HP Operations Orchestration Software

Software Version: 7.50

VMware Virtual Infrastructure Integration Guide

Legal Notices

Warranty

The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein.

The information contained herein is subject to change without notice.

Restricted Rights Legend

Confidential computer software. Valid license from HP required for possession, use or copying. Consistent with FAR 12.211 and 12.212, Commercial Computer Software, Computer Software Documentation, and Technical Data for Commercial Items are licensed to the U.S. Government under vendor's standard commercial license.

Copyright Notices

Trademark Notices

All marks mentioned in this document are the property of their respective owners.

Finding or updating documentation on the Web

Documentation enhancements are a continual project at Hewlett-Packard Software. You can obtain or update the HP OO documentation set and tutorials at any time from the HP Software Product Manuals web site. You will need an HP Passport to log in to the web site.

To obtain HP OO documentation and tutorials

1. Go to the HP Software Product Manuals web site (*http://support.openview.hp.com/selfsolve/manuals*).

2. Log in with your HP Passport user name and password.

   OR

   If you do not have an HP Passport, click **New users — please register** to create an HP Passport, then return to this page and log in.

   If you need help getting an HP Passport, see your HP OO contact.

3. In the **Product** list box, scroll down to and select **Operations Orchestration**.

4. In the **Product Version** list, click the version of the manuals that you're interested in.

5. In the **Operating System** list, click the relevant operating system.

6. Click the **Search** button.

7. In the **Results** list, click the link for the file that you want.

Where to Find Help, Tutorials, and More

The HP Operations Orchestration software (HP OO) documentation set is made up of the following:

- Help for Central

  Central Help provides information to the following:

  - Finding and running flows
  - For HP OO administrators, configuring the functioning of HP OO
  - Generating and viewing the information available from the outcomes of flow runs

  The Central Help system is also available as a PDF document in the HP OO home directory, in the \Central\docs subdirectory.

- Help for Studio

  Studio Help instructs flow authors at varying levels of programming ability.

  The Studio Help system is also available as a PDF document in the HP OO home directory, in the \Studio\docs subdirectory.

- Animated tutorials for Central and Studio

  HP OO tutorials can each be completed in less than half an hour and provide basic instruction on the following:

  - In Central, finding, running, and viewing information from flows
  - In Studio, modifying flows

  The tutorials are available in the Central and Studio subdirectories of the HP OO home directory.

- Self-documentation for operations and flows in the Accelerator Packs and ITIL folders

  Self-documentation is available in the descriptions of the operations and steps that are included in the flows.

Support

For support information, including patches, troubleshooting aids, support contract management, product manuals and more, visit the following site:

- *http://support.openview.hp.com*

Table of Contents

# Overview of VMware Virtual Infrastructure integration

With this integration, administrators can build HP Operations Orchestration (OO) flows that are integrated into the VMware Virtual Infrastructure (VI).

This document will explain how this integration has been implemented and how the operations included communicate between OO and VI.

Use cases and scenarios

1. Control virtual machine (VM) states:
   - Start
   - Stop
   - Suspend
2. Administer virtual machine, including activities such as:
   - Installing and/or updating VMWare tools
   - Snapshot administration (including take and revert)
   - Migration (whether the VM is running or not)
3. Administer virtual network devices:
   - Create, modify, delete
   - Assign VMs to specific ports
   - Change virtual device types and the mapping of physical devices to virtual devices
4. Virtual machine provisioning and removal:
   - Create virtual machine
   - Clone virtual machine
   - Manage storage devices and locations
   - Delete virtual machine

Virtual Infrastructure integration flows and operations
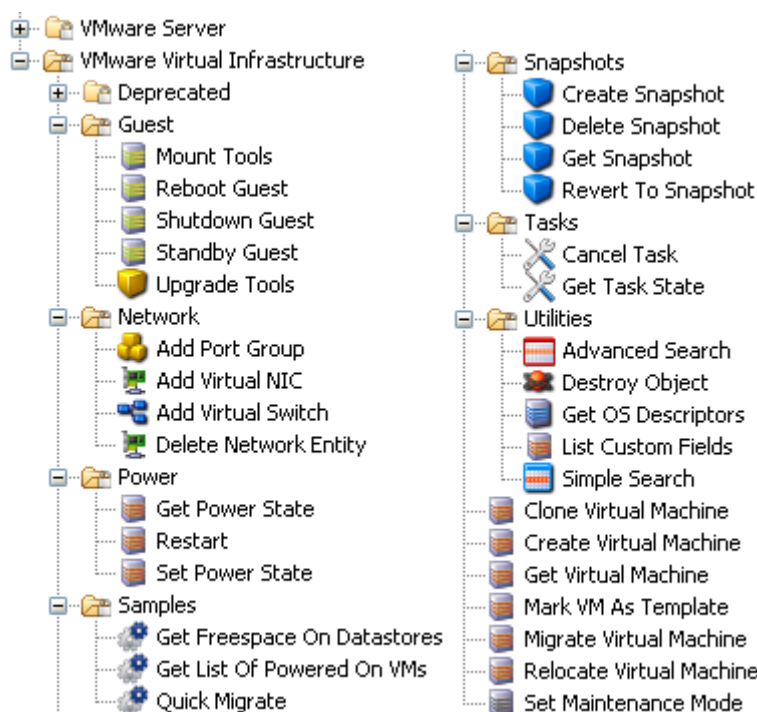
Operations support the following types of tasks:

- Guest OS interaction such as rebooting the guest OS and upgrading VMWare tools
- Virtual network element addition and deletion in a VMWare host system
- Virtual machine power state changes
- Virtual machine snapshot management
- Basic task management
- Search and filtering of elements in the VMWare Infrastructure
- Virtual machine and host system maintenance and administrative operations including deploying template VMs, setting maintenance mode, relocation, and migration

Common inputs in the integration

The following inputs are used consistently throughout the integration's operations.

async

> If false, the operation waits for the underlying operation to complete before returning. If true, the operation will provide a task number for the user to monitor.

closeSession

> This input determines whether to close the cached VI session used by the operation at the completion of the step. All sessions are automatically cleaned at the end of a flow's execution, so it is usually not necessary to set this parameter to true. These sessions are unique to a username, password, port, and host within a flow. Unused sessions expire after a set amount of time in VI, so operations that take a long time to complete an operation should use the async option and poll intermittently to maintain an active session. Otherwise, the session may become invalid, and the OO integration does not automatically reconnect. In these situations it

is expected that the user closes the session using any operation with **closeSession** set to true and attempting the operation again.

vmIdentifierType

Ways to identify a specific VM to perform the operation upon. You may specify the VM by the following:

- **IP**

  The IP address of the VM. Under certain conditions, the IP listed for the VM in Virtual Center may not be correct.

- **Inventory path**

  A variation of the inventory path viewable in Virtual Center via the "Virtual Machines and Templates" view. In Virtual Center, this usually means a string of the format `Datacenter/vm/sub/folder/path/virtual machine name`. Under ESX, this usually means `ha-datacenter/vm/sub/folder/path/virtual machine name`, where ha-datacenter is the default name of a datacenter for an ESX server when directly accessed. Note that special characters such as \ and % are URI-escaped in Virtual Infrastructure and must be formatted with the escape sequence. Note, however, that (unlike in URIs) space is not escaped. If necessary, you can find how VI escaped a path by using VMWare's Managed Object Browser (MOB). Please see General troubleshooting procedures and tools to find out more about using MOB.

- **UUID**

  Every VM has a UUID that you can access by searching on the property config.uuid with the Advanced Search operation. You can also find this UUID in the configuration file of the VM.

- **Name**

  The name of the VM as seen in the VI client. Because there may be multiple VMs with the same name in a data center, the VM that is chosen when multiple VMs exist with the same name is undefined. This value may need to be URI-escaped. To find the correct escaped name for the VM, see the discussion of **Inventory path**, above.

- **Hostname**

  The fully-qualified domain name of the host as seen in the VI client.

- **VMID**

  The internal ID of the VM within the VI SDK that differs between ESX and VC. This is of the form vm-*number* in Virtual Center and *number* in ESX.

virtualMachine

The corresponding value of the data used to identify the virtual machine. The format of this the value depends on the value of **vmIdentifierType**.

resourcePool

The name of the resource pool assigned to a VM. If no resource pool is used, the default name is **Resources** and this input can be empty.
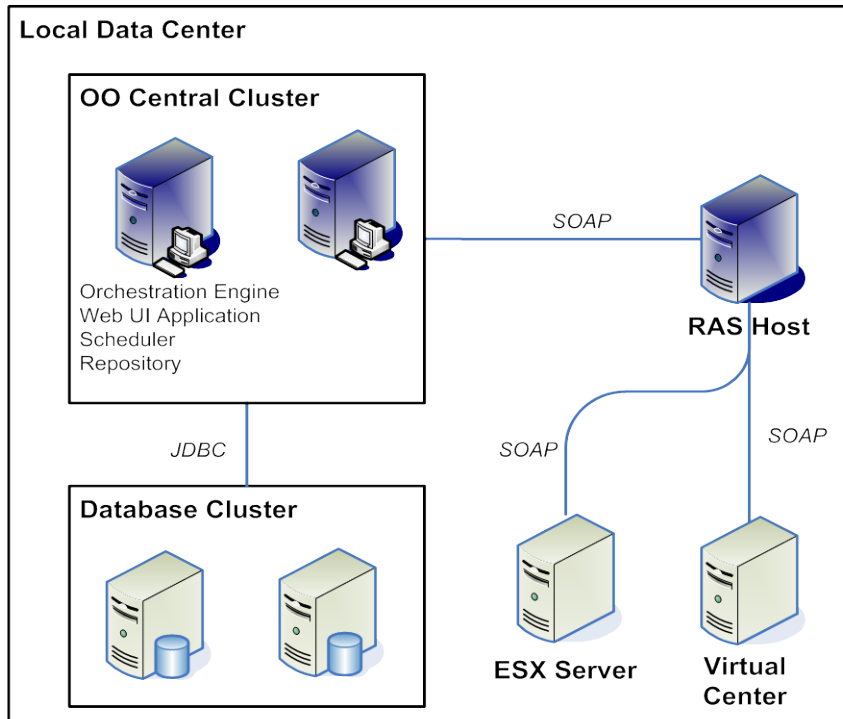
vmResourcePool

Similar to **resourcePool**, this input is used for instantiating a new VM and follows the same conventions as **resourcePool**.

Versions and components

Operations Orchestration Version	Virtual Infrastructure Version
7.50	2.0, 2.5, 3.0, 3.5

Architecture

Installation and configuration instructions

On a system that can access any Virtual Center or ESX server, install a JRAS. If an ESX server is being contacted, the ESX server must be configured to enable its external Web service. To enable the Web service, please see the "Modifying the Server Configuration to Support HTTP" section in the *VMWare Developer's Setup Guide* available at the VMware Web site.

Operation specifics

Advanced Search

The **Advanced Search** operation is usually used to determine properties of certain managed objects and to filter out managed objects that do not match criteria.

This operation directly exposes ID types, objects and their relations, classes, and properties of the virtual infrastructure (VI) SDK used to integrate with VI, so users must understand how different VI objects are related.

propsType

> Managed object type to search for. For example, to find datastore objects, enter Datastore as the type. Note: some objects may not be reachable with the default traversal path and require multiple uses of **Advanced Search**.

propsPathSet

> Comma-separated list of property to retrieve. Each property is dot-delimited for different levels of nesting and supports arrays via square brackets around the key or index (for instance, propertyName[indexOrKey]). For example, you can find the CPU reservation on a virtual machine by using the property path `resourceConfig.cpuAllocation` or the deviceInfo of an LSI Logic SCSI Controller via `config.hardware.device[1000].deviceInfo`.

propsRootObjType

> The type of the Managed Object Reference (such as VirtualMachine, HostSystem, ResourcePool) to begin the search on. Leaving this blank will default the root object to the root folder of the ESX or VC host.

propsRootObj

> The value of the reference (such as vm-123, datastore-123, network-123) used as a root object. Leaving this blank will default the root object to be the root folder of the ESX or VC host.

To retrieve objects that can't be directly found by the default recursive settings, you can use two calls to the operation. First, use the **propsPathset** input to specify the properties of a managed object of interest that you can traverse to. With the managed object IDs returned, you can set these objects as the root objects and retrieve properties with additional calls to the operation.

For an example of the operation, please see the **Get Freespace On Datastores** sample flow.

Hidden inputs

There are two operations with hidden inputs.

Get Task State

_overrideProperties

> Used to override the default properties retrieved by the operation from a Task object. This input is a comma-delimited list of managed object reference properties as seen in the *VMWare Virtual Infrastructure Programming Guide SDK*. For an example of the format, see the "Search For Virtual Machines" step in the **Get List of Powered On VMs** sample flow.

Create Virtual Machine

netNicType

> The virtual network interface card (NIC) type. By default, the virtual NIC device is PCNet32. The allowed values are E1000, PCNet32, and Vmxnet, case insensitive. By default, virtual machines are created with PCNet32 NICs because it is the only NIC type that is supported when a virtual machine does not have VMWare Tools installed.

Troubleshooting

General troubleshooting procedures and tools

The best troubleshooting tool available is VMWare's MOB, a Web-based application to browse a Virtual Center or ESX host system's inventory as seen by the API. MOB also enables you to execute some Virtual Infrastructure commands from a Web browser. To use MOB, open a Web browser to the URL https://hostsystem/mob and enter your credentials.

To reach the parts of MOB that you will need, click on the **content** link and go to the root folder property, which contains all the components in the virtual datacenter. Components such as alarms, events, and performance counters are available via other properties and services within the VMWare SDK.

Error messages

Couldn't find VM type

The VM identifier type input was left blank. VMs are identified by the identifier type (way of specifying a single virtual machine) and a value to search for.

Unsupported VM reference style

The VM identifier type input is invalid. Pick a valid one from the selection list provided.

Must specify VM inventory path, IP, hostname, or UUID

The virtualMachine input was left blank. VMs are identified by the identifier type and a value to search for. Check the format of your input as well:

- Inventory paths are / delimited.
- IP addresses are either IPv4 or IPv6 addresses (depending upon your ESX version).
- Hostnames must be fully qualified domain names.
- UUIDs must consist of hexadecimal characters and dashes.

Other options include searching by the VM's name or its internal ID number. You can see the internal ID number can be seen in MOB as either vm-*number* (in Virtual Center) or just a number (ESX) listed under its type of VirtualMachine.

Datacenter "..." not found

The datacenter specified was not found. Make sure that you are accessing the correct ESX or Virtual Center server if you are accessing an ESX server, that the datacenter is named "ha-datacenter" (the default name of the datacenter on a standalone ESX server).

No ConfigTarget found in ComputeResource "..."

No VirtualHardwareInfo found in ComputeResource

The compute resource associated with a host system or cluster does not include the following, which are required for specifying the virtual hardware configuration of a VM:

- Information on virtual hardware
- Available configuration options

Ensure that the host system or cluster specified has been initialized correctly. The errors leading to this error message may occur if Virtual Center's information is not yet ready or out of date and may require waiting for Virtual Center or possibly restarting Virtual Center.

Invalid nic card type "…"

The NIC type entered is not supported. Use PCNet32, E1000, or VMXNet (all case insensitive) for the input.

Could not find volume "…"

The datastore entered could not be found. Check the format used to specify the datastore. It should not include brackets or any non-word characters.

No Datastore found in ComputeResource

There was no available datastore found for the host system specified. This can mean that the local datastore on the host system is corrupt or that connectivity to the VI host has been lost.

Couldn't find a network configuration for host system "…"

The host system does not have a virtual network configuration. This can be caused by inconsistent state in Virtual Center or by a configuration issue with the host system that is being targeted.

Must bridge to at least one NIC device!

You must specify a NIC device that can be found in the host network configuration. To find the name of virtual NICs that are in the host network configuration, open the configuration tab under the Virtual Infrastructure client information on a host system or via MOB.

No power state information found for vm

An error occurred during retrieval of information about the VM. Make sure the virtual machine was not deleted and that the Virtual Center host is able to connect to the virtual machine.

Unactionable power state request

The power state change requested is not possible (for instance, powered off to suspended, suspended to powered off). Transition the VM to a suitable power state before attempting this operation.

No action performed. VM is currently in requested power state or target power state invalid.

You cannot put a VM in the same power state it is in already, nor can you put a VM in a power state that doesn't exist. Make sure the requested power state is poweredOn, poweredOff, or suspended.

Snapshot tree for VM "…" not found

No snapshot tree found

No snapshots were found associated with the VM. Make sure that the specified VM has a snapshot history and that none of the snapshots are corrupted.

Unexpected number of snapshot trees found

This can occur if a snapshot tree changes while the operation was in execution or if there has been corruption of data within Virtual Center or ESX. Ensure that no other operations are running against the VM and try the operation again.

Unable to retrieve snapshot named "…"

A snapshot tree was found, but no snapshots matching the name were found. Make sure that any escaping has been completed, and if necessary, browse to the appropriate snapshot in MOB to see how it has been escaped within VI.

Host system "..." not found

In the datacenter specified, the specified host system was not found as connected or registered. Check the name of the host system and make sure it matches the name of an ESX host. For example, if there exists a host system named hahost123.mydomain.com, you should specify hahost123.mydomain.com rather than just hahost123.

Could not find computeResource for host: "..."

Every ESX host is assigned a compute resource, which allows the creation of resource pools within a host. This occurs when a specific ESX host is specified but no compute resources can be found for it. This is usually the result of a configuration error or outdated data in Virtual Center.

Cluster "..." not found

The cluster specified was not found in the datacenter. Check the cluster name that you specified. Note that cluster names are case-sensitive.

Couldn't find any compute resources!

This error occurs if there are no host systems or clusters found. This is sometimes due to Virtual Center having communication problems with its managed hosts. Make sure the VC or ESX host is fully connected and configured correctly.

Couldn't find a resource pool on host system

Couldn't find a resource pool on cluster

A suitable cluster or host system was found, but it appears that there are no resource pools. This condition should not happen because there should be at least one resource pool, the default "Resources" pool, available to all virtual machines. Please make sure the VC or ESX host is fully connected and configured correctly.

You cannot specify both a host and cluster name

Must specify a valid hostSystem or cluster first

To execute the operation, you must specify exactly one of either host system or cluster name. Specify a host system or cluster name in the appropriate input and ensure the other is blank.

Could not find resource pool named "..."

Although a resource pool was found, the resource pool specified was not found in that datacenter or host. Remember that:

- Resource pool identifiers are case sensitive.
- Virtual machines cannot be assigned to resource pools outside their host system or cluster, depending upon whether the VM is on a standalone system or VMWare cluster.

Resource pool required when deploying a VM from a template! Try "Resources" for the default resource pool

A resource pool was not specified and use of the default resource pool "Resources" was not attempted. This error can occur due to configuration problems or if you specify a blank or whitespace for the resource pool input. Check your inputs, or refresh or restart Virtual Center.

No custom fields found via this ESX / VC server. If this is not what is expected, please check that the host is a Virtual Center machine

No custom fields have been defined on that ESX or VC server. Custom fields are not supported on standalone ESX host systems and are only accessible via a VC host.

No virtual machines could be found meeting given criteria

The host has no virtual machines, or there are no valid virtual machines connected to the host. This error is expected when running against a new ESX or VC host with no VMs specified.

AxisFault – InvalidPropertyFault ".…"

This is an internal error that occurs when a VI object is retrieved and an unexpected object comes back. This is usually due to user input error (such as use of Advanced Search with invalid or nonexistent properties), but it can also mean that there is an error in the operation that requires engineering effort.

AxisFault - Read time out

This occurs when an operation is waiting for an update from the VI host for too long. This can occur when there's significant load on a VI host or an operation in synchronous mode (async = false) takes a long time to finish. Synchronous tasks taking over 25 minutes are considered to be failures. Please set the async input on any potentially long-running operation (clone, relocate, migrate, etc.) to true and periodically use the Get Task State operation to avoid this error.

Customizing the integration

The VMWare Infrastructure integration should work if the following requirements are met:

- The ESX host version is 2.0 or later.
- The Virtual Center host version is 1.0 or later.
- The Web service is enabled on the host and accessible from the respective OO JRAS. There are no customizations supported by VMWare (except for access control lists) that could invalidate the provided operations or prevent them from accomplishing their tasks.

If tasks unsupported by the included operations are needed, the user must use OO's Web Service Wizard, OO's IActions, or third-party tools such as Microsoft's PowerShell. All of these methods utilize VMWare's Virtual Infrastructure API, so familiarity with VMWare's APIs is required.

Using the OO Web Service Wizard (wswizard.exe) for custom operations requires knowledge of the VI API and VMWare object hierarchy at the XML level and is generally not advised unless the integrator is comfortable reading API documentation and directly modifying XML. The OO Web Service Wizard is located in the \%OO_home%\Studio\tools\ folder.

Custom operations written using IActions require knowledge of the VI API and VMWare object hierarchy as well as familiarity with either Java or a .NET language. For information on creating custom IActions, see the IAction documentation in the *OO SDK Guide* (SDKGuide.pdf).

The third customization option leaves the integrator to use any of the options that VMWare provides for integrations. One popular integration method within the VMWare community is to use PowerShell wrappers to script VMWare's APIs. Currently, users can leverage PowerShell from OO by remotely executing commands through RAS operations.

Security

VMWare ESX and Virtual Center are accessed via SOAP over HTTPS (or HTTP, if enabled on the host) the integration and are subject to the same security principles and rules as any other Web service. Client sessions are established as session tokens separate from the HTTP protocol and can be viewed through the VMWare APIs or, more conveniently, via MOB.

Tools

JRSFlowInvoke.exe

A command-line tool with which flows can be started from outside the OO Central Web application.

Web Service Wizard (wswizard.exe)

A tool that displays a list of the methods in the interface of the Web service that you specify in the Wizard. Within the Wizard, you pick the methods that you want to use, and with one click, for each method you have selected, the Wizard creates an HP OO operation that can execute the method.

These tools are located in the \%OO-home%\Studio\tools\ folder.