

# Using the VMware vRealize Orchestrator Client

vRealize Orchestrator 7.2

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# Using the VMware vRealize Orchestrator Client

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*Using the VMware vRealize Orchestrator Client* provides information and instructions about performing tasks in the VMware® vRealize Orchestrator client.

## **Intended Audience**

This information is intended for advanced vSphere administrators and experienced system administrators who are familiar with virtual machine technology and datacenter operations.



# The Orchestrator Client

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The Orchestrator client is an easy-to-use desktop application. By using the Orchestrator client you can import packages, run and schedule workflows, and manage user permissions.

In addition, by using the Orchestrator client you can also develop workflows and actions as well as create packages and resource elements. For more information, see *Developing with VMware vRealize Orchestrator*.

This chapter includes the following topics:

- [“Log In to the Orchestrator Client from the Orchestrator Appliance Web Console,”](#) on page 7
- [“Orchestrator Client Perspectives,”](#) on page 8
- [“User Preferences,”](#) on page 10
- [“Access the Orchestrator API Explorer,”](#) on page 12

## Log In to the Orchestrator Client from the Orchestrator Appliance Web Console

To perform general administration tasks or to edit and create workflows, you must log in to the Orchestrator client interface.

The Orchestrator client interface is designed for developers with administrative rights who want to develop workflows, actions, and other custom elements.

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**IMPORTANT** Ensure that the clocks of the Orchestrator Appliance and the Orchestrator client machine are synchronized.

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### Prerequisites

- Download and deploy the Orchestrator Appliance.
- Verify that the appliance is up and running.
- Install 64-bit Java on the workstation, on which you will run the Orchestrator client.

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**NOTE** 32-bit Java is not supported

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### Procedure

- 1 In a Web browser, go to the IP address of your Orchestrator Appliance virtual machine.  
`http://orchestrator_appliance_ip`
- 2 Click **Start Orchestrator Client**.

- 3 Enter the IP or the domain name of the Orchestrator Appliance in the **Host name** text box.  
The IP address of the Orchestrator Appliance is displayed by default.
- 4 Log in by using the Orchestrator client user name and password.  
If you are using vRealize Automation authentication, vCenter Single Sign-On, or another directory service as an authentication method, type the respective credentials to log in to the Orchestrator client.
- 5 In the Security Warning window, select an option to handle the certificate warning.  
The Orchestrator client communicates with the Orchestrator server by using an SSL certificate. A trusted CA does not sign the certificate during installation. You receive a certificate warning each time you connect to the Orchestrator server.

Option	Description
<b>Ignore</b>	Continue using the current SSL certificate. The warning message appears again when you reconnect to the same Orchestrator server, or when you try to synchronize a workflow with a remote Orchestrator server.
<b>Cancel</b>	Close the window and stop the login process.
<b>Install this certificate and do not display any security warnings for it anymore.</b>	Select this check box and click <b>Ignore</b> to install the certificate and stop receiving security warnings.

You can change the default SSL certificate with a certificate signed by a CA. For more information about changing SSL certificates, see *Installing and Configuring VMware vRealize Orchestrator*.

### What to do next

You can import a package, start a workflow, or set root access rights on the system.

## Orchestrator Client Perspectives

You can access different views in the Orchestrator client by selecting one of three perspectives. Each perspective offers specific functionality.

You can select a perspective by using the drop-down list on the main menu in the Orchestrator client. The default view is **Run**.

Perspective	Description
<b>Run</b>	You can schedule tasks, manage policies, run workflows, access the inventory, and manage permissions from the <b>My Orchestrator</b> view. This perspective also gives you an overview of recent activities.
<b>Design</b>	You can create and modify workflows and actions. You can also manage resources, configuration elements, and policy templates.
<b>Administer</b>	You can access the inventory and manage authorizations and packages.



## Orchestrator Views in the Run Perspective

From the Run perspective in the Orchestrator client, you can schedule tasks, manage policies, run workflows, access the inventory, and manage permissions.

View	Description
<b>My Orchestrator</b>	Summarizes the most recent activities on the Orchestrator server, such as recently modified elements, pending and running workflows, running policies, completed workflows, and workflows that are waiting for user interaction. You can use the <b>My Orchestrator</b> view to perform common administrative tasks, such as running a workflow, importing a package, and setting root access rights.
<b>Scheduler</b>	Displays a list of all scheduled workflows. The workflows are sorted by name or date, together with their status. You can use the <b>Scheduler</b> view to create, edit, suspend, resume, and cancel scheduled workflows.
<b>Policies</b>	Displays existing policies. You can use the <b>Policies</b> view to create and apply policies.
<b>Workflows</b>	Provides access to the Orchestrator workflow library. You can use the <b>Workflows</b> view to view information about each workflow, create, edit, and run workflows, as well as to interact with the workflows.
<b>Inventory</b>	Displays the objects of the plug-ins that are enabled in Orchestrator. You can use the <b>Inventory</b> view to run workflows on an inventory object.

## Orchestrator Views in the Design Perspective

From the Design perspective in the Orchestrator client, you can create and modify workflows and actions. You can also manage resources, configuration elements, and policy templates.

View	Description
<b>Workflows</b>	Provides access to the Orchestrator workflow library. You can use the <b>Workflows</b> view to view information about each workflow, create, edit, and run workflows, as well as to interact with the workflows.
<b>Actions</b>	Provides access to the libraries of predefined actions. You can use the <b>Actions</b> view to duplicate actions, export them to a file, or move them to a different module in the actions hierarchical list.
<b>Resources</b>	Provides access to the list of resource elements. You can use the <b>Resources</b> view to import external objects such as images, <code>sysprep</code> files, HTML templates, XML templates, and custom scripts, and use them as resource elements in workflows.
<b>Configurations</b>	Provides access to the available configuration elements. You can use the <b>Actions</b> view to create configuration elements to define common attributes across an Orchestrator server.
<b>Packages</b>	Displays a list of the available packages and where a selected package is used. You can use the <b>Packages</b> view to add, import, export, and synchronize packages.
<b>Inventory</b>	Displays the objects of the plug-ins that are enabled in Orchestrator. You can use the <b>Inventory</b> view to run workflows on an inventory object.

## Orchestrator Views in the Administer Perspective

From the Administer perspective in the Orchestrator client, you can access the inventory and manage authorizations and packages.

View	Description
<b>Inventory</b>	Displays the objects of the plug-ins that are enabled in Orchestrator. You can use the <b>Inventory</b> view to run workflows on an inventory object.
<b>Policy Templates</b>	Displays a list of the available master policies. You can use the <b>Policy Templates</b> view to create policy templates.
<b>Authorizations</b>	Displays a list of the available authorization elements. You can use the <b>Authorizations</b> view to create and edit authorization elements.
<b>Packages</b>	Displays a list of the available packages and where a selected package is used. You can use the <b>Packages</b> view to add, import, export, and synchronize packages.

## User Preferences

You can customize the options displayed to users of the Orchestrator client by using the User preferences tool.

Your preferences are saved on the client side in the `vmware-vmo.cfg` file.

To set preferences, select **Tools > User preferences** in the Orchestrator client toolbar.

From the User preferences tool you can change the following preferences.

## General Preferences

**Table 1-1.** Orchestrator Client Customization Options

Option	Description
<b>Auto-edit new inserted</b>	The new elements that you add open in an editor.
<b>Script compilation delay [ms]</b>	The frequency of the background task that compiles the scripts and reports errors in edit mode in milliseconds.
<b>Show decision scripts</b>	The option enables you to see the decision script of the implemented decision functions.
<b>Delete non empty folder permitted</b>	The option enables you to delete a folder together with its subfolders and contents.
<b>Size of run logs (number of lines)</b>	The maximum number of lines in the system log that Orchestrator displays when you select a workflow run in the Orchestrator client and click <b>Logs</b> on the <b>Schema</b> tab. The value must be greater than <b>0</b> .
<b>Server log fetch limit</b>	The maximum number of lines in the server logs that Orchestrator fetches from the database and displays when you click any of the <b>Events</b> tabs in the Orchestrator client. The value must be greater than <b>0</b> .
<b>Finder maximum size</b>	The maximum number of results that the searches return when you search for elements such as actions or workflows. The value must be greater than <b>0</b> .

**Table 1-1.** Orchestrator Client Customization Options (Continued)

Option	Description
Check usage when deleting an element (slow)	Orchestrator checks whether the element you are trying to delete is referenced by other elements. If the element is used by another workflow, policy, or action, a warning message appears.
Check OGNL expression	Orchestrator validates the OGNL expressions in the workflow presentations.

## Workflows Preferences

**Table 1-2.** Workflow Editor Customization Options

Option	Description
Check task/decision IN/OUT parameters	Orchestrator checks whether the input and output parameters of an activity are correctly bound to the corresponding input or output attribute of the workflow.
Check error in task's scripts	Orchestrator validates the script in scriptable task elements.
Check workflow termination	Orchestrator checks whether each terminal transition of a workflow with different possible outcomes is connected to an End Workflow schema element.
Check unreachable items	Orchestrator checks whether all activities are reachable.
Check unused workflow's parameters/attributes	Orchestrator checks whether all parameters and attributes of a workflow are used.
Check for unknown types within plug-ins	Orchestrator checks whether all parameters and attributes of a workflow are of a known type.
Check for legacy actions scripting calls	Orchestrator detects legacy actions calls and displays a warning message.
Use direct lines as workflow diagram links	The connector tool uses direct lines to link the workflow schema elements.
Display workflows in a tree view	The workflow selector displays a hierarchical tree viewer instead of the default list panel.
Edit workflow items in a pop-up window	Orchestrator opens a pop-up window in which you can edit the workflow items.
Display grid in the schema editor	Orchestrator displays a grid in the schema editor.
Validate a workflow before running it	Orchestrator validates each workflow before running it.
Validate a workflow before saving it	Orchestrator validates each workflow before saving it.
Increase the workflow version when clicking save and close	Orchestrator increases the workflow version when clicking save and close.
Pop up a workflow user interaction form	Orchestrator pops up a workflow user interaction form.

## Inventory Preferences

You can select the **Use contextual menu in inventory** option to display the workflows that are available for an inventory object. After the option is enabled, when you right-click an object in the Orchestrator inventory, all workflows applicable to the selected object type are displayed.

## Script Editor Preferences

You can customize the scripting engine. For example, you can disable automatic completion of lines, highlight selected lines and brackets, and change the options for default color code formatting.

## Access the Orchestrator API Explorer

Orchestrator provides an API Explorer that you can use to search the Orchestrator API and see the documentation for JavaScript objects that you can use in scripted elements.

You can consult an online version of the Scripting API for the vCenter Server plug-in on the Orchestrator documentation home page.

### Procedure

- 1 Log in to the Orchestrator client.
- 2 Select **Tools > API Explorer**.

The API Explorer appears. You can use it to search all the objects and functions of the Orchestrator API.

### What to do next

Use the API Explorer to write scripts for scriptable elements.

# Managing Workflows

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A workflow is a series of actions and decisions that you run sequentially. Orchestrator provides a library of workflows that perform common management tasks according to best practices. Orchestrator also provides libraries of the individual actions that the workflows perform.

Workflows combine actions, decisions, and results that, when performed in a particular order, complete a specific task or a specific process in a virtual environment. Workflows perform tasks such as provisioning virtual machines, backing up, performing regular maintenance, sending emails, performing SSH operations, managing the physical infrastructure, and other general utility operations. Workflows accept inputs according to their function. You can create workflows that run according to defined schedules, or that run if certain anticipated events occur. Information can be provided by you, by other users, by another workflow or action, or by an external process such as a Web service call from an application. Workflows perform some validation and filtering of information before they run.

Workflows can call upon other workflows. For example, you can reuse in several different workflows a workflow that starts a virtual machine.

You create workflows by using the Orchestrator client interface's integrated development environment (IDE), that provides access to the workflow library and the ability to run workflows on the workflow engine. The workflow engine can also take objects from external libraries that you plug in to Orchestrator. This ability allows you to customize processes or implement functions that third-party applications provide.

This chapter includes the following topics:

- [“Key Concepts of Workflows,”](#) on page 14
- [“Standard Workflows in the Workflow Library,”](#) on page 16
- [“Set User Permissions on a Workflow,”](#) on page 16
- [“Run a Workflow,”](#) on page 17
- [“Respond to a Request for a User Interaction,”](#) on page 18
- [“Scheduling Workflows,”](#) on page 19
- [“Use Workflow Version History,”](#) on page 20
- [“Restore Deleted Workflows,”](#) on page 21
- [“Export a Workflow,”](#) on page 21
- [“Import a Workflow,”](#) on page 21

## Key Concepts of Workflows

Workflows consist of a schema, attributes, and parameters. The workflow schema is the main component of a workflow as it defines all the workflow elements and the logical connections between them. The workflow attributes and parameters are the variables that workflows use to transfer data. Orchestrator saves a workflow token every time a workflow runs, recording the details of that specific run of the workflow.

### Workflow User Permissions

Orchestrator defines levels of permissions that you can apply to groups to allow or deny them access to workflows.

<b>View</b>	The user can view the elements in the workflow, but cannot view the schema or scripting.
<b>Inspect</b>	The user can view the elements in the workflow, including the schema and scripting.
<b>Execute</b>	The user can run the workflow.
<b>Edit</b>	The user can edit the workflow.
<b>Admin</b>	The user can set permissions on the workflow and has all other permissions.

The **Admin** permission includes the **View**, **Inspect**, **Edit**, and **Execute** permissions. All the permissions require the **View** permission.

If you do not set any permissions on a workflow, the workflow inherits the permissions from the folder that contains it. If you do set permissions on a workflow, those permissions override the permissions of the folder that contains it, even if the permissions of the folder are more restrictive.

### Workflow Parameters

Workflows receive input parameters and generate output parameters when they run.

#### Input Parameters

Most workflows require a certain set of input parameters to run. An input parameter is an argument that the workflow processes when it starts. The user, an application, another workflow, or an action passes input parameters to a workflow for the workflow to process when it starts.

For example, if a workflow resets a virtual machine, the workflow requires as an input parameter the name of the virtual machine.

#### Output Parameters

A workflow's output parameters represent the result from the workflow run. Output parameters can change when a workflow or a workflow element runs. While workflows run, they can receive the output parameters of other workflows as input parameters.

For example, if a workflow creates a snapshot of a virtual machine, the output parameter for the workflow is the resulting snapshot.

## Workflow Attributes

Workflow elements process data that they receive as input parameters, and set the resulting data as workflow attributes or output parameters.

Read-only workflow attributes act as global constants for a workflow. Writable attributes act as a workflow's global variables.

You can use attributes to transfer data between the elements of a workflow. You can obtain attributes in the following ways:

- Define attributes when you create a workflow
- Set the output parameter of a workflow element as a workflow attribute
- Inherit attributes from a configuration element

## Workflow Schema

A workflow schema is a graphical representation that shows the workflow as a flow diagram of interconnected workflow elements. The workflow schema is the most important element of a workflow as it determines its logic.

## Workflow Presentation

When users run a workflow, they provide the values for the input parameters of the workflow in the workflow presentation. When you organize the workflow presentation, consider the type and number of input parameters of the workflow.

## Workflow Tokens

A workflow token represents a workflow that is running or has run.

A workflow is an abstract description of a process that defines a generic sequence of steps and a generic set of required input parameters. When you run a workflow with a set of real input parameters, you receive an instance of this abstract workflow that behaves according to the specific input parameters you give it. This specific instance of a completed or a running workflow is called a workflow token.

### Workflow Token Attributes

Workflow token attributes are the specific parameters with which a workflow token runs. The workflow token attributes are an aggregation of the workflow's global attributes and the specific input and output parameters with which you run the workflow token.

## Workflow Version History

Orchestrator keeps the version history for each workflow, irrespective of whether it is included in the default workflow library or whether the workflow is newly developed. By keeping the version history in the database, you can compare different workflow versions and to revert to a previous workflow version.

Orchestrator creates a new version history item for each workflow when you increase and save the workflow version. Subsequent changes to the workflow do not change the current saved version. The version history is kept in the database along with the workflow itself.

When you delete a workflow or an action, Orchestrator marks the element as deleted in the database without deleting the version history of the element from the database. This way, you can restore deleted workflows and actions.

## Standard Workflows in the Workflow Library

Orchestrator provides a standard library of workflows that you can use to automate operations in the virtual infrastructure. The workflows in the standard library are locked in the read-only state. To customize a standard workflow, you must create a duplicate of that workflow. Duplicate workflows or custom workflows that you create are fully editable.

For information about the different access rights that you can have when you work with the Orchestrator server depending on the type of vCenter Server license, see *Installing and Configuring VMware vRealize Orchestrator*.

The contents of the workflow library is accessible through the **Workflows** view in the Orchestrator client. The standard workflow library provides workflows in the following folders.

<b>Configuration</b>	Configure authentication settings, database, certificates, licences, and troubleshoot Orchestrator.
<b>JDBC</b>	Test the communication between a workflow and a database by using the SQL plug-in shipped with Orchestrator.
<b>Locking</b>	Demonstrates the locking mechanism for automated processes, that allows workflows to lock the resources they use.
<b>Mail</b>	Send and receive emails from workflows.
<b>Orchestrator</b>	Automate certain common Orchestrator operations.
<b>SQL</b>	Manage databases and database tables, as well as run SQL operations.
<b>SSH</b>	Implement the Secure Shell v2 (SSH-2) protocol. These workflows allow you to run remote command and file transfer sessions with password and public key-based authentication. The SSH configuration allows you to specify paths to objects to expose in the Orchestrator inventory through secure connections.
<b>Troubleshooting</b>	Export application settings and log files to a ZIP archive that you can send to VMware support for troubleshooting.
<b>vCenter Server</b>	Access the functions of the vCenter Server API, so that you can incorporate all of the vCenter Server functions into the management processes that you automate by using Orchestrator.
<b>Workflow documentation</b>	Export information about workflows or workflow categories as PDF files.
<b>XML</b>	A Document Object Model (DOM) XML parser that you can use to process XML files in workflows.

## Set User Permissions on a Workflow


You set levels of permission on a workflow to limit the access that user groups can have to that workflow. You can select the users and user groups for which to set permissions from the Orchestrator LDAP server.

### Prerequisites

- Create a workflow.
- Open the workflow for editing in the workflow editor.
- Add some elements to the workflow schema.



**Procedure**

- 1 Click the **Permissions** tab.
- 2 Click the **Add access rights** icon () to define permissions for a new user group.
- 3 Search for a user group.  
The search results contain all the user groups from the Orchestrator LDAP server that match the search.
- 4 Select a user group and select the appropriate check boxes to set the level of permissions for this user group.  
To allow a user from this user group to view the workflow, inspect the schema and scripting, run and edit the workflow, and change the permissions, you must select all check boxes.
- 5 Click **Select**.  
The user group appears in the permissions list.
- 6 Click **Save and close** to exit the editor.

## Run a Workflow

You can perform automated operations in vCenter Server by running workflows from the standard library or workflows that you create.

For example, you can create a virtual machine by running the Create simple virtual machine workflow.

**Prerequisites**

Verify that you have configured the vCenter Server plug-in. For details, see *Installing and Configuring vRealize Orchestrator*.

**Procedure**

- 1 From the drop-down menu in the Orchestrator client, select **Run**.
- 2 Click the **Workflows** view.
- 3 In the workflows hierarchical list, open **Library > vCenter > Virtual machine management > Basic** to navigate to the Create simple virtual machine workflow.
- 4 Right-click the Create simple virtual machine workflow and select **Start workflow**.
- 5 Provide the general parameters and click **Next**.

Option	Action
<b>Virtual machine name</b>	Name the virtual machine <b>orchestrator-test</b> .
<b>Virtual machine folder</b>	<ol style="list-style-type: none"> <li>a Click <b>Not set</b> for the <b>Virtual machine folder</b> value.</li> <li>b Select a virtual machine folder from the inventory.  The <b>Select</b> button is inactive until you select an object of the correct type, in this case, VC:VmFolder.</li> </ol>
<b>Size of the new disk in GB</b>	Enter an appropriate numeric value.
<b>Memory size in MB</b>	Enter an appropriate numeric value.
<b>Number of virtual CPUs</b>	Select an appropriate number of CPUs from the <b>Number of virtual CPUs</b> drop-down menu.
<b>Virtual machine guest OS</b>	Click the <b>Not set</b> link and select a guest operating system from the list.
<b>Make the disk thin provisioned</b>	Select whether to make the disk thin or thick provisioned.

- 6 Provide the infrastructure parameters.

Option	Description
<b>Host on which to create the virtual machine</b>	Click <b>Not set</b> for the <b>Host on which to create the virtual machine</b> value and navigate through the vCenter Server infrastructure hierarchy to a host machine.
<b>Resource pool</b>	Click <b>Not set</b> for the <b>Resource pool</b> value and navigate through the vCenter Server infrastructure hierarchy to a resource pool.
<b>The network to connect to</b>	Click <b>Not set</b> for the <b>The network to connect to</b> value and select a network. Press Enter in the <b>Filter</b> text box to see all the available networks.
<b>Datastore in which to store the virtual machine files</b>	Click <b>Not set</b> for the <b>Datastore in which to store the virtual machine files</b> value and navigate through the vCenter Server infrastructure hierarchy to a datastore.

- 7 Click **Submit** to run the workflow.

A workflow token appears under the Create simple virtual machine workflow, showing the workflow running icon.

- 8 Click the workflow token to view the status of the workflow as it runs.
- 9 Click the **Events** tab in the workflow token view to follow the progress of the workflow token until it completes.
- 10 Click the **Inventory** view.
- 11 Navigate through the vCenter Server infrastructure hierarchy to the resource pool you defined.  
If the virtual machine does not appear in the list, click the refresh button to reload the inventory.  
The `orchestrator-test` virtual machine is present in the resource pool.
- 12 (Optional) Right-click the `orchestrator-test` virtual machine in the **Inventory** view to see a contextual list of the workflows that you can run on the `orchestrator-test` virtual machine.

The Create simple virtual machine workflow ran successfully.

### What to do next

You can log in vSphere Client and manage the new virtual machine.

## Respond to a Request for a User Interaction

Workflows that require interactions from users during their run suspend their run either until the user provides the required information or until the workflow times out.

Workflows that require user interactions define which users can provide the required information and direct the requests for interaction.

### Prerequisites

Verify that at least one workflow is in the Waiting for User Interaction state.

### Procedure

- 1 From the drop-down menu in the Orchestrator client, select **Run**.
- 2 Click the **My Orchestrator** view in the Orchestrator client.

- 3 Click the **Waiting for Input** tab.

The **Waiting for Input** tab lists the workflows that are waiting for user inputs from you or from members of your user group that have permission.

- 4 Double-click a workflow that is waiting for input.

The workflow token that is waiting for input appears in the **Workflows** hierarchical list with the following symbol: .

- 5 Right-click the workflow token and select **Answer**.
- 6 Follow the instructions in the input parameters dialog box to provide the information that the workflow requires.

You provided information to a workflow that was waiting for user input during its run.

## Scheduling Workflows

You can schedule a workflow to run once, or multiple times using a recurrence pattern.

### Schedule a Workflow

You can schedule a workflow from the Orchestrator client **Scheduler** or **Workflows** views. The user credential that starts the workflow is the same as the credential you use to schedule it.

#### Prerequisites

You must have the **Execute** privilege to schedule a workflow.

#### Procedure

- 1 From the drop-down menu in the Orchestrator client, select **Run**.
- 2 Click the **Scheduler** view.
- 3 Right-click within the left pane and select **Schedule task**.
- 4 (Optional) Select **Schedule task as** to use another user's credentials to schedule a workflow.
- 5 Search for the workflow to schedule by typing the name of the workflow, select it, and click **Select**.
- 6 Set the start date and time for the workflow.
- 7 (Optional) Select whether to start the workflow if the scheduled time is in the past.

Option	Description
<b>Yes</b>	The workflow starts immediately.
<b>No</b>	The workflow starts at the next set recurrence.

- 8 (Optional) Select a workflow recurrence pattern.
  - a From the **Recurrence** drop-down menu, select the workflow recurrence pattern.
  - b If you set the workflow to recur, you can specify an end time and date for the workflow.
- 9 If the workflow requires input parameters, click **Next** and provide the necessary information.
- 10 Click **Submit** to schedule the workflow.

The scheduled workflow is listed in the **Scheduler** view. An **R** appears next to the scheduled workflow to denote that recurrence is set.

### What to do next

You can monitor the workflow run and delete the scheduled task from the **Scheduler** view.

## Edit the Workflow Recurrence Pattern

A recurrence pattern is used to specify the way in which a given workflow is scheduled. You can edit the recurrence pattern of a workflow from the **Scheduler** view.

### Prerequisites

A recurrent workflow that is scheduled.

### Procedure

- 1 From the drop-down menu in the Orchestrator client, select **Run**.
- 2 Click the **Scheduler** view.
- 3 Right-click the scheduled workflow whose recurrence pattern you want to edit and select **Edit**.
- 4 Click the **Recurrence** tab.
- 5 From the drop-down menu, select the recurrence pattern.

You can add an unlimited number of entries to the pattern. You can edit each entry.

The display changes according to the selected pattern.

- 6 Click **Save and close** to exit the editor.

The new recurrence pattern for the scheduled workflow appears on the **Recurrence** tab.

### What to do next

You can view details about the different runs of the scheduled workflow on the **Workflow Runs** tab.

## Use Workflow Version History

You can use version history to revert a workflow to a previously saved state. You can revert the workflow state to an earlier or a later workflow version. You can also compare the differences between the current state of the workflow and a saved version of the workflow.

Orchestrator creates a new version history item for each workflow when you increase and save the workflow version. Subsequent changes to the workflow do not change the current saved version. For example, when you create a workflow version 1.0.0 and save it, the state of the workflow is stored in the version history. If you make any changes to the workflow, you can save the workflow state in the Orchestrator client, but you cannot apply the changes to workflow version 1.0.0. To store the changes in the version history, you must create a subsequent workflow version and save it. The version history is kept in the database along with the workflow itself.

When you delete a workflow, Orchestrator marks the element as deleted in the database without deleting the version history of the element from the database. This way, you can restore deleted workflows. See [“Restore Deleted Workflows,”](#) on page 21.

### Prerequisites

Open a workflow for editing in the workflow editor.

### Procedure

- 1 Click the **General** tab in the workflow editor and click **Show version history**.

- 2 Select a workflow version and click **Diff Against Current** to compare the differences.

A window displays the differences between the current workflow version and the selected workflow version.

- 3 Select a workflow version and click **Revert** to restore the state of the workflow.



**CAUTION** If you have not saved the current workflow version, it is deleted from the version history and you cannot revert back to the current version.

The workflow state is reverted to the state of the selected version.

## Restore Deleted Workflows

You can restore workflows that have been deleted from the workflow library.

### Procedure

- 1 From the drop-down menu in the Orchestrator client, select **Run** or **Design**.
- 2 Click the **Workflows** view.
- 3 Navigate to the workflow folder in which you want to restore deleted workflows.
- 4 Right-click the folder and select **Restore deleted workflows**.
- 5 Select the workflow or workflows that you want to restore and click **Restore**.

The restored workflows appear in the selected folder.

## Export a Workflow

You can export workflows to use them in another Orchestrator server instance.

### Procedure

- 1 From the drop-down menu in the Orchestrator client, select **Run**.
- 2 Click the **Workflows** view.
- 3 Browse to the workflow you want to export and right-click that workflow.
- 4 Select **Export workflow**.
- 5 Browse to locate the folder in which you want to save the workflow, and click **Save**.

The workflow is saved as a `.workflow` file.

## Import a Workflow

If you have exported a workflow from one Orchestrator server you can import it to another Orchestrator server.

### Procedure

- 1 From the drop-down menu in the Orchestrator client, select **Run**.
- 2 Click the **Workflows** view.
- 3 Browse to the workflow folder in which you want to import the workflow and right-click it.
- 4 Select **Import workflow**.

- 5 Browse to locate the workflow you want to import, and click **Open**.

If the workflow already exists in your workflow library, a dialog box with version information appears.

---

**NOTE** You cannot import a workflow with an earlier version number than the version number of the existing workflow.

---

The imported workflow appears in the workflow folder that you selected.

# Managing Policies

---

Policies are event triggers that monitor the activity of the system. Policies respond to predefined events issued by changes in the status or performance of certain defined objects.

Policies are a series of rules, gauges, thresholds and event filters that run certain workflows or scripts when specific predefined events occur in Orchestrator or in the technologies that Orchestrator accesses through plug-ins. Orchestrator constantly evaluates the policy rules as long as the policy is running. For instance, you can implement policy gauges and thresholds that monitor the behavior of vCenter Server objects of the `VC:HostSystem` and `VC:VirtualMachine` types.

Orchestrator defines the following types of policy:

**Policy Templates** Master policies. Policy templates are not linked to real objects. They are abstract sets of rules that define the behavior to implement if a certain abstract event occurs. You can see existing policy templates and create templates in the **Policy Templates** view in the Orchestrator client.

**Policies** Policies are instances of a template or standalone event triggers that are linked to real objects, and that are triggered by real-life events. You can see existing policies and create policies in the **Policies** view in the Orchestrator client.

You can organize policy templates into folders, for easier navigation. The maximum number of policies supported by Orchestrator is 50.

This chapter includes the following topics:

- [“Create a Policy,”](#) on page 23
- [“Apply a Policy,”](#) on page 24

## Create a Policy

You can create a policy to monitor the activity of the system for specific events.

### Procedure

- 1 From the drop-down menu in the Orchestrator client, select **Run**.
- 2 Click the **Policies** view.
- 3 Right-click within the left pane and select **Create new policy**.
- 4 Type a name for the policy and click **Ok**.

The policy appears in the list of policies.

- 5 Right-click the policy and select **Edit**.  
The policy editor opens.
- 6 On the **General** tab, edit the startup settings, priority, startup user, and description of the policy.
- 7 On the **Scripting** tab, add and remove policy elements, periodic tasks, and trigger events, as well as manage attributes.
- 8 On the **Events** and **Logs** tabs, view information about the policy.
- 9 On the **Permissions** tab, add and remove access rights for users or user groups.
- 10 Click **Save and close** to exit the editor.
- 11 In the **Policies** view, right-click the policy that you created and select **Start policy**.

## Apply a Policy

You can apply a policy from an existing policy template.

### Prerequisites

Verify that you have created a policy template.

### Procedure

- 1 From the drop-down menu in the Orchestrator client, select **Run**.
- 2 Click the **Policies** view.
- 3 Right-click within the left pane and select **Apply Policy**.
- 4 In the **Filter** text box type the name of the policy template.
- 5 Select the policy template and click **Select**.
- 6 Provide the required policy information and click **Submit**.  
The policy appears in the list of policies.
- 7 In the **Policies** view, right-click the policy that you created and select **Start policy**.



# Using Packages

---

You can use packages to transport content from one Orchestrator server to another. Packages can contain workflows, actions, policies, configurations, and resources.

When you add an element to a package, Orchestrator checks for dependencies and adds any dependent elements to the package. For example, if you add a workflow that uses actions or other workflows, Orchestrator adds those actions and workflows to the package.

When you import a package, the server compares the versions of the different elements of its content to matching local elements. The comparison shows the differences in versions between the local and imported elements. The administrator can decide whether to import the whole package, or choose specific elements to import.

Packages feature digital rights management to control how the receiving server can use the content of the package. Orchestrator signs packages and encrypts the packages for data protection. Packages use X509 certificates to monitor which users export and redistribute elements.

This chapter includes the following topics:

- [“Create a Package,”](#) on page 25
- [“Set User Permissions on a Package,”](#) on page 26
- [“Export a Package,”](#) on page 27
- [“Import a Package,”](#) on page 28
- [“Get a Remote Package,”](#) on page 28
- [“Synchronize a Remote Package,”](#) on page 29
- [“Remove a Package,”](#) on page 30

## Create a Package

You can export workflows, policy templates, actions, plug-in references, resources, and configuration elements in packages. All elements that an element in a package implements are added to the package automatically, to ensure compatibility between versions. If you do not want to add the referenced elements, you can delete them in the package editor.

### Prerequisites

Verify that the Orchestrator server contains elements such as workflows, actions, and policy templates that you can add to a package.

### Procedure

- 1 From the drop-down menu in the Orchestrator client, select **Administer**.

- 2 Click the **Packages** view.
- 3 Right-click in the left pane and select **Add package**.
- 4 Type the name of the new package and click **Ok**.  
The syntax for package names is *domain.your\_company.folder.package\_name*.  
For example, *com.vmware.myfolder.mypackage*.
- 5 Right-click the package and select **Edit**.  
The package editor opens.
- 6 On the **General** tab, add a description for the package.
- 7 On the **Workflows** tab, add workflows to the package.
  - Click **Insert Workflows (list search)** to search for and select workflows in a selection dialog box.
  - Click **Insert Workflows (tree browsing)** to browse and select folders of workflows from the hierarchical list.
- 8 On the **Policy Templates**, **Actions**, **Configurations**, **Resources**, and **Used Plug-Ins** tabs, add policy templates, actions, configuration elements, resource elements, and plug-ins to the package.
- 9 Click **Save and close** to exit the editor.

You created a package and added elements to it.

### What to do next

Set user permissions for this package.

## Set User Permissions on a Package

You set different levels of permission on a package to limit the access that different users or user groups can have to the contents of that package.


You can select the different users and user groups for which to set permissions from the users and user groups in the Orchestrator LDAP or vCenter Single Sign-On server. Orchestrator defines levels of permissions that you can apply to users or groups.

<b>View</b>	The user can view the elements in the package, but cannot view the schemas or scripting.
<b>Inspect</b>	The user can view the elements in the package, including the schemas and scripting.
<b>Edit</b>	The user can edit the elements in the package.
<b>Admin</b>	The user can set permissions on the elements in the package.

### Prerequisites

Create a package, open it for editing in the package editor, and add the necessary elements to the package.

### Procedure

- 1 Click the **Permissions** tab in the package editor.
- 2 Click the **Add access rights** icon () to define permissions for a new user or user group.
- 3 Search for a user or user group.  
The search results show all of the users and user groups that match the search.

- 4 Select a user or user group.
- 5 Check the appropriate check boxes to set the level of permissions for this user and click **Select**.  
To allow a user to view the elements, inspect the schema and scripting, run and edit the elements, and change the permissions, you must check all check boxes.
- 6 Click **Save and close** to exit the editor.

You created a package and set the appropriate user permissions.

## Export a Package

You can export a package with workflows, actions, policies, configurations, and resources from an Orchestrator server and import it to another Orchestrator server. An Orchestrator package includes the certificates for all of the contents in it. When you import the package into another server, these certificates are also imported.

### Prerequisites

Create a package and add the elements you want to export.

### Procedure

- 1 From the drop-down menu in the Orchestrator client, select **Administer**.
- 2 Click the **Packages** view.
- 3 Right-click the package to export and select **Export package**.
- 4 Browse to select a location to save the package.
- 5 (Optional) Sign the package.
  - a Click **Add target Certificate**.
  - b From the list of certificates, select the certificate to use for the exported package.
  - c Click **Select**.
- 6 (Optional) To apply permissions for the exported package, deselect the options as required.

Option	Description
<b>View contents</b>	The importer of the package is allowed to view the JavaScript code of the elements contained in the package.
<b>Add to package</b>	The importer of the package is allowed to redistribute the elements contained in the package.
<b>Edit contents</b>	The importer of the package is allowed to edit the code of the elements contained in the package.

- 7 (Optional) To apply restrictions for the contents of the exported package, deselect the options as required.

Option	Description
<b>Export version history</b>	The version history of the package is not exported.
<b>Export the values of the configuration settings</b>	The attribute values of the configuration elements in the package are not exported.
<b>Export global tags</b>	The global tags in the package are not exported.

- 8 Click **Save**.

You exported the package. You can use the workflows, actions, and policies from the exported package on another Orchestrator server.

## Import a Package

To reuse workflows, actions, policies, and configuration elements from one Orchestrator server on another server, you can import them as a package.

### Prerequisites

- Back up any standard Orchestrator elements that you have modified.
- On the remote server, create a package and add the elements you want to import.

### Procedure

- 1 From the drop-down menu in the Orchestrator client, select **Administer**.
- 2 Click the **Packages** view.
- 3 Right-click within the left pane and select **Import package**.
- 4 Browse to the package that you want to import and click **Open**.

Certificate information about the exporter appears.

- 5 Review the package import details and select **Import** or **Import and trust provider**.

The Import package view appears. If the version of an element in the package is later than the version on the server, the system selects the element for import.

- 6 (Optional) Deselect the elements that you do not want to import.
- 7 (Optional) Deselect **Import the values of the configuration settings** if you do not want to import the attribute values of the configuration elements from the package.
- 8 From the drop-down menu, choose whether you want to import tags from the package.

Option	Description
<b>Import tags but preserve existing values</b>	Import tags from the package without overwriting existing tag values.
<b>Import tags and overwrite existing values</b>	Import tags from the package and overwrite existing values.
<b>Do not import tags</b>	Do not import tags from the package.

- 9 Click **Import selected elements**.

### What to do next

You can use all the workflows, actions, policies, and configuration elements from the imported package as new building blocks on your Orchestrator server.

## Get a Remote Package

You can retrieve a package from a remote Orchestrator server.

### Procedure

- 1 From the drop-down menu in the Orchestrator client, select **Administer**.
- 2 Click the **Packages** view.
- 3 Right-click within the left pane and select **Get remote package**.

- 4 Log in to the remote server.

The Orchestrator Synchronization dialog box opens. It displays the differences between the package elements. To view only elements that are different on the local and remote server, select **Hide identical** from the drop-down menu.

- 5 Select the package that you want and click **Import**.
- 6 View the remote package elements and select an option.

Option	Description
<b>None</b>	Does not import the element.
<b>Update</b>	The element is imported from the remote server to the local server.

**NOTE** If the remote server does not recognize your certificate, you cannot commit and overwrite the elements.

- 7 Click **Synchronize**.

## Synchronize a Remote Package

The **Packages** view provides a way to synchronize a package on one Orchestrator server with an existing package on another server.

Synchronizing packages is the only way to obtain all the elements from the remote server. If you synchronize individual elements, Orchestrator only synchronizes elements that already exist on the local server. To obtain any new elements from the remote server, you must synchronize the package that contains those elements.

### Procedure

- 1 From the drop-down menu in the Orchestrator client, select **Administer**.
- 2 Click the **Packages** view.
- 3 Right-click the package that you want to synchronize and select **Synchronize**.
- 4 Log in to the remote server.

The Orchestrator Synchronization dialog box opens. It displays the differences between the package elements. To view only elements that are different on the local and remote server, select **Hide identical** from the drop-down menu.

- 5 View the comparison between the local and remote package elements and select an option.

Option	Description
<b>None</b>	The local and remote elements have the same version number. No synchronization is required.
<b>Commit</b>	The version of the local element is later. The remote element is overwritten.
<b>Update</b>	The version of the remote element is later. The local element is updated. If an element does not exist locally, it is imported from the remote server to the local server.
<b>Merge</b>	The local and remote packages are overwritten with a merged list of references. The referenced elements remain unchanged.

**NOTE** If the remote server does not recognize your certificate, you cannot commit elements.

- 6 Click **Synchronize**.

The synchronized package is reloaded.

### What to do next

You can use the updated package content in workflows, actions, and policies.

## Remove a Package

Workflows and actions, as well as other resources, can be reused in many packages. This is why, before you remove a package, you must decide whether to delete the workflows, actions, policies and other resources contained in the package.

### Procedure

- 1 From the drop-down menu in the Orchestrator client, select **Administer**.
- 2 Click the **Packages** view.
- 3 Right-click the package to delete and select one of the deletion options.

Option	Description
<b>Delete</b>	Removes the package only from the <b>Packages</b> view.
<b>Delete element with content</b>	Removes all workflows, actions, policies, configurations, plug-in settings or resources that the package contains. Does not remove read-only elements and the plug-in .dar archive.  <b>CAUTION</b> This action might delete elements that are referenced by other packages too. To avoid deleting an element that another package needs, remove any dependencies that you added to the package. To view a list of all the packages, workflows and policies that reference an element, use the <b>Find elements that use this element</b> function.

# Using Authorizations

---

With authorizations you can manage the permissions of users and user groups over elements of specific types.

This chapter includes the following topics:

- [“Create an Authorization Element,”](#) on page 31
- [“Configure an Authorization Element,”](#) on page 31

## Create an Authorization Element

You can create an authorization element to provide different permissions to users or user groups over elements or specific type.

### Procedure

- 1 From the drop-down menu in the Orchestrator client, select **Administer**.
- 2 Click the **Authorizations** view.
- 3 Right-click within the left pane and select **Create Authorization**.
- 4 In the **Name** text box, type a name for the element.
- 5 Click **Not set** and search for an LDAP user group.
- 6 (Optional) In the **Description** text box, type a description of the element.
- 7 Click **Submit** to create the element.

The authorization element appears in the list of authorizations.

### What to do next

Edit the configuration of the authorization element.

## Configure an Authorization Element

You can configure references and permissions for an authorization element.

### Prerequisites

Verify that you have created an authorization element.

### Procedure

- 1 From the drop-down menu in the Orchestrator client, select **Administer**.

- 2 Click the **Authorizations** view.
- 3 Right-click the authorization element that you want to modify and select **Edit**.  
The authorization element editor opens.
- 4 (Optional) On the **General** tab, edit the description of the element.
- 5 On the **References** tab, create references to available element types from the tree.
- 6 On the **Permissions** tab, set the level of permissions for a user or user group.
- 7 Click **Save and close** to exit the editor.



# Tagging Objects

---

In vRealize Orchestrator, you can make workflows and other URI objects more searchable by attaching tags to them.

Tags are strings with length between 3 and 64 characters and must contain no white spaces. Global tags are visible to all Orchestrator users and private tags are visible only to the user who created them. Only users with administrative privileges can create and remove global tags.

You can assign values to the tags that you create. A tag value is an optional parameter which you can use to filter tags.

You can manage object tags by using the Orchestrator scripting API or by running the workflows in the Tagging package of the Library plug-in. For information about tagging through the Orchestrator scripting API and the Orchestrator REST API, see *Developing a Web Services Client for VMware vRealize Orchestrator*.

This chapter includes the following topics:

- [“Tag a Workflow,”](#) on page 33
- [“Untag a Workflow,”](#) on page 34
- [“View the Tags Assigned to a Workflow,”](#) on page 34
- [“Search Objects by Tag,”](#) on page 34

## Tag a Workflow

To make workflows more searchable, you can assign tags to them.

You can tag workflows in the Orchestrator client, by running the Tag workflow workflow in the Library plug-in.

---

**NOTE** To create global tags, you must be logged in as a user with administrative privileges.

---

### Procedure

- 1 Log in to the Orchestrator client.
- 2 Click the **Workflows** view in the Orchestrator client left pane.
- 3 In the workflows hierarchical list, expand **Library > Tagging** and select Tag workflow.
- 4 Right-click Tag workflow and select **Start workflow**.
- 5 Click the **Not set** link under Tagged workflow to select the workflow you want to tag.
- 6 In the **Tag** text box, type the name of the tag you want to apply to the selected workflow.
- 7 (Optional) In the **Value** text box, type a value for the tag.

- 8 In the Global tag section, click **Yes** if the tag is global.
- 9 Click **Submit** to run the workflow.

## Untag a Workflow

You can delete a tag from a workflow when it is no more needed.

You can remove a tag from a workflow by running the Untag workflow workflow.

---

**NOTE** To remove global tags, you must be logged in as a user with administrative privileges.

---

### Procedure

- 1 Log in to the Orchestrator client.
- 2 Click the **Workflows** view in the Orchestrator client left pane.
- 3 In the workflows hierarchical list, expand **Library > Tagging** and select Untag workflow.
- 4 Right-click Untag workflow and select **Start workflow**.
- 5 Click the **Not set** link under Workflow to untag to select the workflow you want to untag.
- 6 In the **Tag to remove** text box, type the name of the tag you want to remove from the selected workflow.
- 7 In the Global tag section, click **Yes** if the tag you want to remove is global.
- 8 Click **Submit** to run the workflow.

## View the Tags Assigned to a Workflow

You can see the tags that are assigned to a workflow.

### Procedure

- 1 Log in to the Orchestrator client.
- 2 Click the **Workflows** view in the Orchestrator client left pane.
- 3 In the workflows hierarchical list, expand **Library > Tagging** and select List workflow tags.
- 4 Right-click List workflow tags and select **Start workflow**.
- 5 Click **Workflow** and select a workflow to view the tags assigned to it.
- 6 Click **Submit** to run the workflow.

## Search Objects by Tag

You can search Orchestrator objects by specifying their tags.

### Procedure

- 1 Log in to the Orchestrator client.
- 2 Click the **Workflows** view in the Orchestrator client left pane.
- 3 In the workflows hierarchical list, expand **Library > Tagging** and select Find objects by tag.
- 4 Right-click Find objects by tag and select **Start workflow**.

- 5 In the Advanced section, specify whether you want to perform search in Advanced mode.

Option	Action
<b>Yes</b>	In the <b>Tag filters</b> text box, type a query for multiple tags in JSON format by using the <b>{tag:tag1_name, value:tag1_value}, {tag:tag2_name, value:tag2_value}</b> syntax.
<b>No</b>	<ul style="list-style-type: none"><li>a In the <b>Tag name</b> and the <b>Tag value</b> text boxes, type the name and the value of the tag you want to search.</li><li>b In the Search in global tags section, click <b>Yes</b> if you want to search only global tags.</li></ul>

- 6 Click **Submit** to run the workflow.



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