HP Operations Orchestration

For Windows and Linux operating systems

Software Version: Content Pack 11

VMware Virtual Infrastructure and vSphere Integration Guide

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Chapter 1

Introduction

This chapter includes:

Purpose of the VMware Virtual Infrastructure and vSphere Integration

This integration enables administrators to build HP Operations Orchestration (OO) flows that are integrated into the VMware Virtual Infrastructure (VI) and vSphere.

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

To learn how to create OO flows, see the Studio Guide to Authoring Operations Orchestration Flows in the documentation set for the current OO release.

Supported Versions

Operations Orchestration Version	VMware Virtual Infrastructure Version	VMware vSphere Version
OO Content Pack 11	3.5	4.0, 4.1, 5.0, 5.0u1, 5.1

Downloading OO Releases and Documents on HP Live Network

HP Live Network provides an Operations Orchestration Community page where you can find and download supported releases of OO and associated documents.

To download OO releases and documents, visit the following site:

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To register for an HP Passport ID:

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   Or

   Click the **New users - please register** link on the HP Passport login page.

2. On the HP Live Network page, click **Operations Orchestration**.

3. On the left-hand side, click **Operations Orchestration Content Packs**.

4. In the **Operations Orchestration Content Packs** box, click **Content**. The HP Passport and sign-in page appears.

5. Enter your user ID and Password to access to continue.

6. Click **HP Operations Orchestration 9.00**.

7. Search for the required HP Operations Orchestration Content Pack.

Chapter 2

Getting Started with the VMware Virtual Infrastructure and vSphere Integration

This chapter includes:

Installing and Configuring the Integration

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

VMware Virtual Infrastructure and vSphere Use Cases

Following are the major use cases for the VMware Virtual Infrastructure and vSphere integration, and the operations and flows that you can use to implement them.

1. Manage cluster operations and flows:

   - Get Hosts in Cluster

   - Get VM Port Groups from Cluster

   - Get VMs in Cluster

   - Move Host Into Cluster

   - Remove Host from Cluster

2. Manage datastores:

   - Copy DS Path

   - Create DS Directory

   - Datastore Enter Maintenance Mode

   - Datastore Exit Maintenance Mode

- Delete DS Path

- Download DS Directory

- Download DS Directory Multi Thread

- Download DS File

- FS Get Children Enhanced

- Generate DS Url

- Get Datastore Mount Details

- Get Datastore Provisioned Space

- Get DS Children

- Is DS Directory

- Move DS Path

- Rename Datastore

- Upload DS Directory

- Upload DS Directory Multi Thread

- Upload DS File

3. Managed Datastore Clusters

- Get Datastore Clusters

- Rename Datastore Cluster

4. Manage guest operating systems and VMware tools:

- Apply Guest Customization Spec to VM

- Export Guest Customization Spec

- Get Guest Info

- Import Guest Customization Spec

- Mount Tools

- Reboot Guest

- Shutdown Guest

- Standby Guest

- Upgrade Tools

- VM Tools Running Status

- VM Tools Version Status

5. Manage host storage:

  - Attach SCSI Lun

  - Create NAS Datastore

  - Create VMFS Datastore

  - Detach SCSI Lun

  - Get Available Luns on Host for VMFS

  - Get Host Lun Details

  - Get Luns on Host

  - Mount VMFS Datastore on Host

  - Remove Datastore from Host

  - Rescan Host HBAs

  - Unmount VMFS Datastore from Host

6. Manage ESX and ESXi hosts:

  - Add Host

  - Disconnect Host

  - Get VM Port Groups from Host

  - Reconnect Host

  - Remove Host

  - Set Maintenance Mode

7. Manage the network:

  - Add Distributed Port Group

  - Add Host to vNetwork Distributed Switch

  - Add Port Group

  - Add Virtual NIC

  - Add Virtual Switch

  - Add vNetwork Distributed Switch

  - Delete Distributed Port Group

- Delete Network Entity

- Delete vNetwork Distributed Switch

- Edit Physical NIC Link

- Edit Virtual NIC

- Remove Host from vNetwork Distributed Switch

8. Manage virtual machine power states:

- Get Power State

- Restart

- Set Power State

9. Resource Pools:

- Create Resource Pool

- Destroy Resource Pool

- Get Child Resource Pools

- Get Child VMs in Resource Pool

- Get Resource Pool Details

- Move Resource Pool Into Resource Pool

- Set Resource Pool Resource Allocation

10. Sample flows:

- Get Freespace On Datastores

- Get List of Powered On VMs

- Get VMs Powered On Longer Than By Event

- Get VMs Powered On Longer Than By Task

- Guided Create VMFS Datastore

- Guided Search

- Host Maintenance With No Downtime

- Quick Migrate

11. Manage virtual machine snapshots:

- Consolidate Snapshot Redo Logs

- Create Snapshot

- Delete Snapshot

- Get Snapshot

- Revert to Snapshot

- Snapshot Consolidation Needed

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- Cancel Task

- Get All Running Tasks

- Get Task State

13. Search and filter elements in the VMware Infrastructure:

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- Destroy Object

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- Get Latest Task

- Get OS Descriptors

- List Custom Fields

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- Get vApp

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- Parse OVF

- Power Off vApp

- Power On vApp

- Shutdown vApp

- Suspend vApp

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- Add Floppy Drive To VM

- Add New Disk To VM

- Add NIC To VM

- Add Optical Drive To VM

- Configure NIC on VM

- Edit Floppy Drive on VM

- Edit Optical Drive on VM

- Edit Video Card

- Edit VM Boot Options

- Edit VM CPUID Masks

- Edit VM Power Options

- Edit VM Settings

- Edit VM Tools Options

- Extend Disk on VM

- Get All Hard Disks for VM

- Get Details of Disk on VM

- Get Details of NIC on VM

- Get Details of SCSI Controller on VM

- Get Device Numbers For Type

- Get VM CPU And Memory Resources

- Get VM CPU Count

- Get VM Memory Size

- Remove Disk From VM

- Remove Floppy Drive From VM

- Remove NIC From VM

- Remove Optical Drive From VM

- Set VM Cores per Socket

- Set VM CPU Count

- Set VM Memory Size

- Set VM Resource Allocation

16. Virtual machine maintenance and administrative operations:

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- Clone Virtual Machine to Template

- Create Linked VM

- Create Virtual Machine

- Create VM Folder

- Delete VM Folder

- Deploy Virtual Machine from Template

- Export VM as OVF

- Get Virtual Machine

- Mark VM As Template

- Migrate Virtual Machine

- Move Virtual Machine

- Promote VM Disk

- Register Virtual Machine

- Register Virtual Machine Template

- Relocate Virtual Machine

- Rename Virtual Machine

- Rename VM Folder

- Unregister Virtual Machine

- VM is Template

VMware Virtual Infrastructure and vSphere — OO Integration Architecture

Location of VMware Virtual Infrastructure Integration Operations and Flows in OO Studio

The VMware Virtual Infrastructure integration includes the following operations and flows in the **OO Studio Library/Integrations/VMware/VMware Virtual Infrastructure and vSphere/** folder.

- VMware Virtual Infrastructure and vSphere
  - Cluster
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    - Get VM Port Groups from Cluster
    - Get VMs in Cluster
    - Move Host Into Cluster
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    - Datastore Exit Maintenance Mode
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    - Download DS Directory Multi Thread
    - Download DS File
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    - Get Datastore Provisioned Space
    - Get DS Children
    - Is DS Directory
    - Move DS Path
    - Rename Datastore
    - Upload DS Directory
    - Upload DS Directory Multi Thread
    - Upload DS File
  - Datastore Cluster
    - Get Datastore Clusters
    - Rename Datastore Cluster
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    - Apply Guest Customization Spec To VM
    - Export Guest Customization Spec
    - Get Guest Info
    - Import Guest Customization Spec
    - Mount Tools
    - Reboot Guest
    - Shutdown Guest
    - Standby Guest
    - Upgrade Tools
    - VM Tools Running Status
    - VM Tools Version Status
  - Host
    - Storage
      - Attach SCSI Lun
      - Create NAS Datastore
      - Create VMFS Datastore
      - Detach SCSI Lun
      - Get Available Luns on Host for VMFS
      - Get Host Lun Details
      - Get Luns on Host
      - Mount VMFS Datastore on Host
      - Remove Datastore from Host
      - Rescan Host HBAs
      - Unmount VMFS Datastore from Host
    - Add Host
    - Disconnect Host
    - Get VM Port Groups from Host
    - Reconnect Host
    - Remove Host
    - Set Maintenance Mode
  - Network
    - Add Distributed Port Group
    - Add Host to vNetwork Distributed Switch
    - Add Port Group
    - Add Virtual NIC
    - Add Virtual Switch
    - Add vNetwork Distributed Switch
    - Delete Distributed Port Group
    - Delete Network Entity
    - Delete vNetwork Distributed Switch
    - Edit Physical NIC Link
    - Edit Virtual NIC
    - Remove Host from vNetwork Distributed Switch
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    - Get Power State
    - Restart
    - Set Power State
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      - Guided Search
      - Host Maintenance With No Downtime
      - Quick Migrate
    - Snapshots
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      - Delete Snapshot
      - Get Snapshot
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      - Destroy Object
      - Get Latest Event
      - Get Latest Task
      - Get OS Descriptors
      - List Custom Fields
      - Simple Search
  - Virtual Apps
    - samples
      - subflows
        - Import OVF to Cluster
        - Import OVF to Host
    - Export vApp as OVF
    - Get vApp
    - Get VMs in vApp
    - Import OVF
    - Parse OVF
    - Power Off vApp
    - Power On vApp
    - Shutdown vApp
    - Suspend vApp
  - Virtual Machines
    - Configuration
      - Add Existing Disk To VM
      - Add Floppy Drive To VM
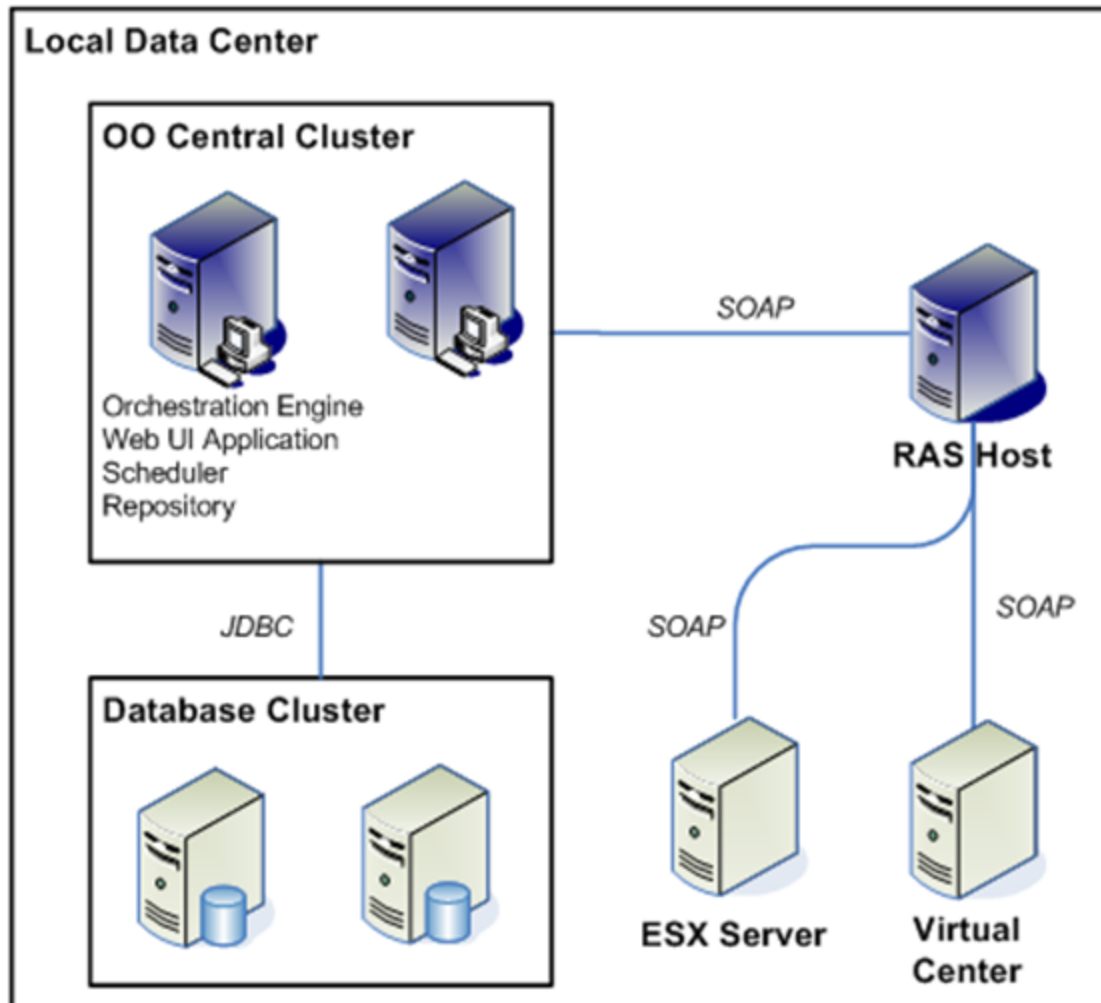   - Add New Disk To VM
      - Add NIC To VM
      - Add Optical Drive To VM
      - Configure NIC on VM
      - Edit Floppy Drive on VM
      - Edit Optical Drive on VM
      - Edit Video Card
      - Edit VM Boot Options
      - Edit VM CPUID Masks
      - Edit VM Power Options
      - Edit VM Settings
      - Edit VM Tools Options
      - Extend Disk on VM
      - Get All Hard Disks for VM
      - Get Details of Disk on VM
      - Get Details of NIC on VM
      - Get Details of SCSI Controller on VM
      - Get Device Numbers For Type
      - Get VM CPU And Memory Resources
      - Get VM CPU Count
      - Get VM Memory Size
      - Remove Disk From VM
      - Remove Floppy Drive From VM
      - Remove NIC From VM
      - Remove Optical Drive From VM
      - Set VM Cores per Socket
      - Set VM CPU Count
      - Set VM Memory Size
      - Set VM Resource Allocation
    - samples
      - Clone Virtual Machine
      - Create Virtual Machine
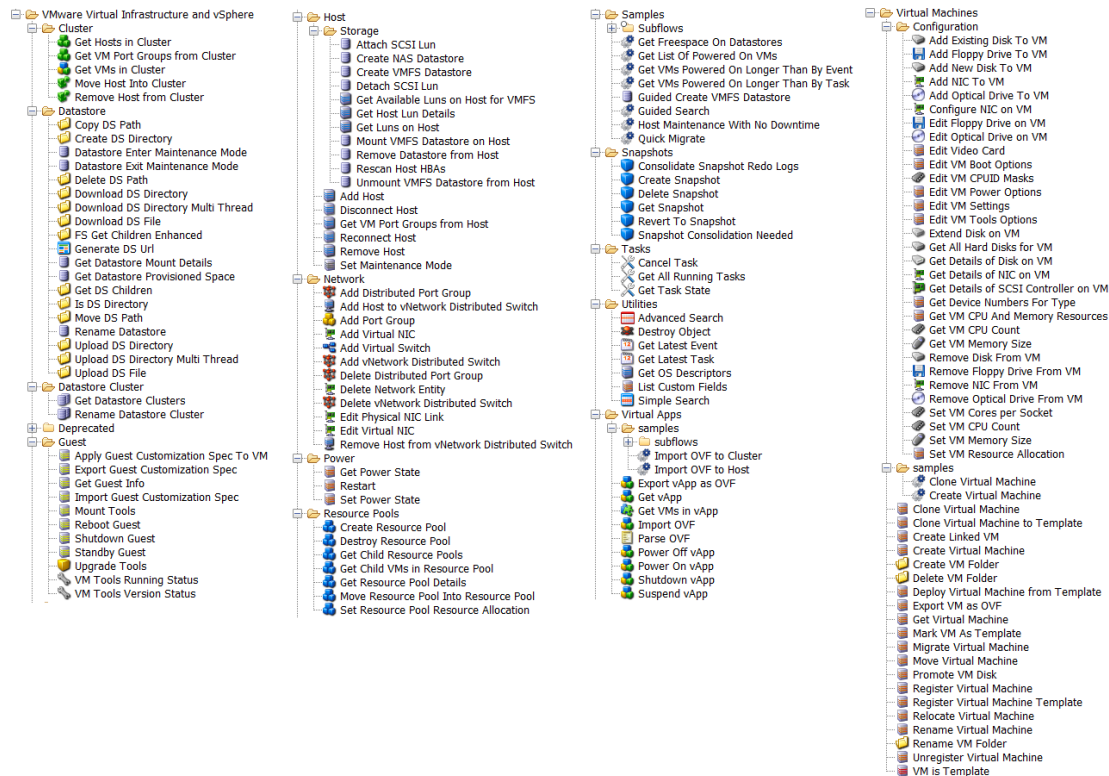   - Clone Virtual Machine
    - Clone Virtual Machine to Template
    - Create Linked VM
    - Create Virtual Machine
    - Create VM Folder
    - Delete VM Folder
    - Deploy Virtual Machine from Template
    - Export VM as OVF
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    - Move Virtual Machine
    - Promote VM Disk
    - Register Virtual Machine
    - Register Virtual Machine Template
    - Relocate Virtual Machine
    - Rename Virtual Machine
    - Rename VM Folder
    - Unregister Virtual Machine
    - VM is Template

Chapter 3

Creating Custom VMware Virtual Infrastructure Integration Operations

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

- The ESXi 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 Web Services Wizard to Create OO Operations for a Web Service

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 **HP OO home folder in the \Studio\tools** folder. For instructions on using the Web Services Wizard, see the Studio Guide to Authoring Operations Orchestration Flows in the documentation set for the current OO release.

Using OO IActions to Create OO Operations

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) in the documentation set for the current OO release.

Using Third-Party Tools to Create OO Operations

The third customization option allows 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.

Chapter 4

Troubleshooting

This chapter includes:

Troubleshooting Overview

This section provides troubleshooting procedures and tools that you can use to solve problems you may encounter while using this integration. It also includes a list of the error messages you may receive while using the integration and offers descriptions and possible fixes for the errors.

General Troubleshooting Procedures and Tools

The best troubleshooting tool available is VMware's MOB, a Web-based application that allows you to browse a Virtual Center or ESXi host system's inventory as seen by the API. MOB also allows 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 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 **vmIdentifierType** input was left blank. VMs are identified by the identifier type (a way of specifying a single virtual machine) and a value for which to search.

- `Unsupported VM reference style`

  The **VM identifierType** 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 for which to search. Check the format of your input as well:

- Inventory paths are / delimited

- IP addresses are either IPv4 or IPv6 addresses (depending upon your ESXi version).

- Host names 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 in MOB as either **vm-number** (in Virtual Center) or just a number (ESXi) listed under its type of **virtualMachine**.

- `Datacenter "…" not found`

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

- `No ConfigTarget found in ComputeResource "…"`

    The host system specified was invalid. Check the name of the host system.

- `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

    Make sure that the host system or specified cluster 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 specified datastore could not be found. Check the format used to specify the datastore. It should not include brackets or any non-word characters.

- `Could not find datastore cluster named "..."`

    The specified datastore cluster could not be found in the datacenter.

- `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 an 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 has not been 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 that it is already in, and you cannot 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 ESXi. Make sure 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 ESXi host. For example, if there is a host system named **hahost123.mydomain.com**, you should specify **hahost123.mydomain.com** rather than just **hahost123**.

- `Could not find computeResource for host: "…"`

  Every ESXi host is assigned a compute resource which allows the creation of resource pools within a host. This error occurs when a specific ESXi 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 specified cluster was not found in the datacenter. Check the cluster name that you specified.

  > **Note:** 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 ESXi 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. Make sure the VC or ESXi 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 either the host system or cluster name exactly. Specify a host system or cluster name in the appropriate input and make sure the other is blank.

- `Could not find resource pool named "…"`

  Although a resource pool was found, the resource pool specified was not found in the 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 because of 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 ESXi / 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 the specified ESXi or VC server. Custom fields are not supported on standalone ESXi 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 ESXi 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 the **Advanced Search** operation 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. Set the **async** input on any potentially long-running operation (such as **clone**, **relocate**, or **migrate**) to **true** and periodically use the **Get Task State** operation to avoid this error.

Chapter 5

VMware Virtual Infrastructure Security

VMware ESXi and Virtual Center are accessed via SOAP over HTTPS (or HTTP, if enabled on the host) in 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.

Chapter 6

OO Tools You Can Use with the VMware Virtual Infrastructure Integration

Following are OO tools that you can use with the [Technology Name] integration:

- **RSFlowInvoke.exe and JRSFlowInvoke.jar**

  RSFlowInvoke (RSFlowInvoke.exe or the Java version, JRSFlowInvoke.jar) is a command-line utility that allows you to start a flow without using Central (although the Central service must be running). RSFlowInvoke is useful when you want to start a flow from an external system, such as a monitoring application that can use a command line to start a flow.

- **Web Services Wizard (wswizard.exe)**

  When you run the Web Services Wizard, you provide it with the WSDL for a given Web service. The WSDL string you provide as a pointer can be a file's location and name or a URL. The Web Services Wizard displays a list of the methods in the API of the Web service that you specify. When you run the wizard, pick the methods 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. This allows you to use the Web Services Wizard to create operations from your monitoring tool's API.

These tools are available in the Operations Orchestration home folder in /Studio/tools/.