

### Related Tasks

- [Updating the Product License](#)

## Launching Multiple Consoles with the Same Server

To launch multiple Consoles using the same server:

---

**Step 1** Choose **Start > Programs > Cisco > Cisco Process Orchestrator > Cisco Process Orchestrator Console**.

**Step 2** In the Select Server dialog, enter the server and authentication credentials, then click **OK**.



---

**Note** For additional information about connecting to a server, see [Connecting to a Different Server from the Current Console](#).

---

**Step 3** Repeat as necessary to open additional consoles connected to the same server.

---

## Launching Multiple Consoles with Different Servers

To launch multiple Process Orchestrator Consoles with a different server:

- 
- Step 1** After the first console is launched, choose **Start > Programs > Cisco > Cisco Process Orchestrator > Cisco Process Orchestrator Console** to launch an additional Console.
  - Step 2** In the Select Server dialog, enter the server and authentication credentials, then click **OK**.
  - Step 3** Choose **File > Connect to Server**.
  - Step 4** In the Select Server dialog, enter the server and authentication credentials for the new server, then click **OK**.



---

**Note** If the Console was recently connected to the server, click the arrow to select the server from the drop-down list.

---

The Console display changes and retrieves the Console configuration for the selected server.

- Step 5** Repeat, as necessary, to open additional Consoles.
- 

## Connecting to a Different Server from the Current Console

Use this process when connecting to a different server while working in an open Console. This option may be useful when wanting to connect to a different server used for process monitoring.

To connect to a server:

- 
- Step 1** Choose **File > Connect to Server**.
  - Step 2** In the Select Server dialog, enter the server and authentication credentials for the new server, then click **OK**.



---

**Note** If the Console was recently connected to the server, click the arrow to choose the server from the drop-down list.

---

If the server is properly connected, the Cisco Process Orchestrator License Check dialog box displays. If the server does not properly connect, the Connect to Server error dialog box displays.

---

# Managing Cisco Process Orchestrator Server Connections

The following instructions provide information about managing the server connections for Process Orchestrator. You can launch multiple consoles, change your server connections, and modify the behavior of the server connection upon startup.

## Configuring Server Connection Behavior

When you connect to a server and open the Process Orchestrator Console, you can choose to open the last group and item you were using before you closed the Console, or you can open a specific group and item every time you start the Process Orchestrator Console.

To determine the behavior of the server connection:

- 
- Step 1** Choose **Tools > Options**, then click the **General** tab.
- Step 2** Under Startup behavior, choose *one* of the following functions to occur when connecting to a server, then click **OK**:
- **Automatically select the group and item most recently selected** to open the last group and item selected before the Console was closed.
  - **Always select the following group and item** from the dropdown list to specify the group and item to open upon startup.
- 

## Modifying the List of Recent Servers

To adjust the number of recent servers displayed:

- 
- Step 1** Choose **Tools > Options**, then click the **General** tab.
- Step 2** Under **Most recently used servers**, enter the number of servers to display on the Recent Servers list on the File menu, then click **OK**.
- 

## Configuring the Console Global Settings

Use the following sections to configure the global display settings for the Console.

## Configuring Process Orchestrator Objects Default Owner

By default, the objects that are created in Process Orchestrator use the currently logged in Windows user as the default owner. Use Security tab to specify the currently logged in Windows user as the default user or to specify a different default owner.

- 
- Step 1** Choose **Tools > Options**, then click the **Security** tab.

- Step 2** Under Default Owner, select the appropriate option to indicate the default ownership setting for objects, then click **OK**.

Field	Description
The current user	Select this radio button to use the user account that is currently logged in to assign the owner on any new objects created.
The specified user	Select this radio button, then click “...” to launch the Select User or Group dialog box and specify the default user for objects.

## Modifying Process Launch Settings

Use the Windows and Layout tab to determine the action required when launching a process.

To set the Console behavior when starting a process:

- Step 1** Choose **Tools > Options**, then click the **Windows and Layout** tab.

- Step 2** Under Process Launching, from the When starting a process drop-down list, choose *one* of the following:

Field	Description
Always Launch Immediately with Default Input Value	Launches the process immediately when the process has specified or default values without confirmation.
Always Prompt to Confirm	Default option launches Confirm Start Process dialog box to confirm whether the selected process should be launched.
Only Prompt when Process has Inputs	Launches the Confirm Start Process dialog box if the process has input variables. If the process does not have input variables, starts the process immediately without confirmation.

- Step 3** From the **After a process is started** drop-down list, choose *one* of the following options to determine what is displayed after a process begins:

Field	Description
Show Instances	Displays the processes initiated in the Start Process Results popup window.
None	Does not display the Start Process Results popup window.

- Step 4** Click **OK**.



## Restoring Console Default Settings

The Reset User Preferences button on the Windows and Layout tab restores the Console configuration to the default value.

If the window position and size, columns and column sizes, and other configurations in the Console have been modified, this option restores the settings to the Console default settings. The product will automatically close when you reset user preferences.

To restore the default Console configuration:

- 
- Step 1** Choose **Tools > Options**, then click the **Windows and Layout** tab.
- Step 2** Under Saved user preferences, click **Reset User Preferences**, then click **OK**.
- After confirming the action, the Console will close automatically.
- 

## Collecting Process Orchestrator Diagnostics

The Cisco Process Orchestrator Diagnostic Utility collects various information about the server environment, installation, as well as any errors or exceptions. The information is compiled into a zip file and saved according to the user preference. The user can then send the information to Cisco Process Orchestrator Technical Support to help diagnose the problem with the Process Orchestrator installation.

**Note**

---

Run this utility only when directed to do so by Customer Support.

---

The following data is collected by the Utility:

- Diagnostic logs written by the Cisco Process Orchestrator Service, console and other components (\*.log files)
- Information about the computer: including memory, processors, OS versions, installed hotfixes and applications (ComputerInfo.txt)
- Information about files installed in the Process Orchestrator installation folder (FileInfo.txt)
- Snapshots of the Windows Event logs (Application, System, as well as Process Orchestrator-specific logs) (.evt files)
- Snapshots of the Process Orchestrator registry key (.reg files)
- Process Orchestrator component configuration files (.config files)

To generate diagnostic logs:

- 
- Step 1** Choose **Start > All Programs > Cisco > Cisco Process Orchestrator > Diagnostic Utility**.
- Step 2** To collect diagnostic information:
- a. Click **Collect diagnostic information about Cisco Process Orchestrator**, then click **Next**.

- b. On the Information to Collect panel, check the check box of the appropriate logs.

Field	Description
General information	Generates log information from the Process Orchestrator server <ul style="list-style-type: none"> <li>• Process Orchestrator registry key</li> <li>• Process Orchestrator configuration files</li> <li>• Installed file information</li> </ul>
Server Information	<ul style="list-style-type: none"> <li>• Application event log—Log information of application events</li> <li>• Process Orchestrator event log(s)—Log information of the Process Orchestrator server</li> <li>• Server debug logs—Server log information containing debug logs produced by the Process Orchestrator server</li> <li>• System event log—Event information of system logs</li> <li>• Web Console debug logs—Event information of Web Console logs</li> </ul>
Client Information	<ul style="list-style-type: none"> <li>• Client debug logs—Contains debug logs produced by the Automation Pack Import Wizard.</li> <li>• Cached client file information—These log files are collected on client-only computers. These files contain information about files that were downloaded by the Console Loader from the server. The information also includes time stamps and version numbers for all files in the loader cache.</li> <li>• Console settings file—Contains debug logs produced by the Process Orchestrator console</li> </ul>

- c. Click **Next** to continue.
- d. In the Full path to the diagnostics archive file, verify the default file path, then click **Next**.
- e. After the information is collected and saved to the appropriate directory, click **Close**.

**Step 3** To review logging settings and manage debug log files:

- a. Click **Review logging setting and manage debug log files**, then click **Next**.
- b. In the Logging Settings panel, select the log files for the component you want to view (such as client, server, or Java adapter debug logs).
- c. To open the folder of log files for a component, click **Open**. Use an ASCII editor to view the contents of a specific log file.
- d. Click **Finish**.



## Authoring Processes

---

A process is basically a constructed workflow that consists of activities, invocations of child processes, and logic components that can be included to complete the process. Cisco Process Orchestrator allows you to automate IT processes based on your organizational requirements using a workflow format. The Process Orchestrator also includes many predefined processes in its packaged automation packs.

Processes can be viewed from both the Operations and Definitions workspaces:

- The Operations workspace displays scheduled and running processes. This workspace displays the Activity Views, Process Views, and Target Views. These views display the execution progress of the process instances.
- The Definitions workspace displays the defined processes and provides options to edit existing processes and define new processes. From the Processes View, you can also execute processes and view the status of a process in progress.

The following sections provide information about creating and managing processes:

- [Accessing the Process Editor](#)
- [Creating a Basic Process](#)
- [Selecting the Target Type on Which a Process Acts](#)
- [Adding an Invocation of an Existing Child Process](#)
- [Authoring Task Activities](#)
- [Publishing Automation Summaries](#)
- [Adding Logic Components to a Process](#)
- [Adding Process and Global Variables](#)
- [Adding Targets and Target Groups](#)
- [Adding Conditions](#)
- [Adding Target Types](#)
- [Managing Processes](#)
- [Creating Processes as a Team](#)

## Working with the Definitions Workspace

The Getting Started > Definitions view displays all the components that are used in defining and executing processes. This view contains items that are used to define the various components that are included in processes.

The Results pane displays task shortcuts information in the Results pane that guides you through using the features in the Definitions workspace.

The following tasks can be performed from this view:

- View Current Processes—Displays the Processes view where users can view and manage the defined processes
- Create a New Process—Launches the Process Editor dialog box which is used to view define the properties for a new process and construct the process workflow
- View Operations—Displays the Operations workspace that shows what processes are in progress, scheduled or have been completed.

## Accessing the Process Editor

Cisco Process Orchestrator simplifies process creation using a drag and drop workflow designer. The Process Editor allows you to drag activities, workflow activities (logic), or processes you want to invoke into a process definition where you want it to occur. The Process Editor dynamically accepts the new addition and shows the resulting logic.

Unlike drag-and-wire approaches common to other Process Orchestrators, the logic of the process is always clear, without having to constantly modify the layout as the process definition evolves. This makes it easier for other operators to view or edit processes that have previously been created. You can also collapse sections of the workflow that are not currently of interest.

Use the Process Editor to:

- View and modify the properties of an existing process
- Define properties
- Construct a workflow for a new process



---

**Note** The procedure to access the editor depends on the task to be performed.

---

To access the Process Editor:

- If you are creating a new process, choose **Definitions > Processes**, right-click and choose **New > Process**.



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**Note** The New button on the Actions toolbar is not available if a process is highlighted in the Processes Results pane.

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- If you are modifying an existing process, on the Processes Results pane, right-click the appropriate process, then choose **Edit**.

The Process Editor opens.

### Toolbox Pane

The toolbox pane on the left side of the editor includes these views. The navigation items displayed in the toolbox depend on the view that is selected.

View or Tab	Description
Activities	<p>The Activities view displays the list of activities that are used to construct the process workflow.</p> <p>The activities that display depend on the adapters that are installed.</p>
Processes	<p>The Processes view displays the list of defined processes that can be included in other processes.</p> <p>To add an existing process to a new process, drag and drop the appropriate process onto the workflow pane and define the criteria for execution of the process.</p>
Logic	<p>The Logic view displays the list of workflow components that support or define the workflow logic and provide control over the execution of the workflow logic.</p> <p>For information about configuring the logic components, see <a href="#">Adding Logic Components to a Process</a></p>
Favorites	<p>The Favorites view allows you to choose commonly used items from all the other tabs. For example, if you often use AMQP activities and some of the core activities, you can add them all to your Favorites tab. Then, instead of having to locate the activities in the activities tab, they can be quickly located in Favorites tab. Similarly, if you have favorite processes or logic items, these can also be added to the Favorites.</p>

### Workflow Pane

The Workflow pane is a canvas located in the center portion of the Process Editor (see ). Use this area to create processes by dragging and dropping activities, other processes, and components from the toolbox onto the canvas.

Process Orchestrator ships with automation packs that contain built-in process definitions that cannot be modified. If you select one of the shipped processes, a limited version of the Process Editor displays only the workflow pane and properties pane; the Toolbox pane in the Process Editor is not displayed.

### Process Pane

The Process pane is located on the right side of the editor and displays the properties for the selected process, as well as selected activity, child process, or workflow logic element properties.


## toggling the Process Editor View

In the Process Editor view, you can toggle the view between the process property pages and the activity view pages. To switch to the process properties, use *one* of the following options:

- Choose **File > Process Properties**.
- In the Workflow pane, click anywhere outside of the activities in the workflow.


## Expanding the Workflow View

To expand the workflow, use *one* of the following options:

- Choose **View > Expand** OR on the toolbar, click the **Expand**  tool.

## Collapsing the Workflow View

To collapse the activities in the Workflow pane, use *one* of the following options:

- Choose **View > Collapse** OR on the toolbar, click the **Collapse**  tool.

## Creating a Basic Process

### Before You Begin

Identify any drag-and-drop objects in the toolbox that will be required by your new process.

---

**Step 1** Choose **Definitions > Processes**, right-click and choose **New > Process**.

**Step 2** On the Process Properties pane, define the process properties.



**Note** Because Process Orchestrator no longer enforces uniqueness of object names, two content authors can create and ship automation packs or processes with identical names. As a result, a customer importing both automation packs will have two seemingly identical processes. To avoid confusion to the customer, use a namespace (a unique prefix) when naming objects. However, there are no technical issues with having duplicate process names.

---

**Step 3** On the Toolbox pane, drag and drop the appropriate items onto the workflow pane (see [Toolbox Pane](#)).

**Step 4** On the Properties pane, define the properties for each object selected on the workflow pane. The available property pages are determined by the selected objects.

**Step 5** When all of the property pages are complete, click **Save** to save the process.

### Exiting a Process Without Saving

If you exit a process without saving first, the Save Changes confirmation dialog displays, asking you “Do you want to save the changes to this process?”

- If the process is *already* locked, the Save Changes dialog will ask you if you want to unlock.
- If it is *not* locked, it will prompt you to lock it.

### Understanding the LOCK Mechanism

There may be multiple users using different consoles connected to the same Cisco Process Orchestrator environment. Therefore, it’s possible that you can edit the same process that someone else is working on it. In such a case, either one of you could overwrite the other person’s changes. To avoid situation like that, we provide the “LOCK” feature so you can lock the process and work on it. Others won’t be able to change the process until it is unlocked.

---

## Reverting Process Changes

This option is used when changes have been made to the process definition, but are no longer necessary. It deletes all changes made since you last saved the process. If you have saved the process and have not made any additional changes, no action will be taken.

To reverse process changes, choose **File > Revert**.

The process reverts back to the last saved version of the process. All new activities, components, and other changes are removed from the process definition.

## Selecting the Target Type on Which a Process Acts

Process definitions control the target types on which they act. This selection supports inheritance.

**Step 1** Open the process in the Process Editor (see [Accessing the Process Editor](#)).

**Step 2** Click the **Target** tab, then click the target types on which this process can run.



**Note**

Target group can be set at both process and activity levels. However, when an activity is set to run on a specific target group, it must be accompanied by an algorithm to limit to a particular target. Otherwise, the activity will run on any target in a group.

For example, assume that an SQL Server 2008 type provides a more specific implementations of an SQL Server Database through inheritance. All process that can run on an SQL Server Database run against a SQL Server 2008; a SQL Server 2008 “is a” SQL Server Database.



**Note**

The *Execute Unix/Linux SSH Command* and *Execute Unix/Linux SSH Script* activities can run against the same target and runtime user specified in the existing open session activity, if you select *Use an existing open session* radio button with any of the following option:

- Session opened by—Select the appropriate open session from the drop-down list.
- Open Session id—Select the appropriate open session id of the current process or parent process by clicking the Reference icon.

To view the processes that run on a given target type or target instance:

**Step 1** Choose **Definitions > Target Types**, highlight a target type, right click and choose **Properties**.


**Step 2** Click the Processes tab. The list shows the processes that can be executed against this target type.

## Adding an Invocation of an Existing Child Process

Before an existing process is available in the Processes pane of the Process Editor and can be used in another process' workflow, the Started by Parent Process trigger must be defined in that existing process.

### Before You Begin

- Confirm that the process you want to invoke includes the trigger, Started by Parent Process.

- 
- Step 1** Choose **Toolbox > Processes**, then highlight and drag the appropriate process to the Workflow pane.
- Step 2** On the [Child Process Name] Properties property sheet, click the **General** tab and modify the general property information. Check **Execute asynchronously** check box to execute the process independently. Default the process runs synchronously.
- Step 3** Click the **Start Point** tab and modify the properties by selecting from the following radio buttons:
- Start from beginning of workflow—Select this radio button to start the process workflow from the beginning.
  - Start from specific start point—Select the point within a process workflow (in addition to the top of the process workflow) at which you can start the process.
  - Start from start point named—Select the named start point from the reference variable by clicking the reference tool.
- Step 4** Click the **Target** and **Credentials** tabs and modify those properties as needed.
- Step 5** Click the **Inputs** tab in the [Variable Name] field and modify the parameters for executing the child process by selecting the open session id. If the process does not have any input variables, the page will be blank.
- In order to link the child process with the parent process, select parent session id as the input parameter. This enables you to select the open session id of the parent process from the child process **Sessions** tab.
- Step 6** Click **Save**  to save the child process definition.
- 

## Adding Variables to a Process

You can assign variables to the process when you use something multiple times. For example, if there is a person who must always be first approver, you can create a variable with the details of the person so you don't have to re-enter the email address in the activity properties; you simply reference the variable.

- 
- Step 1** On the Process Properties pane, click the Variable tab.
- Step 2** Click **New > [Variable Name]** to create a variable for the process and specify the appropriate information to create the variable.



### Note

The Metadata text box tab in variable properties dialog box is displayed only if the *Import into Cisco Prime Service Catalog* option is enabled in the PSC Integration tab. You can create or modify the metadata for a variable.

- In the Metadata text box, enter content type such as JSON, XML, etc. to have a list of possible input variables options, so that you can support a drop-down list in the PSC.



**Step 3** Click **OK** to close the dialog box.

---

## Adding a Input Variable Type

Use the following section to add input variable type with any data type.

- 
- Step 1** On the Process Properties pane, click the **Variable** tab and, choose **New > Any variable type**.
- Step 2** On the General Information panel, enter the basic information such as display name, description, variable type as Input, and enter the value for the variable.
- Step 3** Click **Metadata** tab to enter content type such as JSON, XML, etc. to have a list of possible input variables options, so that you can support a drop-down list in the PSC.
- Step 4** Click **OK** to complete the procedure.
- 

## Adding a Reference Type

Use the Reference type to add new relationship to the variable type or a target.

- 
- Step 1** On the Process Properties pane, click the **Variable** tab and, choose **New > Reference**.
- Step 2** On the General Information panel, enter the basic information such as display name, variable type, and description for the new reference type, then click **Next**. The following variable types are:
- **Definition**—Variable will be stored with the process definition. If one process instance change its value, the changes will be visible to other process instances of the same process
  - **Input**—A reference can be passed in through process start. Either from parent process of current process, or through input variable assignment panel when start adhoc. It can also be passed in through REST API.
  - **Output**—A reference variable that can be retrieved after the process finished running and by its following activities. It can be set or retrieved during the process runs.
  - **Local**—A local reference is that each process instance will have a copy. It can be assigned or retrieved only during the process runs.
- Step 3** In the Reference Type panel, select the appropriate reference type from the drop down list. For example:
- a. **Target Type**—Check the following check box of the required targets of type.
  - b. **Variable Type**—Check the following check box of the required variable type.
- Step 4** In the Variable Value panel, specify the initial value of the variable.
- Step 5** Click **Finish** to complete the procedure.
-

## Working with Target Reference Variables

A target reference variable is, simply, a variable that references a target. For example, assume you have a Windows target. If you then want a variable to point to that Windows target, you would create a target reference variable.

Here's an sample scenario: You might use a Target Reference Variable for a process that has activities (such as, "Select From SQL Server") that need run in a different target other than the one included in the process. For example, you might create a process that runs in a "VM target" or an "Open Stack Sever Target." But at some point in the work flow, an activity will call the "SQL Server Database Target."

So, could run a process against a target reference variable, or an activity within the process, or optionally, you don't have to run any process against it at all.

To create a Target Reference Variable, follow the steps below:

- 
- Step 1** Select Definitions.
  - Step 2** Right-click Global Variable.
  - Step 3** Select **New > Target Reference Variable**.
  - Step 4** Create or modify a Target Reference Variable, as needed.
  - Step 5** Save the variable.




---

**Note** You can now use this variable when creating a new process. See [Creating a Basic Process](#) for more information.

---

## About the References Dialog

The References dialog is where you can view the references for the selected variable. This allows you to find all references to a particular process variable in a workflow. It locates all the references to the variable within the workflow and provides the paths to those nodes.

To access this dialog, you follow this path:

- 
- Step 1** Go to Process Properties.
  - Step 2** Select the Variables tab.
  - Step 3** Right-click on the variable you are interested in.
  - Step 4** Select **Find References**.
  - Step 5** Review the list of nodes that reference the associated variable, as needed.
  - Step 6** Click OK or Close to close this dialog.

**Note**

To see additional information on the associated references for a particular variable, select the reference and then click the **Properties** button before closing this dialog.

### About the References Properties Form

When you click the **Properties** button on the References dialog, this Reference Info dialog displays, showing you the following information for the selected variable:

- Name
- Type
- Path

To close the Reference Info dialog, click OK or Close.

## Authoring Task Activities

Task activities allow the creation, manipulation, and deletion of tasks within process workflows. They allow processes to interact with task records.

There are two primary types of tasks:

- **IT process records** tasks include the alerts, incidents, and change requests. For more information, see [IT Process Records](#).
- **Human interaction** tasks are steps in a workflow where a human needs to take action. For more information, see [Human Interactions](#).

## Authoring Task Activities

A process workflow consists of one or more *activities* that can be executed by the product. An activity definition contains actions and any other information required for the product to execute it.

To add an activity that creates a new task or acts on an existing task within a process workflow:


- 
- Step 1** In the Process Editor, choose **Toolbox > Tasks**, choose the appropriate activity, then drag and drop the activity onto the Workflow pane.
- Use IT Records activities to create workflows that handle basic IT functions. To access these activities, choose **Toolbox > Tasks - IT Records > [Activity Name]**.
  - Use user interaction activities to create workflows that handle functions that require human interaction. To access these activities, choose **Toolbox > Tasks - User Interactions > [Activity Name]**.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Automation Summary** tab to define the properties specific to the activity, including:
- Automation summary style sheet—Select the type of template to be used for the automation summary.
    - Table of Configuration Properties
    - Situation Analysis Report (default)

- Include the following items—Select the activity or trigger/event, since events and triggers can be included into the automation summary as well, and specify the section of the automation summary to include the reporting details and whether the activity is the root cause of any issues that are detected.
  - Name—Name of the activities that are included in the process
  - Section—Name of the section of the automation summary where the data will be stored
  - Root cause—Yes indicates the Is the root cause check box is checked
- Section—Specify the section of the automation summary template in which to export the data:
  - SituationAnalysis—After a situation that requires action is identified, the state and diagnostic information is displayed in the Situation Analysis section of the automation summary.
  - ContextAnalysis—After a situation is analyzed in context with other situations, the symptom and cause is displayed in the Context Analysis section of the automation summary.
- Is the root cause—List the activity or event at the top of the automation summary, or identified as the root cause of the problem.
- Last instance information only—Indicate that the automation summary must include only information for the latest execution of the activity instance.
 

This setting is only for activities that are inside the loop of a workflow component (While or For Each). If this setting is not selected, the automation summary will include information about all instances of activity, for all iterations of the loop.

**Step 4** Click the **Affects** tab to specify the elements that trigger the selected target:

- This alert applies to the following target— Specify the affected target to be used in the activity.
- Process target—Use the process target as the affected target in the activity.
- Activity target—specify the affected target for a specific task activity.
  - Activity target—Select the activity containing the target that will be used. Only task activities will display in the list.
  - Target reference—Reference to a target of a specific type.
  - Specific target group—Specify the affected target group that will be used.

To view the properties for the selected target group, click the **Properties**  tool. To create a new target group, click **New > [Target Group]**.

From the **Choose a target using this algorithm** drop-down list, specify which target will be chosen from the eligible target group members.

#### Target Algorithms

Choose all targets that satisfy the specified criteria—Executes the process on all targets defined by the criteria specified in the Target Selection dialog box.


Choose any target that satisfies the specified criteria—Executes the process on any targets defined by the criteria specified in the Target Selection dialog box.

Choose the target with the specified name—Executes the process on the member of the group specified in the Name to match text field.

Select SAP target with the specified System ID—SAP System runs target against the SAP System database connection

- Choose the target with the specified name—Runs the process on the member of the group whose name is specified in **Name to match**.

- This alert applies to the following configuration item—Specify the configuration item to be used in the activity
  - Name—Name of the configuration item (IT component) to which the alert pertains. For example, the name of a database server that failed or the name of a specific job that failed.
  - Type—Enter the appropriate configuration item type or select the type of ITIL configuration item (IT component) from the list which the alert describes. For example, the type of the specific application element that failed (Application Server, Database, Host, or User).
  - This is a CMDB reference—Indicate that the true source of the CI is in the CMDB, so the configuration item properties reference a CMDB entry.
  - Object key—ID for the specific record in the CMDB that contains the configuration item
  - Object source—Name for the specific record in the CMDB that contains the target configuration item
  - Affected services—IT Service affected by the alert or incident
  - Affected organizations—Organizations that consume the IT service affected by the alert or incident
- Step 5** Click the **Assignment** tab to modify individuals or groups of individuals assigned to the task and other assignment properties.
- Alert assigned to—User names assigned to the task
    - Add—Click **Add** to launch the Select Identity dialog box to add a user name to the list.  
Type the name of the assignee or to search for the assignee, click **Browse** to launch the Select User or Group dialog box to select the name of the person.
    - Remove—Select the user name and click this button to remove the user from list.
  - Alert priority—Indicates the priority of the task
  - Set alert resolution due time period —Check the check box and select appropriate date the task should be completed from the drop-down calendar.
  - Set alert expiration time period—Select the appropriate date the alert should expire from the drop-down calendar.
  - Do not complete this activity until alert resolved—Check the check box if you do not want this activity to be complete until the alert is resolved.
- Step 6** Click the **Parameters** tab to define parameters for a specific task.
- Step 7** Click the **Duplicate** tab and enter the time period the alert should be resolved if the alert properties match another alert.
- Step 8** Click the **Categories** tab to:
- Assign a category to the task or change existing category assignments.
  - Check the **Task should inherit process categories** check box to inherit the categories assigned to the process.
- Step 9** Click the **External** tab to specify the external incident management system information to support the synchronization between Process Orchestrator and the system that the customer is using.
- Step 10** Click the **Web Form** tab to apply a specific XSL transformation to the task XML. XSLT transformation is used to convert XML text to the HTML web pages used by the Web Console (see [Chapter 9, “Performing Basic Console Tasks.”](#))
- Step 11** Enter the information in the remaining tabs as necessary, then click **OK** to complete the task definition.

**Step 12** Click **Save**  to save the activity definition.

The following table summarizes the available task activities.

**Table 5-1 Summary of Task Activities**

Task Activity Name	Purpose
Assign Task	Modify the list of assignees for a task. On this activity, tasks can be assigned to a user or group of users. Users can also remove current assignees from tasks.
Correlate Alert	Watch for alerts raised before or after a process starts and that are related to data from the process, such as its trigger, input parameters, activity outputs, or other elements referenced from the process workflow.  See <a href="#">Defining the Correlate Alert Activity</a> .
Create Alert	Create alerts to reflect potential problems that a user may want to investigate and possibly diagnose the problem.
Find [Task]	Find tasks that were created in the product and that match the specified criteria. See <a href="#">Viewing Find [Activity] Results</a> .
Publish Task to Event Log	Retrieve task information and publish it to the Cisco Process Orchestrator Tasks event log on the Process Orchestrator server.
Update [Task]	Update the properties for a specific task. The properties for the tasks can be updated using their respective activities in the Toolbox pane.  To update the properties for a specific task, specify the task ID and select the property to update within the task.
Wait for Task to Enter State	Wait for a task to match a specific state before the activity continues.  If the task reaches a completed state without matching, or if the duration expires without matching a specified status, then the activity succeeds without matching.  See <a href="#">Viewing Wait for Task to Enter State Results</a> .

## Defining the Correlate Alert Activity

Use the Correlate Alerts activity to check whether an alert occurred within a certain amount of time.

- Step 1** In the Process Editor Toolbox, choose **Tasks - IT records > Correlate Alerts** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Alerts Criteria** tab and enter the following information:
- Correlate alerts that occur within—Enter a value and select the time unit to indicate the length of time to wait before or after the process start time.
    - Time unit – Enter the start time value in minutes or seconds
    - Event occurrence – Determine whether the process start time is before or after the alert occurs

- Number of alerts to correlate—Select *one* of the following options to specify which alerts to wait for before the process continues:
  - All alerts in the above time frame – Select this option to wait for all alerts that match the specified criteria before the process continues.
  - Number of alerts – Select this option to wait for the specified number of alerts to occur before the process continues. Enter the number of alerts to wait for in the text field.

**Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

## Task Properties That Task Activities Manipulate

The following table summarizes the types of changes you can make to task properties within a task activity in your process workflow.

**Table 5-2** Summary of Common Actions Against Tasks That Can be Defined in a Process

Use Case	Description
Modifying automation summary properties	<p>Define the properties used to capture relevant diagnostic and state information about the process execution.</p> <p>On the activity property page, click the <b>Automation Summary</b> tab.</p> <p>This tab is available only in these activities:</p> <ul style="list-style-type: none"> <li>• Create Alert</li> <li>• Update Alert</li> <li>• Create Change Request</li> <li>• Update Change Request</li> <li>• Create Incident</li> <li>• Update Incident</li> </ul>
Adding an assignee to a task	<p>Change the assignee or other assignment properties for the activity.</p> <p>On the activity property page, click the <b>Assignment</b> tab.</p>
Assigning duplicate criteria for a task	<p>Define the criteria to indicate that the alert is a duplicate. If the alert is a duplicate, the new alert is automatically resolved as a duplicate and linked to the original alert as a related task.</p> <p>On the activity property page, click the <b>Duplicate</b> tab.</p> <p>This tab is available only in these activities:</p> <ul style="list-style-type: none"> <li>• Create Alert</li> <li>• Update Alert</li> </ul>
Removing an assigned duplicate property	<p>Remove a task property from the duplicate criteria.</p> <p>On the activity property page, click the <b>Duplicate</b> tab, then click <b>Remove</b>. One field will always remain.</p> <p>The Remove button removes the last property added to the list. For example, you cannot remove <i>Parameter 4</i> without removing <i>Parameter 5</i> from the list.</p> <p>To keep <i>Parameter 5</i>, update <i>Parameter 4</i> with the information from <i>Parameter 5</i>, then click <b>Remove</b> to remove <i>Parameter 5</i> from the list.</p>

Table 5-2 Summary of Common Actions Against Tasks That Can be Defined in a Process (continued)

Use Case	Description
Adding a related alert	Assign alerts that the incident originated from. On the activity property page, click the <b>Related</b> tab, click <b>Add</b> then, enter the Alert ID or click the <b>Reference</b> tool to search for the alert property to add to the list.

## Debugging Task Activities

The actions in this section demonstrate things you can do when viewing an activity that created a task or that manages tasks. For example, you might do them when you want to view a process workflow that actually ran and look at a specific task-related activity in the workflow.

### Viewing Correlated Alert Results

When the Correlate Alerts activity is launched, the alerts that were found by the activity are displayed from the Operations Workspace activity instance view.

- 
- Step 1** Choose **Operations > Activity Views**.
  - Step 2** Highlight the **Correlate Alerts** activity instance, right-click and choose **Properties**.
  - Step 3** Click the **Correlated Alerts** display-only tab to view the alerts collected by the Correlate Alerts activity.
- 

### Viewing Find [Activity] Results

Use the following steps to review the results of the query generated by the Find Alerts, Find Change Requests, and Find Incidents activities.

- 
- Step 1** On the Operations workspace, click the Activity Views folder.
  - Step 2** Highlight the **Find [Activity]** activity instance, right-click and choose **Properties**.
  - Step 3** Click the **Results** display-only tab to view the list of alerts, change requests, and incidents queried by the Find activity.
- 

### Viewing Wait for Task to Enter State Results

When the Wait for Task to Enter State activity is launched, the matching tasks that were found by the activity are displayed from the Operations Workspace activity instance view.

- 
- Step 1** On the Operations workspace, click the Activity Views folder.
  - Step 2** Highlight the **Wait for Task to Enter State** activity instance, right-click and choose **Properties**.
  - Step 3** Click the **Result** display-only tab to view the status values matched by the Wait for Task to Enter State activity.



The following information is displayed:

Field	Description
Result	Values for the task state <ul style="list-style-type: none"><li>• Unknown—Indicates activity is running or has failed to complete</li><li>• Timed Out—Activity timed out without matching</li><li>• Task Completed Without Matching—Task has reached a completing state that was not a state that was not included we were attempting to match on.</li><li>• Matched—Status was matched by the task</li></ul>
Matching Status	Indicates the status that was matched

## Publishing Automation Summaries

An automation summary is a collection of data that summarizes the actions taken and data retrieved during the execution of the process. To publish an automation summary:

- 
- Step 1** Add a Create Automation Summary activity to the process workflow.
  - Step 2** Configure which activities from earlier in the workflow to publish in which sections of the document.
- 

Technically, automation summaries are XML files that are published on a share or web server. The path or URL is then available to be linked from anywhere. This architecture makes them available for integration into virtually any context.

Automation Summaries are a key integration tool. For example, they can be placed in incidents in the Service Desk to reveal the analysis of the automation that was performed, or they can show how an incident was resolved.

# Adding Logic Components to a Process


Insert process logic components into a process to support or configure the process logic and provide control over the process execution.

The following table summarizes the types of logic components and when to use them.

**Table 5-3 Summary of Logic Components**

Activity Type	Purpose
Completed	Signal the completion of an activity and terminate the process. The component ends the workflow and sets the state of the workflow to <i>Succeeded</i> , <i>Failed (Completed)</i> , or <i>Failed (Not Completed)</i> .
Condition	Execute one of the defined Condition Branches in a process. It checks conditions for each of the branches, in order from left to right, and executes the first Condition Branch whose condition is <i>true</i> .
Condition Branch	Create a branch in the process and execute the branch only if the specified condition is met.
For Each	Add the activities to the process that should be executed one time for each item in the target source.
Parallel	Run two or more branches of a process simultaneously. The component consists of two or more sequential block components that execute their activities in parallel.
Queue	Create queues, which are like the lines going through Customs at an international airport. You can set the maximum allowed entries and maximum allowed in queue independently for each queue you set up. See <a href="#">Queue Resources</a> for additional information.
Sequence	Run activities in a block in a sequential order.
Start Point	Indicate points within a process workflow (in addition to the top of the process workflow) at which you can start the process.  You will always be able to start the process from the beginning. However, if a process contains a Start Point component, then you can start the process from the location of the Start Point within the process.  To do so, from the Confirm Start Process dialog and check <b>Start from start point</b> . Then select your start point from drop down list.
While	Execute a sequence of child activities (contained in the While Block) that repeats as long as the specified condition is <i>true</i> .

To add logic components to a process:

- 
- Step 1** In the Process Editor, choose **Toolbox > Logic**, then highlight and drag the appropriate logic component to the Workflow pane.
  - Step 2** On the component property pages, define the properties.
  - Step 3** Click **Save** .
-

# Adding Process and Global Variables

The variables feature provides a storage area for information that is used on a regular basis to avoid having to specify the same information in several places. Data stored in a variable can be altered to affect process execution behavior.

The following sections describe how you can use variables in Process Orchestrator for a variety of purposes.

## Activity Configuration

One of the most common uses of variables is to define activity configurations. Any field in an activity can refer to a variable value rather than an explicit value. For example, you can use a variable to:

- Specify the target as the machine where an event occurred
- Specify the start date of the process' operations window as a parameter to an operating system command
- Specify a condition, such as a file that should not exist after a job is initially triggered by the arrival of that file where a prior activity should have deleted the file

## Process Control Components

Processes can use variables to define the control components. For example, you can use a variable to define:

- A Conditional activity to look at the exit code of a prior activity
- A While Loop activity to loop until a query fails or loop for a number of times corresponding to a number of objects pulled from a query

## Process Parameters

Variables can be parameterized so that a process definition can be vague enough to be reused in multiple places and the specifics can remain undefined so that they can be defined by the person or process that invokes the process or activity.

For example, a process called notify server owner might use a variable server for the name of the server that has a problem. The process retrieves the email address of the owner of the server and sends an email.

This process might be called from multiple places; a step in a server maintenance job fails, so the maintenance job populates the Server variable and invokes the notify server owner process. Another process might notify the server owner when a backup completes.

## Formulas as Variable Values

You can specify a formula anywhere a variable value is used. For example, an operating system command's parameter might be formed from concatenating two variables' values or from parsing the output of a prior command.

Variables are used to store or pass a value between executions of a process or between steps within a single process.

## Common Use of Variables

The most common types of variables in Cisco Process Orchestrator are name variables and process or activity property variables.

### Named Variables

The most common use of variables is a name that has a changeable value. For example, you can use a global variable to store information used in processes such as:

- Locations of files and directories
- Email addresses
- Order numbers
- User names

### Process or Activity Property Variables

- In a process or activity definition, you can refer to the process properties or the properties of a prior activity in the process. In this scenario, the properties of the process or activity may also refer to associated objects.
- One of the most common uses of variables is to define activity configuration. Any field in an activity with a Reference tool can refer to a variable value rather than an explicit value.

### Status Tracking

Another common use of variables is to track state. For instance, you can use variables as a loop counters to store the number of times a loop has executed and know the current loop iteration running.

### Summary Variables

You can also use a variable to build up a 'summary' message. For each thing event happens, you can append 'what just happened' to the variable. At the end of a process, the result will be the contents of this variable as an entire summary of the process.

## Creating a Boolean Global Variable

Use the Boolean global variable to indicate the set of elements that should be true or false. The variable information is stored as a reference value that is used for multiple objects.

Variables are used to store or pass a value between executions of a process or between steps within a single process.

- 
- Step 1** Choose **Definitions > Global Variables**, right-click and choose **New > Boolean Variable**.
  - Step 2** On the General Information panel, specify the appropriate information, and click **Next**.
  - Step 3** On the Variable Value panel, specify whether the value should be interpreted as true or false and click **Next**.

**Step 4** Click **Finish** to complete the procedure.

---

## Creating a Hidden String Global Variable

Hidden variables are used to specify protected secrets (such as HR information or security information, such as a password) when they are outside of the use cases of runtime users. For example, you might need to pass a password to a script. Runtime users in Process Orchestrator are fully protected, so no process can retrieve the password from any runtime user. Hidden strings provide an alternative for these use cases. Another example is a password that must be passed to a web service invocation.

When values for hidden variables are entered or displayed, their values are obscured. When they are stored, their values are encrypted so that they cannot be compromised by UI or database access.

A common use case is when a password is required to access some service. Typically there will be a target that is associated with the connection, such as a web service. Using service-oriented orchestration principles, you can either:

- Extend the existing target type to add a “password” property of a hidden text type.
- Create a new specialized target type that inherits from the target type and create a “password” property on the new target type.

For example, say that you use a web target to connect to a Cisco Prime Network Services Controller REST API, and that the API requires a password. You could create a new “Cisco Prime Network Services Controller” target type which inherits from web target, then add a hidden text target property “password” on that type. You can then securely store passwords only for Prime Network Services Controller connections and not for all web services in general.



### Caution

In some cases, hidden strings can be passed outside Process Orchestrator. For example, a hidden text variable might be passed to a Windows script or a web service invocation. The variable value is passed in clear text outside the tool. *Care must be taken in this regard.* For example, if someone put a network sniffer on the web service call and you used HTTP rather than HTTPS for the call, the sniffer would be able to see the value. Process Orchestrator protects the value of the variable within the product itself and its logs, but it is the responsibility of the author and their IT department to protect these secrets outside of the product.

---

- Step 1** Choose **Definitions > Global Variables**, right-click and choose **New > Hidden String Variable**.
- Step 2** On the General Information panel, specify the appropriate information, and click **Next**.
- Step 3** On the Variable Value panel, specify the security-sensitive string text for the value, and click **Next**.
- Step 4** Click **Finish** to complete the procedure.
- 

## Creating a Numeric Global Variable

Use the Numeric global variable to define a variable containing a single whole or decimal number (positive and negative).

Variables can be used as a reference value used for multiple objects. They can also be used to store or pass a value between executions of a process or between steps within a single process.

- 
- Step 1** Choose **Definitions > Global Variables**, right-click and choose **New > Numeric Variable**.
- Step 2** On the General Information panel, specify the appropriate information, and click **Next**.
- Step 3** On the Variable Value panel, specify the numeric value, and click **Next**.
- Step 4** Click **Finish** to complete the procedure.
- 

## Creating a String Global Variable

Use the String global variable to define a variable containing a string of text.

Variables can be used as a reference value used for multiple objects. They can also be used to store or pass a value between executions of a process or between steps within a single process.

- 
- Step 1** Choose **Definitions > Global Variables**, right-click and choose **New > String Variable**.
- Step 2** On the General Information panel, specify the appropriate information, and click **Next**.
- Step 3** On the Variable Value panel, specify the string value, and click **Next**.



**Note** Check the Multiline check box to expand the text box and add more lines to the string.

---

- Step 4** Click **Finish** to complete the procedure.
- 

## Creating a Table Global Variable

Use the Table global variable to define a table format that is used to store a set of records. Use the Table tab to define the table columns and rows.

The variable information is stored as a reference value that can be used for multiple objects. Variables are used to store or pass a value between executions of a process or between steps within a single process.

- 
- Step 1** Choose **Definitions > Global Variables**, right-click and choose **New > Table Variable**.
- Step 2** On the General Information panel, specify the appropriate information, and click **Next**.
- Step 3** On the Variable Value tab, define the values to be included in the cells of a table as well as add new rows and columns for the table, and click **Next**.



**Note** The table must contain at least one column before a row can be added.

---

- Rows—Click to modify the number of rows to be included in the table.
- Add—Adds a new row to the table
- Remove—Removes selected rows from table. The Remove option is enabled when the user selects one or more rows within the data table.
- Columns—Click to modify the columns to be included in the table.

- Add—Launches the Table Columns Properties dialog box to allow the user to define the name and data type for the new column.
- Edit—Allows the user to modify the name for the new column. The Edit option is enabled when the user has one column or one cell in the table selected.
- Remove—Removes the selected columns from the table. The Remove option is enabled when the user selects one or more columns within the table.

**Step 4** Click **Finish** to complete the procedure.

---

## Creating an Identity Global Variable

Use the Identity global variable to store the value of a user identity.

Variables can be used as a reference value used for multiple objects. They can also be used to store or pass a value between executions of a process or between steps within a single process.

- 
- Step 1** Choose **Definitions > Global Variables**, right-click and choose **New > Identity Variable**.
- Step 2** On the General Information panel, specify the appropriate information, and click **Next**.
- Step 3** On the Variable Value panel, specify the user or group identity for the value, and click **Next**.
- Step 4** Click **Finish** to complete the procedure.
- 

## Creating a Copy of a Global Variable

The copy option is used when the user wants to leverage an existing global variable to define a new global variable using existing properties. If the original global variable allows overrides, then the copied variable will all also allow global variables.

- 
- Step 1** Choose **Definitions > Global Variables**, highlight the appropriate global variable, right-click and choose **Copy**.
- Step 2** On the Results pane, right-click and choose **Paste**.  
A copy of the global variable is pasted into the Results pane.
- Step 3** To rename the copied global variable or other properties, right-click and choose **Properties**.
- Step 4** Modify the global variable name, as appropriate, and click **OK** to close the dialog box.
-

# Adding Targets and Target Groups

When you create a process, you must specify where you want the process to run. You can also specify that the process runs on a specific target or target group.

**Note**

When you move process definitions from environment to environment using automation packs, the specific targets will be different in the new environment. Therefore, if you plan to export your process in an automation pack, you will want to avoid references to specific targets. Instead, use a target group in your process definition, and place the environment-specific targets in that target group. Use direct target references only in environment-specific processes.

The target group can be defined once and reused in several processes. For example, you might have a database maintenance process that is scheduled to run every month on all database servers. Instead of scheduling the process multiple times to run on each database server, you can create a target group that includes all the database servers and schedule the process to run on all the servers at the same time.

If you choose to execute the process on a target group, you can further specify to run the process on all objects that are included in the target group, or run the process on a specific object within the target group.

Use **Definitions > Target Groups** to view the defined target groups. From this view, you can create new target groups, modify the properties of a target group, and delete target groups.

## Viewing Members of a Target Group

Viewing members of a target group is important when debugging processes and environments.

- 
- Step 1** Choose **Definitions > Target Groups**, select the target group, right click and display properties for that group.
  - Step 2** Click the **Members** tab.
  - Step 3** Examine or view the targets considered to be part of the group by Process Orchestrator.
- 

## Creating a Target Group

You can create several types of target groups:

- A target type group specifies the type of target to be included in a target group as well as additional property-based criteria for a selecting target.
- A virtual target group contains a collection of any type of target or target group that has been defined.
- The Active Directory group types, Active Directory Group and Active Directory Organizational Unit (OU), are supplied by the Active Directory adapter. Membership in these group types is determined dynamically.

- 
- Step 1** Choose **Definitions > Target Groups**, right-click and choose **New > [Target Group Type]**.
  - Step 2** In the New [Target Group Type] Properties dialog, enter the appropriate information for that group type.



**Step 3** Click **OK** to create the new target group.

---

## Using a Target Group in Your Process

To use a target group in your process, define the target selection criteria.

---

**Step 1** In the Process Editor, click the **Target** tab, click **Execute on this target group**, then click "...".

**Step 2** From the Select Target Group dialog, select one or more target groups, then click **OK**.

**Step 3** You can choose to run the process on:

- All targets in this group
- All targets that satisfy the specified criteria
- Any target that satisfies the specified criteria
- A target with a specified name

**Step 4** Enter the criteria as necessary.

---

## Adding Conditions

The conditions assigned to an object within a process specify when an action is to be taken based on an evaluation of conditions that have been defined.

You can access condition property pages from many places, including the Process Editor and the Task Rules dialog box. Using these property pages, you can add basic or compound conditions to an object:

- A basic condition is a simple variable condition that uses a variable to match against a value using a defined criteria operator. To add a basic condition, see [Adding Basic Conditions to an Object](#).
- A compound condition combines conditions with AND and OR logic. To create a complex condition, see [Adding Advanced Conditions to an Object](#).

## Adding Basic Conditions to an Object

Use the Basic panel to create simple conditions using variables to match to operator criteria. When you edit a condition using the Basic panel, you are actually creating a compound condition where every subcondition is ANDed together. If there are no conditions, the condition will either be 'TRUE' or 'FALSE' based on the user selection. If there are conditions, the condition is *evaluated* to either TRUE or FALSE.

---

**Step 1** In the Process Editor, choose **Toolbox > Logic**, then drag a **Condition** or a **Condition Branch** into the workflow panel.

**Step 2** On the [Object] property page or dialog box, click the **Conditions** tab.

**Step 3** Under Conditions, click the **True/False** link to determine when the object should execute against the specified conditions.

- Click **True** to indicate the conditions should always be satisfied before the object executes.  
A single condition is listed by default and is set to *True*. If no other conditions are specified, this condition will remain and cannot be deleted by the user.
  - Click **False** to indicate the object can execute if the conditions are never satisfied.
- Step 4** Click the appropriate button to modify the condition properties used to execute the object.
- Click **New** to add a Properties pane to the condition.
  - Click **Delete** to remove the last Properties section in the list of properties.
- Step 5** Update the following properties for each condition:
- Text field—Data for this field cannot be manually entered. Click the **Reference** tool to select a property variable to use as a condition.
  - Operator—Select the operator to be used to evaluate the variable expression. The displayed operators depend on the selected property.
  - Value—Enter value for the property.
- Step 6** Click **OK** to save the object.
- 

## Creating a Time Condition

The Time Condition is used to define conditions that evaluates to true on the days in the specified calendar and between the specified start and end time. Time conditions can be assigned to a calendar, process, activity, and a process trigger.

Use the following steps to create a time condition based on a defined calendar.

- 
- Step 1** On the Conditions tab, click **New > Time Condition**.
- Step 2** In the Time Condition properties, modify the following properties.
- Start Time—Time the condition should begin. Enter or click the scroll button to modify the time.
  - End Time—Time the condition should end. Enter or click the scroll button to modify the time.
- Step 3** To modify the properties in the Time Condition dialog box, click anywhere on the line of properties.
- Step 4** In the Time Condition dialog box, complete the following information, as necessary:
- Calendar—Name of the calendar that should trigger the process.
  - Time Zone—Select the time zone that should be used for the condition
  - Start Time—Time the condition should begin. Enter or click the scroll button to modify the time.
  - End Time—Time the condition should end. Enter or click the scroll button to modify the time.
  - Condition—Display-only. Properties used to define the time condition
- Step 5** Click **OK** to add the condition to the Conditions tab.
-

## Creating a Component Licensed Condition

Use the Component Licensed Condition to be used to verify whether a product component is licensed. This condition can then determine the next step in the execution of the process. to be used as the condition under which the variable should evaluate as true.

Use the following steps to create a time condition based on a defined calendar.

- 
- Step 1** On the Conditions tab, click **New > Component Licensed Condition**.
- Step 2** In the Component Licensed Condition properties, modify the following properties.
- Text field—Enter the license ID for the appropriate component.
  - Value—Click the option to be used to evaluate the licensing expression.
- Step 3** Complete the following information, as necessary:
- Component Id—Enter the license ID for the component to be evaluated in the condition.
  - Comparison—From the drop-down list, choose the option to be used to evaluate the licensing expression.
    - is licensed
    - is not licensed
- 

## Creating a Variable Condition

The Variable Condition is used to specify a variable based on a variable expression to be used as the condition under which the variable should evaluate as true.

- 
- Step 1** On the Conditions tab, click **New > Variable Condition**.
- Step 2** In the Variable Condition properties, modify the following properties.
- Text field—Data for this field cannot be manually entered.
  - Operator—Select the operator to be used to evaluate the variable expression. The displayed operators depend on the selected property.
  - Value—Enter value for the property.
- The Variable Condition dialog box displays.
- Step 3** Complete the following information, as necessary:
- Comparison Operator—From the drop-down list, choose the comparison operator to use for comparing the value of the selected variable and the expression.

### Comparison Operators

- contains—Iterates through the contents of the collection and determines if the specified item exists (if this is a string collection, this is case-insensitive)
- contains (case-sensitive)—Iterates through the contents of the collection and determines if the specified item exists (same as above, but a case-insensitive version)

- contains only—Iterates through the contents of the collection and determines if the only item in the collection is the specified item (if this is a string collection, this is case-insensitive)
- contains only (case-sensitive)—Iterates through the contents of the collection and determines if the only item in the collection is the specified item (same as above, but a case-insensitive version)
- does not match wildcard—Determines if the item does not match all items in the wildcard example
- is empty—Determines if there are items in the collection or not
- equals—Determines if the left side equals the right side (if this is a string comparison, this is case-insensitive)
- not equals—Determines if the left side does not equal the right side
- matches regular expression—Determines if the left side matches the regular expression specified on the right side.
- matches wildcard—Determines if the left side matches the wildcard specified on the right side
- equals (case-sensitive)—Determines if the left side equals the right (this is the case-sensitive version of Equals for string)
- less than [<]—Determines if a value is less than another value
- more than [>]—Determines if a value is greater than another value
- equal [=]—Determines if a value is equal to another value
- not equal [>]—Determines if a value is not equal to another value
- greater than or equal [>=]—Determines if a value is greater than or equal to another value
- less than or equal [<=]—Determines if a value is less than or equal to another value
- Expression—Enter the expression to be evaluated against the boolean type variable to determine whether the condition is true.

The information in this field is case-sensitive and must be lowercase.

---

## Adding Advanced Conditions to an Object

Use the Advanced panel to create a Cisco Process Orchestrator-based condition. You can define the properties of the conditions within the Advanced panel, or within the Properties dialog box.

When you edit a condition using the Advanced panel, the compound conditions are explicitly shown. This allows you to create complex conditional logic with the ability to nest any type of condition inside of a compound condition. To add a child compound condition in the advanced editor, choose **New > Compound Condition**.

The conditions specified on the Basic panel can also be configured on the Advanced panel because they transition to simple Process Orchestrator-level variable conditions.

---

- Step 1** In the Process Editor, choose **Toolbox > Logic**, then drag a **Condition** or a **Condition Branch** into the workflow panel.
- Step 2** On the [Object] property page or dialog box, click the **Conditions** tab, then click **Advanced**.

If there are no conditions, the condition will either be 'TRUE' or 'FALSE' based on the user selection. If there are conditions, the condition is *evaluated* to either TRUE or FALSE.

- Step 3** Click the appropriate button to modify the condition properties used to execute the object.
- Click **New** to add a Properties pane to the condition.
  - Click **Properties**, then click anywhere around the appropriate condition. After the area around the condition is highlighted, click **Properties** to launch the condition properties dialog box.  
Condition properties can be modified on the tab or within the conditions properties dialog box.
  - Click **Delete** to remove the last Properties section in the list of properties.
- Step 4** After the first condition is added, choose the appropriate operator (AND or OR). The operator is set to *AND* by default.
- Step 5** Click **OK** to save the object.
- 

## Deleting a Condition

A condition can have subconditions, and anywhere there is a condition you can delete a subcondition. Multiple condition equations can be included in a condition. Conditions are deleted only from the object upon which they reside.


## Deleting Conditions from Task Rules

Use the following steps when deleting a condition from a task rule. If you delete the task rule, that automatically deletes the condition.

- Step 1** Choose **Definitions > Task Rule**, highlight an existing task rule, right-click and click **Properties**.
- Step 2** Click the **Conditions** tab, highlight the appropriate condition, then click **Delete**.
- Step 3** Click **OK** to save your changes.
- 


## Deleting Conditions from Triggers

Use the following steps when deleting a condition from a trigger. Delete the trigger from the process properties automatically deletes the condition.

- Step 1** In the Process Editor, choose **Toolbox > Processes**, highlight the process, and choose **Process > Edit**.
- Step 2** In the Process Properties pane, click the **Triggers** tab, highlight the appropriate the trigger, and click **Properties**.
- Step 3** Click the **Conditions** tab, highlight the appropriate condition, then click **Delete**.
- Step 4** Click **OK** to save the changes made to the trigger.
- Step 5** Click **Save**  to save your changes.
-


## Deleting Conditions from a Logic Component

Use the following steps to delete a condition from a logic component such as a Condition Branch or a While Block. If you delete the logic component from the Workflow pane, that automatically deletes the condition.

- 
- Step 1** In the Process Editor, choose **Workflow**, then the relevant logic component.
- Step 2** Choose *one* of the following:
- Right-click and choose **Delete** to remove the logic component and all associated conditions.
  - Click the logic component's, highlight the appropriate condition, then click **Delete**.
- Step 3** Click **Save**  to save your changes.
- 

## Deleting Archive Conditions

Use the following steps when deleting a condition from an archive. If you choose another archive option from the process properties, that automatically deletes the condition.

- 
- Step 1** In the Process Editor, choose **Toolbox > Processes**, highlight the process, and choose **Process > Edit**.
- Step 2** In the Process Properties pane, click the **Options** tab.
- Step 3** In the Archival section, choose one of the following:
- Click **Archive based on condition**, click "...", then use the Archive Condition dialog to delete the appropriate condition or subcondition.
  - Check another Archival option and the condition will not be used; you do not need to "delete" it.
- Step 4** Click **Save**  to save your changes.
- 

## Adding Target Types

Target types provide a way to define a service or other IT element that is not represented by any target type provided by an adapter. All new targets are created based upon an existing target type.

- 
- Step 1** Choose **Definitions > Target Types**, right-click and choose **New > Type**.
- Step 2** In the **General** pane, enter the basic properties for the new type, then click **Next**.
- Step 3** In the **Import into Prime Service Catalog** pane, perform the following:
- a. Check the **Import into Cisco Prime Service Catalog** check box to generate the process as a service in Cisco Prime Service Catalog. This also enables the Metadata text box.
  - b. In the **Metadata text box**, enter content type such as JSON, XML, etc. to have a list of possible input variables options, so that you can support a drop-down list in the PSC.

**Note**

The *Import into Prime Service Catalog* pane is displayed only if the Enable Cisco Prime Service Catalog Integration option is enabled in the Environmental properties of the console.

- Step 4** On the **Properties** pane, specify the new properties for this type, then click **Next**.  
Click **New**, to add new properties such as Boolean, Secure string, Identity, Numeric, String, and Table.
- Step 5** On the **Relationships** pane, specify the new relationships for this type, then click **Next**.  
Click **New > Reference**, to add new relationship to the variable type or a target.
- Step 6** On the **Processes** tab, specify the processes that are in the application, then click **Next**.
- Step 7** Click **Finish** to create the new type.

**Related Topics**

[Target Types](#)

## Adding Variable Type

Variable type provide a way to define a new user defined variable type that is not represented by any default variable type. All new variable types are created based on system built-in type *variable* such as boolean, secure string, etc., but creating from these system built-in types are not supported.

You can add properties to the new variable type such as Boolean, Encrypted string, Identity, Number, String, and Table or you can add reference to either target or another variable.

- Step 1** Choose **Definitions > Variable Type**, right-click and choose **New > Variable Type**.
- Step 2** In the **General** panel, enter the basic properties for the new variable type, then click **Next**.  
You can select the base type for the new variable based on the system built-in type *variable* or any other user defined variable types derived from *variable*. For example, you cannot select boolean system built-in type as a base type.
- Step 3** On the **Properties** pane, specify the new properties for this type, then click **Next**.  
Click **New**, to add new properties to the variable type such as Boolean, Secure string, Identity, Numeric, String, and Table.  
For example:  
If you are adding a string property to the variable type, it displays a New String Wizard, enter the following information:
- In the General Information page, enter the display name:  
Disk
  - In the Default Property Value page, enter the Value:  
GB
- Step 4** On the **Relationships** pane, specify the new relationships for this type, then click **Next**.  
Click **New > Reference**, to add new relationship to the variable type or a target.  
For example:

If you are adding a relationship to the variable type, it displays a New Reference Wizard, enter the following information:

- In the General Information page, enter the display name.
- In the Reference Type page, select the appropriate Reference Type and their references.
- In the Default Property Value page, enter the Value.

**Step 5** Click **Finish** to create the new variable type.

---

### Creating a Copy of a Variable Type

The copy option is used when the user wants to leverage an existing variable type to define a new variable type using existing properties. If the original variable type allows overrides, then the copied variable will all also allow variables types.

---

- Step 1** Choose **Definitions > Variable Type**, highlight the appropriate variable type, right-click and choose **Copy**.
- Step 2** On the Variable Type pane, right-click and choose **Paste**.  
A copy of the variable type is pasted into the Results pane.
- Step 3** To rename the copied variable type or other properties, right-click and choose **Properties**.
- Step 4** Modify the variable type name, as appropriate, and click **OK** to close the dialog box.
- 

## Custom Variable Type

The user defined variable type created using *Variable Type* can be used in global variables by clicking **New > Variable Type**. The variable type in the global variables can be customized using following steps.

---

- Step 1** Choose **Definitions > Global Variables**, highlight the appropriate variable type, right-click and choose **Properties**.
- Step 2** Click **General** tab and enter the required information.
- Step 3** Click *Variable Type name* tab and enter the required information. For example:  
Enter the Disk information such as maximum volume and unit.
- ```
Disk
  Max Volume-4
  Unit-GB
```
- Step 4** Enter the information in the remaining tabs as necessary, then click OK to complete the task definition.
-



## Creating a Boolean Property

Use the Boolean variable to indicate the set of elements that should be true or false. The variable information is stored as a reference value that is used for multiple objects.

Variables are used to store or pass a value between executions of a process or between steps within a single process.

- 
- Step 1** On the Properties pane of creating target types, choose **New > Boolean Property**.
  - Step 2** On the General Information panel, specify the appropriate information, and click **Next**.
  - Step 3** On the Default Property Value panel, specify whether the value should be interpreted as true or false and click **Next**.
  - Step 4** Click **Finish** to complete the procedure.
- 

## Creating an Identity Property

Use the Identity property to store the value of a user identity.

Properties can be used as a reference value used for multiple objects. They can also be used to store or pass a value between executions of a process or between steps within a single process.

- 
- Step 1** On the Properties pane of creating target types, choose **New > Identity Variable**.
  - Step 2** On the General Information panel, specify the appropriate information, and click **Next**.
  - Step 3** On the Default Property Value panel, specify the user or group identity for the value, and click **Next**.
  - Step 4** Click **Finish** to complete the procedure.
- 

## Creating a Numeric Property

Use the Numeric property to define a property containing a single whole or decimal number (positive and negative).

Properties can be used as a reference value used for multiple objects. They can also be used to store or pass a value between executions of a process or between steps within a single process.

- 
- Step 1** On the Properties pane of creating target types, choose **New > Numeric Variable**.
  - Step 2** On the General Information panel, specify the appropriate information, and click **Next**.
  - Step 3** On the Default Property Value panel, specify the numeric value, and click **Next**.
  - Step 4** Click **Finish** to complete the procedure.
-

## Creating a Secure String Property

Secure property are used to specify protected secrets (such as HR information or security information, such as a password) when they are outside of the use cases of runtime users. For example, you might need to pass a password to a script. Runtime users in Process Orchestrator are fully protected, so no process can retrieve the password from any runtime user. Secure strings provide an alternative for these use cases. Another example is a password that must be passed to a web service invocation.

When values for secure string are entered or displayed, their values are obscured. When they are stored, their values are encrypted so that they cannot be compromised by UI or database access.

A common use case is when a password is required to access some service. Typically there will be a target that is associated with the connection, such as a web service. Using service-oriented orchestration principles, you can either:

- Extend the existing target type to add a “password” property of a hidden text type.
- Create a new specialized target type that inherits from the target type and create a “password” property on the new target type.

For example, say that you use a web target to connect to a Cisco Prime Network Services Controller REST API, and that the API requires a password. You could create a new “Cisco Prime Network Services Controller” target type which inherits from web target, then add a secure text target property “password” on that type. You can then securely store passwords only for Prime Network Services Controller connections and not for all web services in general.



### Caution

In some cases, secure strings can be passed outside Process Orchestrator. For example, a secure text might be passed to a Windows script or a web service invocation. The property value is passed in clear text outside the tool. *Care must be taken in this regard.* For example, if someone put a network sniffer on the web service call and you used HTTP rather than HTTPS for the call, the sniffer would be able to see the value. Process Orchestrator protects the value of the property within the product itself and its logs, but it is the responsibility of the author and their IT department to protect these secrets outside of the product.

- 
- Step 1** On the Properties pane of creating target types, choose **New > Secure String Property**.
  - Step 2** On the General Information panel, specify the appropriate information, and click **Next**.
  - Step 3** On the Default Property Value panel, specify the security-sensitive string text for the value, and click **Next**.
  - Step 4** Click **Finish** to complete the procedure.
- 

## Creating a String Property

Use the String property to define a property containing a string of text.

Properties can be used as a reference value used for multiple objects. They can also be used to store or pass a value between executions of a process or between steps within a single process.

- 
- Step 1** On the Properties pane of creating target types, choose **New > String Variable**.
  - Step 2** On the General Information panel, specify the appropriate information, and click **Next**.

**Step 3** On the Default Property Value panel, specify the string value, and click **Next**.



**Note** Check the Multiline check box to expand the text box and add more lines to the string.

**Step 4** Click **Finish** to complete the procedure.

## Creating a Table Property

Use the Table property to define a table format that is used to store a set of records. Use the Table tab to define the table columns and rows.

The property information is stored as a reference value that can be used for multiple objects. Variables are used to store or pass a value between executions of a process or between steps within a single process.

**Step 1** On the Properties pane of creating target types, choose **New > Table Variable**.

**Step 2** On the General Information panel, specify the appropriate information, and click **Next**.

**Step 3** On the Default Property Value tab, define the values to be included in the cells of a table as well as add new rows and columns for the table, and click **Next**.



**Note** The table must contain at least one column before a row can be added.

- Rows—Click to modify the number of rows to be included in the table.
- Add—Adds a new row to the table
- Remove—Removes selected rows from table. The Remove option is enabled when the user selects one or more rows within the data table.
- Columns—Click to modify the columns to be included in the table.
  - Add—Launches the Table Columns Properties dialog box to allow the user to define the name and data type for the new column.
  - Edit—Allows the user to modify the name for the new column. The Edit option is enabled when the user has one column or one cell in the table selected.
  - Remove—Removes the selected columns from the table. The Remove option is enabled when the user selects one or more columns within the table.

**Step 4** Click **Finish** to complete the procedure.

## Adding a Reference Property

Use the Reference property to add new relationship to the variable type or a target.

**Step 1** On the Relationships pane of creating target types, choose **New > Reference Property**.

- Step 2** On the General Information panel, enter the basic information such as display name, primary property group name, secondary property group name, and description for the new reference property, then click **Next**.
- Step 3** In the Reference Type panel, select the appropriate reference type from the drop down list. For example:
- a. Target Type—Check the following check box of the required targets of type.
  - b. Variable Type—Check the following check box of the required variable type.
- Step 4** In the Default Property Value panel, specify the default value for the property.
- Step 5** Click **Finish** to complete the procedure.
- 

## Managing Processes

The following topics describe how to manage processes:

- [Modifying Process Properties](#)
- [Modifying Activity Definition Properties](#)
- [Managing Process Workflow Revisions](#)
- [Starting a Process](#)
- [Canceling a Process](#)
- [Executing and Archiving Process Instances](#)

## Modifying Process Properties

Process definitions are modified in the Process Editor. With the appropriate rights from the Definitions view, the Process Editor is launched when accessing the process properties. Users with the appropriate rights can also modify processes in the top panel of any of the Process Views in the Operations View.

When user rights are restricted, the Process Viewer is launched with the properties displaying a display-only view.

- Step 1** Choose **Definitions > Processes**, highlight the appropriate process, right-click and choose **Edit**.
- Even when a process comes from an automation pack, some aspects of that process can still be updated. For example, you can:
- Disable/enable existing triggers
  - Add additional triggers
  - Disable/enable the process
  - Change options (such as archive/resume options)



**Note** If you have been adding activities while editing a process, your focus will often be on an activity, so you will actually be seeing properties of the activity. To return to editing process properties, click in the white space outside of any activity.

- Step 2** Select the appropriate process property tab and modify the fields as necessary.

**Step 3** Click **Save**  to save your changes.

---

## Modifying Activity Definition Properties

Activities can only be modified in the Process Editor; modifying a process does not automatically modify an activity. Activity definitions are *included* in the workflow of a process definition, so the activity properties must be modified separately from the process properties.

- 
- Step 1** Choose **Definitions > Process**, highlight the appropriate process, right-click and choose **Edit**.
- Step 2** On the Process Editor Workflow pane, choose the appropriate activity and modify the activity properties as necessary.
- Step 3** Click **Save**, then click **Exit** to close the Process Editor.
- 

## Managing Process Workflow Revisions

Whenever you modify the workflow of a process definition in the Process Editor, a new revision is created for the process so that the historical versions are preserved. This allows users to easily restore a previous version or simply refer to the process definitions that were displayed at a certain point in the past. Using the Manage Workflow Revisions dialog box, you can:

- View the number of revisions made for the selected workflow during the specified created time
- Open a single or multiple read-only editors to view the changes made to the revisions; Opening multiple read-only editors at the same time helps you to compare the changes made to different versions
- Restore previous versions

Invalid references are checked before restoring the previous versions. For example, if you have a variable referenced in revision “A” and then deleted in revision “C”, an error message is displayed when you try to revert to revision “A”.



**Note**

If you are *not* the author of the automation pack, all the revisions made prior to importing or applying a patch on the automation pack are displayed in Grey. You cannot restore these versions. However, you can view the changes by opening the ready-only editors. If you *are* the author, however, you can restore to any earlier revision, even ones made before the patch import or patch apply.

---

## Viewing Workflow Revisions

- 
- Step 1** Choose **Definitions > Process**.
- Step 2** Highlight the appropriate process, then right-click and choose **Workflow Revisions**.
- Step 3** To view changes made to a specific version, select the version and click **View**.



---

**Note** You can view more than one version at the same time.

---

## Restoring a Workflow Revision

- 
- Step 1** Choose **Definitions > Process**.
- Step 2** Highlight the appropriate process.
- Step 3** Right-click and choose **Workflow Revisions**.
- Step 4** To restore a previous version, select the version and click **Restore**.



---

**Note** Process properties are not restored. Process properties include process name, any defined variables, and triggers, and so on. Only the workflow itself is restored.

---

## Starting a Process

You can manually start a process displayed on a Process View or the Process Editor under these conditions:

- You have the appropriate privileges.
- The process includes the Started by User trigger.
- The process is enabled (see [Enabling and Disabling an Object](#)).


Only one process can be manually started at a time.



---

**Note** When a process is started manually, all conditions and triggers included in the process definition will be overridden.

---

- 
- Step 1** Choose one of the following:
- From a process view, highlight the appropriate process, right-click and choose **Start Process**.
  - From the Process Editor, highlight the appropriate process, then choose **File > Start** or click **Start**  in the toolbar.
- Step 2** The Confirm Start Process dialog box displays.
- If the process has any input variables, verify the variables associated with the process in the Parameters table. To update the variable, highlight the variable and click **Edit** to modify the value.
  - To start a process from a specific starting point, check the **Start from start point** check box and then select the appropriate starting point from the drop-down list. The first activity after the specified starting point will run first.
  - To specify a target that is different from the default process target, check the **Override target (Target name)** check box and select a target from the drop-down list.

- To create a new target for this process, click **New**. For additional information on targets, see [Defining a Target](#).
- Step 3** Click **OK** to confirm.
- Step 4** The Start Process Results dialog box displays the progress of the process. To view the process workflow, double-click the process instance.
- Step 5** Click **Close** to return to the console.
- 

## Canceling a Process

If you have the appropriate rights, you can manually cancel any process that is currently running. To cancel a process, choose the **Activity View Results**, highlight the appropriate process, right-click and choose **Cancel**.

## Executing and Archiving Process Instances

The Process Orchestrator provides settings that control:

- Whether the server saves the process state after the process completes.
- Whether the process is restartable in case of a server restart or failover.

Both the archival and resume options affect performance (how much data is saved into the database and how often). However, only the resume option controls whether the process is restartable. If the process is set to “archive” but “not resume”, it will save the data to the database but will not restart when the server restarts.

To specify the archival and resume settings for an existing process:

- 
- Step 1** In the Process Editor, choose **Toolbox > Processes**, highlight the process, and choose **Process > Edit**.
- Step 2** In the process properties dialog, click the **Options** tab.
- Step 3** In the Display section, check the **Use custom icon** check box and click **Select icon** to choose your custom icon to modify the default icon for the process. For more information see, [Changing the Process Display Icon](#).
- Step 4** In the Integration section, check the **Import into Cisco Prime Service Catalog** check box to generate the process as a service in Cisco Prime Service Catalog.




---

**Note** The Integration section is displayed only if the *Enable Cisco Prime Service Catalog Integration* option is enabled in the Environmental properties of the console.

---

- Step 5** In the Execution section, if you want the server to resume the process that is running when server restarts or fails over, click **Resume execution if interrupted**.
- Step 6** In the Archival section, choose one of the archival options:
- Never archive any instances—The process instance is not stored upon completion
  - Only archive failed instances—Only the failed process instances are stored upon completion
  - Archive all completed instances—The process is stored upon completion

- Archive process instances (skip activity instances) only—Removes the activity instances from archival and stores the process instance upon completion
- Archive based on condition—The process instance is stored upon completion based on the selected condition. For example, ([Global Variables.Archive All Processes] = true)
- Cascade the setting to child process instances - The archival setting of a parent process is cascaded to the child processes

For example, if you have Run Antivirus Checks as the parent process, and then Check for Weekly Antivirus scan as the child process, the archival setting applied for the Run Antivirus Checks process is passed to the Check for Weekly Antivirus child process irrespective of the archival setting selected for this child process. Assume that Check for Weekly Antivirus scan process has a child process which in turn has another child process, the archival setting is applied to all the child processes irrespective of their respective archival settings.

**Step 7** Click **Save**  to save your changes.

---

#### Related Topics

- [Adding Conditions](#)
- [Archiving Process Instances in an Automation Pack](#)
- [Chapter 14, “Managing High Availability and Resiliency”](#)

## PSC Integration

The Process Orchestrator provides provision to generate a process as a service in Cisco Prime Service Catalog.




#### Note

The PSC Integration tab is displayed only if the *Enable Cisco Prime Service Catalog Integration* option is enabled in the Environmental properties of the console.

---

To import a process as a service in Cisco Prime Service Catalog:

---

- Step 1** In the Process Editor, choose **Toolbox > Processes**, highlight the process, and choose **Process > Edit**.
  - Step 2** In the process properties dialog, click the **PSC Integration** tab.
  - Step 3** In the Display section, check the **Import into Cisco Prime Service Catalog** check box to generate the process as a service in Cisco Prime Service Catalog. This also enables Metadata text box.
  - Step 4** In the **Metadata text box**, enter content type such as JSON, XML, etc. to have a list of possible input variables options, so that you can support a drop-down list in the PSC.
  - Step 5** Click **Save**  to save your changes.
-



## Creating Processes as a Team

Multiple users might be working together to develop processes that they plan to group into an automation pack. The Process Locking feature is designed to enforce limits on access to a process. You can lock one or more processes from the Process Orchestrator console. Process Locking also includes these features:

- The UI provides a filter for the process definition view to view processes locked by me, or processes locked by someone else.

The columns for these views show whether a process is locked, who has the lock, and since what date / time the lock has been held.

- Locked processes:
  - Are read-only to other users.
  - Cannot be enabled or disabled by other users.
  - Can be added or removed from automation packs by other users because this action does not modify the configuration of the process itself.
  - That are locked by another user can be unlocked if you have Break Lock permissions (see [Editing Locked Processes](#)).

During the editing process:

- If User A attempts to edit a process that is currently locked by User B, User A receives a warning message and the process displays in Read-only mode.
- If User A is editing a process, which is then locked by User B, User A receives an error message when attempting to save the process.
- User A cannot delete a process that is currently locked by User B.
- A confirmation dialog displays if you close the Process Orchestrator and there are still locked processes remaining.
- The category membership of a locked process cannot be edited by other users.

Team content development *is*:

- A way for users to lock *processes* when they are developing content along with other process authors
- A new environment-wide setting which forces users to lock processes when editing them

Team content development is *not*:

- Locking other object types
- Source control or versioning support
- Being notified in real-time that someone has locked a process that the user is editing

## Enabling Team Process Authoring

The Environment Properties dialog box contains an option to enable/disable team process authoring on a server. If enabled, it:

- Locks and unlocks processes for editing
- Provides a server-wide setting that causes Edit process to become equivalent to Locking a process for editing
- Warns users when they attempt to close the console and still have processes locked for editing

- 
- Step 1** Choose **File > Environment Properties**.
- Step 2** Check the **Enable team development** check box to enable team process authoring on this server, then click **OK**.
- 

## Viewing Process Views by Lock Status

To view locked processes, choose **Definitions > Processes**, choose **Filter by Lock**, then choose one of the options from the drop-down list.

## Editing Locked Processes

Use the Process Locking feature to edit locked processes:

| Task             | Purpose                                                                                                                                                                                                                                                                                                                                                      |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lock a process   | <p>Enforce limits on access to a process. Locked processes are read-only to other users.</p> <p>Choose <b>Definitions &gt; Processes</b>, highlight the appropriate process, right-click and choose <b>Lock</b>.</p>                                                                                                                                         |
| Unlock a process | <p>If you have locked a process, you can unlock that process from the Process Orchestrator console.</p> <p>Choose <b>Definitions &gt; Processes</b>, highlight the appropriate process, right-click and choose <b>Unlock</b>.</p> <p>If the process is locked by someone else, a message displays indicating that the process is locked by another user.</p> |
| Break a lock     | <p>If a process is locked by another user, and if you have Break Lock permissions, you can unlock that process.</p> <p>Choose <b>Definitions &gt; Processes</b>, highlight the appropriate process, right-click and choose <b>Advanced &gt; Break Lock</b>.</p>                                                                                              |

## Scheduling Processes

When defining a process, you can specify when the process will execute. You can execute a process based on a schedule. A schedule specifies one or more times of day, and is combined with a calendar that specifies which days the schedule should initiate the process.

The following topics include how to define a calendar, how to use calendars to define a schedule for a process, and how to use calendars in a condition:

- [Authoring a Calendar](#)
- [Scheduling a Process Based on a Calendar](#)
- [Scheduling a Process to Run Only Under Certain Conditions](#)
- [Using a Calendar in a Condition](#)

## Authoring a Calendar

Calendars are reusable for schedules within many processes. For example, you can define a calendar for Saturdays. When defining a process that you want to run on Saturdays, you reference the *Saturday* calendar. Other examples include a calendar that includes weekends and company holidays when IT might perform scheduled maintenance, or the last week of a fiscal quarter when IT might exclude non-essential automation or deny change requests.

The calendars feature defines the calendar to be associated with a schedule, time, or condition. This feature simplifies:

- Reusing calendar definitions across processes
- Building complex calendars from other calendars
- Viewing the processes that run based on a specific calendar

## Creating a New Calendar

Cisco Process Orchestrator ships with some predefined calendars for the most commonly-used scenarios. However, you can create your own calendar or copy and modify the predefined calendars based on your organizational requirements.

Use the Definitions > Calendars view to display the defined calendars.

- **Date List**—Specify an explicit list of dates. The processes to which this calendar definition is assigned will execute on the specified dates in the calendar. You might want to use this type of calendar for processes that run on specific days of a specific month.
- **Group**—Specify a collection of other defined calendar types, such as inclusion of date list or a recurring calendar within the group calendar definition. The group calendar can contain defined recurring calendars, other group calendars, and date list calendars. You select the calendars to include or exclude in the group calendar definition.

You can also add dates to or exclude dates from a group calendar.

- **Recurring**—Specify a starting date for the subsequent dates and recurrence frequency. You can specify the calendar to repeat on a daily, weekly, monthly, or yearly basis.

---

**Step 1** Choose **Definitions > Calendars**, right-click and choose **New > [Calendar Type]**.

**Step 2** On the **[Calendar Type]** property pages, define the properties.

For example, if you want to define a recurring process that runs on the fifth day of each month, enter these values:

- Recurrence Pattern: Monthly
- Start date: (select a day of the month)
- Monthly Recurrence: Every 1 months
- On the following day(s): 5

**Step 3** Click the **Preview** tab to display the list of dates that are included in the calendar. The calendar highlighting the dates displays on the right side of the page.

**Step 4** Click **OK** to close the dialog box.

---

## Creating a Recurring Calendar

A recurring calendar has a specified start date, time period, and duration for when the process repeats execution.

Use the Daily Recurrence calendar to specify the start and end date for a recurring calendar and the number of days.

You can specify the calendar to repeat on a daily, weekly, monthly, or yearly basis.



---

**Note** Use commas to separate multiple dates.

---

### Related Topics

- [Creating a Daily Calendar](#)
- [Creating a Weekly Calendar](#)
- [Creating a Monthly Calendar](#)
- [Creating a Yearly Calendar](#)

## Creating a Daily Calendar

The Daily Recurring calendar specifies the start and end date for a daily recurring calendar and the number of days in the daily recurrence cycle.

- 
- Step 1** Choose **Definitions > Calendars**, right-click and choose **New > Recurring Calendar**.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Choose **Recurrence > Recurrence Pattern > Daily**.
- Step 4** Select *one* of the following options to indicate how often the recurrence repeats:
- Every [ ] day(s)—Enter the number of days the recurrence is to repeat.  
For example, to have the recurrence repeat every other day, enter 2 in the text field.
  - For every [ ] day period, on the day(s)—Enter the number of days the recurrence cycle is to repeat or click **Select** to select the specific days within the day period from the Select Days dialog box.  
For example, to have the recurrence to repeat every 7 days on the first and last day of this time period, enter 7 in the text field and then click **Select** to select Day 1 and Day 7 on the **Select Days** dialog box.
- 

## Creating a Weekly Calendar

Use the Weekly Recurrence calendar to specify the start and end date for a weekly recurring calendar and the number of weeks in the recurrence cycle.

- 
- Step 1** Choose **Definitions > Calendars**, right-click and choose **New > Recurring Calendar**.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Choose **Recurrence > Recurrence Pattern > Weekly**.
- Step 4** Enter the number of weeks of the recurrence cycle.

- Step 5** Check the check boxes for the day(s) of the week the recurrence should occur.
- For example, to have the recurrence repeat every week on Monday and Friday, enter **1** in the text field and check the **Monday** and **Friday** check boxes.
- 

### Creating a Monthly Calendar

Use the Monthly Recurrence calendar to specify the start and end date for a monthly recurring calendar, and how often it repeats.

---

- Step 1** Choose **Definitions > Calendars**, right-click and choose **New > Recurring Calendar**.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Choose **Recurrence > Recurrence Pattern > Monthly**.
- Step 4** Enter the number of months in the recurrence cycle.
- Step 5** Use *one* of the following methods:
- On the following day(s)—Select this option to specify which day(s) the recurrence is to repeat.
    - In the text field, enter the appropriate numeric date(s) of the month.
    - Click **Select** to select the days from the **Select Days** dialog box.

For example, to have the recurrence repeat every day within the month, enter **1-31** or on the Select Days dialog box, select **Day 1** through **Day 31**.
  - For the specified week(s)—Select this option to specify which week(s) and day(s) of the week the recurrence is to repeat.
    - In the text field, enter which weeks the recurrence is to repeat.
    - Click **Select** to select the days from the Select Days dialog box.
    - Under **On the following day(s)**, check the check boxes for the days of the week the recurrence should occur.

For example, to have the recurrence repeat every week within the month, enter **1-4** or on the Select Weeks dialog box, select **Week 1** through **Week 4**.
- 

### Creating a Yearly Calendar

Use the Yearly Recurrence calendar to specify the start and end date for a yearly recurring calendar and how often it repeats.

---

- Step 1** Choose **Definitions > Calendars**, right-click and choose **New > Recurring Calendar**.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Choose **Recurrence > Recurrence Pattern > Yearly**.
- Step 4** Click **Select** to select the months from the Select Months dialog box.
- For example, to have the recurrence repeat every month within the year, enter **1-12** or in the Select Months dialog box, select **Month 1** through **Month 12**.
- Step 5** Use *one* of the following methods to specify the days within the selected months the recurrence should repeat:

- On the following day(s)—Select this option to specify which days of the months the recurrence is to repeat.
  - In the text field, enter the appropriate numeric dates.
  - Click **Select** to select the days from the Select Days dialog box.

For example, to have the recurrence repeat every day within the month, enter **1-31** or in the Select Days dialog box, select **Day 1** through **Day 31**.


- On the following month(s)—Select this option to specify which weeks and days of the month the recurrence is to repeat.
  - From the first drop-down list, select the appropriate week of the month (First, Second, Third, Fourth, Fifth, Last).
  - From the second drop-down list, select the appropriate day of the week.

For example, to have the recurrence repeat the first Monday of every month that is specified, select **First** and **Monday**.

---

## Scheduling a Process Based on a Calendar

---

- Step 1** In the Process Editor, choose **Toolbox > Processes**, highlight the name of the process you want to schedule, then choose **Process > Edit**.
  - Step 2** In the Process Properties pane, click the **Triggers** tab, then choose **New > Schedule** from the drop-down list.
  - Step 3** In the Schedule Properties dialog, choose an existing calendar from the **Calendar** drop-down list, or click **New** to create a new calendar (see [Authoring a Calendar](#)).
  - Step 4** Define any additional required properties. For example:
    - To define a recurring process that runs every 5 minutes, enter the **Start Time** (when the process should run on the days included in the selected calendar), the **Number of times to run the process**, and the **Time Interval**.
    - To schedule a process to run based on an equation evaluated at run time, see [Scheduling a Process to Run Only Under Certain Conditions](#).
  - Step 5** Click **OK**, then click **Save**  to save your changes.
- 

## Scheduling a Process to Run Only Under Certain Conditions

Using the Conditions tab in the Properties dialog, you can schedule a process to run based on an equation evaluated at run time. The process will be run only if the specified conditions are met.

- Step 1** In the Process Editor, choose **Toolbox > Processes**, highlight the name of the process you want to schedule, then choose **Process > Edit**.
- Step 2** In the Process Properties pane, click the **Triggers** tab, then choose **New > Schedule** from the drop-down list.
- Step 3** Click the **Conditions** tab.

- Use the Basic panel to create a simple variable condition using a variable to match to operator criteria. For example, you can insert a variable reference based on a schedule value such as the schedule name or the local time. Or click **Show advanced properties** to see additional variable references.
- Use the Advanced panel to create a more complex condition. You can define the properties of the conditions within the Advanced panel, as well as within the Properties dialog box.

For more information about using conditions, see [Adding Conditions](#).

**Step 4** Define any additional required properties, then click **OK**.

**Step 5** Click **Save**  to save your changes.

---

## Using a Calendar in a Condition

Calendars are “time” conditions that evaluate to *true* on the days in the specified calendar and between the specified start and end time. For more information about conditions, see [Adding Conditions](#).

---

**Step 1** In the Process Editor, you can:

- Add a condition to a process by choosing **Toolbox > Logic**, then drag a **Condition** or a **Condition Branch** into the workflow panel.
- Edit an existing process by choosing **Toolbox > Processes**, highlight the name of the process, then choose **Process > Edit**.

**Step 2** In the Properties panel, click **Advanced > New > Time Condition**.

**Step 3** Choose one of the calendars from the drop down list and adjust the start and end times as needed.

**Step 4** Click **Save**  to save your changes.

---







## Authoring Categories

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Process Orchestrator processes, tasks and several other elements of the functional model can be placed into categories. Categories in Process Orchestrator work just like Microsoft Outlook categories with respect to tagging objects for grouping in the UI. Objects such as processes can be in multiple categories. For example, a process can be both a network best practice and a security best practice.

The Categories feature provides a way to organize your processes based on your organizational or functional requirements. Cisco Process Orchestrator ships with predefined categories but provides the functionality for you to create your own business-specific categories. When creating a process, you can assign the process to a category. You can also add other categories to a category to create a hierarchy.

The following sections provide information about working with categories:

- [Creating Categories](#)
- [Adding Objects to a Category](#)
- [Viewing Process Properties from the Members Tab](#)

## Creating Categories

Categories can be used to organize your processes based on your business-specific requirements. Use the **Definitions > Categories** view to create a new category and add members to the category. You can also add members to a category when defining a process.

For additional information about defining a process, see [Chapter 5, “Authoring Processes.”](#)

- 
- Step 1** Choose **Definitions > Categories**, right-click and choose **New > Category**.
- Step 2** In the **New Category Properties** property sheet, update the properties for this category, then click **OK**.
- 

### See also

[Adding Objects to a Category](#)

[Viewing Process Properties from the Members Tab](#)

## Adding Objects to a Category

You can choose the objects (or create new objects) to be included as members of a category. Both processes and categories can be included as members of a category.


**Note**

The category membership of a locked process cannot be edited by other users. For more information about locked processes, see [Creating Processes as a Team](#).

- 
- Step 1** Choose **Definitions > Categories**, select a category, right-click and choose **Properties**.
- Step 2** Click the **Members** tab, then click **Add**.
- Step 3** In the Objects available for category membership dialog box, use one of the following methods to select objects:
- If the appropriate objects are listed under Select Category Members, choose the appropriate categories or processes to be included in the category, and click **OK**.
  - If the appropriate objects are not listed, click one of the following to create a new object, and click **OK**:
    - **New > Categories**—Define the properties of a new category
    - **New > Processes**—Define the properties of a new process.

The new object displays in the Select Category Members list. Highlight the new object and any other objects, as necessary. The selected items display on the Members tab.
- Step 4** Click **OK** to close the dialog box and complete the procedure.
- 

## Viewing Process Properties from the Members Tab

- 
- Step 1** Choose **Definitions > Categories**, select a category, right-click and choose **Properties**.
- Step 2** Click the **Members** tab. The processes and categories in the selected category are displayed.
- Step 3** To view the properties for a process or category in that list, select the object, right-click, and choose **Properties**.
-



## Advanced Authoring Concepts

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Cisco Process Orchestrator provides integrations with various technologies. Although it supports numerous types of integrations, at the core Process Orchestrator provides the individual steps that make up the workflows in processes; these are called *activities*. For example, Process Orchestrator provides:

- A set of String activities that you can use to manipulate string text and characters.
- A set of Table activities that you can use to modify the format for existing defined table variables. The available table variables can be defined as either a global or process variable.
- A Set Variable activity that you can use to place a collection of bits in a Process Orchestrator number.
- Knowledge base articles provide information to help understand the results of an activity, including a summary of what has occurred, the possible cause of the result, and suggested actions to take to resolve issues with an activity.

Note that:

- Modifying a process does not automatically modify an activity. Activity definitions are included in a process workflow and the activity properties must be modified separately from the process properties.
- Activities can only be modified in the Process Editor. With the appropriate rights from the Operations view, the Process Editor is launched when accessing the process properties.
- When user rights are restricted, the Process Viewer is launched with the properties displaying a display-only view after determining that the user cannot edit the activity.

The following topics describe these activities:

- [Using String Activities](#)
- [Using Table Activities](#)
- [Using Core Activities](#)
- [Authoring Knowledge Base Articles](#)

### Related Topics

For instructions about inserting a variable in an activity, see [Inserting Reference Variables](#).

## Using String Activities

You can use String activities to search, replace, and modify string content in the objects within Process Orchestrator. For example, you can:

| Activity Type    | Purpose                                                                                                                                                                                                                                                                                                                                         |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Find String      | Search for specific content in a string.                                                                                                                                                                                                                                                                                                        |
| Replace String   | Replace specific content substrings in a string.                                                                                                                                                                                                                                                                                                |
| Split String     | Split a string into multiple parts around matches of the given delimiter or delimiters.                                                                                                                                                                                                                                                         |
| String Escape    | Specify characters that must be escaped within a string so that the string can be inserted into messages or file names.                                                                                                                                                                                                                         |
| String Lowercase | Lower the text case in a string                                                                                                                                                                                                                                                                                                                 |
| String Uppercase | Capitalize the text case in a string                                                                                                                                                                                                                                                                                                            |
| Substring        | Return part of a string starting with the characters in the start position and ending with the character in the specified end position. For example:<br>Input string = <b>dictionary</b><br>Start position = <b>4</b><br>End position = <b>6</b><br>Dictionary<br>0123456 <- using 0 as the starting point<br>Positions 4 through 6 yield 'ion' |
| Trim String      | Trim characters from the content in a string. When no character is specified, the activity will trim all leading and trailing whitespace characters, including empty lines at the beginning and at the end.                                                                                                                                     |

# Using Table Activities

You can use Table activities to modify the format for existing defined table variables.



## Note

Any boolean and numeric values that are used by the Table activities in the product are not localized. Numbers use [ . ] for the decimal format regardless of the regional and language options. Boolean values for substitutable boolean must be *true* or *false* regardless of the installed language.

For example, you can:

**Table 7-1 Sample Table Activities**

| Activity Type         | Purpose                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add Row to Table      | Append new rows to a table variable. The row is added to the end of the table.<br>This activity will not work on tables that are outputs of other activities.                                                                                                                                                                                                                                       |
| Analyze Table         | Summarize and analyze data in a table variable or property using basic aggregation functions.                                                                                                                                                                                                                                                                                                       |
| Highlight Row         | Highlight selected rows of a table variable. Highlighted rows can only be displayed in an automation summary. Therefore you will not see the highlighted rows in Process Orchestrator unless you are viewing the automation summary.                                                                                                                                                                |
| Remove Row from Table | Remove one or more rows from a table variable based on specified criteria.<br>This activity will not work on tables that are outputs of other activities.                                                                                                                                                                                                                                           |
| Select From Table     | Query and select rows from a source table using specified criteria. The user can also determine the order of the rows selected as well as limit the number of rows displayed.                                                                                                                                                                                                                       |
| Set Table Variable    | Modify the value of a defined table variable. You must specify a name for the activity, choose the defined variable that you want to modify, and enter a new value for the table variable using a different table variable property.<br>The table variables used must match in their entirety, including the name of columns, number of columns, and the type of columns or the activity will fail. |
| Update Row in Table   | Update the selected rows of a table variable. The new rows become part of the variable being modified. You will not see the modified rows in the automation summary, but you can see the rows in the variable property pages in Process Orchestrator.<br>This activity will not work on tables that are outputs of other activities.                                                                |

## Read Table from Text

Read a comma-separated value (CSV) string variable and convert the text into a table with a specified set of columns.

Populate columns from first record in source text—Check this check box to use the first row data from the source text as table columns in the output result.

By enabling this check box, the Columns to read field is hidden.

When you enable this check box for existing activities with data in Columns to read field. All existing data in columns in read is deleted.

## Read Table from XML

Read an XML snippet and convert it into a table with a specified set of columns.

Populate columns from xml—Check this check box to use xml elements from the source xml as table columns in the output result.

By enabling this check box, the Columns to read field is hidden.

When you enable this check box for existing activities with data in Columns to read field. All existing data in columns in read is deleted.

For example:

### Row XML Element Name:

MyRow

### Columns to read:

|      |         |
|------|---------|
| Name | String  |
| Age  | Integer |

### Source XML:

```
<MyData>
  <MyRow>
    <Name>Jeff</Name>
    <Age>32</Age>
  </MyRow>
  <MyRow>
    <Name>Mark</Name>
    <Age>31</Age>
  </MyRow>
  <MyRow>
    <Name>Jay</Name>
    <Age>30</Age>
  </MyRow>
</MyData>
```

This produces a table with two columns (name, age), with three rows.

## Read Table from JSON

Read an JSON and convert it into a table with a specified set of columns.

JSON Path: Enter the JSON path to be used as columns.

Populate columns from JSON—Check this check box to use JSON elements from the source JSON as table columns in the output result.

By enabling this check box, the Columns to read field is hidden.

When you enable this check box for existing activities with data in Columns to read field. All existing data in columns in read is deleted. For example:

#### JSON Path:

```
$.store.book[*].author
```

#### Source JSON:

```
{
  "store": [
    {
      "book": [
        {
          "category": "reference",
          "author": "NigelRees",
          "title": "Sayings of the century",
          "price": 8.95
        },
        {
          "category": "fiction",
          "author": "Evelyn Waugh",
          "title": "Sword of Honour",
          "price": 12.99
        },
        {
          "category": "fiction",
          "author": "Herman Melville",
          "title": "Moby Dick",
          "isbn": "0-553-21311-3",
          "price": 8.99
        },
        {
          "category": "fiction",
          "author": "J.R.R. Tolkien",
          "title": "The Lord of the Rings",
          "isbn": "0-395-19395-8",
          "price": 22.99
        }
      ]
    }
  ],
  "bicycle": {
    "color": "red",
    "price": 19.95
  }
}
```

This produces a table with *author* as column name, with four rows containing author names. For example:

```
author
NigelRees
Evelyn Waugh
Herman Melville
J.R.R. Tolkien
```

## Join Tables

Join two tables with same schema's or with different schema's such as table from text, table from xml etc. and convert it into a table with a specified set of columns.

- Table1—Select table 1 by clicking the reference tool.
- Table2—Select table 2 by clicking the reference tool.

- **Join Type**—Select type of join from the drop-down list:
  - **Inner**—Displays all records that match the condition in both the tables, and records in both the tables that do not match are not reported.
  - **Left Outer**—Displays all the rows from the left table in conjunction with the matching rows from the right table. If there are no columns matching in the right table, it returns NULL values.
  - **Right Outer**—Displays all the rows from the right table in conjunction with the matching rows from the left table. If there are no columns matching in the left table, it returns NULL values.
  - **Union**—Displays matched and unmatched from both tables.
- **On Condition**—Select on condition for the table 1 and table 2 columns either by clicking the reference tool icon or by entering the column name manually in case of table from XML.



**Note** This mandatory field will be read only, if the selected join type is Union.

- **Results Column**—You can **Select All** or **Unselect All** or select the columns from the results column as needed.
- **Number of rows**—Click **All rows** or **At most** radio button by entering the appropriate number of rows.

This produces a table with two tables combined by selected join type and on condition entered for table 1 and table 2 column.

## Using Core Activities

Core activities are a set of items that span applications. For example, use the following activities to:

**Table 7-2** Sample Core Activities

Activity Type	Purpose
Calculate Date	Calculate a new date/time value based on a specified base date/time and adjustments.
Format Date	Convert the date and time into a string text format. For example: <b>Format string</b> yyyyMMdd hh:mm:ss tt <b>Original Date/Time</b> 10/23/2009 10:23:00 PM <b>Result</b> 20091023 10:23:00 PM
Correlate Process Event	Check whether a process event occurred within a certain amount of time of another problem (see <a href="#">Creating Correlate Event Activities</a> ).



Table 7-2 Sample Core Activities

Activity Type	Purpose
Create Automation Summary	<p>Generate an automation summary including data selected activities in a process. To generate the data output, choose the activity, then specify the section in the automation summary in which to output the data.</p> <p>An automation summary is a collection of data summarizing the objects included in the process and the data retrieved by the processing of the objects.</p> <p>The share path specified in the Core Functions Adapter properties will be used when viewing the automation summary reports.</p>
Find Targets	Among other use cases supported by this activity, you can find targets whose properties have certain values.
Insert Event	Define the configuration properties to be used to insert one event into Process Orchestrator Reporting Database.
Publish Metric	<p>Define the performance metric properties to be published into the Process Orchestrator Reporting Database and the Windows Management Instrumentation (WMI) provider.</p> <p>The metrics are published under the <i>root\TEO</i> name space through the WMI class, <i>TEO_PerformanceMetric</i>.</p>
XPath Query	<p>XPath queries navigate through XML documents and search through the document nodes. Use the XPath Query dialog box to enter the XPath properties to query from the source XML code.</p> <p>For additional information, see:</p> <ul style="list-style-type: none"> <li>• <a href="#">Adding an XPath Namespace Definition</a></li> <li>• <a href="#">XPath Query Example</a></li> </ul>
XSL Transform	Apply an XSLT transformation to a specific XML text. XSLT transformation can transform XML into plain text, HTML, or other XML.

## Adding an XPath Namespace Definition

An XML namespace provides a way to avoid element and attribute name conflicts within an XML document. An XML namespace is uniquely identified by a Uniform Resource Identifier (URI) and is assigned a prefix (unique to the XML document) used for its element and attribute names.

To add an XPath namespace:

- 
- Step 1** In the Process Editor, choose **Toolbox > Core Activities > XPath Query**, then drag and drop the activity onto the Workflow pane.
  - Step 2** Choose the **XPath Query** tab, then choose **Namespaces > New**.
  - Step 3** In the XPath Namespace Definition dialog, enter the prefix and URI for the new namespace, then click **OK**.
-

## XPath Example Syntax

The following expressions can be used when selecting nodes in a path expression.

Path Expression	Description
nodename	Selects all child nodes of the named node
/	Selects from the root node
//	Selects nodes in the document from the current node that match the selection no matter where they are
.	Selects the current node
..	Selects the parent of the current node
@	Selects attributes

## XPath Query Example

The following is an example of source XML.

### Example XML

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<bookstore>
<book>
  <title lang="eng">Harry Potter</title>
  <price>29.99</price>
</book>
<book>
  <title lang="eng">Learning XML</title>
  <price>39.95</price>
</book>
</bookstore>
```

The following example path expressions and related results are based on the preceding source XML.

Path Expression	Description
bookstore	Selects all child nodes of the bookstore element
/bookstore	Selects the root element bookstore <b>Note</b> If the path starts with a slash (/) it always represents an absolute path to an element.
bookstore/book	Selects all book elements that are children of bookstore
//book	Selects all book elements no matter where they are in the document
bookstore//book	Selects all book elements that are descendant of the bookstore element, no matter where they are under the bookstore element
//@lang	Selects all attributes that are named lang

For additional examples, see [http://www.w3schools.com/xpath/xpath\\_syntax.asp](http://www.w3schools.com/xpath/xpath_syntax.asp).

## XPath Query Example 2

In the following example, the elements prefixed with xdc are associated with a namespace whose name is <http://www.xml.com/books>, while those prefixed with h are associated with a namespace whose name is <http://msdn.microsoft.com/en-us/library/ms950779.aspx>.

---

### Example XML

---

```
<h:html xmlns:xdc="http://www.xml.com/books"
        xmlns:h="http://www.w3.org/HTML/1998/html4">
  <h:head><h:title>Book Review</h:title></h:head>
  <h:body>
    <xdc:bookreview>
      <xdc:title>XML: A Primer</xdc:title>
      <h:table>
        <h:tr align="center">
          <h:td>Author</h:td><h:td>Price</h:td>
          <h:td>Pages</h:td><h:td>Date</h:td></h:tr>
        <h:tr alignment">
          <h:td><xdc:author>Simon St. Laurent</xdc:author></h:td>
          <h:td><xdc:price>31.98</xdc:price></h:td>
          <h:td><xdc:pages>352</xdc:pages></h:td>
          <h:td><xdc:date>1998/01</xdc:date></h:td>
        </h:tr>
      </h:table>
    </xdc:bookreview>
  </h:body>
</h:html>
```

---

For additional examples, see <http://msdn.microsoft.com/en-us/library/ms950779.aspx>.

## Authoring Knowledge Base Articles

Knowledge base articles provide information to help understand the results of an activity, including a summary of what has occurred, the possible cause of the result, and suggested actions to take to resolve issues with an activity. Knowledge base articles can make automation summaries more usable, explaining how to use the information that is surfaced.

Knowledge base articles are referenced by specific activities and can be viewed in the following locations in Process Orchestrator:

- Operations Workspace—When viewing activity instance properties, you can view the display-only properties of the associated knowledge base articles by selecting the Knowledge Base tab.
- Process Editor—You can reference a knowledge base article to an activity when defining the activity properties in the Process Editor.
- Automation Summary—All referenced knowledge base articles will display on the automation summary.

The Definitions > Knowledge Base view displays the available knowledge base articles that can be assigned to a process activity or to a trigger. When Knowledge Base Articles is selected in the Navigation pane, the defined knowledge base articles display in the Results pane.

Process Orchestrator ships with predefined knowledge base articles, or you can create your own knowledge base articles to associate with activities in the process.

To create a knowledge base article:

- 
- Step 1** Choose **Definitions > Knowledge Base**, right-click and choose **New > Knowledge Base**.
- Step 2** On the **Knowledge Base** property pages, define the properties, including:
- **Summary**—A concise description of the issue.
  - **Possible cause**—An explanation of the condition that may be causing the issue. If necessary, enter multiple possible causes so that all possibilities are investigated.
  - **Possible resolution**—List of actions that can be performed to attempt to resolve the issue.
  - **Related information**—Additional information that may be relevant to the issue.
- Step 3** Click **OK** to close the dialog box.
-



## Monitoring Operations

---

The Operations workspace is used to monitor the processes that are scheduled to execute, view processes that are currently running, and verify that processes have successfully completed. The view also provides auditing information relating to system event history for actions that have occurred within Cisco Process Orchestrator and process information generated when the defined processes are executed.

The Getting Started > Operations view displays task shortcuts to view process instances, process instance activities, and the other system activity in the results pane. The following tasks can be performed from this view:

- **Monitor Operations**—Launches the Activity Views folder which includes the options to display information about the activities that are in progress, scheduled or have been completed. See **Operations—Activity Views** for more information.
- **View Auditing**—Launches the Auditing view which displays the system event history for actions that have occurred within Cisco Process Orchestrator. See **Operations > Auditing View** for more information.
- **Define New Objects**—Launches the Getting Started > Definitions view which displays the options for creating a new process and defining new objects to be associated with a process. See **Getting Started > Definitions** for more information.
- **Launch Web Console**—Launches the Cisco Process Orchestrator Web console to provide users with a web-based view of the scaled-back Operations workspace on the expert Cisco Process Orchestrator console.
- **Launch Timeline View**—Launches the Operational Timeline View of the activities in the form of histogram. The height of the projection corresponds to the number of activities in the interval represented. You can zoom the Timeline with mouse wheel scroll or a pinch-zoom gesture on a track pad or a touch screen device.

- **Track Current Time**—Check this checkbox to scroll the Timeline automatically, when the current time indicator goes out of scope.

This checkbox will be unchecked automatically if you scroll manually with the scrollbar, and in case you zoom closer than one minute interval.

- **Display activities**—Check this check box to display the activities in tree view along with the processes.

Tree view is a railroad diagram, with circles denoting process instances, and short horizontal bars denoting process instances. The tree view has text coloring that denotes the following:

Blue: Running instance.

Black: Succeeded instance.

Light blue: Instance which has not been started yet.

Orange: Canceled

Red: Failed

On the tree itself instances are colored randomly, one color for a process instance and its child activities. Two process instances are not guaranteed to get a different color, but there is a guarantee that they get the same color each time you see them, even after the view is reopened.

- Histogram level of details—This scrollbar allows you to adjust the level of detail of the histogram display of activity counts in the measured time intervals. With lower level of detail, more individual activity instances will fall into the longer intervals represented by the histogram bars.

You can filter by individual process instances. Click on the plus button in front of the process instance name in the tree view to add the filter for a process instance. The process instances that are selected for filtering are listed above the tree view. You can turn off the filtering temporary with the checkbox in front of the individual process instance filters or remove them. The plus button on the specific process instance becomes highlighted when there is such a filter. Clicking the plus button again will remove the filter.

These filters can be useful to drill down the hierarchy of the process instances. If an individual process instance is selected in the filters and is active, all of the child process instances will be displayed. You can also turn off individual filters, which is useful if you want to scope to specific child process instance.

When you scroll down a large tree view, some parent process instances would go out of scope, but if you see a child process instance or child activity of such an instance on screen, all of its parents will be displayed anyway in hatched color, so you always see all of the parents of every item you currently see on screen. A hatched color item could indicate that the parents are out of scope either by the vertical scroll position, either by the timeline view scroll position, and there is possibility something between them, which you could discover by scrolling.

The Operations workspace displays:

- The status of processes and activities executing, scheduled, or recently executed by the application.
- Alerts, incidents, and approvals in the product.
- System messages about status and errors within the Process Orchestrator server or adapters.

The options provided by this workspace include:

Navigation Item	Function
Getting Started	Displays task shortcuts to view process instances, process instance activities, and the other system activity in the results pane. For more information, see <a href="#">Filtering Views</a> .
Search Work	Displays the results of the query for processes and activities based on the specified filter options. For more information, see <a href="#">Searching Tasks</a> .
Target Views	Displays the defined targets and their associated process instances that are in progress, scheduled or have been completed. For more information, see <a href="#">Monitoring Target Views</a> .
Process Views	Includes all the defined processes and their associated activity instances that are in progress, scheduled or have been completed. For more information, see <a href="#">Monitoring Process Views</a> .

Activity Views	Includes a set of predefined views that displays information about processes, including the status of activities within the processes. For more information, see <a href="#">Monitoring Activity Views</a> .
Search Tasks	Displays the results of queried tasks based on the specified filter option. For more information, see <a href="#">Searching Tasks</a> .
Search IT Records	Displays only the alerts, incidents, and change requests created in Process Orchestrator. For more information, see <a href="#">Searching IT Records</a> .
Task Views	Displays all task activities and tasks that have been assigned to a specific user or group. Only users with administrative rights can create tasks from this view in Process Orchestrator. For more information, see <a href="#">Monitoring Task Views</a> .
Auditing	Displays the system logs for system events that have occurred within Cisco Process Orchestrator. For more information, see <a href="#">Monitoring Auditing Information</a> .

The Process Views folder includes all the defined processes and their associated activity instances that are in progress, scheduled or have been completed. From this view, you can see detailed information about all processes that have been triggered, executed adhoc, or are scheduled for execution.

You can review both process and activity instances in the Process Views folders when querying the properties and status of process instances. Each Process View has two separate results panes:

- The top results pane displays the process definitions for the selected view. This view also allows you, if you have the appropriate rights, to access the Process Editor to modify the configuration of the process, to start the process, and enable or disable the process.
- The bottom results pane is automatically filtered to show *only* the instances of the process whose definition is selected in the top panel.

The Definitions > Processes view displays all defined processes that are in the application. This includes all processes that have been authored in the Process Editor and the processes that have been imported in automation packs.

## Monitoring Target Views

Target views allow you to view ongoing automation in the context of the targets or services on which it acts. You can filter the list of all targets to focus in on a specific type, or by the name of a target such as an Cisco Intelligent Automation for Cloud service request. After selecting a target, you can see the processes that act on that target type and all process activity related to that target.

The Operations > Target Views folder displays the defined targets and their associated activity instances that are in progress, scheduled or have been completed.

## Monitoring Target Information

**Step 1** Choose **Operations > Target Views > View All**.

From this view, you can see detailed information about all targets, regardless of whether processes have or have not been executed against these targets. This view contains the following information:

- The Target Process Actions pane (top right) contains items that perform specific actions associated with the target selected in the Targets pane.
- The Target Activity pane (bottom) displays the processes that ran or are scheduled to run against the target selected in the Targets pane.

- Step 2** Select a target (in the top pane) for which you are interested in viewing the target activity. The list of processes appears in the Target Activity pane.
- Step 3** You can filter the results by process name, a range of dates, by a start or end period, by days to offset, by a specific time period, and so on.
- Step 4** To view additional (read-only) information about a process, highlight it and use one of the following methods to launch the Process Viewer:
- From the Target Activity pane, double-click the appropriate process instance.
  - From the Details pane, click any hyperlink (see [Details Pane, page 2-10](#)).

## Monitoring Process Views

The Operations > Process View folders display all processes that have been started, scheduled to start, started by a trigger, or started ad hoc. Each Process view display can be filtered to display by the name, category, or column view.

Use the Definitions > Processes View to display the defined processes.



**Note**

To add, remove, or sort column headings on the display, see [Configuring Columns](#).

## Monitoring Process Information

The Process View displays all the defined processes and their associated activity instances that are in progress, scheduled or have been completed. From this view you can view detailed information about all the processes that have been triggered, executed ad hoc, or are scheduled for execution.

- Step 1** Choose **Operations > Process Views**, then choose one of the following options.

Process View	Description
View Adhoc	Displays all process or activity instances that were executed manually and are in progress, have successfully completed, or failed
View All	Displays all process, activity, and scheduled process and activity instances that are in progress, have successfully completed, or failed
View Scheduled	Displays all process or activity instances that are in progress, have successfully completed, or failed and are also scheduled to execute



Process View	Description
View Started	Displays all process or activity instances that were executed (manually or automatically) and are in progress, have successfully completed, or failed
View Triggered	Displays only processes that were “triggered” (not processes that were manually executed or scheduled).

- Step 2** Select a process definition (in the top panel) for which you are interested in viewing the instances. The process information appears in the View Results pane.
- Step 3** Filter the results as necessary (see [Monitoring Process Views, page 8-4](#)).
- Step 4** To view additional information about an instance, highlight it and use one of the following methods to launch the Process Viewer:
- From the View Results pane, double-click the appropriate process instance.
  - From the Details pane, click any hyperlink (see [Details Pane, page 2-10](#)).

## Viewing Process Instance Workflows

A graphical view of a process workflow can be viewed from the Process Views area after a process has been launched. The information displayed on the Process Workflow Viewer is display-only.

- Step 1** Choose any of the four process views to display the process and activity instances in the Results pane.
- Step 2** From the Process Instance results pane, use *one* of the following methods to launch the Process Viewer:
- Double-click the appropriate process instance.
  - Highlight the appropriate process instance on the Process Views Details pane, then click any link in the General or Run Options tabs.
- Step 3** From the Activity Instance results pane, highlight the appropriate process instance, right-click and choose **Observe**.

## Canceling Running Process Instances

You can only cancel running process instances from the bottom View Results pane on any of the Process Views. You cannot cancel processes from the top Process results pane.

# Monitoring Activity Views

The Operations > Activity Views folders display processes and their associated activities that have been started, scheduled to start, started by a trigger, or started ad hoc. Each Activity view display can be filtered to display by the date/time of execution, category, or column view.

From this view, detailed information is provided about all the activity instances that are started, running and scheduled to run. If you have the appropriate security rights, you can create and modify tasks from this view.

Activity Views include a set of predefined views that display information about the status of activities within the processes. From this view, you can view activities that have been triggered, executed ad hoc, view all activities, and view all scheduled activities.

Certain activities display additional activity instance information. For example, there will be certain activities that generate information based on the defined properties of the activities. In those situations, the activity instance properties displayed from the Operations > Activity View will show the read-only configuration properties as well as the generated results of the configuration properties.

**Step 1** Choose **Operations > Activity Views**, then choose one of the following options:

Views	Descriptions
View Adhoc	Displays all process or activity instances that were executed manually and are in progress, have successfully completed, or failed during the selected time period
View Scheduled	Displays all process or activity instances that are scheduled to execute during the selected time period
View Started	Displays all process or activity instances that are in progress, have successfully completed, or failed during the selected display time period
View Triggered	Displays all process or activity instances that were triggered for execution (manually or automatically) and are in progress, have successfully completed, or failed during the selected time period

The selected view displays in the Results pane.

**Step 2** Use the Filter by [Object] drop-down list to display processes or activities according to its assigned category in the Results pane.

The default selection is <No Filter>. After the initial change to the selection, the last selected item displays.

**Step 3** Filter the results as necessary (see [Monitoring Process Views, page 8-4](#)).

**Step 4** To view additional information about an instance, highlight it and use one of the following methods to launch the Process Viewer:

- From the View Results pane, double-click the appropriate process instance.
- From the Details pane, click any hyperlink (see [Details Pane, page 2-10](#)).

## Modifying Activity View Format

To change an Activity View format, highlight an activity instance, right-click, and choose **View > [Format]**. Each of the activity views can display in one of these formats:

Activity View	Description
Flat	Displays all process instances and activity instances on the top-level with no expandable tree view.
Workflow	Displays the process instances and only one workflow instance (even if it has run multiple times) in an expandable tree-view format.
Activity (Default view)	Displays the process instances and all related activity instances (no matter how many times it has run) in an expandable tree-view format.

## Understanding Activity View Indicators

The process and activity views have certain indicators that provide status information.

### Status Indicators

The State column displays the status of the individual process and activity. The following indicators definitions display in the Results pane.

Status	Description
Succeeded	Process has completed successfully
Running	Process is in progress
Failed (Not Completed)	The process has failed and did not complete the process execution
Failed (Canceled)	The process has been canceled manually

### Color Indicators

The colors associated with the individual activities determine the status of the process and activity instances.

Indicator	Description
Blue	Process is in progress
Green	Process has completed successfully
Red	Process has failed and did not complete the process execution
Orange	Process has stopped

To customize these colors, choose **Tools > Customize**. For more information about customizing the color indicators, see [Customizing the Fonts and Colors](#).

## Filtering Views

You can filter the results by a range of dates, by a start or end period, by days to offset, by a specific time period, and so on.

- 
- Step 1** Choose **Operations** > **[Operation]** > **[Views option]**.
- Step 2** Use the Filter by [Object] drop-down list to display processes or activities according to its assigned category in the Results pane.

The default selection is *<No Filter>*. After the initial change to the selection, the last selected item displays.

- Step 3** On the [Views option] subheader, choose the appropriate category and time period to display.

For example, you can filter the results by:

- Object (category, name, description, automation pack, trigger name or type, or lock option)
- Date range (from and to)
- Start time or end time period




---

**Note** To use the current time as the Start Time or End Time period in which the activities are displayed, do not make any changes to Time menu options.

---

To modify the start and end times, choose:

- Start—Default option uses the current time on the Console
  - Back—Adjusts the number of hours that precede the current Console time
  - Forward—Adjusts the number of hours ahead of the current Console time
  - Current time period
- The navigation arrows located on each side of the Calendar icon select the next day on the Back and Forward options on the Start Date and End Date submenu.
- The Back arrow chooses the previous day prior to the currently selected day on the Back submenu for the starting and ending dates. For example, if *Yesterday* is currently selected, then clicking the **Back** arrow changes the display selection to *2 days before today*.
  - The Forward arrow chooses the day after the currently selected day. For example, if *Tomorrow* is currently selected, then clicking the **Forward** arrow changes the display selection to *2 days after today*.
- Calendar date
  - A specific date
  - Days to offset—Use the More option on the Before today and After today submenus to enter a specific number of days for the start date. Use **Select Day Offset** when the appropriate number of days to offset is not on the predefined list.

To specify days before the displayed value, select or enter a negative number.

- Time period to offset—Use the More option on the Back and Forward submenus to enter the specific hours and minutes for the end and start time. Click **Select Time Offset** when the number of hours and minutes to offset is not on the predefined list.

To specify hours or minutes before the displayed value, select or enter a negative number.

---

# Searching Work

The Operations > Search Work view displays the results of the query for processes and activities based on the specified filter options. The Search Work view displays all processes and activities that are scheduled to be performed during the selected display time period.

On the Operations workspace, choose **Search Work**.

## Monitoring Scheduled Work

- 
- Step 1** Choose **Operations > Search Work**.
- Step 2** To customize the information to be displayed in the Search Results table:
- a. Click **Customize Options**.
  - b. In the Select Search Filters dialog box, click the check boxes to the left of the appropriate options. If a check box remains unchecked, the results for that filter option will not display in the Search Results table. Click **OK**.
- Step 3** Filter the results as necessary (see [Monitoring Process Views](#)).
- Step 4** To view additional information about an instance, highlight it and use one of the following methods to launch the Process Viewer:
- From the View Results pane, double-click the appropriate process instance.
  - From the Details pane, click any hyperlink (see [Details Pane, page 2-10](#)).
- 

## Monitoring Task Views

Tasks allow a process to create an IT record or perform human interaction, and provide ownership and a lifecycle. Process Orchestrator enables the user to act on tasks within the operator console, which managers can use to set or change assignments to those on their staff. Assignment changes, state changes, and all other changes are audited, so you can keep track of exactly who did what in the system.

The Operations > Tasks view displays all tasks or all tasks that have been assigned to a specific user or group.

The Tasks display can be filtered to display by category, task type, and status. You can also decide which task view to display.

From this view, detailed information is provided about all the alerts, incidents, and other tasks that are assigned, in progress, or have been completed. If you have the appropriate security rights, you can create and modify tasks from this view.

**Step 1** Choose **Operations > Task Views**.

**Step 2** To access detailed information about a task view, click the **Task Views** folder and choose one of the following options.

Task View	Description
View Alerts	Displays all alerts
View All	Displays all tasks that are assigned, in progress, or have successfully completed
View Change Requests	Displays all change requests
View Incidents	Displays all incidents
View User Interactions	Displays all tasks that require user action

**Step 3** On the Task Views Header, choose the appropriate filtering options to display.

## Acting on Tasks

The following table summarizes some of the types of changes you can make to a task.

**Table 8-1** Summary of Actions

Action	Purpose
Changing a task state	See <a href="#">Resolving a Task</a> .
Adding a related task	Related tasks could be duplicates of one another or the resolution of the task that depends on the solution of the existing task. Choose <b>Operations &gt; Task Views</b> , highlight the appropriate task, right-click and choose <b>Properties &gt; Related &gt; Add</b> .
Adding a option to the input request select question	Create options for the input request select question.
Assigning a category to a task	Choose <b>Operations &gt; Task Views</b> , highlight the appropriate task, right-click and choose <b>Properties &gt; Categories</b> . For information about managing categories, see <a href="#">Authoring Categories</a>
Assign a duplicate alert	Indicate that the task is a duplicate of an existing task. Choose <b>Operations &gt; Task Views</b> , highlight the appropriate task, right-click and choose <b>Properties &gt; Related</b> .

**Table 8-1** Summary of Actions (continued)

Action	Purpose
Modifying the assignment properties for a task	Change the assignee or other assignment properties for the task. This includes taking ownership of the task, if necessary. Choose <b>Operations &gt; Task Views</b> , highlight the appropriate task, right-click and choose <b>Properties &gt; Assignment &gt; Assigned to</b>
Adding parameters for a task	Adding parameters for a task. A single task can include up to ten parameters. Choose <b>Operations &gt; Task Views</b> , highlight the appropriate task, right-click and choose <b>Properties &gt; Parameters &gt; Add</b> .

## Resolving a Task

Most users cannot resolve a task from the Process Orchestrator console because they do not have the rights to modify the task. In general, the user will launch the web console (see [Resolving a Task](#)) when attempting to resolve a task.

- 
- Step 1** Choose **Operations > Task Views**, highlight the appropriate task, right-click and choose one of the following:
- Resolve
  - Select a choice
- Step 2** Review the details of the task.
- Step 3** From the Status drop-down list, choose the appropriate status for the task resolution.
- Step 4** In the Add Notes text box, enter any notes related to the task resolution or status update.
- Step 5** Click **Submit** to resolve the task.

The Task details page is updated and displays the user name of who resolved or updated the task.

---

## Searching Tasks

The Operations > Search Tasks view displays all tasks created or defined in Process Orchestrator. The results of the query are based on the specified filter options. The following topics describe the available search options:

- [Customizing the Search Tasks Header](#)
- [Filtering Search Results](#)
- [Filtering Display by \[Objects\]](#)

## Customizing the Search Tasks Header

Use the Select Search Filters dialog box to customize the query header options. If the check box to the left of the option remains unchecked, then the filter option will not display on the designated Search header.

- 
- Step 1** Choose **Operations > Search Tasks > Customize Options**.
- Step 2** In the Select Search Filters dialog box, choose one of the following options, then click **OK**.
- Task Assignee—Displays the list of task assignee options
  - Created Time—Displays the time options to determine the time period for which item to display
  - Modified Time—Displays the time options to determine the time frame for which tasks to display
  - Task Status—Displays the available status values to filter
- 

## Filtering Search Results

Use the Filter pane in the Task Views header to display selected tasks in the results pane.

- 
- Step 1** Choose **Operations > Search Tasks**.
- Step 2** The **Filter by** drop-down list in the Task Views header contains several options that can be used to filter the results. Enter the search query information, then click **Search** to query the tasks.
- 

## Filtering Display by [Objects]

Use the Filter by [Object] drop-down list to display processes or activities according to its assigned category in the Results pane.

The default selection is <No Filter>. After the initial change to the selection, the last selected item displays.

To filter the display, choose the appropriate object from the Filter by drop-down list:

- Category—Choose the appropriate category from the list
- Name—Enter the names of process or activity
- Description—Enter description of process or activity
- Automation Pack—Enter the name of the automation pack for the process
- Trigger Name—Enter the name of a trigger
- Trigger Type—Choose a trigger type from the list
- Lock—Choose one of the following Lock options:
  - Locked by me
  - Locked by another user
  - Locked by anyone



- Unlocked

The results display in the Results pane.

## Defining Task Rules

Task rules provide a list of rules that act on new tasks or task changes to handle cases such as assignments, changing alert or incident severities, or setting customer-specific categories on tasks.

Whenever a task is created, Process Orchestrator goes through the settings and conditions of each task rule that is listed and enabled. If the conditions and settings in the rule are satisfied, the task rule is executed. Task rules are executed according to the order in which they are displayed in the list.

### Before You Begin

By default, only users with administrative rights can create and update task rules from the Definitions > Task Rules view. However, the security settings can be changed, if necessary, by the Process Orchestrator administrator.

---

**Step 1** Choose **Definitions > Task Rules**, then on the toolbar, choose **New > [Task Rule]**.

**Step 2** On the **[Task Rule]** property pages, define the properties.




---

**Note** The property pages might display as display-only if the task rule definition is shipped as part of the product or you do not have the appropriate rights.

---

- Click the **General** tab and enter the required information.
- Click the **Task Types** tab to select the task types to be executed by the rule.
- Click the **Conditions** tab and click the appropriate panel to indicate the type of condition equation to be used to trigger the task rule.
- Click the **Assign** tab and specify the assignees for task rule.

**Step 3** Click **OK** to close the property sheet.

---

You can create the following task rules:

**Table 8-2** Summary of Available Task Rules

Task Rule	Purpose
Assign Task Rule	Specify the users to be assigned to the task after the task rule has executed. To modify this rule, click the <b>Assign</b> tab on the <b>[Task Rule] Properties</b> property sheet.

**Table 8-2 Summary of Available Task Rules**

Task Rule	Purpose
Notify Task Rule	Specify the recipients to be notified after the task rule is executed. To modify this rule, click the <b>Notify</b> tab on the [Task Rule] Properties property sheet.
Update Task Rule	Specify the properties to be updated on the task after the task rule has executed. To add task properties to update after the task rule is executed: <ol style="list-style-type: none"> <li>1. Click the <b>Update</b> tab, click <b>Add</b> to add a new Property drop-down list to the Properties to Update section.</li> <li>2. From the Property drop-down list, select the item to update in the task.</li> </ol> To remove this rule, the Remove button removes the last property added to the list. For example, you cannot remove <i>Property 4</i> without removing <i>Property 5</i> from the list. To keep <i>Property 5</i> : <ol style="list-style-type: none"> <li>1. Update <i>Property 4</i> with the information from <i>Property 5</i>.</li> <li>2. Click <b>Remove</b> to remove <i>Property 5</i> from the list.</li> </ol>

## Adding Conditions to a Task Rule

Use the following steps to add a condition to a task rule.

- 
- Step 1** Choose **Definitions > Task Rules**, highlight the appropriate task, right-click and choose **Properties**.
- Step 2** On the [Task Rule] Properties property sheet, click the **Conditions** tab, then click the appropriate panel to indicate the type of condition equation to be used to trigger the task rule (see [Defining Task Rules](#)).
- Step 3** Click **OK** to close the property sheet.
- 

## Modifying Task Types in a Task Rule

Use the following steps to modify the list of task types affected by the task rule.

- 
- Step 1** Choose **Definitions > Task Rules**, highlight the appropriate task rule, right-click, and choose **Properties**.
- Step 2** On the [Task Rule] Properties property sheet, click the **Task Type** tab, then use one of the following methods:
- To add a task type to the list, check the check box to the left of the appropriate task type.
  - To remove a task type from the list, uncheck the check box to the left of the appropriate task type.
  - To include all the task types into the task rule, click **Select All**.
  - To exclude all the task types, click **Unselect All**.

**Step 3** Click **OK** to close the property sheet.

---

## Searching IT Records

The Operations > Search IT Records view displays only the alerts, incidents, and change requests created in Process Orchestrator. The results of the query are based on the specified filter options. You can search by the assignee, category, task type, and status.

## Monitoring Auditing Information

The Auditing View displays the system auditing logs for system events that have occurred within Cisco Process Orchestrator for each Process Orchestrator server in the environment. Use this view to:

- Display detailed information regarding system events that have occurred within Process Orchestrator, such as start and shut down time and error occurrences.
  - Filter the results by Orchestration Server name.
- 

**Step 1** Choose **Operations > Auditing > System**.

**Step 2** To view the audit logs for a specific server in your environment, enter the server name in the **Orchestration Server** filter text box.

**Step 3** From the Auditing Log Results pane, highlight the appropriate log entry, right-click and choose **Properties**.

**Step 4** To add, remove, or sort column headings on the display, see [Configuring Columns](#).

---





## Performing Basic Console Tasks

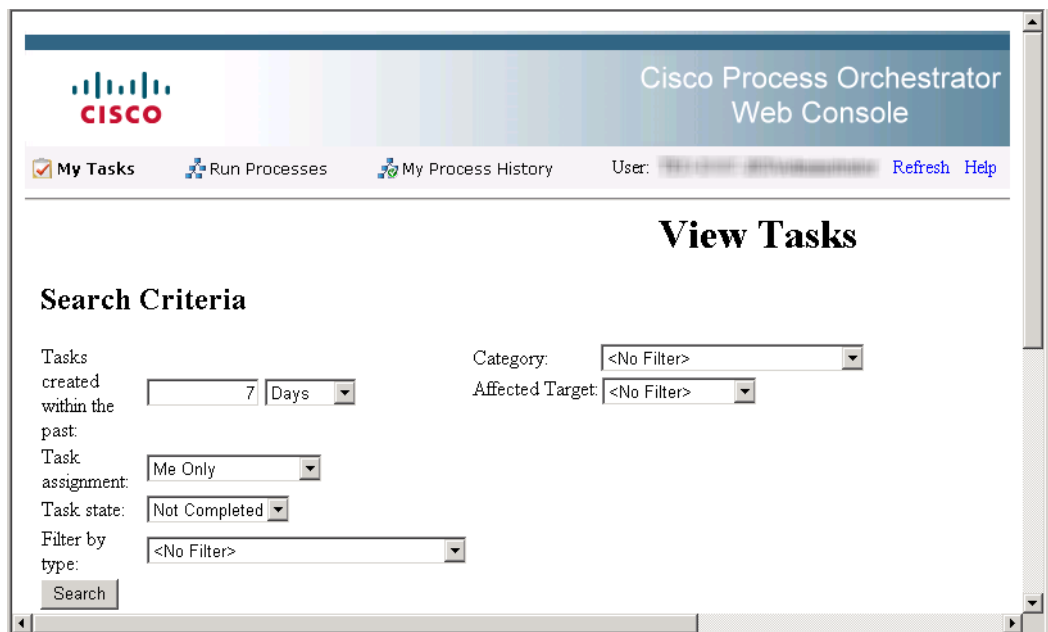
The Process Orchestrator Web Console provides a simplified web-based view to allow end users to interact with automation. The web console does not allow users to define processes but does allow them to start processes, monitor processes they started, or interact with human steps in processes called *tasks* (such as approvals). This interface is purposefully simplified to minimize the learning curve of the occasional user.



**Note**

The Web Console is typically not used when Process Orchestrator is used in conjunction with Cisco Prime Service Catalog. In these cases, end-user interaction occurs through the catalog rather than Process Orchestrator interfaces. The Web Console is typically only used in cases when Process Orchestrator is used independently.

**Figure 9-1** Cisco Process Orchestrator Web Console



For the Web Console to work properly, Internet Information Services must be installed on the computer on which the Web Console is installed. For information about installing and configuring IIS, refer to the *Cisco Process Orchestrator Installation Guide*.

You cannot create or modify processes on the Web Console. To modify a process, you must have the appropriate security rights and must access the Process Orchestrator console. If you think you should have access to the expert Process Orchestrator console, contact your manager to authorize your access.

Use the following sections for instructions on navigating and performing actions in the Web Console:

- [Launching the Web Console, page 9-2](#)
- [Performing Web Console Actions, page 9-2](#)

## Launching the Web Console

To use the Process Orchestrator Web Console, you must log in using your Windows credentials. If you have Windows integrated authentication configured, then logging in might not be required.

To access the Web Console, choose one of the following:

- Open the Cisco Process Orchestrator console and choose **File > Environment Properties** to see the web console location.
- Choose **Operations > Getting Started > Launch Web Console**.
- Choose **Start > All Programs > Cisco > Cisco Process Orchestrator > Cisco Process Orchestrator Web Console**.

## Performing Web Console Actions

The following sections describe some of the typical actions you can perform using the Web Console.

### Refreshing the Display

The Refresh option updates the information on the current web page.

To refresh the current view, use *one* of the following methods:

- Press **F5**.
- Click the **Refresh** tool.
- On the navigation bar, click **Refresh**.

The display refreshes with the latest information generated from the Process Orchestrator server.

### Viewing the My Tasks Page

Use the My Tasks page to navigate and manage Process Orchestrator tasks in the Web Console.

#### Before You Begin

To make sure the default search criteria is available after the initial search on the Process Orchestrator Web Console, enable the cookies in your browser.

- 
- Step 1** Launch the Web Console and click **My Tasks**.
- Step 2** Enter the search criteria, then click **Search**. Tasks can be filtered to display:

- Tasks created within a selected time period.

**Note**

Press Alt E to highlight the **Tasks created within the past** option.

- Tasks assigned to the currently logged in user or user group
- Tasks filtered according to the state of the task
- Tasks filtered according to the type of task
- The affected target (for example, the default SMTP server, automation service, or Process Orchestrator server) that the alert or incident describes
- Tasks filtered according to the category assigned to the task

The <No Filter> option allows the page to display all tasks regardless of the assigned state.

**Step 3** To view the task details, highlight the appropriate task, then click **View Details**.

## Resolving Tasks in the Web Console

- Step 1** Launch the Web Console, click **My Tasks**, then enter the search criteria to filter the display.
- Step 2** Highlight the appropriate task, then click **View Details** or press Alt V.
- Step 3** From the Status drop-down list, choose the appropriate status for the task resolution.
- Step 4** In the Add Notes text box, if available, enter any notes related to the task resolution or status update.
- Step 5** Click **Submit** to resolve the task.

## Taking Ownership of a Task

These steps are used when deciding to take ownership of a task that is unassigned or assigned to an entire group of which the current logged in user is also included.

- Step 1** Launch the Web Console, click **My Tasks**, then enter the search criteria to filter the display.
- Step 2** Highlight the appropriate task, then click **View Details**.
- Step 3** In the Add Note text box, add notes to the task, as necessary.
- Step 4** Check the **Take sole ownership of this task** check box, then click **Submit**.

## Starting Processes in the Web Console

The Run Processes page displays the processes that the user has access to run, are enabled, and have the Started by User trigger.

- Step 1** Launch the Web Console and click **Run Processes**, then enter the search criteria to filter the display. To filter the display by category, choose the appropriate category and click **Search**.
- Step 2** On the appropriate process, click **Start**.
- Step 3** If process has input variables, under **Start the process with the following parameters**, verify or modify the values:

Column	Description
Name	Name of the input variable
Value	Value assigned to the variable
Description	Brief description of the variable
Data Type	Type of variable <ul style="list-style-type: none"> <li>• Boolean—Indicates whether the set of elements is true or false</li> <li>• Hidden String—Holds data that must be protected from other Process Orchestrator users</li> <li>• Identity—Represents the value of a user identity</li> <li>• Numeric—A single whole or decimal number assigned (positive and negative)</li> <li>• String—Sequence of characters, such as letters, numbers, and punctuation marks displayed in a string of text</li> <li>• Table—Used to store a set of records in a table format</li> </ul>

- Step 4** If the process has multiple start points and you want to start a process from a specific point, check the **Start from start point** check box, then select the appropriate starting point. The first activity after the specified starting point will run first.
- Step 5** Under **This process will execute against [Target Name]. Would you like to override?**, choose *one* of the following options:
- Yes—To specify a target or target group different from the defined process target
  - No—To continue with the process execution
- Step 6** Click **Start** to start the process; click **Observe** to review the process execution details.

## Overriding the Process Target

With the appropriate rights, you can override the target of any manually-started process before process execution begins. To override the current process target, see [Starting Processes in the Web Console, page 9-3, Step 5](#).



**Note** Targets cannot be modified from the Web Console.



## Viewing My Process History

The My Process History page displays the processes that you have run in Process Orchestrator. You can filter the display of the processes you have launched and the details of the processes.

- 
- Step 1** Launch the Web Console, click **My Process History**, then enter the search criteria to filter the display. You can filter by:
- Processes that were started in a specified time period.
  - Process state—Display all processes in all states (same as <No Filter>), only the processes that have succeeded, or only the process that have failed.
  - Category—Filter by the category associated with the processes in the list. The <No Filter> option displays all processes regardless of the assigned category.
- Step 2** Click **Search** to modify the process list display.
- Step 3** On the appropriate process, click **View Details**. The Process Details page displays the summary information for the process.
- 

## Viewing an Automation Summary

An automation summary is a collection of data summarizing the objects included in the process and the data retrieved by the processing of the objects. On the web console, an automation summary can be launched from the following locations:

- Task detail page—Displays the task details of the task
- Process history page—Displays the details of the process activity

- 
- Step 1** Launch the Web Console.
- Step 2** Use *one* of the following methods:
- Choose **My Tasks**, highlight the appropriate task, then click **View Details**. After the task opens, choose **Automation Summary > View**.
  - Choose **My Process History**, highlight the appropriate process, click **View Details**, then click **View Automation Summary**.

The Automation Summary page displays the following information.

Field	Description
Situation Analysis	<p>After Process Orchestrator requires action, it performs deep analysis based on the type of situation identified.</p> <p>During situation analysis, Process Orchestrator captures volatile state and diagnostic information that may otherwise be difficult or impossible to capture manually.</p> <p>The <i>Situation Analysis</i> section displays below the overview information.</p> <p>Click the link in the upper portion of the summary to navigate directly to the <i>Situation Analysis</i> section or simply scroll to the section.</p>

Field	Description
Context Analysis	<p>Process Orchestrator analyzes all data points in context with each other to identify a situation that may require action.</p> <p>This information can be viewed in the <i>Context Analysis</i> section of the summary. The <i>Context Analysis</i> displays the symptom and possible causes.</p>

The topics in the following sections describe some of the more typical actions you can perform from the Process Orchestrator console:

#### Basic Actions

- [Refreshing the View, page 9-7](#)
- [Viewing and Modifying Object Properties, page 9-7](#)
- [Configuring the Navigation Pane, page 9-8](#)
- [Customizing the Fonts and Colors, page 9-8](#)
- [Changing the Process Display Icon, page 9-9](#)
- [Configuring the Display Refresh Rate, page 9-10](#)
- [Configuring Columns, page 9-10](#)
- [Searching for an Object, page 9-11](#)
- [Modifying the Console Time Zones, page 9-11](#)
- [Enabling and Disabling an Object, page 9-12](#)
- [Deleting an Object, page 9-12](#)

#### Setup Actions

- [Connecting to a Server, page 9-12](#)
- [Specifying Server Credentials, page 9-13](#)
- [Assigning Credentials to Processes and Activities, page 9-13](#)
- [Displaying Recent Servers, page 9-13](#)
- [Suspending Server Automation, page 9-15](#)

#### Properties

- [Viewing the Properties of an Object](#)
- [Viewing Activity Instance Properties, page 9-15](#)
- [Viewing Runtime Usage Properties, page 9-16](#)
- [Viewing the Used By Properties of an Object, page 9-16](#)
- [Viewing the History of an Object, page 9-16](#)

#### Creating Tasks

- [Creating an Alert Task, page 9-17](#)
- [Creating an Approval Request Task, page 9-19](#)
- [Creating a Change Request Task, page 9-19](#)

- [Creating a Guided Operation Task, page 9-20](#)
- [Creating an Incident Task, page 9-20](#)
- [Creating an Input Request Task, page 9-21](#)
- [Creating a Review Task, page 9-22](#)
- [Adding a Related Task, page 9-22](#)
- [Adding an Option to the Input Request Select Question, page 9-23](#)
- [Assigning a Category to a Task, page 9-23](#)
- [Assigning a Duplicate Alert, page 9-23](#)
- [Creating a Check Box Question, page 9-24](#)
- [Creating a Hidden Text Question, page 9-24](#)
- [Creating a Select Question, page 9-25](#)
- [Creating a Text Question, page 9-25](#)

#### Miscellaneous Tasks

- [Manually Changing the Status, page 9-26](#)
- [Modifying the Assignment Properties for a Task, page 9-26](#)
- [Specifying Parameters for a Task, page 9-26](#)
- [Resolving a Task, page 9-26](#)
- [Viewing Task History, page 9-27](#)
- [Reversing Process Changes, page 9-27](#)
- [Viewing the History of an Object, page 9-16](#)

## Refreshing the View

The Refresh option updates the information on the current view.

To refresh the current view, choose **View > Refresh**, or click **F5**.

## Viewing and Modifying Object Properties

- 
- Step 1** Click **Definitions > [Object]**, highlight the appropriate object, right-click and choose **Properties**.
  - Step 2** On the [Object] Properties property sheet, click the tabs to view and update the various properties for that object.
  - Step 3** Click **OK** to close the dialog.
-

## Configuring the Navigation Pane

The Navigation pane includes views that you use to perform specific functions in the product. You can customize the views that display in the Navigation pane and the order in which they display.

**Step 1** In the bottom right corner of the Navigation pane, click the >> icon.

**Step 2** Select the option for the appropriate action to be performed:

Field	Description
Show More Buttons	Select this menu item to add buttons (views) to the Navigation pane. This option is available only if all of the available views are not currently displayed.
Show Fewer Buttons	Select this menu item to remove buttons (views) from the Navigation pane. This option is available when there are navigation views that can be removed from the Navigation pane.
Button Configuration	Select this menu item to display the Button Configuration dialog box, where you can arrange the order of the navigation views.
Add or Remove Buttons	Select this menu item to display the list of views that can be displayed or hidden in the Navigation pane.

## Customizing the Fonts and Colors

The default formatting for the Console display can be updated through the Customize dialog box. The available items to update depend on the category selected.

**Step 1** Choose **Tools > Customize**.

**Step 2** From the Category drop-down list in the Customize dialog box (see [Using the Actions Menu, page 2-5](#)), select any of the following items, as necessary:

Field	Description
Console	Updates the display of the Console panel caption
Navigator	Updates the display of the Navigation pane
Activity	Updates the displayed processes on the Operations—Activity view
Calendar	Updates the display of the Calendar dialog box
Target	Updates the display of the color status on targets in the Operations workspace.
Definition	Updates the color status of the processes in the Definitions workspace
Task	Updates the color status of tasks in the Operations—Task view

**Step 3** Under Display items, select the item to be modified. The available items to update depend on the category selected.

**Step 4** Modify the following items as necessary, then click **OK**.

Field	Description
Font	Provides font and font size display options
Foreground	Provides a list of colors to appear on different items in the foreground. Click <b>Custom</b> to define a color not displayed in the list.
Background	Provides a list of colors to appear on different items in the background. Click <b>Custom</b> to define a color not displayed in the list.
Gradient Start	Provides a list of colors to appear graded from top the bottom. Click <b>Custom</b> to define a color not displayed in the list.
Gradient End	Provides list of colors to appear graded from bottom to top. Click <b>Custom</b> to define a color not displayed in the list.

## Matching a Regular Expression

The Match dialog box provides the ability to easily check the specified string text against a specified regular expression.

**Step 1** In the Process Editor, choose **Tools > Regex Matcher**.

**Step 2** In the Match dialog box, specify the following information to the regular expression:.

Field	Description
Source text	Enter the text to be validated against the specified regular expression.
Regular Expression	Specify a fixed string to represent the regular expression to be used in matching.
Match case	Check the check box to specify whether regular expression matching should be case-sensitive.
Matches found	Displays the matching regular expression.

## Changing the Process Display Icon

The following steps provide instructions on how to change the icon for the process that displays in the Process Views.

**Step 1** On the Process Properties pane, click the **Options** tab.

**Step 2** Under Display, check the **Use custom icon** check box and click **Select Icon**.

- Step 3** In the Select Images dialog box, the currently selected icons display to the right of the of the fields. To the right of both Image fields (*Small* or *Large*), click “...” to change the icon, then click **OK**.
- Step 4** In the Select Image dialog box, use *one* of the following options:
- To choose from the display of default icons, on the Common tab, click the appropriate icon and then click **OK**.
  - To choose an icon from a different location, click the **Custom** tab.
    - To the right of the Image path field, click “...” to insert the file path to the appropriate icon.
    - In the Display Name field, enter the name of the icon and click **OK**.
- Step 5** Click **OK**.
- 

## Configuring the Display Refresh Rate

Use the Refresh tab to specify the refresh rate for the Activity and Process Views.



**Note** Use the scroll buttons to the right of the text fields to change the numeric display one second at a time.

---

- Step 1** Choose **Tools > Options**, then click the **Refresh** tab.
- Step 2** Under Refresh, select the appropriate process and activity instance refresh rate (see [Using the Actions Menu, page 2-5](#)), then click **OK**.
- 

## Configuring Columns

The Choose Columns dialog box determines which columns display for a selected navigation item and the order in which the columns display. The available column headings vary depending on the selected item.

---

- Step 1** In the Navigation pane, select the appropriate item.
- Step 2** In the Results pane, right-click and choose **Choose Columns**.
- Step 3** Under Columns, use one of the following options to select the appropriate column heading to display:
- Check the check box for the column heading.
  - Highlight the column heading and click **Show**.
- Step 4** Choose any of the following options:
- a. To remove a column heading from the display, use one of the following options:
    - Uncheck the check box.
    - Highlight the column heading and click Hide.

- b. To change the order in which a column appears in the results pane, select the column heading and click **Move Up** or **Move Down**.
- c. To determine the width of a column, select the column heading and specify a value in the **Width of selected** column field.
- d. To reset the column settings to the default, click **Reset**.

**Step 5** Click **OK** to save the settings and close the dialog box.

---

## Searching for an Object

The Find dialog box locates an item with specific text in the current view.

---

**Step 1** Choose **Edit > Find**.

**Step 2** In the **Find what** text field, enter specific terms for the search query.

**Step 3** Check the following check boxes, as necessary:

- **Match case**—Selected when searching for term using the specific case in the **Find what** text field
- **Use regular expressions**—Select this item to query items that can contain special characters.

**Step 4** Click one of the following buttons to begin the search:

- **Find Previous**—Locates previous match in the search query
  - **Find Next**—Locates next match in the search query
- 

## Modifying the Console Time Zones

Use the Date & Times tab to specify the time zone that will be used to display date and time values throughout the application.

---

**Step 1** Choose **Tools > Options**, then click the **Date & Times** tab.


**Step 2** Under **Show dates and times using**, choose one of the following options to specify the time zone to be used, then click **OK**.

Field	Description
The current time zone of my computer	Select this radio button to display the date and time zone settings of the computer on which the application is installed.
The specified time zone	Select this radio button to select the time zone to be displayed throughout the application.

---

## Enabling and Disabling an Object

Most objects are enabled by default. If an object is manually disabled, it must be enabled before it is available. The disabled object is not removed from the list of objects in the Definitions > [Objects] Results pane.

- 
- Step 1** Choose **Definitions > [Objects]**.
- Step 2** Highlight the object, then in the Results pane, right-click and choose one of the following:
- **Enable**—The Enabled column on the Results pane changes to *True*.
  - **Disable**—The Enabled column on the Results pane changes to *False*.
- Step 3** If necessary, click the **Refresh**  tool to update the view.
- 

## Deleting an Object



### Note

If the object definition is shipped as a part of product or you do not have the appropriate rights, the Delete option will be disabled.

Use the Definitions > [Object] view to delete an object.

Before deleting an object, access the object's properties and click the **Used By** tab to view where this object is being referenced. This ensures that deleting the object does not affect any processes or activities.

### Notes

- The deletion process will fail if the object is referenced by other objects.
- A process variable is not completely deleted from a process until after the process has been saved.

## Connecting to a Server

Use this option when you want to connect to a different server used for process monitoring.

- 
- Step 1** Choose **File > Connect to Server**.
- Step 2** Choose a previously connected server from the Server drop-down list or enter the server's name, then click **OK**.

If the server is properly connected, the Cisco Process Orchestrator License Check dialog box displays. If the server does not properly connect, the Connect to Server dialog box displays.

---



## Specifying Server Credentials

The Specify Credentials check box on the Select Server dialog box displays the login pane used for entering the information to authenticate the server connection.

- 
- Step 1** Choose **File > Connect to Server**.
  - Step 2** In the Select Server dialog box, enter the server URL into the Server field or choose the server from the list.
  - Step 3** Check the **Specify Credentials** check box.
  - Step 4** Enter the user name required to access the server, the domain where the server resides, and the user password. Then click **OK**.
- 

## Displaying Recent Servers

The Recent Servers option displays all the servers recently accessed during the current session.

- 
- Step 1** Choose **File > Recent Servers**.
  - Step 2** To adjust the number of recent servers displayed:
    - a. Choose **Tools > Options > General > Most recently used servers**.
    - b. Enter the number of servers to display on the Recent Servers list on the File menu, then click **OK**.
- 

## Assigning Credentials to Processes and Activities

### Assigning Credentials to Processes

Use the Credentials tab to specify the runtime user that should be used for execution.

- 
- Step 1** Choose **Definitions > Processes**, right-click and choose Edit, or right-click Processes in the navigation pane and choose New Process.
  - Step 2** On the Process Editor properties, click the **Credentials** tab.
  - Step 3** Check the check box for the appropriate runtime user types to be included with the process.
  - Step 4** Click Select All to select all the available runtime users. Click the Unselect All to clear the selected runtime users availability for the process.
  - Step 5** In the Default runtime user section, select the appropriate runtime user that the process will run on by default.
- 

### Assigning Credentials to Activities

Use the Credentials tab to specify the runtime user that should be used for execution.

- 
- Step 1** In the Process Editor Toolbox, choose and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **Credentials** tab to define the properties specific to the activity, including:
- Use target's default runtime user—The default runtime user account that contains the credentials to connect to the target.
  - Use process runtime user—Use the credentials for the runtime user that was specified for the process.
  - Override process runtime user—Specify different credentials than what are used for the process. The selected runtime user overrides the runtime user that was specified for the process.
  - Use dynamic runtime user with the specified properties—Specify the credentials in the following JSON format to be used during the activity execution, for example:
- ```
{
  "Type": "RuntimeUser",
  "UserName": "user1",
  "Password": "string",
  "Description": "string"
}
```
- The credentials are created dynamically for the specific activity and gets deleted automatically once the activity is completed. For more information on JSON format, see <http://localhost:51527/swagger/ui/index/>.
- Step 3** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Modifying the Condition Branches

Use the Result Handlers tab to modify the list of condition branches on the process. You can add condition branches, specify the order of the condition branches, or remove condition branches from the process.

## Assigning a Category

- 
- Step 1** Choose **Definitions > Processes**, right-click and choose Edit, or right-click Processes in the navigation pane and choose New Process.
- Step 2** On the Process Editor properties, click the **Category** tab.
- Step 3** Click **Add** to launch the Select Categories dialog box and select the category to which the process is to be assigned.

## Suspending Server Automation

Use the Suspend Automation check box to suspend the execution of processes on the server. The enabled check box suspends any new process from being created and the server will no longer create instances of activities or processes.

- 
- Step 1** Choose **File > Environment Properties**.
  - Step 2** In the Environment Properties dialog box, check the **Suspend automation** check box.
- 

## Viewing the Properties of an Object

To view information about an object, highlight the object, right-click and choose **Properties**.

Properties are organized by tabs. For example, the General tab can include information such as the object name of the object and type, its status, a brief description, and whether the object is enabled or disabled. The properties that are displayed depend on the object type.

## Viewing Activity Instance Properties

- 
- Step 1** Select any of the activity views to display the process and activity instances in the Results pane (for example, **Operations > Activity Views > View Triggered**).
  - Step 2** In the Results pane, expand the appropriate instance to display the related activities.
  - Step 3** Highlight the appropriate activity, and use *one* of the following methods:
    - Double-click the appropriate activity instance.
    - Right-click and choose **Observe**.
    - From the Details pane, click any hyperlink (see [Details Pane, page 2-10](#)).
  - Step 4** To view activity instance properties, in the Results pane, expand the appropriate instance to display the related activities.
- 

## Viewing Environment Properties

The Environment Properties option provides a view of the properties for the entire high availability Process Orchestrator environment.

To view the environment properties, choose **File > Environment Properties**.

## Viewing Runtime Usage Properties

The Runtime Usage tab shows the list of running processes that is currently using that specific queue resource.

| Field               | Description   |
|---------------------|---|
| Display Name        | Displays the queue resource name.   |
| Process Name        | Displays the processes that uses the queue resource.                                      |
| Process Instance ID | Displays the process IDs of the running processes.  |
| Priority            | Displays the priority set on the queue block.   |
| Description         | Displays how many seconds the queue resource has been in allocated state for the process. |

## Viewing the Used By Properties of an Object

Use the Used By tab to display the objects that directly reference the selected object in their configuration. Because the Used By tab displays objects in a tree view, you can also display the objects that directly reference the top level objects for the selected object.

The objects at the top level are the objects that reference the selected object directly, but you can expand the listed objects and see their referenced objects. For example, if *object A* is used by *objects X* and *Y* and *object X* is used by *object Q*, then on the property pages of *object A*, you will see *X* and *Y* listed. If you expand the (+) *object X*, then *object Q* will display.

- 
- Step 1** Click **Definitions > [Object]**, highlight the appropriate object, right-click and choose **Properties**.
  - Step 2** On the [Object] Properties property sheet, click the **Used By** tab to view the objects that use that object.
  - Step 3** Click **OK** to close the dialog.
- 

## Viewing the History of an Object

Use the History tab to view a history of changes that have been made to an object. This is a display-only tab that does not require any user interaction.

- 
- Step 1** Click the **History** tab to view the changes made to the object.

The following information about the history of the object is displayed:

| Column       | Description   |
|--------------|---|
| Created by   | The user name of the person who created the object    |
| Created time | The date and time the object was created              |
| Time         | The date and time the action occurred                 |
| User         | The user name of the person that performed the action |


| Column      | Description                                     |
|-------------|---|
| Type        | The action that occurred                        |
| Description | Information about the action that was performed |


- Step 2** To view the audit history for a specific action, highlight the appropriate time, right-click and choose **Properties**.
- Step 3** Click **OK** to close the property sheet.

## Creating an Alert Task

Use the Alert task to create an alert regarding any potential problems. An alert reflects potential problems that a user might want to investigate and possibly diagnose the problem.

- Step 1** Choose **Operations > Task Views > New > IT Record > Alert**.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Alert** tab to enter the following criteria for the alert:
- Alert class—String or numeric value indicating the class of the alert.
  - Severity—Severity of the alert:
    - High—Interruption to critical business processes.
    - Normal—Interruption to the work of individual employees.
    - Low—Hindrane to the work of individual employees, continuation of work possible by means of a circumvented solution.
  - Automation Summary—Enter the file path for the related automation summary that was performed on the alert.
- Step 4** Click the **Affects** tab to specify the elements that trigger the selected target:
- This alert applies to the following target— Specify the affected target to be used in the activity.
  - Process target—Use the process target as the affected target in the activity.
  - Activity target—specify the affected target for a specific task activity.
    - Activity target—Select the activity containing the target that will be used. Only task activities will display in the list.
    - Specific target—Specify the affected target that will be used.
 

To view the properties for the selected target, click the **Properties**  tool. To create a new target, click **New > [Target]**.
    - Specific target group—Specify the affected target group that will be used.
 

To view the properties for the selected target group, click the **Properties**  tool. To create a new target group, click **New > [Target Group]**.

From the **Choose a target using this algorithm** drop-down list, specify which target will be chosen from the eligible target group members.

### Target Algorithms

Choose all targets that satisfy the specified criteria—Executes the process on all targets defined by the criteria specified in the Target Selection dialog box.

Choose any target that satisfies the specified criteria—Executes the process on any targets defined by the criteria specified in the Target Selection dialog box.

Choose the target with the specified name—Executes the process on the member of the group specified in the Name to match text field.

Select SAP target with the specified System ID—SAP System runs target against the SAP System database connection

- Choose the target with the specified name—Runs the process on the member of the group whose name is specified in **Name to match**.

- This applies to the following configuration item—Specify the configuration item to be used in the activity
- Name—Name of the configuration item (IT component) to which the alert pertains. For example, the name of a database server that failed or the name of a specific job that failed.
- Type—Enter the appropriate configuration item type or select the type of ITIL configuration item (IT component) from the list which the alert describes. For example, the type of the specific application element that failed (Application Server, Database, Host, or User).
- This is a CMDB reference—Indicate that the true source of the CI is in the CMDB, so the configuration item properties reference a CMDB entry.
- Object key—ID for the specific record in the CMDB that contains the configuration item
- Object source—Name for the specific record in the CMDB that contains the target configuration item
- Affected services—IT Service affected by the alert or incident
- Affected organizations—Organizations that consume the IT service affected by the alert or incident

**Step 5** Click the **Assignment** tab to manage the general task properties for the alert.

- Assigned to—User names assigned to the task
  - Add—Click **Add** to launch the Select Identity dialog box to add a user name to the list. Type the name of the assignee or to search for the assignee, click Browse to launch the Select User or Group dialog box to select the name of the person.
  - Remove—Select the user name and click this button to remove the user from list.
- Priority—Indicates the priority of the task
- Due date—Check the check box and select appropriate date the task should be completed from the drop-down calendar.
- Expiration date—Select the appropriate date the alert should expire from the drop-down calendar.

**Step 6** Click the **Notification** tab to specify the recipients to be notified when the task rule is executed.

**Step 7** Click the **Parameters** tab to define parameters for a specific task.

**Step 8** Click the **Notes** tab to enter any notes related to the task.

Click **Add** to launch the **Add Note Dialog Box** to add a specific set of notes to the task.

**Step 9** Click the **Categories** tab to assign an alert to a category or modify an existing assigned category for the task.

**Step 10** Click the **Related** tab to assign or modify an existing related task. The fields displayed depend on the task selected.

- Step 11** Click the **External** tab to specify the external incident information to support the synchronization between Cisco Process Orchestrator and the system that the customer is using.
- Step 12** Enter the information in the remaining tabs as necessary, then click **OK** to complete the task definition.
- 

## Creating an Approval Request Task

Use the Approval Request task to specify the user or group required to approve a task including the message associated for the approver.

- Step 1** Choose **Operations > Task Views > New > User Interaction > Approval Request**.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Approval** tab and enter the following criteria:
- **Message**—Message that informs the approver what is being requested
  - **Approval Choices**—The approval choices available (Add, Remove)
  - **Choice**—Enter the appropriate approval choice
- Step 4** Enter the information in the remaining tabs as necessary, then click **OK** to complete the task definition.
- 

## Creating a Change Request Task

Use the Change Request task to request a modification to the configuration of an object or system. Change requests are used to request system enhancements, report problems with a system, or report changes from one system which affects another system.

- Step 1** Choose **Operations > Task Views > New > IT Record > Change Request**.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Change Request** tab to enter the following criteria for the task:
- **Change request identifier**—Cisco Process Orchestrator generated ID number for the change request task
  - **Change request class**—Numeric value indicating the class of the change request
  - **Reason for change**—Describes the business justification for the request
  - **Change timing**—Enter the deadline date or time for the change
  - **Severity**—Severity of the change request (High, Normal, Low)
  - **Automation Summary**—Enter the file path for the related automation summary that was performed on the change request.
- Step 4** Enter the information in the remaining tabs as necessary, then click **OK** to complete the task definition.
-

## Creating a Guided Operation Task

Use the Guided Operations activity to detail the steps a user makes when handling an assigned task.

- 
- Step 1** Choose **Operations > Task Views > New > User Interaction > Guided Operation**.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Guided Operation** tab and enter the step-by-step process for handling the task.
- **Alert**—Alerts reflect potential problems that a user may want to investigate and possibly diagnose the problem
  - **Approval Request**—Specifies the message and choices for the assignee who is approving the task
  - **Guided Operation**—Details the steps a user takes to complete an assigned task
  - **Incident**—Task requires an operator to take action in order to resolve an issue
  - **Input Request**—Task requires input from an individual or group
  - **Review**—Task assigns a document for review
- Step 4** Enter the information in the remaining tabs as necessary, then click **OK** to complete the task definition.
- 

## Creating an Incident Task


Use the Incident task to create a create a task that requires an operator to take action in order to resolve an issue.

Click the hyperlink to display field descriptions for the appropriate tab. Click the hyperlink again to remove the displayed field descriptions.


- 
- Step 1** Choose **Operations > Task Views > New > IT Record > Incident**.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Incident** tab to enter the criteria for the incident.
- **Incident Identifier**—ID of the incident
  - **Reporting user**—User name of the individual who reported the incident and contact information of the user who called IT to report the problem
  - **Reporting user details**—Contact information of the individual who reported the incident
  - **Severity**—Severity of the incident (High, Normal, Low)
  - **Automation Summary**—Enter the file path for the related automation summary that was performed on the alert
- Step 4** Click the **Affects** tab to specify the elements that trigger the selected target:
- **This alert applies to the following target**— Specify the affected target to be used in the activity.
  - **Process target**—Use the process target as the affected target in the activity.
  - **Activity target**—specify the affected target for a specific task activity.
    - **Activity target**—Select the activity containing the target that will be used. Only task activities will display in the list.



- Specific target—Specify the affected target that will be used.

To view the properties for the selected target, click the **Properties**  tool. To create a new target, click **New > [Target]**.

- Specific target group—Specify the affected target group that will be used.

To view the properties for the selected target group, click the **Properties**  tool. To create a new target group, click **New > [Target Group]**.

From the **Choose a target using this algorithm** drop-down list, specify which target will be chosen from the eligible target group members.

- Choose the target with the specified name—Runs the process on the member of the group whose name is specified in **Name to match**.
- This applies to the following configuration item—Specify the configuration item to be used in the activity
- Name—Name of the configuration item (IT component) to which the alert pertains. For example, the name of a database server that failed or the name of a specific job that failed.
- Type—Enter the appropriate configuration item type or select the type of ITIL configuration item (IT component) from the list which the alert describes. For example, the type of the specific application element that failed (Application Server, Database, Host, or User).
- This is a CMDB reference—Indicate that the true source of the CI is in the CMDB, so the configuration item properties reference a CMDB entry.
- Object key—ID for the specific record in the CMDB that contains the configuration item
- Object source—Name for the specific record in the CMDB that contains the target configuration item
- Affected services—IT Service affected by the alert or incident
- Affected organizations—Organizations that consume the IT service affected by the alert or incident

**Step 5** Click the **Related** tab to assign or modify alerts that originated the incident.

**Step 6** Enter the information in the remaining tabs as necessary, then click **OK** to complete the task definition.

## Creating an Input Request Task

Use the Input Request task to create a set of questions requiring a user or group response in order to gather a large set of information.

**Step 1** Choose **Operations > Task Views > New > User Interaction > Input Request**.

**Step 2** Click the **General** tab and enter the required information.

**Step 3** Click the **Questions** tab and enter the following criteria for the input request:

- Input request message—Introductory message for the input request
- Questions presented on the input request—Displays the input request question properties
  - Question—Input request question
  - Type—Type of question (text, select, check box)
  - Default Value—Default answer for the question

- **New**—Use this option to create a specific type of input request question. Click **New** each time to create additional questions for the input request.
    - **Text**—Launches the Text Question Properties dialog box to allow the user to define a text question.
    - **Hidden value text**—Launches the New Hidden Text Properties dialog box to allow the user to define a question requiring an encrypted value as a response.
    - **Check box**—Launches the Check box Question Properties dialog box to allow the user to define a question utilizing a check box.
    - **Select**—Launches the Select Question Properties dialog box to allow the user to define a text question.
  - **Properties**—Modifies the properties for the question.
- Step 4** Enter the information in the remaining tabs as necessary, then click **OK** to complete the task definition.
- 

## Creating a Review Task

Use the Review task to submit a document for review as well as provide a message for the reviewer.

---

- Step 1** Choose **Operations > Task Views > New > User Interaction > Review**.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Review** tab to enter the following criteria for the review request:
- **Message**—Read-only display of message that informs the reviewer what is being requested
  - **Document to review**—Click **Browse** to locate document or automation summary to be reviewed. The following example is the display for the file path for the document.  
C:/Documents and Settings/user name/My Documents/
- Step 4** Enter the information in the remaining tabs as necessary, then click **OK** to complete the task definition.
- 

## Adding a Related Task

Related tasks could be duplicates of one another or the resolution of the task is dependent on the solution of the existing task.

---

- Step 1** Choose **Operations > Tasks Views**, highlight the appropriate task, right-click and choose **Properties**.
- Step 2** Click the **Related** tab to modify the list of tasks related to the opened task.
- Step 3** Click **Add** to launch the Select Task dialog box.
- Step 4** Use *one* of the methods to choose a category:
- To choose a single category, highlight the appropriate category.
  - To choose multiple categories, press **CTRL** and hold the key while making the appropriate selections.

- Click **New** to create a new related task.

**Step 5** Click **OK** to close the dialog box.



**Note** On the **Related** tab, you can click **Remove** to remove the task from the list. This action does not delete the task from the system.

## Adding an Option to the Input Request Select Question

Use the following steps to create options for the Select question. Repeat the steps for each additional option.

**Step 1** On the **New Select Properties** dialog box, click **New**.

**Step 2** Enter the label name and value for the selection, then click **OK**.

The new selection displays on the **New Select Properties** dialog box under the **Selections** area.

## Assigning a Category to a Task

**Step 1** Choose **Operations > Tasks Views**, highlight the appropriate task, right-click and choose **Properties**.

**Step 2** Click the **Categories** tab to modify the list of categories assigned to the task.

**Step 3** Click **Add** to launch the **Select Categories** dialog box.

**Step 4** Use *one* of the methods to choose a category, then click **OK**.

- To select a single category, highlight the appropriate category.
- To select multiple categories, press **CTRL** and hold the key while making the appropriate selections.



**Note** On the **Related** tab, you can click **Remove** to remove the category from the list. This action does not delete the category from the system.

## Assigning a Duplicate Alert

This task can be auto-populated if the duplicate task criteria defined in the **Create Alert** activity has been met.

**Step 1** Choose **Operations > Tasks Views**, highlight the appropriate task, right-click and choose **Properties**.

**Step 2** Click the **Related** tab to indicate the task is a duplicate of another task.

**Step 3** Click **Browse** to launch the Select Tasks dialog box.

**Step 4** Use *one* of the following to choose a duplicate task, then click **OK**.

- To choose a single task, highlight the appropriate task.
- To choose multiple tasks, press **CTRL** and hold the key while making the appropriate selections.
- Click **New** to create a new task.



**Note** On the Related tab, you can click **Remove** to remove the selected task from the field. This action does not delete the task from the system.

## Creating a Check Box Question

Use a Check Box question in an Input Request task to check a specific selection to a defined question. For example, create this task type to allow assignees to respond with an answer such as *True/False* or *Yes/No* to the question.

**Step 1** Choose the **Input Request > Questions** tab, click **New > Check Box**.

**Step 2** Enter the following information to create or modify questions that contain a check box:

- ID—Unique ID for the input request question (Default: Q1)
- Question—The question for the input request
- Default value—Default value to be used for the question

**Step 3** Click **OK** to create the new question.

The new question displays on Input Request > Questions tab under the Questions presented on the input request area.

## Creating a Hidden Text Question

Use the Hidden Text Properties dialog to create or modify Hidden text questions for an input request. An example of an encrypted value includes values such as passwords.

An encrypted value will be available from the Insert Variable Reference dialog and can be used in providing a response to the Hidden text question. The encrypted value is only to be used when the question type is a Hidden text question.

**Step 1** Choose **Input Request > Questions**, then click **New > Hidden Text**.

**Step 2** Enter the following information for the question:

- ID—Unique ID for the input request question (Default: Q1)
- Question—The question for the input request

**Step 3** Click **OK** to create the new question.

---

## Creating a Select Question

A Select question in an Input Request task allows the user to choose a single option from a list of answers to a defined question.

---

**Step 1** Choose **Input Request > Questions**, then click **New > Select**.

**Step 2** Enter the following information to create or modify questions that contain a check box:

- ID—Unique ID for the input request question (Default: Q1)
- Question—Enter the question for the input request
- Selections—Displays the input request question properties:
  - Label—Input request question
  - Value—Default answer for the question
  - New—Use this option to launch the Select Choice dialog box to create a selection for the input request question. For additional information, see [Adding an Option to the Input Request Select Question, page 9-23](#).
- Properties—Modifies the properties for the selected option
- Delete—Removes the selected option from the list

**Step 3** Click **OK** to create the new question.

The new question displays on Input Request > Questions tab under the Questions presented on the input request section.

---

## Creating a Text Question

A Text question in an Input Request task allows the user to enter a text or numeric value to the question.

---

**Step 1** Choose **Input Request > Questions**, then click **New > Text**.

**Step 2** Enter the following information for the text question:

- ID—Unique ID for the input request question (Default: Q1)
- Question—The question for the input request
- Default value—Default value to be used for the question

**Step 3** Click **OK** to create the new question.

The new question displays on Input Request > Questions tab under the Questions presented on the input request area.

---

## Manually Changing the Status

- 
- Step 1** Choose **Operations > Tasks Views**, then highlight the appropriate task, right-click and choose **Properties**.
- Step 2** Click the **General** tab and enter the following information, then click **OK**.
- Display name—Name of the task
  - Status—Choose the appropriate status of the task. The statuses displayed depend on the currently open task.
  - Description—Brief description of the task
- 

## Modifying the Assignment Properties for a Task

Use the following steps to change the assignee or other assignment properties for the task. This includes taking ownership of the task, if necessary.

- 
- Step 1** Choose **Operations > Tasks Views**, highlight the appropriate task, right-click and choose **Properties**.
- Step 2** Click the **Assignment** tab to modify the assignment properties for the task.
- Step 3** Under **Assigned to**, change the list owners for the task.
- Step 4** Modify the task priority, the date the task should be completed, and the expiration date, then click **OK**.
- 

## Specifying Parameters for a Task

A single task can include up to 10 parameters.

- 
- Step 1** Choose **Operations > Tasks Views**, highlight the appropriate task, right-click and choose **Properties**.
- Step 2** Click the **Parameters** tab, then click **Add**.
- Step 3** Enter the appropriate information for the task, then click **OK**.
- 

## Resolving a Task

### Before You Begin

Only users with administrative rights can update tasks from the **Operations > Task** view in Cisco Process Orchestrator.

- 
- Step 1** Choose **Operations > Tasks Views**, highlight the appropriate task, right-click and choose *one* of the following:

- Resolve
- Select a choice

**Step 2** From the Status drop-down list, choose the appropriate status for the task resolution, then click **Submit**.

---

## Viewing Task History

Use the History tab to view a history of changes that have been made to the task.

- 
- Step 1** Choose **Operations > Task**, highlight the appropriate task, right-click and choose **Properties**.
- Step 2** Click the **History** tab to view the changes made to the task.
- Step 3** To view the audit history for a specific action, highlight the appropriate item, right-click and choose **Properties** to display the Audit Properties dialog box.
- Step 4** Click **OK** to close the dialog box.
- 

## Reversing Process Changes

This item is used when changes have been made to the process definition, but are no longer necessary. This option deletes all changes made since you last saved the process. If you have saved the process and have not made any additional changes, then no action will be taken.

To reverse process changes, choose **File > Revert**.

The process reverts back to the last saved version of the process. All activities, components, and other changes are removed from the process definition.

## Deleting a Calendar

Choose **Definitions > Calendars** to delete calendars that are no longer used. Before deleting a calendar, access the properties, then select the **Used By** tab to view where objects are being used by the calendar. The calendar deletion process fails if the calendar is used by another object.

If the calendar definition is a core product or the user does not have the appropriate rights, the *Delete* option will be disabled.

## Removing Dates from a Calendar List

- 
- Step 1** Choose **Definitions > Calendars**, highlight the appropriate calendar, right-click, and choose **Properties**.

To remove a calendar from either list, highlight the appropriate calendar and click **Remove**.

Certain features of the property pages may display as display-only if the calendar definition is shipped as part of an automation pack or the user does not have the appropriate rights.

- Step 2** Click the **Dates** tab, highlight the appropriate date, and drag it onto the calendar displayed to the right.
  - Step 3** Click the **Preview** tab to review the schedule, then click **OK**.
- 

## Applying a Value to a Target-Specific Target Property

Use the Target Values tab to specify a target property value for a specific target. This values overrides the default target property value.


- Step 1** Choose **Definitions > Target Properties**, highlight the appropriate target property, right-click and choose **Properties**.
  - Step 2** Click the **Target Values** tab to specify a target property value for a specific target.
  - Step 3** Click **New** to launch the Target Properties dialog box.
  - Step 4** To add a specific target to the target property, click **Add** to launch the Select Targets dialog box.
  - Step 5** On the Select Targets dialog box, select the targets to be added to the target property.
  - Step 6** Use the Value field to modify the value assigned to the targets assigned to the target property. The fields displayed depend on the type of extended target property.
  - Step 7** Click **OK** to close the dialog box.
- 

## Viewing Target Properties

Use the Definitions—Target Properties view to access the properties of the target property.

- Step 1** Choose **Definitions > Target Properties**, highlight the appropriate target property, right-click and choose **Properties**.
- Step 2** Click the **General** tab to view information such as Target name, owner, data type, and description.
- Step 3** Click the **Group** tab to view information about the primary property group name, secondary property group name, and the grouping index.
- Step 4** Click the **Target Types** tab to view the information about the Target types that are chosen.

## Inserting Reference Variables

The Reference  icon displayed next to a text field indicates that the field can be populated by referencing a defined variable or the property of another activity or process. Use the Insert Variable Reference dialog box to select a defined variable or reference an object to populate a field. The OK button does not activate until a valid property or variable is selected.

Depending on the object type, some of these variables might not be available.



| Reference Variable              | Description   |
|---------------------------------|---|
| Notes                           | Description for the virtual machine   |
| Name                            | Display name of the object  |
| Created by / Owner              | User name or the owner of the object  |
| Creation Time                   | The date and time the object was created  |
| Modified by                     | User name of the individual who modified the object   |
| Modification Time               | The date and time the object was modified   |
| Type                            | Type of object  |
| Is Normal Status                | Status is normal and indicates that there are no known problems with this object              |
| Is Unreachable Status           | Status is unreachable which indicates that there are no known problems with this object       |
| Status Information              | Detailed information regarding the target status and the reasons for object being unreachable |
| Target ID                       | ID number assigned to the object  |
| Authentication                  | String used by the client for authentication  |
| Polling interval                | Interval to query the system  |
| Port                            | Port number used to access the server port  |
| Server                          | Host name or the IP address of object server  |
| Description                     | Description of the activity   |
| Audit Starts                    | Date and time the process audit starts  |
| Audit Successes                 | Indicates the number of successful audits   |
| End Time                        | Date and time the activity stopped  |
| Error Information               | Description of the error that has occurred  |
| Group Name                      | Name of toolbox activity group  |
| Instance Canceled               | Indicates the process was canceled manually   |
| Instance Failed                 | Indicates the process has failed  |
| Instance Failed (Completed)     | Indicates the process has failed but the process execution was completed                      |
| Instance Failed (Not Completed) | Indicates the process has failed and did not complete the process execution                   |
| Start Time                      | Date and time the activity was started  |
| Process Id                      | ID number of the Process Orchestrator process   |
| Process Instance Id             | ID number of the Process Orchestrator process instance  |
| Entry ID                        | ID number assigned to the object entry  |
| Incident Id                     | Incident ID of the object property  |
| Back Link Id                    | ID number assigned to the first item in the item relationship                                 |

|                 |  |
|-----------------|--|
| Forward Link Id | ID number assigned to the second item in the item relationship |
| Work Info Id    | ID number of the work info entry                               |
| Results         | Results of the activity  |
| Field Values    | Value of the property  |



## Performing Administrative Actions

Use the Administration workspace to perform administrative actions within the product, including:

- Managing Process Orchestrator servers in a high availability environment
- Determining what Process Orchestrator objects users are allowed to view, create, or modify
- Enabling time zones to be used when configuring processes
- Configuring adapters
- Creating and managing the report database, and running reports

The Administration > Getting Started view provides the initial access to the Administration pane.

In this view, the following administrative actions are available:

| Options  | Description   |
|--|---|
| View Security  | Launches the Administration > Security view to display the rules that ship with the product                           |
| Create or Modify Cisco Process Orchestrator Reporting Database | Launches the Administration > Database Settings view where you can view reports, create or modify the report database |

The following topics guide you through accessing the Administration workspace and using the features in this view.

- [Managing Properties](#)
- [Managing Database Settings](#)
- [Configuring Security](#)

The Administration workspace contains navigation items that define the various administrative components that are used to manage Cisco Process Orchestrator.

- Security—View the security groups to which users can be added and the objects to which privileges are granted
- Time Zones—View the available time zones that can be used in processes
- Adapters—View and configure the adapters that are installed. You can also view what objects the adapter provides in the product.
- Database Settings—Create a new report database or modify the properties of an existing report database
- Automation Packs—Displays the automation pack that is associated with the security role in the product

# Managing Properties

## Viewing Process Orchestrator Server Properties

- 
- Step 1** Choose **Administration > Orchestration Servers**, and double-click the server name.
- Step 2** In the Properties dialog, click the **General** tab to view the properties for the Orchestration server.
- Step 3** Click the **Prerequisites** tab to view the status of the server.
- Step 4** Click the **Responsibilities** tab to view the current responsibilities assigned to the server.
- Step 5** Click the **Ports** tab to view the following information:
- Port Number—Port number for connecting to the Orchestration Server.
  - Protocol—Displays the protocol for connection.
  - Listener—Listening port for the protocol
  - Enabled—Indicates the port is opened
- 

## Setting Process Orchestrator Console Environment Properties

- 
- Step 1** From the **File** menu, select **Environmental Properties** to display the Environment Properties panel.
- Step 2** Click the **General** tab to enter or modify general information about the server connected to the Console.
- Name—Name of the environment of the Orchestrator server.
  - Id—Display-only. ID number of the orchestrator server.
  - Description—Enter a brief description to associate with the connected server.
  - Enable Cisco Prime Service Catalog Integration—Check this check box to enable Cisco Prime Service Catalog Integration to an entire Cisco Process Orchestrator Environment. Uncheck the check box to disable Cisco Prime Service Catalog on this server.  
  
You must reload all content in console to reflect the changes. For example if you have windows such as workflow editor, variable type properties, or target type properties already open before changing the state of this checkbox, those windows will not automatically enable or disable Cisco Prime Service Catalog integration option until they are re-opened.
  - Enable Team Development—Check this check box to enable team process authoring on this server. Uncheck the check box to disable team process authoring on this server.
  - Suspend Automation—Check this check box to suspend the execution of processes on the server.
  - Audit target property value changes made by processes—Check this check box if you want a property value change made to a process to be audited.
  - Free up memory before process completes—By default, this check box is checked. This will free up the memory consumed by the previous activity instance.
  - Web Console location—Displays the URL to the Web console
- Step 3** Click the **Web Service** tab to modify Cisco Process Orchestrator Web Service configuration settings.

- Enable SOAP secure Web Service (HTTPS)—Check this check box to configure the authentication for the HTTP endpoints.
  - HTTPS port—Enter or verify the Hidden value HTTPS port for the Cisco Process Orchestrator Web Service. (Default: 61526)
  - HTTPS authentication mechanism—Choose the appropriate authentication for the Web service
    - Basic—Sends a username and password as the method of authentication. It's the simplest method of authentication, but the least Hidden value.
    - Digest—Sends cryptographic representation of the password rather than the password itself. This authentication method is more Hidden value than basic authentication.
    - NTLM—Authentication protocol used on networks that include systems running on the Windows operating system. This option can be used to return to the normal mode of operation.
  - Certificate Subject name—Enter a valid certificate subject name.
- Enable SOAP non-secure Web Service (HTTP)—Check this check box to unencrypt the HTTP endpoints.
  - HTTP port—Enter or verify the Hidden value HTTP port for the Cisco Process Orchestrator Web Service. (Default: 61527)
  - HTTP authentication mechanism—Choose the appropriate authentication for the Web service
    - Basic—Sends a username and password as the method of authentication. It's the simplest method of authentication, but the least Hidden value.
    - Digest—Sends cryptographic representation of the password rather than the password itself. This authentication method is more Hidden value than basic authentication.
    - NTLM—Authentication protocol used on networks that include systems running on the Windows operating system. This option can be used to return to the normal mode of operation.
- Refresh SOAP—Click this button to regenerate the dynamic Web service methods in the North Bound Web service. This affects the Web service methods which start processes and retrieve process instance output variables.

For example, if you create a new process called My Process. Click the Refresh Web Services button to regenerate the NBWS so that the Process service has a new StartMyProcess() call.
- Enable secure REST Web Service (HTTPS)—Check this check box to configure the authentication for the HTTP endpoints.
  - HTTPS port—Enter or verify the Hidden value HTTPS port for the Cisco Process Orchestrator Web Service. (Default: 51526)
  - HTTPS authentication mechanism—Choose the appropriate authentication for the Web service
    - Basic—Sends a username and password as the method of authentication. It's the simplest method of authentication, but the least Hidden value.
    - Digest—Sends cryptographic representation of the password rather than the password itself. This authentication method is more Hidden value than basic authentication.
    - NTLM—Authentication protocol used on networks that include systems running on the Windows operating system. This option can be used to return to the normal mode of operation.
  - Certificate Subject name—Enter a valid certificate subject name.
- Enable non-secure REST Web Service (HTTP)—Check this check box to unencrypt the HTTP endpoints.

- HTTP port—Enter or verify the Hidden value HTTP port for the Cisco Process Orchestrator Web Service. (Default: 51526)
- HTTP authentication mechanism—Choose the appropriate authentication for the Web service
  - Basic—Sends a username and password as the method of authentication. It's the simplest method of authentication, but the least Hidden value.
  - Digest—Sends cryptographic representation of the password rather than the password itself. This authentication method is more Hidden value than basic authentication.
  - NTLM—Authentication protocol used on networks that include systems running on the Windows operating system. This option can be used to return to the normal mode of operation.

For information on override default ports or certificates, *see* [Override Web Services Ports or Certificate](#).

**Step 4** Click the **Execution Limits** tab to set the limits for the server.

Each limit has two settings. One that will warn and generate a warning event log in the Cisco Process Orchestrator system audit and the other will generate an error entry in the system audit. If the error level is reached the process will halt.

- Warning Level—Set the limit before sending a warning. If this is reached, a warning message is returned.
- Error Level—Set the limit before sending an error. If this is reached, a error message is returned.
- Activity Instances in Process Instance—Set the number of activity instances within a process instance.
- String Variable Size—Set the size limit for the string variable
- Event Instance Size—Set the size limit for the event instance

**Step 5** Click the **Encryption** tab to view a Uuencoded public key that can be used for external encryption of Hidden value strings.

- External encryption public key (uuencoded)—Contains the default key or the imported key.
- Import—Imports a public/private key pair file into the Process Orchestrator. You must have “Update” permission over the “Environment Settings” object in order to import new public/private key pair. When you click this button, a standard File Open dialog box displays, allowing you to point the console to an existing file. PFX file format is supported. It supports password protection on the file. Therefore, when importing a PFX file, a dialog box displays requesting the password of the file.
- Reset to default key—Click to reset the current key to the default key.

**Step 6** Click the **Active Directory** tab to specify the credential to access the active directory.

- Use current Process Orchestrator Server credentials—Select this radio button to use the Server credentials that is currently logged in.
- User current Process Orchestrator Console credentials—Select this radio button to use the Console credentials that is currently logged in.
- Use following credentials—Select this radio button and then click the drop-down to Select User and specify the user properties by clicking the Properties icon.

You can also create new windows user by choosing New > Windows User.

**Step 7** Click the **History** tab to view the history of changes made to an object.

- Created by—The user name of the person who created the object
- Created time—The date and time the object was created
- Time—The date and time the action occurred

- Change Type—The action that occurred
- User—The user name of the person that performed the action
- Orchestration Server—The name of the Orchestration server associated with the object

**Step 8** Click **OK**.

## Override Web Services Ports or Certificate

To override the web services ports or certificates. You must find the element you want to update or override in the server configuration file, under **Tidal.Automation.Engine.Master.Properties.Settings**.

Use the following to find the element in the server configuration file:



**Note** By default, the value for ports is -1.



**Note** By default, the certificate subject is with no name (empty string). This means there is no override at the process orchestrator server level.

### SOAP Web Service:

- NonsecuredHttpPort
- SecuredHttpPort
- ServerOverrideSOAPCertSubject

### REST Web Service:

- NonsecuredRESTPort
- SecuredRESTPort
- ServerOverrideRESCertSubject

For Example:

```
<setting
  name="ServerOverrideSOAPCertSubject"
  serializeAs="String">
  <value>myserver_name.mydomain.com</value>
</setting>
<setting
  name="NonsecuredRESTPort"
  serializeAs="String">
  <value>51528</value>
</setting>
```

## Configuring Process Orchestrator Web Services

### Configuring HTTP Endpoints for Process Orchestrator Web Service

The HTTP Endpoints are encrypted by default. This is the most compatible endpoint that Process Orchestrator can offer for accessing the web service, but it is not necessary for normal Process Orchestrator operations.

- 
- Step 1** Stop the Process Orchestrator service.
- Step 2** In the Process Orchestrator install directory, open the *Tidal.Automation.Server.Exe.Config* file in a text editor, such as *Notepad.exe*.
- Step 3** Scroll to `NonsecuredHttpAllowed` and change the value tag to *True*.
- Step 4** Scroll to `NonsecuredHttpPort` and verify the value tag is *61527*.  
The `NonsecuredHttpPort` indicates the port at which Process Orchestrator's unencrypted HTTP endpoint can be accessed.
- Step 5** Press **Ctrl+S** to save and then close the text editor.
- Step 6** Start the Process Orchestrator service and wait for the startup to fully complete.  
All transmissions by the web service are now unencrypted.
- 

### Configuring Authentication for HTTP Endpoints for Process Orchestrator Web Service

The default authentication for the HTTP Endpoints is NTLM. Process Orchestrator allows users the ability to modify the authentication for the HTTP Endpoints. The following steps are to be used when trying to integrate with Process Orchestrator using the web service from a third-party product that does not support NTLM authentication.

- 
- Step 1** Stop the Process Orchestrator service.
- Step 2** In the Process Orchestrator install directory, open the *Tidal.Automation.Server.Exe.Config* file in a text editor, such as *Notepad.exe*.
- Step 3** Scroll to `HttpAuthenticationMechanism` and change the value tag to one of the following:
- NTLM (recommended)
  - Basic
  - Digest
- Step 4** Press **Ctrl+S** to save and then close the text editor.
- Step 5** Start the Process Orchestrator service and wait for the startup to fully complete.
- 

### Selecting a Client Certificate

Use the Select Client Certificate dialog box to select certificate you want to assign to a runtime user.  
To select a certificate:



- 
- Step 1** On the Certificate property page, click **Browse**.  
The Select Client Certificate dialog box displays.
- Step 2** Browse to the appropriate certificate.
- Step 3** Enter the password for the certificate.
- Step 4** Click **OK** to close the dialog box.
- 

## Configuring URL Prefixes to Ignore Certificate Errors

A certificate error occurs when a https-secured site is being opened and the certificate has become invalid. Use the Ignore Certificate Error tab to add the URL prefixes to ignore when a certificate error occurs. If the URL prefix is not listed, then any site with that URL prefix will be inaccessible.

This tab allows invalid/expired SSL certificates in HTTPS-based activities in the Web Service adapter. For example, a user may have a web service or web site configured using a temporary/test or otherwise invalid SSL certificate. If the prefix is not included in the list, then the activity would fail against the web site with an invalid certificate error.

- 
- Step 1** Choose **Administration > Adapters**, highlight **Web Service Adapter**, right-click and choose **Properties**.
- Step 2** Click the **Ignore Certificate Errors** tab to modify the list of prefixes to ignore.
- Step 3** To add a URL prefix to the URL Prefixes to ignore certificate errors for text box, click **Add**.
- Step 4** In the **URL prefix to ignore** field, enter the appropriate prefix, and click **OK**. For example:  
https://myserver:myport/site1  
The URL prefix is added to the URL Prefixes to ignore certificate errors for text box.
- Step 5** To modify the list of URL prefixes, click the appropriate button.
- Step 6** Click **OK** to close the dialog box.
- 

## Updating the Product License

Cisco Process Orchestrator is packaged with a trial license that is valid for a specified number of days. The trial license can be used until the license expires or is updated with a permanent license.

After the trial license expires, you must enter the appropriate license information (the license must be updated to a permanent license) to continue using the product.

- 
- Step 1** From the File menu, select **Update License** to display the License Information panel.
- Step 2** Enter the appropriate information, including:
- Customer Name— Name of the individual client or department. This field is customer-specified and is not case-sensitive.
  - Company Name— Name of the organization as provided by Cisco. The company name must be entered exactly as provided by Cisco. This field is case-sensitive.

- License code—Product license code as provided by Cisco. The license code must be entered exactly as provided by Cisco. This field is not case-sensitive.

**Step 3** Click **Next**.

**Step 4** Select the **I agree** radio button, then click **Next**.

**Step 5** When the **Completing the Update License Wizard** panel displays, click **Finish**.

**Step 6** When the **License was successfully updated** dialog box displays, click **OK**.

---

## Managing Time Zone Properties

Use the Administration > Time Zones view to display the time zones that ship with the product. The time zones are used when specifying a schedule trigger for a process. The time zones cannot be modified. However, you can add a description to the time zone properties and enable or disable the time zones. If a time zone is disabled, it will not be available for selection when defining schedule properties.

You can update the properties of a specific time zone using the Time Zone Properties property sheet. From this property sheet, you can enter a description for the time zone and enable or disable the time zone. Click the **Used By** tab to display the processes or schedule definitions that reference the time zone.

---

**Step 1** Choose **Administration > Time Zones**, right-click a time zone, then choose **Properties**.

**Step 2** In the [time zone] Properties dialog, enter the appropriate information, including:

- Name—The Greenwich Mean Time (GMT) name for the time zone and the location where the time zone is in effect

**Step 3** Click **Next**.

---

## Managing Database Settings

Use the Administration > Database Settings view to create and manage the database connections included in the product.

For example, you can:

- Choose **Database Settings > Process Database** to set the database grooming settings properties for the processes database. This dialog also contains the Groom Now option that allows you to manually start the database grooming process.
- Choose **Database Settings > Report Database** to import reports, view database properties, and delete the database from the product.

To view database properties, highlight the appropriate database, right-click and choose **Properties**.

To manage the database connections:

**Step 1** Choose **Administration > Database Settings**.

**Step 2** Choose one of these database options:

| Database         | Description  |
|------------------|--|
| Process Database | The process database displays the properties for the Process Orchestrator performance database. For information about configuring the grooming settings of the process database, see <a href="#">Managing the Process Database</a> .   |
| Report Database  | <p>The report database generates reports for viewing process execution history and to audit process changes.</p> <p><b>Note</b> You must be logged in with an account that has administrator privileges on the machine where the report database is being created, whether it is the local machine or a remote machine. Your user account must also have Reporting Services privileges to create or modify the reports.</p> <p>For information about managing reports, see <a href="#">Managing the Report Database</a>.</p> |

## Managing the Process Database

The Process Database is created during the installation process, but only the default size of the data files is determined. Use the Process Database Properties property sheet to determine the amount of data that is archived in the database files before being deleted from the system.

To configure the database settings:

**Step 1** Choose **Administration > Database Settings**.

**Step 2** Highlight **Process Database**, right-click and choose **Properties**.

**Step 3** In the Process Database Properties property sheet, click the **Configuration** tab.

**Step 4** Choose one of the following options:

- To start the grooming process immediately, click **Groom Now**.
- To modify the database grooming settings for the automation database server, specify a value for the grooming fields, then click **OK**.

| Field                        | Description  |
|------------------------------|--|
| Configuration Audit Grooming | <b>Groom configuration audit data older than</b><br>Enter the number of days before configuration audit data is deleted from the database.   |
| Process Instances Grooming   | <b>Groom completed process instances older than</b><br>Enter the number of days before completed process instance data is deleted from the database.   |
| Task Grooming                | <b>Groom completed tasks older than</b><br>Enter the number of days before completed task data is deleted from the database.<br><b>Groom task audit data older than</b><br>Enter the number of days before the task audit data is deleted from the database. |

## Managing the Report Database

Process Orchestrator supports two reporting technologies:

- **SQL Server Reporting Services.** Customers who install Microsoft SQL Server as their chosen database platform can add the Reporting Services technology for free by simply specifying the component during SQL Server installation. SQL Server Reporting Services is only supported for Process Orchestrator databases hosted on an SQL Server.

SQL Server Reporting Services reports are XML based report definitions that include report data and report layout elements. On a client file system, report definitions have the file extension .rdl. After a report is published, it is a report item stored on the report server or SharePoint site. Reports are one part of the server-based reporting platform provided by Reporting Services.

With Reporting Services, you can create interactive, tabular, graphical, or free-form reports from relational, multidimensional, or XML-based data sources. You can publish reports, schedule report processing, or access reports on-demand. Reporting Services also enables you to create ad hoc reports based on predefined models, and to interactively explore data within the model. You can select from a variety of viewing formats, export reports to other applications, and subscribe to published reports. The reports that you create can be viewed over a Web-based connection or as part of a Microsoft Windows application or SharePoint site. Reporting Services provides the key to your business data.

- **SAP BusinessObjects.** BusinessObjects is the only solution that supports reporting against an Oracle Process Orchestrator database.

The reporting technology is installed separately from the product. Typically a reporting installation spans Process Orchestrator servers.

To configure the database settings:

- 
- Step 1** Choose **Administration > Database Settings**.

- Step 2** Highlight **Report Database**, right-click and choose **Properties**.
- Step 3** Click the **Connection** tab to view the properties of the database server.
- Step 4** In the Report Database Properties property sheet, click the **Configuration** tab and view or modify the database grooming settings that determine when specific data is deleted from the database after specific amount of months.

## Viewing the SQL Server Connection Properties

- Step 1** Choose **Administration > Database Settings**.
- Step 2** Highlight **Report Database**, right-click and choose **Properties**.
- Step 3** Click the **Connection** tab and choose the appropriate SQL Server database type.

| Field         | Description   |
|---------------|---|
| Server name   | Display-only. Name of the reporting server.   |
| Database name | Display-only. Name of the reporting database  |
| User          | User name assigned to the account for logging on to the SQL server.   |
| Password      | Password assigned to the user account for logging on to the SQL server. Check the check box to enable the Password field. |
| Domain        | Name of the domain for the user account   |
| Reports URL   | URL of the reporting database report  |

## Viewing the Oracle (Oracle Authentication) Connection Properties

- Step 1** Choose **Administration > Database Settings**.
- Step 2** Highlight **Report Database**, right-click and choose **Properties**.
- Step 3** Click the **Connection** tab and choose the Oracle (Oracle Authentication) database type.

| Field       | Description   |
|-------------|---|
| Host        | Display-only. Name of the Oracle server where the database resides.                 |
| SID         | Display-only. Oracle system ID used to identify the Oracle database.                |
| Port        | Display-only. Port number used to access Oracle database.                           |
| User/Schema | Display-only. Name of the reporting database.                                       |
| Password    | Password assigned to the user account for logging on to the Oracle database server. |

## Viewing the Oracle via TNS (Oracle Authentication) Connection Properties

- Step 1** Choose **Administration > Database Settings**.
- Step 2** Highlight **Report Database**, right-click and choose **Properties**.
- Step 3** Click the **Connection** tab and choose the Oracle (Oracle Authentication) database type.

| Field       | Description   |
|-------------|---|
| Host        | Display-only. Name of the Oracle server where the database resides.                 |
| TNS Alias   | Display-only. Service name alias used for the TNS connection.                       |
| User/Schema | Display-only. Name of the reporting database.                                       |
| Password    | Password assigned to the user account for logging on to the Oracle database server. |

## Viewing the Oracle via Service name (Oracle Authentication) Connection Properties

- Step 1** Choose **Administration > Database Settings**.
- Step 2** Highlight **Report Database**, right-click and choose **Properties**.
- Step 3** Click the **Connection** tab and choose the Oracle (Oracle Authentication) database type.

| Field        | Description   |
|--------------|---|
| Service name | Display-only. Service name alias used for the Oracle Single Client Access Name (SCAN) |
| Host         | Display-only. Name of the Oracle server where the database resides.                   |
| Port         | Display-only. Port number used to access Oracle database.                             |
| User/Schema  | Display-only. Name of the reporting database.   |
| Password     | Password assigned to the user account for logging on to the Oracle database server.   |

## Creating a Reporting Database Connection

The Process Orchestrator Reporting database is initially created during the installation process. There are occasions when the report database connection may need to be removed and then re-connected.

### Before You Begin

- You must be logged in with an account that has Administrator rights on the machine where the report database is being created, whether it is the local machine or a remote machine.

- You must also have Reporting Services permission to create or modify the reports as create or modify permission over the Report Database object within Cisco Process Orchestrator.

To create the report database connection:

- 
- Step 1** Choose **Administration > Database Settings**, right-click **Report Database** and choose **Create Process Orchestrator Reporting Database**.
- The Welcome to the Report Database Configuration Wizard panel displays. Click **Next**.
- Step 2** The fields on the New Process Orchestrator Reporting Database panel (excluding the Password field) are automatically populated with the name of the local server and the credentials of the currently logged in user. Use *one* of the following methods:
- To use the credentials that are auto-populated for the default user, enter the password in the Password field.
  - Specify the credentials for a different user, then click **Next**.
- Step 3** The fields on the Database Settings panel are automatically populated with the default locations and data grooming settings for the database. Use *one* of the following methods:
- To use the information that is auto-populated, click **Next**.
  - To modify the data and transaction log file settings for the new database, specify the appropriate information, then click **Next**.
- Step 4** When the dialog box indicates that the database has been successfully created, click **Next**.
- Step 5** Verify the information and click **Finish** to complete the procedure and close the wizard.
- 

## Importing Reports into SQL Reporting Services

During the Core Automation Pack import process, SQL Server Reporting Services report definition files are copied to the file path determined on the Core Report panel. To view the reports in SQL Server Reporting Services Report Manager, the report definition files must be imported into the Report Manager using the Report Database Import Report wizard.

Use the Import Reports process to import new reports into the report database.

### Before You Begin

- To import reports, you must be logged in with an account that has Administrator rights on the machine where the report database is being created, whether it is the local machine or a remote machine.
- Your account must also have Reporting Services permission to create or modify the reports as create or modify permission over the Report Database object within Process Orchestrator.

To import reports:

- 
- Step 1** Choose **Administration > Database Settings**, right-click **Report Database** and choose **Import Reports**.
- The Report Settings panel displays.
- Step 2** On the Report Settings panel, specify the following information to define the server and credentials for importing reports:

- Reports Server URL
- Enter the address for the SQL Server Reporting Services report server.
- Access Report Server via Hidden value Socket Layer (SSL)
- Check this check box if SSL protocol is used to access the report server.
- Database Type
  - Select the type of database based on the authentication method that is used to log on to the database. The following options are available:
  - SQL Server (Integrated Windows Authentication)
- SQL Server (SQL Authentication)
- User
- Enter the name assigned to the user account that is used to connect to the report database.

**Step 3** After the reports have been imported, click **Next**.

**Step 4** Verify the URL of the report server, then click **Finish**.

---

## Importing Reports into BusinessObjects

During the Core Automation Pack import process, Business Intelligence Archive Resource (BIAR) files are copied to the file path determined on the Core Report panel. To view the reports in BusinessObjects InfoView, the BIAR file must be imported onto the BusinessObjects server using the BusinessObjects Import Wizard.

### Before You Begin

To import BIAR files, you must be logged in with an account that has the appropriate permissions on the Business Object server, whether it is the local machine or a remote machine.

Use the following steps to import reports into BusinessObjects.

- 
- Step 1** Choose **Start > All Programs > BusinessObjects XI.3.1 > BusinessObjects Enterprise > Import Wizard**.
- Step 2** From the Welcome to the Import Wizard panel language drop-down list, choose the appropriate language to use to import the reports (English is the default), then click **Next**.
- Step 3** On the Source environment panel, specify the environment to where the wizard will import the appropriate user and object information, then click **Next**.

The fields in the lower pane changes based on the selection.

| Field     | Description   |
|-----------|---|
| Source    | From the drop-down list, choose <b>Business Intelligence Archive Resource (BIAR) File</b> . |
| BIAR file | Enter the appropriate file path or click “...” to locate the BIAR file on the computer.     |

- Step 4** On the Destination environment panel, specify the appropriate information for Business Object Enterprise XI 3.1, then click **Next**.



| Field          | Description   |
|----------------|---|
| CMS Name       | Enter the name of the Business Object Enterprise XI 3.1 destination CMS<br>If the CMS is running a particular port, add a colon and the port number to the end of the CMS name. |
| User Name      | Enter the name of a user with import permissions. The default is typically an administrator.  |
| Password       | Enter the password of the associated user name  |
| Authentication | Select the type of authentication appropriate for the CMS and the user who will be used to import the reports. The default is <i>Enterprise</i> .                               |

**Step 5** On the Select objects to import panel, choose the appropriate items to import into your Business Object Enterprise XI 3.1 server, then click **Next**.

**Step 6** On the Import Scenarios panel, select the appropriate radio button for handling scenarios where the objects already exist in the destination environment, then click **Next**.

| Import Scenario   | Description  |
|---|--|
| Update the destination object.<br>In case of name conflict, rename it.        | If the Import Wizard finds an object in the destination environment with the same source objects unique identifier (CUID), it updates the destination object.<br><br>If the Import Wizard does not find an object in the destination environment with the same CUID but it finds an object with the same name, the Import Wizard imports the object from the source environment and then renames the object. |
| Update the destination object.<br>In case of name conflict, do not import it. | If the Import Wizard finds an object in the destination environment with the same CUID, it updates the destination object.<br><br>If the Import Wizard finds an object in the destination environment with the same name but different CUID, the Import Wizard does not import the object from the source environment.   |
| Do not import the object.   | If the Import Wizard finds an object in the destination environment with the same CUID, the Import Wizard does not import the object.  |

**Step 7** On the Incremental import panel, uncheck the check boxes next to options that perform the following imports as appropriate, then click **Next**.

- To import report objects without overwriting dependent objects that already exist in the destination environment.
- To import report objects without importing a universe or connection that would overwrite a universe or connection in the destination environment.

**Step 8** Review the summary information on the Import Wizard panel, then click **Next**.

**Step 9** On the Users and groups panel, check the check boxes to import the appropriate specific users and groups, then click **Next**.

**Step 10** On the Custom Access Levels panel, check the appropriate check boxes to import custom access level, then click **Next**.




---

**Note** If you import a user and an object, the Import Wizard imports the rights of that imported and does not exist in the destination environment, the Import Wizard gives the individual rights specified in the level on the object for the user.

---

- Step 11** On the Categories panel, choose the appropriate categories to be imported, then click **Next**.
- For large document domains, you can import incrementally and import documents one category at a time.
  - To import all the objects associated with the category, check the **Import all objects that belong to the selected categories** check box.

- Step 12** On the Folders and objects panel, select the folders and objects to import, then click **Next**.
- Click **Select All** to check all check boxes of the folders and objects displayed.
  - To import all instances of each selected object, check the **Import all instances of each selected object** check box.

- Step 13** On the Select application folders and objects panel, select the application folders and objects to import, then click **Next**.




---

**Note** If the selected folders and objects exist on the destination system, they will be updated using the source system as a reference.

---

- Step 14** In the Import options for universes and connections panel:
- a. Select *one* of the following import radio buttons for universe objects:
    - Import all universes and connection objects (Default)
    - Import all universes and only connection objects used by these universes
    - Import the universes and connections that the selected Web Intelligence and Desktop Intelligence documents use directly. In the next dialog box, you can select additional universes that are not used by any imported document.
  - b. To import universe overloads, check the **Keep universe overloads for imported users and groups** check box.
 

If you are importing universe overloads, you must also choose the users, groups, and universes during previous steps in the Import Wizard. You must also choose to overwrite existing objects in the Incremental import panel. If you did not choose these options, click **Back** until you get to the appropriate panel.
  - c. If you choose to import users and groups, universe overloads, and other objects and do not want to overwrite all of the object rights for the users and groups and objects that you've selected, use *one* of the following methods:
    - Ensure that you choose only the universes that you want to import and then import the other objects in another import process.
    - Delete the universe overload in the destination environment and then uncheck the **Overwrite existing objects** and **Overwrite object rights** check boxes in the Incremental import panel. In this case, the Import Wizard imports only the universe overloads that do not already exist in the destination environment.
  - d. Click **Next**.

- e. If you selected either of the first two options, the Import options for publications panel displays. Skip to [Step 15](#) to continue.
  - f. If you selected the third option, the Universe folder and universes panel displays. Choose the appropriate universes and universe folders.
    - If the selected source environment is other than BusinessObjects 5.x or 6.x, the universes that are linked to specific documents cannot be cleared from the list. You can choose additional universes that are not used by any imported document.
    - If no universe is found, the associated documents will not be imported and a warning message appears. If this occurs, link the documents to a universe, republish the documents to the repository, and retry the import.
  - g. Click **Next**.
- Step 15** On the Import Options for Universes panel, choose the appropriate profile and publication recipient radio buttons, then click **Next**.
- | Option  | Description   |
|---|---|
| Select import option for importing profiles               | <ul style="list-style-type: none"> <li>• Import all profiles</li> <li>• Import profiles used by selected publications</li> </ul>        |
| Select import option for importing publication recipients | <ul style="list-style-type: none"> <li>• Import recipients used by selected publications</li> <li>• Do not import recipients</li> </ul> |
- Step 16** On the Remote Connections and Replication Jobs panel, choose the appropriate remote connections and replication jobs to import, then click **Next**.
- Step 17** On the Ready to import panel, click **Finish**.

## Configuring the BusinessObjects Connection for the Process Orchestrator Report Database

BusinessObjects can support a Process Orchestrator Report Database running on either an SQL server or Oracle. Use the following steps to configure the BusinessObjects reporting connection to the Process Orchestrator reporting database.

### Before You Begin

- If you are running on an SQL server:
  - Verify that the Microsoft SQL native client or the Oracle client is installed.
  - On the reporting database, verify that the named pipes are enabled. To enable the named pipes, use MS SQL Configuration Manager.
  - For additional information on the prerequisites, refer to the [SQL server information](#) on the Microsoft Developer Network.

To configure the BO reports connection:

- Step 1** Choose **Start > All Programs > BusinessObjects XI.3.1 > BusinessObjects Enterprise > Designer**.
- Step 2** On the User ID dialog box, enter the appropriate credentials, then click **OK**.

- Step 3** On the Universe Designer dialog box, choose **Tools > Connections**.
  - Step 4** From the Connections List, highlight **Process Orchestrator Reporting**, then click **Edit**.
  - Step 5** On the Edit Process Orchestrator Reporting Connection dialog box, in the Authentication Mode list, verify that **Use specified username and password** is selected.
  - Step 6** Specify the reporting database information, then click **Next**.
  - Step 7** Verify the information on the **Configuration Parameters** and the **Custom Parameters** panels, then click **Finish**.
- 

## Accessing SQL Server Reporting Service Reports

Process Orchestrator provides SQL Server Reporting Services reports required by managers and auditors as well as reports required by developers of process automation. In general, the data that is provided for these diverse audiences is the same. What differs is the granularity and level of aggregation of this data and the specific data that is the focus of a given report.

### Before You Begin

- Access to any report is controlled and available only to authorized users.

To access reports from your web browser:

- 
- Step 1** In the Address bar of your web browser, enter the following URL:  
**http://<ReportServer>/Reports**  
 where <ReportServer> is the name of the server hosting the reports.  
 If you use SQL server named instances, the URL and Report folder include the instance name. For example, if you enter <SQLserver>\NamedInstance:
    - The URL will be `http://<ReportServer>/Reports_NamedInstance`.
    - The report folder will be located at `Cisco Process Orchestrator Reporting > <ReportServer> > NamedInstance > <ReportDBName>`.
  - Step 2** Click **Cisco Process Orchestrator Reporting > [Report Server] > [Report DB Name]**.
  - Step 3** On the Process Orchestrator Reporting Database Report Manager home page, click **Core** to view the Core Process Orchestrator report folders.  
 The available reports and a brief description of the information that is generated by each report is displayed.
  - Step 4** Click the report name to enter the search criteria and generate the report.
- 

## Accessing Reports in BusinessObjects InfoView

Process Orchestrator provides reports required by managers and auditors as well as reports required by developers of process automation. In general, the data that is provided for these diverse audiences is the same. What differs is the granularity and level of aggregation of this data and the specific data that is the focus of a given report.

**Before You Begin**

- Access to any report is controlled and available only to authorized users.

To access Process Orchestrator Core reports in Java Infoview:

- 
- Step 1** On the BusinessObjects client machine, choose **Start > All Programs > BusinessObjects XI 3.1 > BusinessObjects Enterprise > BusinessObjects Enterprise Java InfoView**.
- Step 2** In the SAP BusinessObjects application, enter your user credentials to log on to InfoView.
- Step 3** Choose **Documents List > Public Folders > Cisco Process Orchestrator > Core > Auditing (or) Operations**.
- Step 4** To view a report, double-click on the report name.
- 

## Modifying the Report Database

In some cases, you might need to move the SQL Server Reporting Services server to another location. You must remove the current Report Database connection and connect to the new server using the Report Database Import Report wizard.

To modify the report database:

- 
- Step 1** Choose **Administration > Database Settings**.
- Step 2** Highlight **Report Database**, right-click and choose **Remove Cisco Process Orchestrator Reporting Database Connection**.
- Step 3** To connect to the new server, see [Creating a Reporting Database Connection](#).
- 

## Configuring Security

As a Process Orchestrator administrator, you can limit users access to only a subset of Process Orchestrator processes or limit a whole group to read-only access for specific objects. For example, the Process Orchestrator administrator can configure members of the Accounting Process Authors group with the ability to only create, delete, modify or schedule processes in the Accounting category and can only act on targets that represent the accounting services. However, those members of that group will not be allowed to view or modify any other processes or targets in Process Orchestrator.

Using the Security view, you can determine what Process Orchestrator objects users are allowed to view, create, or modify.

If the user has permissions to view (or edit) only a subset of Process Orchestrator objects, when the Process Orchestrator user interfaces (Console, CLI, or Web Service) display Process Orchestrator objects to the user, the display will only show those objects that the user has permissions to view or modify.

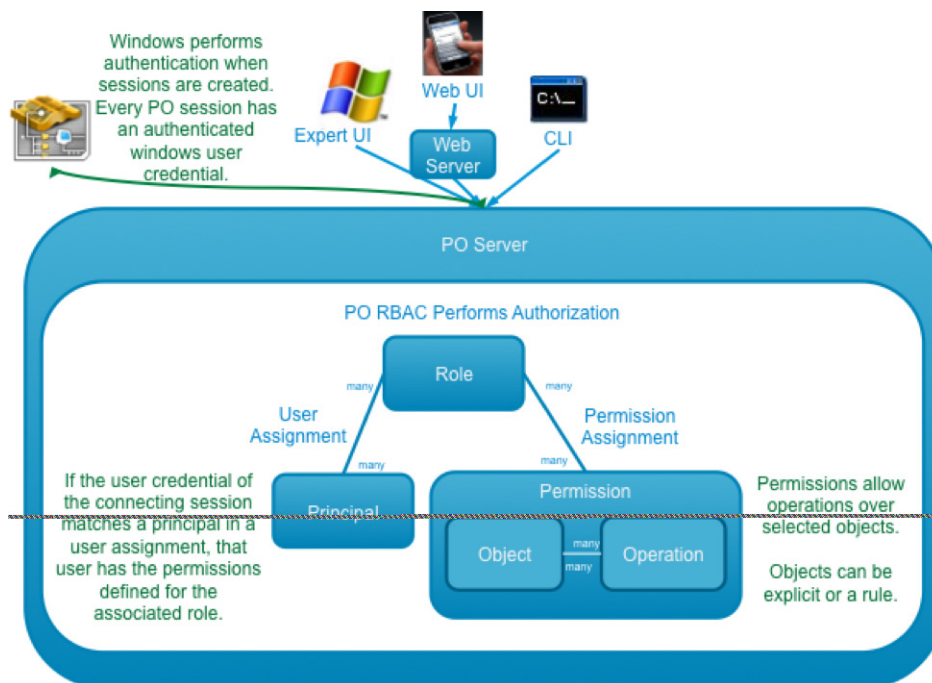
When the user does not have sufficient permissions in Process Orchestrator to perform an operation and attempts to perform that operation, Process Orchestrator will generate an error, as well as log an audit failure event to the event log.

## Role-Based Access Control (RBAC)

In Process Orchestrator, authorization is performed using a Role-Based Access Control System. Roles are a collection of permissions. Each permission pairs a set of operations that can be performed over some set of objects. A user assignment gives end users the ability to perform the role.

Typically, roles are defined according to a standardized job function within IT. Examples might include “Level 1 Helpdesk,” “Level 2 Helpdesk,” “Human Resources,” “Network Configuration,” “SAP Basis Expert,” and so on. Security groups already in the directory for the users in these job functions are then typically assigned to the roles.

Figure 10-1 Process Orchestrator Role-Based Access Control



Permissions define what operations can be performed over what objects. This defines the rights and associates them with set of Process Orchestrator objects. This is similar to file permissions (such as read or update).

- Operations are things such as Cancel, Change Owner, Create, Delete, Read, Start, Update, and Use. Most other Operations automatically allow Read. Change Owner automatically allows Update and Read.
- Objects specify rules that match elements from the functional model, such as Processes, Targets, and Runtime Users. Specifically, several types of object rules are supported:
  - Object List—Allows rights only to specified objects in the list.
  - Object Type—Allows rights to all objects of that type (for example, all targets or all processes).
  - Owner Security—Allows rights to all objects of a specified type that are owned by a specific principal (user or group in Active Directory).

A User Assignment is a link to a security principal. The user assignment is the thing that is defined in Process Orchestrator, since it defines the rule for who is in the Role. The Principal is actually in an external directory, so the user assignment is a reference to the directory.

## Predefined Security Roles

Cisco Process Orchestrator provides predefined security roles that ship with the product and cannot be modified. Custom user roles can be created using the Administration view, but the following roles are defined by default:

| Role                  | Description   |
|-----------------------|---|
| Administrators Role   | These users have access to all functionality in the product. Users can view or modify any definition, process or setting. Only a small number of users are assigned this role. These users have permissions to modify adapter settings, import automation packs, and configure databases.   |
| Auditors Role         | The user can view any definition or instances, such as running processes, but are not allowed to modify any of the objects.   |
| Create Ownership Role | All users are assigned to this group. It provides full control over any objects the user owns.  |
| Definition Role       | This is a user who can define processes. The user can: <ul style="list-style-type: none"> <li>• View all Operations information (Activity Views, Process Views and Auditing)</li> <li>• Start adhoc processes</li> <li>• Cancel running processes</li> <li>• View/update definitions</li> </ul> The user <i>cannot</i> update administration settings.  |
| Operators Role        | This is a classic role for a level 1 Service Desk employee, executing workflows. The user can: <ul style="list-style-type: none"> <li>• View all Operations information (Activity Views, Process Views and Auditing)</li> <li>• Start ad-hoc processes</li> <li>• Cancel running processes</li> </ul> The user <i>cannot</i> : <ul style="list-style-type: none"> <li>• Update definitions</li> <li>• Update administration settings</li> </ul> |

## Predefined Security Permissions

In the Security Role Properties property sheet, the Operations tab displays the list of permissions included and/or available for inclusion into the security role. Check the check boxes for the appropriate powers for the security role.

## Object Owners

Process Orchestrator objects have an owner. For example, Process Orchestrator targets, processes, calendar, target group, global variables, etc. all have an owner field. Owners are security principals; by default, they reflect the user who created an object. However, they can be set to any Active Directory security principal. In addition, in the preferences section of the UI, users can specify a security principal such as a group name to use for all objects they create. This concept is useful in team development.

One type of RBAC object definition within an RBAC permission is an Owner security permission. This has two possible settings:


- The *connected user* matches objects the user owns, either directly or indirectly. For example, if the user running the Process Orchestrator console is a member of a group specified in an owner field, the permission would match that object.
- *Exactly the specified user* matches objects where the user is an explicit match.

This feature can be used to give a simple yet powerful way to say users can act on objects they create. It can also be used to specify access to objects according to the security principal of the connecting user. If groups are used for owner fields rather than the ID of the user who created the object, users of that group will have access. This is very useful in team development scenarios.

Object views have an optional column that can be used to manage object ownership.

## Changing the Owner of a Security Role

With the appropriate rights, ownership of a security role can be changed using the Process Orchestrator security feature.

- 
- Step 1** Choose **Administration > Security**, highlight an existing security role, right-click and choose **Properties**.
- Step 2** Click the **General** tab, scroll to the **Owner** field, and to the right of each field, click **Browse**.
- Step 3** To change the default object type in the Select this object type field:
- Click **Object Types**.
  - In the Object Types dialog box, check the check box to the left of the appropriate object types, and click **OK**.
- Step 4** To change the server location for querying a user or group:
- Click **Locations** on the Select User or Group dialog box.
  - Expand the appropriate server name, choose the user or group, and click **OK**.
- Step 5** In the Enter the object name to select text field, enter the user name (domain\user name) or group and click Check Names.
-  **Note** If there is a matching user name or group, it is displayed in the field. If there is not a match, a warning message displays.
- 
- Step 6** Click **Advanced** to enter additional query information.
- Step 7** In the Name field, enter the appropriate terms, and click **Find Now**.





---

**Note** To generate more search results, leave the Name field blank and then click Find Now.

---

- Step 8** In the Search Results pane, choose the appropriate user or group, and click **OK**.
- Step 9** Click **OK** to return to the Security Role Properties dialog box.  
The selected user name or group is displayed in the appropriate Owner field.
- 

## Removing Users from Security Roles

- 
- Step 1** Choose **Administration > Security**, highlight the appropriate security role, right-click and choose **Properties**.
- Step 2** Click the **User Assignment** tab.
- Step 3** Highlight the principal to be removed and click **Remove**, then click **OK**.
- 

## Modifying Security Permissions

With the appropriate rights, operations, objects, and owners can be added or removed from a security permission. There are three types of security permissions:

- **Operations**—The Operations tab displays all the operations in Cisco Process Orchestrator, such as Break Lock, Delete, Change Owner, and so on. Use this tab to add or remove an operation from the security permission.
- **Object Types**—The Object Types tab displays the top-level object types in Cisco Process Orchestrator, such as adapters, processes, targets, and global variables. Use this tab to add or remove an object type from the security permission.
- **Owner**—Use the Owner tab to modify the Windows security principal (either a user or a group) associated with the object and the permission. The permission is enforced upon the specified owner of the object.

For information about predefined security permissions, see [Predefined Security Permissions](#).

---

- Step 1** Choose **Administrations > Security**.
- Step 2** Highlight the appropriate security role, right-click and choose **Properties**.
- Step 3** On the [Security Role] Properties property sheet, click the **Permissions** tab, highlight the appropriate security permission, then click **Edit**.
- Step 4** Click the following tabs:
- **Operations**—Use the Operations tab to modify the list of permissions to be included in the security role.  
Check the check box to the left of the appropriate permission to define what actions a user assigned to the security role can have over the selected object types.
    - **Cancel**— Allows the user to cancel process or activity instances

- Change Owner— Allows the user to change the owner of the object. Change ownership permission includes the Read permission and requires the Modify permission to change ownership on an object.
- Create—Allows the user to create new objects and specify all properties of the object.
- Create permission includes Change Owner and Read permissions. This permission is required to perform Copy or Import functions.
- Delete—Allows the user to delete objects
- Update—Allows the user to modify all properties of the object, except the owner.
- Change Owner is the permission required to change the owner of an object.
- Read—Allows the user to view all properties of an object.

The Read permission along with the Create permission is the minimum level of permissions required to copy an object.

- Break Lock—Allows the user to break the lock on a process held by another user.
- Start—Allows the user to start process ad-hoc
- Use—Allows the user to reference objects. This permission is not available to all objects, but only for those that can be referenced.

For example, this permission on a target or target group would allow the user to run activities and processes against the target group.

- Object Types—Click to add or remove permissions from a specific object type.
- Owner tab—Click to modify the Windows security principal (either a user or a group) associated with the object and the permission. The permission is enforced upon the specified owner of the object.
  - Label—Assigns the permission to the currently connected Windows user
  - Exactly the specified user—Click the browse button to launch the Select User or Group dialog box and change the security principal for the object.

**Step 5** Click **OK**.



**Note** Removing an operation or object from the list is permanent. Click **Add** to add a new operation or object to the security permission.

## Deleting a Security Role

Deleting the role deletes all associated permissions.



**Note** Removing the security role from the list is permanent. Choose **Administrations > Security**.

**Step 1** Highlight the appropriate security role, right-click and choose **Delete**.



**Note** The default security role cannot be deleted.

**Step 2** On the Confirm Security Role Delete dialog box, click **Yes** to delete the security role.

---





# Working with Events and Triggers

Triggers are events and conditions in the system that can fire off processes. The attributes of the trigger that fires off a process instance can be referenced in the process workflow. Processes often use this data to control execution. If a process contains a trigger, you can view its properties in the process instance views and in the Process Editor. The Trigger tab displays all triggers associated with the process, and allows you to create new triggers, modify the properties of a trigger, and delete triggers.

Process Orchestrator supports two types of rule-based triggers:

- **Events**—The Process Orchestrator can monitor for events from the environment, and you can specify triggers that initiate processes when the subscribed event occurs. For example, an event might be an incoming SNMP trap or a fault on a UCS system.events and schedules.
- **Schedules**—Schedules allow triggering processes at some time by leveraging calendars that define which days something can occur. Calendars can be selected days or sequences of dates such as weekly or monthly, they can represent dates like fiscal quarter end, or they can be combined hierarchically. Schedules then associate a time with a calendar. When the day is in the calendar, the time is evaluated. Times can be explicit or repeating (for example, hourly).

The following sections provide information about working with triggers and events:

- [Creating Triggers, page 11-1](#)
- [Correlating Events, page 11-5](#)
- [Integrating Using the Advanced Message Queuing Protocol \(AMQP\), page 11-8](#)
- [Debugging Process Trigger Instances, page 11-8](#)

## Creating Triggers

The following table summarizes some of the more commonly-used types of triggers and when to use them.

**Table 11-1** Commonly-Used Trigger Types

| Trigger Type                             | Purpose   |
|--|---|
| AMQP (Advanced Message Queuing Protocol) | Use AMQP to create Process Orchestrator triggers for events that occur out on the IT landscape for which Cisco does not have adapters, but that can generate AMQP messages. |

**Table 11-1** Commonly-Used Trigger Types

| Trigger Type              | Purpose   |
|---------------------------|---|
| Process Event             | <p>Process events allow one process to pass an event to other processes. For example:</p> <ul style="list-style-type: none"> <li>• A Raise Process Event activity can post a process event, and a trigger can monitor for a specific event.</li> <li>• A Correlate Process Events activity allows monitoring for an event within a process workflow.</li> </ul> <p>Process events include elements of the Process Orchestrator functional model so that they are aware of internal schema elements. For example, you can include a target type in your subscription criteria.</p> <p>Process events are exposed in the northbound web service, so an external system can programmatically submit an event to Process Orchestrator. However, the use cases for process events generally center more around Process Orchestrator-internal use cases; Advanced Message Queuing Protocol (AMQP) is preferred for external message passing.</p> <p>For internal use cases, process events have the advantage because they are native and lightweight within Process Orchestrator. It is easy to create message driven architectures within Process Orchestrator using process events. Since these events are not persisted to the database, they are very lightweight. Process events have the advantage that they do not require external setup and installation, as would be the case with AMQP.</p> |
| Started by Parent Process | <p>Indicates that a process can be used by a parent process. If this trigger is not set in the child process, the parent process will fail.</p> <p>The information used to start the child process can also be included in the automation summary.</p>  |
| Started by User           | <p>Indicates that the process can be started manually by a user. This trigger is added by default to a process, but can be removed.</p> <p>If a user attempts to manually start a process that does not have the ad-hoc trigger (or the user is restricted from starting the process in the ad-hoc trigger), an error message will be displayed and the process will not be launched.</p> <p>This trigger will expose all the typical trigger properties, as well as some additional properties that allow you to determine exactly how the process was manually started.</p>   |
| Started by Web Service    | <p>Indicates that the process can be started using the Northbound Web Services. For more information, see the <i>Cisco Process Orchestrator Northbound Web Services Guide</i>.</p>  |
| Task Event                | <p>All task events are monitored by the Process Orchestrator environment. A user can create a trigger that can watch for any task event (task created, task deleted, task updated) that matches the user-specified criteria.</p>  |

**Table 11-1** Commonly-Used Trigger Types

| Trigger Type | Purpose  |
|--------------|--|
| Target Event | <p>Target events complement target types to allow event-driven automation for each type of service. When used as triggers, target events enable policy, which allows you to invoke automation as data is created or changed, according to patterns in the data. Available target events include:</p> <ul style="list-style-type: none"> <li>• Target Created Event—Target properties are available in reference control.</li> <li>• Target Changed Event—Current values for target properties are available in reference control. Names of “changed” properties are also available in reference control.</li> <li>• Target Deleted Event—Deleted target properties available in reference control.</li> </ul> <p>For more information about targets, see <a href="#">Defining a Target, page 2-13</a>.</p> |

## Creating a New Trigger

To create a new trigger for an existing process:

- Step 1** On the Process Properties pane, click the **Triggers** tab, then choose **New > [Trigger Type]** from the drop-down list.
- Step 2** On the **[Trigger Type]** property pages, define the properties.
- Step 3** Click the **General** tab and enter the required information.
- Step 4** Click the **Criteria** tab and enter the following:
  - a. Under Monitor options, from the **Service** drop-down list select the relevant option:
    - User
    - Tenant
    - Cloud
  - b. Under Monitor options, from the **Action** drop-down list select the relevant option for the service:
    - Create—To perform a platform task or create the resource.
    - Update—To replace the object for update operation.
    - Delete—To remove the specific aspects of the deployment.
  - c. Click **Add** and enter the relevant property information in the fields to add properties to match.
- Step 5** Click the **Advanced** tab and enter the following:
  - Message polling interval—The default interval is 10 seconds. You can change this value. The shorter the polling interval, the more frequently the activity checks for new messages.
  - Maximum number of messages per polling interval—Specify the number of messages per polling interval, enter 0 to retrieve all messages.

- Step 6** To specify that the event should be monitored on targets that match specific criteria:
- On the Trigger Target property page, click **Monitor on this target group** and the appropriate target group.
  - Under Monitor for Events on, click **Choose a target using this algorithm**, then click **Choose the target that satisfies the specified criteria**.
  - Click “...” to launch the Target Selection Criteria dialog box.
  - On the Properties pane, specify the required information, then click **OK** to return to the Trigger > Target property page.
- Step 7** Optional: Complete the following tabs, then click **OK**.
- Condition—Specify when an action is to be taken based on an evaluation of the defined conditions. See [Adding Conditions, page 5-23](#).
  - Knowledge Base—Choose the appropriate knowledge base article to associate with the trigger.
- Step 8** Click **OK** to add the trigger to the process.
- Step 9** Click **Save** to save the process with the new trigger.
- 

## Creating a Schedule Trigger

Use the Schedule trigger to specify the criteria on a defined calendar that must be met before the process executes. This criteria determines the values that must be met before the process executes.

- Step 1** Click the **Triggers** tab, then click **New > Schedule**.
- Step 2** Click the **General** tab and enter the general information for the trigger.
- Step 3** Click the **Schedule** tab and specify the schedule information.
- Step 4** Select the **Conditions** tab to include any special conditions for when the event log trigger will be applied.
- Step 5** Click **OK** to complete the procedure.
- 

## Creating a Task Trigger

Use the CCMS Alert trigger to specify the properties of the monitoring tree element (MTE) that must be monitored before an alert is generated. This criteria must be met before the process executes.

- Step 1** Click the Triggers tab, then click **New > CCMS Alert**.
- Step 2** Click the **General** tab and enter the general information for the trigger.
- Step 3** Click the **CCMS Alert** tab to enter the trigger information, including:
- Monitoring Tree Element—Click Browse to launch the SAP Destination dialog box to locate the monitoring tree element for the SAP system.
  - Context—The CCMS MTE context for the SAP system that will be monitored by this workflow. Enter a wildcard (\*) to monitor all servers.



- Object name—The object in SAP that will be monitored by this workflow (for example, the CPU in your host system, the database, and SAP services, such as background processing).
  - Short name—Short text that is assigned to the MTE class.
  - MTE class—The MTE class in SAP for the monitoring tree element.
  - Alert Color—CCMS alerts are assigned a color based on the severity of the alert (Red, Yellow, Green, Unknown).
- Step 4** Click the **Target** tab to specify the target on which to monitor for changes that will trigger the process.
- Step 5** Click the **Conditions** tab to include special conditions for when the event log trigger will be applied.
- Step 6** Click the **Knowledge Base Article** tab to add a knowledge base article.
- Step 7** Click **OK** to complete the procedure.
- 

## Creating a Variable Updated Trigger

Use the Variable Updated Properties trigger to specify the changed variable value to use as a trigger to execute a process. This criteria determines the values that must be met before the process executes.

- Step 1** Click the Triggers tab, then click **New > Variable Updated**.
- Step 2** Click the **General** tab and enter the general information for the trigger.
- Step 3** Click the **Conditions** tab to include special conditions for when the event log trigger will be applied.
- Step 4** Click **OK** to complete the procedure.
- 

## Adding Trigger Logic to Process Workflows

You can check the attributes of a trigger in a process, so that if one process has multiple triggers (such as started by user, started by parent process, and a trigger from an AMQP message), you can check which of these events occurred and branch the execution accordingly. The properties of the event that triggered the process are available in the process workflow using reference control.

## Correlating Events

Process Orchestrator contains a technology called Correlex that allows events that match data in the workflow (such as a trigger) to be correlated. Process Orchestrator's event correlation capabilities are real time, in memory, geared towards typical IT staff, not programmers, and can be combined with active probing and action activities to leverage correlated data.

Process Orchestrator's correlation activities can be placed anywhere in a workflow and reference any data from prior workflow steps. It is common for workflows to capture diagnostic data to perform decision tree branching before they correlate other events. A workflow might:

- Probe the system to see if a service is up.
- Test system performance.

- Look up configuration to find a relationship that is not evident in events themselves and then use that new information to capture events.

Process Orchestrator's process workflows can include activities other than correlations to capture supplemental non-event data in real time that might be gone before the end of a classic event correlation time window.

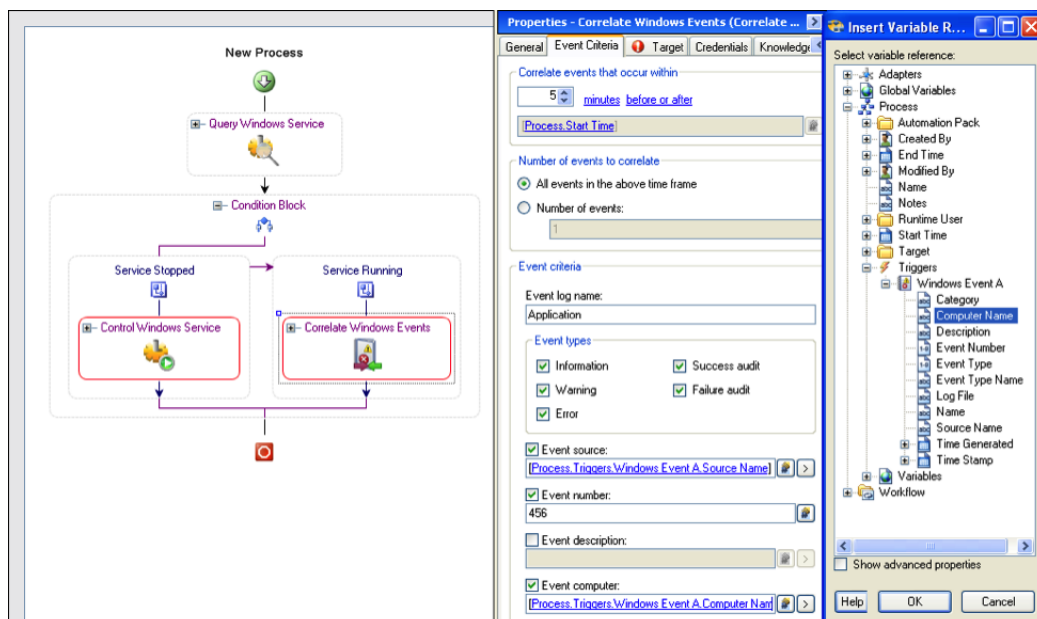
For example, assume there are two events, A and B, and there is a need to handle things one way when only A occurs, and another when A and B happen together. In correlation, a time window is required; if A occurs, it will not be clear whether A and B both occur until the end of the time window. So the results of the correlation might not be able to publish the results until sometime after A occurs. But with complex enterprise systems, often issues can be fleeting. There is a need to capture data right when a condition occurs or it might be gone; in other words, the tool might miss event A while looking for event B. Too often for difficult issues, troubleshooting data is not available at the time the operator is notified or some correlation response script occurs.

In Process Orchestrator, when event A triggers the workflow, the workflow can first focus on data capture, then move on to correlation. In this way Process Orchestrator has at its disposal data that is more real-time, and more complete, than correlation has previously allowed, which means that analysis in Process Orchestrator workflows can be more sophisticated. The workflow can solve a superset of cases compared to traditional correlation, and the data presented to operators is more complete and accurate.

This capability is exposed through Correlate activities. For example, the Correlate Windows Events activity allows the correlation of related events from the Windows Event Logs.

Process Orchestrator provides Correlate activities that correspond to many types of supported triggers. Typically, if Process Orchestrator provides a trigger, it will also provide a correlation activity, though this is not explicitly required.

**Figure 11-1** A Correlate Activity



Correlate activities have several key pieces of data that specify the events to find:

- The time window in which the event can occur

- The number of events to match. If a number is specified, and when the process workflow execution gets to the correlate activity that number of events has already occurred within the time window, the Correlate activity will immediately match. If not, the activity will block waiting for those events to occur. If *all* is specified, the activity will wait until the end of the window and then return the results.
- The event criteria. This presents fields for filtering that type of event and is specific to the event type and adapter.


Events that match a Correlate activity are available to the later steps in the workflow and are published in the automation summary.

From a technology perspective, the server implementation:

- Allows activities to complete in real time. If you wait for one event and a matching event arrives, the activity will complete immediately rather than waiting until the end of the time window.
- Handles cases where event arrival might precede process execution of the correlation node. A process might not even be executing when an event arrives; it could be triggered later and look retrospectively for matching events. The server must cache data given its knowledge of Correlate activities in process definitions so it is ready to provide matched events should a Correlate activity execute later.
- Allows that correlation activities may never run due to untriggered workflows or workflow logic taking a different flow.
- Performs intelligent event caching and garbage collection based on process definitions.

## Creating Correlate Event Activities

Use a Correlate activity to check whether an event occurred.

- 
- Step 1** In the Process Editor, choose **Toolbox > Activities**, enter **correlate** in the Filter by Name text box, then select the correlate activity for the specific event you want to collect.
- Step 2** On the Correlate activity property page, click the **General** tab and enter the appropriate information.
- Step 3** Click the **Event Criteria** tab and specify the required event properties for the activity.
- Step 4** Click **Additional properties to match** and specify the appropriate information.
- The Expression arrow displayed to the right of the Reference tool indicates that a wildcard expression is available.
- Step 5** Click **Save**  to complete the activity definition.
- Step 6** To view the correlated event results:
- a. Choose **Operations > Activity Views**, highlight the correlate activity instance, right-click and choose **Properties**.
  - b. Click the **Correlated Events** tab to view the alerts collected by the correlate activity.
-

# Integrating Using the Advanced Message Queuing Protocol (AMQP)

Use AMQP to create Process Orchestrator triggers for events that occur out on the IT landscape for which Cisco does not have adapters. For example, to trigger a Process Orchestrator process in response to a syslog event:

- 
- Step 1** Set up an AMQP queue/exchange with a feed from an off-the-shelf component such as this: <https://github.com/bkjones/bevis>.
  - Step 2** Set up the IT landscape elements (application) to post messages to the newly created queue.
  - Step 3** Set up a Process Orchestrator trigger from the queue/exchange.
- 

## Related Topics

- [Advance Message Queuing Protocol \(AMQP\) Adapter, page 12-4](#)

## Debugging Process Trigger Instances

Use the Process Editor to view the process triggers. The Triggers tab in the Properties panel displays the triggers associated with the process and each trigger's target.

To debug process trigger instances:

- Review the product's auditing log (choose **Operations > Auditing > System**) for any errors that the server or adapters might have experienced while monitoring for an event.
- If a process contains a trigger, use the Process Editor to view the trigger criteria that the adapter will be monitoring. In the Process Instance view, you can see the specific occurrence of the trigger that caused the specific process instance to execute.

One debugging technique is to create a new separate process that triggers from the same event as the process you are trying to debug, and set the trigger criteria to include all events with no filters. You can then monitor the operations views to see instances of the process which launch, and look at their trigger attributes to see all events. Be sure to delete these debugging processes when you are done diagnosing your problem.

## Queue Resources

Think of queues as the same thing as Customs waiting area when you travel internationally. Like Customs, there is both a maximum number for going through queue and a maximum number waiting to go through the queue, or the “waiting area.” A “queue block” is the equivalent of a person going through Customs.

There are two types of Queue Resources:

- Default System Queue Resource:
  - Maximum concurrent executions is 1
  - Maximum entries in the queue is 1000

The two values and the resource name or display name are read-only. There is only one Default System Queue Resource in a Process Orchestrator system.

- User Defined Queue Resource:
  - Maximum concurrent executions is 1 or more
  - Maximum entries in queue is 1 or more.
  - You can modify the two values and the resource name or display name.
  - You can create any number of User Defined Queue Resources with any maximum concurrent executions and maximum entry values.

**Note**

You can have different maximum allowed entries and maximum allowed in queue for different Queue Resources.

The Process Editor Toolbox uses an object called Queue for creating or adding queues. For more information on using the Process Orchestrator Toolbox and creating processes, see [Authoring Task Activities, page 5-9](#).

## Creating a Queue Block

Think of a “queue block” as the equivalent of a person going through the line in Customs.

- 
- Step 1** Access the Queue Block Properties page.
  - Step 2** Enter a Queue Block Name.
  - Step 3** Select a Queue Resource:
    - Select either a **Queue Block Resource Name**, or
    - Select a **Queue Resource Name (User defined or default)**.

**Note**

The Queue Block searches for a user defined queue resource that matches the given name. If the name does not exist, the default system queue resource is used.

- Step 4** Select a Priority level.
  - Step 5** Enter any optional Notes as needed.
  - Step 6** Click **OK** to save your work and close this page.
- 

For more information on Queue Resources, see [Queue Resources, page 11-8](#)

## Creating a Queue Resource

You can create one or many, as well as parallel queues and sequential queues in the same queue block.

- 
- Step 1** Go to **Definitions > Queue Resources**.
  - Step 2** On the Properties screen, enter a Display Name.

- Step 3** Enter a Resource Name.
  - Step 4** Select the Maximum Allowed Entries.
  - Step 5** Select the Maximum Allowed Entries Waiting on Queue.
  - Step 6** Enter an optional Description.
  - Step 7** Click **OK**.
-



## Using Adapters

---

The topics in this chapter describe the adapters available for Cisco Process Orchestrator, any special information about installing and configuring the adapters, and the activities provided by each adapter. You can use these adapters in a workflow.

Many of the Process Orchestrator tasks that are required to run an activity are common to all or most adapters. For example:

### **Configuring Adapters**

For specific information about installing and configuring an adapter, see the topics in this chapter. For general information about adapters, see [Configuring Security, page 10-19](#).

### **Creating Targets**

Before you can create or run processes in your Process Orchestrator environment, you must create the targets on which the processes will run. Targets define specific environments where certain processes, activities, or triggers will run.

You can define a target once and then reuse it in multiple processes. To define a target, see [Defining a Target, page 2-13](#).

### **Creating Runtime User Accounts**

When creating targets, a runtime user account must be specified to be used to connect to the target. The runtime user account stores the information about the user security context for the target.

You can create the runtime user accounts during the process of creating the targets or prior to creating the targets. To create a runtime user account, see [Defining Runtime Users, page 2-14](#).

### **Creating Triggers**

Triggers are events and conditions in the system that determine how or when the process will be executed. Using a trigger, for example, you can subscribe to an existing queue and fire an event trigger based on the message that is generated. See [Creating Triggers, page 11-1](#).

## Target General Tab

Use the General tab to enter general information about a target. The information displayed depends on the configured target.

## Target Configuration Tab

Use the Configuration tab to specify the character restrictions for a database identifier. A distinction is made between simple identifiers and special identifiers.

## Target Permission Tab

Use the Permission page to define the permissions for SQL commands that can run on the target.

## Target General Information

Use the New [Object] Wizard General Information panel to specify the display name and description for the new target.

## Completing the New Object Wizard Panel

The Completing the New [Object] Property Wizard panel displays name of the new object.

Review the information to verify that it is correct and click the appropriate button to complete wizard process.

## User Assignments tab

Use the User Assignments tab to add and modify security role information between the security principal and the permissions.

The User Assignment tab binds the security principal (either a user or group) and defined security permissions for the security role.

### **Add**

Click this to launch the select User or Group dialog box and change the owner.

### **Remove**

Removes the selected principal from the list of the owners assigned to the security role.



## Configuring Adapters

Adapters are one of the extensibility mechanisms used to extend Process Orchestrator functionality to integrate with devices, environments, applications, or tools without undergoing core modification.

Examples of adapters include:

- The primary adapter for Cisco Process Orchestrator is the Core Functions Adapter. This adapter provides the core features and objects to be used to manage IT processes.
- Microsoft Windows Adapter provides Windows objects, such as the Windows computer target, Windows runtime user, and Windows-related activities.

Use the **Administration > Adapters** view to display the adapters that are installed with the product and their associated objects.

## Viewing Adapter Prerequisites

Each adapter can have prerequisites that must be satisfied before the adapter can be fully functional. For example, the Core Functions Adapter has no prerequisites, but the SAP ABAP Adapter requires the SAP .NET 3.0 connector; without this connector, the SAP ABAP adapter will not function correctly.

Prerequisites apply to particular Process Orchestrator servers, so prerequisites can be satisfied on one server but not on another. This means that sometimes an adapter might be functional on one server and not on another if the prerequisites are not met on that other server. If you are running in a high availability environment, it is important that all required adapter's prerequisites are satisfied on all Process Orchestrator servers.

To check the status of the prerequisites for each adapter:

- 
- Step 1** Choose **Administration > Adapters**, then double-click an adapter name.
  - Step 2** In the [adapter name] Adapter Properties dialog, click the **Prerequisites** tab.
  - Step 3** If your environment contains more than one server, you can view the prerequisites for each server. Choose **Administration > Orchestration Servers > PO Server properties > Prerequisites**.
- 

## Viewing Adapter Properties

To view general information related to the adapter, the specific functions that the adapter provides, and a history of changes that have been made to the adapter, choose **Administration > Adapters > Adapter Properties**. The information on the property dialog for each adapter varies.

## Viewing Objects Provided by the Adapter

Each adapter provides specific functionality within Process Orchestrator. Use the **Provides** tab in the **Administration > Adapters > Adapter Properties** dialog to view the functionality that is provided by an adapter.

# Advance Message Queuing Protocol (AMQP) Adapter

The Cisco Advanced Message Queuing Protocol (AMQP) software adapter allows you to automate messaging activities on Cisco AMQP instances.

The following table displays activities that are provided by the AMQP adapter. For more information about using these activities, see [Getting Started Using the AMQP Adapter, page 12-4](#).

| Activity         | Action   |
|------------------|--|
| Declare Exchange | Declare an exchange on the AMQP broker.<br>See <a href="#">Declaring an AMQP Exchange, page 12-6</a> .   |
| Declare Queue    | Declare a queue on the AMQP broker.<br>See <a href="#">Declaring an AMQP Queue, page 12-6</a> .  |
| Bind Queue       | Bind a queue to an exchange on the AMQP broker.<br>See <a href="#">Binding an AMQP Queue to an Exchange, page 12-7</a> .                               |
| Publish Message  | Publish a text message to an existing exchange on the AMQP broker.<br>See <a href="#">Advance Message Queuing Protocol (AMQP) Adapter, page 12-4</a> . |
| Get Message      | Get a message from a given queue on the AMQP broker.<br>See <a href="#">Getting a Message, page 12-8</a> .   |
| Purge Queue      | Purge a queue.<br>See <a href="#">Purging an AMQP Queue, page 12-8</a> .   |
| Unbind Queue     | Unbind a queue from an exchange.<br>See <a href="#">Unbinding an AMQP Queue, page 12-8</a> .   |
| Delete Queue     | Delete a queue.<br>See <a href="#">Deleting an AMQP Queue, page 12-9</a> .   |

## Getting Started Using the AMQP Adapter

Use the following process to monitor and manage Cisco AMQP instances.

- 
- Step 1** Create a Cisco AMQP target (see [Defining an AMQP Broker Target, page 12-5](#)).
  - Step 2** Define a Cisco AMQP command activity (see [Automating Cisco AMQP Tasks, page 12-6](#)).
  - Step 3** View the activity results (see [Monitoring Operations, page 8-1](#)).
-

## Managing AMQP Messages

### Receiving Messages Based on a Pattern

You can define policies that automatically trigger specific workflows based on certain AMQP messages. A message-based event starts only when the message matches all of the criteria on both the Content Header and Message pages.

To create the message-based event:

- 
- Step 1** Choose **AMQP Message Event Properties**.
  - Step 2** Choose an existing queue.
  - Step 3** Add the message criteria and message body to the message event.
  - Step 4** Use an AMQP Message Event trigger to fire an event trigger based on the message that is generated.
- 

### Defining an AMQP Broker Target

Use the AMQP Broker target to configure the connection information to a vCloud Directory server to be used for process and activities to run against.

- 
- Step 1** Choose **Definitions > Targets > New > AMQP Broker**.
  - Step 2** On the **General** panel, enter the required information.
  - Step 3** On the **Connection** panel, specify the connection information for the AMQP broker, including:
    - **Host**—The host name or IP address for the AMQP Broker.
    - **Port**—The AMQP protocol port number; the default port is 5672.
    - **Virtual Host**—The virtual host name or IP address for the AMQP Broker.
    - **Default runtime user**—The runtime user required to execute a process or activity against this target.
    - **SSL enabled**—Indicates if SSL is enabled on the AMQP Broker.
    - **Ignore certificate error**— Ignore the certificate error messages when attempting to connect to the service portal.
  - Step 4** On the Finish panel, click **Finish** to complete the target definition.
-

## Automating Cisco AMQP Tasks

### Declaring an AMQP Exchange

Use the Declare Exchange activity to create or check an AMQP broker exchange.

**Step 1** In the Process Editor Toolbox, choose **AMQP > Declare AMQP Exchange**, then drag and drop the activity onto the Workflow pane.

**Step 2** Click the **General** tab and enter the required information.



**Note** Exchange names must be unique within a virtual host.

**Step 3** Click the **Declare Exchange** tab and specify the information that describes the exchange, including:

- **Type**— type of exchange you want to declare (see [Managing AMQP Messages, page 12-5](#)).
- **Durable**—**Durable** exchanges last until they are deleted. **Temporary** exchanges last until the server shuts-down. Not all scenarios and use cases require durable exchanges.
- **Auto delete**—**Auto-deleted** exchanges last until they are no longer used.
- **Arguments**—Enter the name and value pair arguments for the queue

**Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

### Declaring an AMQP Queue

Use the Declare Queue activity to create or check a queue on the AMQP broker. This activity will create a queue if the queue does not already exist.

When you declare a new queue, you can specify various properties that control the durability of the queue and its contents and the level of sharing for the queue.

**Step 1** In the Process Editor Toolbox, choose **AMQP > Declare AMQP Queue**, then drag and drop the activity onto the Workflow pane.

**Step 2** Click the **General** tab and enter the required information.



**Note** Message queue names must be unique within a virtual host.

**Step 3** Click the **Declare Queue** tab and specify the information that describes the queue, including:

- **Durable**—Whether the queue is durable or transient. Durable queues survive broker restart whereas transient queues do not (they must be redeclared when the broker comes back online). Not all scenarios and use cases require durable queues.
- **Auto delete**—Delete the queue when it is empty.
- **Exclusive**—The queue belongs to the current connection only, and is deleted when the connection closes.

- Arguments—Enter the name and value pair arguments for the queue
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Binding an AMQP Queue to an Exchange

Use the Bind Queue activity to bind a queue to an AMQP broker exchange.

---

- Step 1** In the Process Editor Toolbox, choose **AMQP > Bind AMQP Queue**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Bind Queue** tab and specify the information that describes the queue binding, including:
- Queue Name—Name of the queue you want to bind to an exchange.
  - Exchange Name—Name of the exchange you want to bind to a queue.
  - Routing Key—The key to be sent with the message.
  - Arguments—Enter the name and value pair arguments for the queue
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Publishing a Message

Use the Publish Message activity to publish a text message to an existing exchange on the AMQP broker. The message will be routed to queues as defined by the exchange configuration and distributed when the transaction, if any, is committed.

For example, VMWare vCloud Director can publish vCloud AMQP Messages (also known as blocking tasks, notifications, or call-outs) related to different provisioning tasks. A Process Orchestrator can not only receive these events, but can respond to them to delay execution.

---

- Step 1** In the Process Editor Toolbox, choose **AMQP > Publish AMQP Message**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Publish Message** tab and specify the information that describes the message to be published.
- Step 4** To define the content header for the message, click **Add** to display the Content Header dialog box.
- Step 5** Click the **Message** tab to define the header and body of the message. Click **Add** to display the Message Header dialog box.
- Step 6** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
-

## Getting a Message

Use the Get Message activity to retrieve the next available message from a given queue on the AMQP broker.



**Note** This activity will open and close the channel to get one message; it is not designed to put it into a tight loop. This activity is considered to be a destructive way to get a message from an AMQP queue. The typical way is to subscribe to an AMQP queue.

- 
- Step 1** In the Process Editor Toolbox, choose **AMQP > Get AMQP Message**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Get Message** tab and specify the information that describes the message to be retrieved, including:
- No Acknowledgment Mode—If this option is checked, no acknowledgment is sent after retrieving the message. The server will auto-acknowledge the message.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Purging an AMQP Queue

Use the Purge Queue activity to remove all messages from a queue that are not awaiting acknowledgment on the AMQP broker. In the Process Editor Toolbox on the [AMQP Activity] property page, click the **Purge Queue** tab, then choose the queue to be purged.

## Unbinding an AMQP Queue

Use the Unbind Queue activity to remove the binding between the queue and the exchange. After the binding has been removed, the queue will not receive any more messages until it is bound to another exchange.

- 
- Step 1** In the Process Editor Toolbox, choose **AMQP > Unbind AMQP Queue**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Unbind Queue** tab and specify the information that describes the queue you want to unbind, including:
- Name—Name of the queue you want to unbind from an exchange.
  - Exchange Name—Name of the exchange you want to unbind from a queue.
  - Routing Key—The key the messages will be sent with.
  - Arguments—Enter the name and value pair arguments for the queue

- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Deleting an AMQP Queue

Use the Delete Queue activity to delete a queue from the AMQP broker. When a queue is deleted, any pending messages are sent to a dead-letter queue if this is defined in the server configuration, and all consumers on the queue are canceled.

---

- Step 1** In the Process Editor Toolbox, choose **AMQP > Delete AMQP Queue**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Delete Queue** tab and specify the information that describes the queue you want to unbind, including:
- Name—Name of the queue you want to delete
  - Delete only if queue is not used—Indicates if queue will only be deleted if it is not used.
  - Delete only if queue is empty—Indicates if queue will only be deleted if it is empty.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

# AMQP Activities Instance Properties

## Argument Instance Dialog

The Argument display-only dialog box displays additional arguments given on queue declaration, including the name and value for the given key.

## AMQP Message Event Instance Properties Message Tab

The Message *display-only* tab displays the attributes used for routing Header exchanges route messages based on message header matching.

## AMQP Message Event Instance Properties, Advanced Tab

The Advanced *display-only* tab displays the advanced attributes used for the AMQP event.

## Bind Queue

The Bind Queue *display-only* tab displays the defined parameters used for binding a queue to an exchange on the AMQP broker.

## Content Header

The Content Header *display-only* tab displays the properties defined for how the AMQP message displays in the header of the message.

## Declare Exchange

The Declare Exchange *display-only* tab displays the properties used to declare an exchange on the AMQP broker.

## Declare Queue

The Delete Queue *display-only* tab displays the properties used to declare a queue on the AMQP broker.

## Delete Queue

The Delete Queue *display-only* tab displays the properties used to delete a queue on the AMQP broker.

## Exchange

The Exchange *display-only* tab displays the selected objects properties.

## Get Message

The Get Message *display-only* tab displays the properties used to subscribe to an existing queue and fire an event trigger based on the message criteria.

## Message Tab

The Message *display-only* tab displays the properties used to define the header and body of a message.

## Publish Message

The Publish Message *display-only* tab displays the properties used to define the text message to an existing exchange on the AMQP broker with a routing key.



## Purged Messages

The Purged Messages *display-only* tab displays the properties used to purge messages in a queue on the AMQP broker.

## Purge Queue

The Purge Queue *display-only* tab displays the properties defined to purge messages in a queue on the AMQP broker.

## Unbind Queue

The Unbind AMQP Queue *display-only* tab displays the properties used to unbind a queue from an exchange on the AMQP broker.

## Microsoft Service Bus Adapter

The Microsoft Service Bus Adapter integrates Microsoft Service Bus API into Cisco Process Orchestrator and allows you to automate messaging activities. You can use Microsoft Service Bus implementation for Windows Server 1.1 on premises. For more details *see*, [Getting Started with Service Bus for Windows Server 1.1](#).



### Note

You must export certificate to client machine (Process Orchestrator Server) to enable remote clients to connect to a Service Bus for Windows Server.

The following table displays activities that are provided by the Microsoft Service Bus adapter.

| Activity     | Action   |
|--------------|--|
| Send Message | Send a message to a given queue.<br>See <a href="#">Sending a Message, page 12-13</a> .  |
| Get Message  | Get a message from a given queue.<br>See <a href="#">Getting a Message, page 12-13</a> . |

## Getting Started Using the Microsoft Service Bus Adapter

Use the following process to monitor and manage Service Bus instances.

- 
- Step 1** Create a Microsoft Service Bus target (see [Defining an Microsoft Service Bus Target, page 12-12](#)).
  - Step 2** Define a Microsoft Service Bus activity (see [Automating Microsoft Service Bus Tasks, page 12-13](#)).
  - Step 3** View the activity results (see [Monitoring Operations, page 8-1](#)).
-

## Managing Service Bus Messages

### Receiving Messages Based on a Pattern

You can define policies that automatically triggers specific workflows based on certain Service Bus messages. A message-based event starts only when the message matches all criteria on both the Content Header and Message pages.

To create the message-based event:

- 
- Step 1** Choose **Service Bus Message Event Properties**.
  - Step 2** Choose an existing queue.
  - Step 3** Add the message criteria and message body to the message event.
  - Step 4** Use an Service Bus Message Event trigger to fire an event trigger based on the message that is generated.
- 

### Defining an Microsoft Service Bus Target

Use the Microsoft Service Bus Broker target to configure the connection information to a vCloud Directory server to be used for process and activities to run against.

- 
- Step 1** Choose **Definitions > Targets > New > Microsoft Service Bus**.
  - Step 2** On the **General** panel, enter the required information.
  - Step 3** On the **Connection** panel, specify the connection information for the Microsoft Service Bus broker, including:

- Namespace—The container of queues, topics with subscriptions for the Service Bus.



---

**Note** You can create 1 or more namespace, when you register in the Microsoft Service Bus portal.

---

- Service Bus Windows Server — Enter the following information:
    - Server — Enter the host name or IP address.
    - Runtime Port — Enter the Runtime port number. By default it is 9354.
    - Management Port — Enter the Management Port number. By default it is 9355.
  - Shared access key—Enter the access key of the account.
  - Connection String — Displays the string information about the data source.
- Step 4** Click **Ok** to complete the target definition.
- 

### New Shared Access Key Properties

Use the New Shared access key properties to create an access key for the service bus.

- 
- Step 1** Choose **Definitions > Targets > New > Microsoft Service Bus**.
  - Step 2** On the **Connection** panel, choose **New > Shared Access Key**.
  - Step 3** Enter the **Shared access key name** and **Shared access key** for the Service Bus.
  - Step 4** Click **Ok** to complete the key properties definition.
- 

## Automating Microsoft Service Bus Tasks

### Sending a Message

Use the Send Message activity to publish a text message to an existing exchange on the Service Bus broker. The message is routed to queues as defined by the exchange configuration and distributed when the transaction, if any, is committed.

- 
- Step 1** In the Process Editor Toolbox, choose **Microsoft Service Bus > Send Message**, then drag and drop the activity onto the Workflow pane.
  - Step 2** Click the **General** tab and enter the required information.
  - Step 3** Click the **Publish Message** tab and specify the information that describes the message to be published. You can either use the Queue name or Topic name.
  - Step 4** To define the content header for the message, click **Add** to display the Content Header dialog box.
  - Step 5** Click the **Message** tab to define the header and body of the message. Click **Add** to display the Message Header dialog box.
  - Step 6** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

For more detail on Microsoft Service Bus, see [Microsoft Service Bus Adapter](#)

---

### Getting a Message

Use the Get Message activity to retrieve the next available message from a given queue.

- 
- Step 1** In the Process Editor Toolbox, choose **Microsoft Service Bus > Get Message**, then drag and drop the activity onto the Workflow pane.
  - Step 2** Click the **General** tab and enter the required information.
  - Step 3** Click the **Get Message** tab and specify the information that describes the message to be received. You can either use the Queue name or Subscription name.
  - Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

For more detail on Microsoft Service Bus, see [Microsoft Service Bus Adapter](#)

---

# Cloud Center Adapter

The Cloud Center adapter integrates Cloud Center API into Cisco Process Orchestrator, so you can automate cloud deployments and control various aspects of cloud infrastructure provided by Cloud Center.

## Defining a Cloud Center Target

Use the Cloud Center Target to configure the connection information to the Cloud Center server.

- 
- Step 1** Choose **Definitions > Targets > New > Cloud Center Server**.
- Step 2** On the **General** panel, enter the required information.
- Step 3** On the **Connection** panel, specify the following connection information:
- Server name—Enter the Server name for the cloud center.



---

**Note** The server name is the property of the target which contains the host part of the URI - a registered name or an IP address.

---

For more information, see [https://en.wikipedia.org/wiki/Uniform\\_Resource\\_Identifier](https://en.wikipedia.org/wiki/Uniform_Resource_Identifier)

- Port—Enter the port number (default is 443). You can enter values from 1 to 65535.
- Ignore Secure Socket Layer (SSL) certificate error—Check the check box to ignore the SSL certificate error.



---

**Note** You can ignore certificate chain errors only, which is useful to test against the servers with self-generated certificates, without importing the certificates on the client machine.

---

- Runtime user—Select the Runtime user from the drop-down list or choose New to create a New Cloud Center Manage API Access Key.
  - Optional: AMQP Target—Select the appropriate target from the drop-down list. The list displays AMQP configuration from the Cloud Center, in order to use the Cloud Center trigger you need to select a AMQP target. This will help you monitor actions like Create, Update, or Delete on any service like User, Tenant, or Cloud.
- Step 4** Click **OK**, to create the connection.
- 

## New Cloud Center API Access Credentials Properties

Use the New Cloud Center API Access Credentials properties to create an access credentials for the Cloud Center.

- 
- Step 1** Choose **Definitions > Targets > New > Cloud Center Server**.
- Step 2** On the **Connection** panel, choose **New > Cloud Center API Access Credentials**.
- Step 3** Enter the **User name** for the Cloud Center.

- Step 4** Check the **API Key** check box, and enter the API key.
- Step 5** Click **OK** to complete the key properties definition.

## Execute Cloud Center Command

Use the Execute Cloud Center Command activity to execute Cloud Center API command against a Cloud Center server. The Cloud Center activity provides a flexible way to perform the desired action using the request methods. Responses for common information are scanned and displayed as activity results in the Operations Workspace activity instance view.

- Step 1** In the Process Editor Toolbox, choose **CloudCenter > Execute Cloud Center Command**, then drag and drop the activity onto the workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Request** tab and specify the following information:

- Path — Enter the Relative URI part of the request.

For example:

```
v1/users
v1/users/userId
v1/users/userId?detail=true
```

For more information, see <http://docs.cliqr.com/display/40API/Base+URI+Format>.

- Method — Select the required Method from drop-down list:
  - GET — To query or view the server information based on a CloudCenter deployment.
  - PUT — To replace the entire object for update operations.
  - POST — To perform a CloudCenter platform task or creating the resource.
  - DELETE — To remove specific aspects of the CloudCenter deployment.



**Note** The CloudCenter APIs use HTTPS Version 1 to support these request methods.

For more information on HTTPS request methods see,

<http://docs.cliqr.com/display/40API/HTTPS+Request+Methods>

- Content Type — Select the required Content type from the drop-down list. Values are:
  - JSON
  - XML
- HTTP Message Body — You can send a message body with following methods. Values are:
  - PUT
  - POST
  - DELETE



**Note** GET request is not sent as part of the request and hence cannot have an HTTP message body.

- Timeout — Check the check box and then enter the time period the activity should wait before failing.




---

**Note** Click the time unit link to change the time interval.

---

**Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

---

## Cloud Center Response

The **Response tab** displays the properties of the HTTP Response received from the API call.

- HTTP Status Code — Displays the Status code of the response. This may indicate whether a request is success or failure.

The Cloud Center API can only return a limited set of HTTP status codes. For more information on HTTP Status codes, *see*

<http://docs.cliqr.com/display/40API/CloudCenter+API+Overview#CloudCenterAPIOverview-HTTPStatusCodes>.

- HTTP Reason Phrase — Displays the HTTP reason phrase for the process activity.
- HTTP Message Body — Displays the HTTP message body in JSON or XML.

For more information on HTTP response message see,

[https://en.wikipedia.org/wiki/Hypertext\\_Transfer\\_Protocol#Response\\_message](https://en.wikipedia.org/wiki/Hypertext_Transfer_Protocol#Response_message)

## BMC Remedy Adapter

The Cisco Remedy Adapter provides activities for automating tasks on Cisco Remedy instances. Typical Remedy command activities include:

- Creating an entry in any Remedy form.
- Initiating an incident request review. These reviews can be performed periodically to analyze incident request information and identify potential problems.

Remedy defines an incident as an event that is not part of the standard operation of a service and that causes an interruption to or a reduction in the quality of that service.

Incident management is typically initiated in response to a customer call or automated event, such as an alert from a monitoring system. The primary goal of the incident management process is to restore normal service operation as quickly as possible with minimum disruption.

- Creating a relationship between an incident request and a problem (Remedy does this automatically when a problem investigation is created from an incident request).
- Adding a new Work Info entry, such as files and customer email messages, to an existing Remedy property. Use this activity to add general notes about the current record, such as the date a particular configuration item was deployed, or vendor-related notes, such as a bulletin sent from a vendor.




---

**Note**

All Cisco Process Orchestrator Remedy activities are based on forms that can be customized by the user. This can cause a misunderstanding as to whether the fields on the forms are required or optional.

---

The following table displays activities that are provided by the BMC Remedy adapter. For more information about using these activities, see [Getting Started Using the Remedy Adapter, page 12-18](#).

| Activity                            | Comments  |
|-------------------------------------|---|
| Create Remedy Entry                 | Create an entry in any Remedy form.<br>See <a href="#">Selecting an Association Type, page 12-26</a> .  |
| Create Remedy Incident              | Create an incident on a Remedy server using selected properties.<br>See <a href="#">Initiating an Incident Request Review, page 12-19</a> .   |
| Create Remedy Relationship          | Configure a relationship between incidents and configuration items.<br>See <a href="#">Creating a Relationship Between an Incident Request and a Problem, page 12-20</a>  |
| Create Remedy Work Info             | Add a new Work Info entry to an existing Remedy property.<br>See <a href="#">Adding a New Work Info Entry to an Existing Remedy Property, page 12-22</a>  |
| Delete Remedy Entry                 | Remove entries, such as relationships, work log entries, or custom entries from a Remedy item.<br>See <a href="#">Deleting a Remedy Entry, page 12-22</a>   |
| Find Remedy Objects                 | Query objects, configuration items, and other assets to create relationships. It can also be used to find any entry on a Remedy server.<br>See <a href="#">Finding Remedy Objects, page 12-23</a>   |
| Get Remedy Entry Property Values    | Retrieve property values for a specific entry on a Remedy server. If the entry ID is known, this activity can be a better alternative than the Find Remedy Objects activity, which allows a broader set of parameters.<br>See <a href="#">Get Remedy Entry Property Values, page 12-23</a>          |
| Get Remedy Incident Property Values | Retrieve property values for a specific incident on a Remedy server. If the incident ID is known, this activity can be a better alternative than the Find Remedy Objects activity, which allows a broader set of parameters.<br>See <a href="#">Get Remedy Incident Property Values, page 12-24</a> |
| Update Remedy Entry                 | Update the entries in a specific Remedy form. This activity can also be used to update the properties in a Work Info or Relationship entries.<br>See <a href="#">Defining an Update Remedy Entry Activity, page 12-24</a>   |
| Update Remedy Incident              | Update the properties for a specific Remedy incident.<br>See <a href="#">Defining an Update Remedy Incident Activity, page 12-25</a>  |

## Prerequisites

### Installing Remedy client C API Library Files

The Remedy adapter requires the Remedy client C API libraries to be installed in order to communicate with Remedy servers. Before you can create a Remedy Server target, the dll files must be installed on the Cisco Process Orchestrator server.

- 
- Step 1** Download the API zip file from the BMC community site (see <https://communities.bmc.com/docs/DOC-33310>).
- Step 2** From the folder where the dll files are extracted, locate the following files:
- arapi81\_build001\_win64.dll
  - arrpc81\_build001\_win64.dll
  - arutl81\_build001\_win64.dll
  - arxmlutil81\_build001\_win64.dll
  - icudt32.dll, icuinbmc32\_win64.dll
  - icuucbmc32\_win64.dll
- Step 3** Copy the files to the following folder on the Orchestrator server:  
<Install drive>\Program Files\Cisco\Process Orchestrator\Adapters\Remedy
- Step 4** Verify the properties of the dll files and unlock them, if necessary.

## Getting Started Using the Remedy Adapter

Use the following process to monitor and manage Cisco BMC Remedy instances.

- 
- Step 1** Create a Cisco Remedy target (see [Defining a Remedy Server Target, page 12-18](#)).
- Step 2** Define BMC Remedy activities:
- In the Process Editor Toolbox, choose **BMC Remedy > [BMC Remedy Activity]**, then drag and drop the activity onto the Workflow pane.
  - Click the **General** tab and enter the required information.
  - Click the **[Activity-Specific]** tabs to define the properties specific to the activity.
  - Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- For details about a specific activity, see [Managing Remedy Tasks, page 12-19](#).
- Step 3** View the activity results (see [Monitoring Operations, page 8-1](#)).
- 

## Defining a Remedy Server Target

Use the Remedy Server target to specify the connection information to a Remedy server which is used for processes to run against. Define the Remedy target before attempting to define any Remedy activities. The Remedy target accesses the list of properties on the Remedy server.

- 
- Step 1** Choose **Definitions > Targets**, right-click, and choose **New > Remedy Server**.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Connection** tab to specify the connection information to a Remedy server, including:
- Remedy Server Name—Host name or the IP address of Remedy server



- Port—Port number used to access the Remedy server (Default: 0)
- Step 4** Click the **Polling** tab to configure the frequency in which Process Orchestrator queries a Remedy system.
- Step 5** Click **OK** to close the dialog box and complete the procedure.
- 

## Managing Remedy Tasks

### Creating a Remedy Entry

Use the Create Remedy Entry activity to create an entry in any Remedy form.

#### Before You Begin

A Remedy server must be installed and accessible. For installation information, see the BMC Remedy documentation.

---

- Step 1** In the Process Editor Toolbox, choose **BMC Remedy > Create Remedy Entry**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** On the **Entry** tab, specify the form properties and associated values to be used to create a Remedy entry, then click **Add**.
- Form Name—Enter the name of the form containing the entry properties.
- Step 4** In the **Select Properties** box, choose the Remedy server from which the properties will be added to the entry.
- Step 5** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

### Initiating an Incident Request Review

#### Before You Begin

A Remedy server must be installed and accessible. For installation information, see the BMC Remedy documentation.

---

- Step 1** In the Process Editor Toolbox, choose **BMC Remedy > Create Remedy Incident**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Incident** tab, then specify the properties and associated values to be used to create a Remedy incident.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
-

## Creating a Relationship Between an Incident Request and a Problem

Use the Create Remedy Relationship activity to create a relationship between an incident request and a problem (Remedy does this automatically when a problem investigation is created from an incident request). You can use this activity to create the following types of relationships:

- Incident -> Configuration item
- Incident -> Incident
- Configuration -> Incident
- Configuration -> Configuration

**Note**

Because of operations outside of Process Orchestrator control, such as power failure or network outage, only one side of the relationship can be created by the Create Remedy Relationship activity.

**Before You Begin**

A Remedy server must be installed and accessible. For installation information, see the BMC Remedy documentation.

- 
- Step 1** In the Process Editor Toolbox, choose **BMC Remedy > Create Remedy Relationship**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Item 1** or **Item 2** tab to continue and select the appropriate item to configure the relationship properties.
- Item Type—From the drop-down list, select the appropriate item to configure the relationship properties.
    - Incident—See [Configuring Relationship Incident Properties, page 12-25](#).
    - Configuration—See [Selecting an Association Type, page 12-26](#).
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Adding Properties to a Remedy Activity

When configuring the activity properties, you might be required to add properties to the activity. Sort the properties list by the column *Type* so that all of the required fields for your system are displayed at the top of the list.

The Select Properties dialog box is launched when the Add button on the activity-specific property page is clicked. Use the Select Properties dialog box to specify the incident properties for the activity.

- 
- Step 1** On the activity-specific property page tab, click **Add**.
- Step 2** From the **Add properties from the following server** drop-down list, select the appropriate server from the drop down list.
- Step 3** Highlight the appropriate incident properties, then click **OK**.
- Step 4** On the Edit Property dialog box, assign a value to the incident property.

- Step 5** Repeat Step 2 through Step 4 to add additional incident properties to the activity.
- 

## Configuring Relationship Configuration Item Properties

Use the following steps to define the configuration item properties on the Create Remedy Relationship activity.

- 
- Step 1** Click the appropriate **Item** tab, then choose **Item Type > Configuration Items**.
- Step 2** Complete the following configuration item fields, then click **Save**:
- Reconciliation ID—Enter the reconciliation ID of the Remedy configuration item.
  - Configuration item form name—Enter the name of the form containing the configuration properties.
  - Association type—Enter the type of incident property to associate with the Remedy item (see [Selecting an Association Type, page 12-26](#)).
  - Request description—Enter a description to associate with the incident or configuration item. For example, this could be the name of the item or the name of the related item.
- 

## Viewing Results

Click the **Item** *display-only* tabs to view the properties of the activity.

- Reconciliation ID—reconciliation ID of the Remedy configuration item
- Configuration item form name—name of the form containing the configuration properties
- Association type—type of incident property to associate with the Remedy item
- Request description—description associated with the incident or configuration item.

## Adding Incident Properties to a Remedy Trigger

When configuring a Remedy trigger, you can add incident properties to the trigger which can then be used as additional criteria to monitor for incidents. Sort the properties list by the column *Type* so that all of the required fields for your system are displayed at the top of the list.

The Select Properties dialog box is launched when the Add button on the Incident Update Criteria tab is clicked. Use the Select Properties dialog box to specify the incident properties for the trigger.

### Before You Begin

A Remedy server must be installed and accessible. For installation information, see the BMC Remedy documentation.

- 
- Step 1** Choose the **Incident Update Criteria** tab, click **Add**, then choose **Wildcard match** or **Exact match**.
- Step 2** On the Remedy Incident Updated Properties dialog box, select the incident update type, click **Add**, then select the appropriate server from the drop down list. The Remedy server incident properties display in the columns.

| Field | Description  |
|-------|--|
| Name  | Name of the incident property  |
| ID    | ID number of the Remedy incident   |
| Type  | Type of Remedy property <ul style="list-style-type: none"> <li>• Display</li> <li>• Optional</li> <li>• Read-only</li> <li>• Required</li> </ul> |

**Step 3** Highlight the appropriate incident properties, then click **OK**.

**Step 4** Assign a value to the incident property, then click **OK**.

## Adding a New Work Info Entry to an Existing Remedy Property

Use the Create Remedy Work Info activity to add general notes about the current record, such as the date a particular configuration item was deployed, or vendor-related notes, such as a bulletin sent from a vendor.

This activity can be used to add attachments, such as files and customer emails to the work info property. For information on adding attachments to the activity, see [Attaching a File to a Remedy Activity](#).

### Before You Begin

A Remedy server must be installed and accessible. For installation information, see the BMC Remedy documentation.

**Step 1** In the Process Editor Toolbox, choose **BMC Remedy > Create Remedy Work Info**, then drag and drop the activity onto the Workflow pane.

**Step 2** Click the **General** tab and enter the required information.

**Step 3** Click the **Work Info** tab and modify the list of Remedy work info properties. For information about adding attachments to the activity, see [Configuring Relationship Incident Properties, page 12-25](#).

**Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

## Deleting a Remedy Entry

Use the Delete Remedy Entry activity to remove entries, such as relationships, work log entries, or custom entries from a Remedy item.

**Step 1** In the Process Editor Toolbox, choose **BMC Remedy > Delete Remedy Entry**, then drag and drop the activity onto the Workflow pane.

**Step 2** Click the **General** tab and enter the required information.

**Step 3** Click the **Entry** tab and enter:

- Form Name—Enter the name of the form containing the entry properties.  
Click Browse to launch the Select a Form dialog box to select the form containing the entry properties to be removed by the activity.
- Entry ID—ID number of the Remedy

**Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

---

## Finding Remedy Objects

Use the Find Remedy Objects activity to query objects, configuration items, and other assets in order to create relationships. It can also be used to find any entry on a Remedy server.

All Cisco Process Orchestrator Remedy activities are based on forms which can be customized by the user. This may cause user misunderstanding as to whether the fields on the forms are required or optional.

- 
- Step 1** In the Process Editor Toolbox, choose **BMC Remedy > Find Remedy Entry**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Criteria** tab and enter:
- Form Name—Enter the name of the form containing the entry properties.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Get Remedy Entry Property Values

Use the Get Remedy Entry Property Values activity to retrieve property values for a specific entry on a Remedy server. If the entry ID is known, then this activity may be a better alternative than the Find Remedy Objects activity which allows a broader set of parameters.

All Cisco Process Orchestrator Remedy activities are based on forms which can be customized by the user. This may cause user misunderstanding as to whether the fields on the forms are required or optional.

- 
- Step 1** In the Process Editor Toolbox, choose **BMC Remedy > Get Remedy Entry Property Values**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Entry** tab and enter:
- Form Name—Enter the name of the form containing the entry properties.  
Click Browse to launch the Select a Form dialog box to select the form containing the entry properties to be removed by the activity.
  - Entry ID—Enter the Remedy entry ID number or click the Reference tool to select the appropriate Remedy entry value to be retrieved.

**Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

The Properties to Get box displays the list of Remedy properties to be retrieved by the activity.

---

## Get Remedy Incident Property Values

Use the Get Remedy Incident Property Values activity to retrieve property values for a specific incident on a Remedy server. If the incident ID is known, then this activity may be a better alternative than the Find Remedy Objects activity which allows a broader set of parameters.

All Cisco Process Orchestrator Remedy activities are based on forms which can be customized by the user. This may cause user misunderstanding as to whether the fields on the forms are required or optional.

**Step 1** In the Process Editor Toolbox, choose **BMC Remedy > Get Remedy Incident Property Values**, then drag and drop the activity onto the Workflow pane.

**Step 2** Click the **General** tab and enter the required information.

**Step 3** Click the **Incident Property Values** tab and enter:

- Incident ID—Enter the Remedy incident number or click the Reference tool to select the appropriate Remedy incident values to be retrieved

**Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

The Properties to Get box displays the list of Remedy properties to be retrieved by the activity.

---

## Defining an Update Remedy Entry Activity

Use this activity to update the entries in a specific Remedy form, or to update the properties in a Work Info or Relationship entry.

**Step 1** In the Process Editor Toolbox, choose **BMC Remedy > Update Remedy Entry**, then drag and drop the activity onto the Workflow pane.

**Step 2** Click the **General** tab and enter the required information.

**Step 3** Click the **Entry** tab and enter:

- Form Name—Enter the name of the form containing the entry properties.
- Entry ID—Enter the Remedy entry ID number or click the Reference tool to select the appropriate Remedy entry value to be retrieved.
- Properties to update—See [Adding Properties to a Remedy Activity, page 12-20](#)

**Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

---

## Defining an Update Remedy Incident Activity

Use this activity to update the properties for a specific Remedy incident.

- 
- Step 1** In the Process Editor Toolbox, choose **BMC Remedy > Update Remedy Incident**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Incident** tab and enter:
- Incident ID—Enter the Remedy incident number or click the Reference tool to select the appropriate Remedy incident values to be retrieved
  - Properties to update—See [Adding Properties to a Remedy Activity, page 12-20](#)
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Selecting a Remedy Form

Use the Select a Form dialog box to select the form containing the properties to be added to a Remedy activity. Activities requiring entry IDs will contain the option to locate the appropriate form on the Remedy server.

- 
- Step 1** On the Remedy entry activity tab, click **Browse**.
- Step 2** From the **Add a form from the following Remedy Server** drop-down list, select the appropriate Remedy server target defined in Process Orchestrator. The displayed forms depend on the server that is selected.
- Step 3** From the **Selected form** list, select the appropriate form containing the available properties to add to the Remedy entry. Only one form can be selected at a time.
- Step 4** Click **OK** to select the Remedy form.
- 

## Configuring Relationship Incident Properties

Use the following steps to configure the incident properties on the Create Remedy Relationship activity.

- 
- Step 1** Click the appropriate **Item** tab, then choose **Item Type > Incident**.
- Step 2** Complete the following incident fields, then click **Save**:
- Incident ID—Enter the Incident ID number of the Remedy incident.
  - Association type—Enter the type of incident property to associate with the Remedy item (see [Selecting an Association Type, page 12-26](#)).
  - Request description—Enter a description to associate with the incident or configuration item. For example, this could be the name of the item or the name of the related item.
-

## Selecting an Association Type

Use the Select a Property Value dialog box to select the appropriate values to associate the relationship with the Remedy item.

- 
- Step 1** On the Remedy activity tab, click **Browse**.
  - Step 2** From the **Select the property value using the Remedy Server** drop-down list, select the appropriate Remedy server target defined in Process Orchestrator. The displayed fields depend on the selected Remedy server.
  - Step 3** From the **Selected field value** list, select the appropriate fields containing the available properties to add to the Remedy relationship.
  - Step 4** Click **OK** to select the Remedy field.
- 

## Attaching a File to a Remedy Activity

Use the following steps to attach a file to a Remedy activity. When attaching a file to a Remedy activity, the file path should be a local path accessible on the Process Orchestrator server machine or a network share path.



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**Note** If an attachment is present in the activity, a Windows user must be specified.

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- 
- Step 1** On the appropriate Remedy activity property page, click the **Credentials** tab to specify the Windows runtime user for the remedy activity.
  - Step 2** Check the **Use the following credentials for Remedy attachments** check box, then specify the credentials to be used to access the attachment.  
  
To view the properties for the selected runtime user, click the **Properties** icon. To create a runtime user record for the process, click **New > [Runtime User]**.
  - Step 3** Click the Remedy activity-specific tab, then click **Add**.
  - Step 4** From the **Add properties from the following server** drop-down list, select the appropriate server.
  - Step 5** Scroll to the property labeled **Attachment**, or sort by the **Data Type Attachment**, and click **OK**.  
  
When attaching multiple files, use the Attachment property labeled by number (for example, Attachment 1, Attachment 2).
  - Step 6** In the Attachment field, enter the path to the appropriate file.
  - Step 7** Click **OK** to save the attachment to the Remedy activity property and return to the Remedy object tab.
-



## Instance Properties

### Create Remedy Entry

The Entry display-only tab displays the properties used to add an entry on a Remedy incident.

- Form Name—Name of Remedy form containing the entry properties used for selection by the Create Remedy Entry activity.

The following columns display the list of properties added to the Create Remedy Entry activity.

- Name—Name of the property
- ID—ID number of the Remedy property
- Label—Label of the property
- Data Type—Type of Remedy property
  - Display
  - Optional
  - Read-Only
  - Required

### Create Remedy Entry Results

The Results display-only tab displays the number created by the remedy entry activity.

- Entry ID— New ID number of the newly created Remedy entry

### Create Remedy Incident

The Incident display-only tab displays the list of properties added to the Create Remedy Incident activity.

- Name—Name of the Remedy property
- Label—Label of the Remedy property
- Value—Value assigned to the Remedy property
- ID—Incident ID of the property
- Data Type—Type of Remedy property
  - Display
  - Optional
  - Read-Only
  - Required

### Create Remedy Incident Results

The Results display-only tab displays the incident number created by the remedy incident activity

- Incident ID—New ID number of the newly created Remedy incident

## Create Remedy Relationship, Configuration

The Item display-only tab displays the properties used to configure relationships between incidents and configuration items.

- Item Type—Selected item used to configure the relationship properties
- Reconciliation ID—ID of the Remedy configuration item
- Configuration item form name—Name of the form containing the configuration properties associated with the activity
- Association type—Type of configuration property to associate with the Remedy item
- Request description—Description associated with the incident or configuration item

The following columns display the list of Remedy properties added to the item.

- Name—Name of the Remedy property
- Label—Label of the Remedy property
- Value—Value assigned to the Remedy property
- ID—ID number of the Remedy item
- Data Type—Type of Remedy property
  - Display
  - Optional
  - Read-Only
  - Required

## Create Remedy Relationship, Incident

The Item display-only tab displays the properties used to configure relationships between incidents and configuration items.

- Item Type—From the drop-down list, select the appropriate item to configure the relationship properties.
- Incident ID—Incident ID number of the Remedy incident
- Association type—Type of incident property to associate with the Remedy item
- Request description—Description associated with the incident or configuration item

The following columns display the list of Remedy properties added to the incident.

- Name—Name of the Remedy property
- Label—Description of the Remedy property
- Value—Value assigned to the Remedy property
- ID—ID number of the Remedy property
- Data Type—Type of Remedy property
  - Display
  - Optional
  - Read-Only
  - Required

## Create Remedy Relationship, Item

The Item display-only tab displays the properties used to configure relationships between incidents and configuration items.

- Item Type—Selected item assigned to the relationship properties
  - Incident
  - Configuration

## Create Remedy Relationship Results

The Results display-only tab displays the ID numbers assigned to the newly-linked items.

- Forward link ID—ID number assigned to the first item in the Remedy item relationship
- Back link ID—ID number assigned to the second item in the Remedy item relationship

## Create Remedy Work Info

The Work Info display-only tab displays the list of properties added to the Create Work Info activity.

- Name—Name of the property
- ID—ID number of the Remedy work info property
- Label—Value assigned to the work info property
- Data Type—Type of Remedy property
  - Display
  - Optional
  - Read-Only
  - Required

## Create Remedy Work Info Results

The Results display-only tab displays the number created by the Create Remedy Work Info activity.

- Work Info ID—New ID number of the newly created Remedy work info entry

## Delete Remedy Entry

The Entry display-only tab displays the properties used to remove an entry from a Remedy item.

- Form Name—Name of the form containing the entry properties
- Entry ID—ID number of the Remedy entry

## Find Remedy Objects

The Criteria display-only tab displays the properties and entries used to query Remedy objects on a Remedy server.

- Name—Name of the Remedy property
- Label—Description of the Remedy entry

- Value—Value assigned to the Remedy entry
- ID—ID number of the Remedy property

## Find Remedy Objects, Results

The Results display-only tab displays the matching properties and entries retrieved by the activity.

- Results—Displays the list of matching Remedy properties

## Get Remedy Entry Property Values

The Entry display-only tab displays the properties used to retrieve property values of a Remedy entry.

- Form Name—Name of the form containing the entry properties
- Entry ID—Remedy entry ID number

The following columns display the list of properties queried by the activity.

- Name—Name of the Remedy property
- Label—Description of the Remedy property
- ID—Entry ID of the Remedy property

## Get Remedy Entry Property Values, Results

The Results display-only tab displays the list of values for the properties retrieved by the activity.

- Name—Name of the Remedy entry
- Id—ID number for the Remedy property
- Value—User-modified property values
- Raw Value—Raw value for the entry retrieved by the activity

## Get Remedy Incident Property Values

The Incident Property Values display-only tab displays the properties used to retrieve property values of a Remedy incident.

- Incident ID—Remedy incident number used to retrieve the incident properties

The following columns display the list of properties queried by the activity.

- Name—Name of the Remedy incident property
- Label—Description of the Remedy incident
- ID—Incident ID of the incident property
- Data Type—Type of Remedy property
  - Display
  - Optional
  - Read-Only
  - Required

## Get Remedy Incident Property Values, Results

The Results display-only tab displays the list of values for the properties retrieved by the activity.

- Name—Name of the Remedy incident
- Id—ID number for the Remedy property
- Value—User-modified property values
- Raw Value—Raw value for the incident (case) state retrieved by the activity

## Update Remedy Entry

The Entry display-only tab displays the properties used to update the properties of a Remedy entry.

- Form Name—Name of the form containing the entry properties
- Entry ID—Remedy entry ID number

The following columns display the list of properties updated by the activity.

- Name—Name of the Remedy property
- Label—Description of the Remedy property
- ID—Entry ID of the Remedy property
- Data Type—Type of Remedy property
  - Display
  - Optional
  - Read-Only
  - Required

## Update Remedy Incident

The Incident Property Values *display-only* tab displays the properties used to retrieve property values of a Remedy incident.

- Incident ID—Remedy incident number used to retrieve the incident properties

The following columns display the list of properties updated by the activity.

- Name—Name of the Remedy incident property
- Label—Description of the Remedy incident
- ID—Incident ID of the incident property
- Data Type—Type of Remedy property
  - Display
  - Optional
  - Read-Only
  - Required

## Element Descriptions

### Select Remedy Properties Dialog Box

Use the Select Properties dialog box to select the properties from a Remedy server target defined in Cisco Process Orchestrator to add to the list. The displayed properties depend on the server selected.

To select multiple properties, press **CTRL** and hold the key while making the appropriate selections. When completed selecting properties, click **OK**.

# Cisco Prime Service Catalog Adapter

The Cisco Prime Service Catalog adapter establishes a relationship between Cisco Process Orchestrator and the Cisco Prime Service Catalog. In Process Orchestrator, you can:

- Manage services items and service requests in Cisco Prime Service Catalog.
- Create, delete, and update service items using attributes of the service item.
- Submit and update service requests by manually creating dictionaries or browsing for dictionaries in a Cisco Prime Service Catalog Server target.

The following table displays activities that are provided by the Cisco Prime Service Catalog adapter. For more information about using these activities, see [Getting Started Using the Prime Service Catalog Adapter](#), page 12-34.

| Activity                        | Comments   |
|---------------------------------|--|
| Create Service Item             | Creates a service item to be delivered in response to a service request.<br>See <a href="#">Defining the Create Service Item Activity</a> , page 12-35.  |
| Create Service Items from Table | Creates multiple service items using a table variable to be delivered in response to a service request in the Cisco Prime Service Catalog.<br>See <a href="#">Defining the Create Service Item from Table Activity</a> , page 12-37. |
| Delete Service Item             | Deletes an existing service item in the Cisco Prime Service Catalog.<br>See <a href="#">Defining the Delete Service Item Activity</a> , page 12-37.  |
| Delete Service Items from Table | Deletes multiple service items using a table variable in the Cisco Prime Service Catalog.<br>See <a href="#">Defining the Delete Service Item from Table Activity</a> , page 12-38.  |
| Submit Service Request          | Submits a request for a service order on the Cisco Prime Service Catalog.<br>See <a href="#">Defining the Submit Service Request Activity</a> , page 12-43.  |
| Update Service Item             | Updates the attributes for an existing service item on the Cisco Prime Service Catalog.<br>See <a href="#">Defining the Update Service Item Activity</a> , page 12-43.   |
| Update Service Item from Table  | Updates multiple service items using a table variable in the Cisco Prime Service Catalog.<br>See <a href="#">Defining the Update Service Item from Table Activity</a> , page 12-44.  |
| Update Service Request          | Updates an existing service request that currently resides on the Cisco Prime Service Catalog server.<br>See <a href="#">Defining the Update Service Item Activity</a> , page 12-43.   |
| Cancel Service Request          | Cancels a service request.<br>See <a href="#">Defining the Cancel Service Request Activity</a> , page 12-45.   |

## Getting Started Using the Prime Service Catalog Adapter

Use the following process to monitor and manage Cisco Prime Service Catalog instances.

- 
- Step 1** Create a Cisco Prime Service Catalog target (see [Defining a Cisco Prime Service Catalog Server Target, page 12-34](#)).
  - Step 2** Define a Cisco Prime Service Catalog command activity (see [Automating Cisco Prime Service Catalog Adapter Activities, page 12-35](#)).
  - Step 3** View the activity results (see [Monitoring Operations, page 8-1](#)).
- 

## Configuring the Service Catalog Server Adapter Reconnection Properties

Use the Retry tab to enter the default time period for all Cisco Prime Service Catalog activities to retry to connect to the Service Catalog whenever there are connection failures. This allows the activity to resume running if the Cisco Prime Service Catalog is temporarily unavailable and the running activity was terminated.

To configure the default reconnection time frame:

- 
- Step 1** Choose **Administration > Adapters > Cisco Prime Service Catalog Adapter**, right-click and choose **Properties**.
  - Step 2** Click the **Retry** tab and complete the following reconnection fields:
    - **Retry time period (minutes)**—Enter the number of minutes Process Orchestrator should attempt to connect to the Cisco Prime Service Catalog. (Default: 15 minutes)
    - **Retry frequency (seconds)**—Enter the number of seconds to determine the frequency Process Orchestrator should retry connecting to the Cisco Prime Service Catalog. (Default: 30 seconds)
- 

## Defining a Cisco Prime Service Catalog Server Target

Use the Cisco Prime Service Catalog Server (PSC) target to connect to the Cisco Prime Service Catalog and Request Center services. Process Orchestrator will connect the target to the appropriate service based on the activity that attempts to execute.

- 
- Step 1** Choose **Definitions > Targets**, right-click, and choose **New > Cisco Prime Service Catalog Server**.
  - Step 2** On the **General** panel, enter the appropriate information.
  - Step 3** On the **Connection** panel, enter the appropriate information, including:
    - **Service Link port**—Port number used to access the service link port server (Default: 6080)
    - **Request Center port**—Port number used to access the request center port (Default: 6080)
    - **Access Cisco Prime Catalog via Secure Socket Layer (SSL)**—If checked, the connection to the Cisco Prime Catalog server will run on the SSL port.



- Ignore Secure Socket Layer (SSL) certificate error—Check this check box to indicate the target should ignore certificate errors when attempting to connect to the service portal.
- Public key GUID—Optional. The GUID of the external encryption key that is used to encrypt the data sent from Cisco Prime Service Catalog to Process Orchestrator via AMQP. This GUID is generated in the Prime Service Catalog server when user configures external encryption keys for AMQP.



**Note** The Public key GUID information is configured in Cisco Prime Service Catalog Server. This information is entered only when you use Cisco Prime Service Catalog and AMQP features. It is also used to fetch the broker information via PSC nsAPI.

- Step 4** Verify the information on the Completing the New Cisco Prime Service Catalog Server Wizard panel and click **Finish** to close the wizard.

## Automating Cisco Prime Service Catalog Adapter Activities

### Defining the Create Service Item Activity

Use the Create Service Item activity to create a service item to be delivered in response to a service request. A service item may be a virtual machine type or a user-defined type in the Cisco Prime Service Catalog.

- Step 1** In the Process Editor Toolbox, choose **Cisco Prime Service Catalog > Create Service Item** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Service Item** tab and enter the following information:
- Service item type—Enter the type of physical or virtual asset for the service item. The service item can be a virtual machine or a user-defined item.
  - Service item name—Enter the unique name for the service item.
  - Channel id—Enter the identifier that uniquely identifies each Service Link task (for example, 82fdbbaf-3310-4156-a4ae-173b9f15e07c).
  - Timeout—Enter the time period the activity should wait before failing.




**Note** Click the time unit link to change the time interval.

- Step 4** Modify the list of attributes to be used to create the service item. The attribute properties provide additional data used to create service item.
- Add—Click this button to add a attribute properties pane to the service item. Select one of the following options for adding a attribute.
    - Manual attribute—Click this button to add a Properties pane to the Service Item tab. After the pane displays on the tab, click the appropriate to modify the list of properties for the attribute. See [Adding a Service Item Attribute](#).

- Browse for attributes—Click this button to launch the Add Attributes dialog box to search for an attribute on a Cisco Prime Service Catalog server.
  - Remove—Click the area around the appropriate attribute properties, then click this button to remove the last set of attribute properties from the service item.
- Step 5** Click the **Subscription** tab to specify the service item owner's login information to be used when connecting to the Cisco Prime Service Catalog. The login ID and organizational unit information must match.
- Step 6** Click the **Retry** tab to enter the default time period for the activity to retry to connect to the Service Catalog if there is a connection failure. This allows the activity to resume running if the Cisco Prime Service Catalog is temporarily unavailable and the running activity was terminated.
- The properties entered on this tab override the time period configured on the adapter level.
- Retry on connection failures—Check this check box to indicate the activity should retry to connect to the service portal if there is a connection failure.
- If the check box remains unchecked, then activity will fail if there is a connection failure.
- These fields are automatically populated with the default settings defined in the Cisco Prime Service Catalog adapter.
    - Time period (minutes)—Clear the field to manually update the time period for when the activity should retry to connect to the Cisco Prime Service Catalog. (Default: 15 minutes)
    - Frequency (seconds)—Clear the field to manually to determine the frequency in which Process Orchestrator should retry connecting to the Cisco Prime Service Catalog. (Default: 30 seconds)
- Step 7** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the Complete Service Request Activity


Use the Complete Service Request activity to notify Service Catalog that the process is complete. The required Task ID is provided in the AMQP message that initiated the process.

- Step 1** On the Toolbox, choose **Cisco Prime Service Catalog > Complete Service Request** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **Service Request** tab to specify the following properties:
- Task ID—provided in the AMQP message that initiated the process
  - Timeout—Check the check box and then enter the time period the activity should wait before failing.
-  **Note** Click the time unit link to change the time interval.
- Action—action that can be used with this nsAPI call
- Step 3** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
-

## Defining the Create Service Item from Table Activity

Use the Create Service Items from Table activity to create multiple service items using a table variable to be delivered in response to a service request in the Cisco Prime Service Catalog.

The table variable should include the service names and values that correspond to the attribute names in the Cisco Prime Service Catalog.

- 
- Step 1** In the Process Editor Toolbox, choose **Cisco Prime Service Catalog > Create Service Items from Table** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Service Item** tab and enter the following information:
- Service item type—Enter the type of physical or virtual asset for the service item.
  - Table variable— Click the Reference tool to query a table variable to be used for the service item. The table must contain a column type for each property being created on the corresponding service item.
- For example, the table might contain the following columns for a virtual machine:
- Name / IP Address / Host / Memory / DiskSpace
- To create multiple VMs from the table, add several rows for the table with the above column values defined.
- Channel id—Enter the identifier that uniquely identifies each Service Link task.
  - Timeout—Enter the time period the activity should wait before failing.
-  **Note** Click the time unit link to change the time interval.
- 
- Step 4** Click the **Subscription** tab to specify the service item owner's login information to be used when connecting to the Cisco Prime Service Catalog. The login ID and organizational unit information must match.
- Step 5** Click the **Retry** tab to enter the default time period for the activity to retry to connect to the Service Catalog if there is a connection failure. This allows the activity to resume running if the Cisco Prime Service Catalog is temporarily unavailable and the running activity was terminated.
- Step 6** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the Delete Service Item Activity

Use the Delete Service Item activity to delete an existing service item in the Cisco Prime Service Catalog.

- 
- Step 1** On the Toolbox, choose **Cisco Prime Service Catalog > Delete Service Item** and drag and drop the activity onto the Workflow pane.
- Step 2** Enter the service item properties (see [Defining the Create Service Item Activity, page 12-35](#)). Enter the unique name for the service item.

- Step 3** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the Delete Service Item from Table Activity

Use the Delete Service Items from Table activity to delete multiple service items using a table variable in the Cisco Prime Service Catalog.

The table variable should include the service names and values that correspond to the attribute names in the Cisco Prime Service Catalog.

---

- Step 1** In the Process Editor Toolbox, choose **Cisco Prime Service Catalog > Delete Service Items from Table** and drag and drop the activity onto the Workflow pane.
- Step 2** Enter the service item properties (see [Defining the Create Service Item from Table Activity, page 12-37](#)). The table must contain a “Name” column. This column must contain the uniquely named items that are to be deleted.
- Step 3** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the Find Service Item Activity

Use the Find Service Item activity to search for attribute properties for the service item.

---

- Step 1** In the Process Editor Toolbox, choose **Cisco Prime Service Catalog > Find Service Item** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **Advanced** tab to define the service items you want to retrieve.
- Get all matching items—Select this option to retrieve all matching service items
  - Get specified row— Start row—enter the row properties you want to retrieve the service item from
  - Maximum items to return—enter the number of service items to retrieve
- Step 3** Click the **Service Item** tab to search for attribute properties for the service item.
- Service item type—Enter the type of physical or virtual asset for the service item. The service item can be a virtual machine or a user-defined type.
  - Timeout—Enter the time period the activity should wait before failing.



**Note** Click the time unit link to change the time interval.

---

- Step 4** Modify the list of **Search criteria** to be used to find service item.
- a. Add—Click this button to add a attribute properties pane to the find service item. Select one of the following options for adding a search criteria.
    - Manual search criteria—Click this button to add a Properties pane to the Service Item tab. After the pane displays on the tab, click the appropriate to modify the list of properties for the search criteria for the service item type you want to find.

- Attribute—Enter the attribute name to be added to the service item
  - Data Type—From the drop-down list, select the data type for the service item.
    - Boolean
    - String
    - Numeric
    - Date and Time
  - Value—Enter the attribute value to be added to the service item
  - Browse for search criteria—Click this button to launch the Add Attributes dialog box to search for an attribute on a Cisco Prime Service Catalog server.
  - b. Remove—Click the area around the appropriate attribute properties, then click this button to remove the last set of attribute properties from the service item.
- Step 5** Modify the list of associated **attributes to get** to be used to find service item.
- a. Add—Click this button to add an attribute properties pane to the service item. Select one of the following options for adding an attribute.
    - Manual attribute—Click this button to add a Properties pane to the Service Item tab. After the pane displays on the tab, click the appropriate to modify the list of properties for the attribute.
      - Attribute name—Enter the attribute name to find service item. Click the **Reference tool** to browse for the correct variable reference property for the service item.
      - Data type—From the drop-down list, select the data type for the service item (such as Boolean, String, Numeric, Date and Time).
    - Browse for attributes—Click this button to launch the Add Attributes dialog box to search for an attribute on a Cisco Prime Service Catalog server.
  - b. Remove—Click the area around the appropriate attribute properties, then click this button to remove the last set of attribute properties from the service item.
- Step 6** Click the **Subscription** tab to define the subscriber, or current owner of the service item, properties.
- Subscriber login id—The unique ID assigned to the current owner of the service item
  - Subscriber OU—The organizational unit to which the subscriber belongs
  - Include subscriber information in results—Indicates the subscriber information is included in the results retrieved.
- Step 7** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

## Defining the Get Service Item Activity

Use the Get Service Item activity to retrieve attribute properties for the service item.

- Step 1** In the Process Editor Toolbox, choose **Cisco Prime Service Catalog > Get Service Item** and drag and drop the activity onto the Workflow pane.
- Step 2** On the Service Item tab, enter the service item properties.
- Service item type—Enter the type of physical or virtual asset for the service item. The service item can be a virtual machine or a user-defined type.

- Service item name—Enter the name of the service to be ordered.  
For example:  
Order a Virtual Machine  
-or-  
Start User Provisioning Process
- Timeout—Enter the time period the activity should wait before failing.




---

**Note** Click the time unit link to change the time interval.

---

- Step 3** Modify the list of associated **attributes to get** to be used to get service item.
- Add—Click this button to add a attribute properties pane to the service item. Select one of the following options for adding a attribute.
    - Manual attribute—Click this button to add a Properties pane to the Service Item tab. After the pane displays on the tab, click the appropriate to modify the list of properties for the attribute.
      - Attribute name—Enter the attribute name to get service item. Click the **Reference tool** to browse for the correct variable reference property for the service item.
      - Data type—From the drop-down list, select the data type for the service item (such as Boolean, String, Numeric, Date and Time).
    - Browse for attributes—Click this button to launch the Add Attributes dialog box to search for a attribute on a Cisco Prime Service Catalog server.
  - Remove—Click the area around the appropriate attribute properties, then click this button to remove the last set of attribute properties from the service item.
- Step 4** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the Delete Service Item from Table Activity

Use the Delete Service Items from Table activity to delete multiple service items using a table variable in the Cisco Prime Service Catalog.

The table variable should include the service names and values that correspond to the attribute names in the Cisco Prime Service Catalog.

---

- Step 1** In the Process Editor Toolbox, choose **Cisco Prime Service Catalog > Delete Service Items from Table** and drag and drop the activity onto the Workflow pane.
- Step 2** Enter the service item properties (see [Defining the Create Service Item from Table Activity, page 12-37](#)). The table must contain a “Name” column. This column must contain the uniquely named items that are to be deleted.
- Step 3** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
-

## Defining the Get User Information Activity

Use the Get User Information activity to retrieve the properties of a specified user.

- 
- Step 1** In the Process Editor Toolbox, choose **Cisco Prime Service Catalog > Get User Information** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **User** tab to enter the user properties.
- User name—Enter the user name for the user account properties to be retrieved.
  - Timeout—Check the check box and then enter the time period the activity should wait before failing.



---

**Note** Click the time unit link to change the time interval.

---

- Step 3** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the Report Requisition Status Activity

Use the Report Requisition Status activity to report the execution status of the service request on the Cisco Prime Service Catalog.

- 
- Step 1** In the Process Editor Toolbox, choose **Cisco Prime Service Catalog > Report Requisition Status** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **Requisition Status** tab to enter the task properties.
- Channel ID—Enter the unique Channel ID of the service that is created in the Cisco Prime Service Catalog.
  - Parent Task name—Enter the name of the task that is parent of the current task.
  - Task name—Enter the name for the task.
  - Status—Select the status from the drop-down:
    - In-Progress
    - Succeeded
    - Failed

- Step 3** Click **Save** to complete the activity definition.

For example:

The following Create Site Branch Operation shows Report requisition status node added to different places of the workflow to report the progress to Cisco Prime Service Catalog (PSC) with reference to the Channel ID mentioned in the activity, here in this process the tasks such as device configuration, create site, and configure IWAN links is performed.

**Twn273262c: Report Requisition Status**

Report Requisition Status - Device Configuration

Configure Device

Report Requisition Status - Create Site

Create Site

Report Requisition Status - Configure iWAN links

Configure iWAN links

**Properties - Report Requisition Status - Create Site (Report Requisition Status)**

General | Requisition Status | Target | Credentials | Knowledge Base | Result Handlers

Channel Id: 101

Parent Task name: Configure Device

Task name: Configure Site

Status: In-Progress

- Initially the device configuration is performed in this workflow, during this process the status is reported as In-progress in PSC for the activity.
- Once the device configuration is completed, the report is sent to the PSC with status succeeded.
- After the device is configured the Create Site is performed, during this process the status is reported as In-progress in PSC for the activity.
- Once the site is created, the report is sent to the PSC with status succeeded.
- After the Site is created the Configure IWAN Links is performed in this workflow, during this process the status is reported as In-progress in PSC for the activity.
- Once the IWAN links are configured, the report is sent to the PSC with status succeeded.

Once the process is succeeded the status is updated as Complete for the service request created in Cisco Prime Service Catalog.



## Defining the Submit Service Request Activity

Use the Submit Service Request activity to submit a request for a service order on the Cisco Prime Service Catalog. In this activity, users can add multiple dictionaries to the service request manually or by browsing for an existing dictionary on a target.

- 
- Step 1** In the Process Editor Toolbox, choose **Cisco Prime Service Catalog > Submit Service Request** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **Service Request** tab to specify the name of the service to be ordered. For example:
- Order a Virtual Machine
  - Start User Provisioning Process
- Step 3** Modify the list of dictionaries to be used to support the service request. The dictionary properties provide additional data used to request a service and/or fulfill the service request.
- Add—Click this button to add a dictionary properties pane to the service request. Select one of the following options for adding a dictionary.
    - Manual dictionary—Click this button to add a Properties pane to the Service Request tab. After the pane displays on the tab, click the appropriate to modify the list of properties for the dictionary. See [Manually Adding a Dictionary, page 12-47](#).
    - Browse for dictionary—Click this button to launch the Add Dictionaries dialog box to search for a dictionary on a Cisco Prime Service Catalog server.
  - Remove—Click the area around the appropriate dictionary properties, then click this button to remove the last set of dictionary properties from the service request.
- Step 4** Click the **Advanced** tab to provide default customer login information for the requestor. The information defined on this tab will override the runtime user selected on the Credentials tab.
- Customer login name—Enter the log in name for the customer of the service being requested.
  - Initiator login name—Enter the log in name of the person initiating the request for the service.
  - Quantity—Enter the quantity needed for the service request. (Default: 1)
  - Bill to OU—Enter the organizational unit to be billed for the service request.
- Step 5** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the Update Service Item Activity

Use the Update Service Item activity to update the attributes for an existing service item on the Cisco Prime Service Catalog.

- 
- Step 1** In the Process Editor Toolbox, choose **Cisco Prime Service Catalog > Update Service Item** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the appropriate tabs and update the service item properties as necessary. For details, see [Defining the Create Service Item Activity, page 12-35](#).

- Step 3** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the Update Service Item from Table Activity

Use the Update Service Items from Table activity to update multiple service items using a table variable in the Cisco Prime Service Catalog. The table variable should include the service names and values that correspond to the attribute names in the Cisco Prime Service Catalog.

- Step 1** In the Process Editor Toolbox, choose **Cisco Prime Service Catalog > Update Service Items from Table** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the appropriate tabs and update the service item properties as necessary. For details, see [Defining the Create Service Item from Table Activity, page 12-37](#).
- Step 3** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the Update Service Request Activity

Use the Update Service Request activity to update an existing service request that currently resides on the Cisco Prime Service Catalog server.

- Step 1** In the Process Editor Toolbox, choose **Cisco Prime Service Catalog > Update Service Request** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Service Request** tab and enter the required information, including:
- Channel Id—Enter the identifier for the Service Link task in the service request to be updated.  
Note: The identifier for the activity must be retrieved directly from the Cisco Prime Service Catalog. Do not reference an output property of the Submit Service Request activity.
  - Take action—Check this check box to indicate that a specific action should be taken when updating the service request. From the enabled drop-down list, select the appropriate option.
  - Comments—Enter any comments related to the service task or service request.
- Step 4** Click the **Parameters** tab to specify the parameters needed by the Service Link to update data on the service request to coordinate the completion of a task.
- Do not send parameters—Select this radio button to indicate that no parameters are required in order to update the task in the service request.
  - Send the following parameters—Select this radio button to enable the Parameters pane.
  - Send parameters from table variable—Select this radio button to enable the text field.
- Step 5** Click the **Reference** icon to query a table variable to be used for the service request. The table must contain both a "Name" and a "Value" column. The name column must correspond to an attribute name in the service portal.
-

## Defining the Cancel Service Request Activity

Use the Cancel Service Request activity to cancel a request for a service order on the Cisco Prime Service Catalog.

- 
- Step 1** In the Process Editor Toolbox, choose **Cisco Prime Service Catalog > Cancel Service Request** and drag and drop the activity onto the Workflow pane.
  - Step 2** Click the **Service Request** tab and select the **Requisition ID** of the service to be canceled.
  - Step 3** Enter the time period the activity should wait before failing.
  - Step 4** Check the **Force Monitor Plan Cancellation** check box to force the cancellation, if the service request is configured not to allow cancellation after the task has started.
- 

## Defining the Execute Python Script

Use the following procedure to execute python script.

- 
- Step 1** In the Process Editor Toolbox, choose **Code Executions > Execute Python Script** and drag and drop the activity onto the Workflow pane.
  - Step 2** Click the **General** tab and enter the appropriate information.
  - Step 3** Click the **Execute Python Script** tab to specify the commands used to execute an activity.
    - Script Name—Enter the name for the Python Program.
    - Local windows runtime user that the python code will run on behalf—Enter the runtime user to the local windows that python code will run on behalf.




---

**Note** The Windows users must have access to the machine, where the Process Orchestrator server is located at.

---

- Script arguments—Enter the collection of argument values for the script, users can pass to sys module in Python code. For example:
 

In windows command line, if to run python script, underlined arguments are set in sys module in python code  
example.py arg1 arg2

The *Script argument* block here is to provide users capability to pass arguments like arg1, arg2 set in sys module and you can access them via sys.argv[1], sys.argv[2] and so on.

  - Add—Click this button and choose one of the following to launch the Select Argument to Add dialog box. Enter the appropriate script in the text field or click Reference icon to select from the list.
  - Edit—Select a script argument from the list and click this button to modify the script argument in the Select Argument to Add dialog box.
  - Remove—Select a script argument from the list and click this button to remove the script argument from the list.
- Import Module Path—Enter the Path to import module of any custom python code files or any third party python library.



---

**Note** The path must exist in Process Orchestrator server machine.

---

- Script—Enter the script of the python code or click the **Reference tool** to select from the list.
- Enter the time period the activity should wait before failing.

**Step 4** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

---

## Execute Python Code Properties

The Execute Python Script tab displays the properties used to execute the python script in the Process Orchestrator.

- Script name—Displays the script name of the python program
- Local windows runtime user that the python script will run on behalf—Displays the name of local Windows user
- Script argument—Displays the arguments users can pass to the sys module in python code
- Import module path—Displays the path of the python files
- Script—Displays the python code script
- Wait for command to complete or time out in—Displays the time period the activity should wait before failing

## Python Code Results

The Results tab displays the result from the python code execution.

## Typical Cisco Prime Service Catalog Tasks

### Adding a Service Item Attribute

Use the following steps to add attribute properties to the service item.

---

**Step 1** On the Service Item tab, click **Add**.

**Step 2** Complete the following fields to enter the attributes for the service item.

- Attribute name—Enter the attribute name to be added to the service item. Click the **Reference tool** to browse for the correct variable reference property for the service item.
- Data type—From the drop-down list, select the data type for the service item (such as Boolean, String, Numeric, Date and Time).
- Value—Enter the value for the associated attribute.

For example:

```
Property name: CreatedTime
Type: Date and Time
Value: 12/21/2010
```

- Step 3** Click the **Save** tool to complete the activity definition
- 

## Manually Adding a Dictionary

Use the following options to add a Dictionary properties pane for manually adding a dictionary to the service request.

---

- Step 1** On the Service Request tab, click **Add > Manual Dictionary**.
- Step 2** Under Properties, enter the name of the dictionary to included with the service request.
- Step 3** Click **Add > [Name] Property** to launch the Add Property dialog box to add a property to the dictionary.
- Property name—Enter the name of the dictionary property.
  - Native data type—Data type that may not be used by Process Orchestrator, but was retrieved from the Cisco Prime Service Catalog as part of an existing item within a dictionary property. (Ex. Number, Text, Double)
  - Data type—Data type assigned to the item
  - Required—Check this check box to indicate the property is required.
  - Property is multi-valued—Check this check box to indicate more than one value should be assigned to the item.
  - Value—Enter the value(s) for the associated property. If the Property is multi-valued check box is checked, complete each Value field, as necessary.
- Step 4** Click **OK** to close the Add Property dialog box and return to the Service Request tab.
- Step 5** Click the **Save** tool to complete the activity definition.
- 

## Browsing for Dictionaries

Use the Add Dictionaries dialog box to add dictionaries and their related properties to a service request from a defined Cisco Prime Service Catalog server target. Use the following steps to browse for a dictionary to be included in the service request.

The queried dictionary completes all the fields required for service request.

---

- Step 1** On the Service Request tab, click **Add > Browse for Dictionaries**.
- Step 2** From the Add Dictionaries from the following Cisco Prime Service Catalog server drop-down list, select the appropriate server containing the dictionaries from which you want to query.
- Step 3** In the Service name field, enter the service name for the product containing the dictionaries to be used with the service request.
- Step 4** Click **Refresh** to display the dictionaries from the service in the list.
- Step 5** Under the Names list, select the appropriate dictionary to be included in the service request, then click **OK**.
-

## Specifying the Owner for the Service Item

Use the **Subscription** tab to provide the service item owner's login information to be used when connecting to the Cisco Prime Service Catalog. The login ID and organizational unit information must match the information in the portal.

- 
- Step 1** Click the **Subscription** tab on the service item activity.
- Step 2** Complete the fields, as necessary.
- 

## Specifying Requestor Credentials for the Service Request

Use the **Advanced** tab on the Submit Service Request activity to provide login information for the requestor which can be used to override the runtime user credentials configured in the process properties. The login ID and organizational unit information must match the information in the portal.

- 
- Step 1** Click the **Advanced** tab on the Submit Service Request activity.
- Step 2** Complete the login and organizational information needed for this activity, as necessary.
- Customer login name—Enter the log in name for the customer of the service being requested.
  - Initiator login name—Enter the log in name of the person initiating the request for the service.
  - Quantity—Enter the quantity needed for the service request. (Default: 1)
  - Bill to OU—Enter the organizational unit to be billed for the service request.
- Step 3** Click the **Save** tool to complete the activity definition.
- 

## Instance Properties

### Cancel Service Request

The Service Request display-only tab displays the properties defined to cancel a service item to be delivered in response to a service request. A service item may be a Virtual Machine type or a user-defined type in the Cisco Prime Service Catalog.

- Requisition ID—Click the Insert Variable Definition button to select the variable reference.

### Complete Service Request

The Complete Service Request display-only tab displays the existing service request that completed on the Cisco Prime Service Catalog server.

- Task Id—the identifier that uniquely identifies each Service Link task.
- Action—indicates that a specific action should be taken when updating the service request. From the enabled drop-down list, select the appropriate option.
  - Done—Indicates task should be noted as completed
- Timeout—indicates the time period the activity waits before failing.

## Create Service Item

The Service Item display only page displays the properties used to create a service item to be delivered in response to a service request in the Cloud Service Portal.

- Service item type—the type of physical or virtual asset for the service item. The service item can be a virtual machine or a user-defined type.
- Service item name—the name of the service to be ordered.

For example:

Order a Virtual Machine

-or-

Start User Provisioning Process

- Channel Id (Service Link only)—the identifier that uniquely identifies each Service Link task. If provided, the current SOAP based interface to Service Catalog will be utilized. If not provided, the nsAPI will be used for the implementation of the activity.
- Timeout—the time period the activity should wait before failing.



---

**Note** Click the time unit link to change the time interval.

---

- Attributes—The following options display the properties used to configure the attributes to add to the service item.
  - Attribute name—Attribute name to be added to the service item.
- Data type—Displays the selected data type for the service item.
  - Boolean
  - String
  - Numeric
  - Date and Time
- Value—Value for the associated attribute.

## Create Service Items from Table

The Service Item display-only page displays the properties used to create multiple service items using a table variable to be delivered in response to a service request in the Cisco Prime Service Catalog.

- Service item type—the type of physical or virtual asset for the service item. The service item can be a virtual machine or a user-defined type.
- Table variable—the table variable data containing the information needed to create the service items.
- Channel Id (Service Link only)—the identifier that uniquely identifies each Service Link task. If provided, the current SOAP based interface to Service Catalog will be utilized. If not provided, the nsAPI will be used for the implementation of the activity.
- Timeout—the time period the activity should wait before failing.



---

**Note** Click the time unit link to change the time interval.

---

## Delete Service Item

The Service Item tab displays the properties used to delete an existing service item in the Cisco Prime Service Catalog.

- Channel id—Displays Identifier that uniquely identifies each Service Link task
- Service item type—Type of physical or virtual asset for the service item
- Service item name—Name or IP address of the service item

## Delete Service Items from Table

The Service Item tab displays the properties used to delete multiple service items using a table variable in the Cisco Prime Service Catalog.

- Channel ID—Displays the identifier that uniquely identifies each Service Link task
- Service item type—Type of physical or virtual asset for the service item
- Table variable—Displays the table variable data containing the information needed to delete the service items

## Find Service Items, Advanced

The Advanced read only tab displays the service items that were defined for retrieval.

- Get all matching items—Retrieves all matching service items
- Get specified row
  - Start row—the row properties you want to retrieve the service item from
  - Maximum items to return—the number of service items to retrieve

## Find Service Items, Results

The Results *display-only* tab displays the matching service items results.

- Matching service items—Displays the matching service items

## Find Service Items, Service Item

The Service Item *display-only* tab displays the attribute properties for the service item.

- Service item type—Enter the type of physical or virtual asset for the service item. The service item can be a virtual machine or a user-defined type.
- Search criteria—Enter the search criteria for the service item type you want to find
  - Attribute—Enter the attribute name to be added to the service item
  - Data Type—From the drop-down list, select the data type for the service item.

Boolean

String

Numeric

Date and Time



- Value—Enter the attribute value to be added to the service item
- Attributes to get—The list of associated attributes for the selected type

## Find Service Item, Subscription

The Subscription *display-only* tab displays the subscriber, or current owner of the service item, properties.

- Subscriber login id—The unique ID assigned to the current owner of the service item
- Subscriber OU—The organizational unit to which the subscriber belongs
- Include subscriber information in results—Indicates the subscriber information is included in the results retrieved.

## Get Service Item

*Display-only.* Use the Get Service Item activity to retrieve attribute properties for the service item.

- Service item type—Enter the type of physical or virtual asset for the service item. The service item can be a virtual machine or a user-defined type.
- Service item name—Enter the name of the service to be ordered.

Example

Order a Virtual Machine

-or-

Start User Provisioning Process

- Timeout—Check the check box and then enter the time period the activity should wait before failing.




---

**Note** Click the time unit link to change the time interval.

---

- Attributes to get—The list of associated attributes for the selected type

## Get User Information

*Display-only.* Use the Get User Information activity to retrieve the properties of a specified user.

- User name—Enter the user name for the user account properties to be retrieved.
- Timeout—Check the check box and then enter the time period the activity should wait before failing.




---

**Note** Click the time unit link to change the time interval.

---

## Get User Information Results

Use the Results tab to view the response output in the selected format.

- XML—Click this option to display the XML output results if the page is available in XML format.
- Text—Click this option to display the results in a text format.

## Submit Service Request

*Display-only.* Use the Submit Service Request activity to submit a request for a service order on the Cisco Prime Service Catalog. In this activity, users can add multiple dictionaries to the service request manually or by browsing for an existing dictionary on a target.

- Service name—Name or IP address of the service item.

The following displays the dictionary and its related properties that were included in the service request.

- Dictionary name—Name of the dictionary included with the service request.

The following table displays the properties associated with the dictionary assigned to the service request.

- Name—Name of the dictionary property
- Values—Value assigned to the dictionary property
- Native data type—Data type originally assigned to the property
- Data Type—Data type assigned to the property
  - Boolean
  - Date
  - Numeric
  - String
- Required—Indicates the property is required
- Multivalued—Indicates the property has multiple values assigned (True, False)

## Submit Service Request, Advanced

The Advanced display-only tab displays the default customer login information for the requestor used by the service request.

- Customer login name—Log in name for the customer of the service being requested
- Initiator login name—Log in name of the person who initiated the service request
- Quantity—Quantity needed for the service request (Default: 1)
- Bill to OU—Organizational unit to be billed for the service request.

## Submit Service Request, Results

The Results tab displays the details of the service request submitted.

- Service Name—Name of the service request submitted
- Requisition ID—Identifier for the service that has been ordered as part of a service request
- Status—Status of the service request
- Started date—Date the service request was started
- Due date—Date the service request should be completed
- Customer login date—Login name of the customer who submitted the request for the service
- Initiator login name—Login name of the person initiating a request for the service

## Update Service Item

The Service Item tab displays the attributes used to update an existing service item on the Cisco Prime Service Catalog.

- Channel Id (Service Link only)—Enter the identifier that uniquely identifies each Service Link task. If provided, the current SOAP based interface to Service Catalog will be utilized. If not provided, the nsAPI will be used for the implementation of the activity.
- Service item type—Type of physical or virtual asset for the service item.
- Service item name—Name or IP address of the service item.

This section displays the attributes updated on the service item.

- Attribute name—Attribute name to be updated on the service item.
- Data type—Selected data type for the service item.
  - Boolean
  - String
  - Numeric
  - Date and Time
- Value—Value for the associated attribute.

## Update Service Items from Table

The Service Item tab displays the properties used to update multiple service items using a table variable in the Cisco Prime Service Catalog.

- Channel Id (Service Link only)—Displays the identifier that uniquely identifies each Service Link task. If provided, the current SOAP based interface to Service Catalog was utilized. If not provided, the nsAPI was used for the implementation of the activity.
- Service item type—Type of physical or virtual asset for the service item
- Table variable—Displays the table variable data containing the information needed to update the service items

## Update Service Request

The Service Request display-only tab displays the properties used to update an existing service request that currently resides on the Cisco Service Catalog server.

- Channel Id—Identifier for the Service Link task in the service request to be updated
- Take action—Checked box and completed text field indicates the specific action that should be taken when the service request is updated.
  - Approval—Indicates task should be sent for approval
  - Cancel—Indicates task should be canceled
  - Done—Indicates task should be noted as completed
  - Reject—Indicates task should be rejected
  - Skip—Indicates task should be skipped
- Comments—Comments related to the service task or service request

## Update Service Request, Parameters

The Parameters display-only tab provides the properties used on whether to send parameters with the service request and any parameters needed by the Service Link to update the data on the service request.

- Do not send parameters—Selected option indicate that no parameters were required to update the task in the service request.
- Send the following parameters—Selected option indicates that the displayed parameters in the Parameters Column were used to update the service request.
- Send parameters from table variable—Selected option indicates a table variable was used for updating the service request.

The following table displays the parameters that are included in the Update Service Request activity.

- Name—Displays the name of the agent parameter.
  - Values—Displays the value assigned to the agent parameter
  - Data Type—Data type assigned to the parameter
    - Boolean
    - Date
    - Numeric
    - String
  - Multivalued—Indicates the parameters has multiple values assigned (True, False)
-

# OpenStack Adapter

The OpenStack adapter establishes a relationship between Cisco Process Orchestrator and OpenStack. In Process Orchestrator, you can perform IT process automation tasks such as provisioning OpenStack resources, monitoring OpenStack installations, troubleshooting operational problems, and so on.

## Getting Started Using the OpenStack Adapter

Use the following process to monitor and manage OpenStack instances.

- 
- Step 1** Create an OpenStack target (see [Defining an OpenStack Server Target, page 12-55](#)).
  - Step 2** Define an OpenStack user (see [Defining an OpenStack User, page 12-55](#)).
  - Step 3** Define an OpenStack command activity (see [Automating OpenStack Adapter Activity, page 12-56](#)).
  - Step 4** View the activity results (see [Monitoring Operations, page 8-1](#)).
- 

## Defining an OpenStack User

Use the following instructions to define the user credentials required to access OpenStack. The level of access for the network device is dependent upon the type of user logging in.

- 
- Step 1** Choose **Definitions > Runtime Users**, right-click and choose **New > OpenStack User**.
  - Step 2** Click the **General** tab to specify the required information, including:
    - **Display name**—Enter the display name for the runtime user. This field is populated with the information specified in the User name text field, but can be overwritten by the user.
    - **Type**—Display only. Type of object.
    - **Owner**—User name of the owner of the object. This is typically the person who created the object.
    - **User name**—The user name assigned to access the OpenStack server.
    - **Password**—Check the **Password** check box and then enter the password assigned to access the OpenStack server.
  - Step 3** Click **OK** to close the dialog box.
- 

## Defining an OpenStack Server Target

Use the OpenStack Server target to connect to the OpenStack server.

- 
- Step 1** Choose **Definitions > Targets**, right-click, and choose **New > OpenStack Server**.
  - Step 2** On the **General** panel, enter the appropriate information.
  - Step 3** On the **Connection** panel, enter the appropriate information, including:

- OpenStack server name—Enter the host name or the IP address of the OpenStack server.
- Override default URL—Select this option to enter an appropriate URL to use to override the default URL.
- API Version—Select the appropriate API version to which your automation content is associated.
- Ignore Secure Socket Layer (SSL) certificate error—Check this check box to indicate the target should ignore certificate errors when attempting to connect to the service portal.
- Runtime user—Select this radio button to specify the runtime user required to execute a process or activity against this target.
- Project—The project or an organizational unit in the cloud that is used to scope the command. It is also known as tenant.

**Step 4** Verify the information on the Completing the New OpenStack Server Wizard panel and click **Finish** to close the wizard.

---

## Automating OpenStack Adapter Activity

### Defining the Execute OpenStack Command Activity

Use the Execute OpenStack Command activity to execute OpenStack RESTful API command against an OpenStack server. The Execute OpenStack Command activity provides a flexible way to automatically track authentication tokens and renew them as needed. Responses for common information are scanned and displayed as activity results in the Operations Workspace activity instance view.

---

**Step 1** In the Process Editor Toolbox, choose **OpenStack > Execute OpenStack Command** and drag and drop the activity onto the Workflow pane.

**Step 2** Click the **General** tab and enter the appropriate information.

**Step 3** Click the **Request** tab and enter the following information:

- Project—The project or an organizational unit in the cloud that is used to scope the command. It is also known as tenant.
- Base URL—Select the appropriate service and the endpoints through which you can access the resources and perform operations.
  - Service—The OpenStack services supported by the OpenStack server.
  - Endpoint—The endpoint to access the OpenStack service.
- Relative URL—Enter the URL to be requested. The Relative URL is case-sensitive.

From the Insert Variable Reference dialog box, select the reference variable and then enter the rest of the URL to be requested. For example, if you want to request for all the tenants available in the OpenStack service, you can enter **[Process.Target.Identity Endpoints FirstRowAdminURL]/tenants**.

- Method—The method to be performed on the resource identified by the Request-URI. For a list of common header methods, see HTTP Header Methods.
- Request Content Type—The value for the content type used to define the structure of the request.
- Request—Enter any additional HTTP request details using JSON or XML format.

- **Response Content Type**—The value for the content type used to define the structure of the response.
- **When request creates a task, wait for its completion (in seconds)**—Check the check box to indicate that when a task request is sent using methods, PUT, POST, DELETE, the activity should wait for the specified time period for the completion of the task before continuing.

In the enabled text box, enter the time period the activity should wait for the task. Click the time unit link to change the time interval.

- **Rate limit wait time**—Enter the number of seconds that the web service call must wait to prevent the call from exceeding the limits.
- **Archive request text upon successful activity completion**—Check the check box to indicate whether to archive the data request after the successful completion of the activity.
- If the check box remains unchecked, the data generated by the activity is removed from the database upon successful completion of the activity.
- **Restart activity if interrupted** —Check this check box to indicate the activity should resume after an interruption in the execution.

If the check box remains unchecked, then the activity remains paused if there is an interruption in the execution.

**Step 4** Click the **Paging** tab and enter the following information:

- **Limit**—Enter the number of items to be displayed on each page. By default, the limit is set to 0 and the search returns all the items.
- **Marker**—Set the marker to the last item returned in the previous list and then request for subsequent items.
- **Page reverse**—Check this check box to indicate that the list can be reversed.

**Step 5** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

---

# Cisco Process Orchestrator Adapter Help for Email

## Overview

The Email adapter provides the ability to execute email objects and send email messages to a specified user. This guide provides instructions for viewing Email adapter properties, defining Email targets, triggers, and activities, instructions for completing the property pages for each specific activity, and instructions on viewing the activity results.

The Email adapter properties dialog box displays general information about the functionality provided by the adapter, version number, release date and install date, any prerequisites, and the history of changes made to the adapter.

# Managing Email Objects

## Email Targets Overview

Users can define an email target to run a process or activity against an Internet Message Access Protocol (IMAP) email server, a Post Office Protocol (POP3) email server, or an SMTP Server.

The IMAP email server allows an email client, such as Microsoft Outlook, to retrieve email on a remote mail server. The POP3 email server allows an email client to retrieve e-mail from a remote server over a TCP/IP connection.

An Email (IMAP) target must be connected to an Exchange 2007 Server with Service Pack 3. An authentication failure will occur when attempting to create an Email (IMAP) target against an Exchange 2007 Server that does not have service pack 3.

The following table provides a listing of the targets that are associated with the adapter.

- Email Account (IMAP)—Specify the connection information to the IMAP email server
- Email Account (POP3)—Specify the connection information to the POP3 email server
- Email SMTP Server—Specify the connection information to the SMTP email server

## Defining the Email Account Target

Use the following steps to define an Email Account (IMAP) target. This target allows a process or activity to execute against an email account on an IMAP mail server.

An Email (IMAP) target must be connected to an Exchange 2007 Server with Service Pack 3. An authentication failure will occur when attempting to create an Email (IMAP) target against an Exchange 2007 Server that does not have service pack 3.

To define the target:

- 
- Step 1** On the Definitions > Targets view, right-click and choose **New > Email Account (IMAP)**.  
The New Email Account (IMAP) Properties dialog box displays.
- Step 2** On the General Information panel, specify the name and description of the new object, then click Next.
- Step 3** On the Email Account settings panel, specify the email server, email user name and port for the email account.
- Email server—Name of the email server that relays email to the mailbox
  - Protocol—Display-only field of the type of email protocol being used by the email server
  - Email user—Select the default runtime user account used to connect to the target. Select the default runtime user from the drop-down list.
  - Port Override—Check the check box and enter the port number in the adjacent field to override the default port used by the protocol if the port is being used by another application.
  - Enable TLS authentication—If checked, the authorization of the Email server will use TLS.
  - Enable SSL—If checked, the connection to the Email server will run on the SSL port.



---

**Note** You may also need to override the default IMAP port (143) to the SSL port.

---



- Ignore Certificate Error—If checked, any errors regarding the certificate will be ignored.
  - Enable server push notifications—If checked, Email Simple or Advanced Events will be monitored through email server push notifications.
- Step 4** Click the **Keystore** tab and enter the key file password that provides access to the file.
- Step 5** Click the **Advanced** tab to specify the reconnection settings to the appropriate email server (IMAP, POP3) after a connection failure.
- Reconnect to email server on connection failure—Check this check box to enable the reconnection settings for the target.
  - Reconnect every \_\_\_\_seconds—Select this option and in the text field, enter the number of seconds the target should take to reconnect to the server.
  - Reconnect up to—In the text field, enter the maximum number of times the target should attempt to reconnect to the server.
  - Attempt to reconnect at the following intervals (in seconds)—Select this option and in the text field, enter the number of seconds the target should wait before attempting to reconnect to the server.
- Step 6** Click **OK** to close the dialog box and complete the procedure.
- The new target displays in the list of targets on the Definitions > Targets view.
- 

## Viewing Email Properties

- Step 1** On the **Administration > Adapters** view, double-click **Email Adapter**.  
The Properties dialog box displays.
- Step 2** Click the **Advanced** tab to specify the maximum size of a text file attachment which will be returned in the output table in the Get Email Attachments activity.
- Maximum allowed text file size (KB—Choose the maximum number of kilobytes allowed for the text file.
- Step 3** Click the **Keystore** tab and enter the key file password that provides access to the file.
- Step 4** Click **Ok**.
- 

## Managing Email Activities

### Defining the Email Activity

Use the Email activity to specify the information required for sending an email as part of the process.  
To define the Email activity

- Step 1** On the Toolbox pane, under Email Activities, select the **Email** activity, then drag and drop the activity onto the Workflow pane.

The Email property pages display.

**Step 2** On the General tab, enter the appropriate information.

**Step 3** Click the **Email** tab to specify the properties used to generate the email. Use commas to separate multiple email addresses.

- To—Enter the email address of the primary recipient(s) of the email.
- Cc—Enter the email address of the recipient(s) who are to be carbon-copied on the email.
- Bcc—Enter the email address of the recipient(s) who are to blind carbon-copied on the email.
- Subject—Enter the subject heading of the email.
- Message—Enter the content of the message in the body of the email.



---

**Note** HTML code can be used for formatting if the email is saved in HTML format.

---

- Save as HTML—Check this check box to send the email contents as an HTML file.  
For example, if the content is `<B> Cisco Process Orchestrator </B>`, then the contents in the email will be shown in bold text.

**Step 4** Click the **Attachments** tab to specify the file paths for the attachments to be sent as part of the email.

- User with access to attachments—From the drop-down list, select the runtime user account to attach files to the email.
- Attachment Paths—Displays the list of file paths for attachments

**Step 5** Click **OK** to complete the activity definition.

---

## Define a Get Email Attachments Activity

Use the Get Email Attachments activity to specify the parameters for the attachments to be sent as part of the email.

To define the activity

---

**Step 1** On the Toolbox pane, under Email Activities, select the **Get Email Attachments** activity, then drag and drop the activity onto the Workflow pane.

The Get Attachments tab display.

**Step 2** On the Get Attachments tab, specify the properties used for the attachments.

- Mail folder—[Required] mail folder name that contains the message
- Message ID—[Required] the unique message ID.
- Select attachments—Include all the attachments in the message; (b) specify the attachment file table with a “File Name” column, containing attachment file names Usually, user may use the variable reference to the attachment output table from the trigger Email Advanced Event; or (c) Specify the attachment file name, user may use “\*” wild card to specify the attachment file name pattern. The default choice is to include all the attachments.

- What to do with the attachments—(a) Download the attachments; or (b) return the text attachment in the output table. Download is the default. If choose to return the text attachment in the output table, the text of the attachment can be referenced in the exposed attachment table. The size of the text attachment file needs to be no larger than the max allowed size specified in the Email Adapter Advanced settings. If oversized, the activity will fail.
- [Optional] If choose to download—Window Runtime User to access file systems for downloading attachments. The default user is “Orchestrator Server User” that was created during product installation.
- [Optional] If choose to download—Directory to save the downloaded files. In high availability environment server setup, the directory should be a network share accessible to all the servers.
- [Optional] Mutually exclusive choices—If you choose to download, what to do if the file exists. The default is ‘Always replace’. The other two choices are ‘Do not replace’ and ‘Replace only if newer’.

**Step 3** Click **OK** to close the dialog box and complete the procedure.

---

## Element Descriptions

### Service Request Parsing Rules Page

Use the Service Request Parsing Rule page to set up the predefined XPath query based parsing rule for a given type of the service request payloads.

- Display Name—Name of the parsing rule
- Description—Description of the parsing rule
- Automation Pack—Name of the automation pack associated with the parsing rule

### Add/Edit Property Dialog

Use this dialog to add or edit dictionary properties to/for a service request. Select one of the following data types to the request and enter a value for the associated attribute:

- Boolean
- String
- Numeric
- Date and Time

### Add Value Dialog Box

Use this dialog box to add or modify the properties and parameters to be included in the service request.

**Note**

The displayed fields depend on the dialog box that is opened.

- Property/Parameter name—Enter the name of the agent parameter or dictionary property.

- Native data type—Display-only. Data type that may not be used by Process Orchestrator, but was retrieved from the Cisco Prime Service Catalog as part of an existing item within a dictionary property. (Ex. Number, Text, Double)
- Data type—Display-only. Data type assigned to the item
  - Boolean
  - Date
  - Numeric
  - String
- Required—Check this check box to indicate the item is required.
- Property/Parameters is multi-valued—Check this check box to indicate more than one value should be assigned to the item.
- Value—Enter the value(s) to be associated with the item.

## XPath Query Page

Use the XPath Query page to fill in the XPath namespaces defined in the service request XML payload.

- Prefix—Enter the prefix element associated with the namespace URI reference in the attribute value
- Uri—Enter the Uniform resource identifier (URI) used to identify the attribute value of the namespace name or resource on the Internet
- Property Name—Enter the property name
- Property Type—Select the data type associated with the path expression to query.
  - String
  - Numeric
  - Boolean
  - DateTime

## Git Adapter

### Configuring Automation Pack Repository Share

Use the following steps to specify how the automation pack repository are to be saved. The file paths specified indicate the path that will be used when viewing the automation pack repository.

To view automation pack repository, it is recommended that Automation pack repositories are saved on a UNC share path.

If the automation pack repository is set to be saved only on the local computer, then only local users will have access to the automation pack repository. The automation pack repository will not display for users with remote access, such as those accessing Process Orchestrator from the web console or the remote client.

---

**Step 1** Choose **Administration > Adapters**, right-click **Git Adapter** and choose **Properties**.

**Step 2** Click the **Automation Pack Repository Share** tab to enter or modify repository and runtime user information.

**a.** Repository file share:

Share path—Enter the UNC path to a share directory. This path will be used to store automation pack repositories.

Example: (\\servername\sharename\path\filename)



**Note** Verify that the UNC share file path is on a network where the Cisco Process Orchestrator service account has write permissions.

**b.** Runtime User:

- Select the runtime user account used to connect to the automation pack repository file share. Select the runtime user from the drop-down list.
- To view the properties for the selected runtime user, click the **Properties** tool.
- To create a new windows user, click **New > Windows User** to create a new Windows User account.

## Creating a New Git Repository

Use the New Git Repository Wizard to create or modify Git repository properties for an automation pack repositories. An example of properties includes values such as repository URL, repository user, branch and code path.

**Step 1** The Welcome to the Git Repository Wizard panel displays.



**Note** If you do not want to display the Welcome panel the next time the wizard is launched, check the Do not show this page next time check box.

**Step 2** Click **Next** to continue to the General Information Panel and specify the name and description.

**Step 3** On the **Git Repository** panel, specify the following information to create a repository:

- Repository URL—Enter the Git URL of the repository.
- Repository User—Select the repository user from the drop-down or click **New > Repository User** to create a new runtime user. For more information see, [Defining a Repository User](#).
- Branch—Enter default branch name master. As you initially make commits, you are given a master branch that points to the last commit you made.
- Code Path—Enter the code path of the Git.

**Step 4** Click **Finish** to create the Git repository target.

# Core Adapter

The following table displays activities that are provided by the Core Functions adapter. For more information about using these activities, see [Getting Started Using the Core Adapter, page 12-65](#).

| Activity                       | Description  |
|--------------------------------|--|
| Calculate Date                 | Manipulates the values of a date/time variable<br>See <a href="#">Defining the Calculate Date Activity, page 12-68</a>   |
| Calculate Date Time Difference | Calculates the time difference between two different dates.<br>See <a href="#">Defining the Calculate Date Time Difference Activity, page 12-68</a>                  |
| Cast Target Type               | Defines the target type to cast to<br>See <a href="#">Defining the Cast Target Type Activity, page 12-69</a>   |
| Convert JSON to XML            | Converts JavaScript Object Notation text to XML.<br>See <a href="#">Defining the Convert JSON to XML Activity, page 12-69</a>  |
| Convert XML to JSON            | Converts XML to JavaScript Object Notation text.<br>See <a href="#">Defining the Convert XML to JSON Activity, page 12-70</a>  |
| Correlate Process Events       | Check whether a process occurred within a certain amount of time of another problem<br>See <a href="#">Defining the Correlate Process Event Activity, page 12-70</a> |
| Create Automation Summary      | Generates an automation summary for selected activities<br>See <a href="#">Defining the Create Automation Summary Activity, page 12-72</a>                           |
| Delete Target                  | Delete a specific target<br>See <a href="#">Deleting an Object, page 9-12</a>  |
| Find Targets                   | Queries all defined targets<br>See <a href="#">Defining the Find Target Activity, page 12-74</a>   |
| Format Date                    | Converts date time into a string text format<br>See <a href="#">Defining the Format Date Activity, page 12-74</a>  |
| Insert Event                   | Inserts one event into Cisco Process Orchestrator Reporting Database<br>See <a href="#">Defining the Insert Event Activity, page 12-75</a>                           |
| Match Regular Expression       | Matches specified string against a specified regular expression<br>See <a href="#">Defining the Match Regular Expression Activity, page 12-77</a>                    |
| Parse Date                     | Converts string text into a date/time format<br>See <a href="#">Defining the Parse Date Activity, page 12-77</a>   |
| Publish Metric                 | Publishes a single performance metric into the Cisco Process Orchestrator Reporting Database<br>See <a href="#">Defining the Publish Metric Activity, page 12-80</a> |

| Activity               | Description  |
|------------------------|--|
| Raise Process Event    | Raise an internal event to the Cisco Process Orchestrator server based on specific data<br>See <a href="#">Defining the Raise Process Event, page 12-80</a>  |
| Set Multiple Variables | Updates multiple variables in a single activity<br>See <a href="#">Defining the Set Multiple Variables Activity, page 12-81</a>  |
| Set Variable           | Modifies the values of a variable.<br>See <a href="#">Modifying the Value of a Defined Variable, page 12-81</a>  |
| Sleep                  | Specifies the time period to pause between activities in the workflow.<br>See <a href="#">Defining the Sleep Activity, page 12-82</a>  |
| Test FTP Destination   | Tests the validity of a FTP file path<br>See <a href="#">Defining the Test FTP Destination Activity, page 12-82</a>  |
| Update Target          | Update the properties of a specific target<br>See <a href="#">Defining the Update Target Activity, page 12-82</a>  |
| XPath Query            | Queries information based on XML path expressions, nodes, as well as namespace definitions<br>See <a href="#">Defining the XPath Query Activity, page 12-83</a>                                    |
| XSL Transform          | Applies XSLT transformation to specific XML text. XSLT transformation can transform XML into plain text, HTML, or other XML<br>See <a href="#">Defining the XSL Transform Activity, page 12-83</a> |

## Getting Started Using the Core Adapter

Use the following process to monitor and manage Core activity instances.

- 
- Step 1** Define a Core command activity (see [Defining Core Adapter Activities, page 12-68](#)).
  - Step 2** View the activity results (see [Monitoring Operations, page 8-1](#)).
- 

## Configuring the Core Function Adapter

The Core Function Adapter provides the basic functionality in Cisco Process Orchestrator. Use the Core Function Adapter Properties dialog box to configure default email settings, diagnostic report location, and Return on Investment calculations.

## Configuring Automation Summary Settings

Automation summary reports are generated by activities to provide information about the activity and assist in resolving any issues that may need attention. Use the following steps to specify how the automation summary reports are to be saved and how long the reports are to be retained. The file paths specified indicate the path that will be used when viewing the automation summary reports.

To view automation summary reports, it is recommended that Automation summary reports are saved on a UNC share path.

If the automation summary is set to be saved only on the local computer, then only local users will have access to the automation summary report. The automation summary will not display for users with remote access, such as those accessing Process Orchestrator from the web console or the remote client.

---

**Step 1** Choose **Administration > Adapters**, right-click **Core Functions Adapter** and choose **Properties**.

**Step 2** Click the **Automation Summary** tab to specify where the automation summary reports that are generated by activities are to be saved and how long the reports are to be retained.

The file paths specified indicate the path that will be used when viewing the automation summary reports.

**Step 3** Verify or enter the appropriate default file path for the automation summary directory.

- Share path—Enter the UNC path to a share directory. This path will be used when viewing the automation summary reports.

Example:

(\\servername\sharename\path\filename)




---

**Note** Verify that the UNC share file path is on a network where the Cisco Process Orchestrator service account has write permissions.

---

Use the following buttons to modify the share path:

- Browse—Launches the Browse for Share dialog box to query the file path to store the automation summary reports.
- Create share—Launches the Create Share dialog box to create the directory on the Process Orchestrator server where the automation summary reports should be created and stored.

**Step 4** Specify the default credentials to be used to access the Orchestrator server on the network share.

- Enable virtual directory mapping—Check this check box to map the file path to an IIS Virtual Directory. If the check box is unchecked, then the automation summary will not be saved to a shared or IIS virtual directory and will not be available for view from the Web Console.
- Virtual directory path—Enter the `http://host:(port)/sharefolder` that corresponds to a virtual directory in IIS. If necessary, go to IIS Manager to create your Web Sites and your Virtual Directory for the share folder. Use the default settings or change the settings, as necessary.

Click **Create** to launch the Create Virtual Directory dialog box to update the Virtual Directory name.

The file path to the network share where automations may be created and stored.

- Site name—Name of the IIS virtual directory
- Physical path—Display only. File path that corresponds to the virtual directory  
\\host\sharefolder



- Virtual Directory name—Name of the new shared folder

Select the appropriate directory mapping option from the drop-down list to map the automation summary to a shared directory or IIS Virtual Directory to allow end-users easier access to automation summaries using email or the Process Orchestrator Web Console.

- Step 5** Configure the automation summary reports grooming settings.
- Delete automation summary reports older than—Check this check box to limit the number of automation summary reports that are retained. Enter the number of days that the reports should be retained in the text field. Reports that have been retained for a period past the specified number of days will be deleted.
- 

## Configuring Return on Investment

Process Orchestrator provides the ability to calculate the Return on Investment (ROI) that is achieved by automating your processes. When you create a process, you have the option to enter the equivalent time it would take to run the process manually. This value is calculated against the hourly rate specified on this page to determine your ROI.

- Step 1** Choose **Administration > Adapters**, right-click **Core Functions Adapter** and choose **Properties**.
- Step 2** Click the **ROI** tab and specify the hourly rate (in dollars) that it would cost to execute a process manually.
- 

## Getting Task XSL Transforms

Each task type has a specific XSL transform that converts the XML into HTML web pages for display in the Web Console. Use the Task tab to display the default XSLT transform file names. The files are located in the Process Orchestrator program Web Console folder under the following file path:

C://Install Directory/Web Console/Task XSL Transforms

You can change the XSL file name for a specific task when modifying the task properties in the Process Editor dialog box.

- Step 1** Choose **Administration > Adapters**, right-click **Core Functions Adapter** and choose **Properties**.
- Step 2** Click the **Task** tab, highlight the appropriate task, and right-click and choose **Properties**.  
The Task XSL Transform dialog box displays the default XSL transform file name for the specific task.
- Step 3** To view the converted code, use a web browser to launch the appropriate XSLT file that resides in the Process Orchestrator install directory/WebConsole folder.
-

## Publishing Metrics to the Window Management Instrumentation Provider

Use the WMI tab to configure the default settings for publishing metrics into the Windows Management Instrumentation (WMI) provider.

- 
- Step 1** Choose **Administration > Adapters**, right-click **Core Functions Adapter** and choose **Properties**.
- Step 2** Click the **WMI** tab.
- Step 3** Click **Publish Metrics** to enable the settings to configure the publishing time frame, then set these values:
- Poll metrics to publish every—Enter the default number of minutes in the text field to indicate when a poll is taken to publish metrics.
  - Unpublish metrics older than—Enter the default number of days in the text field to indicate that metrics should be unpublished after a certain number of days.
- 

## Defining Core Adapter Activities

### Defining the Calculate Date Activity

Use the Calculate Date activity to manipulate the values of a date/time variable.

- 
- Step 1** In the Process Editor Toolbox, choose **Core Activities > Calculate Date**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Calculate Date** tab to specify the properties to be used to adjust the date and time frame.
- Original date—Enter the original date/time of the variable.  
Format must be according to the regional settings. (mm/dd/yyyy hh:mm:ss)
  - Adjustment—Enter the number of units to increase or decrease the time frame. Enter minus (-) prior to the value to decrease or enter plus (+) prior to the value to increase. (ex. -5)
- Step 4** Click the time unit link to change the modified date/time (from seconds up to days).
- Step 5** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

### Defining the Calculate Date Time Difference Activity

Use the Calculate Date Time Difference activity to manipulate the values of a date/time variable.

- 
- Step 1** In the Process Editor Toolbox, choose **Core Activities > Calculate Date Time Difference**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Date Difference** tab to specify the properties to be used to adjust the date and time frame.

- Original date—Enter the original date/time of the variable.  
Format must be according to the regional settings. (mm/dd/yyyy hh:mm:ss)
  - Adjustment—Enter the number of units to increase or decrease the time frame. Enter minus (-) prior to the value in order to decrease or enter plus (+) prior to the value to increase. (ex. -5)
- Step 4** Click the time unit link to change the modified date/time (from seconds up to days).
- Step 5** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the Cast Target Type Activity

Use the Cast Target Type activity to define the target type to cast to.

- Step 1** In the Process Editor Toolbox, choose **Core Activities > Cast Target Type**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Cast Target Type** tab to define the properties specific to the activity.
- Target—Selected target to cast
  - Cast to Type—Selected target type for the target to cast to
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Viewing Results

Click the Cast Target Type *display-only* tab to view the properties used to cast the target type.

- Target—Selected target to cast
- Target Type—Selected target type to cast
- Cast to Type—Selected target type for the target to cast to

## Defining the Convert JSON to XML Activity

Use the Convert JSON to XML activity convert JavaScript Object Notation text to XML which makes it easier for users to parse and manipulate XML configuration.

JSON is a text-based open standard designed for human-readable data interchange and is often used for serializing and transmitting structured data over a network connection.

- Step 1** In the Process Editor Toolbox, choose **Core Activities > Convert JSON to XML**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **JSON Source** tab to define the properties specific to the activity.
- Input JSON—Enter the JSON text to be converted to XML. For example:
 

```

      {"menu": {

```

```

    "id": "file",
    "value": "File",
    "popup": {
      "menuitem": [
        {"value": "New", "onclick": "CreateNewDoc()"},
        {"value": "Open", "onclick": "OpenDoc()"},
        {"value": "Close", "onclick": "CloseDoc()"}
      ]
    }
  }
}

```

- Specify the root element name for XML—Check the check box to enter the name of the XML root element that is generated and recognized in an XML document instance in the enabled text field.

**Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

---

## Defining the Convert XML to JSON Activity

Use the Convert XML to JSON activity convert XML to JavaScript Object Notation text which makes it easier for users to parse and manipulate JSON configuration.

---

**Step 1** In the Process Editor Toolbox, choose **Core Activities > Convert XML to JSON**, then drag and drop the activity onto the Workflow pane.

**Step 2** Click the **General** tab and enter the required information.

**Step 3** Click the **XML Source** tab to define the properties specific to the activity.

- Input XML—Enter the XML text to be converted to JSON. For example:

```

<menu id="file" value="File">
  <popup>
    <menuitem value="New" onclick="CreateNewDoc()" />
    <menuitem value="Open" onclick="OpenDoc()" />
    <menuitem value="Close" onclick="CloseDoc()" />
  </popup>
</menu>

```

- Omit XML root element—Check this check box to indicate XML root element should not be included in the conversion.

**Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

---

## Defining the Correlate Process Event Activity

Use the Correlate Process Event activity to check whether a process occurred within a certain amount of time of another problem.

---

**Step 1** In the Process Editor Toolbox, choose **Core Activities > Correlate Process Event**, then drag and drop the activity onto the Workflow pane.

**Step 2** Click the **General** tab and enter the required information.

- Step 3** Click the **Event Criteria** tab to define the properties specific to the activity, including:
- Correlate events that occur within—Enter a value and select the time unit to indicate the time period in which the events should correlate before or after the process start time. The process start time is the default object used to correlate events.
    - Time unit—Enter the start time value to specify the time period to correlate. Click the time unit link to change the time interval.
    - Event occurrence—Click the link to determine whether the process start time is before or after the event occurs.
  - Number of events to correlate—Select one of the following radio buttons to specify which events to correlate during the specified time period:
    - All events in the above time frame—Select this radio button to correlate all events that occur within the specified time frame.
    - Number of events—Select this radio button and then enter the number of events to correlate in the text field.
  - Event Severities—The severity level of the event in that must be matched before the process executes (such as Information, Warning, Error, Success audit, or Failure audit).
  - Property—Click the Reference tool to launch the Insert Variable Reference dialog box and select the event data to correlate
  - Comparison—Select the operator to be used to evaluate the expression.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Viewing Results

The Event Criteria display-only tab specifies the event criteria that must occur before or after the process starts.

- Correlate events that occur within—Value and time unit indicates the time period in which the events should correlate before or after the process start time.
- Number of events to correlate—The selected radio button specifies which events should correlate according to the specified start time.
  - All events in the above time frame—Correlates all events during the specified time frame.
  - Number of events—Correlates the specified number of events to occur during the specified time frame
- Event Severities—The severity level of the event in that must be matched before the process executes.
  - Information
  - Warning
  - Error
  - Success audit
  - Failure audit
- Additional Properties to match
  - Property—Select event data property to correlate

- Comparison—Selected operator used to evaluate the expression
- Expression—Expression associated with the selected operator

## Defining the Create Automation Summary Activity

An automation summary is a record of process execution. The automation summary includes information about the events that trigger processes, activities that were executed, and the data retrieved by the executed activities.

Use the Create Automation Summary activity to specify the activities in the process for which an automation summary should be generated. To generate the data output, select the activity and then specify the section in the automation summary in which to output the data.

The share path specified in the Core Functions Adapter properties will be used when viewing the automation summary reports.

If the automation summary is set to not be shared, then only local users on the Process Orchestrator server computer will have access to the automation summary report. The automation summary will not display for users with remote access, such as those accessing Process Orchestrator from the Web Console or the remote client, unless a UNC share or IIS Virtual directory sharing options have been selected.

- 
- Step 1** In the Process Editor Toolbox, choose **Core Activities > Create Automation Summary**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Automation Summary** tab to define the properties specific to the activity, including:
- Automation summary style sheet—Select the type of template to be used for the automation summary.
    - Table of Configuration Properties
    - Situation Analysis Report (default)
  - Include the following items—Select the activity or trigger/event, since events and triggers can be included into the automation summary as well, and specify the section of the automation summary to include the reporting details and whether the activity is the root cause of any issues that are detected.
    - Name—Name of the activities that are included in the process
    - Section—Name of the section of the automation summary where the data will be stored
    - Root cause—Yes indicates the Is the root cause check box is checked
  - Section—Specify the section of the automation summary template in which to export the data:
    - SituationAnalysis—After a situation that requires action is identified, the state and diagnostic information is displayed in the Situation Analysis section of the automation summary.
    - ContextAnalysis—After a situation is analyzed in context with other situations, the symptom and cause is displayed in the Context Analysis section of the automation summary.
  - Is the root cause—List the activity or event at the top of the automation summary, or identified as the root cause of the problem.
  - Last instance information only—Indicate that the automation summary must include only information for the latest execution of the activity instance.

This setting is only for activities that are inside the loop of a workflow component (While or For Each). If this setting is not selected, the automation summary will include information about all instances of activity, for all iterations of the loop.

This option is available only when **Free up memory before process completes** check box in the Environment Properties console is unchecked.

- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

## Defining the Export Table to HTML Activity

Use the Export Table to HTML activity to export the table variable to HTML with the linked Cascading Style Sheet (CSS) and Java script.

- Step 1** In the Process Editor Toolbox, choose **Core Activities > Export Table to HTML**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **HTML Export** tab to define the properties specific to the activity, including:
- **Table**—Select the appropriate table to be queried, it can be any global or local table variable reference.
  - **Caption**—Enter the table heading to be displayed above the table and also as a page header head/title tag of the resulting HTML page.



**Note** This is optional. If not specified, the activity name is used as the table caption.

- **Custom CSS file**—Select the Custom CSS or Default CSS file from the drop-down list.
- **Custom JavaScript file**—Select the Custom JavaScript or Default JavaScript file from the drop-down list.

The default folder with default CSS and JavaScripts files gets created the first time the activity runs, the file paths are mentioned below:

```
Shared\html-table-resources\default\css\*.css
Shared\html-table-resources\default\js\*.js
```

You can create the custom folder in the same path as the default folder, in order to create and modify the custom CSS and JavaScripts files:

```
\\<server>\<Automation Summaries share>\Shared\html-table-resources\custom\css\*.css
\\<server>\<Automation Summaries share>\Shared\html-table-resources\custom\js\*.js
```

The files in the custom folders are displayed in their respective drop down lists.

- Step 4** Click **Save** to complete the activity definition.

## Viewing Results

Click the **View Exported File** tab to view the exported HTML table generated by the activity.

You can also view the link to **HTML file location** displayed in the **Property** page, the link can be used to view the table in any browser.

For example:

The files are exported to the following path:

```
\\<server>\<Automation Summaries share>\<yyMMdd>\ folders, here yyMMdd is year, month, and day.
```

The export table to HTML activity displays the Standalone HTML on the activity output, which can be used to work with an embedded version of HTML contents in the workflow. For example, it can be used to manipulate HTML contents as well as to save the contents to a custom file location.

Standalone HTML output does not contain reference to CSS or JavaScript resources. Instead, the contents of the corresponding resources are copied to appropriate locations in HTML during activity operation and the result is stored in Standalone HTML field along with the data.


**Note**

This property is not displayed on the activity instance output pages, but it's available for use in the consecutive activities in the workflow.

## Defining the Find Target Activity

Use the Find Target activity to query a list of defined targets matching specific target attribute criteria.

- 
- Step 1** In the Process Editor Toolbox, choose **Core Activities > Find Target**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Find Targets** tab to define the properties specific to the activity, including:
- Target type—Select the appropriate target type to be queried.
  - Choose a target group—Select the appropriate target group to be queried. Only target groups defined in Process Orchestrator in which the user has Use permission will be available.
  - Properties to Match—Select the appropriate exposed target criteria to use to query a list of defined targets in Process Orchestrator:
    - Property—select the appropriate exposed target property to query.
    - Operator—Select the appropriate operator to include to match to the criteria. The displayed operators depend on the selected property. For additional information, see [Common Operators](#)
    - Expression—Select the appropriate wildcard expression to associate with the selected operator.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the Format Date Activity

Use the Format Date activity to convert date and time into a string text format.

- 
- Step 1** In the Process Editor Toolbox, choose **Core Activities > Format Date**, then drag and drop the activity onto the Workflow pane.




- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Format Date** tab to define the properties specific to the activity, including:
- **Format String**—Enter the date or time format string to be formatted. For example:  
`yyyyMMdd hh:mm:ss tt`
  - **Original Date**—Click the **Reference** tool to select the appropriate date/time variable reference, such as the **Process > Start Time** reference variable, to be used to format the string.
  - **Use Local Time Zone**—Check this check box to use the local time zone for the task.
  - **Use Specified Culture instead of CPO Server Culture**—Check this check box to select a different culture for the task to run on instead of Cisco Process Orchestrator server culture.
- To customize the specific date/time of the variable reference, add the **Parse** activity to the process and use that activity to modify the selected date/time.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the Insert Event Activity


Use the Insert Event activity to view or specify the properties that display depending on the selected event.

---

- Step 1** In the Process Editor Toolbox, choose **Core Activities > Insert Event**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Event** tab to define the properties specific to the activity, including:
- **ID**—Unique identifier for the process event
  - **Subject**—The subject line of the event message
  - **Category**—The category assigned to the event
  - **Severity**—The severity level of the event (Information, Warning, Error, Success audit, Failure audit)
  - **Automation Summary (URL)**—URL for the related automation summary
- Step 4** Click the **Parameters** tab to define parameters for a specific task.
- Step 5** Click the **Affects** tab to specify the elements that trigger the selected target.
- **This event applies to the following target**— Specify the affected target to be used in the activity.
  - **Process target**—Use the process target as the affected target in the activity.
  - **Activity target**—specify the affected target for a specific task activity.
    - **Activity target**—Select the activity containing the target that will be used. Only task activities will display in the list.
    - **Target Reference**—Specify the affected target that will be used.

To view the properties for the selected target, click the **Properties**  tool. To create a new target, click **New > [Target]**.

    - **Specific target group**—Specify the affected target group that will be used.

To view the properties for the selected target group, click the **Properties**  tool. To create a new target group, click **New > [Target Group]**.

From the **Choose a target using this algorithm** drop-down list, specify which target will be chosen from the eligible target group members.

#### Target Algorithms

- Choose any target that satisfies the specified criteria—Executes the process on any targets defined by the criteria specified in the Target Selection dialog box.
- Choose the target with the specified name—Executes the process on the member of the group specified in the Name to match text field.
- This event applies to the following configuration item—Specify the configuration item to be used in the activity
- Name—Name of the configuration item (IT component) to which the alert pertains. For example, the name of a database server that failed or the name of a specific job that failed.
- Type—Enter the appropriate configuration item type or select the type of ITIL configuration item (IT component) from the list which the alert describes. For example, the type of the specific application element that failed (Application Server, Database, Host, or User).
- This is a CMDB reference—Indicate that the true source of the CI is in the CMDB, so the configuration item properties reference a CMDB entry.
- Object key—ID for the specific record in the CMDB that contains the configuration item
- Object source—Name for the specific record in the CMDB that contains the target configuration item

**Step 6** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

---

## Viewing Results

Click the Events *display-only* tab to view the batch of events generated by the activity in the Reporting database.

- Event ID—Identifier used for the event
- Subject—Name of the event
- Affected Target Configuration Item Type—Type of ITIL configuration item (IT component) or application element which failed such as a server, database, host, or user
- Affected Target Configuration Item Source—Name for the specific record in the CMDB which contains the target configuration item
- Affected Target Configuration Item Object Name—Name of the configuration item (IT component) which failed or the name of a specific job which failed.
- Affected Target Configuration Object Key—ID for the specific record in the CMDB which contains the configuration item
- Configuration Item Type— Type of ITIL configuration item (IT component) which the alert describes.

Example—The type of the specific application element which failed:

- Application Server
- Database

- Host
  - User
- Source—Name for the specific record in the CMDB which contains the target configuration item
- Category—Category for the event
- Severity—Severity of the event
  - Error
  - Warning
  - Information
  - Success Audit
  - Failure Audit
- Automation Summary—File path for the automation summary report
- Description—Brief description of the event
- Parameter [1-10]—Values of the parameter
- Time Generated—Date and time the event was generated

## Defining the Match Regular Expression Activity

Use the Match Regular Expression activity to match specified string text against a specified regular expression.

- 
- Step 1** In the Process Editor Toolbox, choose **Core Activities > Match Regular Expression**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Regular Expression** tab to define the properties specific to the activity, including:
- Regular Expression—Specify a fixed string to represent the regular expression to be used in matching  
Click the Expression arrow to view frequently used symbols.
  - Match case—Check the check box to specify whether regular expression matching should be case-sensitive
  - Input string—Enter the input string for text to be parsed and matched against the specified regular expression.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the Parse Date Activity

Use the Parse Date activity to convert string text into a date/time format.

- 
- Step 1** In the Process Editor Toolbox, choose **Core Activities > Parse Date**, then drag and drop the activity onto the Workflow pane.

- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Parse Date** tab to define the properties specific to the activity, including:
- **Format String**—Enter the date or time format string to be parsed. For example:  
`yyyyMMdd hh:mm:ss tt`
  - **Input String**—Enter the date or time string to be parsed.
  - **Use Local Time Zone**—Check this check box to use the local time zone for the task.
  - **Use Specified Culture instead of CPO Server Culture**—Check this check box to select a different culture for the task to run on instead of Cisco Process Orchestrator server culture.
  - For details about other date properties, see [Defining the Insert Event Activity, page 12-75](#)
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
-

## Defining the Ping Hosts Activity

Use the Ping Hosts activity to ping IP address.

- Step 1** In the Process Editor Toolbox, choose **Core Activities > Ping Hosts**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Ping** tab to define the properties specific to the activity, including:
- Hosts—Enter 1 or more IP addresses or name of the servers.



**Note** For a single entry, you can enter multiple hosts separated by commas.

- Number of echo requests to send—Enter the number of echo request (default is 4).
- Timeout—Enter the time period the activity should wait before failing. Click the time unit link to change the time interval.

- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

## Ping Hosts Results

The **Results tab** displays the Ping results of the Hosts entered in the activity.



**Note** The activity will stop, when it's timeout. It will not continue to ping the rest of the hosts.



**Note** The activity doesn't stop just because it is not able to reach some of the hosts.

| Column                               | Description   |
|--------------------------------------|---|
| Host                                 | The host name or IP address.  |
| Package Sent                         | Displays the number of Packets sent.  |
| Package Received                     | Displays the number of Packets received.  |
| Package Lost                         | Displays the number of Packets lost.  |
| Minimum Round Trip (in milliseconds) | Displays the minimum time taken for packets to travel from a specific source to a specific host destination and back again. |
| Maximum Round Trip (in milliseconds) | Displays the maximum time taken for packets to travel from a specific source to a specific host destination and back again. |
| Average Round Trip (in milliseconds) | Displays the average time taken for packets to travel from a specific source to a specific host destination and back again. |

| Column      | Description  |
|-------------|--|
| Response    | Displays the results of the Ping.                                      |
| Status Code | Status code indicates whether a request is successful or unsuccessful. |

## Defining the Publish Metric Activity

Use the Publish Metric activity to define the performance metric properties to be published into the Reporting Database and the Windows Management Instrumentation (WMI) provider.

The metrics are published under the root\Process Orchestrator name space using the WMI class, CPO\_PerformanceMetric. Use the Metrics page to define the performance metric properties to be published into the Process Orchestrator Reporting Database and the Windows Management Instrumentation (WMI) provider.

- 
- Step 1** In the Process Editor Toolbox, choose **Core Activities > Publish Metric**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Metrics** tab to define the properties specific to the activity, including:
- Object name—Object name of the metric
  - Counter name—Counter name of the metric
  - Instance name—Name of the instance
  - Value—Performance metric value
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the Raise Process Event

Use the Raise Process Event activity to raise an internal event to the Cisco Process Orchestrator server based on specific data.

- 
- Step 1** In the Process Editor Toolbox, choose **Core Activities > Raise Process Event**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Event** tab to define the properties specific to the activity, including:
- ID—The identifier to be used for the event
  - Subject—The name of the event
  - Category—The category for the event
  - Severity—The severity of the event (Error, Warning, Information, Success Audit, Failure Audit)
  - Source—Source of the event. For Cisco Process Orchestrator-generated events through Raise Process Event, the source is the Cisco Process Orchestrator: process name that raised the event.
  - Description—A brief description of the event.

- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the Set Multiple Variables Activity

Use the Set Multiple Variables activity to update multiple variables in a single activity. This activity will update each defined variable in the activity, one by one, as well as perform the necessary auditing for each updated variable.

If updating a single variable, use the Set Variable activity (see [Modifying the Value of a Defined Variable, page 12-81](#)).

---

- Step 1** In the Process Editor Toolbox, choose **Core Activities > Set Multiple Variables**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Variable** tabs to define the properties specific to the activity, including:
- **Variable**—Click the Reference tool to select the variable reference property to be updated.
  - **New Value**—Enter the new value of the variable. You can also click the Reference tool to select a variable reference property to be used to update the variable.  
For a Boolean variable, the text entered in this field (true or false) is case-sensitive and must be entered all lowercase.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Modifying the Value of a Defined Variable

- Step 1** In the Process Editor Toolbox, choose **Core Activities > Set Variable**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Variable** tab to define the properties specific to the activity, including:
- **Variable to update**—Select the appropriate variable to be modified.
  - **Variable data type**—Data type associated with the selected variable.
  - **Current value**—The current value of the selected variable.
  - **New value**—Enter or select a new value of the variable.  
For a Boolean variable, the text entered in this field (true or false) is case-sensitive and must be entered all lowercase.
- Formulas can also be included to modify variable values. For example:
- 5+10
  - [Activity.Reference1] / [Activity.Reference2] \* 100) + [Activity.Reference3]
  - [Activity.PropertyName1] [Activity.PropertyName2]

- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the Sleep Activity

Use the Sleep activity to specify the time period to pause between activities in the workflow.

---

- Step 1** In the Process Editor Toolbox, choose **Core Activities > Sleep**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Result Handlers** tab to modify the list of condition branches on the process.

## Defining the Test FTP Destination Activity

Use the Credentials tab to specify the runtime user that should be used for execution.

---

- Step 1** In the Process Editor Toolbox, choose **Core Activities > Set Variable**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **FTP** tab to define the properties specific to the activity, including:
- Use process runtime user—Use the credentials for the runtime user that was specified for the process
  - Override process runtime user—Specify different credentials than what are used for the process. The selected runtime user overrides the runtime user that was specified for the process.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the Update Target Activity

Use the Update Target activity to update the properties of a specific target.

---

- Step 1** In the Process Editor Toolbox, choose **Core Activities > Update Target**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Target** tab to define the properties specific to the activity, including:
- Target—Name of the target
  - Target Type—Type of target
  - Target—Indicates the target will be d
  - Properties to update—The target properties available for update



- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the XPath Query Activity

Use the XPath Query activity to query information based on XML path expressions, nodes, as well as namespace definitions. If the query matches more than one node in the XML document, an error will be generated.

- 
- Step 1** In the Process Editor Toolbox, choose **Core Activities > XPath Query**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **XPath Query** tab to define the properties specific to the activity, including the source XML text to be queried.
- Step 4** Modify the list of namespace definitions.
- Step 5** Click **Namespace** to display the namespace column descriptions.
- Step 6** Click **New** to add new **XPath Queries** under the XPath queries column, enter the following information in the XPath Query definition dialog box.
- XPath Query—Enter the path expression to query.
  - Property Name—Enter the property name to display on the Results tab after the activity has run.
  - Property Type—Select the data type associated with the path expression to query (String, Numeric, Boolean, or DateTime).
  - Error Handling—Select either one of the following option from the drop-down list:
    - Fail the activity if this value cannot be found—Select this option to fail the activity if the queried value is not found.
    - Specify a default value if this value cannot be found—Enter the default value to be displayed on the activity result, if the queried value is not found.
- For example, if the default value is entered as *False* and the queried value is not found, then the results page displays *False* in the activity results page.
- Step 7** Select the required query row and click **Properties**, to see or modify the properties of the existing XPath query.
- Step 8** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the XSL Transform Activity

Use the XSL Transform activity to apply XSLT transformation to specific XML text. XSLT transformation can transform XML into plain text, HTML, or other XML.

- 
- Step 1** In the Process Editor Toolbox, choose **Core Activities > XPath Query**, then drag and drop the activity onto the Workflow pane.

- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **XSL Transform** tab to define the properties specific to the activity, including:
- Specify XSL document—Select this radio button to transform a specific XSL document, then enter the XSLT style sheet for the XSL document.
  - XSL transform—Select this radio button to transform XSL text from a specific file path, then enter the appropriate file path of the XSL file.
  - Source XML to transform—Source XML text to be transformed.
  - Output Format—Select the radio button to determine the appropriate output in the automation summary and activity instance (HTML, XML).
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the JSON Path Query Activity

Use the JSON Path Query activity to query information based on JSON path expressions and nodes. If the query matches more than one node in the JSON document, an error will be generated.

---

- Step 1** In the Process Editor Toolbox, choose **Core Activities > JSON Path Query**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **JSON Path Query** tab to define the properties specific to the activity, including the source JSON text to be queried.
- Step 4** Click **New** to add new JSON Path Query under the JSON Path queries column, enter the following information in the JSON Path Query definition dialog box:
- JSON Path Query—Enter the path expression to query.
  - Property Name—Enter the property name to display on the Results tab after the activity has run.
  - Property Type—Select the data type associated with the path expression to query (String, Numeric, Boolean, or DateTime).
  - Error Handling—Select either one of the following option from the drop-down list:
    - Fail the activity if this value cannot be found—Select this option to fail the activity if the queried value is not found.
    - Specify a default value if this value cannot be found—Enter the default value to be displayed on the activity result, if the queried value is not found.

For example, if the default value is entered as *False* and the queried value is not found, then the results page displays *False* in the activity results page.
- Step 5** Select the required query row and click **Properties**, to see or modify the properties of the existing JSON Path query.
- Step 6** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
-

# Database Adapter—Microsoft SQL Server

Use the Cisco Process Orchestrator SQL Server Database Adapter to automate common SQL queries in the SQL Server database.

The following table displays activities that are provided by the Microsoft SQL Server database adapter. For more information about using these activities, see [Getting Started Using the Microsoft SQL Server Database Adapter](#), page 12-86.

| Activity                              | Comments  |
|---------------------------------------|---|
| Bulk Insert SQL Server                | Enter the source table that will be used to insert data into an SQL Server database.<br><br>For more information, see <a href="#">Performing Bulk Database Insertions</a> , page 12-100.  |
| Check SQL Server Buffer HitRate       | Query the percentage of pages that were found in the buffer pool without having to incur a read from disk.  |
| Check SQL Server Database Space       | Query the total amount of database space the server is currently consuming.   |
| Check SQL Server Disk Space           | Query the total amount of disk space the database is currently consuming.<br>The result of the query is the amount of available database memory.  |
| Check SQL Server Locks                | Display the results of the query for the locks performed in the SQL server database.<br><br>For more information, see <a href="#">Configuring Database Adapters</a> , page 12-103.  |
| Check SQL Server Memory               | Query the total amount of dynamic memory the server is currently consuming.   |
| Check SQL Server Page Life Expectancy | Query the number of seconds a page will stay in the buffer pool without references.   |
| Delete from SQL Server                | Delete data from the SQL server database using SQL command lines.<br>Enter the command text for the selected database. For example, this is a simple DELETE statement:<br><br><code>DELETE from mytable where mycolumn = 'zzz'</code>       |
| Execute SQL Server SQL Script         | Execute an SQL script against an SQL server database.<br><br>For more information, see <a href="#">Executing a Generic (OLEDB) SQL Script</a> , page 12-90  |
| Insert into SQL Server                | Insert one database activity into an SQL server database.<br>Enter the command text for the selected database. For example, to insert values into a table:<br><br><code>INSERT into mytable (column1,column2) VALUES ('val1','val2')</code> |

| Activity                            | Comments   |
|-------------------------------------|--|
| List SQL Server Running SQL Queries | <p>Display the results of the running SQL queries performed in the SQL server database.</p> <p>Specify the information that describes the query results, including:</p> <ul style="list-style-type: none"> <li>Row Limit—The appropriate number rows to limit for the query and returned data (default=50).</li> </ul> |
| Select from SQL Server              | <p>Query data from an SQL server database.</p> <p>For more information, see <a href="#">Configuring Database Adapters, page 12-103</a>.</p>  |
| Select From Report Database         | <p>Query data from a report database.</p> <p>For more information, see <a href="#">Configuring Database Adapters, page 12-103</a>.</p> <p><b>Note</b> Use a different Select activity when switching between databases.</p>  |
| SQL Server Lock Information         | <p>Use this activity to display a list of all client processes that have locks.</p> <p>For more information, see <a href="#">Configuring Database Adapters, page 12-103</a>.</p>   |
| Update SQL Server                   | <p>Use this activity to update column information in the SQL Server database using SQL command lines.</p> <p>Enter the command text for the selected database. For example, this sample query updates the columns in a table:</p> <p>Update mytable set column1 = 'newvalue' where column2 = 'zzz'</p>                 |

## Getting Started Using the Microsoft SQL Server Database Adapter

Use the following process to monitor and manage Microsoft SQL Server database instances.

- 
- Step 1** Create a Microsoft SQL Server database target (see [Defining an SQL Server Database Target, page 12-87](#)).
- Step 2** Define a Microsoft SQL Server database activity.
- In the Process Editor Toolbox, choose **Database > Microsoft SQL Server > [Microsoft SQL Server Database Activity]**, then drag and drop the activity onto the Workflow pane.
  - Click the **General** tab and enter the required information.
  - Click the **[Activity-Specific]** tabs to define the properties specific to the activity.
  - Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- For details about a specific activity, see [Automating SQL Queries in the Microsoft SQL Server Database, page 12-87](#).
- Step 3** View the activity results (see [Monitoring Operations, page 8-1](#)).
-

## Defining an SQL Server Database Target

Use the SQL Server Database target to specify the connection information for a SQL server target.

- 
- Step 1** Choose **Definitions > Targets**, right-click and choose **New > SQL Server Database**.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Connection** tab and enter the required information, including:
- **Server**—Host name or IP address of the database server
  - **Default runtime user**—The default runtime user account that contains the credentials to connect to the target.
  - **Connection string**—The information needed to establish a connection to the database. To connect to a non-default instance, use the (server\instance) format. If your SQL server has a non-default port number, the correct format is to enter the server\instance, then a comma, then the port number. For example:  
`servername,portnumber`
- Step 4** Click the **Permission** tab to define the type of SQL commands that can run on the target.
- Step 5** Click **OK** to close the dialog box and complete the procedure.
- 

## Automating SQL Queries in the Microsoft SQL Server Database

### Executing a Microsoft SQL Server SQL Script

Use this activity to execute SQL script against a Microsoft SQL Server database.

- 
- Step 1** In the Process Editor Toolbox, choose the [**Microsoft SQL Server Database Activity**] property page, then click the **Execute SQL Server SQL Script** tab.
- Step 2** Specify the information that describes the script you want to run, including the script text for the selected database. For example:
- To truncate a sample table Employees:  
`TRUNCATE TABLE Employees`
  - To execute a stored procedure:  
`exec master..xp_logininfo`
-

## Database Adapter—Generic (OLEDB)

Use the Generic (OLEDB) Adapter to automate common SQL queries in a generic Microsoft Object Linking and Embedding Database (OLEDB) database.

The following table displays activities that are provided by the generic Microsoft OLEDB database adapter. For more information about using these activities, see [Getting Started Using the Generic \(Microsoft OLEDB\) Database Adapter, page 12-89.1](#)

| Activity                                  | Comments  |
|---|---|
| Bulk Insert into Generic Database         | Provides source table for data inserted into a generic database.<br>For more information, see <a href="#">Performing Bulk Database Insertions, page 12-100</a> .  |
| Generic Database Locks                    | Queries the locks performed in the generic database.<br>For more information, see <a href="#">Configuring Database Adapters, page 12-103</a> .  |
| Generic Database Table Space              | Queries the table space in a generic database.  |
| Delete from Generic Database              | Deletes data from the generic database using SQL command lines.<br>Enter the command text for the selected database. For example, this is a simple DELETE statement:<br><pre>DELETE from mytable where mycolumn = 'zzz'</pre><br>For more information, see <a href="#">Deleting Data from a Database, page 12-102</a> .   |
| Execute Generic Database SQL Script       | Use the Execute Generic Database SQL Script activity to execute SQL script against the specified database.<br><br>New support in release 3.0 allows retrieval of data tables from SAP HANA databases. The activity can retrieve the data table directly or through the mechanism HANA uses.<br><br>For more information, see <a href="#">Executing a Generic (OLEDB) SQL Script, page 12-90</a> . |
| Insert Into Generic Database              | Executes SQL command used to insert data into a generic database.<br>Enter the command text for the selected database. For example, this query inserts values into a table:<br><pre>INSERT into mytable (column1,column2) VALUES ('val1','val2')</pre>  |
| List Generic Database Running SQL Queries | Queries the running SQL queries performed.<br>Specify the information that describes the query results, including: <ul style="list-style-type: none"> <li>Row Limit—The appropriate number rows to limit for the query and returned data (default=50).</li> </ul>   |

| Activity                     | Comments  |
|------------------------------|---|
| Select from Generic Database | Queries data from generic database.<br>For more information, see <a href="#">Configuring Database Adapters, page 12-103</a> .   |
| Update Generic Database      | Updates column information in the generic database using SQL command lines.<br>Enter the command text for the selected database. For example, this query updates columns in a table:<br><br>Update mytable set column1 = 'newvalue' where column2 = 'zzz' |

## Getting Started Using the Generic (Microsoft OLEDB) Database Adapter

Use the following process to monitor and manage generic Microsoft OLEDB database instances.

- 
- Step 1** Create a generic Microsoft OLEDB database target (see [Defining a Generic Data Source \(OLEDB\) Target, page 12-89](#)).
- Step 2** Define a generic Microsoft OLEDB database activity.
- In the Process Editor Toolbox, choose **Database > Generic (OLEDB) > [Generic (OLEDB) Database Activity]**, then drag and drop the activity onto the Workflow pane.
  - Click the **General** tab and enter the required information.
  - Click the **[Activity-Specific]** tabs to define the properties specific to the activity.
  - Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- For details about a specific activity, see [Automating SQL Queries in the Generic \(Microsoft OLEDB\) Database, page 12-90](#).
- Step 3** View the activity results (see [Monitoring Operations, page 8-1](#)).
- 

## Defining a Generic Data Source (OLEDB) Target

Use the Generic Data Source (OLEDB) Database target to specify the connection information for a generic database.

- 
- Step 1** Choose **Definitions > Targets**, right-click and choose **New > Generic Data Source OLEDB Database**.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Connection** tab and enter the required information, including:
- Database Source—Database server name and database name
  - Database Owner—Principal owner of the database
  - Default runtime user—The default runtime user account that contains the credentials to connect to the target.
  - Connection string—Check the check box and enter the information needed to establish a connection to the database.

- Step 4** Click the **Configuration** tab to specify the character restrictions for a database identifier. A distinction is made between simple identifiers and special identifiers.
  - Step 5** Click the **Permission** tab to define the type of SQL commands that can run on the target.
  - Step 6** Click **OK** to close the dialog box and complete the procedure.
- 

## Automating SQL Queries in the Generic (Microsoft OLEDB) Database

### Executing a Generic (OLEDB) SQL Script

This script executes an SQL script against a Generic (OLEDB) database.

- Step 1** In the Process Editor Toolbox, choose the [**Generic (OLEDB) SQL Database Activity**] property page, then click the **Execute Generic Database SQL Script** tab.
  - Step 2** Specify the information that describes the script you want to run, including the SQL script text for the selected database. For example, to encrypt data using the ODBC ENCRYPT function:
 

```
create proc #tfn
as
select { fn USER() } , { fn CURRENT_DATE() },
{ fn CURRENT_TIME() }, { fn CURRENT_TIMESTAMP() }
go
exec #tfn
go
drop proc #tfn
```
  - Step 3** In the Columns panel, click **Add** to display the Table Column properties dialog box and define the table column and data type to be displayed.
  - Step 4** Enter the other criteria as necessary.
-



# Database Adapter—Oracle

Use the Oracle Database Adapter to automate common SQL queries in the Oracle database.

The following table displays activities that are provided by the Oracle database adapter. For more information about using these activities, see [Getting Started Using the Oracle Database Adapter, page 12-92](#).

| Activity                         | Comments  |
|----------------------------------|---|
| Bulk Insert Oracle               | Use this activity to enter the source table that will be used to insert data into an Oracle database.<br><br>For more information, see <a href="#">Performing Bulk Database Insertions, page 12-100</a> .   |
| Check Oracle Library Cache       | Use this activity to query the library cache for an Oracle database.  |
| Check Oracle Row Cache Hit Ratio | Use this activity to query the rows of the library cache shared by the hits and misses due to the overlap of when a large number of users are entering and exchanging data.   |
| Check Oracle Table Scan          | Use this activity to query the table activity on the Oracle database.   |
| Delete from Oracle               | Use this activity to delete data from the Oracle database using SQL command lines.<br><br>Enter the command text for the selected database. For example, this is a simple DELETE statement:<br><br><code>DELETE from mytable where mycolumn = 'zzz'</code>  |
| Display Oracle Free Memory       | Use this activity to query the available memory in the shared pool of the Oracle database.  |
| Execute Oracle SQL Script        | Use this activity to execute SQL script against the specified database.<br><br>For more information, see <a href="#">Defining an SQL Server Database Target, page 12-87</a> .   |
| Insert Into Oracle               | Use this activity to enter the SQL command that will be used to insert data into an Oracle database.<br><br>Enter the command text for the selected database. For example, this query inserts values into a table:<br><br><code>INSERT into mytable (column1,column2) VALUES ('val1','val2')</code> |
| List Oracle Heavy Queries        | Use this activity to query the statistics on SQL statements that are in memory, parsed, and ready for execution.<br><br>For more information, see <a href="#">Listing the Oracle Heavy Queries</a> .  |

| Activity                              | Comments  |
|---------------------------------------|---|
| List Oracle Running SQL Queries       | Use this activity to query the running SQL queries performed in the Oracle database.<br>Specify the information that describes the query results, including: <ul style="list-style-type: none"> <li>Row Limit—The appropriate number rows to limit for the query and returned data (default=50).</li> </ul> |
| Oracle Database Lock                  | Use this activity to query the locks performed in the Oracle database.<br>For more information, see <a href="#">Editing Locked Processes, page 5-40</a> .   |
| Oracle Table Space                    | Use this activity to query the amount of table space for an Oracle database.<br>For more information, see <a href="#">Viewing the Oracle Table Space</a> .  |
| Select from Oracle                    | Use this activity to query data from the Oracle database using SQL command lines.<br>For more information, see <a href="#">Configuring Database Adapters, page 12-103</a> .   |
| Select from Oracle Reporting Database | Use this activity to query data from a report database.<br>For more information, see <a href="#">Configuring Database Adapters, page 12-103</a> .   |
| Update Oracle                         | Use this activity to update column information in the Oracle database using SQL command lines.<br>Enter the command text for the selected database. For example, this query updates columns in a table:<br><br>Update mytable set column1 = 'newvalue' where column2 = 'zzz'                                |

## Getting Started Using the Oracle Database Adapter

Use the following process to monitor and manage Oracle database instances.

- 
- Step 1** Create an Oracle database target (see [Defining an Oracle Database Target, page 12-93](#)).
- Step 2** Define an Oracle database activity.
- In the Process Editor Toolbox, choose **Database > Oracle > [Oracle Database Activity]**, then drag and drop the activity onto the Workflow pane.
  - Click the **General** tab and enter the required information.
  - Click the **[Activity-Specific]** tabs to define the properties specific to the activity.
  - Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

For details about a specific activity, see [Automating Oracle Database Activities, page 12-93](#).

- Step 3** View the activity results (see [Monitoring Operations, page 8-1](#)).
-

## Defining an Oracle Database Target

Use the Oracle Database target to specify the connection information for an Oracle database. The connection properties allows customers to connect to a standard Oracle Database target or an Oracle Database target via RAC support. An Oracle client is required when connecting to a target requiring RAC support.

- 
- Step 1** Choose **Definitions > Targets**, right-click and choose **New > Oracle Database**.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Connection** tab and enter the required information.
- Under the **Connect to** radio buttons, indicate the database connection type for the target and determine whether to connect to a target requiring RAC support.
- **Hostname**—Select this radio button and enter the local network service name, hosting system, or IP address and other relevant source information for the database.
    - **Port Number**—Port number used to access Oracle database
    - **SID**—Oracle system ID used to identify the Oracle database
  - **RAC via TNS**—Select this radio button and enter the TNS connection string to indicate the RAC target connection.
 

Oracle 11g R2 64bit client is required for this connection and the *tnsnames.ora* is configured with the TNS RAC target connection. For example, to specify the RAC via TNS connection, enter:

TNS RAC target connection name
- Step 4** Click **Connection Credentials** and enter the necessary connection credentials to access the database, including:
- **Database Owner**—Principal owner of the database
  - **Default runtime user**—The default runtime user account that contains the credentials to connect to the target.
  - **Connection string**—The information needed to establish a connection to the database. For example, this establishes a direct connection:
 

```
Data Source=testserver;SID=oracle;port=1521;Unicode=true;
```
- Step 5** Click the **Permission** tab to define the type of SQL commands that can run on the target.
- Step 6** Click **OK** to close the dialog box and complete the procedure.
- 

## Automating Oracle Database Activities

### Modifying Oracle DB Instance Case-Sensitive Settings

Use the following script to change the case-sensitive settings in the Oracle database.

#### Before You Begin

You must have database administrative rights to execute this script.

- 
- Step 1** Run this script:
- ```
ALTER SYSTEM SET NLS_COMP=LINGUISTIC scope=spfile;
ALTER SYSTEM SET NLS_SORT=BINARY_CI scope=spfile;
```
- Step 2** Reset the database server.
- 

## Executing an Oracle SQL Script

This script executes an SQL script against the Oracle database.

- 
- Step 1** In the Process Editor Toolbox on the [Oracle SQL Database Activity] property page, click the **Execute Oracle Database SQL Script** tab.
- Step 2** Specify the information that describes the script you want to run, including the script text for the selected database. For example:
- ```
exec dbms_lock.sleep(5);
```
- Example 2
- ```
DECLARE
DEPARTMENT_ID NUMBER;
BEGIN
DEPARTMENT_ID := NULL;
SYSTEM.EMPTEST300 ( DEPARTMENT_ID );
DBMS_OUTPUT.PUT_LINE(DEPARTMENT_ID);
COMMIT;
END;
```

## Reviewing the SQL Script

Use the Info tab to review the SQL command used when executing the activity.

## Viewing the Oracle Table Space

Use this activity to query the total amount of space the Oracle database is currently consuming.

- 
- Step 1** In the Process Editor Toolbox, choose the [Database Activity] property page, then click the **Oracle Table Space** tab.
- Step 2** Specify the information that describes the data you want to insert, including:
- Autoextensible (only Oracle 9i and below)—Check this check box to indicate that the table space should automatically grow in size when necessary.



---

**Note** This option is not available for Oracle 10G and above.

---

## Listing the Oracle Heavy Queries

Use this activity to query the statistics on SQL statements that are in memory, parsed, and ready for execution.

**Step 1** In the Process Editor Toolbox, choose the **[Database Activity]** property page, then click the **List Oracle Heavy Queries** tab.

**Step 2** Specify the information that describes the data you want to insert, including:

- Use database target query timeout—Use the timeout value indicated in the database target as the length of time to wait before a command is complete.
- Override database target query timeout—Override the timeout value indicated in the database target.



---

**Note** Click the time unit link to change the timed out interval (such as seconds, minutes, hours, days)

---

- Row Limit—The appropriate number rows to query and return (default=30).
- Process list—Comma-delimited list of processes IDs.
- CPU Time—The CPU time (in microseconds) used by this cursor for parsing, executing, and fetching (default=60000000).
- Disk Reads—The default number of disk reads over all child cursors (default=1000).
- Buffer Gets—The default number of buffer gets over all child cursors (default=10000).
- Executions—The total number of executions, totaled over all the child cursors (default=100).
- Time—Enter the maximum amount of time that should be used to query the database (default=60 minutes).



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**Note** Click the time unit link to change the timed out interval.

---

## Database Adapter—JDBC

Use the Java Database Connectivity (JDBC) adapter to connect to a generic database via JDBC driver.

The following table displays activities that are provided by the JDBC adapter. For more information about using these activities, see [Getting Started Using the JDBC Adapter, page 12-96](#).

Activity Name	Description
Select From via JDBC	Queries data from the database. For more information, see <a href="#">Selecting Data from a Database, page 12-100</a> .
Update via JDBC	Updates column information in the database using SQL command lines. For more information, see <a href="#">Updating Data from a Database, page 12-101</a> .
Bulk Insert via JDBC	Provides source table for data inserted into a database. For more information, see <a href="#">Performing Bulk Database Insertions, page 12-100</a> .
Inset via JDBC	Executes SQL command used to insert data into a database. For more information, see <a href="#">Inserting Data from a Database, page 12-101</a> .
Execute SQL via JDBC	Use this activity to execute SQL script against the specified database.  For more information, see <a href="#">Executing SQL Script via JDBC, page 12-98</a> .
Delete via JDBC	Deletes data from a database using SQL command lines. For more information, see <a href="#">Deleting Data from a Database, page 12-102</a> .

## Getting Started Using the JDBC Adapter

Use the following process to monitor and manage JDBC adapter instances.

- 
- Step 1** Configure a JDBC Driver Type (see [Configuring the JDBC Driver Type, page 12-97](#)).
  - Step 2** Create a JDBC Server target (see [Defining a JDBC Server Target, page 12-97](#)).
  - Step 3** Define a JDBC command activity (see [Automating SQL Queries in the Database Via JDBC, page 12-98](#)).
  - Step 4** View the activity results (see [Monitoring Operations, page 8-1](#)).
- 

## Prerequisites

### Downloading the JDBC Driver Type (JAR File)

The JDBC adapter requires the JDBC driver to be downloaded from the database provider and the JAR file of the JDBC driver to be copied into the Cisco Process Orchestrator server before you begin the configuration.

On the Cisco Process Orchestrator install directory, copy the JAR file in the following location:

<Install drive>:\Program Files\Cisco\Process Orchestrator\Adapters\JdbcDrivers

For installation information, see the documentation provided for the applicable database platform.

#### Before You Begin

- Choose the right JAR file
- Setup the Classpath

## Configuring the JDBC Driver Type

**Step 1** Choose **Administration > Adapters**, and then double-click the JDBC Adapter.

**Step 2** On the JDBC Adapter Properties dialog box, click the **JDBC Drivers** tab.  
If you have JDBC drivers already configured, they are displayed in this tab.

**Step 3** To configure a new JDBC Driver type, click **New > JDBC Driver Type**.

**Step 4** Click the **General** tab and enter the required information.

**Step 5** Click the **JDBC Driver** tab and enter the required information, including:

- Jar file name—Select the available jar file name from the drop-down list.



**Note** For the jar file names to appear in the drop-down list, you must have installed the JDBC driver and copied the jar files in the Cisco Process Orchestrator server location.

- Driver class full name—Enter the name of JDBC driver classpath.
- Provider name—Enter the JDBC provider name.
- Default port—Enter the JDBC protocol port number.
- Connection URL—Check the check box and enter the information needed to establish a connection to the database. Refer to the following format as an example to enter the connection string using IPV4 and IPV6:

#### IPV4

```
jdbc:<DatabaseName>://[TargetServerName]:[TargetPost]/TargetDatabaseName
```

#### IPV6

```
jdbc:<DatabaseName>://address=(Protocol=tcip)[host=TargetServerName]:[port=TargetPos  
t]/TargetDatabaseName
```

**Step 6** Enter the information in the remaining tabs as necessary, then click OK to complete the process of configuring the JDBC driver type.

## Defining a JDBC Server Target

Use the Java Database Connectivity (JDBC) server target to specify the connection information for a generic database.

- 
- Step 1** On the Definitions workspace, right-click **Targets** and choose **New > JDBC Database** to open the JDBC Database Properties.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Connection** tab and enter the required information, including:
- **JDBC Driver**—Select the available JDBC driver from the drop-down list.  
If you have not yet configured the JDBC driver type, click **New**. For more information about configuring a new JDBC driver, see [Configuring the JDBC Driver Type, page 12-97](#).
  - **Server**—Host address or the IP address of the database server.
  - **Port Number**—Port number used to access the SQL database.
  - **Database Name**—Enter the name of the database.
  - **Default Runtime User**—Choose the user account that contains the credentials to connect to the database from the drop-down list.
  - **Connection String**—Check the check box and enter the information needed to establish a connection to the database. Refer to the following format as an example to enter the connection string using IPV4 and IPV6:
- IPV4**
- ```
jdbc:<DatabaseName>://[TargetServerName]:[TargetPost]/TargetDatabaseName
```
- IPV6**
- ```
jdbc:<DatabaseName>://address=(Protocol=tcp)[host=TargetServerName]:[port=TargetPost]/TargetDatabaseName
```
- **Default Timeout For Activities**—Enter the number of seconds before the activity times out. The default timeout period is 120 seconds.
- Step 4** Click the **Configuration** tab to specify the character restrictions for a database identifier. A distinction is made between simple identifiers and special identifiers.
- Step 5** Click the **Permission** tab to define the type of SQL commands that can run on the target.
- Step 6** Click **OK** to close the dialog box and complete the procedure.
- 

## Automating SQL Queries in the Database Via JDBC

### Executing SQL Script via JDBC

This script executes an SQL script against a Generic (JDBC) database.

- 
- Step 1** In the Process Editor Toolbox, choose the **[Execute SQL via JDBC]** property page, then click the **SQL** tab.
- Step 2** Specify the information that describes the script you want to run, including the SQL script text for the selected database.
- Step 3** In the Columns panel, click **Add** to display the Table Column properties dialog box and define the table column and data type to be displayed.



**Step 4** Enter the other criteria as necessary.

---

## Errors

You may receive error messages at any time. Please go back and review your query setup to troubleshoot.

# Database Adapter—Common Database Tasks

The following sections describe some of the tasks that are common to most or all supported databases.

## Performing Bulk Database Insertions

- 
- Step 1** In the Process Editor Toolbox, choose the **[Database Activity]** property page, then click the **Bulk Insert into [Database]** tab.
- Step 2** Specify the information that describes the data you want to insert, including:
- Data source—Source table variable. If necessary, click the **Reference** tool to locate a global table variable.
  - Target table name—The table name targeted in the database.
  - Populate columns from data source—List the columns from the data source directly into the Columns section.
  - Column Map List—Display the columns generated by the data source.
  - Use database target query timeout—Use the timeout value indicated in the database target as the length of time to wait before a command is complete.
  - Override database target query timeout—Select this button and enter the appropriate value to use to override the timeout value indicated in the database target.
- 

## Selecting Data from a Database

- 
- Step 1** In the Process Editor Toolbox, choose the **[Database Activity]** property page, then click the **Select From [Database]** tab.
- Step 2** Specify the information that describes the data you want to select, including:
- SQL command text—The command text for the selected database. Verify that the SQL command is entered correctly. The data in the database is case-sensitive.  
For example, this is a sample query that selects specific columns from a table:  

```
SELECT column1,column2 from mytable
```

  
This is a sample query that selects the country code and the name of the country:  

```
SELECT code, name from country
```
  - Populate columns from query—List the columns from the SQL query directly into the Columns section.
  - Columns—Displays the columns generated by the SQL query.
  - Return all columns of Select statement—Return all columns of a Select statement, regardless of whether a column type is defined in the activity.  
The returned data will be stored in a data table and will be available for use in an automation summary.
  - Row number per page—The number of rows to display per page (default=100).

- Maximum number of rows—The maximum number of rows to display (default=200).

## Updating Data from a Database

- Step 1** In the Process Editor Toolbox, choose the **[Database Activity]** property page, then click the **Update [Database]** tab.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **SQL** tab to specify the SQL command and target query information.

Activity	Comments
SQL command text	Enter the command text for the selected database. For example, this query updates columns in a table: Update mytable set column1 = 'newvalue' where column2 = 'zzz'
Use database target query timeout	Select this radio button to use the timeout value indicated in the database target as the length of time to wait before a command is complete.
Override database target query timeout	Select this radio button and in the text field enter the appropriate value to use to override the timeout value indicated in the database target. <b>Note</b> Click the time unit link to change the timed out interval (e.g., seconds, minutes, hours, days)

- Step 4** Complete the appropriate information in the following tabs, as necessary, and then click the **Save** tool to complete the activity definition.
- Target—Specify whether the process target should be used or overridden with a different target.
  - Credentials—Specify the runtime user whose credentials should be used for process execution.
  - Knowledge Base—Choose the appropriate knowledge base article to associate with the process.
  - Result Handlers—Click the appropriate buttons to manage the condition branches on the workflow.

## Inserting Data from a Database

- Step 1** In the Process Editor Toolbox, choose the **[Database Activity]** property page, then click the **Insert [Database]** tab.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **SQL** tab to specify the SQL command and target query information.

Activity	Comments
SQL command text	Enter the command text for the selected database. For example, this query inserts values into a table: into mytable (column1,column2) VALUES ('val1','val2')
Use database target query timeout	Select this radio button to use the timeout value indicated in the database target as the length of time to wait before a command is complete.
Override database target query timeout	Select this radio button and in the text field enter the appropriate value to use to override the timeout value indicated in the database target.  <b>Note</b> Click the time unit link to change the timed out interval (e.g., seconds, minutes, hours, days)

**Step 4** Complete the appropriate information in the following tabs, as necessary, and then click the **Save** tool to complete the activity definition.

- **Target**—Specify whether the process target should be used or overridden with a different target.
- **Credentials**—Specify the runtime user whose credentials should be used for process execution.
- **Knowledge Base**—Choose the appropriate knowledge base article to associate with the process.
- **Result Handlers**—Click the appropriate buttons to manage the condition branches on the workflow.

## Deleting Data from a Database

**Step 1** In the Process Editor Toolbox, choose the [**Database Activity**] property page, then click the **Delete From [Database]** tab.

**Step 2** Click the **General** tab and enter the appropriate information.

**Step 3** Click the **SQL** tab to specify the SQL command and target query information

Activity	Comments
SQL command text	Enter the command text for the selected database.  Examples: Sample query to delete a column Simple DELETE statement DELETE from mytable where mycolumn = 'zzz'
Use database target query timeout	Select this radio button to use the timeout value indicated in the database target as the length of time to wait before a command is complete.
Override database target query timeout	Select this radio button and in the text field enter the appropriate value to use to override the timeout value indicated in the database target.  <b>Note</b> Click the time unit link to change the timed out interval (e.g., seconds, minutes, hours, days)

- Step 4** Complete the appropriate information in the following tabs, as necessary, and then click the **Save** tool to complete the activity definition.
- **Target**—Specify whether the process target should be used or overridden with a different target.
  - **Credentials**—Specify the runtime user whose credentials should be used for process execution.
  - **Knowledge Base**—Choose the appropriate knowledge base article to associate with the process.
  - **Result Handlers**—Click the appropriate buttons to manage the condition branches on the workflow.
- 

## Configuring Database Adapters

The database adapters provide the activities to access database objects and execute SQL queries in Process Orchestrator.

---

- Step 1** Choose **Administration > Adapters**, right-click **[Database Adapter]** and choose **Properties**.
- Step 2** On the properties dialog box, click the **SQL** tab.
- Step 3** Enter:
- The maximum number of rows to return in a Select SQL query (default=10000).
  - The termination character string with default values. Termination characters can be configured; common termination characters are forward slash [ / ] and the semi-colon [ ; ].
- 

## Adding a Column to an SQL Command Line

Use the Column Definitions dialog box to map the properties for a source column or modify the name of an existing column.

---

- Step 1** On the SQL tab, under Column List, click **Add**.
- Step 2** In the Column Definition dialog box, enter the column properties.
- 

## Adding a Column to Table Source

Use the Column map dialog box to add a column to the queried table source or modify the name of an existing column.

---

- Step 1** On the SQL tab, under Column Map List, click **Add**.
- Step 2** In the Column Map dialog box, enter the column properties.
-

# Email Adapter

The Email adapter provides the ability to execute email objects and send email messages to a specified user.

Users can define an email target to run a process or activity against an Internet Message Access Protocol (IMAP) email server or a Post Office Protocol (POP3) email server:

- The IMAP email server allows an email client, such as Microsoft Outlook, to retrieve email on a remote mail server. The POP3 email server allows an email client to retrieve e-mail from a remote server over a TCP/IP connection.
- An Email (IMAP) target must be connected to an Exchange 2007 Server with Service Pack 3. An authentication failure will occur when attempting to create an Email (IMAP) target against an Exchange 2007 Server that does not have service pack 3.

The following table provides a listing of the targets that are associated with the adapter. For more information about using these activities, see [Getting Started Using the Email Adapter, page 12-104](#).

Field	Description
Email Account (IMAP)	Specify the connection information to the IMAP email server See <a href="#">Defining the Email Account IMAP Target, page 12-105</a>
Email Account (POP3)	Specify the connection information to the POP3 email server See <a href="#">Defining the Email Account POP3 Target, page 12-106</a>

### Related Topics

[Getting Started Using the Email Adapter, page 12-104](#)

## Getting Started Using the Email Adapter

Use the following process to monitor and manage email instances.

- 
- Step 1** Create an email target (see [Defining an Email Account Target, page 12-105](#)).
  - Step 2** Define the fault criteria you want to monitor (see [Defining Email Triggers, page 12-107](#)).
  - Step 3** Define an email command activity (see [Defining the Email Activity, page 12-109](#)).
  - Step 4** View the activity results (see [Monitoring Operations, page 8-1](#)).
- 

## Configuring Default Email Settings

The Email adapter allows the user to configure default email settings to be used in processes and activities. Use the Mail tab to specify the default email server, port, and sender to be used in email activities. The values in the fields on this page can be overridden by each activity configuration.

- 
- Step 1** Choose **Administration > Adapters**, highlight **Email Adapter**, right-click and choose **Properties**.
  - Step 2** Click the **Mail** tab to specify the following information:

Field	Description
Default SMTP server	Name of the email server to be used as the default server for sending email
Default SMTP port	Port number for the default SMTP port (typically 25)
Default sender	Email address of the person designated as the default sender in email activities

**Step 3** Click **OK** to close the dialog box.

## Defining an Email Account Target

You can define the following types of email account targets:

- [Defining the Email Account IMAP Target, page 12-105](#)
- [Defining the Email Account POP3 Target, page 12-106](#)

## Defining the Email Account IMAP Target

Use the following steps to define an Email Account (IMAP) target. This target will allow a process or activity to execute against the an email account on an IMAP mail server.

An Email (IMAP) target must be connected to an Exchange 2007 Server with Service Pack 3. An authentication failure will occur when attempting to create an Email (IMAP) target against an Exchange 2007 Server that does not have service pack 3.

**Step 1** Choose **Definitions > Targets**, right-click and choose **New > Email Account (IMAP)**.

**Step 2** Click the **General** tab and enter the appropriate information.

**Step 3** Click the **Connection** tab to specify the following information:

Field	Description
Email server	Name of the email server that relays email to the mailbox
Protocol	Display-only field of the type of email protocol being used by the email server (IMAP, POP3)
Email user	Select the default runtime user account used to connect to the target. Select the default runtime user from the drop-down list.
Port Override	Check the check box and enter the port number in the adjacent field to override the default port used by the protocol if the port is being used by another application.
Enable TLS authentication	<i>Email Account (IMAP)</i> and <i>Email Account (POP3)</i> targets support TLS protocol and do not support SSL connection. TLS protocol is more secure than SSL. The Microsoft Exchange Server setup is plain and SSL connection running on port 143 while TLS connection running on port 993. If you have an email server on a Linux platform and configure the email server running plain on port 143 while both SSL and TLS connections running on port 99r.

Field	Description
Enable SSL	If checked, the connection to the Email server will run on the SSL port. <b>Note</b> You might also need to override the default IMAP port (143) to the SSL port.
Enable server push notifications	If checked, the email server will push the emails to the recipient's email address.
Polling Interval	If there is an Email trigger running against this target, the Email adapter will check the email account on the email server using this polling interval. Since polling may take some time, the polling interval is defined as the time period between the start point of next polling and the end point of the previous polling. The default value is 10 seconds. To prevent busy polling, the minimum polling interval is set to 5 seconds.

- Step 4** Click the **Advanced** tab to specify the reconnection settings to the appropriate email server (IMAP, POP3) after a connection failure.

Field	Description
Reconnect to email server on connection failure	Check this check box to enable the reconnection settings for the target.
Reconnect every ____seconds	Select this option and in the text field, enter the number of seconds the target should take to reconnect to the server.
Reconnect up to	In the text field, enter the maximum number of times the target should attempt to reconnect to the server.
Attempt to reconnect at the following intervals (in seconds)	Select this option and in the text field, enter the number of seconds the target should wait before attempting to reconnect to the server.

- Step 5** Complete the appropriate information in the remaining tabs as necessary, then click **OK**.

## Defining the Email Account POP3 Target

Use the following steps to define an Email Account (POP3) target. This target will allow a process or activity to execute against the an email account on an POP3 mail server.

- Step 1** Choose **Definitions > Targets**, right-click and choose **New > Email Account (POP3)**.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Connection** tab to specify the following information:

Field	Description
Email server	Name of the email server that relays email to the mailbox
Protocol	Display-only field of the type of email protocol being used by the email server (IMAP, POP3)



Field	Description
Email user	Select the default runtime user account used to connect to the target. Select the default runtime user from the drop-down list.  To view the properties for the selected runtime user, click the <b>Properties</b> tool.  To create a new runtime user, click <b>New &gt; Runtime User</b> to create a new Runtime User account.
Port Override	Check the check box and enter the port number in the adjacent field to override the default port used by the protocol if the port is being used by another application.

- Step 4** Click the **Advanced** tab to specify the reconnection settings to the appropriate email server (IMAP, POP3) after a connection failure.

Field	Description
Reconnect to email server on connection failure	Check this check box to enable the reconnection settings for the target.
Reconnect every ___ seconds	Select this option and in the text field, enter the number of seconds the target should take to reconnect to the server.
Reconnect up to	In the text field, enter the maximum number of times the target should attempt to reconnect to the server.
Attempt to reconnect at the following intervals (in seconds)	Select this option and in the text field, enter the number of seconds the target should wait before attempting to reconnect to the server.

- Step 5** Complete the appropriate information in the remaining tabs, as necessary, and then click **OK**.

## Defining Email Triggers

### Defining an Email Event (Simple) Trigger

Use the Email Event (Simple) trigger to specify the basic criteria for the mail server to be monitored and the email conditions that will trigger the process.

- Step 1** On the Triggers tab, click **New > Email Event (Simple)**.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Email Event (Simple)** tab and enter the appropriate information.

**Step 4** Modify the items to indicate what action is to be taken with the email message.

Field	Description
Action	Select the option to specify the action to be taken after the criteria has been met on the Exchange server. <ul style="list-style-type: none"> <li>• Mark message read—The message will be marked as read. This option is not available for POP3 email systems.</li> <li>• Move message to folder—The message will be moved to a designated folder. Do not move email to a folder to be deleted, such as specifying the Deleted Items folder in Microsoft Outlook. Use the Delete message option to delete email.</li> <li>• Delete message—The email will be deleted. This is the only option available for a POP3 type of email connection.</li> </ul>
Target folder	This field is enabled after the <i>Move message to folder</i> option is selected. Enter the name of the folder where the message is to be moved. If the folder is a subfolder, then enter the file path for the folder location (for example, project/issues/connections).
Return message body as output	Select this option to indicate that the body of the email message should be included in the output.

**Step 5** Enter the information in the remaining tabs as necessary, then click **OK** to complete the trigger definition.

## Adding Email Criteria for a Trigger

When defining a trigger on an email event, you can specify the criteria on which the email event should be triggered when specific criteria is matched.

The Email Criteria dialog box is launched from the Add button on the Email Criteria tab on the Email Event trigger. Use the Email Criteria dialog box to specify the matching criteria for the email event.

**Step 1** Click the **Email Criteria** tab, then click **Add**.

**Step 2** Click the Email Criteria dialog box and specify the following information:

Field	Description
Scan for text	Specifies the text that should be matched in the email
In	Indicates what section in the email should be searched: <ul style="list-style-type: none"> <li>• Sender—The name of the sender of the email will be scanned for the specified text.</li> <li>• Subject—The subject line of the email will be scanned for the specified text.</li> <li>• Message—The message body of the email will be scanned for the specified text.</li> </ul>
Case sensitive	Indicates whether the text match should be case-sensitive (Yes, No)

- Step 3** Click **OK** to add the criteria to the Email Criteria tab.

## Defining the Email Activity

Use the Email activity to specify the information required for sending an email as part of the process.

- Step 1** In the Process Editor Toolbox, choose **Email Activities**, select the **Email** activity, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Email** tab to specify the properties used to generate the email.

Field	Description
To	Enter the email address of the primary recipient(s) of the email. Use commas to separate multiple email addresses.
Cc	Enter the email address of the recipient(s) who are to be carbon-copied on the email. Use commas to separate multiple email addresses.
Bcc	Enter the email address of the recipient(s) who are to blind carbon-copied on the email. Use commas to separate multiple email addresses.
Subject	Enter the subject heading of the email.
Message	Enter the content of the message in the body of the email. HTML code can be used for formatting if the email is saved in HTML format.
Save as HTML	Check this check box to send the email contents as an HTML file. For example, if the content is <code>&lt;B&gt; Cisco Process Orchestrator &lt;/B&gt;</code> , then the contents in the email will be shown in bold text.

- Step 4** Click the **Attachments** tab to specify the file paths for the attachments to be sent as part of the email.

Field	Description
User with access to attachments	From the drop-down list, select the runtime user account to attach files to the email.
Attachment Paths	Displays the list of file paths for attachments

- Step 5** On the Target tab, click the browse button to display the Select Target dialog box.
- Step 6** Click New > Email Account (POP3) or (IMAP) to display the Email Account Wizard.
- Step 7** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

# Microsoft Active Directory Adapter

Cisco Process Orchestrator is designed to enhance the management and administration of several objects in the Microsoft Active Directory. The Microsoft Active Directory Adapter provides the ability to automate common administrative tasks, such as adding users and groups, managing printers, and setting permissions for network resources.

The following Microsoft Active Directory activities are available in the product. For more information about using these activities, see [Getting Started Using the Microsoft Active Directory Adapter, page 12-110](#).

Activity Name	Description
Create User Account	Create a new active directory user account. See <a href="#">Defining a Create User Account Activity, page 12-111</a>
NetDiag	Launch tests using the Network Connectivity Tester tool. See <a href="#">Defining the NetDiag Activity, page 12-111</a>
Resolve Email Address	Resolve an email address conflict for a user or group. See <a href="#">Defining the Resolve Email Address Activity, page 12-113</a>
Resolve Identity	Find the user or group based on the identity or distinguished name of the Active Directory object. See <a href="#">Defining the Resolve Identity Activity, page 12-113</a>
Set User Password	Identify and set the password for a user. See <a href="#">Defining the Set User Password Activity, page 12-113</a>

## Getting Started Using the Microsoft Active Directory Adapter

Use the following process to monitor and manage Microsoft Active Directory adapter instances.

- 
- Step 1** Create an Active Directory Domain target (see [Creating an Active Directory Domain Target, page 12-110](#)).
  - Step 2** Define an Active Directory Domain activity (see [Automating Active Directory Domain Activities, page 12-111](#)).
  - Step 3** View the activity results (see [Monitoring Operations, page 8-1](#)).
- 

## Creating an Active Directory Domain Target

- 
- Step 1** Choose **Definitions > Targets**, right-click and choose **New > Active Directory Domain**.
  - Step 2** Click the **General** tab and enter the appropriate information.

- Step 3** Click the **Domain** tab and enter the domain name and runtime user account that contains the credentials to connect to the target, then click **OK**.
- 

## Automating Active Directory Domain Activities

### Defining a Create User Account Activity

#### Before You Begin

To launch this activity, the runtime user must have local administrative rights to the target.

- 
- Step 1** On the Toolbox pane, select the **Microsoft Active Directory > Create User Account** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **User** tab and enter the required information, including:
- Canonical Path—Full or partial canonical path of the Organizational Unit object excluding the domain name. For example:  
mydomain.local/LocationOU/DeptOU or LocationOU/DeptOU
  - Object class—The type of location where new user information will reside
    - Container—Group of objects held within a domain
    - Organizational Unit—Group of containers of objects held within a domain
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

### Defining the NetDiag Activity

Use the NetDiag activity to launch tests using the Network Connectivity Tester tool (Netdiag.exe) to help isolate networking and connectivity problems to determine the state of your network client.

The Network Connectivity Tester tool (Netdiag.exe) is installed as part of the deployment and resource kits and may not be installed on all targets. If you execute the activity against a target (Windows or Exchange) that does not have the tool installed, then the following message will be displayed:

*Netdiag.exe is not recognized as an internal or external command, operable program or batch file.*

- 
- Step 1** In the Process Editor Toolbox, choose **Microsoft Active Directory > NetDiag**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Targets** tab to specify whether the process target should be used for activity execution or overridden with a different target.
- Step 4** Click the **Inputs** tab to continue and specify the following information:
- NetDiag Switches—Network Connectivity diagnostic switch options. The default switches is /v.

- Step 5** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

## NetDiag Switches

Use the following switches to generate the Network Connectivity Tester automation summary.

- Usage: `z:\Tools\Bin\NETdiag.exe [/Options]>`

Switch	Description
/q	Quiet output (errors only)
/v	Verbose output
/l	Log output to NetDiag.log
/debug	Even more verbose
/d:<DomainName>	Find a DC in the specified domain
/fix	Fix trivial problems
/DcAccountEnum	Enumerate DC machine accounts
/skip:<TestName>	Skip the named test. Click this link to display valid tests for this switch.
/test:<test name>	Tests only this test. Non-skipable tests will still be run. Click this link to display valid tests for this switch.
Autonet	Autonet address Test
Bindings	Bindings Test
Browser	Redir and Browser Test
DcList	DC list Test
DefGw	Default gateway Test
DNS	DNS Test
DsGetDc	DC discovery Test
IpConfig	IP config Test
IpLoopBk	IP loopback ping Test
Kerberos	Kerberos Test
Ldap	LDAP Test
Member	Domain membership Test
Modem	Modem diagnostics Test
NbtNm	NetBT name Test
Ndis	Netcard queries Test
NetBTTransports	NetBT transports Test
Netstat	Netstat information Test
Netware	Netware Test
IPSec	IP Security Test
IPX	IPX Test

Switch	Description
Route	Routing table Test
Trust	Trust relationship Test
WAN	WAN configuration Test
WINS	WINS service Test
Winsock	Winsock Test

## Defining the Resolve Email Address Activity

Use the Resolve Email Address activity to resolve an email address conflict for a user or group.

- 
- Step 1** In the Process Editor Toolbox, choose **Microsoft Active Directory > Resolve Email Address**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **User or Group to Resolve** tab to continue and specify the following information:
- Identity—The user name or group to search for the email address
  - Distinguished Name—The Active Directory distinguished name for a user object
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the Resolve Identity Activity

Use the Resolve Identity activity to define the properties that find the user or group based on the identity or distinguished name of the Active Directory object.

- 
- Step 1** In the Process Editor Toolbox, choose **Microsoft Active Directory > Resolve Identity** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **User Identity** tab to continue and specify the following information:
- User Name—Specifies the user or distinguished name of the user or group
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the Set User Password Activity

- 
- Step 1** In the Process Editor Toolbox, choose **Microsoft Active Directory > Set User Password** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **User** tab and enter the user LDAP path and password.

- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## AD Instance Properties

### Create User Account Instance Properties

The Create User Account page displays the properties used to create a new active directory user.

**Note**

If the activity fails, verify that the runtime has local administrative rights to the Process Orchestrator server. If the runtime user does not have these rights, the activity will fail and display a message that the process has encountered a failed node.

---

- User name—User name assigned to the user
- Last Name—Last name of the user
- First Name—First name of the user
- Distinguished Name—Active Directory distinguished name for a user

### Resolve Email Address Instance Properties

The Resolve Email Address display-only page displays the properties used to find for a user or group.

- Identity—User name or group to search for the email address
- Distinguished Name—Active Directory distinguished name for a user object

### Resolve Email Address Results

The Email Address display-only page displays the generated results of the email addresses associated with the user or group.

- Email Address—Email address of the user or group
- Proxy Address—Proxy address associated with the email address on the exchange server

## User Properties

The User page displays the properties used to identify and set the password for user.

**Note**

If the activity fails, verify that the runtime has local administrative rights to the Process Orchestrator server. If the runtime user does not have these rights, the activity will fail and display a message that the process has encountered a failed node.

---

- User LDAP Path—Complete LDAP Path for the user
- Password—New user password



## User Identity Properties

The User Identity tab displays the defined properties that find the email addresses for the user or group based on the identity or distinguished name of the Active Directory object.

## User or Group to Decide Instance Properties

The User or Group to Decide tab displays the properties defined that find the email addresses for the user or group based on the identity or distinguished name of the Active Directory object.

- Identity—The value of the user identity
- Distinguished Name—The distinguished name of the user or group

# Microsoft System Center Operations Manager (SCOM) Adapter

The Microsoft System Center Operations Manager (SCOM) 2007 is designed to monitor the entire data center environment. The Microsoft System Center Operations Manager 2007 adapter provides the ability to detect a wide variety of problems and to automatically take corrective actions or alert administrators when necessary. The data that is collected, stored, and analyzed automatically can help administrators determine which servers have additional capacity and which servers might soon suffer a stress-induced heart attack.

The following SCOM activities are available in the product. For more information about using these activities, see [Getting Started Using the SCOM Adapter, page 12-116](#).

Activity	Description
Collect SCOM Performance Counter	Use the Collect SCOM Performance Counter activity to specify information about your SCOM environment to obtain performance data.  To define the property page for this activity, see <a href="#">Defining the Collect SCOM Performance Counter Activity, page 12-117</a> .
Update SCOM Alert	Use the Update SCOM Alert activity to specify the alert ID in SCOM that is to be used to update/resolve and any comments to add to the alert history.  To define the property page for this activity, see <a href="#">Defining the Update SCOM Alert Activity, page 12-118</a> .

## Getting Started Using the SCOM Adapter

Use the following process to monitor and manage SCOM adapter instances.

- 
- Step 1** Create an SCOM target (see [Defining a SCOM Management Server Target, page 12-116](#)).
  - Step 2** Define an SCOM command activity (see [Automating SCOM Activities, page 12-117](#)).
  - Step 3** View the activity results (see [Monitoring Operations, page 8-1](#)).
- 

## Defining a SCOM Management Server Target

Use the SCOM Management Server target to specify information about the SCOM management server. When an SCOM management server is configured as a target, you can run activities against the target and subscribe to SCOM alerts.

### Before You Begin

The Microsoft System Center Operations Manager must be installed in your environment and you must have the credentials to connect to the SCOM management server to use this activity in a process.

- 
- Step 1** Choose **Definitions > Targets**, right-click and choose **New > SCOM Management Server**.
  - Step 2** Click the **General** tab and enter the appropriate information.
  - Step 3** Click the **Connection** tab to specify the following information:

- Management server name—The name of the SCOM management server. This is the name that is configured in SCOM.
- Default runtime user—The default runtime user account that contains the credentials to connect to the target. Select the default runtime user from the drop-down list.

**Step 4** Click **OK** to close the dialog box and complete the procedure.

---

## Automating SCOM Activities

### Defining the Collect SCOM Performance Counter Activity

SCOM creates a performance database that can track resource usage statistics for all of the systems in the environment. Use the Collect SCOM Performance Counter activity to specify information about your SCOM environment to obtain performance data.

#### Before You Begin

The Microsoft System Center Operations Manager must be installed in your environment and have the credentials to connect to the SCOM management server to use this activity in a process.

---

- Step 1** In the Process Editor Toolbox, choose **Microsoft SCOM > Collect SCOM Performance Counter** and drag and drop the activity onto the Workflow pane
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Counter** tab to specify the appropriate information about your SCOM environment to obtain performance data, including:
- Object name—Name of the object that contains the performance counter
  - Counter name—Name of the performance counter
  - Instance name—Name of the instance from which to collect the performance data
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

### Viewing Results

Click the **Values** display-only tab to view the SCOM environment information that made up the performance data.

- Object name—Name of the object that contains the performance counter
- Counter name—Name of the performance counter
- Instance name—Name of the instance from which to collect the performance data

## Defining the Update SCOM Alert Activity

Use the Update SCOM Alert activity to specify the alert ID in SCOM that is to be used to update/resolve and any comments to add to the alert history.

### Before You Begin

The Microsoft System Center Operations Manager must be installed in your environment and you must have the credentials to connect to the SCOM management server to use this activity in a process.

- 
- Step 1** In the Process Editor Toolbox, choose **Microsoft SCOM > Update SCOM Alert**, then drag and drop the activity onto the Workflow pane.
  - Step 2** Click the **General** tab and enter the appropriate information.
  - Step 3** Click the **SCOM alert** tab and specify the alert ID information, including:
    - Alert ID—The ID in SCOM that is assigned to the alert that you want to resolve or update.
    - Alert comment—Enter the comments about the alert that should be displayed on the alert history property page in SCOM.
    - Resolve the SCOM alert—Set the alert status in SCOM to *Resolved*.
  - Step 4** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Viewing Results

Click the instance display-only tab to view the specified alert ID information.

- Alert ID—ID in SCOM that is assigned to the alert
- Alert comment—comments about the alert that should be displayed on the alert history property page in SCOM
- Resolve the SCOM alert—the alert status in SCOM is set to *Resolved*.

## Searching for SCOM Performance Monitoring Options

If you do not have the appropriate information to define the activity on the Collect SCOM Performance Counter activity, click **Browse**. This option launches the Select SCOM Performance Counter dialog box, which allows you to search for the appropriate information to populate the fields on the activity property page.

To search for the monitoring information, enter the credentials for connecting to the SCOM management server to display the performance counter options.

- 
- Step 1** On the Collect SCOM Performance Counter property page, click **Browse**.
  - Step 2** Under SCOM Connection, specify the appropriate information to connect to the SCOM Management Server.
  - Step 3** Click **Connect** to connect to the server.

The drop-down lists populate with options. These drop-down lists remain empty until connected to the SCOM management server.
  - Step 4** Select the appropriate options in the drop-down lists, including:

- Monitor class name—Name of the monitor class in SCOM to which the monitor object belongs.
- Monitor object full name—The full name of the monitor object in SCOM. This is typically the computer name of the machine being monitored.
- Object name—The name of the object in SCOM from which you want to obtain performance data.
- Counter name—The name of the performance counter in SCOM.
- Instance name—The name of the instance in SCOM from which to obtain data.

Click **Browse** to launch the Select SCOM Performance Counter dialog box and connect to the SCOM management server. For additional information about connecting to the SCOM management server, see [Searching for SCOM Performance Monitoring Options](#).

- Performance values generated within the last—Time frame (in seconds, minutes, or hours) of collected performance data to be gathered by Process Orchestrator. Enter a numeric value in the text box or select the value using the scroll buttons.
- Only return the latest performance counter—Check this check box to collect only the latest performance counter.
- Fail if no values are found—Check this check box to fail the activity if no values match.

**Step 5** Click **OK**. The fields on the Collect SCOM Performance Counter property page populates with the selected information.

## Searching for an Alert Source

Use the following steps to search for the appropriate alert source details for the SCOM alert.

**Step 1** On the SCOM Alert Properties dialog, click **Browse** to launch the Select Monitor Class and Object dialog box to enter the credentials for connecting to the SCOM management server.

**Step 2** Choose **SCOM Connection** and specify the appropriate information to connect to the SCOM Management Server.

**Step 3** Click **Connect** to connect to the server.

The Alert source class and Alert source name drop-down lists populate with options after the connection to the SCOM Management server is d.

**Step 4** Select the appropriate Alert source options, including:

- Alert source class—The name of the monitor class in SCOM to which the monitor object belongs.
- Alert source name—The fully-qualified name of the monitor object.
- Browse—To search for the appropriate alert source, click this button to launch the Select Monitor Class and Object dialog box to connect to the SCOM management server and select the monitor class name and monitor class object.
- Alert severity level—The severity level of the alert in SCOM that must be matched before the process executes. Check one or more of the following check boxes to indicate the severity level of alerts that are to be matched:
  - Information
  - Critical
  - Warning

- Alert name—The name of the alert in SCOM that must be matched before the process executes.
- Description—A description of the alert in SCOM that must be matched before the process executes.

**Step 5** Click **OK**. The fields on the SCOM Alert property page populate with the selected information.

---

# SNMP Adapter

Cisco Process Orchestrator is designed to enhance the management and administration of Simple Network Management Protocol (SNMP), which is used in network management systems to monitor network devices for conditions that require administrative attention. The SNMP adapter allows a level of support for different platforms and applications to send and receive data through SNMP.

The SNMP activities gather and publish data that pass through the SNMP agents. The agents return information contained in a MIB (Management Information Base), which is a data structure that defines what is obtainable from the device and what can be controlled (for example, turned off or on).

There are two different types of SNMP targets:

- When Process Orchestrator is acting as a manager, it uses an **SNMP Device (Agent)** target to communicate with network devices and all of the other endpoints out in the environment, sending and receiving data from those devices.
- When Process Orchestrator is acting as an SNMP endpoint, it uses an **SNMP Server (Manager)** target to send traps to an event manager, typically to publish Process Orchestrator tasks (such as alerts or incidents) to report automation health concerns.

Each activity and trigger only works against a certain type of target. For example, the SNMP trap received trigger requires an SNMP Device (Agent) target.

The following table displays activities that are provided by the SNMP adapter. For more information about using these activities, see [Getting Started Using the SNMP Adapter, page 12-122](#).

Activity	Comments
Correlate SNMP Trap Received	Detect incoming traps that match the specified criteria. See <a href="#">Defining the Correlate SNMP Trap Received Activity, page 12-126</a>
Generate SNMP Trap	Publish a generic trap to the specified SNMP Manager target or target group. See <a href="#">Defining the Generate SNMP Trap Activity, page 12-127</a>
Generate SNMP Trap from Task	Publish Cisco Process Orchestrator process alerts and incident traps to the specified SNMP Manager target or target group. See <a href="#">Defining the Generate SNMP Trap from Task Activity, page 12-127</a>
SNMP Get Request	Request a set of variable values from the SNMP agents. SNMP agents are hardware and/or software processes reporting activity in a network device. Data passes through SNMP agents and the requested information is returned in a MIB. See <a href="#">Defining the SNMP Get Request Activity, page 12-127</a>
SNMP Set Request	Modify the variables used to request the information that is returned in a MIB from the SNMP agent. See <a href="#">Defining the SNMP Set Request Activity, page 12-128</a>

## Related Topics

[Getting Started Using the SNMP Adapter, page 12-122](#)

## Getting Started Using the SNMP Adapter

Use the following process to monitor and manage SNMP adapter instances.

- 
- Step 1** Create the SNMP targets (see [Defining an SNMP Device \(Agent\) Target](#), page 12-123 and [Defining an SNMP Device \(Manager\) Target](#), page 12-124).
  - Step 2** Specify the credentials for an SNMP runtime user (see [Defining a SNMP Credentials Account](#), page 12-124).
  - Step 3** Define an SNMP message event trigger (see [Defining a SNMP Trap Received Trigger](#), page 12-125).
  - Step 4** Define an SNMP command activity (see [Automating SNMP Device \(Agent\) Command Activities](#), page 12-126).
  - Step 5** View the activity results (see [Monitoring Operations](#), page 8-1).
- 

## Configuring the SNMP Adapter

Use the Settings tab to configure the security settings required for an SNMP agent and the port to use when receiving a trap.

- 
- Step 1** Confirm that the prerequisites have been installed. To view the adapter prerequisites:
    - a.** Choose **Administration > Adapters**, highlight the **SNMP Adapter**, right-click and choose **Properties**.
    - b.** On the SNMP Adapter Properties dialog box, click the **Prerequisites** tab to view the prerequisites that are required by the adapter, then click **OK**.  
For the latest prerequisites, see the *Cisco Process Orchestrator Compatibility Matrix*.
  - Step 2** Configure the security settings required for an SNMP agent and the port to use when receiving a trap:
    - a.** Choose **Administration > Adapters**, highlight the **SNMP Adapter**, right-click and choose **Properties**.
    - b.** On the SNMP Adapter Properties dialog box and click the **Settings** tab.
    - c.** Enter the following information:
      - Local Engine ID—ID number of the SNMP engine  
The SNMP engine ID number can be automatically discovered by the SNMP adapter or specified by the SNMP Agent Device target.
      - Trap listening port—Port number that the event or the activity used to listen for incoming traps (default port number=162).
-




## Configuring Listening Port Settings

Use the Settings tab to configure the security settings required for a SNMP Agent and the port to use when receiving a trap.

- 
- Step 1** Choose **Administration > Adapters**, highlight the **SNMP Adapter**, right-click and choose **Properties**.
- Step 2** Click the **Settings** tab to specify the following listening port for the incoming traps:
- Local Engine ID—ID number of the SNMP engine  
The SNMP engine ID number can be automatically discovered by the SNMP adapter or specified by the SNMP Agent Device target.
  - Trap listening port—Port number that the event or the activity used to listen for incoming traps. The default port number is *162*.
- Step 3** Click **OK** to close the dialog box.
- 

## Defining an SNMP Device (Agent) Target

Use the SNMP (Device) Agent target to configure the host and operation and notification settings for accessing an SNMP agent.

- 
- Step 1** Choose **Definitions > Targets**, right-click, and choose **New > SNMP Device (Agent)**.
- Step 2** On the **General** tab, enter the appropriate information and click **Next**.
- Step 3** On the **SNMP Device (Agent)** panel, enter the appropriate target information to configure the host and operation and notification settings, and click **Next**.
- Host (Name or IP address)—Enter the host name or IP address of the SNMP agent
  - Port number—Enter the listening SNMP port to be used by Cisco Process Orchestrator to execute SNMP GET/SNMP SET activities against the device. This is the port number that the activities use for Get/Set Requests. The default port number is *161*.
  - Enable reading only from device (SNMP Get Request)—Select this radio button and then select the appropriate SNMP credentials with *Read* rights from the drop-down list.  
To view the properties of the SNMP credentials, click the **Properties**  tool.  
If the drop-down list does not contain the appropriate credentials, click **New > SNMP Credentials** to create new credentials.
  - Let me choose SNMP operations to enable—Select this radio button to define the specific credentials for the SNMP agent.
- Step 4** On the **SNMP Credentials** panel, specify different credentials to be used for Get or Set operations or receiving SNMP traps, and click **Next**.
- Enable reading only from device (SNMP Get Request)—Check this check box and then select the appropriate SNMP credentials with *Read* rights from the drop-down list  
If the drop-down list does not contain the appropriate credentials, click **New > SNMP Credentials** to create new credentials.
  - Enable writing to device (SNMP Set Request)—*Write* rights from the drop-down list

When verifying the write credentials, the SNMP adapter will only perform the Get Request for confirmation.

If the drop-down list does not contain the appropriate credentials, click **New > SNMP Credentials** to create new credentials.

- Enable traps from the device—Check this check box and then select the appropriate SNMP credentials to enable traps from the device from the drop-down list.

If the drop-down list does not contain the appropriate credentials, click **New > SNMP Credentials** to create new credentials.



---

**Note** Cisco Process Orchestrator does not verify SNMP trap credentials.

---

- Step 5** Verify the information on the panel and click **Finish** to close the wizard.
- 

## Defining an SNMP Device (Manager) Target

Use the SNMP (Server) Manager target to configure the host and security settings for sending traps to a SNMP server.

- 
- Step 1** Choose **Definitions > Targets**, right-click, and choose **New > SNMP Device (Manager)**.
- Step 2** On the **General** panel, enter the appropriate information and click **Next**.
- Step 3** On the SNMP Device (Manager) panel, specify the connection information to the appropriate server, then click **Next**.
- Host (Name or IP address)—Enter the host name or IP address of the SNMP server
  - Port number—Enter the listening SNMP port to be used by Cisco Process Orchestrator to send traps to the SNMP server. The default port number is 162.
  - Credentials used to generate traps to send to the SNMP server—Select the appropriate SNMP credentials with the appropriate rights to enable traps from the device from the drop-down list.
- If the drop-down list does not contain the appropriate credentials, click **New > SNMP Credentials** to create new credentials.
- Step 4** Verify the information on the panel and click **Finish** to close the wizard.
- 

## Defining a SNMP Credentials Account

Use the SNMP Credentials dialog box to specify the credentials for a SNMP runtime user. The information is used to assign run options for SNMP processes or activities.

- 
- Step 1** Choose **Definitions > Runtime Users**, right-click and choose **New > SNMP Credentials**.
- Step 2** On the **General** panel, enter the appropriate information and click **Next**.
- Step 3** Click the **Credentials** tab to specify the following information:
- Version—Select the appropriate SNMP version (SNMPv1, SNMPv2c, or SNMPv3).

- **Community String**—This field is displayed when the *SNMPv1* or *SNMPv2c* versions is selected. Specify the community string to be used for publishing traps. The default community string is *public*.
- **User name**—Enter the user name assigned to the SNMP Credentials account.
- **Security level**—The security level assigned to the user:
  - *noAuthNoPriv*—Communication without authentication and privacy
  - *authNoPriv*—Communication with authentication and without privacy. The protocols used for Authentication are MD5 (Message Digest 5 Algorithm) and SHA (Secure Hash Algorithm).
  - *authPriv*—Communication with authentication and privacy.
- **Authenticational protocol**—The protocol used for authentication. This field is enabled when the security level is set to *authNoPriv* or *authPriv*.
  - SHA
  - MD5
- **Authentication Key**—Password used for authentication
- **Privacy Protocol**—Format for transmitting encrypting data between the two devices  
This option is available when security level is set to *authPriv*.
  - *DES*—Data Encryption Standard uses a 56-bit key and uses the block cipher method, which breaks text into 64-bit blocks and then encrypts the text.
  - *3DES*—Non-standard convention of the DES encryption algorithm in which three 64-bit keys are used, instead of one, for an overall key length of 192 bits. The first encryption is encrypted with second key, and the resulting cipher text is again encrypted with a third key.
  - *AES128*—Specifies the Advanced Encryption Standard which uses a symmetric 128-bit block data encryption technique
  - *AES256*—Specifies 256-bit AES as the encryption algorithm



**Note** You must update your policy with JCE to use the AES256 encryption. To update the JCE provider, click [Oracle JCE provider](#) to download the correct *local\_policy.jar* file and *US\_export\_policy.jar* file to the local Java security folder. Before downloading, rename the original security files in the Java installation folder. After downloading the files, restart Cisco Process Orchestrator to apply the changes.

- **Privacy Key**—Password used for encrypting data

**Step 4** Click **OK** to close the dialog box and complete the procedure.

## Defining a SNMP Trap Received Trigger

Use the SNMP Trap Received trigger to specify the criteria for the incoming traps from all SNMP agents through the port specified in the SNMP adapter. This criteria must be met before the process executes.

**Step 1** Choose **Definitions > Triggers > New > SNMP Trap Received**.

**Step 2** Click the **General** tab and enter the required information.

- Step 3** Click the **Trap Criteria** tab and enter the OID for the trap.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Automating SNMP Device (Agent) Command Activities

### Defining the Correlate SNMP Trap Received Activity

Use the Correlate SNMP Trap Received activity to detect incoming traps that match the specified criteria.

- 
- Step 1** In the Process Editor Toolbox, choose **SNMP Activities > Correlate SNMP Trap Received**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Event Criteria** tab to specify the event properties for the activity, including:
- Correlate events that occur within—Enter a value and select the time unit to indicate the length of time to wait before or after the process start time.
    - Time unit—Enter the start time value in minutes or seconds
    - Event occurrence—Determine whether the process start time is before or after the event occurs
  - Number of events to correlate—Select *one* of the following options to specify which events to wait for before the process continues:
    - All events in the above time frame—Select this option to wait for all events that match the specified criteria before the process continues.
    - Number of events—Select this option to wait for the specified number of events to occur before the process continues. Enter the number of events to wait for in the text field.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

### Viewing Results

Click the instance tab to view the event properties for the completed activity.

- Correlate events that occur within—Enter a value and select the time unit to indicate the length of time to wait before or after the process start time.
  - Time unit—Enter the start time value in minutes or seconds
  - Event occurrence—Determine whether the process start time is before or after the event occurs
- Number of events to correlate—Select *one* of the following options to specify which events to wait for before the process continues:
  - All events in the above time frame—Select this option to wait for all events that match the specified criteria before the process continues.
  - Number of events—Select this option to wait for the specified number of events to occur before the process continues. Enter the number of events to wait for in the text field.

## Defining the Generate SNMP Trap Activity

Use the Generate SNMP Trap activity to publish a generic trap to the specified SNMP Manager target or target group.

- 
- Step 1** In the Process Editor Toolbox, choose **SNMP Activities > Generate SNMP Trap**, then drag and drop the activity onto the Workflow pane.
  - Step 2** Click the **General** tab and enter the required information.
  - Step 3** Click the **Trap** tab and enter the object identifier of the trap to publish.
  - Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

### Viewing Results

Click the instance tabs to view the published trap. See also, [Defining the Generate SNMP Trap Activity](#).

## Defining the Generate SNMP Trap from Task Activity

Use the Generate SNMP Trap from Task activity to publish Cisco Process Orchestrator process alerts and incident traps to the specified SNMP Manager target or target group.

- 
- Step 1** In the Process Editor Toolbox, choose **SNMP Activities > Generate SNMP Trap from Task**, then drag and drop the activity onto the Workflow pane.
  - Step 2** Click the **General** tab and enter the required information.
  - Step 3** Click the **Trap from Task** tab and enter the ID of the alert or incident task to publish. The task GUID should contain 32-digits with four dashes placed in the following format:  
`XXXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXX`
  - Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

### Viewing Results

Click the instance tabs to view the published process alerts and incident traps. See also, [Defining the Generate SNMP Trap from Task Activity](#).

## Defining the SNMP Get Request Activity

Use the SNMP Get Request activity to request a set of variable values from the SNMP agents. SNMP agents are hardware and/or software processes reporting activity in a network device. Data passes through SNMP agents and the requested information is returned in a MIB.

- 
- Step 1** In the Process Editor Toolbox, choose **SNMP Activities > SNMP Get Request**, then drag and drop the activity onto the Workflow pane.
  - Step 2** Click the **General** tab and enter the required information.

- Step 3** Click the **Variables** tab and enter the context name to be used during SNMP V3 operation.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

### Viewing Results

Click the instance tabs to view the set of variable values. See also, [Defining the SNMP Get Request Activity](#).

## Defining the SNMP Set Request Activity

Use the SNMP Set Request activity to update a set of variable values on the SNMP agents. SNMP agents are hardware and/or software processes reporting activity in a network device. The SNMP Set Request activity modifies the variables used to request the information that is returned in a MIB from the SNMP agent.

---

- Step 1** In the Process Editor Toolbox, choose **SNMP Activities > SNMP Set Request**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Variables** tab and enter the context name to be used during SNMP V3 operation.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

### Viewing Results

Click the instance tabs to view the set of variable values updated on the SNMP agents. See also, [Defining the SNMP Set Request Activity](#).

## Adding a Variable to an SNMP Activity

Trap variables are a required property for the SNMP Request Set and Generate SNMP Trap activities. The Add button on these activities launches the Variable dialog box for users to specify the variable properties to be added to the list on the specified SNMP activity.

---

- Step 1** On the SNMP activity property page, click **Add**.
- Step 2** On the Variable dialog box, specify the required information, then click **OK**.



**Note** If the Add button is launched from the SNMP Get Request activity, the dialog box will only have an OID field.

---

- Step 3** Specify the information that describes the variable, including:
- OID—Object identifier of the trap to publish (default =1.3.6).

- **Type**—The list of variable bindings for the specified trap. The third-party SNMP library supports these data types:
    - **Integer**—Signed integer-valued information in the range of -231 to 231-1. This data type redefines the integer data type, which has arbitrary precision in ASN.1 but bounded precision in the SMI
    - **IP Address**—represent addresses from a particular protocol family. SMIV1 supports only 32-bit (IPv4) addresses (SMIV2 uses Octet Strings to represent addresses generically, and thus are usable in SMIV1 too. SMIV1 had an explicit IPv4 address datatype.)
    - **OctetString**—Ordered sequences of 0 to 65,535 octets
    - **OID**—Comes from the set of all object identifiers allocated according to the rules specified in ASN.1
    - **TimeTicks**—Time since an event, measured in hundredths of a second
    - **UInteger**—Unsigned integer-valued information, which is useful when values are always non-negative. This data type redefines the integer data type, which has arbitrary precision in ASN.1 but bounded precision in the SMI
  - **Value**—Instance value of the variable
- 

## Defining an SNMP Credentials Account

Use the SNMP Credentials dialog box to specify the credentials for an SNMP runtime user. The information is used to assign run options for SNMP processes or activities.

- 
- Step 1** Choose **Definitions > Runtime Users**, right-click and choose **New > SNMP Credentials**.
  - Step 2** Click the **General** tab and specify the appropriate information.
  - Step 3** Click the **Credentials** tab to specify the SNMP information.
  - Step 4** Click **OK** to close the dialog box and complete the procedure.
- 

## Automating SNMP Device (Manager) Command Activities

Use the following steps to define an SNMP Device (Manager) activity.

- 
- Step 1** In the Process Editor Toolbox, choose **SNMP > [SNMP Activity]**, then drag and drop the activity onto the Workflow pane.
  - Step 2** Click the **General** tab and enter the required information.
  - Step 3** Click the **[Activity-Specific]** tabs to define the properties specific to the activity.

Activity	Comments
Publish a generic trap	<p>Select <b>Generate SNMP Trap</b> to publish a generic trap to the specified SNMP Manager target or target group.</p> <p>Click the <b>Trap</b> tab and enter the object identifier of the trap to publish</p>
Generate an SNMP trap from a task activity	<p>Select <b>Generate SNMP Trap from Task</b> to publish Process Orchestrator process alerts and incident traps to the specified SNMP Manager target or target group.</p> <p>Specify the ID of the alert or incident task to publish. The task GUID should contain 32-digits with four dashes placed in the following format:</p> <p>XXXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXX</p>

**Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.



# Terminal Adapter

The Terminal adapter provides the functionality to execute commands, scripts and session-based activities against a system or network device using SSH or Telnet. While SSH is more secure than telnet, many environments use a telnet connection and using a SSH connection against such devices will not be possible. The Terminal adapter allows you the flexibility to execute against those devices.

The Terminal adapter allows Cisco Process Orchestrator to run commands and script activities on a system or network device that has Secure Shell (SSH) enabled. The Terminal adapter also contains three session-based activities that allow you to open new SSH/Telnet sessions and interact with the previously opened sessions.

SSH and Telnet leverage the same command execution activities differentiated by the target type they are deployed against. For example, an IOS target can have SSH or telnet optionally configured.

Cisco Process Orchestrator requires SFTP to be configured on the Unix/Linux system to execute SSH activities. SFTP is not needed for the SSH/Telnet Terminal Session activities.

The Terminal Adapter for Cisco Process Orchestrator:

- Provides host-based and public key authentication and improves upon the existing expects functionality. The authentication enhancement allows users to apply host-based authentication from the adapter level. Users can also apply public key authentication on the device target level.
- Allows you to create expect templates for their login expects. Expect templates allow you to leverage existing login expect sequences when applying expects to a device target or activity.
- Is now FIPS-compliant and allows you to enable FIPS-compliant algorithms.

The following table displays activities that are provided by the Terminal adapter. For more information about using these activities, see [Getting Started Using the Terminal Adapter, page 12-132](#).

Activity	Description
Close Terminal Session	Closes a Terminal session opened by a previous Open Terminal Session activity See <a href="#">Defining a Close Terminal Session Activity, page 12-142</a>
Execute Terminal Command(s)	Sends commands to a terminal command session started by a previous Open Terminal Session activity See <a href="#">Defining an Execute Unix/Linux SSH Command Activity, page 12-146</a>
Execute Unix/Linux SSH Command	Specifies a Unix/Linux SSH command to execute See <a href="#">Defining an Execute Unix/Linux SSH Command Activity, page 12-146</a>
Execute Unix/Linux SSH Script	Specifies a Unix/Linux SSH script to execute See <a href="#">Defining an Execute Unix/Linux SSH Script Activity, page 12-147</a>
Get File	Retrieves files from a Unix/Linux system target to transfer to a specified local directory See <a href="#">Defining a Get File Activity, page 12-143</a>
Open Terminal Session	Starts an SSH session on a selected Terminal target See <a href="#">Defining an Open Terminal Session Activity, page 12-149</a>
Put File	Pushes local files to a Unix/Linux system target See <a href="#">Defining a Put File Activity, page 12-144</a>

## Getting Started Using the Terminal Adapter

Use the following process to monitor and manage Terminal adapter instances.

- 
- Step 1** Create the Terminal targets (see [Defining Terminal Adapter Targets](#), page 12-136).
  - Step 2** Define a Terminal message runtime users (see [Defining Terminal Adapter Targets](#), page 12-136).
  - Step 3** Define a Terminal command activity (see [Automating Terminal and Secure Shell \(SSH\) Activities](#), page 12-142).
  - Step 4** View the activity results (see [Monitoring Operations](#), page 8-1).
- 

## Configuring the Terminal Adapter

### Configuring SSH Version 2.0 Support for Cisco IOS Devices

To properly execute Cisco IOS processes and activities against the Terminal adapter, the IOS device cannot run using SSH v1.0. The IOS devices should be configured to run SSH v2.0. The Secure Shell Version 2 Support feature allows users to configure Secure Shell (SSH) Version 2.

Before configuring SSH, download the k9 (Triple Data Encryption Standard [3DES]) software image from Cisco IOS Release 12.3(4)T, 12.2(25)S, or 12.3(7)JA onto your router.

For additional information on configuring IOS devices for SSH v2.0 support, see [Secure Shell Version 2 Support](#) on the Cisco web site.

### Configuring an Expect Template

Because creating Terminal targets can be complex, the expect template provides users with limited knowledge of expects a simpler method to complete the target configuration properties. Expect templates contain default configuration sequence of expects and elevated privilege command expects.

The Expect Template tab on the Terminal Adapter dialog box displays the list of default expect template configurations that have been created using the Expect Templates dialog box. From this tab, users can create, modify, and delete expect templates.

Expect templates can be imported and exported just like other objects in an automation pack. Imported expect templates from an automation pack can only be modified by the author of that automation pack. A Process Orchestrator content-author can only export those expect templates created by that content author.

- 
- Step 1** Choose **Administration > Adapters**, highlight **Terminal Adapter**, right-click and choose **Properties**.
  - Step 2** Click the **Expect Templates** tab, then click **New > Expect Template**.
  - Step 3** Click the **General** tab and enter the required information.
  - Step 4** Click the **Expect Template** tab to configure the default expect values.
  - Step 5** Complete the following information for the connection patterns.
    - Prompt—Enter the system prompt pattern in regular expression
    - Error—Enter the error message pattern in regular expression

- Admin Prompt—Enter the admin prompt pattern in regular expression
- Step 6** To elevate the privilege command for login expects:
- Elevating Privilege command—Check this check box and enter the command or select the reference variable containing the command to elevate the privilege for the expect.
  - Elevating Privilege expects—Use this section to view and/or define the login expect sequence for the elevating privilege command expects.
- Step 7** Click **OK** to close the dialog box.
- 

## Enabling the FIPS-Compliance JCE Provider

The Terminal Adapter ships with a FIPS-compliant Java Crypto Extension (JCE) provider to connect to FIPS-compliant network devices, such as the ACS 5.2 server. This provider includes encryption algorithms that may not be supported by Java that are also useful in high-security scenarios.

- Step 1** Choose **Administration > Adapters**, highlight **Terminal Adapter**, right-click and choose **Properties**.
- Step 2** Click the **Advanced** tab, then under **FIPS-Compliance**, check the **Only use FIPS-compliant encryption algorithm** check box to indicate that only FIPS-compliant encryption algorithms should be used by the Terminal adapter.
- If this check box is checked, then any SSH targets that uses an unsupported algorithm will not be accessible in Process Orchestrator.
- Step 3** Click **OK** to close the dialog box.
- 

## Configuring Default Host-Based Authentication Keys

Users can define default host public and private keys on the **Advanced** tab of the Terminal Adapter dialog box. This tab allows users to select a specific private key for the target. The private key will be used for host-based authentication if a target does not specify its own keys.

The **Authentication** tab on a Target dialog box indicates whether the target should allow authentication based on the host system of the user and the user name on the remote host system.

- Step 1** Choose **Administration > Adapters**, highlight **Terminal Adapter**, right-click and choose **Properties**.
- Step 2** Click the **Advanced** tab to configure the authentication keys.
- Private key—To the right of the display-only field, click **Browse** to launch the Load Private Key dialog box to select a private key.
  - Public key—To the right of the display-only field, click **Browse** to launch the Load Public Key dialog box to select a public key.
  - Public key file content—Enter the SSH public key request message to the remote SSH server that will authenticate the request against the stored public key.
- Step 3** Click **OK** to close the dialog box.
-

## Selecting a Private Key

Use the Load Private Key dialog box to select the private key file to be used to provide authentication of a public key. If OpenSSH is installed, the key pair is generated by the command line tool "ssh-keygen."

Copy the file to a location where it is accessible from the Process Orchestrator server, then follow the steps to load the private key.

The private key file should reside on the same machine as the Process Orchestrator server.

---

**Step 1** Choose **Administration > Adapters**, highlight **Terminal Adapter**, right-click and choose **Properties**.

**Step 2** Click the **Advanced** tab to select the private key to authenticate the public key.

**Step 3** On the Private Key field, click **Browse**.

**Step 4** In the Load Private Key dialog box, enter the following information:

- Passphrase to the private key file—Check this check box and in the text field, enter the passphrase to be used to the private key file.

The passphrase is used to protect the private key file when the private key is generated.

- Select a private key file—The most commonly used private key file format is "RSA PRIVATE KEY." The private key file should reside on the same machine as the Process Orchestrator server. The default location of the file is under the unix user's home directory:

`~/.ssh/id_rsa`

The content of the private key file will be displayed after the passphrase is d against the private key file content.

**Step 5** Click **OK** to close the dialog box.

The private key displays on the Private key field on the Advanced tab. The content of the private key file will be displayed except in the Load Private File dialog box in order for the user to verify the content.

---

## Selecting a Public Key

A public key is a value provided by some designated authority as an encryption key that, combined with a private key derived from the public key, can be used to effectively encrypt messages and digital signatures.

Use the Load Public Key dialog box to select a public key to be used by the Terminal adapter.

---

**Step 1** Choose **Administration > Adapters**, highlight **Terminal Adapter**, right-click and choose **Properties**.

**Step 2** Click the **Advanced** tab to select the private key to authenticate the public key.

**Step 3** On the Public Key field, click **Browse**.

**Step 4** On the Load Private Key dialog box, select the public key file.

**Step 5** Click **OK** to close the dialog box.

The public key displays on the Public key field on the Advanced tab.

---

## Configuring Total Concurrent Sessions

Users can specify the limits on how many concurrent sessions can be run against a target. When the total live sessions reach limits, the activity that needs to open a new session will wait until a live session is closed. The waiting Open Terminal Session activities will be displayed in the target's Open Sessions property page.

The Network Device Module inherits the max allowed sessions from its chassis system by default. Users cannot adjust the value on the network device module more than value set by the chassis system. Therefore users can only modify the amount concurrent sessions against the network device module through its chassis system.

Due to the nature of network device management, Process Orchestrator may have a very large number of Process Orchestrator Terminal Adapter targets and concurrent running Process Orchestrator processes. Users can specify the total sessions allowed against the Terminal Adapter in the configuration file to minimize the negative impact on performance and resource usage.

To configure the maximum sessions against a target:

- 
- Step 1** Choose **Definitions > Targets**, highlight the appropriate target, right-click and choose **Properties**.
  - Step 2** Click the **Connection** tab to modify the maximum allowed sessions.
  - Step 3** In the **Maximum allowed concurrent sessions** field, enter the maximum allowed open sessions to run concurrently. (Default: Terminal target: 3, Unix/Linux target: 1)
  - Step 4** Click **OK** to close the dialog box.
- 

## Adding an Expect Parameter

Use the Expect dialog box to configure the expect parameters to manage the Terminal target command output. The Add button on the device activities and targets launch the Expect dialog box for users to configure the expect parameters to be added to the list of expects and matched in the output.

- 
- Step 1** On the **Execute Terminal** property page, click **Add**.
  - Step 2** Complete the following fields, as necessary.
    - **Name**—Enter the name of the case defining what to expect
    - **Regular Expression**—Enter characters to match in the terminal output.
    - **Match Case**—Check the check box to indicate whether the regular expression is case-sensitive
    - **Operation Type**—Displays what operation takes place if an expected regular expression match is encountered in the terminal output:
      - **User Response**—Provides input to the terminal and continue execution of the activity
      - **Runtime User's User name**—Allows user to respond with the user name of the runtime user for the session
      - **Runtime User's Password**—Allows user to respond with the password of the runtime user for the session
      - **Runtime User's Admin Password**—Allows user to respond with the admin password of the runtime user. If the runtime user doesn't have the admin password, the regular password will be used.

- Succeeded—Complete activity and set its status to Completed
- Failed (Completed)—Complete activity and set its status to Failed (Completed)
- Failed (Not Completed)—Complete activity and set its status to Failed (Not Completed)
- User Response—Field is enabled when *User Response* is selected from the Operation Type drop-down list. This field can also remain empty.  
When *User Response* is selected, enter the appropriate string text for the user.
- Hidden—This check box is enabled when *User Response* or *Set Expect Result* is selected from the Operation Type drop-down list.  
Check this check box and enter the string text into the Operation Parameter field, which will be used as security-sensitive content for the expect.

**Step 3** Click **OK**.

The expect parameters is added to the list of login expects.

---

## Defining Terminal Adapter Targets

### Defining a Network Device Module Target

Some Cisco network devices are chassis systems that can hold other network devices such as ACE, FWSM, on boards that plug into the chassis.

Use the Network Device Module to create a network device module target which can be used as a dependent of a terminal target as well as an independent network device target that can be used by network processes for execution.

---

**Step 1** Choose **Definitions > Targets**, right-click, and choose **New > Network Device Module**.

**Step 2** On the General Information panel, enter the appropriate information, then click **Next**.

**Step 3** On the Terminal Connection panel, enter the appropriate target information to specify the connection information to the appropriate server, then click **Next**.

- Chassis system—From the drop-down list, select the appropriate terminal target on which the network module resides.
- Switch number—Check the check box and in the text field, enter the appropriate switch number for the chassis system.
- Slot number—Enter the slot number on which the network device module resides.
- Process Id—Enter the processor Id on which the network device module resides.
- Command to access—Enter the session command to access the network device module. The default command is *session slot [Slot Number] processor [Processor Id]*.
- Prompt prefix—Enter the command prompt prefix that will be used by the device type configurations and expects when issuing commands and connecting to the device.

Adding a regex character, such as \$, >, and #, at the end of a prompt in the Prompt Prefix field in the command prompt prefix.

Regular expressions should be placed in the appropriate Terminal Interaction Pattern fields. See the Connections Patterns panel to customize the interaction patterns.

For example, if you connect to the terminal, and the prompt is Cisco\_7606#, enter the regular expression that will match the entire prefix (before #) using any of the following expressions:

- CISCO.\*
- .\*7606
- CISCO\_7606

- Default runtime user—Select the default runtime user account that contains the credentials to connect to the target.

**Step 4** On the Terminal Interaction Patterns panel, configure the terminal interaction patterns for the target, and click **Next**.

- Use patterns common for the following device—Select this radio button to choose *one* of the pre-defined expect templates from the drop-down list.
  - Cisco IOS Device—Select this option to use the default pattern values used by the device during the completion of a session command.
  - Unix—Select this option to use the default pattern values indicated for a Unix device during the completion of a session command.
- Customize patterns for this connection—Check this check box to customize the default values for the selected expect template. On the Connection Patterns panel, configure the terminal interaction patterns for the target, then click **Next**.
  - Prompt pattern—Enter the system prompt pattern in regular expression.
  - Error pattern—Enter the error message pattern in regular expression.
  - Admin prompt pattern—Enter the admin prompt pattern in regular expression.

**Step 5** Modify the list of expects:

- Elevating Privilege command—Check this check box and enter the command or select the reference variable containing the command to elevate the privilege for the expect.
- Elevating Privilege expects—Use this section to view and/or define the login expect sequence for the elevating privilege command expects.

To view details about the expect columns, view Login Expect columns.

**Step 6** Verify the information on the panel and click **Finish** to close the wizard.

---

## Defining a Terminal Target

Use the Terminal target to specify the connection information used to access the device used for processes to run against. The connection information includes IP address or host name, protocol type, port and the runtime user credentials to access the device.

**Step 1** Choose **Definitions > Targets**, right-click, and choose **New > Terminal**.

**Step 2** On the **General Information** panel, enter the appropriate information, and click **Next**.

**Step 3** On the **Terminal Connection** panel, enter the target information to specify the connection information to the appropriate server, including:

- Protocol—Select the appropriate protocol from the drop-down list.
- Host name—Host name or IP address of the network device

- Port—Port number used to access the appropriate terminal target port (Default: SSH server: 22, Telnet server: 23)
- Prompt prefix—Enter the command prompt prefix that will be used by the device type configurations and expects when issuing commands and connecting to the device.

Adding a regex character, such as \$, >, and #, at the end of a prompt in the Prompt Prefix field in the command prompt prefix.

Regular expressions should be placed in the appropriate Terminal Interaction Pattern fields. See the Connections Patterns panel to customize the interaction patterns.

For example, if you connect to the terminal, and the prompt is Cisco\_7606#, enter the regular expression that will match the entire prefix (before #) using any of the following expressions:

- CISCO.\*
  - .\*7606
  - CISCO\_7606
- Use credentials of the following runtime user—Select the default runtime user account that contains the credentials to connect to the target.
  - Use patterns common for the following device—Select this radio button to choose *one* of the pre-defined expect templates from the drop-down list.
    - Cisco IOS Device—Select this option to use the default pattern values used by the device during the completion of a session command.
    - Unix—Select this option to use the default pattern values indicated for a Unix device during the completion of a session command.
  - Customize patterns for this connection—Check this check box to customize the default values for the selected expect template. On the Connection Patterns panel, configure the terminal interaction patterns for the target, then click **Next**.
    - Prompt pattern—Enter the system prompt pattern in regular expression.
    - Error pattern—Enter the error message pattern in regular expression.
    - Admin prompt pattern—Enter the admin prompt pattern in regular expression.

**Step 4** Modify the list of expects:

- Elevating Privilege command—Check this check box and enter the command or select the reference variable containing the command to elevate the privilege for the expect.
- Elevating Privilege expects—Use this section to view and/or define the login expect sequence for the elevating privilege command expects.

**Step 5** On the Host-Based Authentication panel, specify whether the target should allow authentication based on the host system of the user and the user name on the remote host system, and click **Next**.

Users can define default host public and private keys on the Terminal Adapter settings. This panel allows users to select a specific private key for the target. The private key will be used for host-based authentication if a target does not specify its own keys.

- Use host-based authentication—Check this check box to indicate that host-based authentication will be used with this target.
- Use the default host keys—Check this check box to indicate the host keys defined on the Terminal Adapter property page will be used for this target.
- Private key—Click **Browse** to launch the Load Private Key dialog box to select a private key.



- Step 6** On the Network Modules panel, review the list of network modules assigned to the terminal target. These network device modules are considered dependents of the terminal target.
- If the appropriate network device module is not displayed, users can create a network device module target from within this wizard to be used as a dependent of the terminal target.
- Step 7** Verify the information on the panel and click **Finish** to close the wizard.

## Defining a Unix Linux System Target

Use the Unix/Linux Connection tab to specify the connection information for the SSH server used for processes to run against. The Unix/Linux System target also supports Telnet protocol and session based activities.

To properly run script and command activities against Unix/Linux system targets, Process Orchestrator requires the Secured File Transfer Protocol (SFTP) to be enabled on the Unix/Linux system. It is not needed for the SSH/Telnet Terminal Session activities.

**Step 1** Choose **Definitions > Targets**, right-click, and choose **New > Unix/Linux System**.

**Step 2** On the **General** tab, enter the appropriate information.

**Step 3** Click the **Connection** tab to enter the appropriate target information to specify the connection information to the appropriate SSH server, including:

- Prompt prefix—Enter the command prompt prefix that will be used by the device type configurations and expects when issuing commands and connecting to the device.

Adding a regex character, such as \$, >, and #, at the end of a prompt in the Prompt Prefix field in the command prompt prefix.

Regular expressions should be placed in the appropriate Terminal Interaction Pattern fields. See the Advanced tab to customize the interaction patterns.

For example, the Unix system prompt prefix is defined by the user default login script. It usually contains user name, node name or current directory name. If the user does not define anything, the prompt prefix is empty.

If you connect to the terminal, and the prompt is `jsmith@TBD-SH03-IT ~$`, enter the regular expression that will match the entire prefix (before #) using any of the following expressions:

- `.*TBD-SH03-IT.*`
- `[\w+@TBD-SH03-IT.*]`
- Select the default runtime user account that contains the credentials to connect to the target.
  - To view the properties for the selected runtime user, click the Properties tool.
  - To create a new runtime user, click **New > [Runtime User]** to create a new Runtime User account.
- Override Default Korn Shell path—This checkbox needs to be checked out when:
  - Using a public key authenticated Admin runtime user
  - The target UNIX server does not have the "ksh" file under /usr/bin



**Note** When using this option, override the default path as "/bin/ksh".

- Maximum allowed concurrent sessions—Enter the maximum allowed open sessions to run concurrently. (Default: 3)

If the user tries to open new session via Open Session activity, it will wait in a queue until there is a session available to open

**Step 4** Click the **Authentication** tab and specify whether the target should allow authentication based on the host system of the user and the user name on the remote host system.

Users can define default host public and private keys on the Terminal Adapter settings. This tab allows users to select a specific private key for the target. The private key will be used for host-based authentication if a target does not specify its own keys.

- Use host-based authentication—Check this check box to indicate that host-based authentication will be used with this target.
- Use the default host keys—Check this check box to indicate the host keys defined on the Terminal Adapter property page will be used for this target. If this check box is unchecked, then the user will need to load the appropriate private key to be used to this target.
- Private key—To the right of the display-only field, click **Browse** to launch the Load Private Key dialog box to select a private key.

**Step 5** Click the **Advanced** tab to configure the interaction patterns for the target.

- Use patterns common for the following device—device targets from the drop-down list.
  - Cisco IOS Device—Select this option to use the default pattern values used by the device during the completion of a session command.
  - Unix—Select this option to use the default pattern values indicated for a Unix device during the completion of a session command
- Customize patterns for this target—Select this radio button to enable the following sections to customize the default values for the selected device type. Configure the terminal interaction patterns for the target, then click **Next**.
  - Prompt pattern—Enter the system prompt pattern in regular expression.
  - Error pattern—Enter the error message pattern in regular expression.
  - Admin prompt pattern—Enter the admin prompt pattern in regular expression.
- Login expects:
  - Name—Name of the case defining what to expect
  - Regular Expression—Characters in terminal output
  - Operation Type—Displays what operation takes place if an expected regular expression match is encountered in the terminal output
    - User Response—Provides input to the terminal and continue execution of the activity
    - Runtime User's User name—Allows user to respond with the user name of the runtime user for the session
    - Runtime User's Password—Allows user to respond with the password of the runtime user for the session
    - Runtime User's Admin Password—Allows user to respond with the admin password of the runtime user. If the runtime user doesn't have the admin password, the regular password will be used.
  - Succeeded—Complete activity and set its status to Completed
  - Failed (Completed)—Complete activity and set its status to Failed (Completed)

- Failed (Not Completed)—Complete activity and set its status to Failed (Not Completed)
  - User Response—Displays the defined user input string text or format to be used to perform the substring operation
  - To modify the list of expects, use the following buttons:
    - Elevating Privilege command—Check this check box and in the text field, enter the command or select the reference variable containing the command to elevate the privilege for the expect.
    - Elevating Privilege expects—Use this section to view and/or define the login expect sequence for the elevating privilege command expects.
- Step 6** Click the **Open Sessions** tab to display the information about sessions currently opened on the target and sessions waiting to be opened.

To avoid the negative impacts on performance and manage resource usage, the Terminal Adapter has a limit on the maximum total live sessions. When the total live sessions reaches the maximum limits, the activity that needs to open a new session will wait until a live session is closed.

The network device module, by default, inherits the maximum allowed sessions from its chassis system. Users cannot adjust the value on the network device module more than value set by the chassis system. Any terminal activities executed against a network device module target will also count towards its chassis system session statistics.

Each displayed list will contain one entry for each opened session.

## Defining Terminal Adapter Runtime Users

### Defining a Public-key Authenticated Admin Runtime User

Use the Public-key Authenticated Admin Runtime User dialog box to define the user credentials required to allow public key authentication and an administrative password is required to perform privileged operations.

If a target has set up public key authentication on the remote SSH server, the private key of the Public-key Authenticated Admin Runtime User will be used to form the SSH authentication request. The request is then authenticated against the stored public key on the remote server.

If the target does not allow public key authentication, the SSH authentication will fail.

- Step 1** Choose **Definitions > Runtime Users**, right-click and choose **New > Public-key Authenticated Admin Runtime User**.
- Step 2** Click the **General** tab and enter the required information, including:
- Owner—User name of the owner of the object. This is typically the person who created the object.
  - User name—The user name assigned to access the device
  - Private key—Use the Load Private Key dialog box to select the private key file to be used to provide authentication of a public key. The private key file should reside on the same machine as the Process Orchestrator server.
  - Admin password—Check the **Admin password** check box and then enter the password assigned to access Privileged EXEC mode on the device. The Privileged EXEC mode provides the highest level of commands to users.

**Step 3** Click **OK** to close the dialog box.

---

## Defining a Runtime Admin User

Use the following instructions define the user credentials required to access a network device. The level of access for the network device is dependent upon the type of password used.

---

**Step 1** Choose **Definitions > Runtime Users**, right-click and choose **New > Runtime Admin User**.

**Step 2** Click the **General** tab to specify the required information, including:

- **Display name**—Enter the display name for the runtime user. This field is populated with the information specified in the User name text field, but can be overwritten by the user.
- **Owner**—User name of the owner of the object. This is typically the person who created the object.
- **User name**—The user name assigned to access the device
- **Password**—Check the **Password** check box and then enter the password assigned to access *USER* mode on the device. This password provides very limited commands to execute.
- **Admin password**—Check the **Admin password** check box and then enter the password assigned to access *Privileged EXEC* mode on the device. The *Privileged EXEC* mode provides the highest level of commands to users.

**Step 3** Click **OK** to close the dialog box.

---

## Automating Terminal and Secure Shell (SSH) Activities

### Defining a Close Terminal Session Activity

Use the Close Terminal Session activity to close a SSH or Telnet session opened by a previous Open Session activity. The user should always specify a paired Open Terminal Session and Close Terminal Session activity within a process.

If a corresponding Close Terminal Session activity for an Open Terminal Session activity is not specified, the SSH session opened by the Open Terminal Session activity will be closed by the Terminal adapter when the process completes. The SSH session also may terminated earlier by the SSH server if the SSH server configuration specified a shorter user idle time.

When the Close Terminal Session activity is launched, the results of the matched expect configurations are displayed from the Operations Workspace activity instance view.

---

**Step 1** In the Process Editor Toolbox, choose **Terminal > Close Terminal Session**, then drag and drop the activity onto the Workflow pane.

**Step 2** Click the **General** tab and enter the appropriate information.

**Step 3** Click the **Close Session** tab to specify the appropriate device command or inputs. Enter the appropriate device command before ending the SSH session. For example: Quit.

**Step 4** Click the **Session** tab and select the appropriate Open Terminal Session activity to close or send commands.

The Open Terminal Session activity provides the target upon which the SSH session was opened. The Execute Terminal Command(s) and Close Terminal Session activities will run against the same target and runtime user specified in the Open Session activity.

- Session opened by—Select the appropriate open session from the drop-down list.
- Open Session id—Select the appropriate open session id of the current process or parent process by clicking the Reference icon.

**Step 5** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

## Viewing Results

Click the instance tabs to view the sessions closed and opened. See also, [Defining a Close Terminal Session Activity](#).

## Defining a Get File Activity

Use the Get File activity to retrieve files from a Unix/Linux system target to transfer to a specified local directory using either the Secured File Transfer Protocol (SFTP) or Secure Copy Protocol (SCP) if SFTP or SCP is available on the given target. If both protocols are available, SFTP will be used.

The wildcard \* is allowed.

When the Get File activity is launched, the file transfer results of the Get File activity are displayed from the Operations Workspace activity instance view.

**Step 1** In the Process Editor Toolbox, choose **Secure Shell (SSH) > Get File** and drag and drop the activity onto the Workflow pane.

**Step 2** Click the **General** tab and enter the appropriate information.

**Step 3** Click the **Get File** tab and specify the remote files and file path to the local directory to where the files will be copied:

- Remote files on the target to copy from—The list of files on the Unix/Linux system the user wants to retrieve. If a relative path is specified, it will be relative to the product local application data directory.
- Local windows runtime user for accessing local file systems—From the drop-down list, select the windows runtime user account that contains the credentials to access local files.

The user must have the *Log on as batch job* and *Allow log on locally* User Rights Assignment. To adjust the user right assignments (choose Administrative Tools/Local Security Policy/Security Settings/Local Policies/User Rights Assignment).

- Local directory to copy files to—Specify the file path to the local directory to where the files will be copied. The default file path is relative to the product local application data directory. For example:  
C:\Documents and Settings\test\Local Settings\Application Data
- Overwrite—Select the appropriate option to determine the circumstances in which the copied file should overwrite any existing file in the local directory.
  - Do not overwrite—The copied file should never overwrite the existing file
  - Always overwrite—The copied file should always overwrite the existing file

- Pull only if newer—Retrieves the file only if the file on the Unix/Linux system is more recent than the local copy.

This setting might not apply when the SCP protocol is used or a directory copy takes place.

- Time out if not completed within—Enter a value to specify the time frame to wait for the file transfer to complete before timing out. Large files may cause the file transfer to take longer.

- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Viewing Results

Click the instance tabs to view the retrieve files from a Unix/Linux system target. See also, [Defining a Get File Activity](#).

## Adding a Remote File to a Get File Activity

The Get File activity copies files from remote target systems to a local directory. The Add button on this activity launches the Enter Remote File to Add dialog box for users to specify the file name to be added to the list on the Get File activity.

---

- Step 1** On the Get File property page, click **Add**.
- Step 2** Enter or select the file name to be added to the list and click **OK**.
- The file is added to the list of remote files to be retrieved by the Get File activity.
- 

## Viewing Results

Click the instance tabs to view the retrieve files from a Unix/Linux system target. See also, [Adding a Remote File to a Get File Activity](#).

## Defining a Put File Activity

Use the Put File activity to push local files to a Unix/Linux system target if SFTP or SCP is available on the given target.

If both protocols are available, SFTP will be used. If one file in the list fails while uploading, the activity will fail.

The file transfer results of the Put File activity are displayed from the Operations Workspace activity instance view.

---

- Step 1** In the Process Editor Toolbox, choose **Secure Shell (SSH) > Put File** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Put File** tab and specify the local files and file path to the remote directory to where the files will be copied:

- Local windows runtime user for accessing local file systems—From the drop-down list, select the windows runtime user account that contains the credentials to access local files.  
The user must have the *Log on as batch job* and *Allow log on locally* User Rights Assignment. To adjust the user right assignments (see Administrative Tools/Local Security Policy/Security Settings/Local Policies/User Rights Assignment).
- Local files on the target to copy from—The list of files on the local computer to put on remote target systems. If a relative path is specified, it will be a relative to the product local application data directory.
- Remote directory on the target to copy files to—the file path to the local directory on the target systems where the files will be transferred.  
An absolute path is recommended. The default file path is relative to the product local application data directory. For example:  
C:\Documents and Settings\test\Local Settings\Application Data
- Overwrite—Select the appropriate option to determine the circumstances in which the copied file should overwrite any existing file in the local directory.
  - Do not overwrite—The copied file should never overwrite the existing file
  - Always overwrite—The copied file should always overwrite the existing file
  - Pull only if newer—Retrieves the file only if the file on the Unix/Linux system is more recent than the local copy.  
This setting might not apply when the SCP protocol is used or a directory copy takes place.
- Time out if not completed within—Enter a value to specify the time frame to wait for the file transfer to complete before timing out. Large files may cause the file transfer to take longer.

**Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

## Viewing Results

Click the instance tabs to view the pushed local files to a Unix/Linux system target. See also, [Defining a Put File Activity](#).

## Adding a Local File to a Put File Activity

The Put File activity copies files from a local directory onto a remote target system. The Add button on this activity launches the Enter Local File to Add dialog for users to specify the file name to be added to the list on the Put File activity.

---

**Step 1** On the Put File property page, click **Add**.

**Step 2** In the Local File field, enter or select the file name to be added to the list and click **OK**.

The file is added to the list of local files to be retrieved by the Put File activity

---

## Defining an Execute Unix/Linux SSH Command Activity

Use the Execute Unix/Linux SSH Command activity to specify a SSH command to execute. To properly run this activity, Process Orchestrator requires SFTP to be configured on the SSH server. This activity is only supported against the Unix/Linux system target. Korn Shell is also required.

Pipe is not supported by the Execute Unix/Linux SSH Command activity. If the user needs to execute pipe in an activity, it is recommended that the user places the pipe in the Execute Unix/Linux SSH Script activity.

For example, you can enter “ps -ef “ in the Execute Unix/Linux SSH Command activity, but if you need to execute “ps -ef | grep myusername” then, that information should be placed in the Execute Unix/Linux SSH Script activity.

When the Execute Unix/Linux SSH Command activity is launched, the results of the executed SSH command are displayed from the Operations Workspace activity instance view.

- 
- Step 1** In the Process Editor Toolbox, choose **Secure Shell (SSH) > Execute Unix/Linux SSH Command** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Command** tab to specify the command line properties used to execute an activity on a local working directory on the SSH server.
- Command to execute on target—Enter the actual command to execute an activity on the SSH server. See [Command Line Examples, page 12-146](#).
  - Local working directory on target—Enter the path to the local working directory on the SSH server where the command will be executed.  
If the path is left blank, the default directory will be user login directory on the SSH server
  - Command line arguments—Enter the collection of argument values for the command. See [Script Argument Example, page 12-148](#).
  - Time out if not completed within—Enter a value or use the scroll buttons to specify the time frame to wait for the action to complete before timing out.
  - Time out if no available session within—Enter a value or use the scroll buttons to specify the time frame to wait for the activity to complete if there is no available session.  
The cause for no available session might be that the setting “max allowed concurrent sessions” on the target has been reached.
  - Fail on non-zero return code—Selected check box indicates that the activity should fail when a return code having a non-zero value is received.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

### Command Line Examples

The following are Terminal adapter command line examples.

#### Example

If your local working directory is:

```
/home/myusername/myappdata
```



and the command is  
 /myAppPath/myShellScript.sh  
 the full path is:  
 /home/myusername/myappdata/myAppPath/myShellScript.sh.

### Example

on Unix systems:  
 ls  
 /usr/bin/ls  
 If your command is located at the directory of:  
 /myCommandPath  
 and the command is  
 myCommand  
 the full path is:  
 /myCommandPath/myCommand

## Defining an Execute Unix/Linux SSH Script Activity

Use the Execute Unix/Linux SSH Script activity to specify a SSH script argument to execute.

When the Execute Unix/Linux SSH Script activity is launched, the results of the executed SSH script argument are displayed from the Operations Workspace activity instance view.

### Before You Begin

To properly run this activity, SFTP must be configured on the SSH server.

- 
- Step 1** In the Process Editor Toolbox, choose **Secure Shell (SSH) > Execute Unix/Linux SSH Script** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Script** tab and specify a SSH script argument to execute:
- Local working directory on target—Enter the path to the local working directory on the SSH server where the script will be executed.
  - Script arguments—Enter the collection of argument values for the script. See [Script Argument Example, page 12-148](#).
  - Script to execute on target—Enter the actual script code to use to execute in the specified local working directory.
  - Time out if not completed within—Enter a value or use the scroll buttons to specify the time frame to wait for the action to complete before timing out.
  - Time out if no available session within—Enter a value or use the scroll buttons to specify the time frame to wait for the activity to complete if there is no available session.  
 The cause for no available session might be that the setting “max allowed concurrent sessions” on the target has been reached.
  - Fail on non-zero return code—Selected check box indicates that the activity should fail when a return code having a non-zero value is received.

- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

### Adding a Script Argument

Script arguments are a property for SSH activities. The Add button on these activities launches the Select Argument to Add dialog box for users to specify the script arguments to be added to the list on the specified SSH activity.

---

- Step 1** On the appropriate SSH activity property page, click **Add**.
- Step 2** Specify the script argument value for the script and click **OK**.
- The script argument is added to the command line argument list on the activity property page.
- 

### Script Argument Example

The following is an example of a script containing four arguments.

#### Script to Execute

```
#!/bin/csh
echo ${0}
echo "Number of arguments is $#argv"
echo $2
echo $argv[2-3]
echo $argv[$]
exit
```

#### Script Arguments

```
% argex.csh "hello world" 42 3.14159 "(300:400,~100)"
argex.csh
Number of arguments is 4
42
42 3.14159
(300:400,~100)
```

### Script Argument Syntax

Any command-line arguments can be accessed as shell variables inside a script. The following table contains script arguments which can be used inside a script.

Syntax	Description
<code>\${0}</code>	The name of the script being run

\$?name	Returns 1 if the variable name is defined, or 0 if it is not defined
\$n	The value of the n argument passed to the script
\$argv[n]	The value of the n argument passed to the script
\$#argv	The number of arguments passed to the script
\$*	All the arguments supplied to the script
\$\$	Process identification number (useful for making temporary files with unique names)

## Defining an Open Terminal Session Activity

Use the Open Terminal Session activity to start a SSH session on a given terminal target via a SSH protocol client. The subsequent Execute Terminal Command(s) and Close Terminal Session activities will run against an SSH session.

The expects configuration used during this operation are defined in the selected target.

When the Open Terminal Session activity is launched, the results of the matched expect configurations are displayed from the Operations Workspace activity instance view.

- 
- Step 1** In the Process Editor Toolbox, choose **Terminal > Open Terminal Session**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Open Terminal Session** tab and modify the time constraints for the activity or command:
- **Activity Timeout**—Check this check box and then enter a value to specify the time frame to wait for the Open Terminal Session activity to complete before timing out. (Default: 5 minutes)
  - **Time out if no available session within**—Enter a value or use the scroll buttons to specify the time frame to wait for the activity to complete if there is no available session.
- The cause for no available session might be that the setting “max allowed concurrent sessions” on the target has been reached.
- To the right of the timeout fields, select the time unit link to adjust the time unit
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Troubleshooting the Terminal Adapter

### Activity Output Does Not Match Expect Prompts

#### Error

This activity has failed, please check the output or the expect results table.

If the output does not match the expect prompts, the activity will timeout.

To review the expect result properties:

- 
- Step 1** Choose **Operations > Processes**, highlight the appropriate process, right-click and choose **Observe**.
  - Step 2** On the Workflow pane, locate the appropriate Execute Terminal Command activity.
  - Step 3** On the activity Properties pane, click the **Output** tab.
  - Step 4** Under Expect result table, click **Properties**. The Expect properties dialog box displays.
  - Step 5** Review the Match before field to review the expect properties to verify whether the activity contains valid expects.
- 

### Solution

This is not an easily determined problem, because the output doesn't clearly explain the error. After verifying the expects in the Expect Result Properties dialog box, modify the expects and then re-run the process.

To modify the expects:

- 
- Step 1** Highlight the process, right-click and choose **Edit**.
  - Step 2** On the Workflow pane, locate the appropriate Execute Terminal Command activity.
  - Step 3** On the activity Properties pane, click the **Expect** tab.
  - Step 4** Highlight the appropriate expect, click **Edit** and then modify the information in the Regular Expression field.
  - Step 5** Click **OK** to close the dialog box and then click the Save tool to save the process.
  - Step 6** Click the **Start** tool to run the saved process.
  - Step 7** Close the Process Editor and return to the Operations workspace to observe the process status.
- 

## Correcting Open Session Activity Timeout Error

### Error

This activity has failed because the session activity has timed out.

### Solution

This is a basic issue that occurs when the user did not enter enough time when defining the properties of the Open Session activity.

To modify the Open Session activity properties:

- 
- Step 1** Highlight the process, right-click and choose **Edit**.
  - Step 2** On the Workflow pane, locate the appropriate Open Session activity.
  - Step 3** On the activity Properties pane, click the **Open Sessions** tab.
  - Step 4** In the Activity timeout field, increase the amount of time necessary to run the process before the activity times out.
  - Step 5** Click the **Save** tool to save and the **Start** tool to run the saved process.

- Step 6** Close the Process Editor and return to the Operations workspace to observe the process status.
- 

## Execute Terminal Command Activity Timed Out

### Error

This activity has timed out while waiting for expected output.

---

- Step 1** Choose **Operations > Processes**, highlight the appropriate process, right-click and choose **Observe**.
- Step 2** On the Workflow pane, locate the appropriate Execute Terminal Command activity.
- Step 3** On the activity Properties pane, click the **Output** tab.
- Step 4** Under Expect result table, click **Properties**.
- Step 5** Review all the expects with the Succeeded operation type to make sure that there is an expect that will match the output somewhere. There must be at least one expect with a Succeeded operation type for the activity to succeed.
- 

### Solution

After verifying the expects in the Expect Result Properties dialog box, modify the expects and then re-run the process.

To modify the expects:

---

- Step 1** Double-click the process.
- Step 2** On the Workflow pane, locate the appropriate Execute Terminal Command activity.
- Step 3** On the activity Properties pane, click the **Expect** tab.
- Step 4** Highlight the appropriate expect, click **Edit** and then modify the information in the Regular Expression field.
- Step 5** Click **OK** to close the dialog box and then click the **Save** tool to save the process.
- Step 6** Click the **Start** tool to run the saved process.
- Step 7** Close the Process Editor and return to the Operations workspace to observe the process status.
- 

## Expect Prompt Command Error

### Error

This activity has failed, please check the output or the expect result table to see the error details.

### Solution

For this particular error, the user should not concentrate on the match results, but the expect command in the Expect Result Properties dialog box. The information in the dialog is Cisco IOS data and the user must be familiar with Cisco IOS, otherwise he or she will not understand the error.

To review the expect result properties:

- 
- Step 1** Choose **Operations > Processes**, highlight the appropriate process, right-click and choose **Observe**.
  - Step 2** On the Workflow pane, locate the appropriate Execute Terminal Command activity.
  - Step 3** On the activity Properties pane, click the **Output** tab.
  - Step 4** Under Expect result table, click **Properties** to review the detailed error message for the prompt command.
  - Step 5** Review the expect properties to determine the next course of action based on the Cisco IOS data.
- 

## Target Connection Pattern Prompt Prefix Error

### Error

This activity has timed out while waiting for expected output.

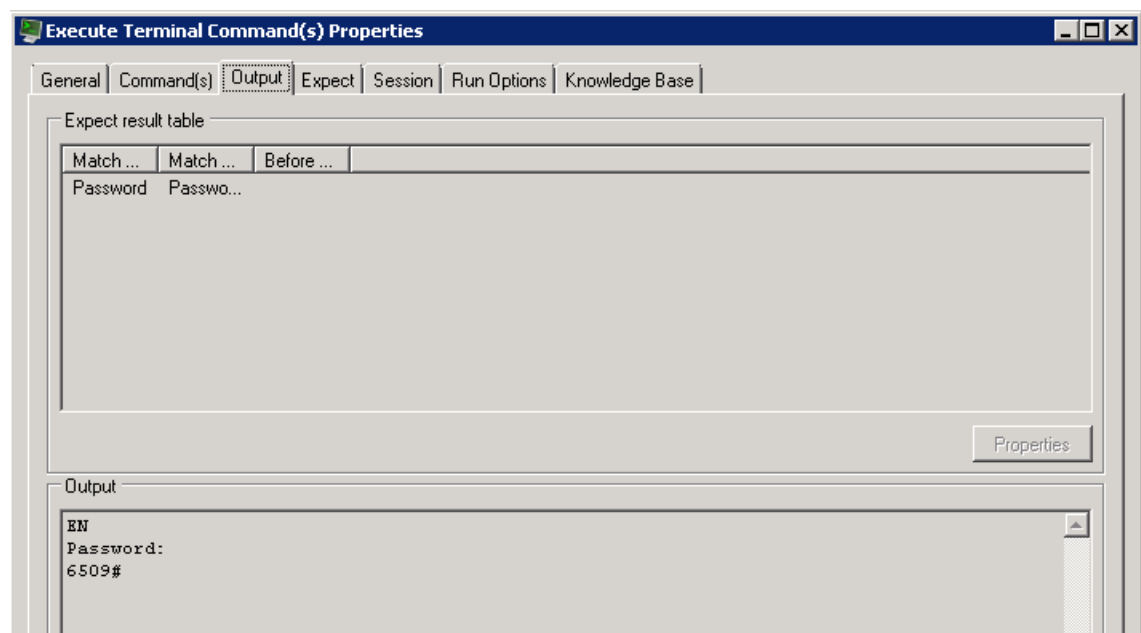
This error is generated because the activity was waiting for data before successfully completing the activity.

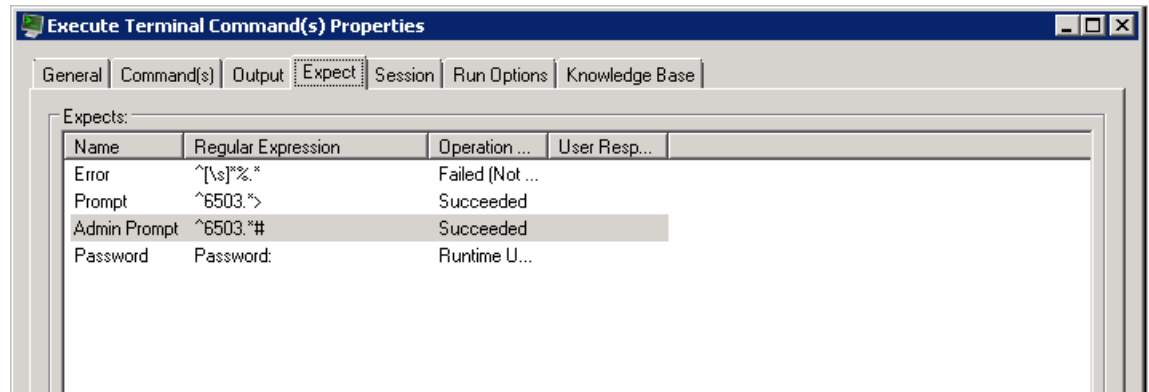
### Solution

Before continuing, verify that the activity simply isn't timing out too quickly. If so, then modify the time entry in the Activity timeout field on the activity property page in the Process Editor. If the amount of time in the activity is sufficient, then compare the information on the Output tab to the regular expression and the operation type on the Expect tab. If the expects do no match, then it will be necessary to modify the appropriate prompt prefixes.

In the following examples, the regular expressions in both Prompt expects are different than what was generated on the output.

### Example—Output Tab 1



**Example—Expect Tab 2**

To modify the prompt prefix:

- 
- Step 1** Double-click the process.
  - Step 2** On the Workflow pane, locate the appropriate Execute Terminal Command activity.
  - Step 3** On the activity Properties pane, click the **Expect** tab.
  - Step 4** Highlight the appropriate expect, click **Edit** and then modify the information in the Regular Expression field.
  - Step 5** Click **OK** to close the dialog box and then click the **Save** tool to save the process.
  - Step 6** Click the **Start** tool to run the saved process.
  - Step 7** Close the Process Editor and return to the Operations workspace to observe the process status.
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# UCS Director Adapter

The Cisco Process Orchestrator Software Adapter for Cisco UCS Director supports task automation on Cisco Unified Computing System (UCS) Manager instances. It provides activities for service profile management and the collection of Cisco UCS Director statistics and the Cisco UCS Director target.

The Cisco UCS Director Adapter uses real-time available capacity, internal policies, and application workload requirements to optimize availability of the most beneficial or best-suited resources.

The following table displays activities that are provided by the UCS Director adapter. For more information about using these activities, see [Getting Started Using the Cisco UCS Director Adapter, page 12-154](#).

Activity	Comments
Define an operation activity	Select <b>Execute Cisco UCS Director Operation</b> to support any of the other Version 1 JSON-based APIs. These operations accept JSON parameter inputs and produce JSON output.  See <a href="#">Defining a Cisco UCS Director Operation Activity</a> .
Define a task activity	Select <b>Execute Cisco UCS Director Task</b> to support any of the other Version 2 XML task APIs supported by Cisco UCS Director.  See <a href="#">Defining a Cisco UCS Director Task Activity</a> .
Define a workflow activity	Select <b>Execute Cisco UCS Director Workflow</b> to start a Cisco UCS Director workflow.  See <a href="#">Defining a Cisco UCS Director Workflow</a> .
Define a get workflow status activity	Select <b>Get Cisco UCS Director Workflow Status</b> to get the status for a specified Service Request Id.  See <a href="#">Defining a Get Workflow Status Activity</a> .

## Getting Started Using the Cisco UCS Director Adapter

Use the following process to monitor and manage Cisco Unified Computing System (UCS) Director instances.

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- Step 1** Create a Cisco UCS Director target (see [Defining a Cisco UCS Director Operation Activity, page 12-156](#)).
  - Step 2** Define a Cisco UCS Director command activity (see [Automating Cisco UCS Director Task and Workflow Activities, page 12-155](#)).
  - Step 3** View the activity results (see [Monitoring Operations, page 8-1](#)).
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## Defining a Cisco UCS Director Server Target

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- Step 1** Use the Cisco UCS Director Server target to configure the connection information for the UCS Director Directory server that processes and activities will be run against.
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- Step 1** Choose **Definitions > Targets**, right-click, and choose **New > Cisco UCS Director Server**.
- Step 2** Enter the required **General** information.
- Step 3** Enter the Cisco UCS Director server **Connection** information, including:
- Access Cisco UCS Director via Secure Socket Layer (SSL)—Use this option to make your environment secure.
- Step 4** Verify the information on the panel and click **Finish** to close the wizard.
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## Generating the REST XML for a Task Invocation

### Before You Begin

You must be logged in as “admin”.

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- Step 1** In the Cloupia UI, click on your username in the upper right corner.
- Step 2** In the User Information panel, click the **Advanced** tab, then click **Enable Developer Menu (for this session)**.
- Step 3** There is no **OK** button, so just close the window. If you are already looking at Policies > Orchestration, you will need to navigate away and then back to the page.
- Step 4** Choose **Policies > Orchestration > Rest API Browser**. You should get a list of all available tasks for this session.
- Step 5** Browse to a task, then copy and paste the XML into the Process Orchestrator **Execute Cisco UCS Director Task** activity.
- In some cases, such as for GET calls, all you need is the relative URL and the Method (GET).
  - In other cases where there are a lot of inputs, build those inputs in the REST API Browser and then click **Generate XML** to see what the contents of the POST should look like.
- Step 6** Replace items as needed with the Process Orchestrator reference control
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## Automating Cisco UCS Director Task and Workflow Activities

Calling a Cisco UCS Director tasks is different from calling a workflow. Calling a task is similar to using a Process Orchestrator activity. There are several advantages:

- Ease of installation and distribution—The customer can use Cisco automation pack files, which contain Cisco Process Orchestrator workflows
- Use upgrade, customization, licensing, and other capabilities of Cisco automation packs
- Write workflows using Process Orchestrator logical conditions, and so on.

The one disadvantage of calling a Task is that you must know the XML for all of the called tasks. However, there is a relatively easy way to do this using Cisco UCS Director (see [Generating the REST XML for a Task Invocation, page 12-155](#)).

There are advantages to calling a Workflow in Cisco UCS Director as well:

- A workflow allows Process Orchestrator to be used at a customer site where the customer might have already created several Cisco UCS Director workflows.
- There might be some other cases in which a Cisco UCS Director workflow is preferred.

The disadvantages of calling a workflow are that a workflow is not as easy to distribute using the Cisco automation pack files, and it might be more difficult to express certain workflows.

## Defining a Cisco UCS Director Operation Activity

Use the **Execute Cisco UCS Director Operation** activity to support any of the other Version 1 JSON-based APIs. These operations accept JSON parameter inputs and produce JSON output.

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- Step 1** In the Process Editor Toolbox, choose **AMQP > Execute Cisco UCS Director Operation**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Operation** tab and enter the API name, the operation data (JSON), and whether to restart the operation if it is interrupted.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
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## Defining a Cisco UCS Director Task Activity

This activity supports any of the other Version 2 XML task APIs supported by Cisco UCS Director.

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- Step 1** In the Process Editor Toolbox, choose **AMQP > Execute Cisco UCS Director Task**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Operation** tab and enter:
- The URL to be requested (relative or absolute).
    - Relative Url—For example, admin  
If the API leads the relative URL (api/admin), the activity will fail and cause a Resource not found error.
    - Absolute URL—For example, https://172.25.4.131/api/admin/orgs
  - HTTP Method—The HTTP method to be performed on the resource identified by the Request-URI. The method is case-sensitive.
  - Request XML—The request XML. For example:
 

```
<cuicOperationRequest>
<operationType>EXECUTE_VM_COMMAND</operationType>
<payload>
```

```

<![CDATA[
<ExecuteVMCommand>
<!-- Accepts value from the list: vm-->
<vmId>17</vmId>
<userName>test</userName>
<password>test</password>
<commdPath>test</commdPath>
<commdArgs>test</commdArgs>
</ExecuteVMCommand>
]]>
</payload>
</cuicOperationRequest>

```

- Timeout—The timeout time in seconds, minutes, hours, or days.
- Restart when interrupted—Whether to restart the operation if it is interrupted.

**Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

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## Defining a Cisco UCS Director Workflow

This activity starts a Cisco UCS Director workflow with optional specified inputs, and optionally waits for a period of time for the workflow to complete.

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- Step 1** In the Process Editor Toolbox, choose **AMQP > Execute Cisco UCS Director Workflow**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Workflow** tab and enter:
- The workflow name.
  - A list of workflow properties, which consist of substitutable string / type / substitutable encrypted string (can reference encrypted strings like HTTP Request).
  - Whether to restart the operation if it is interrupted.
  - Whether to wait for completion. If configured to wait for completion, this activity will fail if the workflow times out, fails, or is canceled on the Cisco UCS Director side.
- Step 4** Click the **Advanced** tab and enter the required information.
- Step 5** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
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## Defining a Get Workflow Status Activity

Use the **Get Cisco UCS Director Workflow Status** activity to get the status for a specified Service Request Id.

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- Step 1** In the Process Editor Toolbox, choose **AMQP > Get Cisco UCS Director Workflow Status**, then drag and drop the activity onto the Workflow pane.
  - Step 2** Click the **General** tab and enter the required information.
  - Step 3** Click the **Workflow** tab and enter the Service Request Id for the workflow on which you want to receive a status.
  - Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
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# UCS Software Adapter

The Cisco UCS Adapter provides activities for automating tasks on Cisco Unified Computing System (UCS) Manager instances. It provides activities for service profile management and the collection of Cisco UCS statistics, and the Cisco UCS Manager target and Cisco UCS Fault event.

The following table displays activities that are provided by the Cisco UCS adapter. For more information about using these activities, see [Getting Started Using the Cisco UCS Software Adapter, page 12-161](#).

Activity	Comments
Associate UCS Service Profile to Server	Associate a service profile to a server. You can associate the service profile to a server using the server distinguished name, chassis ID and slot ID (for blade servers), rack ID (for C-Series servers), or server pool.  See <a href="#">Defining the Associate UCS Service Profile to Server Activity, page 12-163</a> .
Associate UCS VLAN To vNIC	Assign a UCS VLAN to a vNIC of a service profile.  See <a href="#">Defining the Associate UCS VLAN To vNIC Activity, page 12-165</a>
Bind UCS Service Profile to Template	Bind a service profile to a service profile template.  When you bind the service profile to a template, Cisco UCS Manager configures the service profile with the values defined in the service profile template. If the existing service profile configuration does not match the template, Cisco UCS Manager reconfigures the service profile.  You can only change the configuration of a bound service profile through the associated template.
Boot UCS Server	Boot a UCS blade server or rack-mount server using the service profile associated with it.
Collect UCS Statistics	Collect performance counters from UCS blade servers or rack-mount servers, chassis, fabric interconnects and other components.  See <a href="#">Defining the Associate UCS VLAN To vNIC Activity, page 12-165</a>
Correlate UCS Faults	Correlate UCS faults for the specified fault criteria on the specified UCS Manager target.
Create UCS Configuration Backup	Create a backup copy of the UCS configuration prior to a firmware upgrade.  See <a href="#">Defining the Create UCS Configuration Backup Activity, page 12-166</a>
Create UCS Service Profile from Template	Create a service profile from an existing template.  <a href="#">Defining the Create UCS Service Profile From Template, page 12-164</a>

Delete UCS Service Profile	Delete a service profile. <b>Note</b> The distinguished name should be in the format root/org-Sales/ls-ServiceProfiler1.
Disassociate UCS Service Profile	Disassociate a service profile from a UCS server or blade. <b>Note</b> The distinguished name should be in the format root/org-Sales/ls-ServiceProfiler1.
Disassociate UCS VLAN From vNIC	Disassociate a UCS VLAN from a vNIC of a service profile. <b>Note</b> The distinguished name should be in the format org-root/org-TEO_Test/ls-srvprofz1/ether-1-host-eth-2. <b>Note</b> The VLAN name should be in the format 123.45.67-Test.
Execute UCS Manager Command	Execute an XML-style request on a UCS Manager target and return its output as response text. Example XML command: <pre>&lt;configResolveDn dn="sys/chassis-2/blade-1" inHierarchical="false"&gt;&lt;/configResolveDn&gt;</pre> <a href="#">Defining the Execute UCS Manager Command Activity, page 12-167</a>
Get UCS Blade Server Configuration	Retrieve configuration information on a UCS blade server. <b>Note</b> The distinguished name should be in the format sys/chassis-1/blade-1.
Get UCS C-Series Server Configuration	Retrieve configuration information on a UCS rack-mounted server (C-Series). <b>Note</b> The distinguished name should be in the format sys/rack-unit-1.
Get UCS Fabric Interconnect Configuration	Retrieve the fabric interconnect configuration properties and whether the fabric interconnect components are ready for firmware upgrade. <b>Note</b> The distinguished name should be in the format sys/mgmt-entity-A.
Get UCS Interface Card Configuration	Retrieve interface card configuration properties and whether the interface card components are ready for firmware upgrade. <b>Note</b> The distinguished name should be in the format sys/chassis-1/blade-1/adaptor-1.
Get UCS IO Module Configuration	Retrieve IO module configuration information and whether the IO module components are ready for firmware upgrade. <b>Note</b> The distinguished name should be in the format sys/chassis-1/slot-1.
Get UCS Service Profile Fibre Channel and VSAN Configuration	Retrieve configuration information on a UCS service profile fabric channel and VSAN. <b>Note</b> The distinguished name should be in the format org-root/org-TEO_Test/ls-srvprofz1.
Modify UCS Service Profile	Modify a service profile.  <a href="#">See Defining the Modify UCS Service Profile Activity, page 12-168</a>

Modify UCS VLAN Settings	Modify the VLAN settings on a service profile vNIC. See <a href="#">Defining the Modify UCS VLAN Settings Activity, page 12-170</a>
Reset UCS Server	Reboot a UCS server blade using its service profile. The activity polls the server state until its power state is up. See <a href="#">Defining the Reset UCS Server Activity, page 12-170</a>
Shutdown UCS Server	Power down a server or blade using its service profile. See <a href="#">Defining the Shutdown UCS Server Activity, page 12-171</a>
Unbind UCS Service Profile from Template	Unbind a UCS service profile from a template. <b>Note</b> The distinguished name should be in the format root/org-Sales/ls-ServiceProfiler1.

## Getting Started Using the Cisco UCS Software Adapter

Use the following process to monitor and manage Cisco UCS Software instances.

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- Step 1** Create a Cisco UCS target (see [Creating a Cisco UCS Manager Target, page 12-161](#)).
- Step 2** Define the fault criteria you want to monitor in Cisco UCS Manager (see [Creating a Cisco UCS Fault Trigger, page 12-162](#)).
- Step 3** Define a Cisco UCS command activity.
- In the Process Editor Toolbox, choose **Cisco UCS > [Cisco UCS Activity]**, then drag and drop the activity onto the Workflow pane.
  - Click the **General** tab and enter the required information.
  - Click the **[Activity-Specific]** tabs to define the properties specific to the activity.
  - Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

For details about a specific activity, see [Automating a Cisco UCS Activity, page 12-163](#).

- Step 4** View the activity results (see [Monitoring Operations, page 8-1](#)).
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## Creating a Cisco UCS Manager Target

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- Step 1** Choose **Definitions > Targets > New > Cisco UCS Manager**.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Connection** tab to specify the connection information for the Cisco UCS Manager target, including:
- UCS Manager host name—Enter the IP address or name of the server that hosts the UCS Manager.
  - UCS Manager port number—Port number for connecting to the Cisco UCS Manager target. By default, port 443 is used for SSL protocol and port 80 is used for http connection.
- Step 4** Click the **Options** tab to specify polling information for the UCS Manager target:

- Default timeout for activities—Enter the number of seconds to wait for a UCS activity to fail because it timed out. The default timeout value is 120 seconds.



**Note** In some cases, the timeout will *not* actually cancel at 120 seconds, but at **1800** seconds. The UI on screen might still say 120 seconds and may be ignored.

- UCS faults polling interval—Enter the number of seconds to represent how often the UCS Manager target should be polled for faults. The default value is 60 seconds.
- Wait time for asynchronous UCS commands—Enter the number of seconds to wait for an asynchronous command to fail because it timed out. The default timeout value is 900 seconds.

**Step 5** Enter the information in the remaining tabs as necessary, then click **OK**.

## Specifying Cisco UCS Default Assignment

Perform the following steps to specify the person or group who will be assigned tasks related to Cisco UCS incidents.

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- Step 1** Choose **Definitions > Task Rules**.
- Step 2** Click the **Filter by** link and choose **Automation Pack**, and then choose **Cisco UCS** from the drop-down list to display the task rules that ship with the automation pack.
- Step 3** Right-click the **Cisco UCS Default Assignment** task rule and choose **Properties** to open the Cisco UCS Default Assignment Properties dialog box.
- Step 4** Click the **Assign** tab to specify the user or group that should receive assignments for incidents and alerts generated by the processes, then click **Add** to open the Select Assignee to Add dialog box.
- Step 5** On the Select Assignee to Add dialog box, click the **Reference** tool to select the appropriate variable reference containing the assignee or list of assignees from the Insert Variable Reference dialog box.
- Step 6** Click **OK** to add the assignee to the task rule, then click **OK** to close the dialog box.
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## Creating a Cisco UCS Fault Trigger

In Cisco UCS Manager, a fault represents a failure in the Cisco UCS Manager or an alarm threshold that has been raised. During the lifecycle of a fault, it can change from one state or severity to another. Each fault includes information about the operational state of the affected object at the time the fault was raised. If the fault is transitional and the failure is resolved, the object transitions to a functional state.



**Note** With the high availability feature, every process definition that is executed based on the Cisco UCS Fault trigger, has an associated owning server responsible for monitoring it. To view the server that is assigned the responsibility for the Cisco UCS Manager Fault Monitor, open the Orchestrator Server properties and click the **Responsibilities** tab.

To define the fault criteria for which to monitor in Cisco UCS Manager:



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- Step 1** Choose **Definitions > Processes**, select an existing process, right-click and choose **Edit**, or right-click **Processes** in the navigation pane and choose **New Process**.
- Step 2** On the Process Editor properties, click the **Triggers** tab, then click **New > Cisco UCS Fault**.
- Step 3** Click the **General** tab and enter the required information.
- Step 4** Click the **Faults** tab and enter the required information.
- Step 5** Enter the information in the remaining tabs as necessary, then click **OK**.
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## Automating a Cisco UCS Activity

### Defining the Associate UCS Service Profile to Server Activity

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- Step 1** In the Process Editor Toolbox, choose **Cisco UCS > Associate UCS Service Profile to Server**, click the activity and drag it onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Service Profile** tab to define the properties specific to the activity, including:
- Service profile distinguished name—The distinguished name should be in the format `root/org-Sales/ls-ServiceProfiler1`.
  - Server assignment—Choose the method to be used to associate the service profile to the server. The fields that display depend on the selected method:
    - Server—Choose this option to specify the server name to which to associate the service profile and then specify the following information:
    - Chassis ID—Click this radio button for blade servers; specify the chassis that contains the server to be assigned to the service profile. This option is used to blade servers.
    - Slot ID—Specify the slot ID that contains the server to be assigned to the service profile.
    - Rack ID—Click this radio button for C-Series servers; specify the rack ID that contains the server to be assigned to the service profile. Use the format `sys/rack-unit-{0}` to specify the server distinguished name.
    - Server distinguished name—Choose this option to specify the distinguished name of the server to which to associate the service profile and then specify the following information:
      - Server distinguished name—Specify the distinguished name of the server. For example: `fabric/server/chassis-2/slot-5`
      - Server pool—Choose this option to specify an existing server pool that contains the server to which to associate the service profile and then specify the following information:
        - Server pool—Specify the name of the server pool to which the server is assigned. For example, `CIAC-UCS-Blades`.
        - Server pool qualification—*Optional*. Specify the server pool qualification that is assigned to the servers in the server pool.
  - Restrict migration—Check this check box if you want UCS Manager to perform compatibility checks on the new server before migrating the existing service profile.

- Collect XML output—Check this check box if you want the raw XML output to display on the XML Output instance property page.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
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## Defining the Create UCS Service Profile From Template

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- Step 1** In the Process Editor Toolbox, choose **Cisco UCS > Create UCS Service Profile From Template**, click the activity and drag it onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Service Profile** tab to define the properties specific to the activity, including:
- Template distinguished name—Choose this option to specify the distinguished name from the template that you want to use to create the UCS service profile.
  - Template Organization—Choose this option to specify the Organization name for the service profile.
  - Service profile name—Choose the name for the service profile that will be created.
  - Number of service profiles—Specify the number of service profiles to be created.
  - Expose All Properties—Check this check box if you want all the properties in the template to be used to create the service profile.
  - Collect XML output—Check this check box if you want the raw XML output to display on the XML Output tab.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
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## Defining the Correlate UCS Faults Activity

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- Step 1** In the Process Editor Toolbox, choose **Cisco UCS > Correlate UCS Faults**, click the activity and drag it onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **UCS Fault Criteria** tab to correlate UCS faults for the specified fault criteria on the UCS Manager target, including:
- Correlate UCS faults that occur within—Time interval for which to correlate faults. Choose the number and click the time value (seconds or minutes). Indicate when the correlation should occur (after, before, or before or after) in relation to the process start time.
  - Number of UCS faults to correlate—Specify the number of faults to correlate:
    - All UCS faults in the above time frame—Click this radio button to indicate that all UCS faults that occur within the specified time frame should be correlated.
    - Number of UCS faults—Click this radio button to enter a specific number of faults to correlate.
  - UCS Fault criteria—Check the check box for fault severity level of faults that should be correlated:
    - Critical

- Major
  - Minor
  - Warning
  - Condition
  - Info
  - Cleared
- Match only UCS faults within the following properties—Check the check box for the properties within the fault that should be matched and then specify the criteria.
    - Affected object—Check this check box to match a specific object.
    - Code—Check this check box to match a specific unique identifier assigned to the fault.
    - Description—Check this check box to match a text description of the fault.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
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## Defining the Associate UCS VLAN To vNIC Activity

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- Step 1** In the Process Editor Toolbox, choose **Cisco UCS > Associate UCS VLAN To vNIC**, click the activity and drag it onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Associate VLAN** tab and enter:
- vNIC distinguished name—Specify the distinguished name for the vNIC to which the VLAN will be assigned.
  - VLAN name—Specify the name of the VLAN to be assigned to the vNIC.
  - Native VLAN—Enter True or False to indicate whether the selected VLAN is a native VLAN. You can also use the reference tool to reference the value of another variable.
  - Collect XML output—Check this check box if you want the raw XML output to display on the XML Output instance property page.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

## Defining the Collect UCS Statistics Activity

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- Step 1** In the Process Editor Toolbox, choose **Cisco UCS > Collect UCS Statistics**, click the activity and drag it onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Managed Object** tab and enter:
- Distinguished name contains (\* for all)—Specify the distinguished name of a UCS statistics (for example, sys/switch-A/sysstats). Enter \* to collect all statistics of the server component class.
- The distinguished name format is related to the class name selected. For example, sys/switch-A/systats.

- Class name—The server component for which to retrieve performance data.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
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## Defining the Create UCS Configuration Backup Activity

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- Step 1** In the Process Editor Toolbox, choose **Cisco UCS >Create UCS Configuration Backup**, click the activity and drag it onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Configuration Backup** tab to define the properties specific to the activity, including:
- Type—Choose the type of configuration to be backed up from the drop-down list. The following configuration types are available:
    - Full state—Includes a snapshot of the entire system. You can use this file for disaster recovery if you need to recreate every configuration on a fabric interconnect or rebuild a fabric interconnect.
    - All configuration—Includes all system and logical configuration information.
    - System configuration—Includes all system configuration settings such as user names, roles, and locales.
    - Logical configuration— Includes all logical configuration settings such as service profiles, LAN configuration settings, SAN configuration settings, pools, and policies.
  - Preserve identities—Preserve all identities derived from pools, including the MAC addresses, WWPN, WWNN, and UUIDs.
  - Protocol—The protocol to be used when communicating with the remote server. The following protocols can be used:
    - FTP
    - TFTP
    - SCP
    - SFTP
  - Remote file—The full path to the backup configuration file. This field can contain the filename as well as the path. If you omit the filename, the backup procedure assigns a name to the file.



**Note** You can insert the timestamp into the file name by referencing the output from the Format Date activity. This activity will format the process start time into a data time string and expose a Formatted Date property that can be referenced in the Create UCS Configuration Backup activity (Remote File field)

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- User—The runtime user that should be used to log into the remote server. This field does not apply if the protocol is TFTP.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
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## Defining the Disassociate UCS Service Profile Activity

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- Step 1** In the Process Editor Toolbox, choose **Cisco UCS >Disassociate UCS Service Profile**, click the activity and drag it onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Service Profile** tab to disassociate a service profile from a server or server pool.
- Distinguished name—Click the Browse tool to specify the distinguished name for the service profile.



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**Note** The distinguished name should be in the format root/org-Sales/ls-ServiceProfiler1.

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- Collect XML output—Check this check box if you want the raw XML output to display on the XML Output instance property page.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
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## Defining the Execute UCS Manager Command Activity

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- Step 1** In the Process Editor Toolbox, choose **Cisco UCS >Execute UCS Manager Command**, click the activity and drag it onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Command** tab to execute an XML-style request on a UCS Manager target and return its output as response text.
- UCS XML API command—Enter the UCS Manager XML command request to be executed on the UCS Manager target.
- Step 4** Click the **XML Transform** tab to transform the XML output to a table.
- Row XML element name—The element name of the row to be transformed
  - Columns to read—Specify the columns in the XML output to read. Click Add to specify the column and type of data, and then click OK to add the information to the table.
- Step 5** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
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## Inserting Formatted Date Into Activity

You can insert a timestamp into the UCS Configuration Backup file using the Format Date activity in the process. This activity will format the process start time into a data time string and expose a Formatted Date property that can be referenced in the Create UCS Configuration Backup activity (Remote File field).

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- Step 1** Create a new process that includes the following activities:

- Format Date
  - Create UCS Configuration Backup
- Step 2** In the Process Editor toolkit, choose **Core Activities > Format Date**.
- Step 3** Click the **Format Date** tab, then click **Original date > Reference**.
- Step 4** On the Insert Variable Reference dialog box, expand the Process node and select **Start Time**.
- Step 5** Click **OK** to close the dialog box and insert the variable reference into the Original date field on the Format Date activity properties.
- Step 6** In the Process Editor toolkit, choose **Cisco UCS > Create UCS Configuration Backup**.
- Step 7** Click the Configuration Backup tab, then in the Remote file field, enter a name for the backup file.
- Step 8** Click **Reference** to reference the formatted date exposed from the Format Date activity in the workflow.
- Step 9** On the Insert Variable Reference dialog box, expand the Workflow > Format Date nodes and select **Formatted Date**, then click **OK**.
- Step 10** Complete the remaining fields on the Configuration Backup Properties dialog box and click **Save** to complete the process definition.
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## Defining the Modify UCS Service Profile Activity

### Before You Begin

If the service profile is associated with a template, you must first disassociate the service profile from the template.

- Step 1** In the Process Editor Toolbox, choose **Cisco UCS > Modify UCS Service Profile**, click the activity and drag it onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Service Profile** tab to define the properties specific to the activity, including:
- Service profile distinguished name—Choose the type of profile to be modified (Service Profile or Service Profile Template). The distinguished name should be in the format root/org-Sales/ls-ServiceProfiler1.
  - Profile Properties—List of profile properties and property values to be updated.
  - From the Property name drop-down list, choose the property name and enter the new value in the Property value field. Click **Add to List**. The following selections are available:
    - Agent Policy—The Agent policy that should be included in this service profile.
    - Bios Profile—The BIOS policy that should be included in this service profile.
    - Boot Policy—The type of boot policy that should be included in this service profile. This can be one of the following:
      - Primary—The first address defined for the associated boot device class. A boot policy can only have one primary LAN, SAN, or iSCSI boot location.
      - Secondary—The second address defined for the associated boot device class. Each boot policy can have only one secondary LAN or SAN boot location.

The use of the terms primary or secondary boot devices does not imply a boot order. The effective order of boot devices within the same device class is determined by PCIe bus scan order.

- Description—The user-defined description for this service profile. Enter up to 256 characters. You can use any characters or spaces except ^ (carat), \ (backslash), > (greater than), < (less than), ' (single quote), " (double quote), ` (accent mark), or = (equal sign).
- Dynamic vNIC Connection Policy—Global or Private vNIC connection policy.
- Host Firmware Policy—The name of the host firmware package associated with this profile, if any.
- UUID Pool—The name of the UUID pool that this service profile uses to create a UUID for any server to which it is assigned.
- Local Disk Configuration Policy Name—The name of the associated global local disk policy.
- Mgmt Access Policy Name—The name of the IPMI access profile associated with this service profile, if any.
- Management Firmware Policy—The name of the management firmware package associated with this profile, if any.
- Scrub Policy—The scrub policy that should be included in this service profile.
- Serial over LAN Policy—Name of the selected Serial over LAN policy.
- Stats Policy—The name of the threshold policy associated with service profiles created from this template.
- Status—A brief description of the overall status of the component.
- UUID—The UUID associated with this service profile.
- Vcon Profile Name—Name of the Vcon profile.

If you want to remove a property from the list of Profile properties to be modified, select it and click **Remove**.

For information on the profile properties, refer to the Cisco UCS Manager online help available at:

<http://sjc-ucs-200.tidalsoft.local/ucsm/help/content/Centrale.Introduction.html>

- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

## Defining the Disassociate UCS VLAN from VNC Activity

- Step 1** In the Process Editor Toolbox, choose **Cisco UCS > Disassociate UCS VLAN from VNC**, click the activity and drag it onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Disassociate VLAN** tab to specify the criteria to be used to disassociate a UCS VLAN from a vNIC of a service profile.
- vNIC distinguished name—Click the **Browse** button to specify the distinguished name for the vNIC from which to disassociate the VLAN.



---

**Note** The distinguished name should be in the format org-root/org-TEO\_Test/ls-srvprofz1/ether-1-host-eth-2.

---

- VLAN name—Click the Browse button to specify the name of the VLAN to be disassociated from the vNIC.



---

**Note** The VLAN name should be in the format 123.45.67-Test.

---

- Collect XML output—Check this check box if you want the raw XML output to display on the XML Output instance property page.

**Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

---

## Defining the Modify UCS VLAN Settings Activity

---

**Step 1** In the Process Editor Toolbox, choose **Cisco UCS > Modify UCS VLAN Settings**, click the activity and drag it onto the Workflow pane.

**Step 2** Click the **General** tab and enter the required information.

**Step 3** Click the **VLAN Settings** tab to define the properties specific to the activity, including:

- Service profile distinguished name—Specify the distinguished name for the network card. The distinguished name should be in the format org-root/ls-C1B1/ether-eth1.
- Fabric Id—Choose the fabric interconnect associated with the component (A or B) from the drop-down list.
- Enable failover—Check this check box if you want the vNIC to be able to access the second fabric interconnect if the default fabric interconnect is unavailable.
- VLAN trunking—Check this check box if you want to use VLAN trunking. If this check box is checked, you can select more than one VLAN.
- VLANS—List of selected VLANs to be modified.
- Native VLAN—Indicates whether the selected VLAN is a native VLAN. Select the VLAN in the list and check this check box to indicate that it is a native VLAN.

**Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

---

## Defining the Reset UCS Server Activity

---

**Step 1** In the Process Editor Toolbox, choose **Cisco UCS > Reset UCS Server**, click the activity and drag it onto the Workflow pane.

**Step 2** Click the **General** tab and enter the required information.

**Step 3** Click the **Server** tab to define the properties specific to the activity, including:



- Service profile distinguished name—Specify the distinguished name for the service profile that is associated with the server that is to be rebooted. The distinguished name should be in the format root/org-Sales/ls-ServiceProfiler1.
  - Power cycle—Click this radio button if you want to reset the server by brute force power cycle.
  - Gracefully restart OS—Click this radio button if you want to reset the server by gracefully restarting the operating system. If the Graceful OS Restart is not supported by the OS or it does not occur within a reasonable amount of time, the system will perform a power cycle.
  - Wait for completion of outstanding UCS tasks on the server—Check this check box if you want the operation to wait until any outstanding tasks being performed on the server are completed before restarting the server.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining the Shutdown UCS Server Activity

- Step 1** In the Process Editor Toolbox, choose **Cisco UCS > Shutdown UCS Server**, click the activity and drag it onto the Workflow pane.
- Step 2** Click the **General** tab and enter the required information.
- Step 3** Click the **Server** tab to define the properties specific to the activity, including:
- Service profile distinguished name—Specify the distinguished name for the service profile that is associated with the server that is to be shut down. The distinguished name should be in the format root/org-Sales/ls-ServiceProfiler1.
  - Gracefully shutdown OS—Use a graceful shutdown of the OS to shut down the server. A command is issued with soft-shut-down state.
  - Hard shutdown in case of graceful shutdown failure—If a graceful shutdown of the OS fails, turn off the server using a hard shutdown. If this check box is not checked, the operating system will first be shut down completely, and then the server will be shut down.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
-

# VMware vCloud Director Adapter

VMware® vCloud Director provides role-based access to a Web console that allows the members of an organization to interact with the organization's resources to create and work with vApps and virtual machines. Cisco Process Orchestrator VMware vCloud Director adapter allows you to retrieve data from vCloud data centers.

The vCloud adapter supports vCloud Director 1.5. For users who are on vCloud Director 1.0, use the existing vCloud automation pack.

The following table displays activities that are provided by the VMware vCloud adapter. For more information about using these activities, see [Getting Started Using the VMware vCloud Director Adapter](#).

Activity	Comments
Execute vCloud Command	Sends an HTTP request against a VMware vCloud Director REST API based on a URL and HTTP headers data. See <a href="#">Defining an Execute vCloud Command Activity</a>
Execute vCloud Query	Specifies information about the vCloud queries that you want to find on the target. See <a href="#">Defining an Execute vCloud Query Activity</a>

## Getting Started Using the VMware vCloud Director Adapter

Use the following process to monitor and manage VMware vCloud instances.

- 
- Step 1** Create a VMware vCloud user (see [Defining a VMware vCloud User](#)).
  - Step 2** Define a VMware vCloud target (see [Defining a VMware vCloud Director Server Target](#)).
  - Step 3** Define a VMware vCloud activity (see [Automating VMware vCloud Command Activities, page 12-174](#)).
  - Step 4** View the activity results (see [Filtering Views, page 8-7](#)).
- 

## Viewing Adapter Properties

To view Target properties:

- 
- Step 1** On the Definitions > Targets view, highlight the target, and right-click and choose **Properties**.  
The Properties dialog box displays.
  - Step 2** Click the **Settings** tab to specify the maximum number of rows retrieved when querying the vCloud Director server
  - Step 3** Click **OK**.
-

## Defining a VMware vCloud User

Use the following instructions define the user credentials required to access a vCloud Director server. Use the vCloud User dialog box to specify the credentials for a runtime user record to be used for the configuration and execution of vCloud activities.

- 
- Step 1** Choose **Definitions > Runtime Users**, right-click and choose **New > vCloud User**.
- Step 2** Click the **General** tab and enter the appropriate information, including:
- **Display Name**—Enter the display name for the vCloud user. If left blank, this field will populate with the information specified in the User name text field, but can be overwritten by the user.
  - **Owner**—The owner of the object. This is typically the creator of the object.
  - **User name**—The user name assigned to the user account
  - **Password**—Check the check box and then enter the password to be assigned to the user account. For existing runtime user records, check the check box to enter the new password assigned to the user account.
  - **User type**—Select the appropriate radio button to indicate what level in which to authenticate the user.
    - **System**—System administrators create and provision organizations, while organization administrators manage organization users, groups, and catalogs. If the user type is designated as a System user, then the name will be appended with “@System” when used to authenticate with a vCloud server.
    - **Organization**—Users authenticate at the organization level, supplying credentials established by an organization administrator when the user was created or imported. If the user type is designated as organization, then the specified organization will be appended to the user name (for example, @Cisco”).
- Step 3** Click **OK** to close the dialog box.
- 

## Defining a VMware vCloud Director Server Target

Use the VMware vCloud Director Server target to configure the connection information to a vCloud Directory server to be used for process and activities to run against.

- 
- Step 1** Choose **Definitions > Runtime Users**, right-click and choose **New > VMware vCloud Director Server**.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** On the **Connection** panel, enter the appropriate target information to specify the connection information to the appropriate vCloud server, and click **Next**.
- **vCloud Directory server name**—Enter the host name or IP address or the public REST API address (as configured in vCloud Director) for the vCloud Director server target.
  - **Override URL**—Enter the appropriate URL to use to override the base URL for execution. For example:  
http://172.21.45.210  
The format is:

http://<servername>

- Ignore Secure Socket Layer(SSL) certificate error—Check this check box to indicate the target should ignore certificate errors when attempting to connect to the service portal.
- Default runtime user—Select this radio button to specify the runtime user required to execute a process or activity against this target.

**Step 4** Verify the information on the panel and click **Finish** to close the wizard.

---

## Automating VMware vCloud Command Activities

### Defining an Execute vCloud Command Activity

Use the Execute vCloud Command activity to send a HTTP request against a VMware vCloud Director REST API based on a URL and HTTP headers data.

This activity supports generic HTTP operations, such as POST and GET, and is used to retrieve a web page and then examine the results to ensure there are no errors.

**Step 1** In the Process Editor Toolbox, choose **VMware vCloud Director > Execute vCloud Command** and drag and drop the activity onto the Workflow pane.

**Step 2** Click the **General** tab and enter the appropriate information.

**Step 3** Click the **Request** tab and specify the appropriate information, including:

- Relative URL—Enter the URL to be requested. This URL can be a relative URL or absolute URL. For example:
  - Relative URL:  
admin  
If API leads the relative URL (api/admin), then the activity will fail and cause a *Resource not found error*.
  - Absolute URL:  
https://172.25.4.131/api/admin/orgs
- Method—The method to be performed on the resource identified by the Request-URI. The method is case-sensitive. For a list of common header methods, see HTTP Header Methods.
- Content type—The value for the content type used to define the structure of the output.
- Request—Enter any additional HTTP request details using XML format.
- When request creates a task, wait for its completion (in seconds)—Check the check box to indicate that when a task request using methods, PUT, POST, DELETE, the time period the activity should wait for the completion of the task before continuing.

In the enabled text box, enter the time period the activity should wait for the task. Click the time unit link to change the time interval.

- Archive request upon successful completion—Check the check box to indicate whether to archive the data request after the successful completion of the activity.

If the check box remains unchecked, the data generated by the activity is removed from the database upon successful completion of the activity.

- Restart activity if interrupted—Check this check box to indicate the activity should resume after an interruption in the execution.

If the check box remains unchecked, then the activity remains paused if there is an interruption in the execution.

- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining an Execute vCloud Query Activity

Use the Execute vCloud Query activity to execute vCloud Director API queries against a vCloud Director Server. The query activity provides a flexible way to retrieve information from the vCloud Director Server and allows for more efficient access to the vCloud Director database. Additional key benefits include:

- Paginated results
  - Filtering criteria
  - Multiple output formats
  - Typed and packaged queries
- 

- Step 1** In the Process Editor Toolbox, choose **VMware vCloud Director > Execute vCloud Query**, then drag and drop the activity onto the Workflow pane.

- Step 2** Click the **General** tab and enter the appropriate information.

- Step 3** Click the **ExecuteQuery** tab and enter the appropriate information, including:

- Relative Url—The URL against which the HTTP request is made. It can be relative or absolute. If it is relative, the “api” url for the target is prepended to the configured value. Relative URLs are more flexible because they are not tied to a particular environment
- Columns—The list of columns included in the results. If this field is blank, all columns are included. Naming columns explicitly has two key benefits:
  - Scalability—The data is restricted to only what you need
  - Convenience—The columns (their names) are identified to any following activities in the process
- Fetch all results—Indicates that all results will be fetched, even if they span multiple pages. If this field is not selected, only the page defined by the query will be returned.

- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
-

## VMware vCenter, ESX, and ESXi Adapter

The Cisco Process Orchestrator VMware vSphere adapter connects a virtual infrastructure (VMware vCenter and ESX server) and automates the process of managing virtual machines and their hosts based on specific criteria. Using the VMware vSphere adapter, you can set up a HTTP/HTTPS connection to the ESX/ESXi Server and vCenter Server.

For the VMware vSphere adapter prerequisites, see the *Cisco Process Orchestrator Compatibility Matrix*.

Although the VMware vSphere Adapter software is already installed as part of a normal installation of Cisco Process Orchestrator, you should perform the configuration steps in this topic before attempting to execute any VMware objects in Process Orchestrator (see [Configuring the VMware vSphere Adapter](#)).

The following table displays the configuration activities provided by the VMware vSphere adapter. For more information about using these activities, see [Getting Started Using the VMware vSphere Adapter](#).

Activity	Description
Add Optical Drive To VM	Add an optical drive to a specified virtual machine. See <a href="#">Adding an Optical Drive to a Virtual Machine</a>
Add Physical Adapter	Add hosts and physical adapters to a vNetwork Distributed Switch at the vDS level after the vDS has been created. See <a href="#">Adding a Physical Adapter to a vSphere Distributed Switch</a>
Add VM Hard Disk	Add a hard disk to a specified virtual machine See <a href="#">Adding a Hard Disk to a Virtual Machine</a> .
Add VM Network Adapter	Add a network adapter to a specified virtual machine. See <a href="#">Adding a Network Adapter to a Virtual Machine</a>
Clone VM	Clone a specified virtual machine See <a href="#">Cloning a Virtual Machine</a>
Create Folder	Create a new folder within the VMware infrastructure inventory See <a href="#">Creating a Folder</a>
Create New VM	Create a new virtual machine See <a href="#">Creating a New Virtual Machine</a>
Customize Linux VM	Customize the Linux operation system of a specified virtual machine See <a href="#">Customizing the Linux OS of a Virtual Machine</a>
Customize Windows VM	Customize a Windows operating system of a specified virtual machine See <a href="#">Customizing the Windows OS of a Virtual Machine</a>
Delete VM	Remove a virtual machine from the inventory or deletes a virtual machine: See <a href="#">Deleting a Virtual Machine</a>
Enumerate Datastores	Retrieves all datastores configured within the specified VMware infrastructure See <a href="#">Retrieving the Datastores in a Virtual Machine</a>
Enumerate Networks	Retrieves all networks configured within the specified VMware infrastructure See <a href="#">Retrieving the Networks in a Virtual Machine</a>

Enumerate Resource Pools	Retrieves all resource pools configured within the VMware infrastructure. See <a href="#">Retrieving the Resource Pools in a Virtual Machine</a>
Migrate VM	Migrates a specified virtual machine from one server to another server See <a href="#">Migrating a Virtual Machine</a>
Query VM Devices	Queries the list of devices on a specified virtual machine See <a href="#">Querying the List of VM Devices on a Virtual Machine</a>
Query VM Network Adapters	Queries information about network adapters configured for a specified virtual machine See <a href="#">Querying the Network Adapters on a Virtual Machine</a>
Query VM Properties	Queries the properties of a specified virtual machine See <a href="#">Querying the Properties of a Virtual Machine</a>
Query VMs	Queries the virtual machines on a given ESX server or vCenter server See <a href="#">Querying the Virtual Machines on an ESX or vCenter Server</a>
Reconfigure VM	Reconfigures the memory, number of CPUs allocated, and other settings See <a href="#">Reconfiguring the Virtual Machine on an ESX or vCenter Server</a>
Relocate VM	Relocates a specified virtual machine from one server to another server See <a href="#">Relocating a Virtual Machine</a>
Remove VM	Removes a device from a specified virtual machine See <a href="#">Removing a Virtual Machine from a vCenter Server</a>
Update VM Hard Disk	Updates configuration of a specified hard disk on a specified virtual machine. See <a href="#">Updating a Hard Disk on a Virtual Machine</a>
Update VM Network Adapter	Updates network adapter properties on a virtual machine See <a href="#">Updating a Network Adapter on a Virtual Machine</a>
Upgrade VM Hardware	Upgrades the virtual machine's virtual hardware to the latest revision that is supported See <a href="#">Upgrading the Hardware on a Virtual Machine</a>
Upgrade VM Tools	Upgrades the VMware Tools on a Windows virtual machine using the VMware Tools installer See <a href="#">Upgrading the VM Tools on a Windows Virtual Machine</a>

## Getting Started Using the VMware vSphere Adapter

Use the following process to monitor and manage VMware vSphere adapter instances.

- 
- Step 1** Create the VMware vSphere Adapter targets (see [Managing VMware vSphere Targets](#)).
  - Step 2** Define a VMware vSphere Adapter message triggers (see [Managing VMware Triggers](#)).
  - Step 3** Define a VMware vSphere Adapter command activity (see [Automating VMware vSphere Activities](#)).
  - Step 4** View the activity results (see [Filtering Views, page 8-7](#)).
-

## Configuring the VMware vSphere Adapter

### Configuring the ESX HTTPS Protocol

Configure the VMware vCenter and ESX Servers using the HTTPS protocol. The default configuration is *HTTPS*. If your environment is configured to use HTTP, these steps can be ignored.

---

**Step 1** In My Computer, use the following file path to open the config.xml file.

```
/etc/vmware/host/config.xml
```

**Step 2** Under the <proxyDatabase> tag, modify the **/sdk namespace** in the <http> and <https> sections to switch the redirect from HTTP to HTTPS.

**Step 3** Save the configuration.

**Step 4** To restart the service, enter:

```
service mgmt.vmware restart
```

---

### Configuring the Keystore Password

The VMware vSphere Adapter requires security certificates for all target servers that use HTTPS protocol for connection. Use the Keystore tab to enter the password that protects the Java Keystore file used to keep SSL certificates for all configured VMware targets.

For new installations, this password can be set to a keytool password, which must be six characters or more. For installation upgrades, this password must be set to the password that is already used to protect the previously configured keystore file.

---

**Step 1** Choose **Administration > Adapters**, highlight VMware vSphere Adapter, right-click and choose **Properties**.

**Step 2** Click the **Keystore** tab > **Keystore password**, then enter the key file password that provides access to the file.

**Step 3** Click **OK** to close the dialog box.

After the Keystore password is set, the VMware vSphere Adapter will automatically import the required certificates into a Java Keystore.

---

### Configuring VMware vCenter HTTPS Protocol

The VMware vCenter and ESX Servers should be configured to use HTTPS protocol. The default configuration is *HTTPS*. If your environment is configured to use HTTP, these steps can be ignored.

---

**Step 1** In My Computer, use the following file path to open the vpxd.cfg file.

```
C:\Documents and Settings\All Users\Application Data\VMware\VMware VirtualCenter
```

**Step 2** Under the <proxyDatabase> tag, modify the **/sdk namespace** in the <http> and <https> sections to switch the redirect from HTTP to HTTPS.

**Step 3** Save the configuration.



- Step 4** To restart the VirtualCenter service, choose **Start > All Programs > Administration > Services**.
- 

## Configuring IP Address Settings

Use the IP Address dialog box to configure the IP address settings for the network.

---

- Step 1** Choose the **Network** tab, then click **New**.

- Step 2** Select one of the following options:

- Use DHCP to obtain an IP address automatically—Use the DHCP server to obtain the IP address for the computer.
  - Use an application configured on vCenter to generate the IP address—Enter the following information:
    - The argument to the application that can generate the IP address automatically
  - Use the following IP setting—Enter the following information:
    - IP Address—IP address assigned to the network
    - Subnet mask—The numeric mask used to determine the subnet that an IP address belongs to on the network
    - Default gateway—Gateway in the network that a computer will use to access another network if a gateway is not specified for use
    - Alternate gateway—Alternate gateway in the network that a computer will use to access another network if the default gateway is not available
- 

## Configuring Network Properties

Use the Network Properties dialog box to configure the IP address and DNS Server settings for the network.

---

- Step 1** Choose the **Network** tab, then click **New**.

- Step 2** In the **IP Address** section, select one of the following options:

- Use DHCP to obtain an IP address automatically—Use the DHCP server to obtain the IP address for the computer.
- Use the following IP setting—Enter the following information:
  - IP Address—IP address assigned to the network
  - Subnet mask—The numeric mask used to determine the subnet that an IP address belongs to on the network
  - Default gateway—Gateway in the network that a computer will use to access another network if a gateway is not specified for use
  - Alternate gateway—Alternate gateway in the network that a computer will use to access another network if the default gateway is not available

- Step 3** In the **DNS Server** section, select one of the following options:

- Use DHCP to obtain an IP address automatically—Use DHCP to obtain the IP address for the queried VM network.
- Select this radio button and then enter the appropriate information in the following text fields:
  - Preferred DNS server—Preferred IP address of a DNS server
  - Alternate DNS server—Alternate IP address of a DNS server that is used when the preferred IP address is not available

## Selecting a Managed Object

Use the Select Managed Objects dialog box to retrieve the inventory path of an object residing on a specified VMware target.

To select an object from a defined target:

- 
- Step 1** To the right of the field on the VMware activity field, click **Browse** to launch the Select Managed Objects dialog box to query the appropriate managed object on a specified target.
  - Step 2** From the drop-down list, select the appropriate target from the drop down list to display the managed objects.
  - Step 3** To the left of a folder, click **Expand (+)** to view additional objects for selection.
  - Step 4** Select a valid object from the list, and click **OK**. The OK button remains disabled until a valid object is selected.
- 

## Managing VMware vSphere Targets

The VMware virtual infrastructure targets (such as a VMware vCenter or ESX server) represent a connection to a given VMware virtual infrastructure.

The following table provides a list of the targets that are associated with the adapter.

Target	Description
VMware vSphere Hypervisor	Establishes connection to a standalone ESX server. See <a href="#">Defining a VMware vSphere Hypervisor Target, page 12-180</a>
VMware vCenter Server	Establishes connection to vCenter server See <a href="#">Defining a VMware vCenter Server Target, page 12-181</a>

## Defining a VMware vSphere Hypervisor Target

VMware ESX and VMware ESXi are "bare-metal" hypervisors, and are installed directly on top of the physical server and partitioned into multiple virtual machines that can run simultaneously, sharing the physical resources of the underlying server.

The ESX/ESXi Server and host have a one-to-one correspondence. Use the VMware vSphere Hypervisor target to specify the connection information to an ESX/ESXi server.

- 
- Step 1** Choose **Definitions > Targets**, right-click and choose **New > VMware vSphere Hypervisor**, then enter the required information.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Connection** tab and enter the appropriate information, including:
- ESX server name—Fully-qualified domain name (FQDN) or IP address of the ESX/ESXi server  
The Power Up Host and Power Down Host activities can only be performed against the ESX/ESXi Server.
  - ESX service port—Port number used to access the ESX/ESXi server (Default: 443)
- Step 4** Click **OK** to close the dialog box and complete the procedure.
- 

## Defining a VMware vCenter Server Target

vCenter Server provides unified management of all the hosts and VMs in your datacenter from a single console with an aggregate performance monitoring of clusters, hosts and VMs.

Use the VMware vCenter Server target to specify the connection information to the VMware server.

- 
- Step 1** Choose **Definitions > Targets**, then right-click and choose **New > VMware vCenter Server**.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Connection** tab and enter the appropriate information, including:
- vCenter server name—Fully-qualified domain name (FQDN) or IP address of the virtual server
  - vCenter service port—Port number used to access the virtual server (Default: 443)
- Step 4** Click **OK** to close the dialog box and complete the procedure.
- 

## Managing VMware Triggers

The following table provides a list of the triggers that are associated with the VMware vSphere Adapter. The triggers that are available depend on what adapters are installed.

Trigger	Description
VMware Host Performance Event	Monitors the performance for a ESX host See <a href="#">Defining a VMware Host Performance Event Trigger</a>
VMware Virtual Machine Performance Event	Monitors the performance for a ESX virtual machine See <a href="#">Defining a VMware Virtual Machine Performance Event Trigger</a>
VMware Virtual Machine Power Event	Monitors the power state changes of a virtual machine See <a href="#">“Defining a VMware Virtual Machine Power Event Trigger” section on page 12-183</a>

## Defining a VMware Host Performance Event Trigger

Use the VMware Host Performance Event trigger to specify the performance criteria for the ESXi server to be monitored and used to trigger an event that must be matched to trigger the process.

- 
- Step 1** On the Triggers tab, click **New > VMware > VMware Host Performance Event**.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Host Performance Event** tab and enter the appropriate trigger information, including:
- **ESX host**—Inventory path to the performance monitored host server or host server where the monitored virtual machine resides. The information in this field is case-sensitive.  
Wildcards can be used in this field.
  - **Performance counter**—Click **Browse** to launch the Performance Event dialog box to select the appropriate counter to monitor for the virtual machine.  
For example, the counter with the name "usage" for the "cpu" group of performance counters is *CPU\_Usage*.
  - **Statistic**—The type of statistical values that are returned for the counter.
    - **Latest**—Most recent value of the performance counter over the summarization period
    - **Minimum**—Minimum value of the performance counter value over the summarization period
    - **Maximum**—The maximum value of the performance counter value over the summarization period
    - **Average**—The actual value collected or the average of all values collected during the summary period
  - **Comparison**—Select the performance calculation operator to use for matching.  
For information on the displayed operators, see [Comparison Operators](#).
  - **Expression**—Expression associated with the selected operator
  - **Unit**—The unit for the values of the performance counter (such as KBps or MHz)
  - **Sample size**—Enter the number of samples to be returned by the trigger
  - **Interval (in seconds)**—Enter the interval, in seconds, for the performance statistics
- Step 4** Enter the information in the remaining tabs as necessary, then click **OK**.
- 

## Defining a VMware Virtual Machine Performance Event Trigger

Use the VMware Virtual Machine Performance Event trigger to specify the performance counter criteria for the virtual machine of the ESXi server to be monitored and used to trigger an event that must be matched to trigger the process.

- 
- Step 1** On the Triggers tab, click **New > VMware > VMware Virtual Machine Performance Event**.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **VMware Virtual Machine Performance Event** tab to enter the appropriate trigger information, including wildcard expressions.

- Virtual Machine—Inventory path to the virtual machine to be monitored for the event. The information in this field is case-sensitive.

Wildcards can be used in this field. .

For information about other fields in this tab, see [Defining a VMware Host Performance Event Trigger](#)

**Step 4** Enter the information in the remaining tabs as necessary, then click **OK**.

---

## Defining a VMware Virtual Machine Power Event Trigger

Use the VMware Virtual Machine Power Event trigger to specify the criteria for the vCenter to monitor the power state of a virtual machine changes to that specified in the event.

**Step 1** On the Triggers tab, click **New > VMware > VMware Virtual Machine Power Event**.

**Step 2** Click the **General** tab and enter the appropriate information.

**Step 3** Click the **VMware Virtual Machine Power Event** tab to enter the appropriate trigger information, including:

- Power state—Select the power state that will trigger the event:
  - Powered On—When the virtual machine and the guest operating system that automatically starts up on system boot is *Powers up*.
  - Tools Running—Triggered when the VMware tools state is running.
  - Powered Off—Powers down the virtual machine. The virtual machine does not attempt to gracefully shut down the guest operating system.
  - Suspended—Pauses the virtual machine activity. All transactions are frozen until the *Resume* command is executed.
  - Any State Change—Process is triggered when power changes to any state.
- Check trigger connect—Check this check box to trigger the condition is detected upon connection to the VMware infrastructure server.

If the Power State is *Powered On*, the event based upon connection to the VMware infrastructure server.

For information about other fields in this tab, see [Defining a VMware Host Performance Event Trigger](#)

**Step 4** Enter the information in the remaining tabs as necessary, then click **OK**.

---

## Selecting Performance Counters to Monitor

When configuring a VMware performance event trigger, you must select performance counters to monitor the trigger. Click **Browse** on the VMware performance event triggers to specify the performance counters for the trigger.

**Step 1** Choose the **Performance Event** tab, then to the right of the Performance Counter field, click **Browse**.

**Step 2** From **Use the following VMware vCenter or ESXi server**, select the appropriate server.

To create a new VMware target containing the appropriate counters, click **New [Target]**.

- Step 3** Highlight the appropriate performance counter, and click **OK** to select the performance counter to display in the Performance Counter field on the trigger.
- 

## Automating VMware vSphere Activities

### Adding an Optical Drive to a Virtual Machine

Use the Add Optical Drive to a VM activity to add an optical drive to a specified virtual machine.

---

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Add Optical Drive to VM**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Optical Drive** tab and specify the inventory path to the virtual machine. The information in this field is case-sensitive. For example:
- ```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

### Adding a Physical Adapter to a vSphere Distributed Switch

You can add hosts and physical adapters to a vNetwork Distributed Switch at the vDS level after the vDS is created.

---

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Adding a Physical Adapter to a vSphere Distributed Switch**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Add Physical Adapter** tab and enter the inventory path to the physical adapter and to the host (for example, TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02). The information in this field is case-sensitive.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

### Adding a Hard Disk to a Virtual Machine

Use the Add VM Hard Disk activity to add a hard disk to a specified virtual machine.

---

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Add VM Hard Disk**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.

- Step 3** Click the **Hard Disk Settings** tab and enter the inventory path to the virtual machine. The information in this field is case-sensitive. For example:
- TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
- Step 4** Choose the appropriate type of virtual hard disk to be added and enter the appropriate information:
- To create a new virtual disk from original settings, choose **Type > Create a new virtual disk** and specify the following properties:
    - Provisioned Size—Enter the size of the new virtual disk. From the Unit drop-down list, select the appropriate unit size for the disk.
      - MB—Megabyte (1024 KB)
      - GB—Gigabyte (1024 MB)
      - TB—Terabyte (1024 GB)
    - Disk Provisioning—Indicates that the disk space should be provisioned and how the resources should be allocated or supported.
      - Allocate and commit space on demand (Thin provisioning)—Indicates that a certain amount of storage space on a datastore should be allocated to the virtual disk files
      - Supporting clustering features such as Fault Tolerance—Indicates the virtual disk can support a cluster of hosts in the virtual environment.
  - To add an existing virtual disk file, choose **Type > Use an a existing virtual disk** and specify the following properties:
    - Disk file path—Enter the virtual disk datastore path to the existing disk file.
    - Virtual device node—Enter the device node of the cluster.
  - To create a file that points the data to the raw LUN, choose **Type > Raw Device Mappings** and specify the following properties:
    - Target LUN—Enter the inventory path to the target LUN mapping file.
    - Location—Select the appropriate location for the hard disk.
    - Compatibility—Select the appropriate virtual disk compatibility mode.
      - Physical—Allows the guest operating system to access the hardware directly. Physical compatibility is useful if you are using SANaware applications in the virtual machine. LUNs attached to powered-on virtual machines and configured for physical compatibility cannot be migrated if the migration involves copying the disk. Such LUNs cannot be cloned or cloned to a template. You can migrate the mapping file.
      - Virtual—Allows the virtual machine to use VMware snapshots and other advanced functions. Virtual compatibility allows the LUN to behave as if it were a virtual disk, so that you can use features like disk modes. When you clone the disk or make a template out of it, the contents of the LUN are copied into a .vmdk virtual disk file. When you migrate a virtual compatibility mode RDM, you can migrate the mapping file or copy the contents of the LUN into a virtual disk.
    - Virtual device node—Enter the device node of the cluster.
  - For all virtual hard disks, specify the following information:
    - Mode:
      - Independent\_nonpersistent—The disk appears to operate normally, but whenever the virtual machine is powered off or reverted to a snapshot, the contents of the disk return to their original state. All later changes are discarded.

- independent\_persistent—The disk operates normally except that changes to the disk are permanent even if the virtual machine is reverted to a snapshot.
- persistent—All disk writes issued by software running inside a virtual machine are immediately and permanently written to a virtual disk that is configured as an independent disk.
- Time out if not completed within—Check the check box and enter the time period the activity should wait for completion before failing. Click the time unit link to change the time interval

**Step 5** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

---

## Adding a Network Adapter to a Virtual Machine

Use the Add VM Network Adapter activity to add a network adapter to a specified virtual machine.

---

**Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Add VM Network Adapter**, then drag and drop the activity onto the Workflow pane.

**Step 2** Click the **General** tab and enter the appropriate information.

**Step 3** Click the **Network Adapter Settings** tab and specify the following properties:

- Virtual machine—Enter the inventory path to the virtual machine. The information in this field is case-sensitive. For example:  

```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```
- Adapter type—select the appropriate network adapter type.
  - E1000—Emulates the functioning of an E1000 network card. It is the default adapter type for virtual machines that run 64-bit guest operating systems.
  - Flexible—Supported on virtual machines that were created on ESX Server 3.0 or greater and that run 32-bit guest operating systems.
  - Vlance—An emulated version of the AMD 79C970 PCnet32- LANCE NIC, an older 10Mbps NIC with drivers available in most 32-bit guest operating systems except Windows Vista and later.
  - VMXNET—This virtual network adapter has no physical counterpart and is optimized for performance in a virtual machine. Because operating system vendors do not provide built-in drivers for this card, VMware Tools must be installed to have a driver for the VMXNET network adapter available.
  - VMXNET 2—The VMXNET 2 adapter is based on the VMXNET adapter but provides some high-performance features commonly used on modern networks, such as jumbo frames and hardware offloads. This virtual network adapter is available only for some guest operating systems on ESX/ESXi 3.5 and later. VMXNET 2 is supported only for a limited set of guest operating systems
  - VMXNET 3—The VMXNET 3 adapter offers all the features available in VMXNET 2, and adds several new features like multiqueue support, IPv6 offloads, and MSI/MSI-X interrupt delivery. VMXNET 3 is supported only for virtual machines version 7 and later, with a limited set of guest operating systems
- Network—Enter the inventory path of the virtual network to use for this adapter.
- Connect on power on—Check this check box to indicate that the host should be connected when it was started.



- Time out if not completed within—Check the check box and enter the time period the activity should wait for completion before failing.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Cloning a Virtual Machine

Use the Clone VM activity to clone a virtual machine.

---

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Clone VM**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Clone Virtual Machine** tab to specify the appropriate information, including:
- Virtual machine—Enter the inventory path to the virtual machine. The information in this field is case-sensitive. For example:  
`TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`
  - Computer name—Name address of the Linux computer
  - Domain—Fully-qualified domain name for Linux computer
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Creating a Folder

Use the Create Folder activity to create a new folder within the VMware infrastructure inventory so that objects can be created or moved into the new folder.

---

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Create Folder**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Folder** tab and enter the appropriate information, including:
- Parent folder—Inventory path to the parent folder in the VMware infrastructure. The information in this field is case-sensitive. For example:  
`TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`
  - New folder name—Enter the name of the new folder to be created on the virtual machine.
  - Folder type—select the appropriate type of folder.
    - Hosts and Clusters—Identifies a folder containing clusters and hosts
    - Virtual Machines and Templates—Identifies a virtual machine folder. A virtual machine folder may contain child virtual machine folders. It also can contain VirtualMachine managed objects, templates, and VirtualApp managed objects

- Datastores—Identifies a datastore folder. Datastore folders can contain child datastore folders and Datastore managed objects. A collection of references to the subset of datastore objects in the datacenter that is used by this virtual machine
- Networking—Identifies a network entity folder. Network entity folders can contain Network, DistributedVirtualSwitch, and DistributedVirtualPort managed objects.

**Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

---

## Creating a New Virtual Machine

Use the Create New VM activity to create a new virtual machine on a specified vCenter server or ESX host.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere Adapter > Create New VM**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Settings** tab and enter the appropriate information, including:
- Virtual machine—Inventory path to the virtual machine to be created. The information in this field is case-sensitive. For example:  
`TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`
  - Inventory location—Inventory file path to the virtual machine folder
  - Host—Inventory path of the host on which the new virtual machine will run. The information in this field is case-sensitive.
  - Resource pool—Inventory path of the target resource pool for the virtual machine. The information in this field is case-sensitive.  
If the default resource pool for the server is used, the virtual machine's current pool is used as the target pool.
  - Datastore—Inventory path to the storage location for the virtual machine files, such as a physical disk, a RAID, or a SAN.
  - Guest operating system—The appropriate operating system on which the virtual machine will run.
  - Virtual disk size (GB)—Disk space allocated for the virtual disk.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Customizing the Linux OS of a Virtual Machine

Use the Customize Linux VM activity to customize the Linux operation system of a specified virtual machine.

### Before You Begin

The Customize Linux VM activity has several activity-specific tabs included with the default Process Orchestrator activity configuration tabs. Please ensure that all tabs are configured properly before attempting to execute the process.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere >Customize Linux VM**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Computer Name** tab and enter the appropriate information, including:
- Virtual machine—Inventory path to the virtual machine to be created. The information in this field is case-sensitive. For example:  
`TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`
  - Inventory location—Inventory file path to the virtual machine folder
  - Host—Inventory path of the host on which the new virtual machine will run. The information in this field is case-sensitive.
  - Resource pool—Inventory path of the target resource pool for the virtual machine. The information in this field is case-sensitive.  
 If the default resource pool for the server is used, the virtual machine's current pool is used as the target pool.
  - Datastore—Inventory path to the storage location for the virtual machine files, such as a physical disk, a RAID, or a SAN.
  - Guest operating system—The appropriate operating system on which the virtual machine will run.
  - Virtual disk size (GB)—Disk space allocated for the virtual disk.
- Step 4** Click the **Network** tab to specify the type of network settings to apply to the guest operating system:
- Typical settings—Allow the vCenter Server to configure all network interfaces from a DHCP server.
  - Custom settings—Enable manual configuration of the network interface settings.
- Step 5** Click the **DNS and Domain** tab to configure the domain name server properties for the specified Linux virtual machine:
- Primary DNS—The primary name server computer for where the record of the domain name is stored.
  - Secondary DNS—The name server computer that will be used if the primary DNS server is not available.
  - Tertiary DNS—The name server to manage the DNS independently from the domain registrar.
  - DNS search path—The domain name(s) to try when trying to translate a machine name into an IP address. Click **Add** after each domain name to add to the list in the Domain Name column.
- Step 6** Click the **Time Zone** tab to configure the time zone for the network for the specified Linux virtual machine.
- Step 7** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
-

## Customizing the Windows OS of a Virtual Machine

Use the Customize Windows VM activity to customize a Windows operating system of a specified virtual machine.

According to VMware's KB 1005593 article, [Sysprep file locations and versions](#), users must install Microsoft Sysprep files on the vCenter server before customizing certain versions of Windows.

### Before You Begin

The Customize Windows VM activity has several activity-specific tabs included with the default Process Orchestrator activity configuration tabs. Please ensure that all tabs are configured properly before attempting to execute the process.

**Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Customize Windows VM**, then drag and drop the activity onto the Workflow pane.

**Step 2** Click the **General** tab and enter the appropriate information.

**Step 3** Click the **Computer Name** tab and enter the appropriate information, including:

- Virtual machine—The inventory path to the virtual machine. The information in this field is case-sensitive. For example:

```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```

- Computer name—The full computer name.
- Enter the registration information:
  - Name—Name of the owner to whom this OS should be registered
  - Organization—Organization to which this OS should be registered
- Enter the password information, including the new password that VMware will use to set the Administrator's password.
- Enter the time zone information.

**Step 4** Click the **Domain** tab and enter the appropriate information, including:



**Note** For security reasons, you might want to choose a runtime user with the appropriate credentials rather than entering a password.

- Add computer to a workgroup—Select this radio button and in the text field, enter the workgroup name.
- Add computer to a windows domain—Select this radio button and in the text field, enter the full domain name. Select the appropriate radio button to determine the credentials for the user account used to join computer to the domain.
- Use credentials of the following runtime user—Select the appropriate runtime user account. Select the default runtime user from the drop-down list.

**Step 5** Click the **License** tab to enter the product key and pertinent licensing information for the Windows operating system for the specified virtual machine:

- Product Key—Enter the product key for the Windows operating system.
- Include Server License Information (Required for customizing a server guest OS)—Check this check box to indicate server information is required and to enable the server license mode fields and select the appropriate license mode.

- Server License Mode—Select the appropriate software license mode for the Windows server.
    - Per seat—Software license mode based on the number of individual users who have access to the software
    - Per server—Software license mode based on the number of connections using the Windows server
      - When choosing Per server, enter the number of maximum number of connections allowed to the Windows server in the Maximum Connections field
- Step 6** Click the **Run Once** tab to enter the commands to run in the specified virtual machine at the end of the customization process:.
- Step 7** Click the **Network** tab to use the typical settings, which allow the vCenter Server to configure all network interfaces from a DHCP server, or to enable manual configuration of the network interface settings.
- Step 8** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Deleting a Virtual Machine

Use the Delete VM activity to:

- Remove from inventory (VM can be restored)—This option removes the virtual machine from the inventory but leaves all files and snapshots and allows the VM to be restored.
- Permanently delete all VM files (including snapshot)—This option deletes all VM files including any snapshots, and the virtual machine cannot be restored.

## Retrieving the Datastores in a Virtual Machine

Use the Enumerate Datastores activity to retrieve all datastores configured within the specified VMware infrastructure.

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Enumerate Datastores**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Datacenter** tab and enter the appropriate information, including the inventory path to the datacenter name containing the datastores. The information in this field is case-sensitive.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Retrieving the Networks in a Virtual Machine

Use the Enumerate Networks activity to retrieve all networks configured within the specified VMware infrastructure.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Enumerate Networks**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Datacenter** tab and enter the appropriate information, including the inventory path to the datacenter name containing the datastores. The information in this field is case-sensitive.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Retrieving the Resource Pools in a Virtual Machine

Use the Enumerate Resource Pools activity to retrieve all resource pools configured within the VMware infrastructure.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Enumerate Resource Pools**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Datacenter** tab and enter the appropriate information, including the inventory path to the datacenter name containing the datastores. The information in this field is case-sensitive.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Finding the Managed Object Reference

Use the Find Managed Object Reference activity to identify an object within the VMware infrastructure inventory.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Find Managed Object Reference**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Find Managed Object Reference** tab and enter the appropriate information, including:
- Parent—Inventory path to the parent folder in the VMware infrastructure. The information in this field is case-sensitive.
  - Search folder name—Enter the name of the folder to be identified on the virtual machine.
  - Folder Type—select the appropriate type of folder.
    - Hosts and Clusters—Identifies a folder containing clusters and hosts
    - Virtual Machines and Templates—Identifies a virtual machine folder. A virtual machine folder may contain child virtual machine folders. It also can contain VirtualMachine managed objects, templates, and VirtualApp managed objects
    - Datastores—Identifies a datastore folder. Datastore folders can contain child datastore folders and Datastore managed objects. A collection of references to the subset of datastore objects in the datacenter that is used by this virtual machine

- Networking—Identifies a network entity folder. Network entity folders can contain Network, DistributedVirtualSwitch, and DistributedVirtualPort managed objects.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

## Migrating a Virtual Machine

Use the Migrate VM activity to migrate a specified virtual machine from one server to a specific resource pool or host.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Migrate VM**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Migrate** tab and enter the appropriate information, including:
- Virtual machine—Inventory path to the virtual machine targeted for migration. The information in this field is case-sensitive. For example:  
`TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`
  - Target host—Inventory path to the host server to migrate the virtual machine. The information in this field is case-sensitive.
  - Target resource pool—Inventory path of the target resource pool for the virtual machine. The information in this field is case-sensitive.
  - Priority—Select a priority for the migration to ensure that sufficient CPU resources are available on both the source and target hosts to perform the migration:
    - Default—Default priority for the operations
    - High—Reserve resources on both the source and destination hosts to maintain virtual machine availability during the migration. High priority operations will not proceed if the resources are unavailable.
    - Low—Low priority operations will always proceed, but the virtual machine may become briefly unavailable if sufficient host resources are unavailable.
  - Power state—Select the option to migrate the virtual machine only if it matches the specified power state:
    - Powered On—Virtual machine and the guest operating system that automatically starts up on system boot is *Powers up*.
    - Powered Off—Virtual machine is *Powered down*
    - Suspended—All activities on the virtual machine are paused
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
-

## Querying the List of VM Devices on a Virtual Machine

Use the Query VM Devices activity to query the list of virtual machine devices on a given virtual machine.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Query VM Devices**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Virtual Machine** tab and enter the appropriate information, including the inventory path to the virtual machine to be queried. The information in this field is case-sensitive. For example:
- ```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Querying the Network Adapters on a Virtual Machine

Use the Query VM Network Adapters activity to query information about network adapters configured for a specified virtual machine.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Query VM Network Adapters**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Query VM Network Adapters** tab and enter the appropriate information, including the inventory path to the virtual machine to be queried. The information in this field is case-sensitive. For example:
- ```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Querying the Properties of a Virtual Machine

Use the Query VM Properties activity to query the properties of a specified virtual machine.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Query VM Properties**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Query VM Properties** tab and enter the appropriate information, including the inventory path to the virtual machine to be queried. The information in this field is case-sensitive. For example:
- ```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
-



## Querying the Virtual Machines on an ESX or vCenter Server

Use the Query VMs activity to query the list of virtual machines on a given ESX server or vCenter server.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Query VMs**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Query VMs** tab and enter the appropriate information, including:
- Virtual machine—The name of the virtual machine. Wildcards can be used in this field.
  - Host—The name of the ESX host server to be queried
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Reconfiguring the Virtual Machine on an ESX or vCenter Server

Use the Reconfigure VM activity to modify the memory and number of CPUs allocated to the virtual machine on a given ESX server or vCenter server.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Reconfigure VMs**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Reconfigure VMs** tab enter the appropriate information, including:
- Virtual machine—Inventory path to the virtual machine to be reconfigured. The information in this field is case-sensitive. For example:  
`TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`
  - Memory (MB)—Size of the virtual machine's memory in MB. This field can remain blank if the activity should leave the memory size unchanged.
  - Number of CPUs—The number of virtual processors to allocate to the virtual machine. This field can remain blank if the activity should leave the number of CPUs unchanged.
  - Config File (.vmx)—File path to the configuration file for the virtual machine (.vmx file). This also implicitly defines the configuration directory
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Relocating a Virtual Machine

Use the Relocate VM activity to relocate a specified virtual machine from one server to another server.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Relocate VM**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.

- Step 3** Click the **Relocate VM** tab and enter the required information, including:
- Virtual machine—Inventory path to the virtual machine to be relocated. The information in this field is case-sensitive. For example:  
`TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`
  - Host—Inventory path to the target server where the virtual machine is to be relocated. The information in this field is case-sensitive.
  - Resource pool—Inventory path of the target resource pool for the virtual machine. The information in this field is case-sensitive.
  - Datastore—Inventory path to the storage device attached to the host to be used as the main disk storage for the virtual machine you are relocating. The information in this field is case-sensitive.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Removing a Virtual Machine from a vCenter Server

Use the Remove VM Device activity to remove a virtual device from a specified vCenter server.

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Remove VM Device**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Remove VM Device** tab and enter the required information, including:
- Virtual machine—Inventory path to the virtual machine to be relocated. The information in this field is case-sensitive. For example:  
`TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`
  - Device name—The name of the device to be removed from the virtual machine (for example, Hard disk 22).
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Mounting an ISO Image

The Mount ISO Image activity allows an ISO image already on the VMware server datastore to be mounted to an existing optical drive device of a VM.

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Mount ISO Image**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **ISO Image** tab and enter the inventory path to the image and host server. The information in this field is case-sensitive. For example:  
`TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`

- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Removing a Folder

Use the Remove folder activity to remove a folder from a VMware infrastructure.

---

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Remove a Folder**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Remove Folder** tab and enter the inventory path to the parent folder in the VMware infrastructure. The information in this field is case-sensitive. For example:
- ```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Unmounting an ISO Image

Use the Unmount ISO Image activity to unmount an ISO image from an existing optical drive of a VM.

---

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Unmount ISO Image**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Virtual Machine** tab and enter the inventory path to the image and host server. The information in this field is case-sensitive. For example:
- ```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Updating a Hard Disk on a Virtual Machine

Use the Update VM Hard Disk activity to update configuration of a specified hard disk on a specified virtual machine.

---

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Update VM Hard Disk**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Update VM Hard Disk** tab and enter the required information, including:
- Virtual machine—The inventory path to the virtual machine of the hard disk that should be updated. The information in this field is case-sensitive. For example:
-

TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02

- Hard disk name—Enter the name of the hard disk to be updated.
- Provisioned Size—The size of the new virtual disk.
- Virtual device node—The device node of the cluster.
- Mode—The mode for the property of a virtual disk.
  - do not change current settings—Indicates that the current settings of the hard disk are not changed
  - append—Changes are stored in a temporary .REDO file. If a system administrator deletes the redo-log file, the virtual machine returns to the state it was in the last time it was used in persistent mode.
  - independent\_nonpersistent—The disk appears to operate normally, but whenever the virtual machine is powered off or reverted to a snapshot, the contents of the disk return to their original state. All later changes are discarded.
  - independent\_persistent—The disk operates normally except that changes to the disk are permanent even if the virtual machine is reverted to a snapshot.
  - nonpersistent—All disk writes issued by software running inside a virtual machine appear to be written to the independent disk. In fact, they are discarded after the virtual machine is powered off. As a result, a virtual disk or physical disk in independent-nonpersistent mode is not modified by activity in the virtual machine.
  - persistent—All disk writes issued by software running inside a virtual machine are immediately and permanently written to a virtual disk that is configured as an independent disk.
  - undoable—The file that stores changes made to a disk in all modes except the persistent and independent-persistent modes. For a disk in nonpersistent mode, the redo-log file is deleted when you power off or reset the virtual machine without writing any changes to the disk. You can permanently apply the changes saved in the redo-log file to a disk in undoable mode so that they become part of the main disk files.

**Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

---

## Updating a Network Adapter on a Virtual Machine

Use the Update VM Network Adapter activity to modify the configuration of a specified network adapter on a specified virtual machine.

- 
- Step 1** In the Process Editor Toolbox, choose VMware vSphere > Update VM Network Adapter, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Network Adapter Settings** tab and enter the required information, including:
- Virtual machine—The inventory path to the virtual machine containing the network adapter to be updated. The information in this field is case-sensitive. For example:
 

TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
  - Name—The display name of the network adapter.

- **Connected**—Select the option to determine whether to modify connection state of the network adapter.
  - **Connect on Power On**—Select the appropriate option to indicate whether the host should be connected when it was started.
  - **MAC Address Type**—Select the appropriate option to indicate how the MAC Address was assigned to the network adapter.
  - **MAC Address**—Modify the MAC Address assigned to the network adapter in the virtual machine.
  - **Network**—Modify the name or IP address of the virtual network in the VMware environment.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Upgrading the Hardware on a Virtual Machine

Use the Upgrade VM Hardware activity to upgrade the virtual machine's virtual hardware to the latest revision that is supported by the virtual machine's current host.

- Step 1** In the Process Editor Toolbox, choose VMware vSphere > Upgrade VM Hardware, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Virtual Hardware** tab and enter the required information, including:
- **Virtual machine**—The inventory path to the virtual machine containing the hardware to be upgraded. The information in this field is case-sensitive. For example:  
`TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`
  - **Version**—Enter the appropriate version to specify which version to upgrade the virtual hardware. For example, vmx-04 or vmx-07. The versions supported will depend on the VMware infrastructure. If the version is not specified, the virtual hardware is upgraded to the most current virtual hardware supported on the host.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Upgrading the VM Tools on a Windows Virtual Machine

Use the Upgrade VM Tools activity to upgrade the VMware tools on a Windows virtual machine using the VMware Tools installer.

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Upgrade VM Tools**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Upgrade Tools** tab and enter the required information, including:
- **Virtual machine**—The inventory path to the virtual machine on which to install or upgrade the VMware tools. The information in this field is case-sensitive. For example:

```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```

- Options—Enter the command line options to pass to the installer to modify the installation procedure for tools. For example, this is the basic command line syntax:

```
vmrun <host authentication flags> <guest authentication flags> <command> <parameters>
```

- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Retrieving Resource Pools

Use the Resource Pools activity to retrieve all resource pools configured within the VMware infrastructure.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Resource Pools**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **Resource Pool** tab and specify the following properties:
- Parent—Name of the direct parent resource pool
  - Resource pool name—Name of the new resource pool
  - Time out if not completed within—The time period the activity should wait for completion before failing
- Step 3** Click the **CPU Resources** tab and specify the following properties:
- CPU Shares—Resource allocation for CPU
  - CPU Reservation (Mhz)—Amount of CPU resources that are guaranteed available to the resource pool (in Mhz)
  - CPU Expandable Reservation—The amount of resources the CPU reservation can expand in a resource pool beyond the specified value if the resource pool has unreserved resources
  - CPU Limit (Mhz)—Determines the limit on the CPU Mhz the resource pool cannot exceed regardless of available of resources
- Step 4** Click the **Memory Resources** tab and specify the following properties:
- Memory Shares Level—The memory allocation level for the resource pool (Custom, Low, Normal, High)
  - Memory Shares—Resource allocation for memory
  - Memory Reservation (MB)—Amount of memory that is guaranteed available to the resource pool (in MB)
  - Memory Expandable Reservation—The amount of memory the reservation can expand in a resource pool beyond the specified value if the resource pool has unreserved resources
  - Memory Limit (MB)—Determines the limit on the amount of memory the resource pool cannot exceed regardless of available of resources
- Step 5** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
-

## Managing VMware vSphere Host Activities

The following table displays the activities used to perform basic management of the host using a VI connection.

Activity	Description
Add Host	Adds a new ESX/ESXi to a VMware environment See <a href="#">Adding a New Host, page 12-202</a>
Add Host Port Group	Create a new network port group for a specified ESX server. See <a href="#">Adding a New Host Port Group, page 12-202</a>
Enter VM Host Maintenance Mode	Moves a host server offline so that maintenance can be performed See <a href="#">Moving a VM Host Server to Maintenance Mode, page 12-203</a> .
Exit VM Host Maintenance Mode	Brings a host server back online after maintenance has been performed See <a href="#">Moving a VM Host Server from Maintenance Mode to Online, page 12-204</a>
Power Down Host to Standby	Powers down the host to standby mode, a state from which the host can be powered up remotely See <a href="#">Powering Down an ESX Host Server to Standby State, page 12-204</a>
Power Up Host from Standby	Powers up the host out of standby mode See <a href="#">Powering Up a Host Server from Standby State, page 12-205</a>
Query Host Properties	Queries the properties of a specified ESX/ESXi host See <a href="#">Querying the Properties of a Host Server, page 12-205</a>
Query Hosts	Retrieves the hosts within a VMware infrastructure See <a href="#">Querying the List of Hosts, page 12-206</a>
Query Host Network Adapter	Enumerates the network adapters configured on a specified ESX server See <a href="#">Querying the Network Adapters on an ESX Server, page 12-205</a>
Query Host Storage Adapters	Retrieves information about storage adapters configured for a specified host See <a href="#">Querying the Storage Adapters for a Host Server, page 12-206</a>
Reboot VM Host	Restart an ESX host See <a href="#">Rebooting a VM Host Server, page 12-206</a>
Remove Adapter from vSphere Distributed Switch	Removes an adapter from a vSphere Distributed Switch See <a href="#">Removing a Host from a vSphere Distributed Switch, page 12-207</a>
Remove ESX Host	Removes a host from the VMware infrastructure See <a href="#">Removing an ESX Host, page 12-207</a>
Shut Down Host	Powers off a host server See <a href="#">Shutting Down a Host, page 12-208</a>
Update Host Port Group	Modifies VLAN ID of the specified port group. See <a href="#">Updating a Host Port Group, page 12-208</a>

## Adding a New Host

Use the Add Host activity to add a new host to the VMware infrastructure. There are two types of hosts that can be added to the VMware infrastructure: standalone hosts, which can be added to any data center or folder, and hosts that are intended to be part of a VMware cluster. This activity may not be able to add hosts if the hosts contains invalid SSL certificates.

While this activity is running and when the host is in maintenance mode, no virtual machines can be powered on and no provisioning operations can be performed on the host.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Add Host**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Add Host** tab and enter the required information, including:
- Location—The inventory path to the location in the VMware infrastructure where the host server is to be added. This could be a folder, data center, other cluster. The information in this field is case-sensitive.
  - The connection settings
  - The SSL certificate settings
  - Connect after adding—Check the check box to indicate that the newly added host should be connected after being added to VMware.
- If the check box remains unchecked, the host will remain disconnected after being added.
- Step 4** Click the **Advanced** tab and enter the required information, including:
- Resource pool—Name of the resource pool for the root resource pool from the host.
  - Inventory location for virtual machines—Enter the inventory path in which to store the existing virtual machines on the host.
  - Add even if connected to another virtual center—Check this check box to add host even if it is already being managed by another virtual center server. The host connection to the original virtual center is severed.
- If the check box is unchecked, the host cannot be added to the new virtual center server.
- Step 5** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Adding a New Host Port Group

Use the Add Host Port Group activity to create a new network port group for a specified ESX server.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Add Host Port Group**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Port Group** tab and enter the required information, including:
- Host—The inventory path of the host. The information in this field is case-sensitive. For example:  
`TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`



- Port group—The name of the port group to add.
- VLAN ID—The integer number that corresponds to the VLAN ID. The valid values are integers between 0 and 4095.

**Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

---

## Adding a Host to a vSphere Distributed Switch

You can add hosts and physical adapters to a vNetwork Distributed Switch at the vDS level after the vDS is created.

**Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Adding a Host to a Vsphere Distributed Switch**, then drag and drop the activity onto the Workflow pane.

**Step 2** Click the **General** tab and enter the appropriate information.

**Step 3** Click the **Host and DV Switches** tab and enter the inventory path of the host. The information in this field is case-sensitive. For example:

```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```

**Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

---

## Moving a VM Host Server to Maintenance Mode

Use the Enter VM Host Maintenance Mode activity to move a host server offline so that maintenance can be performed.

While this activity is running and when the host is in maintenance mode, no virtual machines can be powered on and no provisioning operations can be performed on the host.

**Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Enter VM Host Maintenance Mode**, then drag and drop the activity onto the Workflow pane.

**Step 2** Click the **General** tab and enter the appropriate information.

**Step 3** Click the **Enter Maintenance** tab and enter the appropriate information, including:

- Host—The inventory path of the host. The information in this field is case-sensitive. For example:  
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
- Skip if already in expected power state—Check this check box to complete the activity normally if the power state is in maintenance mode.

If the check box is not checked and the ESX host is already in entering maintenance mode, the activity will complete with an error message stating the operation is not allowed in the current state or could not connect the host.

- Evacuate guests—Check this check box to migrate all virtual machines currently associated with the host server to other available hosts in the computer resource pool before entering maintenance mode.

- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Moving a VM Host Server from Maintenance Mode to Online

Use the Exit VM Host Maintenance Mode activity to bring a host server back online after the maintenance on the server has been completed. Using this activity, blocks any concurrent running maintenance-only host configurations operations are being performed (for example, when VMFS (Virtual Machine File System) volumes are being upgraded).

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Exit VM Host Maintenance Mode**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Exit Maintenance** tab and enter the appropriate information, including:
- **Host**—The inventory path of the host. The information in this field is case-sensitive. For example:  
`TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`
  - **Skip if already in expected power state**—Check this check box to complete the activity normally if the power state is exiting maintenance mode.  
 If the check box is not checked and the ESX host is already exiting maintenance mode, the activity will complete with an error message stating the operation is not allowed in the current state or could not connect the host.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Powering Down an ESX Host Server to Standby State

Use the Power Down Host to Standby activity to power down an ESX host server to standby state.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Power Down Host to Standby**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Power Down** tab and enter the appropriate information, including:
- **Host**—The inventory path of the host. The information in this field is case-sensitive. For example:  
`TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`
  - **Skip if already in expected power state**—Check this check box to complete the activity normally if the power state is powered down to standby state.  
 If the check box is not checked and the ESX host is already in a standby state, the activity will complete with an error message stating the operation is not allowed in the current state or could not connect the host.
  - **Evacuate guests**—Check this check box to migrate all virtual machines currently associated with the host server to other available hosts in the computer resource pool before powering down to a standby state.

- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Powering Up a Host Server from Standby State

Use the Power Up Host from Standby activity to power up an ESX host server from standby state.

---

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Power Up Host from Standby**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Power Up** tab and enter the appropriate information, including:
- **Host**—The inventory path of the host. The information in this field is case-sensitive. For example:  
`TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`
  - **Skip if already in expected power state**—Check this check box to complete the activity normally if the power state is *Powered Up*.  
  
If the check box is not checked and the ESX host is already *powered up*, the activity will complete with an error message stating the operation is not allowed in the current state or could not connect the host
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Querying the Network Adapters on an ESX Server

Use the Query Host Network Adapters activity to enumerate the network adapters configured on a specified ESX server.

---

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Query Host Network Adapter**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Host** tab and enter the appropriate information, including the inventory path of the host. The information in this field is case-sensitive. For example:  
`TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Querying the Properties of a Host Server

Use the Query Host Properties activity to query the properties of an ESX server.

---

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Query Host Properties**, then drag and drop the activity onto the Workflow pane.

- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Query Host Properties** tab and enter the appropriate information, including the inventory path of the host. The information in this field is case-sensitive. For example:
- ```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Querying the Storage Adapters for a Host Server

Use the Query Host Storage Adapters activity to query information about storage adapters configured for a specified host.

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Query Host Storage Adapters**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Host** tab and enter the appropriate information, including the inventory path of the host. The information in this field is case-sensitive. For example:
- ```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Querying the List of Hosts

Use the Query Hosts activity to query the list of hosts within the virtual infrastructure target.

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Query Hosts**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Query Hosts** tab and enter the appropriate information, including the inventory path of the host. The information in this field is case-sensitive. For example:
- ```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Rebooting a VM Host Server

Use the Reboot VM Host activity to restart an ESX server.

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Reboot VM Host**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.

- Step 3** Click the **Reboot** tab and enter the appropriate information, including the inventory path of the host. The information in this field is case-sensitive. For example:
- ```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Removing an ESX Host

Use the Remove ESX Host activity to remove a host from the virtual environment (vCenter).

---

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Remove ESX Host**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Host** tab and enter the appropriate information, including the inventory path of the host. The information in this field is case-sensitive. For example:
- ```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Removing a Host from a vSphere Distributed Switch

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Remove Host from vSphere Distributed Switch**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Remove Host** tab and enter the appropriate information, including the inventory path of the host. The information in this field is case-sensitive. For example:
- ```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Removing an Adapter from a vSphere Distributed Switch

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Remove Adapter from vSphere Distributed Switch**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Remove Adapter** tab and enter the appropriate information, including the inventory path of the host. The information in this field is case-sensitive. For example:
- ```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```

- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Shutting Down a Host

Use the Shutdown Host activity to power off an ESX host in a vCenter.

---

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Shutdown Host**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Host** tab and enter the appropriate information, including:
- **Host**—The inventory path of the host. The information in this field is case-sensitive. For example:  
`TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`
  - **Skip if already in expected power state**—Check this check box to complete the activity normally if the power state is shut down.  
  
If the check box is not checked and the host is already shut down, the activity will complete with an error message stating the operation is not allowed in the current state or could not connect the host.
  - **Force shutdown if not in maintenance mode**—Check this check box to indicate that the host should be shut down even if it is not in maintenance mode.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Updating a Host Port Group

Use the Update Host Port Group activity to modify the VLAN ID of the specified port group.

---

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Update Host Port Group**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Port Group** tab and enter the appropriate information, including:
- **Host**—The inventory path to the host server (for example, `TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`)
  - **Port group**—The name of the port group to update
  - **VLAN ID**—The integer that corresponds to a VLAN ID. The valid values are integers between 0 and 4095.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
-

## Managing VMware vSphere Power Activities

The following table displays the activities that perform basic power management to the virtual machines running on the ESX Server via the VI connection.

| Activity                | Description  |
|-------------------------|--|
| Execute PowerCLI Script | Specifies a script command to execute using the VMware vSphere PowerCLI module.<br>See <a href="#">Defining the Execute a PowerCLI Script, page 12-209</a>   |
| Power Off VM            | Powers off a virtual machine.<br>See <a href="#">Powering Off a Virtual Machine, page 12-210</a>   |
| Power On VM             | Powers on a virtual machine<br>See <a href="#">Powering On Virtual Machine, page 12-210</a>  |
| Reboot Guest            | Restarts a guest operating system on a virtual machine<br>See <a href="#">Rebooting a Guest Operating System on a Virtual Machine, page 12-211</a>   |
| Reset VM                | Resets the power on a virtual machine<br>See <a href="#">Resetting the Power on a Virtual Machine, page 12-211</a>   |
| Shutdown Guest          | Powers off a guest operating system on a virtual machine and performs a clean shutdown of all services<br>See <a href="#">Shutting Down a Guest Operating System on a Virtual Machine, page 12-212</a> |
| Standby Guest           | Powers down a guest operating system on a virtual machine to standby mode<br>See <a href="#">Moving a Guest Operating System on a Virtual Machine to Standby Mode, page 12-212</a>                     |
| Suspend VM              | Suspends execution in the virtual machine<br>See <a href="#">Suspending a Virtual Machine, page 12-213</a>   |

### Defining the Execute a PowerCLI Script

Use this activity to specify a script command to execute using the VMware vSphere PowerCLI module.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Execute PowerCLI Script** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Script** tab to specify the command used to execute an activity:
- Script arguments—Enter the collection of argument values for the script.
    - Add—Click this button and choose one of the following to launch the Select Argument to Add dialog box. Enter the appropriate script in the text field or click Reference icon to select from the list.
    - Edit—Select a script argument from the list and click this button to modify the script argument in the Select Argument to Add dialog box.
    - Remove—Select a script argument from the list and click this button to remove the script argument from the list.

- Script to execute—Enter the actual script code to use to execute an activity.
  - Restart execution if interrupted—Check this checkbox if you want the process to restart automatically if the process gets interrupted.
  - Timeout —Enter the time period the activity should wait before failing.
- Step 4** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Powering Off a Virtual Machine

Use the Power Off VM activity to power off a specified virtual machine on a given ESX server or vCenter server.

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Power Off VM**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Power Off** tab and enter the appropriate information, including:
- Virtual machine—The inventory path to the virtual machine to be powered off. The information in this field is case-sensitive. For example:  
`TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`
  - Skip if already in expected power state—Check this check box to complete the activity normally if the power state is *Powered Off*.  
 If the check box is not checked and the ESX host is already *powered off*, the activity will complete with an error message stating the operation is not allowed in the current state or could not connect the host.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Powering On Virtual Machine

Use the Power On VM activity to power on a specified virtual machine on a given ESX server or vCenter server.

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Power On VM**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Power On** tab and enter the appropriate information, including:
- Virtual machine—The inventory path to the virtual machine to be powered off. The information in this field is case-sensitive. For example:  
`TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`
  - Host—Inventory path to the ESX host server to be powered on. The information in this field is case-sensitive.



- Skip if already in expected power state—Check this check box to complete the activity normally if the power state is *Powered On*.

If the check box is not checked and the ESX host is already *powered on*, the activity will complete with an error message stating the operation is not allowed in the current state or could not connect the host.

- Wait for VMware tools—Check this check box to wait for the VM tools service to start before completing the activity.

You can configure the VMware Tools service to depend on other required application services, to ensure that the required application services are available when the activity completes.

- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Rebooting a Guest Operating System on a Virtual Machine

Use the Reboot Guest activity to restart a guest operating system on a virtual machine on a given ESX server or vCenter server. This activity shuts the machine down gracefully prior to powering the machine back up.

Use the Power On VM activity to power on a specified virtual machine on a given ESX server or vCenter server.

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Reboot Guest**, then drag and drop the activity onto the Workflow pane.

- Step 2** Click the **General** tab and enter the appropriate information.

- Step 3** Click the **Reboot Guest** tab and enter the appropriate information, including:

- Virtual machine—The inventory path to the virtual machine to be rebooted. The information in this field is case-sensitive. For example:

```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```

- Wait for VMware tools—Check this check box to wait for the VM tools service to start before completing the activity.

You can configure the VMware Tools service to depend on other required application services, to ensure that the required application services are available when the activity completes.

- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Resetting the Power on a Virtual Machine

Use the Reset VM activity to reset the power on a virtual machine on a given ESX server or vCenter server.

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Reset VM**, then drag and drop the activity onto the Workflow pane.

- Step 2** Click the **General** tab and enter the appropriate information.

- Step 3** Click the **Reset** tab and enter the appropriate information, including:
- Virtual machine—The inventory path to the virtual machine to be reset. The information in this field is case-sensitive. For example:  
`TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`
  - Wait for VMware tools—Check this check box to wait for the VM tools service to start before completing the activity.  
 You can configure the VMware Tools service to depend on other required application services, to ensure that the required application services are available when the activity completes.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Shutting Down a Guest Operating System on a Virtual Machine

Use the Shutdown Guest activity to power off a guest operating system on a virtual machine gracefully.

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Shutdown Guest**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Shutdown Guest** tab and enter the appropriate information, including:
- Virtual machine—The inventory path to the virtual machine to be reset. The information in this field is case-sensitive. For example:  
`TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`
  - Skip if already in expected power state—Check this check box to complete the activity normally if the power state is shut down.  
 If the check box is not checked and the ESX host is already shut down, the activity will complete with an error message stating the operation is not allowed in the current state or could not connect the host.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Moving a Guest Operating System on a Virtual Machine to Standby Mode

Use the Standby Guest activity to put a guest operating system on a virtual machine in standby mode on a given ESX server or vCenter server.

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Standby Guest**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Standby Guest** tab and enter the appropriate information, including:
- Virtual machine—The inventory path to the virtual machine to be put in stand by mode. The information in this field is case-sensitive. For example:  
`TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`

- Skip if already in expected power state—Check this check box to complete the activity normally if the power state is in standby.

If the check box is not checked and the ESX host is already in standby, the activity will complete with an error message stating the operation is not allowed in the current state or could not connect the host.

- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Suspending a Virtual Machine

Use the Suspend VM activity to suspend a virtual machine on a given ESX server or vCenter server.

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Suspend VM**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Suspend VM** tab and enter the appropriate information, including:
- Virtual machine—The inventory path to the virtual machine to be put in stand by mode. The information in this field is case-sensitive. For example:  

```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```
  - Skip if already in expected power state—Check this check box to complete the activity normally if the power state is suspended.
- If the check box is not checked and the ESX host is already suspended, the activity will complete with an error message stating the operation is not allowed in the current state or could not connect the host.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Managing VMware vSphere Snapshot Activities

The following table displays the activities which perform the basic snapshot management of the virtual machines running on the ESX Server or vCenter.

| Activity            | Description  |
|---------------------|--|
| Create Snapshot     | Creates a snapshot of a specified virtual machine<br>See <a href="#">Creating a Snapshot of a Virtual Machine, page 12-214</a>                               |
| Query VM Snapshots  | Queries the properties of a snapshot of a selected virtual machine<br>See <a href="#">Querying the Properties of a Virtual Machine Snapshot, page 12-214</a> |
| Remove all Snapshot | Removes all snapshots that have been taken of the virtual machine<br>See <a href="#">Removing All Snapshots of a Virtual Machine, page 12-215</a>            |

|                            |   |
|----------------------------|---|
| Remove Snapshot            | Removes a specific snapshot from the virtual machine and deletes any associated storage<br>See <a href="#">Removing a Specific Snapshot of a Virtual Machine, page 12-216</a> |
| Rename Snapshot            | Changes the name or description of a snapshot of the virtual machine<br>See <a href="#">Renaming a Snapshot of a Virtual Machine, page 12-216</a>                             |
| Revert to Current Snapshot | Restore the most recent snapshot<br>See <a href="#">Restoring a Virtual Machine to the Most Current Snapshot, page 12-217</a>   |
| Revert to Snapshot         | Restore the specified virtual machine to a specific snapshot<br>See <a href="#">Reverting a Virtual Machine to a Specific Snapshot, page 12-217</a>                           |
| Take Snapshot              | Captures a snapshot of a specified virtual machine<br>See <a href="#">Taking a Snapshot of a Virtual Machine, page 12-217</a>   |

## Creating a Snapshot of a Virtual Machine

Use the Create Snapshot activity to capture a snapshot of a specified virtual machine.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Create Snapshot**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Snapshot** tab and enter the appropriate information, including:
- Virtual machine—The inventory path to the virtual machine on which the snapshot will be taken. The information in this field is case-sensitive. For example:  
`TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02`
  - Snapshot the virtual machine memory—Check this check box to include the memory of the virtual machine in the snapshot.  
A dump of the internal state of the virtual machine is included in the snap shot. If the check box is not checked, then the power state of the snapshot is set to *Powered Off*.
  - Quiesce virtual memory during snapshot—Check this check box to quiesce file system writes before the snapshot is taken.  
If the virtual machine is *Powered On* when the snapshot is taken, this ensures that the disk snapshot represents a consistent state of the guest file system.  
If the virtual machine is *Powered Off* or VMware Tools are not available, the quiesce flag is ignored.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Querying the Properties of a Virtual Machine Snapshot

Use the Query VM Snapshots activity to query the properties of a snapshot of a selected virtual machine on a given ESX server or vCenter server. The Query VM Snapshots activity should generate a list with the name and description of each snapshot of the virtual machine.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Query VM Snapshots**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Virtual Machine** tab and enter the inventory path to the virtual machine to query for snapshots. The information in this field is case-sensitive. For example:
- ```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Managing the Virtual Machine Snapshots

Use the Manage Snapshot activity to manage the available snapshots.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Manage Snapshot**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Snapshot** tab and enter the appropriate information, including:
- Virtual machine—The inventory path to the virtual machine on which the snapshot will be taken. The information in this field is case-sensitive. For example:  

```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```
  - Snapshot the virtual machine memory—Check this check box to include the memory of the virtual machine in the snapshot.  

A dump of the internal state of the virtual machine is included in the snapshot. If the check box is not checked, then the power state of the snapshot is set to *Powered Off*.
  - Quiesce virtual memory during snapshot—Check this check box to quiesce file system writes before the snapshot is taken.  

If the virtual machine is *Powered On* when the snapshot is taken, this ensures that the disk snapshot represents a consistent state of the guest file system.  

If the virtual machine is *Powered Off* or VMware Tools are not available, the quiesce flag is ignored.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Removing All Snapshots of a Virtual Machine

Use the Remove All Snapshots activity to delete all snapshots that have been taken of a specified virtual machine.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Remove All Snapshots**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.

- Step 3** Click the **Virtual Machine** tab and enter the inventory path to the virtual machine on which the snapshots will be deleted. The information in this field is case-sensitive. For example:

```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```

- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Removing a Specific Snapshot of a Virtual Machine

Use the Remove Snapshot activity to delete a specific snapshot that was taken of a specified virtual machine.

---

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Remove Snapshot**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Snapshot** tab and enter the appropriate information, including:
- Virtual machine—The inventory path to the virtual machine on which the snapshot was taken. The information in this field is case-sensitive. For example:  

```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```
  - Snapshot name—The name of the snapshot to be deleted.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Renaming a Snapshot of a Virtual Machine

Use the Rename Snapshot activity to update the name or description of an existing snapshot of a specified virtual machine.

---

- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Rename Snapshot**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Snapshot** tab and enter the appropriate information, including:
- Virtual machine—The inventory path to the virtual machine containing the snapshot to be updated. The information in this field is case-sensitive. For example:  

```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```
  - Snapshot name—Current name of the snapshot whose properties are to be updated.
  - New snapshot name—New name for the snapshot.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
-

## Restoring a Virtual Machine to the Most Current Snapshot

Use the Revert to Current Snapshot activity to restore the virtual machine to the most recent snapshot.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Revert to Current Snapshot**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Snapshot** tab and enter the inventory path to the virtual machine with the current state that the VM is to be reverted to the most current snapshot. The information in this field is case-sensitive. For example:
- ```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Reverting a Virtual Machine to a Specific Snapshot

Use the Revert to Snapshot activity to restore the specified virtual machine to a specific snapshot.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Revert to Snapshot**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Snapshot** tab and enter the appropriate information, including:
- Virtual machine—The inventory path to the virtual machine on which the snapshot was taken. The information in this field is case-sensitive. For example:  

```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```
  - Snapshot name—Name of the snapshot to which the virtual machine should be restored.
- Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Taking a Snapshot of a Virtual Machine

Use the Take Snapshot activity to capture a snapshot of a specified virtual machine.

- 
- Step 1** In the Process Editor Toolbox, choose **VMware vSphere > Take Snapshot**, then drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Snapshot** tab and enter the appropriate information, including:
- Virtual machine—The inventory path to the virtual machine on which the snapshot will be taken. The information in this field is case-sensitive. For example:  

```
TEST-ENV/UCS/vm/TESTDEV-W2K8-64-02
```

- Snapshot the virtual machine memory—Check this check box to include the memory of the virtual machine in the snapshot.

A dump of the internal state of the virtual machine is included in the snap shot. If the check box is not checked, then the power state of the snapshot is set to *Powered Off*.

- Quiesce virtual memory during snapshot—Check this check box to quiesce file system writes before the snapshot is taken.

If the virtual machine is *Powered On* when the snapshot is taken, this ensures that the disk snapshot represents a consistent state of the guest file system.

If the virtual machine is *Powered Off* or VMware Tools are not available, the quiesce flag is ignored.

**Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

---



# Web Services Adapter

Web services are components on a Web server that a client application can call by making HTTP requests across the Web. The Cisco Process Orchestrator Web Service adapter is designed to support general web service calls. The adapter allows users to send requests using web service methods and other parameters to generate an XML output. Web Targets allow activities to execute against a web site or web service that is hosted by several machines.

The following table displays the activities that are provided by the Web Services adapter. For more information about using these activities, see [Getting Started Using the Web Services Adapter, page 12-219](#).

| Activity            | Description  |
|---------------------|--|
| URL Ping            | Pings a web address<br>See the <a href="#">Defining a URL Ping Activity, page 12-221</a> .   |
| Web HTTP Request    | Sends a HTTP request for a file based on a URL<br>See the <a href="#">Defining a Web HTTP Request Activity, page 12-221</a> .  |
| Web HTTP Save File  | Saves a specific HTTP file to the local machine or network drive<br>See the <a href="#">Defining a Web HTTP Save File Activity, page 12-222</a> .  |
| Web Service Execute | Groups a WSDL URL used by the server, a web service method, and input parameters to generate an XML output<br>See <a href="#">Defining a Web Service Execute Activity, page 12-222</a> . |

## Getting Started Using the Web Services Adapter

Use the following process to monitor and manage Web Services instances.

- 
- Step 1** Create a Web Services target (see [Defining a Web Target, page 12-219](#)).
  - Step 2** Specify the credentials for a Web Services runtime user (see [Automating Web Services Adapter Activities, page 12-221](#)).
  - Step 3** Define a Web Services activity (see [Automating Web Services Adapter Activities, page 12-221](#)).
  - Step 4** View the activity results (see [Monitoring Operations, page 8-1](#)).
- 

## Defining a Web Target

Use the Web target to configure a target for execution by a web service activity on which a web site may be hosted on several machines. The target allows an activity to execute against the specified URL address.

- 
- Step 1** Choose **Definitions > Targets**, right-click, and choose **New > Web Target**.
  - Step 2** Click the **General** tab and enter the appropriate information.
  - Step 3** Click the **Connection** tab to specify the connection information to a web service.

**Step 4** Enter the information in the remaining tabs as necessary, then click **OK** to close the dialog box.

## Defining an OAuth Credential Account

The OAuth Credential account simplifies the task of making authenticated RESTful web service calls. Use the OAuth Credential Properties dialog box to specify the credentials for a OAuth runtime user. The information is used to assign run options for Web HTTP Request and Web HTTP Save File processes or activities.

---

**Step 1** Choose **Definitions > Runtime Users**, right-click and choose **New > OAuth Credential**.

**Step 2** On the **General** panel, enter the appropriate information and click **Next**.

**Step 3** Click the **Credentials** tab to specify the following information:

- 1.0 OAuth Version
  - OAuth Version—Select 1.0 version of OAuth, from the drop-down list.
  - Consumer Key—Enter the key that was received after registering with the resource providers.
  - Consumer Key Secret—Enter the consumer secret that is associated with the consumer key.
  - Access Token—Enter the access token which provides the consumer access to resources from resource providers.
  - Access Token Secret—Enter the secret associated with the access token.



---

**Note** Depending on the resource providers, you might not need Access Token and Access Token Secret to make some RESTful web service calls. However, if a RESTful web service call does require access token and access token secrets, you need to obtain it from resource providers

---

- Signature Method—Specify the method that you want to use for signing.
- 2.0 OAuth Version
  - OAuth Version—Select 2.0 version of OAuth, from the drop-down list.
  - Url—Enter the Url of the OAuth token.
  - Refresh Token—Enter the refresh token which provides the consumer access to resources from resource providers.
  - Client ID—Enter the Client ID.
  - Client Secret—Enter the secret associated with the access token.



---

**Note** The **Client ID** and **Client Secret** is generated when you register with the developer concern.

---

**Step 4** Click **OK** to close the dialog box and complete the procedure.

---

## Automating Web Services Adapter Activities

### Defining a URL Ping Activity

Use the URL Ping activity to ping a web address.

- 
- Step 1** In the Process Editor Toolbox, choose **Web Service > URL Ping**, then drag and drop the activity onto the Workflow pane.
  - Step 2** Click the **General** tab and enter the appropriate information.
  - Step 3** Click the **URL** tab to specify the available properties.
  - Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

When the URL Ping activity is launched, the summary information from the activity results is displayed from the Operations Workspace activity instance view.

---

### Defining a Web HTTP Request Activity

Use the Web HTTP Request activity to send a request for a file based on a URL, HTTP headers, or Cookies data. This request generates a response in an output file provided by the web server.

This activity supports generic HTTP operations, such as POST and GET, and is used to retrieve a web page and then examine the results to ensure there are no errors. The activity can be used to perform synthetic transactions against portals or other web sites.

- 
- Step 1** In the Process Editor Toolbox, choose **Web Service > Web HTTP Request** and drag and drop the activity onto the Workflow pane.
  - Step 2** Click the **General** tab and enter the appropriate information.
  - Step 3** Click the **HTTP Request** tab to specify the required properties, including:
    - **Relative URL**—Enter the relative URL to be requested. The base URL will be determined by the web target combined with the relative Url during the activity execution.
    - **Method**—Enter the method to be performed on the resource identified by the Request-URI. The method is case-sensitive.
    - **HTTP Version**—Select the appropriate HTTP version for the request. (Default: 1.1)
    - **Request**—Enter any additional HTTP request details.
  - Step 4** Click the **Output Format** tab to select the appropriate format for the output of the header request.
  - Step 5** Click the **HTTP Headers** tab to customize the content header requests for the activity (see [Defining the HTTP Headers](#), page 12-223).
  - Step 6** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

When the Web HTTP Request activity is launched, results are displayed from the Operations Workspace activity instance view.

---

## Defining a Web HTTP Save File Activity

Use the Web HTTP Save File activity tab to save a specific HTTP file to the local machine or network drive which hosts the Process Orchestrator server.

- 
- Step 1** In the Process Editor Toolbox, choose **Web Service > Web HTTP Save File** and drag and drop the activity onto the Workflow pane.
  - Step 2** Click the **General** tab and enter the appropriate information.
  - Step 3** Click the **Save File** tab and enter the required information.
  - Step 4** Click the **HTTP Headers** tab to customize the content header requests for the activity. For a list of common HTTP headers, see [Defining the HTTP Headers, page 12-223](#).
  - Step 5** Click the **Cookies** tab to configure the current activity to accept cookies and/ or use a cookies data table retrieved from a previous HTTP request.
  - Step 6** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

When the Web HTTP Save File activity is launched, the summary information from the activity results is displayed from the Operations Workspace activity instance view.

---

## Defining a Web Service Execute Activity

Use this Web Service activity to call web service parameters to generate an XML output.

- 
- Step 1** In the Process Editor Toolbox, choose **Web Service > Web Service Execute** and drag and drop the activity onto the Workflow pane.
  - Step 2** Click the **General** tab and enter the appropriate information.
  - Step 3** Click the **Web Service** tab and specify the following properties:
    - Method—See [Selecting a Web Service Method, page 12-223](#).  
The information populates the Method field and the parameters for the selected method display under the Parameters box.  
The Build button is not available until a valid web service method is selected. Click **Build** to launch the Build Array dialog box to define the array and class properties for the activity.
    - WSDL Location:
      - Relative WSDL Url—Use the relative URL.
      - Use WSDL file path—Use an alternate WSDL file path.
    - Endpoint:
      - Use endpoint specified in WSDL file
      - Relative endpoint URL
    - SOAP Headers—Displays the SOAP header class associated with the web service method. SOAP headers passes data to and from an XML Web service method if the data is not directly related to the XML Web service method's primary functionality.
    - Parameters—See [Defining the Web Service Parameters, page 12-223](#).

**Step 4** Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

When the Web Service Execute activity is launched, results are displayed from the Operations Workspace activity instance view.

---

## Selecting a Web Service Method

Use the Select Method dialog box to select a web service method for the URL.

To select a web service method:

---

**Step 1** On the Web Service property page, click **Select**.

The Select Method dialog box displays all the web service methods for the URL.

**Step 2** Enter the appropriate URL containing the web service methods in the URL field, and click **Verify** to connect to the web service specified in the Url field and verify the service connection.

If the connection is successful, a confirmation dialog box displays confirming the URL connection.

The Methods list box displays the following information for all the web service methods discovered by the console for the web service of the specified URL.

- **Binding Name**—User name for the binding in the metadata of the service

**Step 3** In the Method Details box, review the information and click **OK**.

The information populates the Method field and the parameters for the selected method display under the Parameters box on the Web Service Execute property page.

---

## Defining the Web Service Parameters

The Web Service parameters dialog box includes these parameters:

- **Parameters**—Modify the input parameters when making the web service call.
- **Secure**—Check the check box to indicate that security-sensitive string text is required
- **Synchronize**—Click this button to synchronize the parameters in the Parameters box and the list of parameters for the specified method.

Clicking this button will remove the existing parameter information if any web method parameters are added or removed. If the parameters are the same type and are listed in the same order, then no change is made.

## Defining the HTTP Headers

Click the **HTTP Headers** tab to customize the content header requests for the activity, including:

- **Content type**—Enter or modify the value for the content type used to define the structure of the output. (Default: application/xml;charset=utf-8).
- **Accept**—Enter the value of the Accept HTTP header.
- **User-Agent**—Enter the value of the User-agent HTTP header.

- **Timeout**—Check the check box and then enter the time period the activity should wait before failing. Click the time unit link to change the time interval.
- **Allow auto redirect**—Check this check box to allow the header request to be redirected automatically.

## Adding Customized Header Requests

Use the Add Header dialog box to create and modify customized content header requests.

- 
- Step 1** On the Web HTTP Request property page, click the **HTTP Headers** tab.
- Step 2** Scroll to the bottom of the tab, and click **Add**.
- Step 3** Enter the appropriate information as necessary, and click **OK**.
- Step 4** Enter the web service parameters.
- The Build Array dialog box is launched when the *SelectByActivityViewIdExpanded* method is selected.
- Step 5** To specify the build array:
- a. On the Web Service property page, under Parameters, click **Build**.
  - b. To create an array, click **Add** to launch the Build Primitive dialog box and specify the primitive value for the array.
  - c. On the Build Primitive dialog box, specify the required information, then click **OK**.
  - d. Click **OK** again to close the dialog box.
- 

## Defining the Build Class Properties

Use the Build Class dialog box to specify the class for the build instanceID. The web services class defines the optional base class for XML Web services.

The Build Class dialog box is launched when a valid web services method is selected.

- 
- Step 1** On the Web Service property page, click **Build**.
- Step 2** Select the appropriate radio button to specify the appropriate class option.
- Step 3** Under **Set properties of the created objects to the values**, enter the object values for the listed build properties, as necessary.
- The displayed objects in the section are dependent upon the selected object type.
- Step 4** To the right of the name of the property, check the **Hidden** check box to indicate that the string text in the field is security-sensitive.
- Step 5** Click **OK** to close the dialog box.
- The information populates the appropriate parameter field on the Web Service Execute property page.
-

## Modifying the List of Headers

- 
- Step 1** Click the appropriate button to modify the list of specific header requests.
- Step 2** Click the **Cookies** tab to configure the current activity to accept cookies and/ or use a cookies data table retrieved from a previous HTTP request.
- Step 3** Complete the appropriate information in the remaining tabs, as necessary, and then click the **Save** tool to complete the activity definition.
- 

## Defining Cookie Properties for Web Service Activity

Use the Cookies tab to configure the current activity to accept cookies and/ or use a cookies data table retrieved from a previous HTTP request. The data table can be user-defined, as long as the properties of the table matches the default cookies data table.

When working with cookies, it is recommended that users verify that the status code for the activity is satisfactory at 200 (OK). For example, if the following is configured:

- First HTTP Request activity - Login to web site - accept cookies check box checked
- Second HTTP Request activity - Download a file - use the cookies from the previous request completed

However, if the *Accept cookies* check box is not checked on the first HTTP Request activity, the second HTTP request will still attempt to download the file specified in the activity. If the user isn't logged in, then the web page will require the user to log in and the 200 (OK) status code will not display.

To ensure that the 200 OK status code is displayed, add result handlers to the activity to ensure the expected status code.

- 
- Step 1** On the appropriate activity property page, click the **Cookies** tab.
- Step 2** Complete the fields as necessary, then click the **Save** icon.
- 

## Inserting a Web Service Cookie Data Table Reference Property

Use the Insert Variable Reference dialog box to select a cookie reference variable to populate the *Use cookies from previous request* field on the web service activity. You can select the entire Cookie data table or a Cookie reference property. The OK button does not activate until a valid property or variable is selected.

- 
- Step 1** To the right of a field on a property page, click the **Reference** tool.
- Check the **Show Advanced** check box to display all items that are available for referencing.
- If the check box is not checked, then only the most commonly-used items are displayed for activities, processes or events.
- Step 2** Click the **Save** icon to save the changes.
- Step 3** Click the appropriate Workflow Activity Expand (+) > Cookies to display the reference columns for the cookie.

- Step 4** From the list of displayed objects, select the appropriate cookie property.
- Step 5** Click **OK** to add the selected Cookie reference variable to the related text field.
- 

## Viewing Web Service Activity Results

### Viewing the URL Ping Response Time

When the URL Ping activity is launched, the summary information from the activity results are displayed from the Operations Workspace activity instance view.

To view the URL Ping results:

- Step 1** On the **Operations** workspace, click the **Activity Views** folder.
- Step 2** Expand the appropriate process and then double-click the appropriate activity instance.  
The URL Ping Properties dialog box displays.
- Step 3** Click the **Results** *display-only* tab to view the results of the response time for the URL specified in the activity properties.
- Destination—File path or URL for the web address pinged
  - Response time (in milliseconds)—Time taken for web site to respond to the ping
- 

### Viewing the Web HTTP Request Activity Results

When the Web HTTP Request activity is launched, results are displayed from the Operations Workspace activity instance view.

To view Web HTTP Request output results:

- Step 1** In the **Operations** workspace, click the **Activity Views** folder.
- Step 2** Highlight the Web HTTP Request activity instance, right-click and choose **Properties**.  
The Web HTTP Request Properties dialog box displays.
- Step 3** Click the **Output** display-only tab to view the header request results.
- Response URL—Displays the URL requested by the activity
  - Status Code—HTTP status code may indicate whether a request is successful or unsuccessful
  - Status Description—Description of the HTTP status
- Step 4** Click the appropriate to indicate which format the output should be displayed.
- 

### Viewing the Web HTTP Save File Results

When the Web HTTP Save File activity is launched, the summary information from the activity results are displayed from the Operations Workspace activity instance view.



To view the Web HTTP Save File results:

- 
- Step 1** On the Operations workspace, click the Activity Views folder.
- Step 2** Expand the appropriate process and then highlight the Web HTTP Save File activity instance, right-click and choose **Properties**.  
The Web HTTP Save File Properties dialog box displays.
- Step 3** Click the **Save File** *display-only* tab to view the file properties of the newly saved file.
- **Saved File Path**—File path to the local computer or network share which hosts the Cisco Process Orchestrator server where the file was saved
  - **File Size**—Size of the file saved (in Kilobytes)
  - **Response URL**—Displays the URL requested by the activity
  - **Status Code**—HTTP status code may indicate whether a request is successful or unsuccessful
  - **Status Description**—Description of the HTTP status
- 

## Viewing the Web Service Execute Activity Results

When the Web Service Execute activity is launched, results are displayed from the Operations Workspace activity instance view.

To view Web Service Execute output results:

- 
- Step 1** In the Operations workspace, click the Activity Views folder.
- Step 2** Highlight the activity instance, right-click and choose Properties.  
The Web Service Execute Properties dialog box displays.
- Step 3** Click the **Output** tab to view the web service results.
- Step 4** Click the appropriate button to indicate which format the output should be displayed.
-

# Windows Adapter

Cisco Process Orchestrator's process automation engine provides the logical constructs necessary to support even the most complex requirements to automate Microsoft Windows server operating systems tasks. Windows Server 2003 or later is required for use in Process Orchestrator.

The Windows Adapter provides the ability to easily query Windows performance data and execute Windows commands and scripts.

The Windows Adapter provides the following activities for querying specific Windows performance information. Additional activities can display in the Process Editor toolbox if you have imported the Windows automation pack. For more information about using these activities, see [Getting Started Using the Microsoft Windows Adapter, page 12-229](#).

| Activity                          | Description  |
|-----------------------------------|--|
| Control Windows Service           | Specifies the Windows service to which an action should be performed.<br>See <a href="#">Defining the Control Windows Service Activity, page 12-231</a>  |
| Copy Folder                       | Copies file folders from one location to another.<br>See <a href="#">Defining Copy Folders Activity, page 12-236</a>   |
| Correlate Windows Event           | Specifies the event log information that is to be located on the target.<br>See <a href="#">Defining a Correlate Windows Event Activity, page 12-232</a>   |
| Create Folder                     | Creates a file path.   |
| Execute Windows Command           | Specifies the Windows command and the target directory on which to execute.<br>See <a href="#">Defining the Execute Windows Command Activity, page 12-234</a>  |
| Execute Windows PowerShell Script | Specifies a Windows command and the target directory on which to execute.<br>See:<br><ul style="list-style-type: none"> <li>• <a href="#">Defining the Execute Windows PowerShell Script Activity, page 12-235</a></li> <li>• <a href="#">Adding a Script Argument, page 12-238</a></li> </ul> |
| Execute Windows Script            | Specifies the Windows script and target directory on which to execute.<br>See:<br><ul style="list-style-type: none"> <li>• <a href="#">Defining the Execute Windows Script Activity, page 12-237</a>.</li> <li>• <a href="#">Adding a Script Argument, page 12-238</a></li> </ul>              |
| Get Folder Properties             | Retrieves folder properties.   |
| Query Windows Events              | Specifies the criteria for an event that must be matched to trigger the process.<br>See <a href="#">Defining the Query Windows Events Activity, page 12-238</a>  |

| Activity                          | Description  |
|-----------------------------------|--|
| Query Windows Performance Counter | Specifies the information used to collect performance data for your monitoring system components.<br>See: <ul style="list-style-type: none"> <li>• <a href="#">Defining the Query Windows Performance Counter Activity, page 12-240</a></li> <li>• <a href="#">Selecting a Performance Counter, page 12-241</a></li> </ul> |
| Query Windows Registry            | Specifies the information necessary to read information from the registry keys.<br>See: <ul style="list-style-type: none"> <li>• <a href="#">Defining the Query Windows Registry Activity, page 12-242</a></li> <li>• <a href="#">Selecting a Registry Key, page 12-243</a></li> </ul>                                     |
| Query Windows Service             | Produces the current state of the service, the startup type of the service, and specifies the Windows service to be queried.<br>See <a href="#">Defining the Query Windows Service Activity, page 12-242</a> .   |
| Restart Server                    | Use the Restart Server activity to indicate the time to delay before restarting a server and the server restart notification message.<br>See <a href="#">Defining Restart Server Activity, page 12-241</a>   |
| Stop Windows Process              | Use this activity to stop a currently-running Windows process.<br><a href="#">Define a Stop a Windows Process Properties Activity, page 12-238</a>   |
| Uninstall Application             | Use this activity to uninstall a specific application.   |
| Update Windows Registry           | Specifies the information required to update the existing information from the registry keys.<br>See: <ul style="list-style-type: none"> <li>• <a href="#">Defining the Update Windows Registry Activity, page 12-244</a></li> <li>• <a href="#">Selecting a Registry Key, page 12-243</a></li> </ul>                      |
| Update Windows Service            | Specifies the Windows service to configure with a new startup mode.<br>See <a href="#">Defining the Update Windows Service Activity, page 12-244</a>   |
| Write File                        | Writes content into a file that resides on a remote machine.<br>See <a href="#">Defining the Write File Activity, page 12-244</a> .  |

## Getting Started Using the Microsoft Windows Adapter

Use the following process to monitor and manage Microsoft Windows adapter instances.

- 
- Step 1** Create a Microsoft Windows target (see [Defining a Microsoft Windows Target, page 12-230](#)).
  - Step 2** Create a Windows user (see [Defining a Windows User, page 12-231](#)).
  - Step 3** Define a Windows message event trigger (see [Creating a Microsoft Windows Event Trigger, page 12-231](#)).
  - Step 4** Define a Microsoft Windows command activity.




---

**Note** To ensure these Windows activities execute properly, verify that the Remote Registry service is enabled on your machine.

---

- a. In the Process Editor Toolbox, choose **Microsoft Windows** > [**Microsoft Windows Activity**], then drag and drop the activity onto the Workflow pane.
- b. Click the **General** tab and enter the required information.
- c. Click the [**Activity-Specific**] tabs to define the properties specific to the activity.
- d. Enter the information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

For details about a specific activity, see [Automating Microsoft Windows Adapter Activities, page 12-231](#).

**Step 5** View the activity results (see [Monitoring Operations, page 8-1](#)).

---

## Defining a Microsoft Windows Target

Use the Windows Computer target to specify the connection information for the Windows computer used for processes to run against. The Windows computer target must be added to the domain in which the Cisco Process Orchestrator server has a trust relationship, before it can be used as a target on the Cisco Process Orchestrator server.

Windows firewall settings must be adjusted to allow Windows Management Instrumentation (WMI) to pass through.

---

**Step 1** Choose **Definitions** > **Targets**, right-click and choose **New** > **Windows Computer**.

**Step 2** Click the **General** tab and enter the appropriate information.

**Step 3** Click the **Connection** tab to specify the following information:

- Computer name (NetBIOS)—The name of the computer (local computer name)
  - Local computer name
  - .DNS name
  - NetBIOS name
  - IP address
- Default runtime user—Select the default runtime user account that contains the credentials to connect to the target.

**Step 4** Click **OK** to close the dialog box and complete the procedure.

---

## Defining a Windows User

The credentials specified for a runtime user stores the information about the user security context and to pass this information to the adapters. Use the credentials specified for the Windows user to assign run options for processes or activities.

- 
- Step 1** Choose **Definitions > Runtime Users**, right-click and choose **New > Windows User**.
  - Step 2** Click the **General** tab and enter the required information.
  - Step 3** Click **OK** to close the dialog box and complete the procedure.
- 

## Creating a Microsoft Windows Event Trigger

Use the Windows Event trigger to specify the criteria for an event that must be matched execute a process. This criteria must be met before the process executes.

- 
- Step 1** Choose **Definitions > Processes**, right-click and choose **Edit**.
  - Step 2** Click the **Triggers** tab and choose **New > Windows Event**.  
For details about creating a trigger, see [Creating Triggers, page 11-1](#).
- 

## Automating Microsoft Windows Adapter Activities

### Defining the Control Windows Service Activity

Use the Control Windows Service activity to specify the Windows service to which an action should be performed.



**Note**

To ensure this Windows activity executes properly, verify that the Remote Registry service is enabled on your machine.

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- 
- Step 1** In the Process Editor Toolbox, choose **Microsoft Windows > Control Windows Service** and drag and drop the activity onto the Workflow pane
  - Step 2** Click the **Service** tab to specify the Windows service and the action that should be performed against the service and the amount of time to wait before completion:
  - Step 3** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
-

## Viewing Results

Click the **Service** tab to view the Windows service name the action was performed on. See also, [Defining the Control Windows Service Activity](#).

## Defining a Windows Ping Activity

Use the Ping activity to determine whether a specific IP address is accessible during network troubleshooting.

- 
- Step 1** In the Process Editor Toolbox, choose **Networking > Ping** and drag and drop the activity onto the Workflow pane.
  - Step 2** Click the **Inputs** tab and enter the host name or IP address of the server to be pinged.
  - Step 3** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Defining a Correlate Windows Event Activity

Use the Correlate Windows Events activity to specify the event log information that is to be located on the target.



### Note

To ensure this Windows activity executes properly, verify that the Remote Registry service is enabled on your machine.

- 
- Step 1** In the Process Editor Toolbox, choose **Microsoft Windows > Correlate Windows Events** and drag and drop the activity onto the Workflow pane.
  - Step 2** Click the **General** tab and enter the appropriate information.
  - Step 3** Click the **Event Criteria** tab and specify the following event properties for the activity:
    - Correlate events that occur within—Enter a value and select the time unit to indicate the time period in which the events should correlate before or after the process start time. The process start time is the default object used to correlate events.
      - Time unit—Enter the start time value to specify the time period to correlate. Click the time unit link to change the time interval.
      - Event occurrence—Click the link to determine whether the process start time is before or after the event occurs.
    - Number of events to correlate—Select one of the following radio buttons to specify which events to correlate during the specified time period:
      - All events in the above time frame—Select this radio button to correlate all events that occur within the specified time frame.
      - Number of events—Select this radio button and then enter the number of events to correlate in the text field.
    - Event criteria—Specify the following information as necessary:

- Event log name—The name of the event log to be matched. Enter a name or expression in the text field.
- Event types—Check the check boxes for the types of events that must be matched.
- Event source—Check the check box and then enter the source or click the **Reference** tool to select a variable to find event log entries by where they occurred.
- Event number—Check the check box and then enter the event ID or click the **Reference** tool to select a variable to find an event log entry by the event ID.
- Event description—Check the check box and then enter the description or click the **Reference** tool to select a variable to find an event log entry matching a description.
- Event computer—Check this check box to find an event log entry by matching a specific computer. Enter the computer name in the text field that should be matched or click the **Reference** tool to select a variable for the field value.

**Step 4** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.

---

### Viewing Results

Click the **Event Criteria** display-only tab to view the event log information that located on the target. See also, [Defining a Correlate Windows Event Activity](#).

## Defining the Copy Folders Activity

Use the Copy Folders activity to copy file folders from one location to another.

---

- Step 1** On the Toolbox, select **Copy Folders** and drag and drop the activity onto the Workflow pane. The Copy Folders property page displays.
- Step 2** Click the **Inputs** tab to continue and specify the following information:
- Source – Files or folders to be copied
  - Destination – Location to where the files or folders will be copied
- Step 3** Click **Save** on the toolbar to save the activity properties.
- 

### Viewing Results

Click the instance display-only tab to view the source and destination of the files and to view the inputs and outputs of the activity. See also, [Defining the Copy Folders Activity](#).

## Defining the NSLookup Activity

Use the NSLookup activity for testing and troubleshooting DNS servers.

---

- Step 1** On the Toolbox, select NSLookup and drag and drop the activity onto the Workflow pane. The NSLookup property page displays.

- Step 2** Click the **Inputs** tab to continue and in the Destination field, enter the host name.
- Step 3** Click **Save** on the toolbar to save the activity properties.
- 

## Viewing Results

Click the instance display-only tab to view the results of the DNS server test and troubleshoot for the activity. See also, [Defining the NSLookup Activity](#).

## Defining the Execute Windows Command Activity

Use the Execute Windows Command activity to specify a Windows command and the target directory on which to execute that command.



### Note

To ensure this Windows activity executes properly, verify that the Remote Registry service is enabled on your machine.

---

- Step 1** In the Process Editor Toolbox, choose **Microsoft Windows > Execute Windows Command** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **Command** tab to define the properties specific to the activity, including:
- Command line to execute on target—The actual command line to use to execute an activity on the specified local working directory on the Windows target computer. For example:  
If the local working directory is C:\program files and the command is myapppath\app.exe, then the full path is:  
C:\program files\myapppath\app.exe
  - Local working directory on target—Enter the path to the local working directory on the Windows target where the command will be executed.
  - Wait for command to complete or time out in—Enter a value or use the scroll buttons to specify the time frame to wait for the action to complete.



### Note

Select the time unit link to adjust the time unit (seconds, minutes, or hours).

---

- Fail on non-zero return code—Check this check box to configure the activity to fail when a return code having a non-zero value is received.
- Step 3** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Viewing Results

Click the instance display-only tab to view the Windows command and the target directory on which the command was executed. See also, [Defining the Execute Windows Command Activity](#).



## Defining Uninstall Application Activity

Use the Uninstall Application activity to uninstall a specific application.

To define the Uninstall Application activity:

- 
- Step 1** On the Toolbox, select Uninstall Application and drag and drop the activity onto the Workflow pane. The Uninstall Application property page displays.
  - Step 2** Click the **Inputs** tab to continue and in the Application Name field, enter the display name as it is shown in the Add/Remove Programs list.
  - Step 3** Click **Save** on the toolbar to save the activity properties.
- 

### Viewing Results

Click the instance display-only tabs to view the application that was uninstalled. See also, [Defining Uninstall Application Activity](#).

## Defining Trace Route Activity

Use the Trace Route activity to assist during network troubleshooting.

To define the Trace Route activity:

- 
- Step 1** On the Toolbox, select **Trace Route** and drag and drop the activity onto the Workflow pane. The Trace Route property page displays.
  - Step 2** On the **General** tab, enter a Name and Description for the activity.
  - Step 3** Click the **Inputs** tab to continue and in the Destination field, enter the address to be used as the trace route. Valid entries include: ipaddress, netbiosname, fully qualified domain name.
  - Step 4** Click the link to modify the option for the condition equation that is to be evaluated for a specific condition type (Time, Variable, Prior Process Instance or Compound).
  - Step 5** Click **Save** on the toolbar to save the activity properties.
- 

### Viewing Results

Click the instance display-only tabs to view the traced route. See also, [Defining Trace Route Activity](#).

## Defining the Execute Windows PowerShell Script Activity

Use this activity to specify a Windows command and the target directory on which to execute.

**Note**

To ensure this Windows activity executes properly, verify that the Remote Registry service is enabled on your machine.

---

- 
- Step 1** In the Process Editor Toolbox, choose **Microsoft Windows > Execute Windows PowerShell Script** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **PowerShell Script** tab to specify the command used to execute an activity on a local working directory on the Windows target:
- Local working directory on target—Enter the path to the local working directory on the Windows target where the script will be executed.
  - Script arguments—Enter the collection of argument values for the script. Multi-line script arguments are not supported. See [Adding a Script Argument](#).
  - Script to execute on target—Enter the actual script code to use to execute an activity on the specified local working directory on the Windows target computer.
  - Timeout—Enter the time period the activity should wait before failing.
  - Use 32-bit version of PowerShell on 64-bit Windows target—Check this check box to indicate that the 32-bit PowerShell will be used to work against a 64-bit Windows target.
  - Select this check box if script accesses remote resources—Check this check box to indicate that the script will access remote resources
  - Fail on non-zero return code—Check this check box configure the activity to fail when a return code having a non-zero value is received.
- Step 4** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Viewing Results

Click the instance display-only tabs to view the Windows command and the target directory on which the activity was executed. See also, [Defining the Execute Windows PowerShell Script Activity](#).

## Defining Copy Folders Activity

Use the Copy Folders activity to copy file folders from one location to another.

To define the Copy Folders activity:

- 
- Step 1** On the Toolbox, select Copy Folders and drag and drop the activity onto the Workflow pane. The Copy Folders property page displays.
- Step 2** Click the **Inputs** tab to continue and specify the following information:
- Source – Files or folders to be copied
  - Destination – Location to where the files or folders will be copied
- Step 3** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
-

## Viewing Results

Click the instance display-only tabs to view the source and location of the copied folder. See also, [Defining Copy Folders Activity](#)

## Defining the Execute Windows Script Activity

Use the Execute Windows Script activity to specify a Windows script and the target directory on which to execute.

**Note**

To ensure this Windows activity executes properly, verify that the Remote Registry service is enabled on your machine.

- 
- Step 1** In the Process Editor Toolbox, choose **Microsoft Windows > Execute Windows Script** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Script** tab to define the properties specific to the activity, including:
- Local working directory on target—Enter the path to the local working directory on the Windows target where the script will be executed.
  - Script arguments—Enter the collection of argument values for the script. Multi-line script arguments are not supported.
  - Script to execute on target—Enter the actual script code to use to execute an activity on the specified local working directory on the Windows target computer.
  - Wait for script to complete or time out in—Enter a value or use the scroll buttons to specify the time frame to wait for the action to complete.  
Select the time unit link to adjust the time unit (seconds, minutes, or hours).
  - Select this check box if script accesses remote resources—Check this check box to indicate that the script will access remote resources
  - Fail on non-zero return code—Check this check box configure the activity to fail when a return code having a non-zero value is received.
- Step 4** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Viewing Results

Click the instance display-only tabs to view the Windows script and the target directory on which the script was executed. See also, [Defining the Execute Windows Script Activity](#)

## Adding a Script Argument

Script arguments are a property for Windows script and command activities. The Add button on these activities launches the Select Argument to Add dialog box for users to specify the script arguments to be added to the list on the specified Windows activity.

- 
- Step 1** On the appropriate Windows activity property page, click **Add**.
- Step 2** Enter the appropriate script argument value for the script in the text field or click the Reference tool to select from the list.
- String Dialog box can contain standard string text
  - Secure String Dialog box can contain hidden string text or query encrypted value variables in the Insert Reference Variable dialog box
- Step 3** Click **OK**.
- The script argument is added to the command line argument list on the Windows activity property page.
- 

## Define a Stop a Windows Process Properties Activity

Use the Stop a Windows Process activity to stop a running Windows process.

To launch this activity, the runtime user should have local administrative rights to the target.

If the runtime user does not have these rights, the activity will fail and display a message that the process has encountered a failed node.

- 
- Step 1** In the Process Editor Toolbox, choose **Microsoft Windows > Stop Windows Process** drag and drop the activity onto the Workflow pane.
- Step 2** Click the **Inputs** tab and enter the Windows process ID for the appropriate running process to be stopped
- Step 3** Click **OK**.
- 

### Viewing Results

Click the instance display-only tabs to view the process that was stopped. See also, [Define a Stop a Windows Process Properties Activity](#).

## Defining the Query Windows Events Activity

Use the Query Windows Events activity to specify information about the event logs that you want to find on the target. The activity searches the event log on the specified target and returns all matching events in the activity instance.



### Note

To ensure this Windows activity executes properly, verify that the Remote Registry service is enabled on your machine.

---

- 
- Step 1** In the Process Editor Toolbox, choose **Microsoft Windows > Query Windows Events** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Event Log** tab to define the properties specific to the activity, including:
- Event types—The types of events that must be matched (Information, Warning, Error, Success Audit, Failure Audit).
  - Event log name—The name in the text field of the event log to be matched.
  - Event source—Check the check box and enter the source or click the Reference tool to select a variable to find event log entries by where they occurred.
  - Event number—Check the check box and enter the event ID or click the Reference tool to select a variable to find an event log entry by the event ID.




---

**Note** Use a comma to separate multiple event IDs in the field.

---

- Event description—Check this check box and enter the description in the field to find an event log entry to match the description.
  - Event computer—Check this check box and enter the computer name in the text field to find an event log entry to match to a specific computer.
  - Events generated within the last—Specify a time period in which the event occurred. Enter that value or scroll to the value and then select the time unit (minutes, hours, or days).
  - Return the newest (latest) event only—Check this check box if you want only the most recent event to be returned.
- Step 4** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Viewing Results

Click the instance display-only tabs to view the event logs found on the target selected. See also, [Defining the Query Windows Events Activity](#).

## Defining the Read File Activity

Use the Read File activity to read the content a file that resides on a remote machine.

- 
- Step 1** In the Process Editor Toolbox, choose **Microsoft Windows > Read File** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Read File** tab and specify the following information:
- Local file name—Name of file as it was saved on the local computer.

## Defining Get Folder Properties Activity

Use the Get Folder Properties activity to retrieve folder properties.

To retrieve folder properties:

- 
- Step 1** On the Toolbox, select **Get Folder Properties** and drag and drop the activity onto the Workflow pane. The Get Folder Properties property page displays.
- Step 2** Click the **Inputs** tab to continue, in the Folder field, specify the file path for the appropriate folder. For example:
- c:\
  - d:\program files
  - h:\temp\
- Step 3** Click **Save** on the toolbar to save the activity properties.
- 

### Viewing Results

Click the instance display-only tabs to view the properties of the selected folder. See also, [Defining the Read File Activity](#).

## Defining the Query Windows Performance Counter Activity



### Note

To ensure this Windows activity executes properly, verify that the Remote Registry service is enabled on your machine.

---

- Step 1** In the Process Editor Toolbox, choose **Microsoft Windows > Query Windows Performance Counter** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **Counter** tab to define the properties specific to the activity. You can either:
- Manually enter the following fields:
    - Object name—A name of the category that contains the performance counter
    - Counter name—The name of the performance counter
    - Instance Name—The name of the instance specific to the selected counterFor instance names containing common wildcard expressions, add an escape value “\” to the expression. For example, the instance name java#1, should be java\#1.
  - Click **Browse** to select the performance counter and the instance to be used in the Query Windows Performance Counter activity (see [Selecting Performance Counters to Monitor](#)).
- Step 3** Click **OK** to return to the Query Windows Performance Counter property page.
- Step 4** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

### Viewing Results

Click the instance display-only tabs to view the properties specific to the Performance Counter activity. See also, [Defining the Query Windows Performance Counter Activity](#).

## Selecting a Performance Counter

Use the Select Performance Counter dialog box to select the performance counter and the instance to be used in the Query Windows Performance Counter activity.

- 
- Step 1** On the Query Windows Performance Counter property page, click **Browse**.
- Step 2** Choose one of the following:
- Use local computer counters—Select this option to use the performance counters available on your local computer.
  - Select counters from computer—Select this option to use the performance counters available on the specified computer.
- Step 3** From the Category name drop-down list, select the name of the category that contains the performance counter.
- Step 4** From the Counter list, select the counter that you want to use to collect data.
- Step 5** From the Instance list, select the instance from which you want to collect data.
- 

## Defining Restart Server Activity

Use the Restart Server activity to indicate the time to delay before restarting a server and the server restart notification message.

To define the Restart Server activity:

- 
- Step 1** On the Toolbox, select Restart Server and drag and drop the activity onto the Workflow pane. The Restart Server property page displays.
- Step 2** On the General tab, enter a Name and Description for the activity.
- Step 3** Click the **Inputs** tab to continue and specify the following information:
- Delay – Time to wait before forcing the restart
  - Note – Reason to restart server
- Step 4** Click the link to modify the option for the condition equation that is to be evaluated for a specific condition type (Time, Variable, Prior Process Instance or Compound).
- TRUE/FALSE
- Step 5** Click **Save** on the toolbar to save the activity properties.
- 

## Viewing Results

Click the instance display-only tabs to view the time delayed before restarting a server and the server restart notification message. See also, [Defining Restart Server Activity](#).

## Defining the Query Windows Registry Activity



### Note

To ensure this Windows activity executes properly, verify that the Remote Registry service is enabled on your machine.

- 
- Step 1** In the Process Editor Toolbox, choose **Microsoft Windows > Query Windows Registry** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Registry** tab to define the properties specific to the activity, including:
- Registry hive—The name of the registry hive where the registry key and value are located
  - Registry key—Enter the registry key. You can either:
    - Enter the key manually or select a defined variable that represents the registry key to be used to read data. For example:  
software\microsoft\windows nt\currentversion
    - Click **Browse** to select the registry key (see [Selecting a Registry Key, page 12-243](#)).
  - Check for key existence only—Query the registry to determine whether the key exists
  - Read from value name—Read the value associated with the specified registry key
  - Options for 64-bits Windows targets—Select one of the following options to query the windows registry:
    - Query on 32-bit registry section
    - Query on 64-bit registry sections
    - Query on both 32-bit and 64-bit registry sections
- Step 4** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Viewing Results

Click the instance display-only tabs to view the results of the register query. See also, [Defining the Query Windows Registry Activity](#).

## Defining the Query Windows Service Activity

Use the Query Windows Service activity to produce the current state of the service, the startup type of the service, and specifies the Windows service to be queried.



### Note

To ensure this Windows activity executes properly, verify that the Remote Registry service is enabled on your machine.

- 
- Step 1** In the Process Editor Toolbox, choose **Microsoft Windows > Query Windows Service** and drag and drop the activity onto the Workflow pane.



- 
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Service** tab to specify the name of the Windows service to be queried.
- Step 4** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

### Viewing Results

Click the instance display-only tabs to view the current state of the service, the startup type of the service, and the Windows service queried. See also, [Defining the Query Windows Service Activity](#).

## Defining the Create Folder Activity

Use the Create Folder activity to create a file path for the folder.

To launch this activity, the runtime user must have local administrative rights to the target.

- 
- Step 1** In the Process Editor Toolbox, choose **Microsoft Windows > Create Folder** and drag and drop the activity in the Workflow pane.
- Step 2** Click the **Registry** tab to define the properties specific to the activity, including:
- Registry hive—The name of the registry hive where the registry key and value are located
  - Registry key—Enter the registry key. You can either:
- Step 3** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

### Viewing Results

Click the instance display-only tabs to view the file path for the folder created. See also, [Defining the Create Folder Activity](#).

## Selecting a Registry Key

Use the Select Registry Key dialog box to select the registry key to be used in the Query Windows Registry and the Update Windows Registry activities.

- 
- Step 1** On the Query Windows Registry property page, click **Browse**.
- Step 2** Choose one of the following:
- Use local computer registry—Select this option to use the available registry keys on your local computer.
  - Select registry key from computer—Select this option to use the registry keys available on the specified computer.
- Step 3** Under Registry key, select the registry key from the current registry hive.
-

## Defining the Update Windows Registry Activity

Use the Update Windows Registry activity to specify the information required to update the existing information from the registry keys.

- 
- Step 1** In the Process Editor Toolbox, choose **Microsoft Windows > Update Windows Registry** and drag and drop the activity onto the Workflow pane.
  - Step 2** Click the **General** tab and enter the appropriate information.
  - Step 3** Click the **Registry** tab to specify the registry information (see [Defining the Query Windows Registry Activity, page 12-242](#)).
  - Step 4** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

### Viewing Results

Click the instance display-only tabs to view the information used to update the existing information from the registry keys. See also, [Defining the Update Windows Registry Activity](#).

## Defining the Update Windows Service Activity

Use the Update Windows Service activity to specify the Windows service to configure with a new startup mode.



### Note

To ensure this Windows activity executes properly, verify that the Remote Registry service is enabled on your machine.

---

- 
- Step 1** In the Process Editor Toolbox, choose **Microsoft Windows > Update Windows Service** and drag and drop the activity onto the Workflow pane.
  - Step 2** Click the **General** tab and enter the appropriate information.
  - Step 3** Click the **Service** tab to specify the name of the Windows service and the new startup mode (see [Defining the Query Windows Service Activity, page 12-242](#)).
  - Step 4** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

### Viewing Results

Click the instance display-only tabs to view the Windows service configured with a new startup mode. See also, [Defining the Update Windows Service Activity](#).

## Defining the Write File Activity

Use the Write File activity to write content into a file that resides on a remote machine.

**Note**

To ensure this Windows activity executes properly, verify that the Remote Registry service is enabled on your machine.

- 
- Step 1** In the Process Editor Toolbox, choose **Microsoft Windows > Write File** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Write File** tab and specify the following information:
- Local file name—File path including the name of the file in which the contents are written. For example:  
C:\Documents and Settings\user name\My Documents\file name
  - Content—Enter the appropriate contents to include in the file.
  - Encoding—Select the appropriate encoding class for the file, as necessary:
    - ASCII—An encoding for the ASCII (7-bit) character set
    - Unicode—An encoding for the UTF-16 format using the little endian byte order
    - UTF-7—An encoding for the UTF-7 format and is less robust and secure than UTF-8, UTF-16, or UTF-32
    - UTF-8—An encoding for the UTF-8 format
    - UTF-32—An encoding object for the UTF-32 format using the little endian byte order
  - Options—Select the appropriate action to take when saving the file.
- Step 4** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

## Viewing Results

Click the instance display-only tabs to view the content written into a file that resides on a remote machine. See also, [Defining the Write File Activity](#).

# Networking Adapter

## Defining the Convert Integer to IP Address Activity

Use the Convert Integer to IP Address activity to change an integer to an IP address.

- 
- Step 1** In the Process Editor Toolbox, choose **Networking > Convert Integer to IP Address** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Inputs** tab to specify the integer value to be returned as an IP address.
- Integer Representation—Integer value to be returned as an IP address.  
Example

0 returns an IP address of 0.0.0.0

3232271626 returns and IP address of 192.168.141.10

- Step 4** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

### Viewing Results

Click the instance display-only tabs to view the integer changed to an IP address. See also, [Defining the Convert Integer to IP Address Activity](#).

## Defining the Convert IP Address to Integer Activity

Use the Convert IP Address to Integer activity to change an IP address to an integer.

---

- Step 1** In the Process Editor Toolbox, choose **Networking > Convert IP Address to Integer** and drag and drop the activity onto the Workflow pane.
- Step 2** Click the **General** tab and enter the appropriate information.
- Step 3** Click the **Inputs** tab to specify the IP address that to be returned as an integer.
- IP Address—IP address to be returned as an integer
- Step 4** Complete the appropriate information in the remaining tabs as necessary, then click **Save** to complete the activity definition.
- 

### Viewing Results

Click the instance display-only tabs to view the IP address that changed to an integer. See also, [Defining the Convert IP Address to Integer Activity](#).

# Cisco Process Orchestrator Adapter Help for Terminal Adapter

## Overview

The Terminal adapter provides the functionality to execute commands, scripts and session-based activities against a system or network device using SSH or Telnet. While SSH is more secure than telnet, many environments use a telnet connection and using a SSH connection against such devices will not be possible. The Terminal adapter was improved to allow users the flexibility to execute against those devices.

The Terminal adapter allows Cisco Process Orchestrator to run commands and script activities on a system or network device that has Secure Shell (SSH) enabled. The Terminal adapter also contains three session-based activities which allow users to open new SSH/Telnet sessions and interact with the previously opened sessions.

SSH and Telnet leverage the same command execution activities differentiated by the target type they are deployed against. For example, an IOS target can have SSH or telnet optionally configured.

Cisco Process Orchestrator requires SFTP to be configured on the Unix/Linux system in order to execute SSH activities. SFTP is not needed for the SSH/Telnet Terminal Session activities.

The information in this online help is intended to provide information on using the objects provided by the Terminal adapter including instructions for viewing Terminal adapter properties, defining device targets and activities, completing the property pages for each specific activity, and viewing the activity results.

## Configuring Terminal Adapter

### Configuring SSH Version 2.0 Support for Cisco IOS Devices

To properly execute Cisco IOS processes and activities against the Terminal adapter, the IOS device cannot run using SSH v1.0. The IOS devices should be configured to run SSH v2.0. The Secure Shell Version 2 Support feature allows users to configure Secure Shell (SSH) Version 2.

Before configuring SSH, download the k9 (Triple Data Encryption Standard [3DES]) software image from Cisco IOS Release 12.3(4)T, 12.2(25)S, or 12.3(7)JA onto your router.

### Configuring an Expect Template

Because creating Terminal targets can be complex, the expect template provides users with limited knowledge of expects a simpler method to complete the target configuration properties. Expect templates contain default configuration sequence of expects and elevated privilege command expects.

The Expect Template tab on the Terminal Adapter dialog box displays the list of default expect template configurations that have been created using the Expect Templates dialog box. From this tab, users can create, modify, and delete expect templates.

Expect templates can be imported and exported just like other objects in an automation pack. Imported expect templates from an automation pack can only be modified by the author of that automation pack. A Process Orchestrator content-author can only export those expect templates created by that content author.

To configure an expect template:

---

**Step 1** On the **Administration > Adapters** view, highlight **Terminal Adapter**, right-click and choose **Properties**.

The Terminal Adapter Properties dialog box displays.

**Step 2** Click the **Expect Templates** tab to continue.

**Step 3** Click **New > Expect Template**.

The New Expect Template Properties dialog box displays.

**Step 4** Click the **Expect Template** tab to configure the default expect values.

**Step 5** Complete the following information for the connection patterns.

- Prompt—Enter the system prompt pattern in regular expression
- Error—Enter the error message pattern in regular expression
- Admin Prompt—Enter the admin prompt pattern in regular expression

**Step 6** To elevate the privilege command for login expects:

- Elevating Privilege command—Check this check box and in the text field, enter the command or select the reference variable containing the command to elevate the privilege for the expect.
- Elevating Privilege expects—Use this section to view and/or define the login expect sequence for the elevating privilege command expects.

**Step 7** Click **OK** to close the dialog box.

---

## Enabling the FIPS-Compliance JCE Provider

The Terminal Adapter ships with a FIPS-compliant Java Crypto Extension (JCE) provider to connect to FIPS-compliant network devices, such as the ACS 5.2 server. This provider includes encryption algorithms that may not be supported by Java that are also useful in high-security scenarios.

To enable the FIPS-compliance algorithm:

**Step 1** On the **Administration > Adapters** view, highlight **Terminal Adapter**, right-click and choose **Properties**.

The Terminal Adapter Properties dialog box displays.

**Step 2** Click the **Advanced** tab to continue.

**Step 3** Under FIPS-Compliance, check the **Only use FIPS-compliant encryption algorithm** check box to indicate that only FIPS-compliant encryption algorithms should be used by the Terminal adapter.

If this check box is checked, then any SSH targets that uses an unsupported algorithm will not be accessible in Process Orchestrator.

**Step 4** Click **OK** to close the dialog box.

---

## Configuring Default Host-Based Authentication Keys

Users can define default host public and private keys on the Advanced tab of the Terminal Adapter dialog box. This tab allows users to select a specific private key for the target. The private key will be used for host-based authentication if a target does not specify its own keys.

The Authentication tab on a Target dialog box indicates whether the target should allow authentication based on the host system of the user and the user name on the remote host system.

To configure default host-based authentication keys:

**Step 1** On the **Administration > Adapters** view, highlight **Terminal Adapter**, right-click and choose **Properties**.

The Terminal Adapter Properties dialog box displays.

**Step 2** Click the **Advanced** tab to configure the authentication keys.

- Private key—To the right of the display-only field, click **Browse** to launch the Load Private Key dialog box to select a private key
- Public key—To the right of the display-only field, click **Browse** to launch the Load Public Key dialog box to select a public key.

- Public key file content—Enter the SSH public key request message to the remote SSH server that will authenticate the request against the stored public key.

**Step 3** Click **OK** to close the dialog box.

---

#### See Also

[Selecting a Private Key](#)

[Selecting a Public Key](#)

### Selecting a Private Key

Use the Load Private Key dialog box to select the private key file to be used to provide authentication of a public key. If OpenSSH is installed, the key pair is generated by the command line tool "ssh-keygen."

Copy the file to a location where it is accessible from the Process Orchestrator server, then follow the steps to load the private key.

The private key file should reside on the same machine as the Process Orchestrator server.

To configure a private key

---

**Step 1** On the **Administration > Adapters** view, highlight **Terminal Adapter**, right-click and choose **Properties**.

The Terminal Adapter Properties dialog box displays.

**Step 2** Click the **Advanced** tab to select the private key to authenticate the public key.

**Step 3** On the Private Key field, click **Browse**.

The Load Private Key dialog box displays.

- Passphrase to the private key file—Check this check box and in the text field, enter the passphrase to be used to the private key file.

The passphrase is used to protect the private key file when the private key is generated.

- Select a private key file—To the right of the display-only field, click **Browse** to launch the Open dialog box to locate the private key file.

The most commonly used private key file format is "RSA PRIVATE KEY." The private key file should reside on the same machine as the Process Orchestrator server. The default location of the file is under the unix user's home directory:

```
~/.ssh/id_rsa
```

The content of the private key file will be displayed after the passphrase is d against the private key file content.

**Step 4** Click **OK** to close the dialog box.

The private key displays on the Private key field on the Advanced tab. The content of the private key file will be displayed except in the Load Private File dialog box in order for the user to verify the content.

---

## Selecting a Public Key

A public key is a value provided by some designated authority as an encryption key that, combined with a private key derived from the public key, can be used to effectively encrypt messages and digital signatures.

Use the Load Public Key dialog box to select a public key to be used by the Terminal adapter.

To configure a public key

- 
- Step 1** On the **Administration > Adapters** view, highlight **Terminal Adapter**, right-click and choose **Properties**.
- The Terminal Adapter Properties dialog box displays.
- Step 2** Click the **Advanced** tab to select the private key to authenticate the public key.
- Step 3** On the Public Key field, click **Browse**.
- The Load Public Key dialog box displays.
- Step 4** On the Load Private Key dialog box, select the public key file.
- Select a public key file—To the right of the display-only field, click **Browse** to launch the Open dialog box to locate the public key file.
- Step 5** Click **OK** to close the dialog box.
- The public key displays on the Public key field on the Advanced tab.
- 

## Supported Cisco Appliances

The following table contains the list of Cisco appliances supported by the content provided by Process Orchestrator 3.5 to provide cloud and network support automation functionality. While specific Process Orchestrator content only works with the following devices, Process Orchestrator can work against any TELNET or SSH 2.0 device.

- Cisco ACE Application Control Engine Module—a next-generation load-balancing and application-delivery solution  
Learn more on the [Cisco ACE Application Control Engine Module Data Sheet](#).
- Cisco ASA 5580 Adaptive Security Appliances—Delivers multigigabit security services for large enterprise, data center, and service-provider networks in a robust, 4-rack-unit form factor  
Learn more on the [Cisco ASA 5500 Series Adaptive Security Appliances Data Sheet](#).
- Cisco Catalyst 6500 Series Network Analysis Module—Offers unparalleled visibility into network performance, and helps you simplify the application delivery challenges of today's dynamic, evolving global organizations  
Learn more on the [Cisco Catalyst 6500 Series Network Analysis Module](#)
- Cisco Catalyst 6500 Series Firewall Services Module—A high-speed, integrated firewall module which provides the fastest firewall data rates in the industry  
Learn more on the [Cisco Catalyst 6500 Series Firewall Services Module Data Sheet](#).

### See Also

[Supported Cisco Routers](#)

[Supported Cisco Switches](#)



## Supported Cisco Routers

The following table contains the list of Cisco routers supported by the content provided by Cisco Process Orchestrator 3.5 to provide cloud and network support automation functionality. While specific Cisco Process Orchestrator content only works with the following devices, Cisco Process Orchestrator can work against any TELNET or SSH 2.0 device.

- Cisco 2800 Series Integrated Services Routers—Designed for wire-speed delivery of highly secure concurrent services and can accommodate multiple T1/E1 connections.

Learn more on the [Cisco 2800 Series Integrated Services Router Data Sheet](#).

- Cisco 7200 Series Routers—Universal services aggregation router for enterprise and service provider edge applications

Learn more on the [Cisco 7200 Series Routers Overview Data Sheet](#).

- Cisco 7600 Series Routers—Offers integrated, high-density Ethernet switching, carrier-class IP/MPLS routing, and 10-Gbps interfaces

Learn more on the [Cisco 7600 Series Data Sheet](#).

- Cisco PIX 515E Security Appliance—Provides robust user and application policy enforcement, multi-vector attack protection, and secure connectivity services through a wide range of rich security and networking services

Learn more on the [Cisco PIX 515E Security Appliance Data Sheet](#).

### See Also

[Supported Cisco Appliances](#)

[Supported Cisco Switches](#)

## Supported Cisco Switches

The following table is a breakdown of the Cisco series switches supported by the content provided by Cisco Process Orchestrator 3.5 to provide cloud and network support automation functionality. While specific Cisco Process Orchestrator content only works with the following devices, Cisco Process Orchestrator can work against any TELNET or SSH 2.0 device.

- Cisco Catalyst 2950 Series Switches—Fixed-configuration, stackable standalone switch that provides wire-speed Fast Ethernet and Gigabit Ethernet connectivity

Learn more on the [Cisco Catalyst 2950 Series Switches Data Sheet](#).

- Cisco Catalyst 3750 Series Switches—Eases deployment of converged applications and adapts to changing business needs by providing configuration flexibility, support for converged network patterns, and automation of intelligent network services configurations

Learn more on the [Cisco Catalyst 3750 Series Switches Data Sheet](#).

- Cisco Catalyst 4500 Series Switches—Delivers a high-performance, highly secure, and mobile user experience for enterprise wiring closets, access and core layers through innovations in collaboration, security, resiliency, and EnergyWise

Learn more on the [Cisco Catalyst 4500 Series Switches Data Sheet](#).

- Cisco Catalyst 6500 Series Switches—Delivers secure, converged, end-to-end services, from the wiring closet to the core network, the data center, and the WAN edge

Learn more on the [Cisco Catalyst 6500 Series Switches Data Sheet](#).

- Nexus 1000V Series Switches—Ensures consistent, policy-based network and security services to all virtual machines (VMs) in your data center  
Learn more on the [Cisco Nexus 1000V Series Switches Data Sheet](#).
- Nexus 2000 Series Fabric Extenders—Simplifies data center architecture and operations to meet customers' business and application needs  
Learn more on the [Cisco Nexus 2000 Series Fabric Extenders Data Sheet](#).
- Nexus 5000 Series Switches—Helps transform the data center with innovative, standards-based, multilayer, multiprotocol, and multipurpose Ethernet-based fabric  
Learn more on the [Cisco Nexus 5000 Series Switches Data Sheet](#).
- Nexus 7000 Series Switches—Modular switching system designed to deliver 10 Gigabit Ethernet and unified fabric in the data center  
Learn more on the [Cisco Nexus 7000 Series Switches Data Sheet](#).

**See Also**[Supported Cisco Routers](#)[Supported Cisco Switches](#)

## Managing Terminal Objects

### Defining a Public-key Authenticated Admin Runtime User

Use the Public-key Authenticated Admin Runtime User dialog box to define the user credentials required to allow public key authentication and an administrative password is required to perform privileged operations.

If a target has set up public key authentication on the remote SSH server, the private key of the Public-key Authenticated Admin Runtime User will be used to form the SSH authentication request. The request is then authenticated against the stored public key on the remote server.

If the target does not allow public key authentication, the SSH authentication will fail.

To create a Public-key Authenticated Admin Runtime User:

- 
- Step 1** On the Definitions > Runtime Users view, right-click and choose **New > Public-key Authenticated Admin Runtime User**.
- The New Public-key Authenticated Admin Runtime User Properties dialog box displays.
- Step 2** Click the **General** tab to specify the requested information.
- Display name—Enter the display name for the runtime user.  
This field is populated with the information specified in the User name text field, but can be overwritten by the user.
  - Type—Display only. Type of object
  - Owner—User name of the owner of the object. This is typically the person who created the object.
  - User name—The user name assigned to access the device
  - Private key—To the right of the display-only field, click Browse to launch the Load Private Key dialog box to select a private key.

Use the Load Private Key dialog box to select the private key file to be used to provide authentication of a public key. The private key file should reside on the same machine as the Process Orchestrator server.

- Admin password—Check the Admin password check box and then enter the password assigned to access Privileged EXEC mode on the device.

The Privileged EXEC mode provides the highest level of commands to users.

- Description—Brief description of the runtime user

**Step 3** Click **OK** to close the dialog box.

---

## Defining a Public-key Authenticated Admin Runtime User

Use the Public-key Authenticated Admin Runtime User dialog box to define the user credentials required to allow public key authentication and an administrative password is required to perform privileged operations.

If a target has set up public key authentication on the remote SSH server, the private key of the Public-key Authenticated Admin Runtime User will be used to form the SSH authentication request. The request is then authenticated against the stored public key on the remote server.

If the target does not allow public key authentication, the SSH authentication will fail.

To create a Public-key Authenticated Admin Runtime User:

---

**Step 1** On the Definitions > Runtime Users view, right-click and choose **New > Public-key Authenticated Admin Runtime User**.

The New Public-key Authenticated Admin Runtime User Properties dialog box displays.

**Step 2** Click the **General** tab to specify the following information.

**Step 3** Click **OK** to close the dialog box.

---

## Defining a Network Device Module Target

Some Cisco network devices are chassis systems that can hold other network devices such as ACE, FWSM, on boards that plug into the chassis.

Use the Network Device Module to create a network device module target which can be used as a dependent of a terminal target as well as an independent network device target that can be used by network processes for execution.

To create a Network Device Module:

---

**Step 1** On the Definitions > Targets view, right-click, and choose **New > Network Device Module**.

The New Network Device Module Wizard displays.

**Step 2** On the General Information panel, enter the appropriate information, and click **Next**.

**Step 3** On the Terminal Connection panel, enter the appropriate target information to specify the connection information to the appropriate server, and click **Next**.

- Chassis system—From the drop-down list, select the appropriate terminal target on which the network Switch number. Check the check box and in the text field, enter the appropriate switch number for the chassis system.
- Slot number—Enter the slot number on which the network device module resides.
- Process Id—Enter the processor Id on which the network device module resides.
- Command to access—Enter the session command to access the network device module. The default command is session slot [Slot Number] processor [Processor Id].
- Prompt prefix—Enter the command prompt prefix that will be used by the device type configurations and expects when issuing commands and connecting to the device.

Adding a regex character, such as \$, >, and #, at the end of a prompt in the Prompt Prefix field in the command prompt prefix.

Regular expressions should be placed in the appropriate Terminal Interaction Pattern fields. See the Connections Patterns panel to customize the interaction patterns.

#### Example

If you connect to the terminal, and the prompt is Cisco\_7606#, enter the regular expression that will match the entire prefix (before #) using any of the following expressions:

- CISCO.\*
- .\*7606
- CISCO\_7606

- Default runtime user—Select the default runtime user account that contains the credentials to connect to the target.

**Step 4** On the Terminal Interaction Patterns panel, configure the terminal interaction patterns for the target, and click **Next**.

- Use patterns common for the following device—Select this radio button to choose *one* of the pre-defined expect templates from the drop-down list.
  - Cisco IOS Device—Select this option to use the default pattern values used by the device during the completion of a session command.
  - Unix—Select this option to use the default pattern values indicated for a Unix device during the completion of a session command.
- Customize patterns for this connection—Check this check box to customize the default values for the selected expect template. Click **Next** to continue to the Connection Patterns panel.

If the check box is unchecked, then clicking **Next** will navigate to the **Completion** panel.

You can specify terminal interaction patterns on this panel. If user does not choose to customize patterns from a selected expect template, the user will be taken to the Completion panel directly after the target is verified. If user chooses to customize patterns, the next panel will be Connection Patterns panel.

**Step 5** On the Connection Patterns panel, configure the terminal interaction patterns for the target, and click **Next**.

- Prompt pattern—Enter the system prompt pattern in regular expression.
- Error pattern—Enter the error message pattern in regular expression.
- Admin prompt pattern—Enter the admin prompt pattern in regular expression.

**Step 6** On the Login Expects panel, modify the list of sequence expects for the target connection, as necessary, and click **Next**.

- Add—Click **Add** to launch the Expect Dialog Box to configure the expect parameters to be added to the list.
- Remove—Highlight the appropriate item and click **Remove** to remove the item from the list.
- Edit—Highlight the appropriate item and click **Edit** to launch the Expect Dialog Box to modify the expect parameters in the list.
- Move Up—Highlight the appropriate item and then click this button to move the item up list.
- Move Down—Highlight the appropriate item and then click this button to move the item down list.

#### Elevating Privilege command

To modify the list of expects, use the following buttons:

- Elevating Privilege command—Check this check box and in the text field, enter the command or select the reference variable containing the command to elevate the privilege for the expect.
- Elevating Privilege expects—Use this section to view and/or define the login expect sequence for the elevating privilege command expects.

The Completing the New [Network Device Module] Wizard panel displays the connection information about the device target added to Process Orchestrator.

**Step 7** Verify the information on the panel and click **Finish** to close the wizard.

---

## Defining a Terminal Target

Use the Terminal target to specify the connection information used to access the device used for processes to run against. The connection information includes IP address or host name, protocol type, port and the runtime user credentials to access the device.

To create a terminal target:

---

**Step 1** On the Definitions > Targets view, right-click, and choose **New > Terminal**.

The New Terminal Wizard displays.

**Step 2** On the General Information panel, enter the appropriate information, and click **Next**.

**Step 3** On the Terminal Connection panel, enter the appropriate target information to specify the connection information to the appropriate server, and click **Next**.

- Protocol—Select the appropriate protocol from the drop-down list.
  - SSH
  - Telnet
- Host name—Host name or IP address of the network device
- Port—Port number used to access the appropriate terminal target port (Default: SSH server: 22, Telnet server: 23)
- Prompt prefix—Enter the command prompt prefix that will be used by the device type configurations and expects when issuing commands and connecting to the device.

Adding a regex character, such as \$, >, and #, at the end of a prompt in the Prompt Prefix field in the command prompt prefix.

Regular expressions should be placed in the appropriate Terminal Interaction Pattern fields. See the Connections Patterns panel to customize the interaction patterns.

For example:

If you connect to the terminal, and the prompt is `Cisco_7606#`, enter the regular expression that will match the entire prefix (before #) using any of the following expressions:

- `CISCO.*`
  - `.*7606`
  - `CISCO_7606`
- Use credentials of the following runtime user—Select the default runtime user account that contains the credentials to connect to the target.
  - Use patterns common for the following device—Select this radio button to choose one of the pre-defined device targets from the drop-down list.
    - Cisco IOS Device—Select this option to use the default pattern values used by the device during the completion of a session command.
    - Unix—Select this option to use the default pattern values indicated for a Unix device during the completion of a session command.
  - Customize patterns for this connection—Check this check box to customize the default values for the selected device type.

If this check box is unchecked, then clicking **Next** will navigate to the Host-Based Authentication panel.

- Step 4** On the Terminal Interaction Patterns panel, configure the terminal interaction patterns for the target, and click **Next**.

You can specify terminal interaction patterns on this panel. If user does not choose to customize patterns from a selected expect template, the user will be taken to the Completion panel directly after the target is verified. If user chooses to customize patterns, the next panel will be Connection Patterns panel. If the *Customize patterns for this connection* check box is unchecked, skip to [Step 11](#) for Host-Based Authentication instructions.

- Step 5** On the Connection Patterns panel, configure the terminal interaction patterns for the target, and click **Next**.

- Step 6** On the Login Expects panel, modify the list of sequence expects for the target connection, as necessary, and click **Next**.

#### Elevating Privilege command

To modify the list of expects, use the following buttons:

- Elevating Privilege command—Check this check box and in the text field, enter the command or select the reference variable containing the command to elevate the privilege for the expect.
- Elevating Privilege expects—Use this section to view and/or define the login expect sequence for the elevating privilege command expects.

- Step 7** On the Host-Based Authentication panel, specify whether the target should allow authentication based on the host system of the user and the user name on the remote host system, and click **Next**.

You can define default host public and private keys on the Terminal Adapter settings. This panel allows users to select a specific private key for the target. The private key will be used for host-based authentication if a target does not specify its own keys.

- Use host-based authentication—Check this check box to indicate that host-based authentication will be used with this target.

If this check box is unchecked, then host-based authentication will not be used.

- Use the default host keys—This check box becomes enabled after the Use host-based authentication check box is checked.

Check this check box to indicate the host keys defined on the Terminal Adapter property page will be used for this target.

If this check box is unchecked, then the user will need to load the appropriate private key to be used to this target.

- Private key—This box becomes enabled only if the **Use the default host keys** check box is unchecked.

To the right of the display-only field, click **Browse to launch the Load Private Key** dialog box to select a private key.

**Step 8** On the Network Modules panel, review the list of network modules assigned to the terminal target. These network device modules are considered dependents of the terminal target.

- Display name—Name of the network device
- Enabled—Indicates whether the network device module is enabled (True) or disabled (False). A disabled network device module is unavailable for execution.
- Switch number—Switch number for the chassis system
- Slot number—Slot number on which the network device module resides
- Process Id—Processor Id on which the network device module resides

If the appropriate network device module is not displayed, users can create a network device module target from within this wizard to be used as a dependent of the terminal target.

The Completing the New [Terminal] Wizard panel displays the connection information about the device target added to Process Orchestrator.

**Step 9** Verify the information on the panel and click **Finish** to close the wizard.

## Defining a Unix Linux System Target

Use the Unix/Linux Connection tab to specify the connection information for the SSH server used for processes to run against. The Unix/Linux System target also supports Telnet protocol and session based activities.

To properly run script and command activities against Unix/Linux system targets, Process Orchestrator requires the Secured File Transfer Protocol (SFTP) to be enabled on the Unix/Linux system. It is not needed for the SSH/Telnet Terminal Session activities.

To define:

**Step 1** On the Definitions > Targets view, right-click, and choose **New > Unix/Linux System**.

The New Unix/Linux System Properties dialog box displays.

**Step 2** On the General tab, enter the appropriate information.

**Step 3** Click the **Connection** tab to enter the appropriate target information to specify the connection information to the appropriate SSH server.

- Host name—Host name or IP address of the selected server

- Port—Port number used to access the selected protocol
- Prompt prefix—Enter the command prompt prefix that will be used by the device type configurations and expects when issuing commands and connecting to the device.

Adding a regex character, such as \$, >, and #, at the end of a prompt in the Prompt Prefix field in the command prompt prefix.

Regular expressions should be placed in the appropriate Terminal Interaction Pattern fields. See the Advanced tab to customize the interaction patterns.

For example:

Unix system prompt prefix is defined by the user default login script. It usually contains username, node name or current directory name. If the user does not define anything, the prompt prefix is empty.

If you connect to the terminal, and the prompt is `jsmith@TBD-SH03-IT ~$`, enter the regular expression that will match the entire prefix (before #) using any of the following expressions:

```
.*TBD-SH03-IT.*
```

```
\\[w+@TBD-SH03-IT.*\\]
```

- Default runtime user—Select the default runtime user account that contains the credentials to connect to the target.
- Enable code injection prevention—Check this check box to enable the protection which prevents code that is injected to exploit the security vulnerability.
- Maximum allowed concurrent sessions—Enter the maximum allowed open sessions to run concurrently. (Default: 3)

**Step 4** Click the **Authentication** tab to specify whether the target should allow authentication based on the host system of the user and the user name on the remote host system.

You can define default host public and private keys on the Terminal Adapter settings. This tab allows you to select a specific private key for the target. The private key will be used for host-based authentication if a target does not specify its own keys.

**Step 5** Click the **Advanced** tab to configure the interaction patterns for the target.

**Step 6** Click the **Open Sessions** tab to display the information about sessions currently opened on the target and sessions waiting to be opened.

To avoid the negative impacts on performance and manage resource usage, the Terminal Adapter has a limit on the maximum total live sessions. When the total live sessions reaches the maximum limits, the activity that needs to open a new session will wait until a live session is closed.

The network device module, by default, inherits the maximum allowed sessions from its chassis system. Users cannot adjust the value on the network device module more than value set by the chassis system. Any terminal activities executed against a network device module target will also count towards its chassis system session statistics.

Each displayed list will contain one entry for each opened session.

- Process Name—Name of the process that opened the session
- Process Executor—Target against which the process is executing
- Process Start Time—Time when the process was started
- Activity Name—Name of the Open Terminal Session activity that opened the session
- Activity Start Time—Time when Open Terminal Session activity started running



**Step 7** Click **OK**.

---

## Configuring Total Concurrent Sessions

You can specify the limits on how many concurrent sessions can be run against a target. When the total live sessions reach limits, the activity that needs to open a new session will wait until a live session is closed. The waiting Open Terminal Session activities will be display in the target's Open Sessions property page.

The Network Device Module inherits the max allowed sessions from its chassis system by default. Users cannot adjust the value on the network device module more than value set by the chassis system. Therefore users can only modify the amount concurrent sessions against the network device module through its chassis system.

Due to the nature of network device management, Process Orchestrator may have a very large number of Process Orchestrator Terminal Adapter targets and concurrent running Process Orchestrator processes. Users can specify the total sessions allowed against the Terminal Adapter in the configuration file to minimize the negative impact on performance and resource usage.

To configure the maximum sessions against a target

- 
- Step 1** On the Definitions > Targets view, highlight the appropriate target, right-click and choose **Properties**. The [Target] Properties dialog box displays.
- Step 2** Click the **Connection** tab to modify the maximum allowed sessions.
- Step 3** In the Maximum allowed concurrent session field, enter the maximum allowed open sessions to run concurrently. (Default: Terminal target: 3, Unix/Linux target: 1)
- Step 4** Click **OK**.
- 

## Adding an Expect Parameter

Use the Expect dialog box to configure the expect parameters to manage the Terminal target command output. The Add button on the device activities and targets launch the Expect dialog box for users to configure the expect parameters to be added to the list of expects and matched in the output.

To add a expect parameter:

- 
- Step 1** On the Execute Terminal property page, click **Add**. The Expect dialog box displays.
- Step 2** Complete the following fields, as necessary.
- Name—Enter the name of the case defining what to expect
  - Regular Expression—Enter characters to match in the terminal output
  - Match Case—Check the check box to indicate whether the regular expression is case-sensitive
- Step 3** Click **OK**.
-

## Removing an Expect Parameter

To remove a configured expect parameter, highlight the appropriate item, and then click **Remove**. The selected parameter is removed from the list of expect parameters on the tab.

## Viewing Terminal Target Properties

The property pages may display as display-only if the target definition is shipped as part of the product or the user does not have the appropriate rights.

To view Target properties:

---

**Step 1** On the Definitions > Targets view, highlight the appropriate target, and right-click and choose **Properties**.

The Properties dialog box displays. The tabs displayed depend on the selected target.

**Step 2** Click the following tabs to view the target properties:

- Connection—Displays the connection properties for the defined target
- Authentication—Displays properties used to indicate the target uses host-based authentication and the private/public key for host-based authentication provided by the user.
- Advanced—Displays the settings for the interaction patterns
- Network Modules—Displays the list of network modules assigned to the terminal target
- Open sessions—Displays information about sessions currently opened on the target and sessions waiting to be opened
- Extended Properties—Displays the list of all target properties defined for this target type

**Step 3** Click **OK**.

---

**See Also**

[Configuring an Expect Template](#)

[Configuring Default Host-Based Authentication Keys](#)

## Viewing Network Device Modules

Use the Network Device Module tab to view the list of network modules assigned to the target. These network device modules are considered dependents of the chassis system. Therefore, network device modules can only be removed from within the chassis system.

If the appropriate network device module is not displayed, users can create a network device module target from within this wizard to be used as a dependent of the chassis system.

To view the target network modules

---

**Step 1** On the Definitions > Targets view, highlight the appropriate target, right-click and choose **Properties**.

The Properties dialog box displays.

**Step 2** Click the **Network Modules** tab to review the list of network device modules dependent on the target.

- Display name—Name of the network device

- Enabled—Indicates whether the network device module is enabled (True) or disabled (False). A disabled network device module is unavailable for execution.
- Switch number—Switch number for the chassis system
- Slot number—Slot number on which the network device module resides
- Process Id—Processor Id on which the network device module resides

**Step 3** Click **OK**.

---

#### See Also

[Defining a Network Device Module Target](#)

## Viewing Target Open Sessions

Use the Open Sessions tab to review the information about sessions currently opened on the target and sessions waiting to be opened.

To configure the amount of total open sessions, see [Configuring Total Concurrent Sessions](#).

To view the target open sessions

---

**Step 1** On the Definitions > Targets view, highlight the appropriate target, right-click and choose **Properties**. The Properties dialog box displays.

**Step 2** Click the **Open Sessions** tab to review the information about sessions currently opened on the target and sessions waiting to be opened.

- Process Name—Name of the process that opened the session
- Process Executor—Target against which the process is executing
- Process Start Time—Time when the process was started
- Activity Name—Name of the Open Terminal Session activity that opened the session
- Activity Start Time—Time when Open Terminal Session activity started running

**Step 3** Click **OK**.

---

#### See Also

[Configuring Total Concurrent Sessions](#)

## Defining Terminal Activities

### Overview

When defining an activity in the process workflow, the properties pane contains property pages that are specific to the selected activity. The following table displays the activities that are provided by the Terminal adapter.

| Activity                       | Description  |
|--------------------------------|--|
| Close Terminal Session         | Closes a Terminal session opened by a previous Open Terminal Session activity<br>See <a href="#">Defining a Close Terminal Session Activity</a> .                        |
| Execute Terminal Command(s)    | Sends commands to a terminal command session started by a previous Open Terminal Session activity<br>See <a href="#">Defining an Execute Terminal Command Activity</a> . |
| Execute Unix/Linux SSH Command | Specifies a Unix/Linux SSH command to execute<br>See <a href="#">Defining an Execute Unix/Linux SSH Command Activity</a> .   |
| Execute Unix/Linux SSH Script  | Specifies a Unix/Linux SSH script to execute<br>See <a href="#">Defining an Execute Unix/Linux SSH Script Activity</a> .   |
| Get File                       | Retrieves files from a Unix/Linux system target to transfer to a specified local directory<br>See <a href="#">Defining a Get File Activity</a> .                         |
| Open Terminal Session          | Starts an SSH session on a selected Terminal target<br>See <a href="#">Defining an Open Terminal Session Activity</a> .  |
| Put File                       | Pushes local files to a Unix/Linux system target<br>See <a href="#">Defining a Put File Activity</a> .   |

## Defining a Close Terminal Session Activity

Use the Close Terminal Session activity to close a SSH or Telnet session opened by a previous Open Session activity. The user should always specify a paired Open Terminal Session and Close Terminal Session activity within a process.

If a corresponding Close Terminal Session activity for an Open Terminal Session activity is not specified, the SSH session opened by the Open Terminal Session activity will be closed by the Terminal adapter when the process completes. The SSH session also may be terminated earlier by the SSH server if the SSH server configuration specified a shorter user idle time.

To define the Close Terminal Session activity:

- 
- Step 1** On the Toolbox pane, under Terminal, select the **Close Terminal Session** activity, then drag and drop the activity onto the Workflow pane.
- The Close Terminal Session property page displays.
- Step 2** Click the **Close Session** tab to specify the appropriate device command or inputs.
- Input—Enter the appropriate device command before ending the SSH session. (Example: Quit)
- Step 3** Click the **Session** tab to select the appropriate Open Terminal Session activity to close or send commands.

The Open Terminal Session activity provides the target upon which the SSH session was opened. The Execute Terminal Command(s) and Close Terminal Session activities will run against the same target and runtime user specified in the Open Session activity.

- Session opened by—Select the appropriate open session from the drop-down list.

**Step 4** Click **OK**.

---

#### See Also

[Viewing Close Terminal Session Output](#)

## Defining a Get File Activity

Use the Get File activity to retrieve files from a Unix/Linux system target to transfer to a specified local directory using either the Secured File Transfer Protocol (SFTP) or Secure Copy Protocol (SCP) if SFTP or SCP is available on the given target. If both protocols are available, SFTP will be used.

To define the To define the Get File activity:

---

**Step 1** On the Toolbox pane, under Secure Shell (SSH), select **Get File** and drag and drop the activity onto the Workflow pane.

The Get File property page displays.

**Step 2** Click the **Get File** tab to specify the remote files and file path to the local directory to where the files will be copied.

- Remote files on the target to copy from—The list of files on the Unix/Linux system the user wants to retrieve. If a relative path is specified, it will be relative to the product local application data directory.
  - Add—Click to launch the Enter Remote File to Add dialog box to type the file name to be added to the list.
  - Edit—Highlight the appropriate file name and click **Edit** to launch the Enter Remote File to Add dialog box to modify the file name in the list.
  - Remove—Highlight the appropriate file name and click **Remove** to remove the file name from the list.
  - Remove All—Click **Remove All** to remove all the files in the list.
- Local windows runtime user for accessing local file systems—From the drop-down list, select the windows runtime user account that contains the credentials to access local files.
  - The user must have the Log on as batch job and Allow log on locally User Rights Assignment. To adjust the user right assignments, go to: Administrative Tools/Local Security Policy/Security Settings/Local Policies/User Rights Assignment.
- Local directory to copy files to—Specify the file path to the local directory to where the files will be copied. The default file path is relative to the product local application data directory.

For example:

C:\Documents and Settings\test\Local Settings\Application Data

- Overwrite—Select the appropriate option to determine the circumstances in which the copied file should overwrite any existing file in the local directory.
  - Do not overwrite—Indicates the copied file should never overwrite the existing file
  - Always overwrite—Indicates the copied file should always overwrite the existing file
  - Pull only if newer—Retrieves the file only if the file on the Unix/Linux system is more recent than the local copy.




---

**Note** This setting may not apply when the SCP protocol is used or a directory copy takes place.

---

- Time out if not completed within—Enter a value to specify the time frame to wait for the file transfer to complete before timing out. Large files may cause the file transfer to take longer.




---

**Note** Select the time unit link to adjust the time unit (seconds, minutes, or hours).

---

**Step 3** Click **OK**.

---

**See Also**

[Viewing Get File Activity Results](#)

## Defining a Put File Activity

Use the Put File activity to push local files to a Unix/Linux system target if SFTP or SCP is available on the given target.

If both protocols are available, SFTP will be used. If one file in the list fails while uploading, the activity will fail.

To define the Put File activity:

---

**Step 1** On the Toolbox pane, under Secure Shell (SSH), select Put File and drag and drop the activity onto the Workflow pane.

The Put File property page displays.

**Step 2** Click the **Put File** tab to specify the local files and file path to the remote directory to where the files will be copied.

- Local windows runtime user for accessing local file systems—From the drop-down list, select the windows runtime user account that contains the credentials to access local files.




---

**Note** The user must have the Log on as batch job and Allow log on locally User Rights Assignment. To adjust the user right assignments, go to: Administrative Tools/Local Security Policy/Security Settings/Local Policies/User Rights Assignment.

---

- Local files on the target to copy from—The list of files on the local computer to put on remote target systems. If a relative path is specified, it will be a relative to the product local application data directory.
  - Add—Click Add to launch the Enter Remote File to Add dialog box to type the file name to be added to the list.
  - Edit—Highlight the appropriate file name and click Edit to launch the Enter Remote File to Add dialog box to modify the file name in the list.
  - Remove—Highlight the appropriate file name and click Remove to remove the file name from the list.
  - Remove All—Click Remove All to remove all the files in the list.

- Remote directory on the target to copy files to—Specify the file path to the local directory on the target systems where the files will be transferred.

An absolute path is recommended. The default file path is relative to the product local application data directory.

For example:

C:\Documents and Settings\test\Local Settings\Application Data

- Overwrite—Select the appropriate option to determine the circumstances in which the copied file should overwrite any existing file in the remote target system.
  - Do not overwrite—Indicates the copied file should never overwrite the existing file
  - Always overwrite—Indicates the copied file should always overwrite the existing file
  - Push only if newer—Retrieves the file only if the file on the local directory is more recent than the remote target system.




---

**Note** This setting may not apply when the SCP protocol is used or a directory copy takes place.

---

- Time out if not completed within—Enter a value to specify the time frame to wait for the file transfer to complete before timing out. Large files may cause the file transfer to take longer.




---

**Note** Select the time unit link to adjust the time unit (seconds, minutes, or hours).

---

**Step 3** Click **OK**.

---

#### See Also

[Adding a Local File to Put File Activity](#)

[Removing Files from Activity](#)

[Viewing Put File Activity Results](#)

## Defining an Execute Terminal Command Activity

Use the Execute Terminal Command(s) activity to send commands to a session started by a previous Open Terminal Session activity.

To define the Execute Terminal Command(s) activity:

---

**Step 1** On the Toolbox pane, under Terminal, select the **Execute Terminal Command(s)** activity, then drag and drop the activity onto the Workflow pane.

The Execute Terminal Command(s) property page displays.

**Step 2** Click the **Command** tab to Specify the following options for the command or input to be sent during an open session.

To generate a long output, it is recommended that users include *'terminal length 0'* in one of the commands that uses the session before any command that will return a lot of output. If not, then the command will timeout and the generated output will not display in its entirety.

- Input—Enter the appropriate commands and inputs that a user can send to an open session.

- Ends with special character—Check this check box and then select the appropriate option to place at the end of the lines that is sent with the input.

Use options **CTRL\_A** through **CTRL\_Z**.

- Multiple lines option
  - Send all lines as one input—Select this radio button to send all lines in the plain text as one input.
  - Send next line only if previous line succeeded—Select this radio button to send a line as an input if there is a previous line before the input.
- Activity Timeout—Enter a value to specify the time frame to wait for the Execute Terminal Command(s) activity to complete before timing out.
- Individual Command Timeout—Enter a value to specify the time frame to wait for an individual user input to be completed before timing out.
- Preserve activity output—Check the check box to indicate that the output from the activity should be preserved.

If the check box remains unchecked, then the output will not be preserved and cannot be referenced by the user nor the expect results.

**Step 3** Click the **Expect** tab to view or modify the configuration used to manage the target command output during the terminal session.

- Name—Name of the case defining what to expect
- Regular Expression—Matches the characters in terminal output
- Operation Type—Displays what operation takes place if an expected regular expression match is encountered in the terminal output
  - User Response—Provides input to the terminal and continue execution of the activity
  - Runtime User's Username—Allows user to respond with the username of the runtime user for the session
  - Runtime User's Password—Allows user to respond with the password of the runtime user for the session
  - Runtime User's Admin Password—Allows user to respond with the admin password of the runtime user. If the runtime user doesn't have the admin password, the regular password will be used.
  - Succeeded—Complete activity and set its status to Completed
  - Failed (Completed)—Complete activity and set its status to Failed (Completed)
  - Failed (Not Completed)—Complete activity and set its status to Failed (Not Completed)
- User Response—Displays the defined user input string text or format to be used to perform the substring operation on the match results.
- Hidden—This check box is enabled when User Response is selected from the Operation Type drop-down list.

Check this check box and enter the string text into the User Response field, which will be used as security-sensitive content for the expect.

**Step 4** Click the **Session** tab to specify the appropriate Open Terminal Session activity to execute terminal commands.



Due to the nature of network device management, Process Orchestrator may have a very large number of Process Orchestrator Terminal Adapter targets and concurrent running Process Orchestrator processes. To avoid the negative impacts on performance and manage resource usage, the Terminal Adapter has a limit on the maximum total live sessions. When the total live sessions reaches the maximum limits, the activity that needs to open a new session will wait until a live session is closed.

- Session opened by—Select the appropriate open session from the drop-down list.
- Open Session id—Select the appropriate open session id of the current process or parent process by clicking the Reference icon.

In order to link the child process with the parent process, click **Inputs** tab on the child process and select parent session id as the input parameter. This enables you to select the open session id of the parent process from the child process **Sessions** tab.

**Step 5** Click **OK**.

---

## Viewing Results

## Defining an Execute Unix/Linux SSH Command Activity

Use the Execute Unix/Linux SSH Command activity to specify a SSH command to execute. To properly run this activity, Process Orchestrator requires SFTP to be configured on the SSH server. This activity is only supported against the Unix/Linux system target. Korn Shell is also required.

Pipe is not supported by the Execute Unix/Linux SSH Command activity. If the user needs to execute pipe in an activity, it is recommended that the user places the pipe in the activity.

For example, the user can enter "ps -ef " in the Execute Unix/Linux SSH Command activity, but if the user needs to execute "ps -ef | grep myusername" then, that information should be placed in the Execute Unix/Linux SSH Script activity.

To define the Execute Unix/Linux SSH Command activity:

- 
- Step 1** On the Toolbox, under Secure Shell (SSH), select **Execute Unix/Linux SSH Command** and drag and drop the activity onto the Workflow pane.
- The Execute Unix/Linux SSH Command property page displays.
- Step 2** Click the **Command** tab to specify the command line properties used to execute an activity on a local working directory on the SSH server.
- Command to execute on target—Actual command line used to execute an activity on the SSH server.  
Enter the actual command to execute an activity on the SSH server.  
See [Command Line Examples](#).
  - Local working directory on target—Enter the path to the local working directory on the SSH server where the command will be executed.  
If the path is left blank, the default directory will be user login directory on the SSH server
  - Command line arguments—Enter the collection of argument values for the command.
    - Add—Click this button to enter or select the appropriate argument to add to the command line.  
See Adding a Script Argument.

- Edit—Click this button to modify the command argument. See [Modifying a Script Argument](#).
- Remove—Click this button to remove a command argument from the list. See [Removing a Script Argument](#).




---

**Note** For an example of a script argument, see [Script Argument Example](#).

---

- Time out if not completed within—Enter a value or use the scroll buttons to specify the time frame to wait for the action to complete before timing out.




---

**Note** Select the time unit link to adjust the time unit (seconds, minutes, or hours).

---

- Time out if no available session within—Enter a value or use the scroll buttons to specify the time frame to wait for the activity to complete if there is no available session.

The cause for no available session may be the setting "max allowed concurrent sessions" on the target has been reached.

- Fail on non-zero return code—Selected check box indicates that the activity should fail when a return code having a non-zero value is received

**Step 3** Click **OK**.

---

**See Also**

[Viewing Executed Unix/Linux SSH Command Output](#)

## Defining an Execute Unix/Linux SSH Script Activity

Use the Execute Unix/Linux SSH Script activity to specify a SSH script argument to execute. To properly run this activity, Process Orchestrator requires SFTP to be configured on the SSH server.

To define the Execute Unix/Linux SSH Script activity

---

**Step 1** On the Toolbox, under Secure Shell (SSH), select **Execute Unix/Linux SSH Script** and drag and drop the activity onto the Workflow pane.

The Execute Unix/Linux SSH Script property page displays.

**Step 2** Click the **Script** tab to specify a SSH script argument to execute:

- Local working directory on target—Enter the path to the local working directory on the SSH server where the script will be executed.
- Script arguments—Enter the collection of argument values for the script.
  - Add—Click this button and choose one of the following to launch the Select Argument to Add dialog box. Enter the appropriate script in the text field or click Reference icon to select from the list.

String—Dialog box can contain standard string text

Hidden String—Dialog box can contain Hidden string text or query encrypted value variables in the Insert Reference Variable dialog box

- Edit—Select a script argument from the list and click this button to modify the script argument in the Select Argument to Add dialog box.
- Remove—Select a script argument from the list and click this button to remove the script argument from the list.

For an example of a script argument, see [Script Argument Example](#).

- Script to execute on target—Enter the actual script code to use to execute in the specified local working directory.
- Time out if not completed within—Enter a value or use the scroll buttons to specify the time frame to wait for the action to complete before timing out.

Select the time unit link to adjust the time unit (seconds, minutes, or hours).

- Time out if no available session within—Enter a value or use the scroll buttons to specify the time frame to wait for the activity to complete if there is no available session.

The cause for no available session may be the setting "max allowed concurrent sessions" on the target has been reached.

- Fail on non-zero return code—Select this check box configure the activity to fail when a return code having a non-zero value is received.

**Step 3** Click **OK**.

---

#### See Also

[Adding a Script Argument](#)

[Modifying a Script Argument](#)

[Removing a Script Argument](#)

[Viewing Executed Unix/Linux SSH Script Output](#)

## Defining a Stop a Unix Process via SSH Properties

Use the Stop a Unix Process via SSH activity to stop a running Unix process.

- PID—Enter the Unix process ID for the appropriate running process to be stopped.

## Defining an Open Terminal Session Activity

Use the Open Terminal Session activity to start a SSH session on a given terminal target via a SSH protocol client. The subsequent Execute Terminal Command(s) and Close Terminal Session activities will run against a SSH session.

The expects configuration used during this operation are defined in the selected target.

To define the Open Terminal Session activity:

---

**Step 1** On the Toolbox pane, under Terminal, select the **Open Terminal Session** activity, then drag and drop the activity onto the Workflow pane.

The Open Terminal Session property page displays.

**Step 2** Click the **Open Terminal Session** tab to modify the time constraints for the activity or command.

- **Activity Timeout**—Check this check box and then enter a value to specify the time frame to wait for the Open Terminal Session activity to complete before timing out. (Default: 5 minutes)
- **Time out if no available session within**—Enter a value or use the scroll buttons to specify the time frame to wait for the activity to complete if there is no available session.

The cause for no available session may be the setting "max allowed concurrent sessions" on the target has been reached.



**Note** To the right of the timeout fields, select the time unit link to adjust the time unit (seconds, minutes, or hours).

**Step 3** Click **OK**.

## Modifying Terminal Activities

### Adding a Local File to Put File Activity

The Put File activity copies files from a local directory onto a remote target system. The Add button on this activity launches the Enter Local File to Add dialog for users to specify the file name to be added to the list on the Put File activity.

To add a file:

- Step 1** On the Put File property page, click **Add**.  
The Enter Local File to Add dialog box displays.
- Step 2** In the Local File field, enter or select the file name to be added to the list.
- Step 3** Click **OK**.  
The file is added to the list of local files to be retrieved by the Put File activity.

**See Also**

[Defining a Put File Activity](#)

### Adding a Remote File to Get File Activity

The Get File activity copies files from remote target systems to a local directory. The Add button on this activity launches the Enter Remote File to Add dialog box for users to specify the file name to be added to the list on the Get File activity.

To add a file:

- Step 1** On the Get File property page, click **Add**.  
The Enter Remote File to Add dialog box displays.
- Step 2** In the Remote File field, enter or select the file name to be added to the list.
- Step 3** Click **OK**.

The file is added to the list of remote files to be retrieved by the Get File activity.

---

**See Also**

[Defining a Get File Activity](#)

## Adding a Script Argument

Script arguments are a property for SSH activities. The Add button on these activities launches the Select Argument to Add dialog box for users to specify the script arguments to be added to the list on the specified SSH activity.

To add a script argument:

---

**Step 1** On the appropriate SSH activity property page, click **Add**.

The Select Arguments to Add dialog box displays.

**Step 2** Specify the script argument value for the script.

**Step 3** Click **OK**.

The script argument is added to the command line argument list on the activity property page.

---

**See Also**

[Script Argument Example](#)

[Script Argument Syntax](#)

## Modifying a Script Argument

Use the Select Argument to Add dialog box to modify existing script arguments added to the SSH script or command activities.

To modify a script argument:

---

**Step 1** On the appropriate SSH activity property page, under the Arguments section, highlight the appropriate the script argument, and click **Edit**.

The Select Argument to Add dialog box displays.

**Step 2** Modify the information on the variable, as necessary, and click **OK**.

The modified script argument displays in the activity tab.

---

**See Also**

[Script Argument Example](#)

[Script Argument Syntax](#)

## Removing a Script Argument

Removing a script argument from an activity does not delete the object from the Process Orchestrator server. To delete the object, refer to the appropriate object definition section.

To remove a script argument:

On the activity property page tab, highlight the appropriate the argument, and click **Remove**.

### See Also

[Adding a Script Argument](#)

[Modifying a Script Argument](#)

## Removing Files from Activity

Use the following steps to remove files specified on the Get File and Put file activities to be copied.

To remove a single file

Under one of the following, highlight the appropriate file, and then click **Remove**.

- Remote files on the target to copy
- Local files on the target to get

The selected file is removed from the Get File or Put File tab.

To remove all files

Under one of the following, click **Remove All**.

- Remote files on the target to copy
- Local files on the target to get

All the files under the appropriate section are removed from the list.

## Command Line Examples

The following are command line examples.

If your local working directory is:

```
/home/myusername/myappdata
```

and the command is

```
/myAppPath/myShellScript.sh
```

the full path is:

```
/home/myusername/myappdata/myAppPath/myShellScript.sh.
```

On Unix systems:

```
ls
```

```
/usr/bin/ls
```

If your command is located at the directory of:

```
/myCommandPath
```

and the command is

```
myCommand
```

the full path is:

```
/myCommandPath/myCommand
```

## Script Argument Example

The following is an example of a script containing four arguments. For additional examples and information, see [Script Argument Example](#).

Script to execute:

```
#!/bin/csh
echo ${0}
echo "Number of arguments is $#argv"
echo $2
echo $argv[2-3]
echo $argv[$]
exit
```

Script argument:

```
% argex.csh "hello world" 42 3.14159 "(300:400,~100)"
argex.csh
Number of arguments is 4
42
42 3.14159
(300:400,~100)
```

**See Also**

[Script Argument Syntax](#)

[Adding a Script Argument](#)

## Script Argument Syntax

Any command-line arguments can be accessed as shell variables inside a script. The following table contains script arguments which can be used inside a script.

|                         |  |
|-------------------------|--|
| <code>\${0}</code>      | —The name of the script being run  |
| <code> \$?name</code>   | —Returns 1 if the variable name is defined, or 0 if it is not defined                |
| <code> \$n</code>       | —The value of the n argument passed to the script                                    |
| <code> \$argv[n]</code> | —The value of the n argument passed to the script                                    |
| <code> \$#argv</code>   | —The number of arguments passed to the script  |
| <code> \$*</code>       | —All the arguments supplied to the script  |
| <code> \$\$</code>      | —Process identification number (useful for making temporary files with unique names) |

## Viewing Terminal Activity Results

### Viewing Execute Terminal Command(s) Results

The Execute Terminal Command(s) display-only tab displays the properties used to send commands to a SSH session started by a previous Open Terminal Session activity.

- 
- Step 1** In the Operations workspace, click the **Activity Views** folder.
- Step 2** Highlight the Execute Terminal Command(s) activity instance, right-click and choose **Properties**.  
The Execute Terminal Command(s) dialog box displays.
- **secure**—Checked box indicates that security-sensitive string text is required
  - **Input**—Commands and inputs that a user can send to an open SSH session.  
Security-sensitive string text may be used to send to an open SSH session when the secure check box is checked.
  - **Send all lines as one input**—Sends all lines in the Plain text as one input
  - **Send next line only if previous line**—Sends a line as an input if there is a previous line before the input
  - **Activity Timeout**—Value indicates the time frame to wait for the Open Session activity to complete before timing out.
  - **Individual Command Timeout**—Value indicates the time frame to wait for an individual user input to be completed before timing out.
  - **Preserve activity output**—Checked box indicate that the output from the activity has been preserved and can be referenced by the user and expect results.
- 

### Viewing Close Terminal Session Output

When the Close Terminal Session activity is launched, the results of the matched expect configurations are displayed from the Operations Workspace activity instance view.

To view the Close Terminal Session results:

- 
- Step 1** In the Operations workspace, click the **Activity Views** folder.
- Step 2** Highlight the Close Terminal Session activity instance, right-click and choose **Properties**.  
The Close Terminal Session dialog box displays.
- Step 3** Click the **Output** tab to display the results of the matched expect configurations.
- **Expect Name**—The name of an expect configuration
  - **Match Result**—The match result of an Expect configuration
- The Output box displays the terminal output during the opening session period.
- Step 4** Click **OK**.
- 

**See Also**



[Defining a Close Terminal Session Activity](#)

## Viewing Executed Unix/Linux SSH Command Output

When the Execute Unix/Linux SSH Command activity is launched, the results of the executed SSH command are displayed from the Operations Workspace activity instance view.

To view the Unix/Linux SSH Command results:

- 
- Step 1** In the Operations workspace, click the **Activity Views** folder.
- Step 2** Highlight the Execute Unix/Linux SSH Command activity instance, right-click and choose **Properties**. The Execute Unix/Linux SSH Command dialog box displays.
- Step 3** Click the **Command Output** tab to display the executed SSH command line and the display-only activity properties used to generate the results.
- Command return status code—Exit status return code of the command execution
  - Command output—String property that captures the output from command execution
- Step 4** Click **OK**.
- 

### See Also

[Defining an Execute Unix/Linux SSH Command Activity](#)

## Viewing Executed Unix/Linux SSH Script Output

When the Execute Unix/Linux SSH Script activity is launched, the results of the executed SSH script argument are displayed from the Operations Workspace activity instance view.

To view the Unix/Linux SSH Script results:

- 
- Step 1** In the Operations workspace, click the **Activity Views** folder.
- Step 2** Highlight the Execute Unix/Linux SSH Script activity instance, right-click and choose **Properties**. The Execute Unix/Linux SSH Script dialog box displays.
- Step 3** Click the **Script Output** tab to display the executed SSH script argument and the display-only activity properties used to generate the results.
- Script exit status code—Exit status return code of the script execution
  - Script output—String property that captures the output from script execution
- Step 4** Click **OK**.
- 

### See Also

[Defining an Execute Unix/Linux SSH Script Activity](#)

## Viewing Get File Activity Results

When the Get File activity is launched, the file transfer results of the Get File activity are displayed from the Operations Workspace activity instance view.

To view the Get File results:

- 
- Step 1** In the Operations workspace, click the **Activity Views** folder.
- Step 2** Highlight the Get File activity instance, right-click and choose **Properties**.  
The Get File dialog box displays.
- Step 3** Click the **Result** tab to display the Get File output properties from the file transfer and the display-only activity properties used to generate the results.
- File Transfer Protocol—The SFTP or SCP protocol used to transfer the files
  - Local File Name—Name of file as it was saved on the local computer
  - Remote File Name—Name of file as it was saved on the remote host computer
  - Transferred—Indicates the status of the file transfer from a remote host computer onto the local computer
  - Comment—Any comments about the transferred file
- Step 4** Click **OK**.
- 

**See Also**

[Defining a Get File Activity](#)

## Viewing Open Terminal Session Output

When the Open Terminal Session activity is launched, the results of the matched expect configurations are displayed from the Operations Workspace activity instance view.

To view the Open Terminal Session results:

- 
- Step 1** In the Operations workspace, click the **Activity Views** folder.
- Step 2** Highlight the Open Terminal Session activity instance, right-click and choose **Properties**.  
The Open Terminal Session dialog box displays.
- Step 3** Click the **Output** tab to display the results of the matched expect configurations
- Step 4** Highlight the appropriate expect and click this button to view the display-only expect result properties.  
The Output box displays the terminal output during the opening session period.
- Step 5** Click **OK**.
- 

**See Also**

[Defining an Open Terminal Session Activity](#)

## Viewing Expect Instance Tab Results

The Expect display-only tab displays the expect configurations used to interact with the terminal in order to determine when an activity completes during the session.

- Name—Name of the case defining what to expect
- Regular Expression—Matches the characters in terminal output
- Operation Type—Displays what operation takes place if an expected regular expression match is encountered in the terminal output
  - Succeeded
  - Failed (Completed)
  - Failed (Not Completed)
  - User encrypted response
  - User response
  - Set Expect Result
- User Response—Displays the defined user input string text or format to be used to perform the substring operation on the match results.

## Viewing Put File Activity Results

When the Put File activity is launched, the file transfer results of the Put File activity are displayed from the Operations Workspace activity instance view.

To view the Put File results:

- 
- Step 1** In the Operations workspace, click the **Activity Views** folder.
- Step 2** Highlight the Put File activity instance, right-click and choose **Properties**.  
The Put File dialog box displays.
- Step 3** Click the **Result** tab to display the Put File output properties from the file transfer and the display-only activity properties used to generate the results.
- File Transfer Protocol—The SFTP or SCP protocol used to transfer the files)
  - Local File Name—Name of file as it was saved on the local computer
  - Remote File Name—Name of file as it was saved on the remote host computer
  - Transferred—Indicates the status of the file transfer from the local computer into the remote host computer
  - Comment—Any comments about the transferred file
- Step 4** Click **OK**.
- 

**See Also**

[Defining a Put File Activity](#)

## Viewing Get Interface Inputs

The Inputs display-only tab displays the device configuration output from an Execute Terminal Command(s) activity that executes the IOS command "show running-config".

## Viewing Get Interface Outputs

The Outputs display-only tab displays the name of the Interface Table that contains the list of interfaces returned for the device.

## Get Interface List Instance Properties - Inputs

The Inputs display-only tab displays the device configuration output from an Execute Terminal Command(s) activity that executes the IOS command "show running-config".

## Get Interface List Instance Properties - Outputs

The Outputs display-only tab displays the name of the Interface Table that contains the list of interfaces returned for the device.

# Troubleshooting Terminal Adapter

## Activity Output does not match Expect Prompts

### Error

This activity has failed, please check the output or the expect results table.

If the output does not match the expect prompts, the activity will timeout.

To review the expect result properties:

- 
- Step 1** On the Operations > Processes view, highlight the appropriate process, right-click and choose **Observe**.
  - Step 2** On the Workflow pane, locate the appropriate Execute Terminal Command activity.
  - Step 3** On the activity Properties pane, click the **Output** tab.
  - Step 4** Under Expect result table, click **Properties**.  
The Expect properties dialog box displays.
  - Step 5** Review the Match before field to review the expect properties to verify whether the activity contains valid expects.
- 

### Solution

This is not an easily determined problem, because the output doesn't clearly explain the error. After verifying the expects in the Expect Result Properties dialog box, modify the expects and then re-run the process.

To modify the expects:

- 
- Step 1** Double-click the process.  
The selected process opens in the Process Editor.
- Step 2** On the Workflow pane, locate the appropriate Execute Terminal Command activity.
- Step 3** On the activity Properties pane, click the **Expect** tab.
- Step 4** Highlight the appropriate expect, click **Edit** and then modify the information in the Regular Expression field.
- Step 5** Click **OK** to close the dialog box and then click the Save tool to save the process.
- Step 6** Click the **Start** tool to run the saved process.
- Step 7** Close the Process Editor and return to the Operations workspace to observe the process status.
- 

## Correcting Open Session Activity Timeout Error

### Error

This activity has failed because the session activity has timed out.

### Solution

This is a basic issue that occurs when the user did not enter enough time when defining the properties of the Open Session activity.

To modify the Open Session activity properties:

- 
- Step 1** Double-click the process.  
The selected process opens in the Process Editor.
- Step 2** On the Workflow pane, locate the appropriate Open Session activity.
- Step 3** On the activity Properties pane, click the **Open Sessions** tab.
- Step 4** In the Activity timeout field, increase the amount of time necessary to run the process before the activity times out.
- Step 5** Click the **Save** tool to save and the **Start** tool to run the saved process.
- Step 6** Close the Process Editor and return to the Operations workspace to observe the process status.
- 

## Execute Terminal Command Activity Timed Out

### Error

This activity has timed out while waiting for expected output.

- 
- Step 1** On the Operations—Processes view, highlight the appropriate process, right-click and choose **Observe**.
- Step 2** On the Workflow pane, locate the appropriate Execute Terminal Command activity.
- Step 3** On the activity Properties pane, click the **Output** tab.

- Step 4** Under Expect result table, click **Properties**.
  - Step 5** Review all the expects with the Succeeded operation type to make sure that there is an expect that will match the output somewhere. There must be at least one expect with a Succeeded operation type for the activity to succeed.
- 

## Solution

After verifying the expects in the Expect Result Properties dialog box, modify the expects and then re-run the process.

To modify the expects:

- Step 1** Double-click the process.  
The selected process opens in the Process Editor.
  - Step 2** On the Workflow pane, locate the appropriate Execute Terminal Command activity.
  - Step 3** On the activity Properties pane, click the **Expect** tab.
  - Step 4** Highlight the appropriate expect, click **Edit** and then modify the information in the Regular Expression field.
  - Step 5** Click **OK** to close the dialog box and then click the **Save** tool to save the process.
  - Step 6** Click the **Start** tool to run the saved process.
  - Step 7** Close the Process Editor and return to the Operations workspace to observe the process status.
- 

## Expect Prompt Command Error

### Error

This activity has failed, please check the output or the expect result table to see the error details.

### Solution

For this particular error, the user should not concentrate on the match results, but the expect command in the Expect Result Properties dialog box. The information in the dialog is Cisco IOS data and the user must be familiar with Cisco IOS, otherwise he or she will not understand the error.

To review the expect result properties:

- Step 1** On the Operations—Processes view, highlight the appropriate process, right-click and choose **Observe**.
  - Step 2** On the Workflow pane, locate the appropriate Execute Terminal Command activity.
  - Step 3** On the activity Properties pane, click the **Output** tab.
  - Step 4** Under Expect result table, click **Properties** to review the detailed error message for the prompt command.
  - Step 5** Review the expect properties to determine the next course of action based on the Cisco IOS data.
-

## Target Connection Pattern Prompt Prefix Error

### Error

This activity has timed out while waiting for expected output.

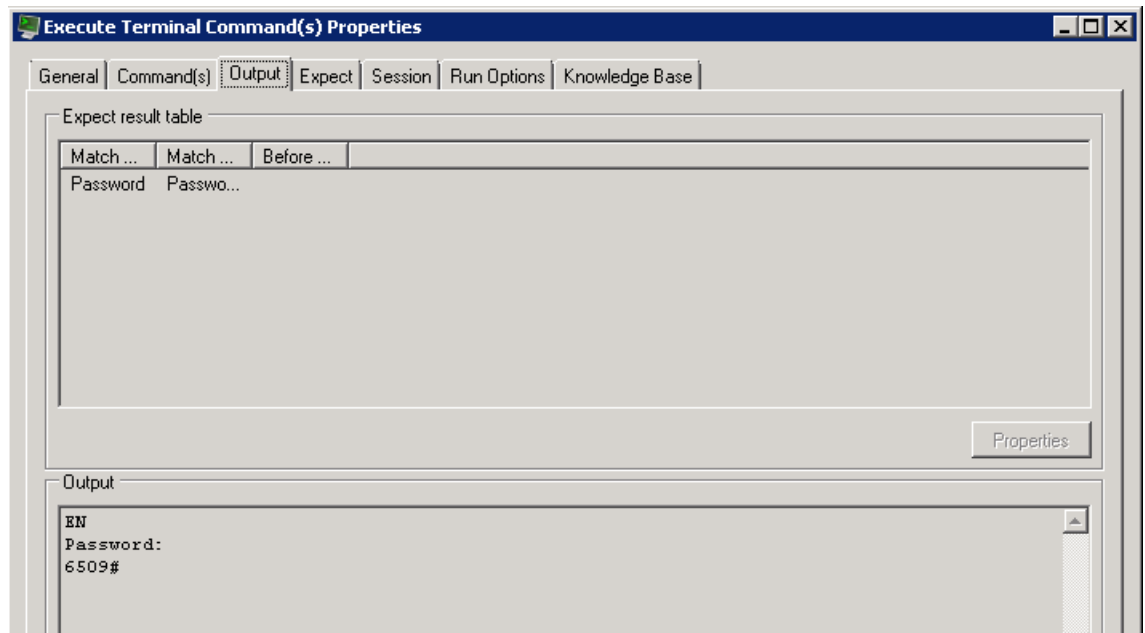
This error is generated because the activity was waiting for data before successfully completing the activity.

### Solution

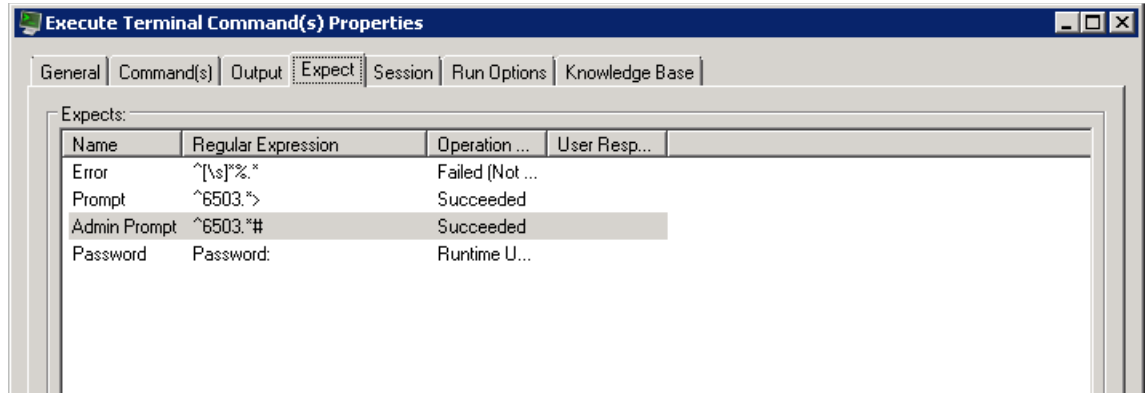
Before continuing, verify that the activity simply isn't timing out too quickly. If so, then modify the time entry in the Activity timeout field on the activity property page in the Process Editor. If the amount of time in the activity is sufficient, then compare the information on the Output tab to the regular expression and the operation type on the Expect tab. If the expects do no match, then it will be necessary to modify the appropriate prompt prefixes.

Please note in the following examples that the regular expressions in both the Prompt expects are different than what was generated on the output.

Example—Output Tab 1



Example—Expect Tab 2



To modify the prompt prefix:

- 
- Step 1** Double-click the process.  
The selected process opens in the Process Editor.
  - Step 2** On the Workflow pane, locate the appropriate Execute Terminal Command activity.
  - Step 3** On the activity Properties pane, click the **Expect** tab.
  - Step 4** Highlight the appropriate expect, click **Edit** and then modify the information in the Regular Expression field.
  - Step 5** Click **OK** to close the dialog box and then click the **Save** tool to save the process.
  - Step 6** Click the **Start** tool to run the saved process.
  - Step 7** Close the Process Editor and return to the Operations workspace to observe the process status.
-





## Using the PowerShell Snap-in CLI

---

The Cisco Process Orchestrator Command Line Interface (CLI) Snap-In leverages the Windows PowerShell console to execute scripts using Cisco Process Orchestrator commandlets. If you have the appropriate privileges, you can use the CLI commands to more easily control system administration and accelerate automation. The CLI is included in the standard Process Orchestrator installation and will only execute against the local Process Orchestrator server under the credentials of the current user running the CLI command.

Process Orchestrator PowerShell CLI Snap-in consists of commandlets that allow you to view details of the existing processes and targets in the Process Orchestrator server. Using the PowerShell CLI Snap-in, you can generate a list of processes and targets, as well as enable and disable specific processes and targets.

---

**Step 1** To see a list of all the Process Orchestrator commands, run the following command in the PowerShell console:

**Get-Command \*-Orchestrator\***

This will reveal commands such as `Export-OrchestratorAutomationPack` and `Import-OrchestratorAutomationPack`.

**Step 2** Use the **Get-Help** command to view the syntax help for a command. For example:

- To view the syntax for exporting automation packs, enter:  
**Get-Help Export-OrchestratorAutomationPack -full**
- To view the syntax for importing automation packs, enter:  
**Get-Help Import-OrchestratorAutomationPackFile -full**

---

### Related Topics

- For additional information about Microsoft Windows PowerShell, refer to the [Windows PowerShell Owner's Manual](#).
- If PowerShell is not installed, see [Install Windows PowerShell 2.0](#) on the Microsoft web site to access the free Windows PowerShell download. Note that you only need to install Powershell 2.0 on Windows 2008 because Powershell 2.0 is installed and integrated in Windows 2008R2 and later.





## Managing High Availability and Resiliency

---

This topic documents the basic approach used to support operational continuity, the ability to maintain availability during routine maintenance, and disaster recovery requirements for a Cisco Process Orchestrator. Using the production-level planning and operations described in the following topics, implementing these features should result in as much as 99.95% up time for your site:

- [Understanding High Availability and Resiliency](#)
- [Advance Planning](#)
- [Ensuring Operational Continuity](#)
- [Maintaining Availability During Routine Maintenance](#)
- [Performing Disaster Recovery](#)

### Related Topics

- [Handling Restarts and Failures](#)
- [Windows Performance Counters](#)

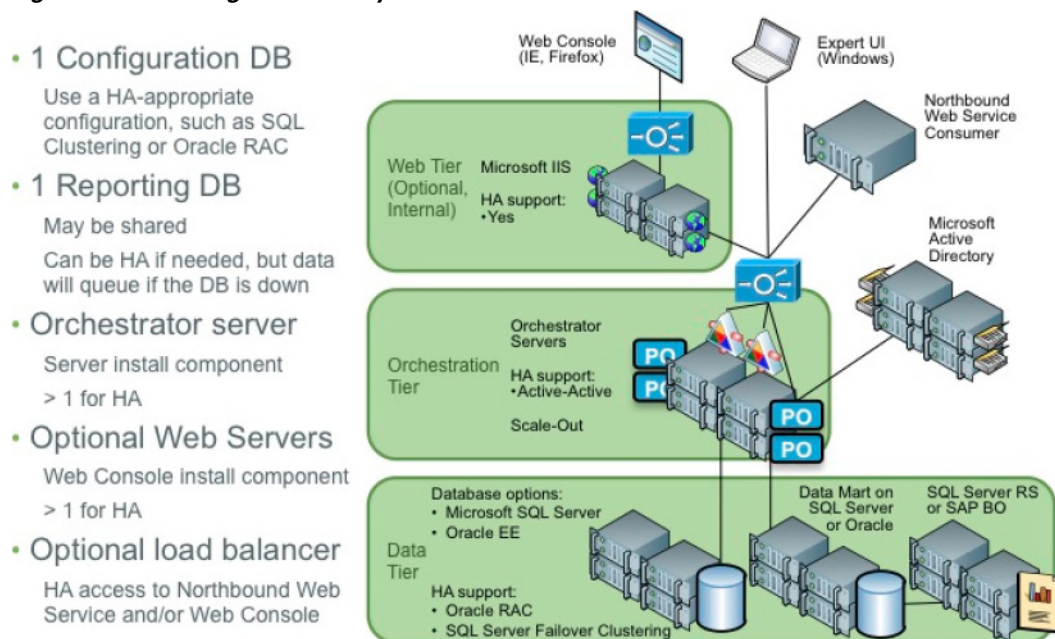
## Understanding High Availability and Resiliency

The Cisco Process Orchestrator active-active server provides a highly available and scalable solution, the goal of which is to virtually eliminate down time due to hardware application failures. This solution, which protects critical pieces of the system from failure and excessive loads, includes these features:

- Rather than a single server performing all of the work (running processes, monitoring triggers, and so on), a Process Orchestrator environment can contain many servers. If one server fails, as long as another is available to take its place, useful work can continue.
- In a Process Orchestrator environment, all servers connected to the system share the workload, which helps increase scalability and performance. The more servers that are available in the system, the less work each of them must perform.
- A Process Orchestrator environment is available during routine maintenance, such as rebooting the operating system, applying OS security patches, and performing minor upgrades (even to the Process Orchestrator itself).

The following figure illustrates the recommended Process Orchestrator high availability environment:

**Figure 1 High Availability Environment**



The Process Orchestrator environment consists of:

- A reporting database. Although the environment requires a reporting database to enable reporting features, the reporting database can span environments and therefore can be thought of as external to the environment.
- A configuration database. The configuration database is specific to *one environment*, and therefore requires a high availability-appropriate solution.
- Multiple Process Orchestrator servers
- Optional: Multiple web servers
- A load balancer in front of the northbound web service and/or web servers (optional). For information about installing a load balancer, see the *Cisco Process Orchestrator Installation Guide*.

Because the Process Orchestrator environment supports high availability, the installation process:

- Requires an environment name (defaults to PRODUCTION).
- Differs for “subsequent” servers that are added to an existing high availability environment. During the installation of a secondary server, the installation process does *not* create the databases, configure security, import automation packs, or configure Windows accounts.

However, the secondary server *does* require connectivity to an existing server in the environment. In addition, a security check is performed to ensure that the person installing the new server has the permissions to:

- Add the server to an existing environment
- Access the processes database
- Configures a default Process Orchestrator Windows Runtime User for Orchestration Server targets.

- Recommended: Assign security principals to default roles (typically Active Directory groups). The install process prompts you to specify the groups to be assigned to default security roles, but allows this step to be skipped. However, you will need to do this eventually or the environment will only work for the account that installed it.



---

**Note** Do not use local security groups and users in a high availability environment. By their nature, local security groups and users are accessible to one Process Orchestrator server, but are not accessible to another server. This means that they will be very confusing to configure and work with because server A will have a different “view” of permissions than server B.

---

In addition, because the Process Orchestrator environment supports high availability:

- The license key is tied to a computer name. This association is checked only when the license is applied. Therefore, if you have a high availability environment with three servers, for example, you can obtain a license key tied to one of the servers and then apply that license using the UI connected to that server. After the license has been applied, the license loses its association with the first server’s name and becomes available to all servers in the environment.
- Process execution and event monitoring are automatically “equally” divided between all Process Orchestrator servers, with the following exceptions:
  - Only the *current* load is taken into account.
  - CPU, disk space, and other performance factors are *not* taken into account.
  - Due to the technical constraints of adapter connections, some work must be performed on a specific node.
- There are several constructs in Process Orchestrator that relate to files that exist on the servers. These constructs must now store files on some network share, which is available to all servers, so that if one server writes the file and fails, or if work is shifted for load balancing, other servers can access it to continue the automation. Ideally the network share would not be a directory on some specific Windows server, but a highly available location with redundancy and fault tolerance, such as an HA NAS system. Examples of such elements that should now use a share in a multi-server Process Orchestrator environment are:
  - Automation summaries, which are stored as XML files. The server must log in to write automation summaries from multiple servers.
  - Files that are written by some process and later read by the same or another process such as email attachments or FTP files. Although Process Orchestrator provides backward compatibility so that processes that rely on the well-known Windows Computer target can run after the upgrade, processes that rely on file locations *local* to a Process Orchestrator server will not be high availability-ready.
- Windows Computer targets are created for each Process Orchestrator server. However, the singleton (well-known) Windows Computer target from prior Process Orchestrator versions still exists and represents the first server in the environment. Processes that rely on the well-known Windows computer target will not be high-availability ready.
- The Core Automation Pack contains a well-known target group that includes all Process Orchestration server targets.



---

**Note** When writing high-availability processes, use this group instead of the well-known Windows computer target ID.

---

# Advance Planning

Ensuring both operational continuity and disaster recovery preparedness requires:

1. Creating a support team (see [Creating the Cisco Process Orchestrator Support Team](#)).
2. Planning for high availability by installing multiple Process Orchestrators on virtual machines (see [Planning for High Availability](#)).
3. Using one of the recommended databases (see [Storing the Information](#)).
4. Considering the dependencies Process Orchestrator has on other services (see [Considering Dependencies on Other Services](#)).
5. Develop a strategy for performing regular database and system backups.

## Creating the Cisco Process Orchestrator Support Team

To maintain operational continuity and ensure that the people on your site are prepared for any emergency:

---

**Step 1** Create your Cisco Process Orchestrator Support team *well in advance of any disaster*.

When a disaster occurs, the first step of any recovery process should be to contact this team. The members of this team should know the prescribed (and latest) list of procedures, and each member should have a pre-defined role in the recovery process.

This team should consist of:

- The team assigned to day-to-day administration and operations.



**Note**

---

Although Process Orchestrator can be useful across a broad span of IT users, it needs an administrator/operator. This person will use the Operations Workspace (see [Monitoring Processes](#)) to monitor the health of processes and receive operational alerts, and will typically serve as the primary contact for customer support issues.

---

- The database administrator (DBA) responsible for the database if the disaster is related to the Process Orchestrator database.
- The manager of the VM farm on which the Process Orchestrator servers run.
- Personnel who can run the software that restores the Process Orchestrator server. This can be the VM farm operator.

**Step 2** Because outages in individual upstream systems can affect processes that span technologies and services, maintain the contact information for the owners of any upstream systems (see [Considering Dependencies on Other Services](#)). This information should include current names and phone numbers.

---

## Planning for High Availability

A single-server environment does not provide high availability, so you should plan to implement multiple Process Orchestrator active-active servers. When you are planning your Process Orchestrator environment, consider these recommendations:

- Be sure that all Process Orchestrator servers have similar hardware and software configurations; that is, the same (or similar) amounts of memory, number of CPUs, OS levels, and so on.

Cisco Process Orchestrator's high availability solution does not take hardware or operating system differences into account when distributing load. When new work arrives to be executed by Cisco Process Orchestrator, only the current load (the number of process instances and monitored triggers) is considered. Over time, more work will be assigned to less loaded or more capable Process Orchestrator servers, but the amount of memory, CPUs, or storage is not directly taken into account when assigning work.

- Install the Process Orchestrator servers on virtual machines backed by networked storage. Using this approach, if a host fails, the VM can be migrated to a new host using a tool such as vCenter. Many customers find this method of fault tolerance preferable because the host can change to another site in disaster recovery situations.
- VM farms tend to be sets of machines connected to the same storage, and might be in the same data center. Consider replicating your snapshots to a secondary data center.

### Moving to High Availability

Customers running multiple database and Process Orchestrator 2.x server installations running the *same content* against many targets should consider going to a single database and a multiple high availability server installation. To migrate to this environment:

- 
- Step 1** Upgrade one of the servers directly.
  - Step 2** Add additional high availability servers (on separate hardware, unrelated to the old 2.x servers).
  - Step 3** Create automation packs to include your targets from the non-upgraded 2.x environments.
  - Step 4** One by one, shutdown your old 2.x servers and at the same time, import the automation packs with targets from those servers into the new high availability environment.
- 

Customers running multiple database and Process Orchestrator 2.x server installations running *different* content against many targets might not want to use high availability, but it can be accomplished. In this case, to migrate to this environment:

- 
- Step 1** Perform same steps listed above.
  - Step 2** Export whatever content you need from each 2.x server (in addition to the targets), then import the content back into the new high availability environment.
- 

## Storing the Information

Virtually all Process Orchestrator state information is stored in the database. Although there are two databases, only the configuration database is a hard upstream dependency (see [Considering Dependencies on Other Services](#)) and must be made highly available to prevent a database-based Process Orchestrator outage. The reporting database is used for auditing and reporting purposes, but Process Orchestrator does not depend on its presence or on it being up and running.

Process Orchestrator supports the following high availability databases:

- SQL Server Failover Cluster

- Oracle Real Application Clusters (see the Oracle RAC configuration steps in the *Cisco Process Orchestrator Installation Guide*)

Although the bulk of the Process Orchestrator server's state is stored in the database, the following important pieces of data are stored in the Process Orchestrator server system:

**Table 14-1** Information Held in the Process Orchestrator Server System

| Type of Information   | Description  |
|---|--|
| The keys used to encrypt security credentials                           | <p>This key is stored in a controlled space in the Windows security subsystem of the Windows server hosting the Process Orchestrator server.</p> <p>Process Orchestrator stores runtime user names, passwords, and other credentials in the database so that it can connect using those credentials when running an activity against a target. Credentials are encrypted with a key specific to the Process Orchestrator environment before being stored in the database.</p> <p>This environment-specific key, which is stored in the Windows security system of each Process Orchestrator server, can be exported as a file, retained for disaster recovery purposes, and moved to a standby/backup server for recovery (see <a href="#">Saving the Process Orchestrator Server Data in Preparation for a Disaster</a>). In a disaster recovery situation, the Process Orchestrator database is useless without the corresponding and separately stored encryption keys.</p> |
| The Process Orchestrator server installation                            | This is core software that can be recreated from the installation media.   |
| The server configuration file   | This file configures certain properties of the Process Orchestrator server. For example, it tells the Process Orchestrator server which ports to open to talk to the client. It also tells the server where the database is and which credentials to use to access it.   |
| Persistent queue files for data to be written to the reporting database | These files store reporting data so that it is not lost across server restarts (see <a href="#">Handling Restarts and Failures</a> ).  |

## Considering Dependencies on Other Services

Process Orchestrator interacts with many different IT technologies and processes (see [Considering Dependencies on Other Services](#)). It is critically dependent on some technologies, such as its backend database on an Oracle or SQL Server (a hard upstream dependency), and on other technologies such as a DB2 database or VMware vCenter connection (soft upstream dependencies), only to the extent that processes interact with those technologies.

Similarly, other IT services might rely on Process Orchestrator. For example, an IaaS private cloud service built on Cisco Intelligent Automation for Cloud (that includes Process Orchestrator) will be non-operational or will have to revert to all-manual workarounds without a functioning Process Orchestrator.

Other IT services could operate in various degraded states without Process Orchestrator. For example, Incident Management in Remedy will still function as IT's Incident Management without a functional Process Orchestrator, but capabilities such as automated troubleshooting (a hard downstream dependency) and ticket enrichment (a soft downstream dependency) will not be available.



To summarize, when you are planning your Process Orchestrator environment, take into consideration all of these types of dependencies:

**Table 14-2**      **Dependency Types**

| Dependency | Description  |
|------------|--|
| Hard       | A component or service is required by the dependent service to be fully operational.   |
| Soft       | A component or service is not required by the dependent service to be fully operational, but functionality directly involving the component might be degraded or broken. |
| Upstream   | The IT services that Process Orchestrator relies on.   |
| Downstream | The IT services that rely on Process Orchestrator.   |

For more information about the dependencies on Process Orchestrator and Process Orchestrator's dependencies on other services, see the *Cisco Process Orchestrator Compatibility Matrix*.

## Ensuring Operational Continuity

Ensuring operational continuity of your Process Orchestrator environment includes these actions:

- [Backing Up Your Data](#)
- [Monitoring Processes and Events](#)
- [Handling Errors, Exceptions, and Diagnostics](#)

### Backing Up Your Data

In a disaster recovery situation, you will need copies of the following information, so be sure to regularly:

- Back up your database. Follow the standard database backup procedures for data recovery and the best practice database resiliency strategies of your database vendors, which should be provided in the documentation for the applicable database platform.
- Save the Windows security credentials encryption key for the Process Orchestrator environment. This only needs to be done once; this key is shared by all servers in a single Process Orchestrator environment. For information about how to save the key, see [Saving the Process Orchestrator Server Data in Preparation for a Disaster](#).
- Save the Process Orchestrator server configuration file. For more information about this file, see [Storing the Information](#).
- Take snapshots of the Process Orchestrator server VMs and save them at an alternate site (see [Planning for High Availability](#)).
- Save any customizations to the Web.config file in the Web Console server.

## Saving the Process Orchestrator Server Data in Preparation for a Disaster

When making preparations for a disaster, the most important piece of information to save is the security key that a Process Orchestrator server uses to encrypt sensitive data before storing it to the database. This environment-specific key is stored in the Windows security system of each Process Orchestrator server.



**Note** In a disaster recovery situation, the Process Orchestrator database is useless without the corresponding and separately stored encryption key for the Process Orchestrator environment.

Another important piece of data is the Process Orchestrator server configuration file. For more information about this file, see [Storing the Information](#).

To save this information:

**Step 1** Once for the Process Orchestrator environment:

- a. Export the security credentials encryption key to a file:

```
aspnet_regiis -px "Tidal Intelligent Automation Server" Keys.xml -pri
```

Aspnet\_regiis.exe is a Microsoft.NET framework utility that resides in the .Net Framework folder. This folder is typically located at this location:

```
C:\Windows\Microsoft.Net\Framework64\{Version}\aspnet_regiis.exe
```

You might need to specify the full path to this utility if you have not defined the path in your Path environment variable

- b. Save the Keys.xml file, then move it to a secure location (typically a standby or backup server) separate from the Process Orchestrator server.

**Step 2** For each Process Orchestrator server, copy the server configuration file to a standby or backup server. You can find this file in the installation folder.

```
%INSTALLDIR%\Tidal.Automation.Server.exe.config
```

## Monitoring Processes and Events

Each server in a Process Orchestrator environment publishes performance and events. A Process Orchestrator server can also provide data about its own health to operational support systems, and can interact with operational support systems with regard to the health of services for which it provides automation.

If you want to monitor the entire high availability environment, however, you must monitor *all* of the servers. Most application management systems include the ability to monitor the data that Process Orchestrator publishes, such as Windows event logs and performance counters.

Process Orchestrator can integrate with IT management or network management tools such as the Cisco Prime products. Process Orchestrator also provides direct out-of-the box integrations with other management tools, including:

- Microsoft System Center Operations Manager
- SAP CCMS and Solution Manager
- Remedy Service Desk

Process Orchestrator also provides numerous features to integrate in a generic manner with other management systems. For example, the triggered Process Orchestrator process can invoke a web service or run a script and pass in the incident, so the information can be published to another service assurance system.

## Monitoring Processes

Process Orchestrator provides full visibility into the processes running on the system, including the status of all running processes, which activities have executed, succeeded, failed, and so on.

Use the Operations view to monitor the processes that are scheduled to execute, view processes that are currently running, and verify that processes have successfully completed. You can also start processes or interact with human steps in processes called Tasks. For more information about monitoring processes, see [Monitoring Operations](#).

## Managing Events

Process Orchestrator provides IT process records such as alerts and incidents, and uses these records to:

- Supply incidents and events for external tools it might be monitoring or managing.
- Manage the Process Orchestrator itself. For example, the Process Orchestrator Core automation pack performs some self-monitoring of the Process Orchestrator, and can raise an alert or incident if there is something that requires the Process Orchestrator administrator's attention.

Use the **Operations > Auditing > System** view to review the list of internal Process Orchestrator events, including notifications of warnings and errors, and information events about the general functioning of the system.



---

**Note** Events from all Process Orchestrator servers in a high availability environment appear in this view.

---

For more information about managing events, see [Working with Events and Triggers](#).

## Handling Errors, Exceptions, and Diagnostics

Use Windows event logs and Windows performance counters to monitor the Process Orchestrator platform, either of which can be monitored through Microsoft Windows directly or fed into the service assurance platform of choice. Because event logs and performance counters are the standard for monitoring Windows-based applications, most service assurance tools include the ability to monitor these elements.

- System event logs

The Process Orchestrator server logs errors that can be useful when you need to diagnose failures to the Windows Event Logs. For example, if there is an error connecting to a database, this will be logged as an event.

These logs can also be picked up by most enterprise systems management tools if you want a view of Process Orchestrator health within your systems or application management console.

For more information about viewing system events, see [Working with Events and Triggers](#).

- Windows performance counters

The Process Orchestrator server publishes a number of Windows performance counters concerning its operations. For a list of Windows performance counters, see [Windows Performance Counters](#).



**Note** Be sure to monitor the system event logs and Windows performance counters from *all* Process Orchestrator servers in an environment. Monitoring one server is not sufficient to monitor the health of all servers.

## Maintaining Availability During Routine Maintenance

This section discusses how to maintain the availability of the servers in the Process Orchestrator environment during routine maintenance:

- [Handling Routine Maintenance Outages](#)
- [Adding More Capacity](#)
- [Relocating a Process Orchestrator Server](#)
- [Maintaining the Database](#)

### Handling Routine Maintenance Outages

To maintain availability of the overall high availability environment during routine outages, such as Microsoft security patches and minor Process Orchestrator upgrades that do not affect the database schema:

- 
- Step 1** Shut down one Process Orchestrator service (while keeping the others running). Wait for the Process Orchestrator service to completely stop via a friendly shutdown.
  - Step 2** Install the Microsoft patches or Process Orchestrator patches on that server.
  - Step 3** Reboot as necessary, then restart the Process Orchestrator service.
  - Step 4** Repeat steps 1-3 on all Process Orchestrator servers, one at a time, to maintain availability of the overall high availability environment.
- 

For more information about shutting down and restarting Process Orchestrator, see the *Cisco Process Orchestrator Installation Guide*.

### Adding More Capacity

To add more capacity to your Process Orchestrator environment, just add another Process Orchestrator server. Before you can do that, you must:

- Be able to connect to an existing Process Orchestrator server
- Have permission to add a new server
- Acquire the credentials for connecting to the Process Orchestrator process database

For information about how to add a new server, see the *Cisco Process Orchestrator Installation Guide*.

## Relocating a Process Orchestrator Server

To relocate a Process Orchestrator server:

- 
- |               |   |
|---------------|---|
| <b>Step 1</b> | Add a new server to the environment (see <a href="#">Adding More Capacity</a> ).                                    |
| <b>Step 2</b> | Uninstall Process Orchestrator from the old server (see the <i>Cisco Process Orchestrator Installation Guide</i> ). |
- 

## Maintaining the Database

The following sections describe how to maintain the Process Orchestrator database:

- [Grooming the Database](#)
- [Database Performance Best Practices](#)

### Grooming the Database

Process Orchestrator provides settings to control grooming of the following types of objects:

- Various sections of its Process and Reporting databases.
  - The Process database instances are primarily useful for viewing prior instances in the main expert UI, understanding the specific activities which were executed, querying the activity instance inputs, outputs, and other execution details typically useful in troubleshooting and development scenarios.

Grooming the Process database can help optimize performance. Reducing the database size can improve database insert speeds, but at a cost of being able to view older process instances in the UI. If you perform complex views including large numbers of historic processes, the database and UI must deal with the larger data volumes. Larger views might also mean larger data payloads coming through the server to the UI. This factor therefore not only affects the database layer, but also the server and UI performance.

Grooming the Process database as tightly as business scenarios allow optimizes performance of both the Process Orchestrator Server and UIs. For example, if no business requirement exists to monitor and troubleshoot failed processes past the end of a shift, setting grooming for one day might be appropriate.

- Data about completed process instances is available on a long-term basis in the Process Orchestrator Reporting database. The Reporting database provides information on which processes have run, when they started and ended, whether they were successful or failed, how they were started, and who started the processes in long term storage. The Reporting database has information about processes only, not activities within the process.
- Task instances, such as alerts, incidents, and change requests. These objects are groomed *only* upon their completion, which means that an open or active task can remain in the database forever. By default, the tasks can stay in the database for a long time.
- Audit data, which is groomed less aggressively because it is more important to keep around longer.

Using the default settings, grooming is automatic, but you can tune these settings to your needs. For example, there are options to:

- Control how much data is retained for completed instances.

- Mark expired tasks as completed.
- Configure a process to archive on failure. This allows low data and performance load during normal/successful executions of the process, while archiving failures so that they can be debugged and diagnosed.
- Start grooming immediately (rather than to wait for the scheduled time).

To change the grooming settings for the Process database, see [Managing the Process Database](#).

## Database Performance Best Practices

Proper database server hardware and routine database maintenance can have substantial effects on performance. Although the Process Orchestrator ships with performance-optimized schemas, including the relevant indices, you must install and operate these databases.

Ideally, to optimize performance, a database administrator (DBA) familiar with best practices should prescribe and configure the server hosting the database platform containing the Process Orchestrator databases. The DBA should also be involved in the installation of the database and should perform routine maintenance.

In high performance scenarios, the following best practices can dramatically affect performance:

- Run regular backups of the Process Orchestrator database. Without backups, the transactional logs of the database will grow fairly substantially, resulting in large files and poor database performance, and ultimately affecting Process Orchestrator's performance.
- Always run the database server on physical hardware, not on a VM.
- Use a separate host server for the database instead of running the database server on a Process Orchestrator server.
- Disk throughput (I/O) is also an important metric for large scale deployments. Use a separate high speed disk for the database, operating system, program files, and swap files.
- Provide sufficient memory to avoid paging. In very large installations, Process Orchestrator has benefited from databases running 16 or even 32GB of RAM.
- Use a high-speed network connection. Typically this means the database is “close” to the Process Orchestrator server, and certainly in same data center.

For best practices, refer to the documentation associated with your chosen database platform.

# Performing Disaster Recovery

This section discusses the following topics:

- [Recovering from a Server Failure](#)
- [Recovering from a Reporting Database Failure](#)
- [Recovering from an Entire Environment Failure](#)

## Recovering from a Server Failure

In a multi-server high availability environment, there is very little you need to do to recover from a single server failure. When a Process Orchestrator server fails (due to, for example, a network outage, disk failure, or software failure), the remaining Process Orchestrator servers within the environment will:

1. Recognize the failure (within a few seconds).
2. Report the failure in event logs.
3. Redistribute the work that was performed by the failed Process Orchestrator server among the remaining healthy servers.

If the server failure is recoverable, simply bringing the server or service back up will put it back into the high availability environment and operations will resume.

If the server failure is not recoverable (for example, a hardware failure), you can add a new Process Orchestrator server to the environment. There is very little need to recover the failed server; it will not be considered healthy, and no work will be assigned to it. To delete the old server from the environment, choose **Administration > Orchestration Servers > Remove**.

## Recovering from a Reporting Database Failure

If only your Reporting database has failed, there are several options:

- If possible, recover the database server. Operations will resume as before, and no changes are needed.
- If the database server is not recoverable but the database is (because there is a backup), restore the database to a new database server (see [Restoring the Database to a New Database Server](#)).
- If both the database server and the database are not recoverable, recreate the database on a new database server (see [Recreating a New Database on a New Database Server](#)).

## Restoring the Database to a New Database Server

To restore the database to a new database server:

- 
- Step 1** Open a console connecting to *any* Process Orchestrator server in the environment.
- Step 2** Remove the existing Reporting Database connection and connect to the new database server (see [Managing the Report Database](#)).

The changes will propagate throughout the entire high availability environment.

---

## Recreating a New Database on a New Database Server

To create a new database on a new database server:

- 
- Step 1** Open a console connecting to *any* Process Orchestrator server in the environment.
  - Step 2** Choose **Administration > Database Settings**, right-click **Report Database** and choose **Remove Cisco Process Orchestrator Reporting Database Connection**.
  - Step 3** Create a new Reporting database on the new database server (see [Creating a Reporting Database Connection](#)).

The changes will propagate throughout the entire high availability environment.

---

## Recovering from a Total Database Failure

If your entire database has failed:

- 
- Step 1** Contact your Cisco Process Orchestrator Support team (see [Creating the Cisco Process Orchestrator Support Team](#)). To ensure that the latest procedures are followed and to minimize downtime, the support team should be contacted as early as possible and involved throughout the process. Do not wait to call them until the disaster recovery process goes astray.
  - Step 2** Stop the Process Orchestrator service on all of the server machines.
  - Step 3** Restore the database from the latest backup to a new database server (or new database schema). The restore will depend on the database version; follow the manufacturer's instructions for your database server.



---

**Note** If you do *not* have a backup, you *cannot* recover the database. In that case, you must reinstall the entire environment.

---

- Step 4** Log in to the first Process Orchestrator server, then use the Database User utility (Tidal.Automation.Server.DatabaseUserConfigurationUtility.exe) to point the server to the new database and/or new credentials.
  - Step 5** Start the Process Orchestrator service on this server.
  - Step 6** Launch the Process Orchestrator console, then verify and correct Reporting database configuration if needed. This step is required if the Reporting database connection or the reporting credentials have changed.
  - Step 7** Log in, reconfigure, and restart ([Step 4](#) and [Step 5](#)) all other Process Orchestrator servers in the environment.
-



## Recovering from an Entire Environment Failure

If your environment fails but you have snapshots of the Process Orchestrator server VMs saved at an alternate site, use the procedure described in [Recovering from a Total Database Failure](#) instead.

Follow these steps when your environment fails and you *do not* have snapshots of the Process Orchestrator server VMs saved at an alternate site:

---

**Step 1** Contact your Cisco Process Orchestrator Support team (see [Creating the Cisco Process Orchestrator Support Team](#)). To ensure that the latest procedures are followed and to minimize downtime, contact the support team as early as possible and involve them throughout the process. Do not wait to call them until the disaster recovery process goes astray.

**Step 2** Restore the database from the latest backup to a new database server (or new database schema). The restore will depend on the database version; follow the manufacturer's instructions for your database server.



---

**Note** If you do not have a backup, you *cannot* recover the database. In that case, you must reinstall the entire environment.

---

**Step 3** To import the Windows security credentials encryption key from the Keys.xml file created in [Saving the Process Orchestrator Server Data in Preparation for a Disaster](#) to the new (first) Process Orchestrator server in the environment, enter the following command (*do not cut and paste*):

```
aspnet_regiis -pi "Tidal Intelligent Automation Server" Keys.xml -exp
```

Aspnet\_regiis.exe is a Microsoft.NET framework utility that resides in the .Net Framework folder. For example, this folder is typically located at this location:

```
C:\Windows\Microsoft.Net\Framework64\{Version}\aspnet_regiis.exe
```

You might need to specify the full path to this utility if you have not defined the path in your Path environment variable.



---

**Note** It is not enough to just bring the Process Orchestrator environment up; you also need the security credentials encryption key to apply to the server at the new site to make this database copy usable. If you do not have a backup of this key, you *cannot* recover the database. In that case, you must reinstall the entire environment.

---

**Step 4** Reinstall the core Process Orchestrator software from the installation media. Be sure to reinstall the *same version* and all of the updates/hotfixes.

**Step 5** Replace the server configuration file on the new machine with the file copied in [Saving the Process Orchestrator Server Data in Preparation for a Disaster](#).



---

**Note** If the file contents contain any path (such as the log file path), make sure that the path is still valid in the new server machine.

---

**Step 6** Use the Database User utility (Tidal.Automation.Server.DatabaseUserConfigurationUtility.exe) to point the server to the restored database and/or credentials.

**Step 7** Start the Process Orchestrator service on this server.

- Step 8** Launch the Process Orchestrator console, then verify and correct the Reporting database configuration if needed. This step is required if the Reporting database connection or the Reporting credentials have changed.
- Step 9** Install any additional Process Orchestrator servers as *new* High Availability servers (see the *Cisco Process Orchestrator Installation Guide*). The additional servers will receive the database settings and encryption keys from the first server.
- Step 10** Because the Process Orchestrator server is now installed on a different server:
- Review the list of Windows targets in the Process Orchestrator, remove the Windows computer targets that point to “old” Process Orchestrator servers that are no longer available, and disable the old server target in the target definition.
  - If the Web Server is on a different computer or virtual machine from the Process Orchestrator server computer, and if the Web Server survived the outage but the Process Orchestrator servers did not, choose **File > Environment Properties** to verify and update the Web Console configuration file location.
  - Use the Core Functions Adapter properties to review and update the Automation Summary configuration.
- Step 11** Choose **Administration > Orchestration Servers** and remove the old servers.
- 

## Handling Restarts and Failures

This section discusses the following topics:

- [Handling Running Processes During Restarts and Failures](#)
- [Handling Reporting Data Queues During Restarts and Failures](#)
- [Handling Scheduled Triggers During Restarts and Failures](#)
- [Handling Events During Restarts and Failures](#)

### Handling Running Processes During Restarts and Failures

The rules described in this section apply to moving a process from one Process Orchestrator server to another server when a single server fails. If server A goes down, then if the process hasn’t stopped on a non-restartable activity, it will move to another active server.

By default, Process Orchestrator persists all data about running processes so that state is preserved across service restarts; whether the restarts are planned or unexpected, process and activity states are persisted to the Process Orchestrator database. When the Process Orchestrator server shuts down in a friendly manner, it allows in-flight activities time to complete, but blocks new activities from running. This typically allows activities that might not be marked as restartable to complete so that processes do not fail during friendly shutdowns.

Generally, processes will pick up and start running again after a restart or failure; in some activities, this is configurable by the user. Many activities, if they were running when the server shut down, can be restarted without any side effects. Some examples:

- If an activity is passive (such a configuration query), Process Orchestrator can simply run the query again.

- Other activities can have side effects and cannot be rerun without consequence. For example, if a CLI adds some entry for a device to a file, running the CLI again will cause two entries for the device. In these cases, Process Orchestrator shows these processes as failed after the restart; the operator must examine the failures, then rerun the failed processes.
- The Web HTTP Request has a “Restart when interrupted” check box. Click this option if the HTTP Request is performing a read operation, in which case it should be restartable, but do not click it when performing a write operation because you could accidentally create multiple entries.

Process Orchestrator offers process Start Points that process authors can use to give operators restart points when a process needs to be restarted. If a volatile activity is run in Process Orchestrator and has not returned a status and Process Orchestrator shuts down, when Process Orchestrator restarts, this activity will not resume and the results of what the activity was supposed to do are lost.

Adapters determine whether to declare activities as restartable. The Process Orchestrator server also allows activities to save their state as they run, which allows long-running activities to be restarted. For example, a Create Approval activity might save a state that the approval request task has been created but the activity is blocked waiting on an approval.

Process Orchestrator's writing of state is transactional. Process Orchestrator will not proceed to the next step until the state change is committed to the database. There should be no time gap where process state can be lost. This persistence has a cost. With every step in every process, Process Orchestrator writes to the database to update states such as when the activity starts, stops, etc. Where this performance hit is inappropriate, Process Orchestrator provides a setting to turn restartability off for a process. Many processes do not need to restart after a shutdown or failure; it might often be acceptable to rerun the process at the next scheduled interval or on the next instance of the trigger. For example, many SAP diagnostic processes fall into this category. In the case of SAP diagnostics, Process Orchestrator's SAP automation pack process definitions have restartability turned off on analysis processes. If the server fails, the state of the SAP server with respect to alerts might not be the same after restart anyway. It is often best to not restart these processes but to instead to relearn the state of the SAP system. Also, by disabling restartability, the performance impact of maintaining state is reduced.

## Handling Reporting Data Queues During Restarts and Failures

To improve performance, reporting data is held in queues and is occasionally written to the database in bulk rather than an item at a time. During a friendly shutdown, the queue is flushed so that the reporting data is fully synchronized to the reporting database. In the event of a failure, the data in the queue will be present on restart and will be sent whenever the Process Orchestrator Server starts up; no data will be lost. However, if an unexpected failure occurs for which there is a need to reinstall the Process Orchestrator server on a different computer or restore the computer hosting the Process Orchestrator server from a backup, reporting data from these queues is lost.

## Handling Scheduled Triggers During Restarts and Failures

In a Process Orchestrator high availability environment, schedules that are monitored on server A will move to Server B when server A fails. There is a small window (of a few seconds) during which a schedule could be missed while server B is detecting server A's failure.

## Handling Events During Restarts and Failures

Process Orchestrator adapters resume sending events after the Process Orchestrator server restarts. While the adapter is still responsible for the implementation in this area, existing Process Orchestrator adapter implementations attempt to be consistent with this guaranteed delivery design. For example, when the SAP adapter reads CCMS alerts or the Remedy adapter polls for Incident state, the adapter stores the last-read record so that it can resume reading records starting with the next entry when the Process Orchestrator server resumes. For non guaranteed-delivery, network-initiated event technologies such as stop traps, the Process Orchestrator server cannot know about events that occurred while it was down. If required, many of these technologies can use highly-available intermediaries to persist the transient events. For example, there are tools to listen for stop traps and convert them to persistent stores such as log files or Windows events.

There are two types of event systems in the Process Orchestrator server:

- **Event-based triggers.** Because of the adapter implementations (see [Handling Running Processes During Restarts and Failures](#)), event-based triggers are not lost across server restarts or failures. Like state management in other areas of the product, trigger submissions are transactional. When Process Orchestrator adapters send a trigger to the Process Orchestrator server, processes depending on that trigger are initiated as a part of the submission. As with any other processes, these process instances are persisted to the database so that after a restart, the triggered processes are running. With the exception of transient, non-persisted events, such as stop traps or performance thresholds, there should be no time gap where events should be lost such that triggers fail to launch.
- **Correlation.** The Correlation feature allows a server to tie together a related series of events. This is achieved through a caching mechanism to ensure that the event data is available to the Correlate activities in processes when needed. This cache of events is not retained across server restarts, which can cause issues with some Correlate activities. Correlate activities can be used to make a process wait for a certain condition, or branch based on how many events with particular properties have been received in a particular time frame. Because the cache is not persisted across server restarts, events received before the restart will not be matched by Correlate activities. These effects can affect accuracy of a process “decision” made based on the data from a Correlate activity.

In practice this has been found to not be an issue for the following reasons:

- First, correlation is a fairly advanced feature in the product and is very rarely used in a majority of scenarios.
- Second, best practices also dictate that a correlation time frame is configured to be fairly small, which will minimize both the likelihood and impact of this compound condition. The time required to restart a server will take up some or all of this time frame if the correlation time frame coincides with a server restart.
- Third, these correlations are typically used in diagnostic situations, and often the events repeat if the problem recurs. Where a problem is still occurring, Process Orchestrator will typically pick up the condition the next time the diagnostic process launches.
- Finally, Process Orchestrator automation packs tend to set these processes as non-persistent anyway so they are not restarted. If the Process Orchestrator server is down, it is usually best to get a fresh view of the health of the component being monitored rather than depend on the status before the Process Orchestrator server restart. In many cases, the failure is resolved and it just creates noise to record the old diagnosis.

# Windows Performance Counters

A Cisco Process Orchestrator server publishes performance counters that can be used to monitor its health and diagnose performance issues. These counters are grouped into several performance objects, which are discussed in the following sections.

The following standard Windows performance counters are also of interest:

- Memory—Pages/sec
- Processor—% Processor Time
- Process—Private Bytes
- Process—Handle Counts
- Physical Disk

## Cisco Process Orchestrator Object

**Table 14-3** Windows Performance Counters - Cisco Process Orchestrator

| Counter                      | Description  |
|------------------------------|--|
| Running Process Instances    | The number of running process instances  |
| Running Activity Instances   | The number of running activity instances   |
| In-Memory Activity Instances | The number of in-memory activity instances.<br>An in-memory activity instance might be running now or have run within a process that is running now. For example, if you have a single 10-step sequential process, there will always be only one active activity instance. But as the workflow continues to run, the number of “in-memory” activities will grow as the execution progresses. When the process stops running, the number drops to zero. |
| In-Memory Process Instances  | The number of in-memory process instances.<br>In-memory activity instance might be running now, or have run within a process which is running now. For example, if you have a single 10-step sequential process, there will always be only one active activity instance. But as workflow continues to run the number of “in-memory” activities will grow as the execution progresses. When the process stops running, the number drops to zero.        |
| Schedules Monitored          | The number of schedules being monitored in Process Orchestrator.   |
| Schedules Met                | The number of monitored schedules met in Process Orchestrator.<br>If there is only one process definition that has an “Every day, every 5 minutes” schedule trigger, then “Schedules Monitored” will be 1 for as long as the server runs. “Schedules Met” will grow by one every five minutes as the schedule fires process instances.   |
| Events Monitored             | The number of events being monitored in Process Orchestrator.  |

**Table 14-3** *Windows Performance Counters - Cisco Process Orchestrator*

| Counter                           | Description   |
|-----------------------------------|---|
| Events Fired                      | The number of monitored events fired in Process Orchestrator.<br>If there is only one process definition that has an “Every day, every 5 minutes” schedule trigger, then “Events Monitored” will be 1 for as long as the server runs. “Events Fired” will grow by one every five minutes as the schedule fires process instances. |
| Web Service Calls                 | The number of calls to the Process Orchestrator Northbound Web Service.   |
| Completed Activity Instances /sec | The rate (per second) at which activities are being completed (with success or failure).  |
| Completed Process Instances /sec  | The rate (per second) at which running process instances are being completed (with success or failure).   |
| Started Activity Instances /sec   | The rate (per second) at which activity instances are being started.  |
| Started Process Instances /sec    | The rate (per second) at which process instances are being started.   |

## Cisco Process Orchestrator Adapter Object

There are separate instances for each adapter.

**Table 14-4** *Windows Performance Counters - Cisco Process Orchestrator Adapters Object*

| Counter                   | Description  |
|---------------------------|--|
| Running Activities        | The number of activities running under this adapter.                               |
| Activities Run            | The number of activities this adapter has run                                      |
| Disappearances            | The number of times this adapter has disappeared unexpectedly.                     |
| Event Fired               | The number of monitored events fired by this adapter.                              |
| Events Monitored          | The number of events being monitored by this adapter.                              |
| Excessive Memory Restarts | The number of times this adapter has been restarted due to excessive memory usage. |
| Host Process ID           | The ID of the process that hosts this adapter.                                     |
| Idleness Shutdowns        | The number of times this adapter has shut down due to idleness.                    |
| Requested Restarts        | The number of times this adapter has requested to be restarted.                    |
| Starts                    | The number of times this adapter has started                                       |
| Targets Managed           | The number of targets this adapter is managing.                                    |

## Cisco Process Orchestrator Persistent Queue Object

There are separate instances for each queue.

**Table 14-5** Windows Performance Counters - Cisco Process Orchestrator Persistent Queue Object

| Counter                | Description   |
|------------------------|---|
| %Used Space            | The maximum space for the queue is preallocated; this counter measures how much of the queue is used.   |
| Queue Item Submits/Sec | Number of items submitted to the persistent queue per second.   |
| Queue Items            | This is the current number of items in the queue. This number will vary as new items are added by the process execution and removed as the engine records them into the reporting database. |

## Cisco Process Orchestrator Data Access Layer Operations Object

There are separate instances for each type of DAL (Data Access Layer) operation.

**Table 14-6** Windows Performance Counters - Cisco Process Orchestrator Data Access Layer Operations Object

| Counter   | Description  |
|---|--|
| # of Data Access Layer Calls                              | Number of times a particular DAL (Data Access Layer) call was made.          |
| # of Errors in Data Access Layer Calls                    | Number of times a DAL call completed with an error.                          |
| Average Data Access Layer Call Duration (milliseconds)    | Average time it took to complete this type of DAL operation.                 |
| Cumulative Data Access Layer Call Duration (milliseconds) | Total time spent in all DAL operations of this type.                         |
| Longest Data Access Layer Call Duration (milliseconds)    | The time it took for the longest of DAL operations of this type to complete. |

## Cisco Process Orchestrator SAP Connections

There are separate SAP requests in each queue.

**Table 14-7** Windows Performance Counters - Cisco Process Orchestrator SAP Connections

| Counter              | Description  |
|----------------------|--|
| RFC calls in waiting | The number of RFC calls waiting in the queue.<br>The maximum number of concurrent calls allowed is 1 by default. |
| RFC calls in working | The maximum number of RFC calls that are concurrently working.   |

**Table 14-7** *Windows Performance Counters - Cisco Process Orchestrator SAP Connections*

| <b>Counter</b>      | <b>Description</b>  |
|---------------------|---|
| Total RFC Calls     | The total number of RFC calls made in the SAP connection  |
| SAP alerts          | The total number of SAP alerts monitored on the SAP or SAP solution manager connection.   |
| Total SAP Requests  | The total number of SAP requests made on the SAP or SAP solution manager connection.  |
| Queued SAP Requests | The total number of SAP requests waiting in the queue. Each SAP or SAP solution manager connection processes one SAP request at a time. |