

Using the vRealize Orchestrator Plug-In for vCloud Director 10.0

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VMware Cloud Director 10.0

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About Using the vRealize Orchestrator Plug-in for vCloud Director 10.0

The *Using the vRealize Orchestrator Plug-In for vCloud Director* 10.0 guide provides information and instructions about configuring and using the VMware® vRealize Orchestrator plug-in for VMware® vCloud Director 10.0.

You can access the guide in HTML format by using the table of contents on the left side of the page.

The guide is also available in PDF format, which you can access by selecting the PDF download icon while reading a page or viewing a search result.

Intended Audience

This information is intended for anyone who is installing and configuring the plug-in, and using the API of the plug-in. *Using the vRealize Orchestrator Plug-In for vCloud Director* is written for experienced users who are familiar with virtualization technology, with vRealize Orchestrator workflow development, and with vCloud Director.

For more information about vRealize Orchestrator, see <https://docs.vmware.com/en/vRealize-Orchestrator/index.html>.

For more information about vCloud Director, see <https://docs.vmware.com/en/vCloud-Director/index.html>.

Introduction to the vRealize Orchestrator Plug-in for vCloud Director

1

The vRealize Orchestrator Plug-in for vCloud Director allows interaction between vRealize Orchestrator and vCloud Director.

You can use the plug-in to run workflows that automate vCloud Director processes.

The plug-in contains a set of standard workflows. You can also create custom workflows that implement the plug-in API to automate tasks in your vCloud Director environment.

This chapter includes the following topics:

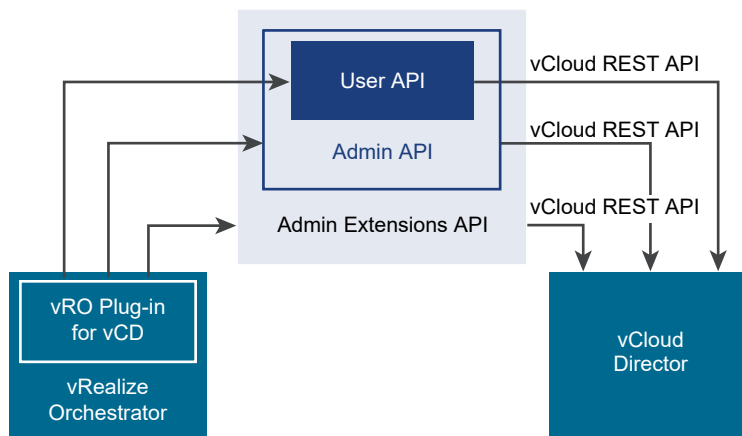
- [vRealize Orchestrator Plug-in for vCloud Director Components](#)
- [Installing and Configuring the vRealize Orchestrator Plug-in for vCloud Director](#)

vRealize Orchestrator Plug-in for vCloud Director Components

The vRealize Orchestrator Plug-in for vCloud Director relies on a number of components to function properly.

vRealize Orchestrator and vCloud Director provide the platform for the plug-in, and the plug-in provides interaction between those products.

Figure 1-1. Component Relations



The vRealize Orchestrator Plug-in for vCloud Director implements the User, Admin, and Admin Extensions API classes that correspond to the types of API classes in vCloud Director.

All users can read User API classes and users with appropriate rights can modify these classes.

Users with administrative rights can modify Admin API and User API classes.

The Admin Extensions API classes are VMware-specific and only system administrators can modify these classes. System administrators can also modify Admin API and User API classes.

The vCloud Java SDK provides the communication platform between the JavaScript API of the plug-in and the vCloud Director REST API.

Role of vRealize Orchestrator with the vRealize Orchestrator Plug-in for vCloud Director

You must use the vRealize Orchestrator configuration interface to install and configure the plug-in. You use the Orchestrator client to run and create workflows and access the plug-in API.

The vRealize Orchestrator Plug-in for vCloud Director is powered by vRealize Orchestrator. vRealize Orchestrator is a development and process-automation platform that provides a library of extensible workflows to manage the VMware vCenter Server infrastructure and other technologies.

vRealize Orchestrator allows integration with management and administration solutions through its open plug-in architecture. vCloud Director is one example of an administration solution that you can integrate with vRealize Orchestrator by using plug-ins.

By configuring your environment for `Multi-site` connection, you can manage and monitor vCloud Director sites and their organizations as single entities. You can use the federation option, when establishing a site connection, to associate two sites and the organizations occupying these sites.

The vRealize Orchestrator Plug-in for vCloud Director provides extensibility and flexibility for user-defined actions, by allowing you to use a REST Client. You can get an XML response and convert it into a vCloud object by calling the REST API provided by the REST Client. This way you can create and customize your own workflows.

List of Modified Actions

The integration of the latest REST API schemas caused modifications to a number of actions. The following table lists the modified actions and the new parameters.

| Modified action | Added parameters |
|----------------------|---|
| createAccessSetting | externalSubjectArg |
| createAdminOrgParams | orgAssociationsArg rightReferencesArg roleReferencesArg roleTemplateReferencesArg vdcTemplatesArg |

| Modified action | Added parameters |
|--------------------------------------|---|
| createAdminServiceLinkParams | externalResourceIdArg |
| createAdminVdcParams | resourcePoolRefsArg universalNetworkPoolReferenceArg vCpuInMhz2Arg vmDiscoveryEnabledArg |
| createAdminVdcStorageProfileParams | iopsAllocatedArg iopsSettingsArg storageUsedMBAArg |
| createCloneVAppParams | sourcedItemArg |
| createComposeVAppParams | createItemArg |
| createCreateVdcParams | resourcePoolRefsArg vmDiscoveryEnabledArg |
| createDiskParams | iopsArg |
| createError | tenantErrorArg |
| createEvent | eventPropertiesArg |
| createGatewayConfiguration | advancedNetworkingEnabledArg distributedRoutingEnabledArg fipsModeEnabledArg syslogServerSettingsArg |
| createGatewayParams | gatewayBackingRefArg |
| createGeneralSettings | advancedNetworkingDfwApiUriArg advancedNetworkingDfwUiUriArg advancedNetworkingEnabledArg advancedNetworkingGatewayApiUriArg advancedNetworkingGatewayUiUriArg allowFipsModeForEdgeGatewaysArg maxVdcQuotaArg" t="number"><![CDATA[TBS]]></param> restApiBaseHttpUriArg restApiBaseUriPublicCertChainArg subInterfacesEnabledArg systemExternalAddressPublicCertChainArg systemExternalHttpAddressArg tenantPortalExternalAddressArg tenantPortalExternalHttpAddressArg tenantPortalPublicCertChainArg vmDiscoveryEnabledArg |
| createImportVmAsVAppParams | importedDiskArg |
| createImportVmIntoExistingVAppParams | importedDiskArg |

| Modified action | Added parameters |
|--|--|
| createInstantiateOvfParams | removeNonStandardOvfExtensionsArg |
| createInstantiateVAppParams | sourcedItemArg |
| createInstantiateVAppTemplateParams | sourcedItemArg |
| createLBPoolMember | conditionArg |
| createNetworkConfiguration | advancedNetworkingEnabledArg distributedInterfaceArg guestVlanAllowedArg subInterfaceArg |
| createNetworkConnection | networkAdapterTypeArg |
| createOperatingSystemInfo | maximumCoresPerSocketArg maximumSocketCountArg recommendedNICArg supportedHardDiskAdapterArg supportedNICTypeArg |
| createOrgAssociation | orgIdArg orgNameArg orgPublicKeyArg siteIdArg siteNameArg |
| createOrgFederationSettings | certificateExpirationArg roleAttributeNameArg samISPEntityIdArg samISPKeyAndCertificateChainArg |
| createOrgGeneralSettings | vdcQuotaArg vmDiscoveryEnabledArg |
| createOrgLeaseSettings | powerOffOnRuntimeLeaseExpirationArg |
| createOrgOperationLimitsSettings | queuedOperationsPerOrgArg queuedOperationsPerUserArg |
| createOrgSettings | orgOAuthSettingsArg |
| createOrgVdcNetworkParams | providerInfoArg vimPortGroupRefArg |
| createProviderVdcStorageProfileParams | iopsAllocatedArg iopsCapacityArg |
| createQueryResultAdminOrgVdcStorageProfileRecord | iopsAllocatedArg iopsLimitArg |
| createQueryResultAdminTaskRecord | progressArg |
| createQueryResultAdminVAppRecord | isAutoNatureArg |

| Modified action | Added parameters |
|--|---|
| createQueryResultAdminVdcRecord | descriptionArg networkPoolUniversalIdArg numberOfDeployedVAppsArg numberOfRunningVMsArg numberOfVMsArg |
| createQueryResultAdminVMRecord | gcStatusArg isAutoNatureArg |
| createQueryResultCatalogRecord | descriptionArg publishSubscriptionTypeArg statusArg versionArg |
| createQueryResultDatastoreRecord | iopsAllocatedArg iopsCapacityArg |
| createQueryResultEdgeGatewayRecord | advancedNetworkingEnabledArg availableNetCountArg distributedRoutingEnabledArg orgVdcNameArg |
| createQueryResultMediaRecord | lastSuccessfulSyncArg versionArg |
| createQueryResultNetworkPoolRecord | universalIdArg |
| createQueryResultOrgVdcNetworkRecord | interfaceTypeArg totalIpCountArg usedIpCountArg |
| createQueryResultOrgVdcRecord | cpuReservedMhzArg descriptionArg memoryReservedMBAArg networkPoolUniversalIdArg numberOfDeployedVAppsArg numberOfRunningVMsArg numberOfVMsArg |
| createQueryResultOrgVdcStorageProfileRecord | iopsAllocatedArg iopsLimitArg |
| createQueryResultProviderVdcStorageProfileRecord | iopsAllocatedArg iopsCapacityArg |
| createQueryResultTaskRecord | progressArg |
| createQueryResultVAppRecord | isAutoNatureArg |
| createQueryResultVAppTemplateRecord | descriptionArg lastSuccessfulSyncArg versionArg |
| createQueryResultVirtualCenterRecord | listenerStateArg |

| Modified action | Added parameters |
|-----------------------------------|--|
| createQueryResultVMRecord | autoDeleteDateArg autoUndeployDateArg gcStatusArg ipAddressArg isAutoDeleteNotifiedArg isAutoNatureArg isAutoUndeployNotifiedArg networkArg networkNameArg ownerArg ownerNameArg vmToolsStatusArg |
| createRecomposeVAppParams | reconfigureItemArg |
| createSession | authorizedLocationsArg rolesArg |
| createShieldManagerParams | controlVmDatastoreNameArg controlVmManagementInterfaceNameArg controlVmResourcePoolNameArg |
| createSmtpServerSettings | smtpSecureModeArg sslTrustStoreArg |
| createSmtpSettings | smtpSecureModeArg sslTrustStoreArg |
| createSourcedCompositionItemParam | localityParamsArg vmCapabilitiesArg vmGeneralParamsArg |
| createSubnetParticipation | useForDefaultRouteArg |
| createSystemSettings | operationLimitsSettingsArg |
| createTaskParams | resultArg |
| createVdcStorageProfileParams | iopsSettingsArg |
| createVersionInfo | deprecatedArg |
| createVmParams | bootOptionsArg mediaArg |
| createVmVimInfo | vmDiskDatastoresArg |
| createVMWExternalNetworkParams | vimPortGroupRefsArg |
| createVMWProviderVdcParams | vxlanNetworkPoolArg |
| createVxlanPoolParams | transportZoneRefArg |

| Modified action | Added parameters |
|------------------------------------|---|
| modifyAdminOrg | orgAssociationsArg rightReferencesArg roleReferencesArg roleTemplateReferencesArg vdcTemplatesArg |
| modifyAdminServiceLink | externalResourceIdArg |
| modifyAdminVdc | resourcePoolRefsArg universalNetworkPoolReferenceArg vCpuInMhz2Arg vmDiscoveryEnabledArg |
| modifyAdminVdcStorageProfile | iopsAllocatedArg iopsSettingsArg storageUsedMBArg |
| modifyDisk | iopsArg |
| modifyGateway | gatewayBackingRefArg |
| modifyOrgVdcNetwork | providerInfoArg vimPortGroupRefArg |
| modifyProviderVdcStorageProfile | iopsAllocatedArg iopsCapacityArg |
| modifyTask | resultArg |
| modifyVApp | autoNatureArg |
| modifyVdc | vCpuInMhz2Arg |
| modifyVdcStorageProfile | iopsAllocatedArg iopsSettingsArg storageUsedMBArg |
| modifyVm | bootOptionsArg mediaArg |
| modifyVMWProviderVdcStorageProfile | iopsAllocatedArg iopsCapacityArg |

Plug-In Interaction with vCloud Director

You use the plug-in to run vRealize Orchestrator workflows that interact with vCloud Director to perform automated tasks in the vCloud infrastructure.

With vCloud Director, you can build secure, multitenant clouds by combining virtual infrastructure resources into virtual data centers. Virtual data centers, or VDCs, are a fully automated, catalog-based service that users access through web-based portals and programmatic interfaces.

Installing and Configuring the vRealize Orchestrator Plug-in for vCloud Director

To automate vCloud Director processes in your environment, you install and configure the vRealize Orchestrator Plug-in for vCloud Director.

vCloud Director Functional Prerequisites

To be able to install and use the vRealize Orchestrator Plug-in for vCloud Director, your system must meet some prerequisites.

vRealize Orchestrator

Verify that you have a running instance of vRealize Orchestrator and its version is compatible with the versions of your vCloud Director and vRealize Orchestrator Plug-in for vCloud Director.

For information about the compatibility between vCloud Director and vRealize Orchestrator, see the .

For information about setting up vRealize Orchestrator, logging in to the vRealize Orchestrator client, and available authentication methods, see the *Installing and Configuring VMware vRealize Orchestrator* documentation.

vCloud Director

Verify that the version of your vRealize Orchestrator Plug-in for vCloud Director is compatible with your vCloud Director version.

For information about the compatibility between vRealize Orchestrator Plug-in for vCloud Director and vCloud Director, see the *vRealize Orchestrator Plug-In for vCloud Director Release Notes*.

For information about setting up vCloud Director, see the .

Install the vRealize Orchestrator Plug-in for vCloud Director

To install the vRealize Orchestrator Plug-in for vCloud Director, you download the .vmoapp installation file, and install the plug-in by using the vRealize Orchestrator Control Center.

Prerequisites

- Verify that you have downloaded the .vmoapp installation file from the **Drivers & Tools** section on the vCloud Director download page.
- Verify that you have installed the vRealize Orchestrator client and you can log in with administrator credentials.
- Verify that you can log in to the vRealize OrchestratorControl Center interface at `http://orchestrator_plugin_IP_or_DNS_name:8283/vco-controlcenter/config/`.

Procedure

- 1 Download the plug-in file to a location accessible from the vRealize Orchestrator appliance.

- 2 In a Web browser, log in to the Control Center at `http://Orchestrator_IP_or_DNS_name:8283/vco-controlcenter`.
The vRealize Orchestrator Control Center home page opens.
- 3 In the Plug-Ins area, click **Manage Plug-Ins**.
- 4 To upload the plug-in installation file, click **Browse**, navigate to the `.vmoapp` installation file, and click **Upload**.
- 5 After the file is successfully uploaded, turn on the **EULA** toggle to accept the End User License Agreement, and click **Install**.

After the configuration change, the vRealize Orchestrator service takes 2 minutes to restart.

- 6 Navigate to **Home > Manage Plug-Ins** and confirm that the vRealize Orchestrator Plug-in for vCloud Director is listed and enabled.
- 7 Verify that vRealize Orchestrator Plug-in for vCloud Director is successfully installed and configured.
 - a Open the vRealize Orchestrator client and log in.
 - b In the **Workflows** tab, enter **vCloud Director** to verify that the vCloud Director workflows are present.

You can now browse through the workflows provided by the vRealize Orchestrator Plug-in for vCloud Director.

Authentication Strategy

When you configure the vRealize Orchestrator Plug-in for vCloud Director, you must select an authentication method for managing users when they log in to your vCloud Director instance.

Basic Authentication

The basic authentication method provides a way to log in with user name and password.

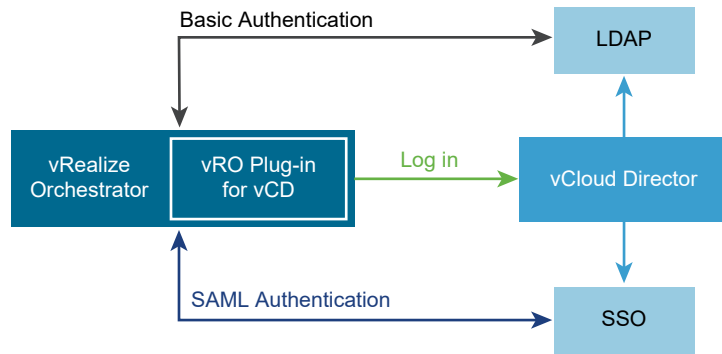
SAML Authentication

The Security Assertion Markup Language (SAML) authentication method provides a token login. This token is shared between all instances used by the user.

If you decide to use Basic Authentication and Session per user methods, ensure that the Orchestrator server is configured for LDAP authentication. The vRealize Orchestrator Plug-in for vCloud Director uses the user name and password of the current user to log in to vCloud Director.

If you decide to use SAML Authentication and Session per user methods, ensure that the Orchestrator server is configured for Single Sign On authentication. The plug-in uses the Single Sign On token provided by the Orchestrator server to log in to vCloud Director.

The following figure shows the Session per user method to connect vRealize Orchestrator, vRealize Orchestrator Plug-in for vCloud Director, LDAP server or Single Sign On Server, and vCloud Director, when using SAML or Basic authentication.

Figure 1-2. Session Per User Method

If you decide to use Basic Authentication and Shared session methods, the Orchestrator server authentication mode is ignored and the plug-in uses a predefined user name and password to log in to vCloud Director.

If you decide to use SAML Authentication and Shared session methods, the Orchestrator server authentication mode is ignored and the plug-in uses the SAML token provided by a callback action to log in to vCloud Director. You must implement the callback action in your Orchestrator client.

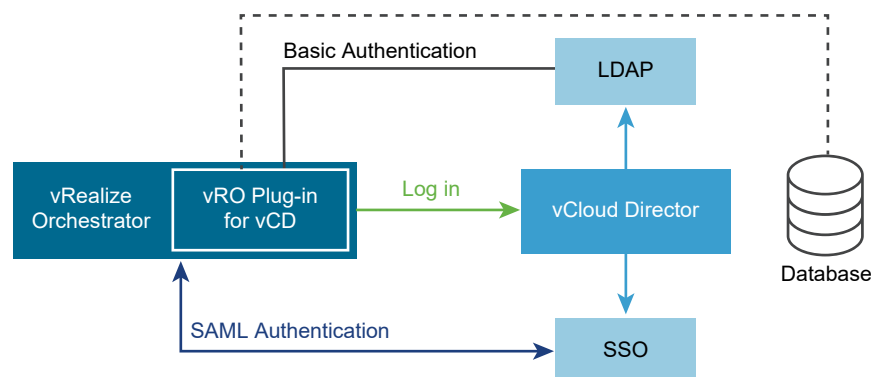
Scripting example of the callback action

```

String acquireSamlToken() {
    var tokenKey = "cd5727e0-b5fd-11e1-afa6-0800200c9a66";
    var properties = new VclSharedProperties();
    var token = properties.getProperty(tokenKey);
    if (token == null) {
        var tokenLifetime = 600000; // 10 min lifetime
        token = // TODO: your logic to acquire the token
        properties.putProperty(tokenKey, token, tokenLifetime);
    }
    return token;
}

```

The following figure shows the Shared session method to connect vRealize Orchestrator Plug-in for vCloud Director, LDAP server or Single Sign On Server, and vCloud Director when using SAML or Basic authentication.

Figure 1-3. Shared Session Method

Configure the vRealize Orchestrator Plug-in for vCloud Director

To manage vCloud Director instances by using the vRealize Orchestrator Plug-in for vCloud Director, you must configure the connection parameters for each instance.

Prerequisites

- Using the **Certificates** tab of the Orchestrator Control Center, import the SSL certificate for the vCloud Director instance that you want to connect.
- Verify that vCloud Director SSL certificate is imported in the VMware vRealize Orchestrator client.
- Verify that the VMware vRealize Orchestrator server, the vCloud Director server and Single Sign On server are synchronized with the NTP server. To synchronize the time, see [Synchronize the Time by Using the vSphere Client](#).

Procedure

- 1 Log in to the vRealize Orchestrator client as an administrator.
- 2 Click the **Workflows** view in left pane of the Orchestrator client.
- 3 In the search box, enter **Add a connection** and press **Enter**.
- 4 Click the **Add a connection** workflow and click **Input Form**.
- 5 In the **Host** text box, type the IP address or the DNS name of the vCloud Director instance.
- 6 In the **Port** text box, type the port number.
The default port is 443.
- 7 Select whether to enable the new connection.
- 8 In the **Max. Connections** text box, type the maximum number of concurrent connections to the vCloud Director instance.
- 9 In the **Connection timeout (ms)** text box, type the timeout interval in milliseconds.
- 10 In the **Cache timeout (s)** text box, type the cache timeout interval in seconds.
- 11 From the drop-down menu, select the API version that your vCloud Director supports.
- 12 If you want the new connection to be federated, select the Federated check box.
By federating a connection, you can manage multiple vCloud Director entities with associated organizations in vRealize Orchestrator Plug-in for vCloud Director.
- 13 Select whether to load the complete entity in the inventory view.
- 14 Click **Save**.
- 15 Click the **Authentication** tab.

- 16 In the Session mode text box, start typing and select the authentication method for managing user access on the vCloud Director instance.

| Option | Description |
|------------------|--|
| Per User Session | Select this option if your vCloud Director is in an Active Directory domain. Make sure that the user has the necessary permissions to perform the required operations. Caution Each user who logs in to Orchestrator creates a session to the vCloud Director instance. Multiple sessions can rapidly strain CPU, memory, and bandwidth. |
| Shared Session | Select this option to allow Orchestrator to create only one connection to the vCloud Director instance. Type the credentials of a user who is a vCloud Director administrator. |

Note If the authentication data comes from LDAP or Single Sign On, make sure the vCloud Director organization is configured with the same LDAP or Single Sign On instance and the user is imported in this organization.

- 17 Select whether to use SAML authentication and provide the needed details.

| Option | Description |
|--------|-------------------------------|
| No | Provides basic authentication |
| Yes | Provides SAML authentication |

- 18 In the **Organization** text box, type the name of the organization that users can access, and click **Submit**.

- Type **System** if you want administrators to be able to run User API, Admin API, and Admin Extensions API operations in all organizations on the vCloud Director instance.
- Type the name of a specific organization if you want to enable administrators to run only User API and Admin API operations in the specified organization.

- 19 Repeat [Step 4](#) through [Step 18](#) for each vCloud Director instance.

Synchronize the Time by Using the vSphere Client

To avoid possible errors, such as imported workflows returning an incorrect error message, or inventory upgrade failure, synchronize the time on the virtual machines on which the vRealize Orchestrator server, vCloud Director server, and Single Sign On server are installed.

Procedure

- 1 Configure all your ESXi hosts to synchronize with the NTP server.
 - a Navigate to **Home Hosts and Clusters** and select an ESXi host.
 - b Select the **Configure** tab.
 - c Under **System**, select **Time Configuration** and click **Edit**.

- d Click the **Use Network Time Protocol (Enable NTP Client)** radio button.
 - e From the **NTP Service Startup Policy** drop-down menu, select **Start and stop with host**.
 - f In the **NTP Servers** text box, enter the IP addresses or host names of the NTP servers that you want to use and click **OK**.
- 2 Synchronize the time on all your virtual machines.
- a Navigate to a virtual machine and right-click it.
 - b Click **Edit Settings** and, in the **VM Options** tab, click the **VMware Tools** drop-down menu.
 - c Select the **Synchronize guest time with host** check box and click **OK**.

Using the vRealize Orchestrator Plug-in for vCloud Director Workflows

2

The vRealize Orchestrator Plug-in for vCloud Director workflow library contains workflows that allow you to manage vCloud Director instances and run custom vCloud Director operations.

This chapter includes the following topics:

- [Using the vRealize Orchestrator Plug-in for vCloud Director Inventory](#)
- [Access the vRealize Orchestrator Plug-in for vCloud Director Workflow Library](#)
- [Standard User Workflows](#)
- [Admin Workflows](#)
- [Admin Extension Workflows](#)

Using the vRealize Orchestrator Plug-in for vCloud Director Inventory

The vRealize Orchestrator Plug-in for vCloud Director exposes all objects in the connected vCloud Director instances in the **Inventory** view.

Disabling the Inventory Update

When you develop a complex workflow, you can disable the automatic update of the list of inventory objects, to avoid performance issues.

The inventory is synchronized on each change in vCloud Director. When you develop complex workflows, the frequent update of elements might cause a huge number of inventory change notifications and performance issues. You can avoid performance issues by preventing redundant inventory updates.

To disable the inventory update, you must call

the `VclProfiler.enableInventoryNotifications(false)` method. The

`VclProfiler.enableInventoryNotifications()` method is reference counted. To allow multiple workflows to disable or enable inventory updates when needed, you should match each call

to `enableInventoryNotifications(false)` with `enableInventoryNotifications(true)`. By default, inventory updates are enabled. Disabling the inventory updates affects all users of the plug-in.

Access the vRealize Orchestrator Plug-in for vCloud Director Workflow Library

You must use the Orchestrator client to access the elements from the vRealize Orchestrator Plug-in for vCloud Director workflow library.

The vRealize Orchestrator Plug-in for vCloud Director workflow library contains building block workflows that allow you to run automated processes related to the management of vCloud Director instances. The workflows are grouped into categories depending on their functional area. You can integrate standard workflows from the workflow library in custom workflows.

Procedure

- 1 Log in to the vRealize Orchestrator client as an administrator.
- 2 Click the **Workflows** view.

| Option | Action |
|--|--|
| Access the set of standard workflow categories | In the filter text box, enter the vcloud_director tags. |
| Access the set of administrative workflow categories | In the filter text box, enter the vcloud_director and the Admin tags. |
| Access the set of administrative extension workflow categories | In the filter text box, enter the vcloud_director , the Admin , and the Extension tags. |

Standard User Workflows

The vCloud Director workflow category contains standard workflows related to vCloud Director management.

Catalog Item Workflows

The Catalog Item workflow category contains workflows related to catalog item management.

You can access these workflows by entering the **vcloud_director** and **catalog_item** tags in the Workflows filter text box.

| Workflow Name | Description |
|-----------------------|---|
| Add a catalog item | Adds an item to a catalog. The new item can be a media file or a vApp template. |
| Delete a catalog item | Deletes a catalog item from a catalog. |
| Update a catalog item | Updates a catalog item. |

Disk Workflows

The Disk workflow category contains workflows related to disk management.

You can access these workflows by entering the **vcloud_director** and **disk** tags in the Workflows filter text box.

| Workflow Name | Description |
|---------------|--------------------------|
| Create a disk | Creates a disk. |
| Delete a disk | Deletes a selected disk. |
| Update a disk | Updates a disk. |

Entities Workflows

The Entities workflow category contains workflows related to the management of vCloud Director entities.

You can access these workflows by entering the **vcloud_director** and **entities** tags in the Workflows filter text box.

Table 2-1. Workflows to List vCloud Director Entities:

| Workflow Name | Description |
|---|---|
| Execute workflow from Listing of Entities | Retrieves the list of entities on a vCloud Director site. |
| Get Entity by href | Gets a vCloud Director entity by its URL. |
| List External networks for a VDC | Lists the external networks that belong to a virtual data center. |
| List Gateways for a VDC | Lists the edge gateways that belong to a virtual data center. |
| List Org Networks for a VDC | Lists the organization networks that belong to a virtual data center. |
| List Sites | Lists the multiple vCloud Director sites. |
| List vApps for a VDC | Lists the vApps in a virtual data center. |
| List VDCs for a Site | Lists the virtual data centers for a specific site. |
| List VMs for a vApp | Lists the virtual machines in a vApp. |

Table 2-2. Integration of Listing with Existing Workflows:

| Workflow Name | Description |
|----------------------------|---|
| Suspend all vApps in a VDC | Suspends selected vApps in a virtual data center. |

Media Workflows

The Media workflow category contains workflows related to media management.

You can access these workflows by entering the **vcloud_director** and **media** tags in the Workflows filter text box.

| Workflow Name | Description |
|---------------|---|
| Clone media | Clones a media file. |
| Delete media | Deletes a media file. |
| Update media | Updates a media file. |
| Upload media | Uploads a media file. The uploaded media can be an ISO file or a floppy file. |

Plug-In Configuration Workflows

The Plug-in Configuration workflow category contains workflows related to vCloud Director connection management.

You can access these workflows by entering the **vcloud_director** and **plug-in configuration** tags in the Workflows filter text box.

| Workflow Name | Description |
|---------------------|--|
| Add a connection | Adds a vCloud Director connection to the plug-in configuration. |
| Delete a connection | Deletes a vCloud Director connection from the plug-in configuration. |
| Update a connection | Updates a vCloud Director connection in the plug-in configuration. |

REST Client Workflows

The REST Client workflows execute on vCloud Director entities and interact with vCloud Director REST APIs and vCloud OpenAPIs.

You can access these workflows by entering the **vcloud_director** and **REST_Client** tags in the Workflows filter text box.

| Workflow Name | Description |
|----------------------------------|---|
| Convert to XML using REST Client | Converts vCloud Object to XML. |
| Execute REST Client | Runs vCloud REST APIs or vCloud OpenAPIs. Note vCloud OpenAPI uses JSON serialization only. To invoke the vCloud OpenAPI, enter application/json in the Content Type text box. |
| Org Associations | Establishes bidirectional association between two organizations. |
| Suspend a vApp with REST Client | Suspends a vApp with vCloud REST APIs. |

Task Workflows

The Task workflow category contains workflows related to task management.

You can access these workflows by entering the **vcloud_director** and **task** tags in the Workflows filter text box.

| Workflow Name | Description |
|-----------------|-----------------------------------|
| Wait for a task | Waits for a task to be completed. |

vApp Workflows

The vApp workflow category contains workflows related to vApp management tasks such as cloning a vApp, adding a vApp network, enabling maintenance mode for it, and so on.

You can access these workflows by entering the **vcloud_director** and **vApp** tags in the Workflows filter text box.

| Workflow Name | Description |
|---|---|
| Add a vApp network | Adds a vApp network |
| Add a vApp template virtual machine | Adds a virtual machine to a vApp from a template. |
| Add a vApp template virtual machine without resetting network section | Adds a virtual machine to a vApp without resetting its network section. |
| Add a vApp virtual machine | Adds a virtual machine to a vApp. |
| Add a vApp with a new virtual machine | Adds a vApp containing a single virtual machine. |
| Capture a vApp | Captures a vApp as a vApp template. |
| Clone a vApp | Clones a vApp. |
| Compose a vApp | Composes a vApp from vApp or virtual machine templates. |
| Delete a vApp | Deletes a vApp. |
| Delete a vApp network | Deletes a vApp network. |
| Download a vApp | Downloads a vApp to a local file system. |
| Enable maintenance mode | Enables or disables the maintenance mode for a vApp. |
| Rename a vApp | Renames a vApp. |
| Share a vApp | Updates the sharing configuration of a vApp. |
| Update a vApp | Updates a vApp. |

vApp Custom Properties Workflows

The Custom Properties workflow category contains workflows related to vApp custom parameter management.

You can access these workflows by entering the **vcloud_director**, **vApp**, and **custom_properties** tags in the Workflows filter text box.

| Workflow Name | Description |
|---------------------------------------|--|
| Add a custom parameter | Adds a custom parameter to the vApp product section. |
| Modify a vApp custom parameter value | Modifies a vApp's custom parameter. |
| Remove a custom parameter from a vApp | Removes a custom parameter from a vApp. |

Network Workflows

The Network workflow category contains workflows related to network configuration management.

You can access these workflows by entering the **vcloud_director**, **vApp**, **Network**, and **Config** tags in the Workflows filter text box.

| Workflow Name | Description |
|---|---|
| Add an organization vDC network to a vApp | Adds an organization vDC network to a vApp. |
| Fence vApp networks | Sets the bridged network configuration to NAT-routed and disables the firewall service. |

You can access the DHCP workflow by entering the **vcloud_director**, **vApp**, **Network**, **Config**, and **DHCP** tags in the Workflows filter text box.

| Workflow Name | Description |
|-----------------------|---|
| Set up a DHCP service | Sets up a DHCP service on a vApp network. |

You can access the Firewall workflows by entering the **vcloud_director**, **vApp**, **network**, **config**, and **firewall** tags in the Workflows filter text box.

| Workflow Name | Description |
|---------------------------|--|
| Add a firewall rule | Adds a firewall rule to the firewall service on a vApp network. |
| Clear firewall rules | Clears all firewall rules of the firewall service on a vApp network. |
| Set up a firewall service | Sets up a firewall service on a vApp network. |

You can access the NAT workflows by entering the **vcloud_director**, **vApp**, **network**, **config**, and **NAT** tags in the Workflows filter text box.

| Workflow Name | Description |
|----------------------|--|
| Add a NAT rule | Adds a NAT rule to the NAT service on a vApp network. |
| Clear NAT rules | Clears all NAT rules of the NAT service on a vApp network. |
| Set up a NAT service | Sets up a NAT service on a vApp network. |

You can access the Routing workflows by entering the **vcloud_director**, **vApp**, **network**, **Config**, and **routing** tags in the Workflows filter text box.

| Workflow Name | Description |
|---------------------------------|---|
| Add a static route | Adds a static route to the static routing service on a vApp network. |
| Clear static routes | Clears all static routes of a static routing service on a vApp network. |
| Set up a static routing service | Sets up a static routing service on a vApp network. |

vApp Power Workflows

The Power workflow category contains workflows related to vApp power management.

You can access these workflows by entering the **vcloud_director**, **vApp**, and **power** tags in the Workflows filter text box.

| Workflow Name | Description |
|--------------------------------|---|
| Deploy a vApp | Deploys a vApp and optionally powers it on. |
| Discard a suspended state vApp | Discards the state of a suspended vApp. |
| Power off a vApp | Powers off a vApp. Does not free the resources reserved for the vApp. |
| Power on a vApp | Powers on a vApp. |
| Reboot a vApp | Sends a notification to the vApp's guest virtual machines to reboot. |
| Reset a vApp | Resets a vApp. |
| Shut down a vApp | Sends a notification to the vApp's guest virtual machines to shut down. |
| Suspend a vApp | Suspends a vApp. Does not free the resources reserved for the vApp. |
| Undeploy a vApp | Stops or suspends a vApp and frees the resources reserved for the vApp. |

vApp Snapshot Workflows

The Snapshot workflow category contains workflows related to vApp snapshot management.

You can access these workflows by entering the **vcloud_director**, **vApp**, and **snapshot** tags in the Workflows filter text box.

| Workflow Name | Description |
|----------------------------|---------------------------------------|
| Create a snapshot | Creates a vApp snapshot. |
| Remove all snapshots | Removes all vApp snapshots. |
| Revert to current snapshot | Reverts to the current vApp snapshot. |

Storage Profile Workflows

The Storage Profile workflow category contains workflows related to storage profile management.

You can access these workflows by entering the **vcloud_director**, **vApp**, and **storage_Profile** tags in the Workflows filter text box.

| Workflow Name | Description |
|-------------------------------------|--|
| Deploy vApp and set storage profile | Deploys a vApp and sets its storage profile. |
| Deploy VM and set storage profile | Deploys a virtual machine and sets its storage profile. |
| Update all vApp VM storage profiles | Updates the storage profile of all virtual machines in a vApp. |
| Update disk storage profile | Updates the storage profile of a virtual machine disk. |
| Update VM storage profile | Updates the storage profile of a virtual machine. |

VM Workflows

The VM workflow category contains workflows related to virtual machine management.

You can access these workflows by entering the **vCloud_Director**, **vApp**, and **VM** tags in the Workflows filter text box.

| Workflow Name | Description |
|--------------------------------|--|
| Delete a virtual machine | Deletes a virtual machine. |
| Eject media | Ejects media from a virtual machine. |
| Insert media | Inserts media into a virtual machine. |
| Rename a virtual machine | Renames a virtual machine. |
| Wire a virtual machine network | Connects a virtual machine's NIC with a vApp network and assigns IP properties to the NIC. |

VM CPU Workflows

The CPU workflow category contains workflows related to virtual machine CPU management.

You can access the workflow by entering the **vCloud_Director**, **vApp**, **VM**, and **CPU** tags in the Workflows filter text box.

| Workflow Name | Description |
|---------------------------|--|
| Change the number of CPUs | Changes the number of CPUs of a virtual machine. |

VM Custom Properties Workflows

The Custom Properties workflow category contains workflows related to virtual machine custom parameter management.

You can access these workflows by entering the **vcloud_director**, **vApp**, **VM**, and **custom_properties** tags in the Workflows filter text box.

| Workflow Name | Description |
|---|--|
| Add a custom parameter to a virtual machine | Adds a custom parameter to a vApp product section. |
| Modify the custom parameter value for a virtual machine | Modifies a virtual machine's custom parameter. |
| Remove a custom parameter from a virtual machine | Removes a custom parameter from a virtual machine. |

VM Guest Customization Workflows

The Guest Customization workflow category contains workflows related to virtual machine guest customization.

You can access these workflows by entering the **vcloud_director**, **vApp**, **VM**, and **guest_customization** tags in the Workflows filter text box.

| Workflow Name | Description |
|----------------------|---|
| Change computer name | Changes the computer name of a virtual machine. |
| Customize guest OS | Customizes the computer name and SID. |

| Workflow Name | Description |
|---------------------------|--|
| Force Guest Customization | Forces customization of guest OS of a virtual machine. |
| Reload from VC | Reloads a virtual machine from the vCenter Server. |

VM Hard Disk Workflows

The Hard Disk workflow category contains workflows related to virtual machine hard disk management.

You can access these workflows by entering the **vcloud_director**, **vApp**, **VM**, and **hard_disk** tags in the Workflows filter text box.

| Workflow Name | Description |
|---------------------------|---|
| Add a hard disk | Adds a hard disk to a virtual machine. |
| Attach a hard disk | Attaches a hard disk to a virtual machine. |
| Change hard disk capacity | Changes a virtual machine's hard disk capacity. |
| Detach a hard disk | Detaches a hard disk from a virtual machine. |
| Remove a hard disk | Removes a hard disk from a virtual machine. |

VM Memory Workflows

The Memory workflow category contains workflows related to virtual machine memory management.

You can access the workflow by entering the **vcloud_director**, **vApp**, **VM**, and **memory** tags in the Workflows filter text box.

| Workflow Name | Description |
|------------------------|---|
| Change memory capacity | Changes the memory capacity of a virtual machine. |

VM Metric Workflows

The Metric workflow category contains workflows related to virtual machine metrics retrieval.

You can access these workflows by entering the **vcloud_director**, **vApp**, **VM**, and **metric** tags in the Workflows filter text box.

| Workflow Name | Description |
|--|---|
| Retrieve CurrentUsage of a vApp VM | Retrieves the current usage metrics of a virtual machine in a vApp. |
| Retrieve CurrentUsage of vApp VM using Spec | Retrieves the current usage metrics of a virtual machine in a vApp using specification. |
| Retrieve HistoricUsage of vApp VM | Retrieves the past usage metrics of a virtual machine in a vApp. |
| Retrieve HistoricUsage of vApp VM using Spec | Retrieves the past usage metrics of a virtual machine in a vApp using specification. |

VM NIC Workflows

The NIC workflow category contains workflows related to virtual machine NIC management.

You can access these workflows by entering the **vcloud_director**, **vApp**, **VM**, and **NIC** tags in the Workflows filter text box.

| Workflow Name | Description |
|---|--|
| Add a NIC | Add a NIC to a virtual machine. |
| Remove a NIC | Removes a NIC from a virtual machine. |
| Update virtual machine MAC address | Changes the MAC address of a virtual machine. |
| Update virtual machine MAC and IP addresses | Changes the NICs MAC addresses and updates the IP for network cards with a pool allocation mode. |

VM Power Workflows

The Power workflow category contains workflows related to virtual machine power management.

You can access these workflows by entering the **vcloud_director**, **vApp**, **VM**, and **power** tags in the Workflows filter text box.

| Workflow Name | Description |
|---|---|
| Deploy a virtual machine | Deploys a virtual machine and optionally powers it on. |
| Discard a suspended state virtual machine | Discards the state of a suspended virtual machine. |
| Power off a virtual machine | Powers off a virtual machine. Does not free the resources reserved for the virtual machine. |
| Power on a virtual machine | Powers on a virtual machine. |
| Reboot a virtual machine | Sends a notification to the virtual machine guest operating system to reboot. |
| Reset a virtual machine | Resets a virtual machine. |
| Shut down a virtual machine | Sends a notification to the virtual machine guest operating system to shut down. |
| Suspend a virtual machine | Suspends a virtual machine. Does not free the resources reserved for the virtual machine. |
| Undeploy a virtual machine | Stops or suspends a virtual machine and frees the resources reserved for the virtual machine. |

VM Screen Workflows

The Screen workflow category contains workflows related to virtual machine screen management.

You can access these workflows by entering the **vcloud_director**, **vApp**, **VM**, and **screen** tags in the Workflows filter text box.

| Workflow Name | Description |
|------------------|--|
| Acquire a ticket | Acquires a ticket for the remote console of a virtual machine. |
| Get a thumbnail | Gets a screenshot of a virtual machine's desktop. |

VM Snapshot Workflows

The Snapshot workflow category contains workflows related to virtual machine snapshot management.

You can access these workflows by entering the **vcloud_director**, **vApp**, **VM**, and **snapshot** tags in the Workflows filter text box.

| Workflow Name | Description |
|----------------------------|--|
| Create a snapshot | Creates a virtual machine snapshot. |
| Remove all snapshots | Removes all virtual machine snapshots. |
| Revert to current snapshot | Reverts to the current virtual machine snapshot. |

vApp Template Workflows

The vApp Template workflow category contains workflows related to vApp template management.

You can access these workflows by entering the **vcloud_director**, and **vApp_template** tags in the Workflows filter text box.

| Workflow Name | Description |
|-----------------------------------|---|
| Clone a vApp template | Clones a vApp template. |
| Delete a vApp template | Deletes a vApp template. |
| Download a vApp template | Downloads a vApp template as an OVF. |
| Instantiate a vApp template | Instantiates a vApp template as a vApp. |
| Update a vApp template | Updates a vApp template. |
| Upload a vApp template | Uploads an OVF as a vApp template. |
| Upload a vApp Template to Catalog | Uploads an OVF as a vApp template to a catalog. |

VM Workflows

The VM workflow category contains workflows related to management of virtual machines in a vApp template.

You can access these workflows by entering the **vcloud_director**, **vApp_template**, and **VM** tags in the Workflows filter text box.

| Workflow Name | Description |
|--|---|
| Retrieve VirtualHardware Section and RASD item elements for vApp Template VM | Retrieves the Virtual Hardware Section and RASD item elements for a vApp Template VM. |

vDC Workflows

The vDC workflow category contains workflows related to vDC management.

You can access these workflows by entering the **vcloud_director**, and **vDC** tags in the Workflows filter text box.

| Workflow Name | Description |
|---------------|--------------------------------|
| Delete a vDC | Deletes a virtual data center. |
| Update a vDC | Updates a virtual data center. |

Admin Workflows

The Admin workflow category contains workflows related to vCloud Director administrative management.

Catalog Workflows

The Catalog workflow category contains workflows related to catalog management.

You can access these workflows by entering the **vcloud_director**, **admin**, and **catalog** tags in the Workflows filter text box.

| Workflow Name | Description |
|-------------------|---|
| Add a catalog | Adds a catalog to an organization. |
| Delete a catalog | Deletes a catalog. |
| Publish a catalog | Publishes or unpublishes a catalog to all organizations external to the catalog's organization. |
| Share a catalog | Updates the sharing configuration of a catalog. |
| Update a catalog | Updates a catalog. |

Group Workflows

The Group workflow category contains workflows related to group management.

You can access these workflows by entering the **vcloud_director**, **admin**, and **group** tags in the Workflows filter text box.

| Workflow Name | Description |
|----------------|---|
| Delete a group | Deletes a group. |
| Import a group | Imports a group from the configured directory service to an organization. |
| Update a group | Updates a group. |

Organization Workflows

The Organization workflow category contains workflows related to organization management.

You can access these workflows by entering the **vcloud_director**, **admin**, and **organization** tags in the Workflows filter text box.

| Workflow Name | Description |
|------------------------|---|
| Add an organization | Adds an organization to a vCloud Director instance. |
| Delete an organization | Deletes an organization. |

| Workflow Name | Description |
|------------------------|--------------------------|
| Enable an organization | Enables an organization. |
| Update an organization | Updates an organization. |

Certificate Workflows

The Certificate workflow category contains workflows related to certificate management.

You can access these workflows by entering the **vcloud_director**, **admin**, **organization**, and **certificate** tags in the Workflows filter text box.

| Workflow Name | Description |
|-----------------------------------|---------------------------------------|
| Regenerate Federation Certificate | Regenerates a federation certificate. |

Role Workflows

The Role workflow category contains workflows related to role management.

You can access these workflows by entering the **vcloud_director**, **admin**, and **role** tags in the Workflow filter text box.

| Workflow Name | Description |
|---------------|--|
| Add a role | Adds a role to a vCloud Director instance. |
| Delete a role | Deletes a role. |
| Update a role | Updates a role. |

User Workflows

The User workflow category contains workflows related to user management.

You can access these workflows by entering the **vcloud_director**, **admin**, and **user** tags in the Workflows filter text box.

| Workflow Name | Description |
|----------------|---|
| Add a user | Adds a user to an organization or imports it from LDAP. |
| Delete a user | Deletes a user. |
| Enable a user | Enables or disables a user. |
| Take Ownership | Takes ownership of a user. |
| Update a user | Updates a user. |

vDC Workflows

The vDC workflow category contains workflows related to virtual data center (VDC) management.

You can access these workflows by entering the **vcloud_director**, **admin**, and **VDC** tags in the Workflows filter text box.

| Workflow Name | Description |
|--------------------------------------|--|
| Add a vDC | Adds a vDC to an organization. |
| Add a VM Affinity rule | Adds a VM affinity rule. |
| Delete a vDC | Deletes a vDC. |
| Delete a VM Affinity rule | Deletes a VM affinity rule. |
| Enable a vDC | Enables a vDC. |
| Retrieve a list of VM Affinity rules | Retrieves a list of VM affinity rules. |
| Retrieve a VM Affinity rule | Retrieves a VM affinity rule. |
| Update a vDC | Updates a vDC. |
| Update a VM Affinity rule | Updates a VM affinity rule. |

vDC Gateway Workflows

The Gateway workflow category contains workflows related to vDC edge gateway management.

You can access these workflows by entering the **vcloud_director**, **admin**, **VDC**, and **gateway** tags in the Workflows filter text box.

| Workflow Name | Description |
|-----------------------------|---|
| Add a gateway | Adds a gateway to a virtual data center. |
| Convert to Advanced Gateway | Converts a legacy gateway to an advanced gateway. |
| Delete a gateway | Deletes a gateway from a virtual data center. |
| Enable Gateway SSH status | Enables gateway SSH status. |
| Modify from Factor | Modifies a gateway configuration. |
| Reapply services | Reapplies services to a gateway. |
| Redeploy a gateway | Redeploys a gateway in a virtual data center. |
| Set SSH settings | Sets SSH settings of a gateway. |
| Update a gateway | Updates a gateway within a virtual data center. |

Network Configuration Workflows

The Configuration workflow category contains workflows related to network configuration.

You can access these workflows by entering the **vcloud_director**, **admin**, **VDC**, **gateway**, and **config** tags in the Workflows filter text box.

| Workflow Name | Description |
|-------------------------|------------------------------------|
| Add a gateway interface | Adds a new interface to a gateway. |

You can access the Network CA Certificates workflows by entering the **vcloud_director**, **admin**, **VDC**, **gateway**, **config**, **certificates**, and **CA** tags in the Workflows filter text box.

| Workflow Name | Description |
|-------------------------|---|
| Create a CA Certificate | Creates a CA certificate for a gateway. |
| Delete a CA Certificate | Deletes a CA certificate for a gateway. |

You can access the Network CRL Certificates workflows by entering the **vcloud_director**, **admin**, **VDC**, **gateway**, **config**, **certificates**, and **CRL** tags in the Workflows filter text box.

| Workflow Name | Description |
|--------------------------|--|
| Create a CRL Certificate | Creates a CRL certificate for a gateway. |
| Delete a CRL Certificate | Deletes a CRL certificate for a gateway. |

You can access the Network CSR Certificates workflows by entering the **vcloud_director**, **admin**, **VDC**, **gateway**, **config**, **certificates**, and **CSR** tags in the Workflows filter text box.

| Workflow Name | Description |
|--------------------------------------|--|
| Create a CSR Certificate | Creates a CSR certificate for a gateway. |
| Create a Signed Certificate | Creates a signed certificate for a gateway. |
| Delete a CSR Certificate | Delete a CSR certificate for a gateway. |
| Delete a Self Signed CSR Certificate | Deletes a self-signed CSR certificate for a gateway. |
| Self Sign a CSR Certificate | Creates a self-signed CSR certificate for a gateway. |

You can access the Network Service Certificates workflows by entering the **vcloud_director**, **admin**, **VDC**, **gateway**, **config**, **certificates**, and **service** tags in the Workflows filter text box.

| Workflow Name | Description |
|------------------------------|--|
| Create a Service Certificate | Creates a service certificate for a gateway. |
| Delete a Service Certificate | Deletes a service certificate for a gateway. |

You can access the DHCP workflows by entering the **vcloud_director**, **admin**, **VDC**, **gateway**, **config**, and **DHCP** tags in the Workflows filter text box.

| Workflow Name | Description |
|---------------------------------|--|
| Enable a DHCP service | Enables or disables the DHCP service on a gateway. |
| Set up a DHCP service | Sets up a DHCP service on a gateway. |
| Update DHCP Relay Configuration | Updates DHCP Relay Configuration for a gateway. |

You can access the DHCP bindings workflows by entering the **vcloud_director**, **admin**, **VDC**, **gateway**, **config**, **DHCP**, and **bindings** tags in the Workflows filter text box.

| Workflow Name | Description |
|-----------------------|---------------------------------------|
| Add a DHCP binding | Adds a DHCP binding for a gateway. |
| Delete a DHCP binding | Deletes a DHCP binding for a gateway. |
| Edit a DHCP binding | Edits a DHCP binding for a gateway. |

You can access the DHCP pools workflows by entering the **vcloud_director**, **admin**, **VDC**, **Gateway**, **config**, **DHCP**, and **pools** tags in the Workflows filter text box.

| Workflow Name | Description |
|--------------------|------------------------------------|
| Add a DHCP pool | Adds a DHCP pool for a gateway. |
| Delete a DHCP pool | Deletes a DHCP pool for a gateway. |
| Edit a DHCP pool | Edits a DHCP pool for a gateway. |

You can access the Firewall workflows by entering the **vcloud_director**, **admin**, **VDC**, **gateway**, **config**, and **firewall** tags in the Workflows filter text box.

| Workflow Name | Description |
|-----------------------------------|---|
| Add a firewall rule | Adds a firewall rule to the firewall service on a gateway. |
| Clear firewall rules | Clears all firewall rules of the firewall service on a gateway. |
| Delete a firewall rule | Deletes a firewall rule. |
| Edit a firewall rule | Edits a firewall rule. |
| Enable or disable a firewall rule | Enables or disables a firewall rule. |
| Set up a firewall service | Sets up a firewall service on a gateway. |

You can access the NAT workflows by entering the **vcloud_director**, **admin**, **VDC**, **gateway**, **config**, and **NAT** tags in the Workflows filter text box.

| Workflow Name | Description |
|------------------------------------|---|
| Add a NAT rule | Adds a NAT rule to the NAT service on a gateway. |
| Add a NAT rule [9.1] | Adds a NAT rule to a legacy/advanced gateway. |
| Clear NAT rules | Clears all NAT rules of the NAT service on a gateway. |
| Delete a NAT rule [9.1] | Deletes a NAT rule for a legacy/advanced gateway. |
| Edit a NAT rule [9.1] | Edits a NAT rule for a legacy/advanced gateway. |
| Enable a NAT service | Enables or disables a NAT service on a gateway. |
| Enable or Disable NAT rule | Enables or disables a NAT rule. |
| Enable or Disable NAT rule logging | Enables or disables NAT rule logging. |
| Set up a NAT service | Sets up a NAT service on a gateway. |

You can access the Routing workflows by entering the **vcloud_director**, **admin**, **VDC**, **gateway**, **config**, and **routing** tags in the Workflows filter text box.

| Workflow Name | Description |
|---------------------------------|--|
| Add a static route | Adds a static route to the static routing service on a gateway. |
| Clear static routes | Clears all static routes of a static routing service on a gateway. |
| Enable a static routing service | Enables or disables the routing service on a gateway. |
| Set up a static routing service | Sets up a static routing service on a gateway. |

You can access the VPN workflows by entering the **vcloud_director**, **admin**, **VDC**, **gateway**, **config**, and **VPN** tags in the Workflows filter text box.

| Workflow Name | Description |
|----------------------|---|
| Add a VPN endpoint | Adds a VPN endpoint to the VPN service on a gateway. |
| Add a VPN tunnel | Adds a VPN tunnel to the VPN service on a gateway. |
| Clear VPN tunnels | Clears all VPN tunnels of the VPN service on a gateway. |
| Set up a VPN service | Sets up a VPN service on a gateway. |

vDC Syslog Server Workflows

The vDC Syslog Server workflow category contains workflows related to vDC syslog server management.

You can access these workflows by entering the **vcloud_director**, **admin**, **VDC**, and **syslog_server** tags in the Workflows filter text box.

| Workflow Name | Description |
|--------------------------|---|
| Set Tenant Syslog Server | Sets the tenant syslog server for a gateway. |
| Sync Syslog Server | Synchronizes the syslog server for a gateway. |

vDC Network Workflows

The VDC Network workflow category contains workflows related to organization network management.

You can access these workflows by entering the **vcloud_director**, **Admin**, **VDC**, and **network** tags in the Workflows filter text box.

| Workflow Name | Description |
|------------------------------------|--|
| Add an organization vDC network | Adds an organization vDC network to a virtual data center. |
| Delete an organization vDC network | Deletes a network within a virtual data center. |
| Update an organization vDC network | Updates a network within a virtual data center. |

vDC Storage Profile Workflows

The Storage profile workflow category contains workflows related to storage profile management.

You can access these workflows by entering the **vcloud_director**, **admin**, **VDC**, and **storage_profile** tags in the Workflows filter text box.

| Workflow Name | Description |
|--------------------------|---|
| Add a storage profile | Adds a storage profile to a virtual data center. |
| Delete a storage profile | Deletes a storage profile from a virtual data center. |
| Update a storage profile | Updates a storage profile within a virtual data center. |

Admin Extension Workflows

The Extension workflow category contains workflows related to vCloud Director administrative extensions management.

Global Catalog Settings Workflows

The Global Catalog Settings workflow category contains workflows related to global catalog settings management.

You can access these workflows by entering the **vcloud_director**, **admin**, **extension**, and **global_catalog_settings** tags in the Workflows filter text box.

| Workflow Name | Description |
|-------------------------------|--|
| Synchronization Configuration | Enables synchronization of catalogs with external sources. |

Notification Workflows

The Notifications workflow category contains workflows related to notification management.

You can access these workflows by entering the **vcloud_director**, **admin**, **extension**, and **notifications** tags in the Workflows filter text box.

| Workflow Name | Description |
|--------------------------|---|
| Configure blocking tasks | Configures the blocking tasks settings of a vCloud Director instance. |
| Enable notifications | Enables or disables notifications from a vCloud Director instance. |
| Set up an AMQP broker | Configures the AMQP broker settings for a given vCloud Director instance. |

VIM Server Workflows

The VIM Server workflow category contains workflows related to vCenter Server management.

You can access these workflows by entering the **vcloud_director**, **admin**, **extension**, and **VIM_Server** tags in the Workflows filter text box.

| Workflow Name | Description |
|---|--|
| Import a virtual machine as a vApp | Imports a virtual machine from an available vCenter Server as a vApp. |
| Import a virtual machine as a vApp template | Imports a virtual machine from an available vCenter Server as a vApp template. |
| Import a virtual machine into a vApp | Imports a virtual machine from an available vCenter Server instance into an existing vApp. |
| Reconnect to a vCenter Server instance | Tries to force a reconnection to a vCenter Server instance from its vCloud Director host. |
| Register a vCenter Server instance | Registers a vCenter Server instance to a vCloud Director instance. |
| Unregister a vCenter Server instance | Unregisters a vCenter Server instance. |
| Update a vCenter Server instance | Updates a vCenter Server instance. |

VMW Datastore Workflows

The VMW Datastore workflow category contains workflows related to datastore management.

You can access these workflows by entering the **vcloud_director**, **admin**, **extension**, and **VMW_datastore** tags in the Workflows filter text box.

| Workflow Name | Description |
|--------------------|----------------------------------|
| Enable a datastore | Enables or disables a datastore. |

VMW Network Pool Workflows

The VMW Network Pool workflow category contains workflows related to network pool management.

You can access these workflows by entering the **vcloud_director**, **admin**, **extension**, **VMW_network_pool** tags in the Workflows filter text box.

| Workflow Name | Description |
|-----------------------|--|
| Add a network pool | Adds a network pool to a vCloud Director instance. |
| Delete a network pool | Deletes a network pool. |
| Update a network pool | Updates a network pool. |

VMW Provider Network Workflows

The VMW Provider Network workflow category contains workflows related to provider network management.

You can access these workflows by entering the **vcloud_director**, **admin**, **extension**, and **VMW_provider_network** tags in the Workflows filter text box.

| Workflow Name | Description |
|----------------------------|---|
| Add an external network | Adds an external network to a vCloud Director instance. |
| Add an IP scope | Adds an IP scope to an external network. |
| Delete an external network | Deletes an external network. |
| Update an external network | Updates an external network. |

VMW Provider vDC Workflows

The VMW Provider vDC workflow category contains workflows related to provider vDC management.

You can access these workflows by entering the **vcloud_director**, **admin**, **extension**, and **VMW_provider_vdc** tags in the Workflows filter text box.

| Workflow Name | Description |
|---|---|
| Add a provider vDC | Adds a provider vDC to a vCloud Director instance. |
| Add a resource pool to a provider vDC | Adds a resource pool to a provider vDC. |
| Delete a provider vDC | Deletes a provider vDC. |
| Enable a provider vDC | Enables or disables a provider vDC. |
| Enable a resource pool | Enables or disables a resource pool visible for a provider vDC. |
| Remove a resource pool from an ESX provider vDC | Removes a resource pool from a provider vDC. |
| Update a provider vDC | Updates a provider vDC. |

VMW VdcTemplate Workflows

The VMW Vdc Template workflow category contains workflows related to VMW Vdc Template management.

You can access these workflows by entering the **vcloud_director**, **extension**, and **VMW_vDCTemplate** tags in the Workflows filter text box.

| Workflow Name | Description |
|----------------------|------------------------|
| Delete a VdcTemplate | Deletes a VdcTemplate. |
| Update a VdcTemplate | Updates a VdcTemplate. |

vRealize Orchestrator Plug-in for vCloud Director Scripting API

3

The vRealize Orchestrator Plug-in for vCloud Director scripting API contains classes, with their respective attributes and methods, that allow interaction between vRealize Orchestrator and vCloud Director. The scripting API maps the classes of the vCloud API to Orchestrator JavaScript classes that you can use to develop custom Orchestrator workflows that interact with vCloud Director.

This chapter includes the following topics:

- [API Categories](#)
- [Access the vRealize Orchestrator Plug-in for vCloud Director API](#)
- [Using Generic Queries](#)
- [Using Non-Generic Queries](#)
- [Decorator Objects](#)
- [Scripting Examples](#)

API Categories

The main categories of vCloud Director API classes are User API, Admin API, and Admin Extensions API. With the User API, you can perform basic tasks. The Admin API adds administrative capabilities. With the Admin Extensions API, you can manage components of the VMware virtual infrastructure.

The vRealize Orchestrator Plug-in for vCloud Director supports vCloud API versions 29.0, 30.0, 31.0, 32.0, and 33.0. For more information, see *vCloud API Programming Guide for Service Providers*.

User API

User API classes are typically readable by all users, and can be modified by users with appropriate rights.

With the User API, you can examine organizations and virtual data centers (vDCs). You can create vApps in the organizations and in vDCs, and manage the created vApps. You can control vApp networks and create vApp templates and media files, such as ISO and floppy images. You can store vApp templates and media files in catalogs for easy access and sharing between organizations and vDCs.

Admin API

Admin API classes are typically readable by all users. However, only a system administrator, an organization administrator, or another user with administrative rights can create and modify them.

With the Admin API, you can administrate and create organizations, vDCs, organization networks, and authorization entities, such as roles, rights, users, and groups. You can create, delete, and modify a catalog of templates and media files.

Admin Extensions API

Admin Extensions API classes can be created and modified only by a system administrator.

The Admin Extensions API is specific to VMware. With the Admin Extensions API, you can manage entities such as provider vDCs, network pools, and vCenter Server instances.

Access the vRealize Orchestrator Plug-in for vCloud Director API

Orchestrator provides an API Explorer to allow you to search the vRealize Orchestrator Plug-in for vCloud Director API and see the documentation for JavaScript objects that you can use in scripted elements.

Procedure

- 1 Log in to the Orchestrator client and click **API Explorer**.
- 2 To expand the hierarchical list of vCloud Director plug-in API objects, double-click the **vCloud** module in the left pane.

What to do next

You can copy code from API elements and paste it into scripting boxes. For more information about API scripting, see *Developing with VMware vRealize Orchestrator*.

Using Generic Queries

When you use generic queries, such as `QueryService.queryRecords` and `QueryService.queryIdRecords`, you must use specific query types and field types to get the appropriate result record types.

The following table lists the expected query types, field types, and record result types when working with generic queries.

| VclQueryRecordType Value and Query Fields Enumeration Type | Query Result Record Type |
|---|---|
| ADMINALLOCATEDEXTERNALADDRESS VclQueryAdminAllocatedExternalAddressField | VclQueryResultAdminAllocatedExternalAddressRecord |
| ADMINCATALOG VclQueryAdminCatalogField | VclQueryResultAdminCatalogRecord |
| ADMINCATALOGITEM VclQueryAdminCatalogItemField | VclQueryResultAdminCatalogItemRecord |
| ADMINGROUP VclQueryAdminGroupField | VclQueryResultAdminGroupRecord |
| ADMINMEDIA VclQueryAdminMediaField | VclQueryResultAdminMediaRecord |
| ADMINORGNETWORK VclQueryAdminOrgNetworkField | VclQueryResultAdminOrgNetworkRecord |
| ADMINORGVDC VclQueryAdminVdcField | VclQueryResultAdminVdcRecord |
| ADMINSHADOWVM VclQueryAdminShadowVMField | VclQueryResultAdminShadowVMRecord |
| ADMINTASK VclQueryAdminTaskField | VclQueryResultAdminTaskRecord |
| ADMINUSER VclQueryAdminUserField | VclQueryResultAdminUserRecord |
| ADMINVAPP VclQueryAdminVAppField | VclQueryResultAdminVAppRecord |
| ADMINVAPPNETWORK VclQueryAdminVAppNetworkField | VclQueryResultAdminVAppNetworkRecord |
| ADMINVAPPTEMPLATE VclQueryAdminVAppTemplateField | VclQueryResultAdminVAppTemplateRecord |
| ADMINVM VclQueryAdminVMField | VclQueryResultAdminVMRecord |
| ALLOCATEDEXTERNALADDRESS VclQueryAllocatedExternalAddressField | VclQueryResultAllocatedExternalAddressRecord |
| BLOCKINGTASK VclQueryBlockingTaskField | VclQueryResultBlockingTaskRecord |
| CATALOG VclQueryCatalogField | VclQueryResultCatalogRecord |
| CATALOGITEM VclQueryCatalogItemField | VclQueryResultCatalogItemRecord |
| CELL VclQueryCellField | VclQueryResultCellRecord |

| VclQueryRecordType Value and Query Fields Enumeration Type | Query Result Record Type |
|---|---|
| DATASTORE VclQueryDatastoreField | VclQueryResultDatastoreRecord |
| DATSTOREPROVIDERVDCRELATION VclQueryDatastoreProviderVdcRelationField | VclQueryResultDatastoreProviderVdcRelationRecord |
| DVSWITCH VclQueryDvSwitchField | VclQueryResultDvSwitchRecord |
| EVENT VclQueryEventField | VclQueryResultEventRecord |
| EXTERNALNETWORK VclQueryNetworkField | VclQueryResultNetworkRecord |
| GROUP VclQueryGroupField | VclQueryResultGroupRecord |
| HOST VclQueryHostField | VclQueryResultHostRecord |
| MEDIA VclQueryMediaField | VclQueryResultMediaRecord |
| NETWORKPOOL VclQueryNetworkPoolField | VclQueryResultNetworkPoolRecord |
| ORGANIZATION VclQueryOrgField | VclQueryResultOrgRecord |
| ORGNETWORK VclQueryOrgNetworkField | VclQueryResultOrgNetworkRecord |
| ORGVDC VclQueryOrgVdcField | VclQueryResultOrgVdcRecord |
| ORGVDCRESOURCEPOOLRELATION VclQueryOrgVdcResourcePoolRelationField | VclQueryResultOrgVdcResourcePoolRelationRecord |
| PORTGROUP VclQueryPortgroupField | VclQueryResultPortgroupRecord |
| PROVIDERVDC VclQueryVMWProviderVdcField | VclQueryResultVMWProviderVdcRecord |
| PROVIDERVDCRESOURCEPOOLRELATION VclQueryProviderVdcResourcePoolRelationField | VclQueryResultProviderVdcResourcePoolRelationRecord |
| RESOURCEPOOL VclQueryResourcePoolField | VclQueryResultResourcePoolRecord |
| RIGHT VclQueryRightField | VclQueryResultRightRecord |
| ROLE VclQueryRoleField | VclQueryResultRoleRecord |

| VclQueryRecordType Value and Query Fields Enumeration Type | Query Result Record Type |
|---|--|
| STRANDEDUSER VclQueryStrandedUserField | VclQueryResultStrandedUserRecord |
| TASK VclQueryTaskField | VclQueryResultTaskRecord |
| USER VclQueryUserField | VclQueryResultUserRecord |
| VAPP VclQueryVAppField | VclQueryResultVAppRecord |
| VAPPNETWORK VclQueryVAppNetworkField | VclQueryResultVAppNetworkRecord |
| VAPPORGNETWORKRELATION VclQueryVAppOrgNetworkRelationField | VclQueryResultVAppOrgNetworkRelationRecord |
| VAPPTEMPLATE VclQueryVAppTemplateField | VclQueryResultVAppTemplateRecord |
| VIRTUALCENTER VclQueryVirtualCenterField | VclQueryResultVirtualCenterRecord |
| VM VclQueryVMField | VclQueryResultVMRecord |

Using Non-Generic Queries

When you use non-generic queries, the name of the query method determines the result record type.

Example: Records Returned by Non-Generic Queries

The following are examples of records returned by non-generic queries.

- `queryVmRecords` returns records of type `VclQueryResultVMRecord`.
- `queryvAppRecords` returns records of type `VclQueryResultVAppRecord`.

Example: Enumeration Types for Query Filter Creation

The following are examples of enumeration types that should be used when creating a query filter.

- `queryVmRecords` accepts fields of type `VclQueryVMField`.
- `queryvAppRecords` accepts fields of type `VclQueryVAppField`.

Decorator Objects

Decorator objects hide the complexity of the vCloud Director REST API.

Decorators provide an easy-to-use interface to the vCloud Director REST API when working with data collections and data objects. Decorators manipulate live object or collection instances. For example, every modification of a collection affects the container object.

VclAbstractRecordResultSet Decorator

The `VclAbstractRecordResultSet` decorator object makes the manipulation of generic query record results easier. This decorator provides methods for getting records of the expected type, as well as navigating between record result pages.

VclRecordResultSet Decorator

The `VclRecordResultSet` decorator object makes the manipulation of specific query record results easier. This decorator provides methods for getting records of a predefined type, as well as navigating between record result pages.

VclReferenceResultSet Decorator

The `VclReferenceResultSet` decorator object makes the manipulation of generic or specific query reference results easier. This decorator provides methods for getting object references, as well as navigating between reference result pages.

Scripting Examples

You can cut, paste, and adapt the JavaScript examples to help you write scripts for common vCloud Director tasks.

For more information about scripting, see the *Developing with VMware vRealize Orchestrator*.

Example: Get Records for All Enabled Organizations

The following JavaScript example uses the `AdminQueryService` object to get records for all enabled organizations on a given vCloud Director instance.

```
var host = ...
var queryService = host.toAdminObject().getAdminQueryService();

var expression = new VclExpression(VclQueryOrgField.ISENABLED, "true",
VclExpressionType.EQUALS);
var filter = new VclFilter(expression);
var params = new VclQueryParams();
params.setFilter(filter);

var resultSet = queryService.queryOrgRecords(params);
while (resultSet != null) {
    // the records should be of type related to the query
    // in this case the type is VclQueryResultOrgRecord
    var records = resultSet.getRecords();
    System.log(records.length + " records found");
    for (var i = 0; i < records.length; i++) {
        System.log(records[i].name);
    }
}
```

```

    }
    if (resultSet.hasNextPage()) {
        resultSet = resultSet.getNextPage();
    } else {
        break;
    }
}

```

Example: Get References to All Enabled Organizations

The following JavaScript example uses the `AdminQueryService` object to get references to all enabled organizations on a given vCloud Director instance.

```

var host = ...
var queryService = host.toAdminObject().getAdminQueryService();

var expression = new VclExpression(VclQueryOrgField.ISEENABLED, "true",
VclExpressionType.EQUALS);
var filter = new VclFilter(expression);
var params = new VclQueryParams();
params.setFilter(filter);

var resultSet = queryService.queryOrgReferences(params);
while (resultSet != null) {
    // the type of the references is predefined - VclReference
    var references = resultSet.getReferences();
    System.log(references.length + " references found");
    for (i = 0; i < references.length; i++) {
        System.log(references[i].href);
    }
    if (resultSet.hasNextPage()) {
        resultSet = resultSet.getNextPage();
    } else {
        break;
    }
}

```

Example: Get Records for All Virtual Machines Inside a vApp

The following JavaScript example uses the `QueryService` object to get records for all virtual machines inside a vApp.

```

var vapp = ...

var queryService = vapp.getHost().getQueryService();

var expression = new VclExpression(VclQueryVMField.CONTAINER, vapp.getReference().href,
VclExpressionType.EQUALS);
var filter = new VclFilter(expression);
var params = new VclQueryParams();
params.setFilter(filter);

var resultSet = queryService.queryRecords(VclQueryRecordType.ADMINVM, params);

```

```

while (resultSet != null) {
    var records = resultSet.getRecords(new VclQueryResultAdminVMRecord());
    System.log(records.length + " records found");
    for (i = 0; i < records.length; i++) {
        System.log(records[i].name);
    }
    if (resultSet.hasNextPage()) {
        resultSet = resultSet.getNextPage();
    } else {
        break;
    }
}

```

Example: Resume a Blocking Task Related to a vApp Deployment Notification

With the following JavaScript example, you can resume a blocking task related to a vApp deployment notification.

```

var host = ...
var message = ...

var helper = new VclNotificationHelper();
helper.setMessage(message);

if (helper.getNotificationEventType() == VclEventType.VAPP_DEPLOY) {
    var vappLink = helper.getEntityLink();
    var vapp = host.getEntityById(vappLink.type, vappLink.id);
    // do something with the vApp ...

    if (helper.isBlockingTask()) {
        var taskLink = helper.getBlockingTaskLink();
        var task = host.getEntityById(taskLink.type, taskLink.id);
        task.resume("put the resuming message here");
    }
}

```

Example: Configure a DHCP Service on a vApp Network

With the following JavaScript example, you can configure a DHCP service on a vApp network.

```

var dhcpService = ...
var vapp = ...
var networkName = ...
var networkConfigSection = vapp.getNetworkConfigSection();
var found = false;
var existingNetworkConfigArray = networkConfigSection.networkConfig.enumerate();
for (index = 0; index < existingNetworkConfigArray.length; index++) {
    var networkConfig = existingNetworkConfigArray[index];
    if (networkConfig.networkName == networkName) {
        var networkConfiguration = networkConfig.configuration;
        if (networkConfiguration.fenceMode == VclFenceModeValuesType.BRIDGED.value) {
            throw 'Dhcp service cannot be applied to network "' + networkName + '"!';
        }
    }
}

```

```

    }
    if (networkConfiguration.features == null) {
        networkConfiguration.features = new VclNetworkFeatures();
    }
    var serviceSet = networkConfiguration.features.networkService;
    var services = serviceSet.find(new VclDhcpService());
    if (services.length > 0) {
        for (i = 0; i < services.length; i++) {
            serviceSet.remove(services[i]);
        }
    }
    serviceSet.add(dhcpService);
    found = true;
}
}
if (!found) {
    throw 'Network "' + networkName + '" does not exist!';
}
task = vapp.updateSection(networkConfigSection);

```

Example: Configure a DHCP Service on a Gateway

With the following JavaScript example, you can configure a DHCP service on a gateway.

```

var gatewayDhcpService = ...
var gateway = ....
var gatewayConfiguration = gateway.configuration;
if (gatewayConfiguration.edgeGatewayServiceConfiguration == null) {
    gatewayConfiguration.edgeGatewayServiceConfiguration = new VclGatewayFeatures();
}
var serviceSet = gatewayConfiguration.edgeGatewayServiceConfiguration.networkService;
var services = serviceSet.find(new VclGatewayDhcpService());
if (services.length > 0) {
    for (i = 0; i < services.length; i++) {
        serviceSet.remove(services[i]);
    }
}
serviceSet.add(gatewayDhcpService);
task = gateway.update();

```

Example: Add a VPN Endpoint

With the following JavaScript example, you can add a VPN endpoint to a gateway.

```

var vpnEndpoint = ...
var gateway = ...
var gatewayConfiguration = gateway.configuration;
if (gatewayConfiguration.edgeGatewayServiceConfiguration == null) {
    gatewayConfiguration.edgeGatewayServiceConfiguration = new
VclGatewayFeatures();
}
var serviceSet = gatewayConfiguration.edgeGatewayServiceConfiguration.networkService;
var services = serviceSet.find(new VclGatewayIpsecVpnService());
if (services.length == 0) {

```

```

        throw 'VPN service not found on gateway ' + gateway.name;
    }
    services[0].endpoint.add(vpnEndpoint);
    gateway.configuration = gatewayConfiguration;
    task = gateway.update();

```

Example: Obtain Performance Statistics

With the following JavaScript example, you can obtain performance statistics for the vCloud Director plug-in.

```

VclProfiler.enableInstanceCounters(true);
...
var instances = VclProfiler.getInstanceCount("VclReference");
System.log("references: " + instances);
...
VclProfiler.enableInstanceCounters(false);
...
var host = ...
var cacheHitCount = VclProfiler.getCacheHitCount(host);
System.log("cache hits: " + cacheHitCount);
var cacheMissCount = VclProfiler.getCacheMissCount(host);
System.log("cache misses: " + cacheMissCount);
var cacheObjCount = VclProfiler.getCacheObjectCount(host);
System.log("cache objects: " + cacheObjCount);
...

```

Example: Get the Plug-In Version

With the following JavaScript example, you can get the plug-in version and distinguish future plug-in versions.

```

var version = VclHostManager.getVersion();
if (version == "5.5") {
    System.log("Plug-in 5.5 is installed!");
}

```

Example: Get Entity Instance Count

With the following JavaScript example, you can get any class instance count.

```

VclProfiler.enableInstanceCounters(true);
...
var className = VclProfiler.getClassNameByFinderType(VclFinderType.HOST);
System.log(VclProfiler.getInstanceCount(className));
...
VclProfiler.enableInstanceCounters(false);

```