

Infoblox IPAM vCO Plug-In for VMware vCenter Orchestrator

Version 2.2.0



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Product Information

Hardware Models

Network Automation: NT-1400, NT-2200, and NT-4000

Trinzic product line: 100, 810, 820, 1410, 1420, 2210, 2220, and Infoblox-4010

Trinzic Reporting: 1400, 2000, 2200, and 4000

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INTRODUCTION TO THE INFOBLOX IPAM vCO PLUG-IN

This guide describes how to install and configure the Infoblox IPAM vCO Plug-In Release 2.2.0 for VMware™ vCenter® Orchestrator 5.1. It also provides information about the Infoblox IPAM vCO Plug-In workflow library, actions, and API classes.

The Infoblox IPAM vCO Plug-In integrates IP address allocation capabilities into the VMware vCloud management solution. It allows fixed IP address allocation and address allocation from DHCP address ranges. When you use the Infoblox IPAM vCO Plug-In to allocate IP addresses to VMs (virtual machines), it automatically forwards a DNS request to the NIOS appliance. NIOS creates a complete host record in its database to enable the VMs to be located through their FQDNs. This information is also replicated in vCloud Director.

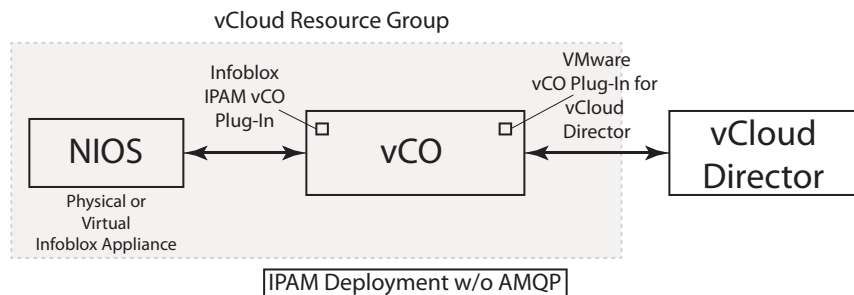
Updates provided in the Infoblox IPAM vCO Plug-In Version 2.2.0 include the following:

- Ability to add a host record with an automatically allocated IP address in one single *addHost* or *addHostInRange* action. This allows avoiding IP allocation conflicts when multiple vCO workflows run in parallel on the NIOS or vNIOS appliance.
- NIOS 6.8.2 systems and above are qualified for use with the Infoblox IPAM vCO Plug-In Version 2.2.0.

IPAM Deployment Types

Two Infoblox IPAM vCO Plug-In deployment scenarios are described in this document:

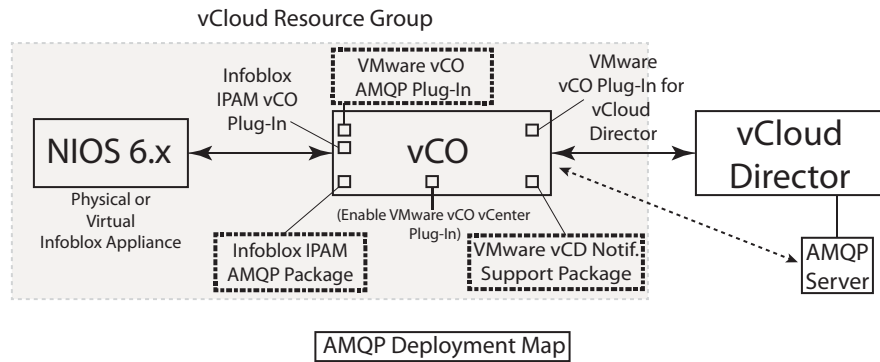
- *Deploying the Infoblox IPAM vCO Plug-In in a VMware environment that does not use AMQP messaging.* This deployment requires two Plug-Ins—the Infoblox IPAM vCO Plug-In and the VMware vCloud Director Plug-In, which is already installed in your vCO for communication to vCloud Director:



The section [Deployment #1: Without AMQP](#) on page 5 describes how to set up and deploy this simpler configuration.

- *Deploying the Infoblox IPAM vCO Plug-In in a VMware environment that uses AMQP messaging.* In this deployment, you also install and configure the following:
 - An AMQP messaging server;
 - Install and configure a third Plug-In, the **VMware vCenter Orchestrator AMQP Plug-In**;
 - Enable the vCO vCenter Server Plug-In, which is already installed in vCenter Orchestrator;

- Install two new Packages, the **Infoblox IPAM AMQP Package** and the **VMware IPAM vCD Notification Support on Blocking Tasks Package for VMware vCenter Orchestrator**, along with an AMQP server established through the vCloud Director, layered in as shown below:



Note: vCloud Director with AMQP operation requires NIOS 6.x and above.

You can use the Infoblox IPAM vCO Plug-In sample workflows to perform provisioning tasks, such as creating vApps, reserving IP addresses for VMs, and creating or tearing down networks. Depending on the tasks you perform, the NIOS or vNIOS appliance obtains the next available IPv4 or IPv6 addresses for the VMs, creates corresponding host records, and stores the associated data in the NIOS database. You can also build your own workflows using available Infoblox IPAM vCO Plug-In actions and API classes.

Note: Two IPAM sample workflows, Create a vApp and Destroy a vApp, are directly supported with AMQP functionality.

When you use the Infoblox IPAM vCO Plug-In to allocate and remove IP addresses, you ensure that the IP addresses allocated and removed through vCloud Director/vCenter Orchestrator and their associated data are also correctly registered and stored in the NIOS database, and that VMs in any deployed VMware vApp reside in the DNS namespace.

INTENDED AUDIENCE

This information is intended for anyone who is installing and configuring the Infoblox IPAM vCO Plug-In, and using the workflow library, actions, and API classes. The information in this document is written for experienced users who are familiar with virtual machine technology, vCloud Director, vCenter Orchestrator workflow development, and VMware vSphere.

For more information about vCenter Orchestrator, see

http://www.vmware.com/support/pubs/orchestrator_pubs.html.

For more information about vCenter Server, see

<http://www.vmware.com/support/pubs/vsphere-esxi-vcenter-server-pubs.html>.

INSTALLATION PREREQUISITES

Below is a list of what you will need to successfully install and use the Infoblox IPAM vCO Plug-In. Check the section [Resources](#) on page 26 for locations to obtain all necessary items.

- Several VMware applications are used for the installation and configuration of Plug-Ins:
 - the VMware vCenter Orchestrator (vCO) Java client program;
 - the VMware vCenter Orchestrator Configuration page, which is accessible from a Web browser;
 - the VMware vCloud Director administration page, accessible through a Web browser.
- **NIOS Appliance or vNIOS Virtual Appliance**—Infoblox NIOS™ systems provide the IP address management capabilities, which the vCenter Orchestrator uses to provision IP addresses to new virtual machines. You can connect the Infoblox IPAM vCO Plug-In to a NIOS or vNIOS Grid Master or independent appliance. For information about NIOS appliances and their features, refer to the *Infoblox NIOS Administrator Guide*;

Note: Several elements must be set up on the NIOS or vNIOS appliance prior to using the Infoblox IPAM vCO Plug-In. For information, see [Before Installing the Infoblox IPAM vCO Plug-In](#) on page 4.

- **vCenter Orchestrator and vCloud Director**—Verify that you have correctly configured and running instances of vCenter Orchestrator 5.1 and vCloud Director 5.1. The Infoblox IPAM vCO Plug-In Version 2.2.0 is qualified against vCenter Orchestrator 5.1;
- **Infoblox IPAM vCO Plug-in**—You download the Infoblox IPAM vCO Plug-In package and all relevant documents from the Infoblox Support web site at <http://support.infoblox.com>;
 - The Infoblox IPAM vCO Plug-In is delivered as a Zip archive file containing the VMware-compatible .DAR file;
 - The Infoblox IPAM vCO Plug-In version 2.2.0. supports NIOS 6.8.2 and later releases.
- **VMware vCenter Orchestrator 5.1 Plug-In for vCloud Director**—If the vCloud Director Plug-In is not already installed, you must download this Plug-In from VMware before using the Infoblox IPAM vCO Plug-In. This Plug-In is not bundled with the Infoblox IPAM vCO Plug-In;
- **VMware vCenter Orchestrator AMQP Plug-In v. 1.0.2**—Enables Orchestrator to work with the AMQP services from vCloud Director. You must download this Plug-In from VMware;
- **IPAM vCD Notification Support on Blocking Tasks Package for VMware vCenter Orchestrator**—You must download this Package from VMware. For administrators to control blocking tasks, the Infoblox IPAM vCO Plug-In Version 2.2.0 supports AMQP;
- The **Infoblox vCO IPAM AMQP** package, which is installed along with the three Plug-Ins listed above, and is included in the downloadable .ZIP file from Infoblox;
- **An established AMQP Server**—VMware supports the RabbitMQ AMQP Messaging Server; an established AMQP server is required for the back-end operation of workflows for the **IPAM vCD Notification Support on Blocking Tasks** Package;
- An Erlang Interpreter for support of the AMQP Server;
- **vCenter Orchestrator Admin account**—An account of this type is required to install the Plug-Ins;
- Additional user account and permissions requirements are listed in the section [Infoblox IPAM vCO Plug-In Permissions Requirements](#).

Note: For information about setting up vCenter Orchestrator, refer to the *VMware vCenter Orchestrator Installation and Configuration Guide*.

BEFORE INSTALLING THE INFOBLOX IPAM vCO PLUG-IN

Before you install the Infoblox IPAM vCO Plug-In, complete the following tasks on the NIOS or vNIOS Grid Master or independent appliance. For information about how to perform tasks specific to Infoblox, refer to the *Infoblox NIOS Administrator Guide*.

- Consult the section [Infoblox IPAM vCO Plug-In Permissions Requirements](#) for information about the admin account permissions you need on the NIOS appliance to ensure successful Plug-In operation;
- In NIOS, define DHCP address ranges from which you plan to allocate IP addresses to VMs through the Infoblox IPAM vCO Plug-In;
- In NIOS, create the authoritative DNS zones that are used by the Infoblox IPAM vCO Plug-In. Ensure that you associate the zones with networks. For more information, consult the *NIOS Administrator's Guide* that ships with your Infoblox appliance;
- Define the extensible attributes for which you enter the values through the Infoblox IPAM vCO Plug-In, if desired. For more information, refer to [Defining Extensible Attributes in NIOS](#);
- Ensure that the vCloud Director Plug-In 5.1 is installed and working in vCenter Orchestrator. We discuss the vCloud Director Plug-In installation in the topic [Installing the VMware vCenter Orchestrator Plug-In for vCloud Director 5.1](#).

Recommended Order of Installation

For the full configuration of this application, three separate Plug-Ins and two separate vCO packages are installed and configured, in a very specific order.

Effective use of the Infoblox IPAM vCO Plug-In requires installation and configuration in a specific order. This document steps you through the process and ensures a successful deployment.

1. On the NIOS appliance, define the required set of four extensible attributes. For more information, refer to [Defining Extensible Attributes in NIOS](#).
2. Install the Infoblox IPAM vCO Plug-In. Refer to [Installing the Infoblox IPAM vCO Plug-In](#).
3. Configure the VMware vCenter Orchestrator Plug-In for vCloud Director 5.1 for IPAM and AMQP operation. Refer to [Installing the VMware vCenter Orchestrator Plug-In for vCloud Director 5.1](#).
 - a. For any deployment that does not use AMQP, you can now run **Create vApp** and **Destroy vApp** workflows from vCenter Orchestrator. Refer to [Configuring IPAM and vCloud Director Workflows](#).
4. Install your AMQP server. Refer to [Setting Up the AMQP Messaging Server](#). The example in this document is for a Windows-based AMQP server using RabbitMQ.
5. Configure vCloud Director for AMQP operations. Refer to [Configuring vCloud Director for AMQP Operations](#).
6. Install the third Plug-In, AMQP Plug-In. Refer to [Installing the VMware vCenter Orchestrator AMQP Plug-In](#).
7. Install the first Package, IPAM vCD Notifications Support for Blocking Tasks. Refer to [Installing the vCD Notifications Support for Blocking Tasks Package](#).
8. Install the second Package, the Infoblox IPAM vCO AMQP Package. Refer to [Install the Infoblox IPAM AMQP Package](#).
9. Create and operationally Start the Listeners and the Notification Subscription/Blocking Tasks for the **Create vApp** and **Destroy vApp** vCloud Director workflows. Refer to [Configuring the Listeners and Blocking Tasks for Infoblox IPAM vCO Plug-In Operation](#).

DEPLOYMENT #1: WITHOUT AMQP

You can deploy the Infoblox IPAM vCO Plug-In in a simpler configuration without AMQP messaging. When you conclude the configurations in this section, you are also able to proceed to the steps to support and apply AMQP messaging in a second deployment type, described in [Deployment #2: AMQP Configuration](#) on page 8.

Defining Extensible Attributes in NIOS

Note: Each workflow description in this Guide describes only the essential attributes for each Workflow without descriptions of extensible attributes, which are defined by each admin user.

When you start any workflow with Infoblox IPAM, you can enter names for the VM system (**VM**), the **vApp**, the virtual data center (**vDC**), and virtual organization (**vOrg**), and possibly other attributes, in a workflow configuration page. These values are called *extensible attributes*. The data you enter is then mapped to the extensible attributes that you must also define on the NIOS appliance.

Any extensible attributes must also be defined on the NIOS appliance. Otherwise, the NIOS appliance cannot map your entries to the corresponding attributes and no data can be saved. As an example, use the following value names to define corresponding extensible attributes on the NIOS appliance:


- **VM** for the name of the VM system
- **vApp** for the name of the vApp
- **vDC** for the name of the virtual data center through vCloud Director
- **vOrg** for the name of the virtual organization through vCloud Director

These extensible attributes are optional for the functioning of any workflow. For information about creating extensible attributes on the NIOS appliance, refer to [About Extensible Attributes](#) in the *Infoblox NIOS Administrator Guide*.

If you do not define the extensible attributes and populate the data of the extensible attributes through the workflows, the data simply does not appear in NIOS. Workflows will still operate normally with their default attributes.

Installing the Infoblox IPAM vCO Plug-In

To install the Infoblox IPAM vCO Plug-In Version 2.2.0, do the following:

1. Unzip the archive file into a folder on your management system. Infoblox provides a separate .DAR file for each version of the Infoblox IPAM vCO Plug-In.
2. Log in to the VMware vCenter Orchestrator Configuration page using a Web browser.
3. Click the **Plug-Ins** side tab.
4. In the right panel, under Install New Plug-In, click the **Plug-in file:** field. From the File Upload dialog, choose the .DAR file matching your NIOS system version and click **Open**.
5. Click **Upload and Install**.
The Infoblox IPAM vCO Plug-In tab appears in the Orchestrator Configuration Plug-Ins list.
6. Click **Apply changes**.
If the installation is successful, **Infoblox IPAM** appears in the left panel.
7. Click **Startup Options** in the left panel, and then click **Restart service**.
8. (*Only if necessary*) Click **Restart the vCO configuration server** on the Startup Options page.
9. You can verify the presence of the Plug-In and its communication with the NIOS system by logging in to the VMware vCenter Orchestrator Java client and choosing **Administer** mode.
10. Click the **Inventory** tab ().
The **Infoblox IPAM** entry appears in the left panel. Clicking its Open arrow shows the IP address for the NIOS system. This indicates a successful connection.

Configuring the Infoblox IPAM vCO Plug-In

Before you can use the Infoblox IPAM vCO Plug-In, you connect it to a NIOS or vNIOS Grid Master or independent NIOS appliance. To connect to the NIOS or vNIOS appliance, you import a valid SSL certificate from the appliance.

To configure the Infoblox IPAM vCO Plug-In, do the following:

1. From the VMware vCenter Orchestrator Configuration page, click **Infoblox IPAM** in the left panel.
2. Click **Infoblox IPAM** in the left panel, and complete the following:
 - **Infoblox IPAM Host Name:** Enter the IP address or host name of the NIOS or vNIOS appliance.
 - **Infoblox IPAM User Name:** Enter the user name for the NIOS or vNIOS appliance. This is the user name you have defined for the Infoblox IPAM vCO Plug-In user account on the appliance.
 - **Infoblox IPAM Password:** Enter the password for the NIOS or vNIOS appliance. This is the password you have defined for the Infoblox IPAM vCO Plug-In user account.
3. Click **Apply changes**. This enables the certificate to be handed over from NIOS to the VMware system.
4. On the Infoblox IPAM Configuration page, click **SSL Certificates**.
5. In the **Import from URL** field, enter the IP address of the appliance or, under **Import from file**, navigate to the certificate file, and then click **Import**.
The SSL certificate is imported and appears in the **Network → SSL Trust Manager** page.
6. To verify that connection to the appliance is successful, go to the **Validation results** section at the bottom of the Configuration page and review the connection status. You should see a **Successfully connected to the Infoblox IPAM server** message.
7. Click **Startup Options** in the left panel, and then click **Restart service**.
 - a. If the Infoblox IPAM vCO Plug-In doesn't start for any reason, click **Restart the vCO configuration server** on the Server startup options page.
 - b. After restarting the service, you can open your vCenter Orchestrator Java client, select **Run** mode, and click the Inventory tab. You should see an Infoblox IPAM listing in the vCO Inventory page.

You have completed basic configuration for the Infoblox IPAM vCO Plug-In.

Installing the VMware vCenter Orchestrator Plug-In for vCloud Director 5.1

Infoblox IPAM vCO Plug-In deployment requires this Plug-In for operation. Current VMware deployments may already have installed the vCloud Director 5.1 Plug-In. If this is true for your installation, you may skip this procedure and go to [Configuring the VMware vCenter Orchestrator Plug-In for vCloud Director 5.1](#).

1. Download the file `o11nplugin-vccloud-5.1-538.vmoapp` from the VMware Web site. This file is the VMware vCenter Orchestrator Plug-In for vCloud Director 5.1. (You may also use a .DAR file for the upload, the filename in this case resembles `o11nplugin-vccloud.dar`. You may need to register on the VMware site to download the file. Also, bear in mind that the version number or file name may differ from the file cited in this procedure.
2. Log in to the VMware vCenter Orchestrator Configuration page.
3. Click the **Plug-Ins** side tab.
4. In the right panel, under **Install New Plug-In**, click the **Plug-in file:** field. From the File Upload dialog, choose the .DAR file and click **Open**.
5. Click **Upload and Install**.
The **vCloud Director 5.1.538** listing appears in the Orchestrator Configuration Plug-Ins list.
6. Click **Apply changes**.
If the installation is successful, **vCloud Director 5.1** appears as a tab in the left panel.
7. Click **Startup Options** in the left panel, and then click **Restart service**.

Note: An account with Read/Write privileges must be created in the vCloud Director system for use by the **vCenter Orchestrator Plug-In for vCloud Director 5.1**. Do not use the System Administrator account for this task.

Configuring the VMware vCenter Orchestrator Plug-In for vCloud Director 5.1

To perform the configuration for the VMware vCenter Orchestrator Plug-In for vCloud Director 5.1, you must start by importing an SSL certificate from the vCloud Director. Do the following:

1. On the Connections tab for the vCloud Director Plug-In, click **SSL Certificates**. Note that the Orchestrator Configuration page changes the left pane to the **Network → SSL Trust Manager** page.
2. In the **Import from URL** field, enter the IP address of the appliance or, under **Import from file**, navigate to the certificate file, and then click **Import**.
3. You may see the request *The certificate is untrusted. Are you sure you want to import it?* along with a listing of the certificate. This is normal. Click **Import** at the bottom of the page.

The vCD Certificate is added to the list of certificates in the **SSL Trust Manager** page.

You now configure the VMware vCenter Orchestrator Plug-In for vCloud Director 5.1.

4. Click **vCloud Director 5.1** in the left pane, and click the **New vCloud Director Connection** tab in the right panel.
5. Define the connectivity settings: **Available** (Enabled or Disabled), **Host** (IP address or host name), **Port** (443 is the default value), **Maximum connections**, **Connection time out**, and the **Organization** (the vOrg that is associated with vCloud Director. For example, **Engineering** or whatever is appropriate for your non-AMQP configuration.)
6. Select the **Shared Session** option, and choose the **Basic Authentication Strategy**. The **Shared Session** and **Basic** authentication options are required for proper operation of the Plug-In as part of the Infoblox IPAM vCO Plug-In deployment.
7. Click **Apply Changes** when done, and then click **Restart service**.
8. If necessary, click **Restart the vCO configuration server** on the Startup Options page.
9. To check the VMware vCenter Orchestrator Plug-In for vCloud Director 5.1 connection to the vCloud Director system, click the **Connections** tab in the right pane. Your connection to the vCloud Director appears in the right pane, similar to the value below:

VMware vCloud Director

Available:

Host:

Port:

Maximum connections:

Connection timeout (ms):

Organization:

Select the authentication strategy to be used to log in.

Authentication strategy:

Specify the method to manage the users logins.

Session per user Shared session


```
https://172.16.1.7:443 (VCO_USER@Engineering)
```


You have completed basic configuration for the VMware vCenter Orchestrator Plug-In for vCloud Director 5.1.

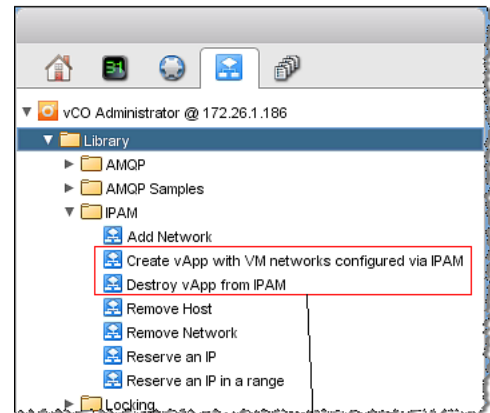
Configuring IPAM and vCloud Director Workflows

After you install the IPAM and vCD Plug-Ins, workflow configuration is straightforward.

Note: You must have one or more vApp templates available for use with the workflows associated with this Plug-In.

1. Log in to the VMware vCenter Orchestrator Java client and choose **Run** mode.
2. Choose the **Inventory** tab (). The **Infoblox IPAM** and **vCloud Director** entries appear in the left panel.

3. Choose the **Workflows** tab ().
4. Expand the **Library** and **IPAM** listings as shown in the figure.
5. Right-click the **Create vApp with VM Networks configured via IPAM** workflow. in the pop-up menu, choose **Start Workflow**.
6. In Step 1a, select the vApp template to use for the workflow instance by clicking in the field, and choosing the template from vCloud Director using the Select requester. After locating the template, select it and then click **Select**.
7. Click **Next**.
8. In Step 1b, select the required virtual data center (vDC) and vOrg for the new workflow instance, and click **Next**.
9. In Step 2a, create a name for the new vApp, and click **Next**.
10. In Step 2b, enter the naming prefix to be used to help define an FQDN for each interface for the new vApp. This value is used by NIOS to help create the host records and define name resolution.
11. Click **Submit** to start the new workflow.



Configure these two workflows for vApp creation (Create vApp requires vApp template)

You use the **Destroy vApp from IPAM** workflow in similar fashion, and any of the other workflows.

At this point, you have completed Infoblox IPAM configuration for use cases that do not use AMQP messaging notifications and blocking tasks. In the Non-AMQP deployment that you have just finished, you can create and destroy vApps using the workflows described above.

For more information about the seven bundled workflows in the Infoblox IPAM vCO Plug-In, see the section [Infoblox IPAM vCO Plug-In Workflows](#) on page 16.

Note: For Infoblox IPAM vCO Plug-In deployments that will use AMQP, continue with the following section [Deployment #2: AMQP Configuration](#).

DEPLOYMENT #2: AMQP CONFIGURATION

Note: vCloud Director with AMQP operation requires NIOS 6.x and above. Infoblox NIOS 5.x does not support AMQP operation with the Infoblox IPAM vCO Plug-In.

In this section, we assume you have already successfully performed all the configurations in the preceding section, [Deployment #1: Without AMQP](#). The procedures in this section build on the Plug-Ins you installed and configured there confirm the settings and configurations to work properly before proceeding with the topics below.

You begin by setting up the AMQP server. For this document, we present a RabbitMQ 2.8.2 example running on a Windows 7 client. Linux-based AMQP server deployments are also supported.

Setting Up the AMQP Messaging Server

You must have a properly configured AMQP server for operation of messaging support in the Infoblox IPAM vCO Plug-In. As an example configuration for Plug-In operation, we provide configuration for a Windows 7 system to act as an AMQP server. The following elements are needed (each listed with a version and filename where applicable) for a successful installation:

- A static IP address;
- Internet Information Server 7.0 or above;
- An Erlang/OTP programming language interpreter, version 15b or above (otp_win32_R15B, download from <http://www.erlang.org/>), installed and activated on the server;

- The RabbitMQ distributable for Windows, version 2.8.2 or above (for example, `rabbitmq-server-2.8.2.exe`, download from <http://www.rabbitmq.com/install-windows.html>).

Do the following to set up the AMQP Server:

1. Install IIS 7 if necessary. You can type `http://localhost` in a browser window to determine what version of IIS you have, or if it is installed. Under Windows 7, open **Control Panel** → **Programs and Features** → **Turn Windows Features on or off**, and enable the **Internet Information Services** checkbox.
2. Download and install the Erlang command interpreter, following the standard installation process.
3. Install the RabbitMQ 2.8.2 Messaging service from the downloaded installer. Afterwards, reboot the system.
4. Then, start the Erlang interpreter by opening a Windows command-line session as Administrator, and `cd` to the following location:

```
C:\Program Files\erl5.9\bin
```

Execute the following command to start the Erlang interpreter:

```
C:\Program Files\erl5.9\bin> erl.exe
```

5. Then, `cd` to the following location:

```
C:\Program Files\RabbitMQ Server\rabbitmq_server-2.8.2\sbin
```

6. Run the following three commands in the sequence shown below:

```
C:\Program Files\RabbitMQ Server\rabbitmq_server-2.8.2\sbin> rabbitmq-server stop
```

```
C:\Program Files\RabbitMQ Server\rabbitmq_server-2.8.2\sbin> rabbitmq-plugins enable
rabbitmq_management
```

```
C:\Program Files\RabbitMQ Server\rabbitmq_server-2.8.2\sbin> rabbitmq-server restart
```

7. To check the server operation, open a browser and connect to `http://localhost:55672`, with the login `guest/guest`. If you are unable to connect, reboot the Windows system and re-attempt connection.

Note: You can use the `guest/guest` login tuple for vCloud Director connectivity to the RabbitMQ service.

Configuring the VMware vCenter Orchestrator Plug-In for vCloud Director 5.1 for AMQP Service

Configuration for the VMware vCenter Orchestrator Plug-In for vCloud Director 5.1 is similar to the Non-AMQP configuration, but a subtle difference exists that bears mentioning. This section assumes you already have a working vCloud Director and working VMware vCenter Orchestrator Plug-In for vCloud Director 5.1 installation.

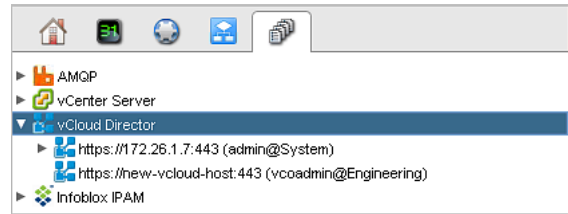
The AMQP-related configuration requires a new vCloud Director connection specifying the **System** vOrg.

1. Log in to the VMware vCenter Orchestrator Configuration page.
2. Click the **vCloud Director 5.1** side tab.
3. To create a new connection for vCloud Director, click the **New vCloud Director Connection** tab in the right pane.
4. In the **Host** field, enter the IP address for the vCloud Director.
5. In the **Organization** field, enter the name **System** as the vOrg from the vCloud Director. This value controls the entire cloud in vCD, and is required for correct operation with the AMQP Plug-In.
6. Click **Apply Changes**. The Connections list should show a value similar to the following:

```
https://172.16.1.7:443 (VCO_USER@System)
```

7. Click **Startup Options** in the left panel, and then click **Restart service**.

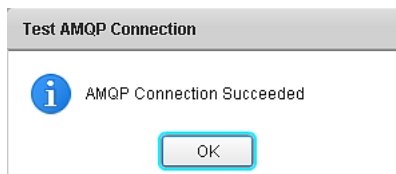
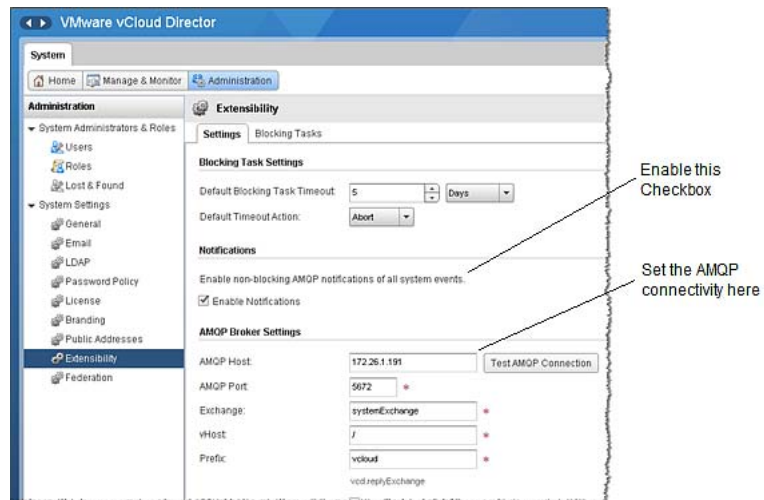
- a. If the VMware vCenter Orchestrator Plug-In for vCloud Director 5.1 doesn't start for any reason, click **Restart the vCO configuration server** on the Server startup options page.
- b. After restarting the service, you can open your vCenter Orchestrator Java client, select **Run** mode, and click the Inventory tab. You should see the new **vCloud Director** connection listing in the vCO Inventory page.



Configuring vCloud Director for AMQP Operations

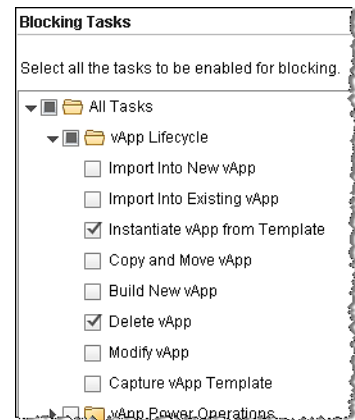
You configure vCloud Director to communicate with the AMQP server.

1. Log in to your vCloud Director instance.
2. Open the **System** → **Administration** → **Extensibility** → **Settings** page. There are three categories of settings on this page: **Blocking Task Settings**, **Notifications**, and **AMQP Broker Settings**.
3. Under **Notifications**, click the **Enable Notifications** checkbox.
4. Under **AMQP Broker Settings**, do the following:
 - a. For the **AMQP Host**, enter the IP address of the AMQP Server you configured in the section *Setting Up the AMQP Messaging Server*.
 - b. Enter port **5672** for the **AMQP Port**. This is the required TCP port that vCloud Director uses to communicate to the AMQP server.
 - c. For the **Exchange** value, enter: **systemExchange**.
 - d. For the **vHost** value, enter **/**.
 - e. For the **Prefix** value, enter **vc1oud** in lower case.
 - f. Use the guest/guest login tuple used as the default by the RabbitMQ server.
5. Click the **Test AMQP Connection** button. You should see an **AMQP Connection Succeeded** message.



6. Click **Apply** to commit settings.

7. Open the **System → Administration → Extensibility → Blocking Tasks** tab.
 8. Enable the checkboxes for two Blocking Tasks: **Instantiate vApp from Template** and **Delete vApp**. These blocking tasks represent the two most common use cases for applications with the Infoblox IPAM vCO Plug-In and are the two blocking tasks and Workflows supported by the Infoblox IPAM vCO Plug-In.
- You should now create a separate vCloud Director account for use with the application you're configuring. The new account must have a vCloud Director Role of System Administrator.
9. Still in vCloud Director, open **System → Administration → Users**.
 10. Enter the new **User Name**, and enter the new **Password** and confirm it.
 11. Click **OK**.



You have concluded IPAM-related configuration on the vCloud Director.

Installing the VMware vCenter Orchestrator AMQP Plug-In

For full operation with AMQP messaging, the Infoblox IPAM vCO Plug-In requires the VMware vCenter Orchestrator AMQP Plug-In. The VMware vCenter Orchestrator AMQP Plug-In must be downloaded from the VMware site.

1. Ensure you have the file `o11nplugin-amqp-1.0.2-228.vmoapp`. You can obtain this file from https://my.vmware.com/web/vmware/details?downloadGroup=VCO_AMQP_PLUGIN_102&productId=268. You may need to log in to the VMware site to download the file.
 2. Log in to the VMware vCenter Orchestrator Configuration page.
 3. Click the **Plug-Ins** side tab.
 4. In the right panel, under Install New Plug-In, click the **Plug-in file:** field. From the File Upload dialog, choose the `o11nplugin-amqp-1.0.2-228.vmoapp` file and click **Open**.
 5. Click **Upload and Install**, and then **I Accept the Terms of the License Agreement**.
 6. Click **Apply changes**.
- If installation is successful, **AMQP 1.0.2.228** appears in the vCenter Orchestrator Plug-Ins list in the right pane.
7. Click **Startup Options** in the left panel, and then click **Restart service**.
 8. Click **Restart the vCO configuration server** on the **Startup Options** page.

The AMQP Plug-In requires no further configuration in vCenter Orchestrator.

Enabling the VMware vCO vCenter Server Plug-In

By default, the VMware vCO vCenter Server Plug-In is not enabled in many deployments, and is required for Infoblox IPAM vCO Plug-In operations.


1. Log in to the VMware vCenter Orchestrator Configuration page.
2. Click the **Plug-Ins** side tab.
3. In the right panel, under Plug-Ins, enable the **vCenter Server 5.1.0.446** checkbox (your version number may vary).
4. Click **Apply changes**.
5. Click **Startup Options** in the left panel, and then click **Restart service**.

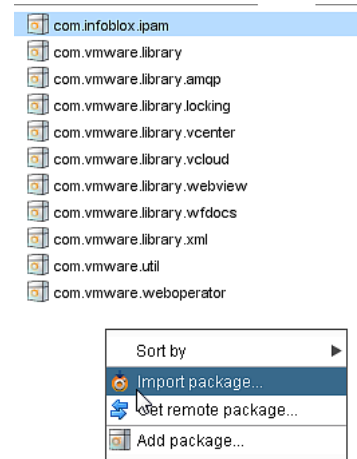
Proceed to the following section, [Installing the vCD Notifications Support for Blocking Tasks Package](#).

Installing the vCD Notifications Support for Blocking Tasks Package

Note: The installation for a Package differs from that used for Plug-Ins. You install Packages through the vCenter Orchestrator client.

Note: Go to the VMware documentation page <http://communities.vmware.com/docs/DOC-20446> to obtain the vCD Notifications Support for Blocking Tasks Package. The file is named `com.vmware.coe.vcd51.notifications.package`.


1. Log in to the VMware vCenter Orchestrator Java client and choose **Administer** mode.
2. Choose the **Packages** tab (.
3. Right-click below the Packages list and choose **Import Package** from the shortcut menu.
4. Select the package file `com.vmware.coe.vcd51.notifications.package` from the directory and click **Open**. A Package Import Information dialog appears; simply click **Import**.
5. When the Import Package window displays the list of workflows and other elements for the package, click **Import Selected Elements**.
After a moment, the package name `com.vmware.coe.vcd51.notifications` appears in the Packages list.
If an error indicator appears under the Package, you must restart the vCenter Orchestrator.



Proceed to the next section, [Install the Infoblox IPAM AMQP Package](#).

Install the Infoblox IPAM AMQP Package

Note: The installation for a Package differs from that used for Plug-Ins. You install Packages through the vCenter Orchestrator client.

1. From the Zip file containing your Infoblox IPAM vCO Plug-In, extract the file `com.infoblox.ipam.amqp51.package`. This file is the IPAM AMQP package.
2. Log in to the VMware vCenter Orchestrator client and choose **Administer** mode.
3. Choose the **Packages** tab (.
4. Right-click below the Packages list and choose **Import Package** from the shortcut menu.
5. Select the package file from the directory and click **Open**. A Package Import Information dialog appears; simply click **Import**.
6. When the Import Package window displays the list of workflows and other elements for the package, click **Import Selected Elements**.
After a moment, the package name `com.infoblox.ipam.amqp51.package` appears in the Packages list.
If an error indicator appears under the Package, you must restart the vCenter Orchestrator.

After concluding Package installation, you define the workflows for creating vApps that also make use of the AMQP broker on the vCloud Director. Proceed to the next section, [Configuring the Listeners and Blocking Tasks for Infoblox IPAM vCO Plug-In Operation](#).

CONFIGURING THE LISTENERS AND BLOCKING TASKS FOR INFOBLOX IPAM VCO PLUG-IN OPERATION

The workflow configuration is the critical step in using AMQP messaging with IPAM provisioning in the VMware environment. Two primary tasks must be performed:

- Create two new vCloud Director notification subscriptions (Blocking Tasks) through vCenter Orchestrator, one each for the **Create vApp** and **Destroy vApp** workflows to ensure messaging for both vApp workflows;


- Create two new Listeners for the for the **Create vApp** and **Destroy vApp** Notifications Workflows.

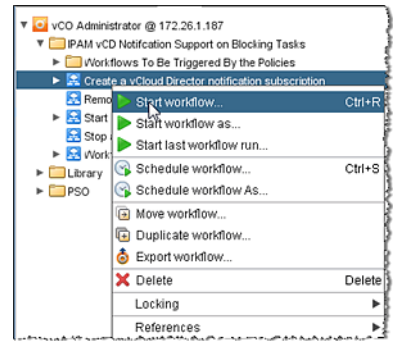
After the Subscriptions and Listeners are created, you can then execute **Create vApp** or **Destroy vApp** workflows from vCloud Director that will support notifications messaging for those vApp operations.

Note: Workflow execution on vCloud Director is beyond the scope of this document.)

Notification Subscriptions Configuration Pt. 1

You begin the primary phase of Infoblox IPAM vCO configuration by creating the two notifications for blocking tasks necessary to bind AMQP messaging with the Create vApp and Delete vApp workflows.

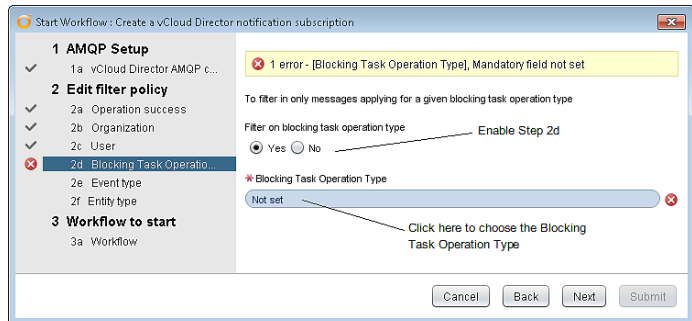
1. Log in to the VMware vCenter Orchestrator client and choose **Run** mode.
2. Choose the **Workflows** tab ().
3. Under **IPAM vCD Support for Blocking Tasks**, right-click the **Create a vCloud Director notification subscription**.
4. Choose **Start Workflow**.
5. In Step 1a of the Start Workflow page, enter the **Queue and Subscription name**.
6. Click the **vCloud Director Host** field.
7. In the Chooser window, type a spacebar in the **Search** field. The vCloud Director instance for the VMware deployment will appear. Click on it and click **Select**.



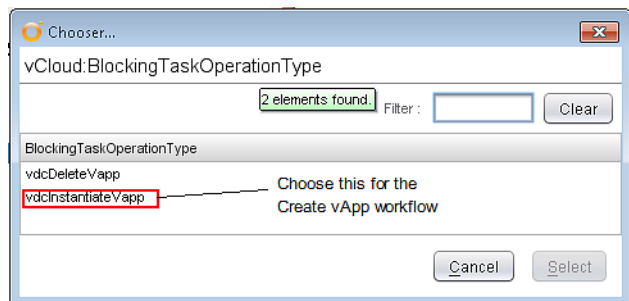
8. Enter the password for the AMQP server: for example, *guest*.
9. Under **Create a Broker?** select **Yes**. Then, click **Next**.
10. In Step 2a, Operation Success, click **No** and click **Next**.
11. In Step 2b, Organization, click **No** and click **Next**.
12. In Step 2c, User, click **No** and click **Next**.

Steps 10-12 are performed because the two workflows supported by the AMQP Plug-In do not support filtering by Operation Success, Organization or User.

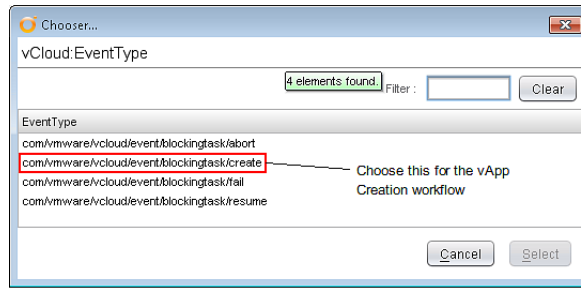
13. In Step 2d, Blocking Task Operation Type, click **Yes**.
14. Click in the **Blocking Task Operation Type** field.



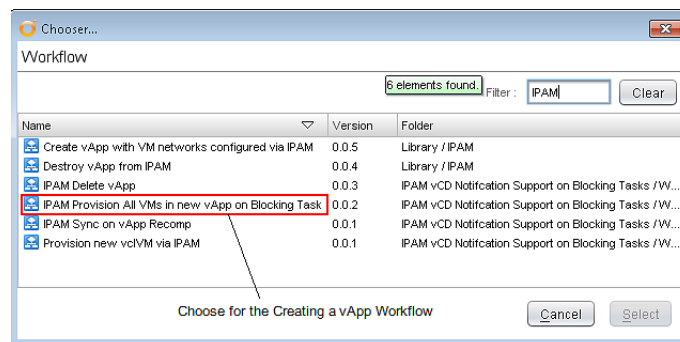
15. In the Chooser, select the **vdInstantiateVapp** object and click **Select**. (We assume here that you are creating a Create vApp-associated blocking task. The process is the same for a Delete a vApp blocking task.)



16. Click **Next**.
17. In Step 2e, Event Type, click **Yes**.
18. Click in the **Event Type** field.
19. In the Chooser, for a Blocking Task involving Creating a vApp, choose the **com/vmware/vcloud/event/blockingtask/create** listing.




20. Click **Select**. The Event Type populates with your blocking task event selection. Then, click **Next**.
21. In Step 2f, Entity Type, click **No** and click **Next**.
22. In Step 3a, Workflow, click **Yes**. Click in the **Workflow** field. The Chooser appears.
23. Type **IPAM** in the **Search** field. (Pressing Spacebar here displays the complete library of workflows in the vCloud Director system.) A list of six workflows from the complete library of workflows appears in the Chooser.

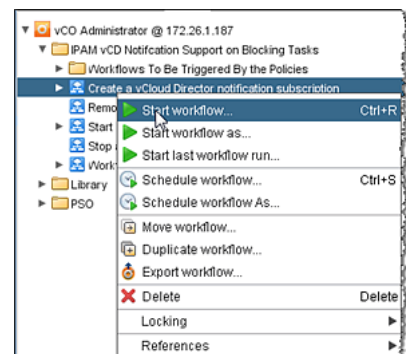


24. Choose the **IPAM Provision All VMs in New vApp on Blocking Task** workflow.
25. Click **Select**.
26. Click **Submit** to complete the new Notification Subscription/Blocking Task for Creating a vApp.

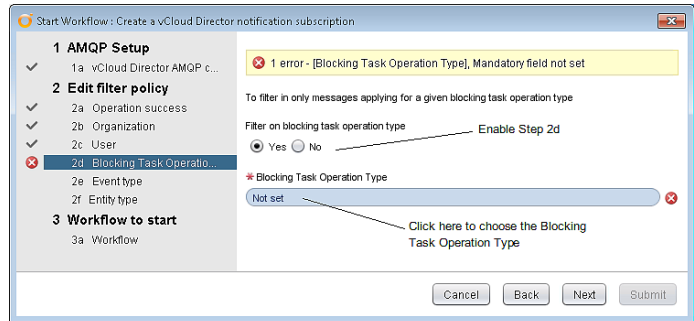
Notification Subscriptions Configuration Pt. 2

You also must create the notification subscription for the Delete a vApp workflow.

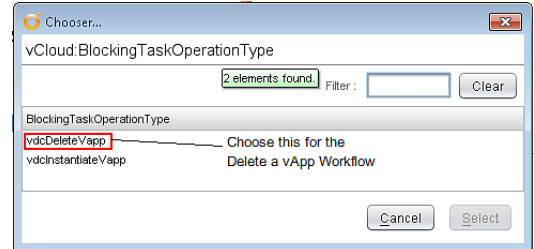
1. Log in to the VMware vCenter Orchestrator client and choose **Run** mode.
2. Choose the **Workflows** tab ().
3. Under **IPAM vCD Support for Blocking Tasks**, right-click the **Create a vCloud Director notification subscription**.
4. Choose **Start Workflow**.
5. In Step 1a of the Start Workflow page, enter the **Queue and Subscription name**.
6. Click the **vCloud Director Host** field.
7. In the Chooser window, type a spacebar in the **Search** field. The vCloud Director instance for the VMware deployment will appear. Click on it and click **Select**.
8. Enter the password for the AMQP server: for example, *guest*.
9. Under **Create a Broker?** select **Yes**. Then, click **Next**.
10. In Step 2a, Operation Success, click **No** and click **Next**.
11. In Step 2b, Organization, click **No** and click **Next**.



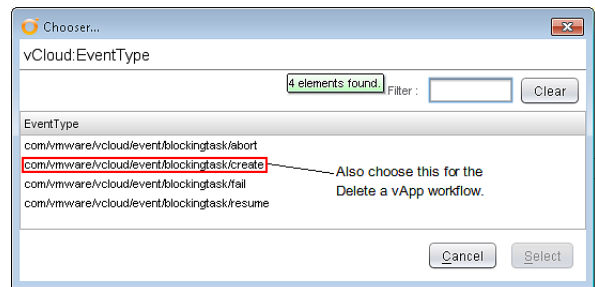
12. In Step 2c, User, click **No** and click **Next**.
Steps 10-12 are done because the two workflows supported by the AMQP Plug-In do not support filtering by Operation Success, Organization or User.
13. In Step 2d, Blocking Task Operation Type, click **Yes**.
14. Click in the **Blocking Task Operation Type** field.



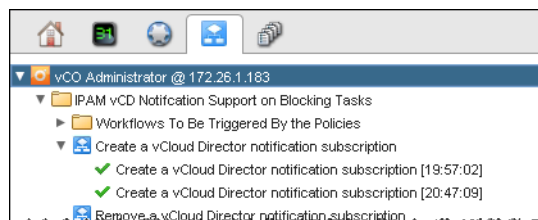
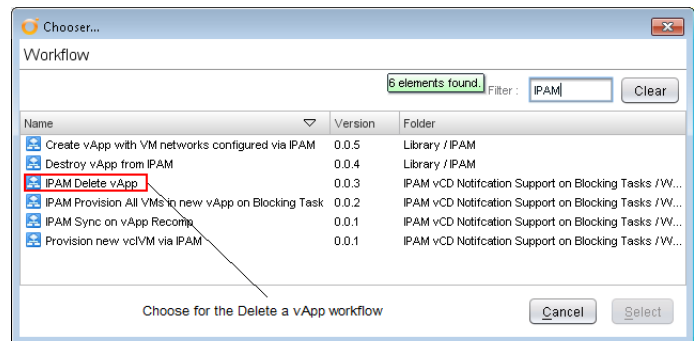
15. In the Chooser, select the **vdcDeleteVapp** object and click **Select**.
16. Click **Next**.
17. In Step 2e, Event Type, click **Yes**.
18. Click in the **Event Type** field.




19. In the Chooser, for a Blocking Task involving Deleting a vApp, choose the **com/vmware/vcloud/event/blockingtask/create** listing.
20. Click **Select**. The Event Type is populated with your blocking task event selection. Then, click **Next**.
21. In Step 2f, Entity Type, click **No** and click **Next**.
22. In Step 3a, Workflow, click **Yes**. Click in the **Workflow** field. The Chooser appears.



23. Type the phrase **IPAM** in the **Search** field. (Pressing Spacebar here displays the complete library of workflows in the vCloud Director system.) The set of IPAM workflows from the complete library of workflows appears in the Chooser.
24. Choose the **IPAM Delete vApp** workflow.
25. Click **Select**.
26. Click **Submit** to complete the new Notification Subscription/Blocking Task for Deleting a vApp.
27. When you are finished, you should have two Notification Subscriptions that appear as the following, with green checkmarks:

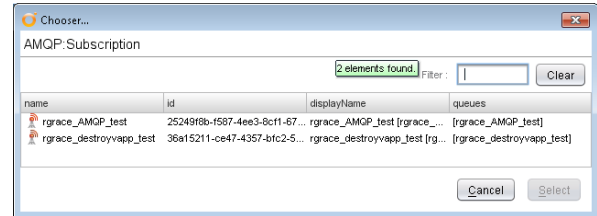


Creating the Listeners

1. Log in to the VMware vCenter Orchestrator client and choose **Run** mode.
2. Choose the **Workflows** tab (). Under **vCO Administrator**, an **IPAM vCD Support for Blocking Tasks** item appears in the list. You create the new workflow instances using AMQP, underneath this Workflow category.
3. Under **IPAM vCD Support for Blocking Tasks**, right-click the **Start a Subscription Listener Workflow** listing and choose **Start Workflow**.

You will see the two Notification Subscriptions you previously created.

4. For the first Listener, choose the element that matches for the Create a vApp workflow and click **Select**.
5. Click **Submit** in the Start Workflow window. After a moment, the new Listener appears in the workflow list, with a difference: a Pause icon, indicating the Listener is waiting for an event to trigger a Notification.
6. Follow steps 3-5 to assign the other subscription for the second Listener.



With the AMQP workflows, the vApps are instantiated in vCloud Director. Once the workflow is started in vCloud Director, the Listener for the particular workflow activates in the vCenter Orchestrator client display and you can watch its execution.

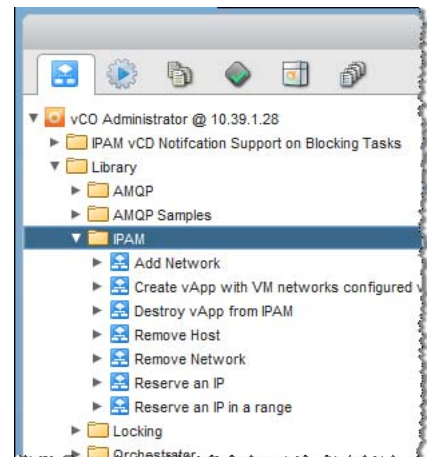
INFOBLOX IPAM vCO PLUG-IN WORKFLOWS

The Infoblox IPAM vCO Plug-In comes with sample workflows that you can use to complete some commonly performed tasks, such as allocating an IP address to a new VM.

To verify that the Infoblox IPAM vCO Plug-In workflows are properly imported, do the following:

1. Log in to the VMware vCenter Orchestrator client and choose **Design** mode.
2. Click the **Workflows** tab.
3. Click **vCO Administrator** → **Library** → **IPAM** in the left panel. You will note a list of workflows in the tree.

The Infoblox IPAM vCO Plug-In provides the following workflows for operation. Some Workflows do not support AMQP operations for messaging, these are indicated below. Consult the following sections for more information:

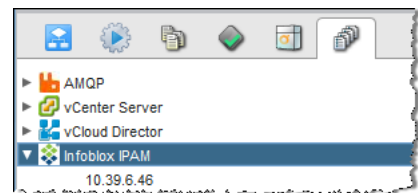


Workflow Name	Description
Reserve an IP*	Obtains the next available IPv4 or IPv6 address for a new host and creates a host record in the NIOS database. For more information, see Using the Reserve an IP Workflow on page 17.
Reserve an IP in a range*	Obtains the next available IPv4 or IPv6 address within a predefined DHCP address range for a new host, and creates a host record in the NIOS database. For more information, see Using the Reserve an IP in a Range Workflow on page 18.
Remove Host*	Removes an IP address that was assigned to a host and deletes the host record from the NIOS database. For more information, see Using the Remove Host Workflow on page 18.

Workflow Name	Description
Create vApp with VM Networks configured via IPAM (used with and without AMQP configuration)	Instantiates a vApp template as a new vApp. Defines IP addresses and host records for all network interfaces on the VMs in the new vApp. For more information, see Using the Create vApp with VM Networks Configured via IPAM Workflow on page 19.
Destroy vApp from IPAM (used with and without AMQP configuration)	Deletes a vApp from the system and removes the IPAM host record associated with it. For information, see Using the Destroy vApp Workflow on page 19.
Add Network*	Creates a new IP network using the CIDR network prefix values you give to the workflow. Two required attributes are used: Network Address and Network CIDR, along with any extensible attributes you have defined.
Remove Network*	Deletes a previously configured IP network from the VMware network and from the NIOS database.

* IPAM Workflow not supported by AMQP Plug-In

Note: You can verify that the Infoblox IPAM vCO Plug-In has been properly imported by opening Design mode and clicking **Inventory** in the left pane. If the Infoblox IPAM vCO Plug-In is properly installed and configured, vCenter Orchestrator displays **Infoblox IPAM** and the IP address of the NIOS appliance (a Grid master, for example) to which it is connected.



Starting a Workflow in a Non-AMQP Configuration

You can access the Infoblox IPAM vCO Plug-In workflows from **Workflows -> vCO Administrator -> Library -> IPAM** in the left panel. To start a workflow, right click the workflow and select **Start Workflow**. The procedures in this section apply if you are using vCenter Orchestrator to operate all of your workflows for the Infoblox IPAM vCO Plug-In but are not using the AMQP Plug-In and associated AMQP messaging. Individual workflow descriptions are provided in the following sections.

Using the Reserve an IP Workflow

Use the *Reserve an IP* workflow to allocate an IPv4 or IPv6 address to a virtual machine on your network. When you use this workflow, the NIOS appliance obtains the next available IP address for the new host and creates a host record when you submit the entry. Note that obtaining the next available IP address and creating a host record with it is performed by a single *addHost* action within this workflow. For more information, refer to [Infoblox IPAM vCO Plug-In Best Practices](#).

1. Log in to the vCenter Orchestrator.
2. Choose **Run** from the top left menu.
3. Choose **Workflows -> vCO Administrator -> Library -> IPAM** in the left panel.
4. Right-click the **Reserve an IP** workflow entry and choose **Start workflow...**
5. Complete the **Common parameters** and click **Submit** to allocate an IP address using the Reserve an IP workflow:
 - **IP address of the network:** Enter the network that you have configured on the NIOS or vNIOS appliance.
 - **CIDR number (the number next to / in CIDR notation):** Enter the netmask for the network you specified above. For example, you can enter 24 or 16 here.
 - **MAC address or DUID of the host:** Enter a MAC address for an IPv4 address or a DUID for an IPv6 address.
 - **Comment about the host:** Enter useful information about the new host.

- **Name of the host (FQDN):** Enter the FQDN of the new host in *hostname.domain name* format. This FQDN must be unique and is not already allocated on the NIOS or vNIOS appliance. For example, you can enter support.corp100.com. Ensure that you have configured the support.corp100.com zone and associated it with the network on the appliance.

6. Enter any values for any extensible attributes and click **Submit**.

Using the Reserve an IP in a Range Workflow

Use the *Reserve an IP in a Range* workflow to allocate an IPv4 or IPv6 address within a specific DHCP address range to a virtual machine on your network. When you use this workflow, the NIOS appliance obtains the next available IP address within the defined address range and creates a new host record when you submit the entry. This workflow is similar to the *Reserve an IP* workflow, except that you need to enter the starting and ending addresses for the DHCP address range. Note that obtaining the next available IP address and creating a host record with it is performed by a single *addHostInRange* action within this workflow. For more information, refer to [Infoblox IPAM vCO Plug-In Best Practices](#).

Note: Note that you must first have the DHCP address range defined on NIOS before you can use this workflow. Also, ensure that the start and end addresses match the ones in the address range.

1. Log in to the vCenter Orchestrator.
2. Choose **Run** from the top left menu.
3. Choose **Workflows** icon → **vCO Administrator** → **Library** → **IPAM** in the left panel.
4. Right-click the **Reserve an IP in a Range** workflow entry and choose **Start workflow...**
5. Complete the following **Common parameters**:
 - **Starting address of the range:** Enter the start IPv4 or IPv6 address of the DHCP address range from which you want NIOS to allocate an IP address.
 - **Ending address of the range:** Enter the end IPv4 or IPv6 address of the DHCP address range from which you want NIOS to allocate an IP address.
 - **MAC address of the host:** Enter a MAC address for an IPv4 address or a DUID for an IPv6 address.
 - **Name of the host (FQDN):** Enter the FQDN of the new host receiving the IP.
6. Enter any values for any extensible attributes and click **Submit**.

After you submit the workflow, vCenter Orchestrator displays the workflow status in the **Workflows** tab.

Using the Remove Host Workflow

Use the *Remove Host* workflow to remove a host that you previously created using the *Reserve an IP* workflow. When you use this workflow to remove a host, the NIOS appliance releases the IP address and deletes the host record associated with the host.

1. Log in to the vCenter Orchestrator.
2. Choose **Run** from the top left menu.
3. Choose **Workflows** icon → **vCO Administrator** → **Library** → **IPAM** in the left panel.
4. Complete the following **Common parameters**:
 - **Host name (FQDN):** Enter the FQDN of the host you want to delete.
5. Enter any values for any extensible attributes and click **Submit**.

After you submit the workflow, vCenter Orchestrator displays the workflow status in the **Workflows** tab.

Using the Create vApp with VM Networks Configured via IPAM Workflow

Note: A vApp is a container for one or more virtual machines, all of which running together comprise a multi-tier application running on any operating system. For example, a Web-based application could have three tiers: Web, application and database. Each of the three run on a separate VM. A vApp of this type would contain three virtual machines. vApps provide a mechanism for customers to move their applications between internal network clouds or external network clouds while keeping similar service levels. Every vApp is based upon a template.

Use the *Create vApp with VM Networks configured via IPAM* workflow to apply a vApp template as a new vApp on a single ESX or ESXi server. The NIOS appliance assigns an IP address to each of the interfaces on each VM. The interfaces are connected to different networks, that are configured in the same virtual organization. When you use this workflow, the NIOS appliance defines IP addresses and host records for all network connections for the VMs in the vApp. The vApp is updated with new network configurations obtained through IPAM, and the NIOS appliance creates a host name for each IP address that it assigns to the VM interfaces. Note that obtaining the next available IP address and creating a host record with it is performed by a single *addHost* action within this workflow. For more information, refer to [Infoblox IPAM vCO Plug-In Best Practices](#).

Note: If you are using this workflow with AMQP, you will not define this workflow in vCenter Orchestrator. Instead, the workflow is run on vCloud Director. This procedure applies only for provisioning vApps without AMQP.

For the process to operate, the DHCP ranges and DNS authoritative zones must be defined in the NIOS server.

1. Log in to the vCenter Orchestrator.
2. Choose **Run** from the top left menu.
3. Choose **Workflows** icon → **vCO Administrator** → **Library** → **IPAM** in the left panel.
4. Right-click the **Create vApp with VM networks configured via IPAM** workflow entry and choose **Start workflow...**
5. Complete the following **Common parameters**:
 - **Host name (FQDN)**: Enter the FQDN of the host you want to add.
 - **vApp Template**: Click on the field. In the *Select (vCloud:vApp Template)* dialog box, navigate to the **vApp Template** folder, select a vApp template, and then click **Select**. vCenter Orchestrator displays the selected template here.
 - **vData Center (vDC) selection**: Click on the field. In the *Select (vCloud:Vdc)* dialog box, navigate to the **vDCs** folder, select a vData center, and then click **Select**. vCenter Orchestrator displays your selection here.
 - **vOrganization of the vApp**: Click on the field. In the *Select (vCloud:Organization)* dialog box, select an organization, and then click **Select**. vCenter Orchestrator displays your selection here.
 - **Name of the vApp**: Enter the name of the new vApp.
 - **Comment**: Enter useful information about the vApp.
 - **VM computer name prefix to be used to form an FDQN for each NIC**: Enter a host name prefix here to create a unique FQDN for multiple VMs in a vApp.
6. Enter any values for any extensible attributes and click **Submit**.

After you submit the workflow, vCenter Orchestrator displays the workflow status in the **Workflows** tab.

Using the Destroy vApp Workflow

Note: This Workflow is also supported by the Infoblox IPAM vCO Plug-In.

Use the *Destroy a vApp* workflow to remove a previously created vApp. When you use this workflow to remove a vApp, the Infoblox IPAM vCO Plug-In deletes the vApp and its associated VMs from the vCloud Director and ESX or ESXi server, and the NIOS appliance removes the host records that are associated with the vApp.

Note: If you are using this workflow with AMQP, you will not define this workflow in vCenter Orchestrator. Instead, the workflow is run on vCloud Director. This procedure applies only for provisioning vApps without AMQP.

1. Log in to the vCenter Orchestrator.
2. Choose **Run** from the top left menu.
3. Choose **Workflows** icon → **vCO Administrator** → **Library** → **IPAM** in the left panel.
4. Right-click the **Destroy vApp** workflow entry and choose **Start workflow...**
5. Complete the following **Common parameters**:
 - **vApp:** Click on the field. In the *Select (vCloud:vApp)* dialog box, navigate to the **vApps** folder, select the vApp you want to remove, and then click **Select**. vCenter Orchestrator displays your selection here.
6. Enter any values for any extensible attributes and click **Submit**.

After you submit the workflow, the selected vApp is deleted from the vCloud Director and the host records associated with this vApp are deleted from the NIOS database.

Using the Add Network Workflow

This workflow creates a new virtual network that can be assigned to vApps and other resources through vCloud Director.

1. Log in to the vCenter Orchestrator.
2. Choose **Run** from the top left menu.
3. Choose **Workflows** icon → **vCO Administrator** → **Library** → **IPAM** in the left panel.
4. Right-click the **Create vApp with VM networks configured via IPAM** workflow entry and choose **Start workflow...**
5. Complete the following **Common parameters**:
 - **Network Address:** Click on the field and enter the IP value for the network you want to create. IPv4 and IPv6 values are permissible, using standard notation.
 - **Network CIDR:** Click on the field and enter the value for the network you want to create, up to a CIDR value of /128.
 - **Comment:** Describe the purpose of the new network in this field.
Other fields in the dialog are comprised of extensible attributes, which may or may not bear relevance to the workflow you are defining.
 - **VM system name:** Enter the name of the virtual system.
 - **vApp name:** Enter the name of the vApp.
 - **Virtual Data Center name (vCloud Director):** Enter the name of the virtual data center you have in vCloud Director.
 - **Virtual Organization name (vCloud Director):** Enter the name of the virtual organization you created in vCloud Director.
6. Enter any values for any extensible attributes and click **Submit**.

Using the Remove Network Workflow

1. Log in to the vCenter Orchestrator.
2. Choose **Run** from the top left menu.
3. Choose **Workflows** icon → **vCO Administrator** → **Library** → **IPAM** in the left panel.
4. Right-click the **Remove Network** workflow entry and choose **Start workflow...**
5. Complete the following **Common parameters**:
 - **Network Address:** Click on the field and enter the IP value for the network you want to remove. IPv4 and IPv6 values are permissible, using standard notation.

- **Network CIDR:** Click on the field and enter the value for the network you want to remove, up to a CIDR value of /128.

6. Enter any values for any extensible attributes and click **Submit**.

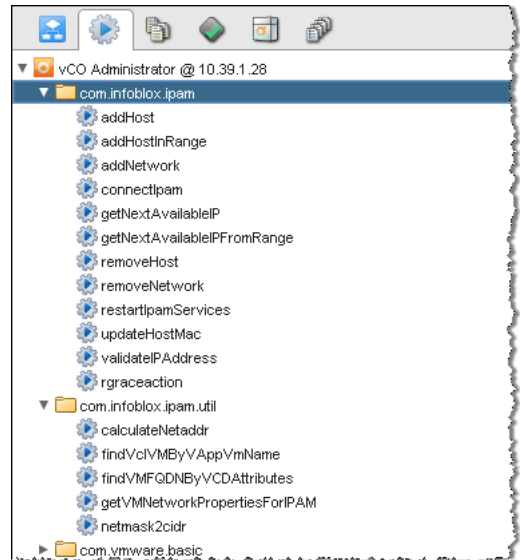
After you submit the workflow, the selected vApp is deleted from the vCloud Director and the host records associated with this vApp are deleted from the NIOS database.

Verifying Workflow Executions

You can verify whether a workflow execution is successful or not by viewing status in the Logs section in vCenter Orchestrator and in the audit log on the NIOS appliance For more information, see the topic *Using the Audit Log* in the *Infoblox NIOS Administrator Guide*.

Infoblox IPAM vCO Plug-in Actions

vCenter Orchestrator actions are the building blocks of workflows. An Infoblox IPAM vCO Plug-In action is a Javascript segment that uses the API exposed by the Infoblox IPAM vCO Plug-In. You can use the Infoblox IPAM vCO Plug-In actions to develop custom workflows. Each Plug-In provides a list of Actions performed by that Plug-In.



Accessing the Infoblox IPAM vCO Plug-In Actions

1. Log in to the vCenter Orchestrator.
2. Choose **Design** from the top left menu.
3. Click the **Actions** tab at the top left.
4. Click **vCO Administrator** → **com.infoblox.ipam** in the left panel. You will note a list of Actions in the tree.
5. Click the **Scripting** tab in the right panel. This provides the list of input parameters comprising the selected Action.

The Infoblox IPAM vCO Plug-In includes the following actions:

Action	Description	Input Parameter	Output Parameter
addHost	Adds a host record for the VM with specified IP. If no IP address is specified, the activity finds and allocates the next available IP address within the specified network.*	ipamConnection, ipAddress, macAddress, comment, hostname, netaddr, netmask, vcd_vm, vcd_vapp, vcd_vorg	ipamHost
addNetwork	Add a new IP network to the Infoblox NIOS database.	ipamConnection, netaddr, netmask, vcd_vm, vcd_vapp, vcd_vdc, vcd_vorg	N/A
addHostInRange	Adds a host record for the VM associated with a DHCP address range. If no IP address is specified, the activity finds and allocates the next available IP address within the specified DHCP address range.*	ipamConnection, startAddress, endAddress, ipAddress, macAddress, comment, hostname, netaddr, netmask, vcd_vm, vcd_vapp, vcd_vorg	ipamHost
connectIpam	Establishes a connection to the NIOS appliance.	N/A	ipamConnection

Action	Description	Input Parameter	Output Parameter
getNextAvailableIP	Finds and allocates the next available IPv4 or IPv6 address within the specified network.	ipamConnection, netaddr, netmask	ipAddress
getNextAvailableIPFromRange	Finds and allocates the next available IPv4 or IPv6 address within the specified DHCP address range.	ipamConnection, startAddress, endAddress	ipAddress
removeHost	Deletes a host record, including all the VM information, in the NIOS database.	ipamConnection, hostName	N/A
removeNetwork	Removes a IP network from the Infoblox NIOS database.	ipamConnection, address, cidr	N/A
restartIpamServices	Restarts services on the NIOS appliance to ensure that IPAM changes are updated.	ipamConnection	N/A
updateHostMac	Updates the MAC Address field of an IPv4 host record.	ipamConnection, hostName, newMacAddress, comment	N/A
validateIPAddress	Checks whether the IP address is IPv4 or IPv6.	ipAddress	Returns a message for failed validation

*For the specifics of the *addHost* and *addHostInRange* actions related to IP address allocation, see [Infoblox IPAM vCO Plug-In Best Practices](#).

For more information about how to build a workflow using actions, refer to the vCenter Orchestrator documentation.

INFOBLOX IPAM vCO PLUG-IN API CLASSES

The vCenter Server scripting API contains classes, with their respective attributes, methods, and constructors that allow interaction between vCenter Orchestrator and vCenter Server.

To locate the Infoblox IPAM API classes, do the following:

1. To access the API Explorer from the Orchestrator client, click **Tools → API Explorer** in the Orchestrator client toolbar. You can use the term “infoblox” in the API Search entry box to help locate the Infoblox IPAM vCO Plug-In API.
2. In the left pane, select the **Infoblox IPAM** API object.

The Infoblox IPAM API Classes consist of the following:

IpamCnameRecord		
Attribute	Returns	Description
alias	String	The fully qualified domain name of the alias.
canonical	String	The Canonical name of the record.
comment	String	Descriptive comment.

IpamConnection

Attribute	Returns	Description
hostName	String	The host name for the IPAM connection.
id	String	the unique ID for the IPAM connection.
addCnameRecord	Object	Method to add a host within a network range.
addHost	IpamHost	Method to add a host.
addHostInRange	IpamHost	Method to add a host in a network range.
getNextAvailableIP	String	Obtain the next available IP address from the defined network.
reconnect	Object	Reconnect to the NIOS server.
removeHost	Object	Destroy the host.
restartServices	Object	Restart the NIOS Grid service.
updateHostMac	Object	Update the host's MAC address.

IpamDhcpRange

Attribute	Returns	Description
endAddress	String	The ending address of the DHCP range.
startAddress	String	The starting address of the DHCP range.

IpamExtensibleAttribute

Attribute	Returns	Description
vapp	String	The virtual appliance to which the VM belongs.
vdc	String	The virtual data center to which the virtual appliance belongs.
vm	String	The virtual machine on which the host runs.
vorg	String	The virtual organization to which the virtual data center belongs.

IpamHost

Attribute	Returns	Description
comment	String	Text comment for the host.
fqdn	String	The host's Fully Qualified Domain Name.
ip	String	The host's IPv4 or IPv6 address.
mac	String	The MAC address of the IPv4 host or the DUID of the IPv6 host.

IpamNetwork

Attribute	Returns	Description
address	String	The IPv4 or IPv6 network address.
cidr	Numeric	The CIDR value for the network.

MANUALLY REMOVING THE INFOBLOX IPAM vCO PLUG-IN

You can manually remove the Infoblox IPAM vCO Plug-In from vCenter Orchestrator.

To remove the Infoblox IPAM vCO Plug-In, do the following:

1. Log in to the Orchestrator configuration interface.
2. From the interface, click **Plug-ins** in the left panel.
3. On the Plug-ins page, deselect the **Infoblox IPAM** check box in the **Enable Plug-Ins installation status** section, and then click **Apply changes**.
4. On the vCenter Orchestrator Linux appliance, shut down the vCO server and the vCO configuration service:

```
/etc/init.d/vcod stop
/etc/init.d/jettyd stop
```

If the vCenter Orchestrator server is running on Windows, open the Services panel and stop the **VMware vCenter Orchestrator Configuration** and **VMware vCenter Orchestrator Server** services.

5. Navigate to the installation directory of the vCenter Orchestrator server:

On a vCenter Orchestrator Linux appliance, enter `cd /opt/vmo`

On a Windows server, go to `C:\Program Files\VMware\Orchestrator`

Remove the following directories and files from the installation directory:

- ./app-server/server/vmo/conf/plugins/Infoblox_IPAM_Plugin.xml
- ./app-server/server/vmo/plugins/o11nplugin-ipam.dar
- ./configuration/jetty/contexts/o11nplugin-ipam-config.xml
- ./configuration/jetty/webapps/o11nplugin-ipam-config.war

6. In the installation directory of the vCenter Orchestrator server, open the file `/app-server/server/vmo/conf/plugins/_VSOPluginInstallationVersion.xml`, and then remove the Infoblox IPAM vCO Plug-In version data by deleting all the lines that start with `<entry key="Infoblox IPAM">` or `<entry key="InfobloxIPAM">`.

7. On the vCenter Orchestrator Linux appliance, start the vCO server and the vCO configuration service:

```
/etc/init.d/vcod start
/etc/init.d/jettyd start
```

If the vCenter Orchestrator server runs on Windows, open the **Services** panel and start the **VMware vCenter Orchestrator Configuration** and **VMware vCenter Orchestrator Server** services.

INFOBLOX IPAM vCO PLUG-IN BEST PRACTICES

Organizations can use VMware's vCloud Director to provision and de-provision new services based on virtual machines. vCenter Orchestrator (part of vCenter) is the workflow engine used to automate this process. The organization may execute the provisioning process using an existing vCenter Orchestrator interface, or a separate third party portal or customized provisioning portal. The interface used to start the process is generic to the operation of the Infoblox IPAM vCO Plug-In.

Best practices to ensure Plug-In operation include the following:

- Take your time.
- Ensure that you can connect to the desired NIOS appliance from vCenter Orchestrator.
- Define an admin account on the NIOS appliance, the name of which corresponds to the vCenter Orchestrator account performing Plug-In operations. This helps ensure that related event logs are directed to the right administrator.
- Avoid using the NIOS superuser account.
- Ensure that the desired extensible attributes are defined on the NIOS system with which the Infoblox IPAM vCO Plug-In is connected. For more information, see [Defining Extensible Attributes in NIOS](#) on page 5.
- When production requires a new VM or vApp, the workflow or action must know which DHCP network or range from which to assign an IP address to a new VM. This DHCP network or range must already be defined in NIOS.
- Ensure you have the vApp templates envisioned for use with the Infoblox IPAM vCO Plug-In.
- The DHCP network or range also should be exclusively for use by the vCenter Orchestrator and not be used to define IP configurations for other networks or devices.
- When configuring individual workflows for operation, ensure that all required values are accurate. If any single value is incorrect, the workflow does not execute properly.
- Each workflow creating a vApp must have a corresponding workflow that destroys that vApp. Otherwise, the IPAM information could be out of synchronization between the NIOS or vNIOS appliance and the vSphere or vCloud Director systems.
- Note that the *addHost* and *addHostInRange* actions allocate an IP address automatically and create a host record with it if no IP address is specified. Therefore, the affected sample workflows (*Reserve an IP*, *Reserve an IP in a range*, and *Create vApp with VM Networks configured via IPAM*) do not include the *getNextAvailableIPAddress* action. To avoid IP allocation conflicts when multiple simultaneous host-adding workflows are run, Infoblox recommends that you use these preconfigured workflows. If you build custom workflows and want an IP address to be allocated automatically, ensure that you configure the *addHost* and *addHostInRange* actions in such a way that their input parameters **ipAddress** is empty.

INFOBLOX IPAM vCO PLUG-IN PERMISSIONS REQUIREMENTS

On the Infoblox NIOS system, users of the Infoblox IPAM vCO Plug-In should possess the following:

- The NIOS user account requires both GUI and API permissions;
- Read/Write permissions for Host Objects in the destination forward zone(s) and for Host Objects in the destination reverse zone(s):
 - The IPAM vCO Plug-In generates an Infoblox Host Object that automatically creates A and PTR records in the appropriate forward and reverse zones;
 - This implies a requirement for at least Read Only permissions to the zone(s).
- Read/Write permissions to the appropriate subnetworks:
 - The vCO plugin currently automatically adds the Host with the MAC address and DHCP “enabled,” creating a fixed address in the appropriate subnet;
 - Read/Write permissions for Fixed address/hosts is therefore a minimum requirement.

- Read/Write permissions to the grid members or associated appliance:
 - The Infoblox IPAM vCO Plug-In automatically performs a “Restart Service” when NIOS adds a fixed address. Without the Read/Write permissions, the Restart Service call by the Plug-In to the NIOS appliance will not work.

Note: With DHCP disabled, and assuming no pending DNS restarts, services will not restart when the REstart Services call is made by the Plug-In to the NIOS appliance, because an Add Host action does not require a DNS restart.

INFOBLOX IPAM vCO PLUG-IN CPU AND MEMORY UTILIZATION FOR WORKFLOW EXECUTION

Workflow	CPU Utilization	RAM Utilization	RAM Utilization in %
Add Network	2.6%	0.023 GB	1.5%
Create vApp with VM networks configured via IPAM	3.6%	0.060 GB	3.0%
Destroy vApp from IPAM	6.0%	0.060 GB	3.0%
Remove Host	5.2%	0.061 GB	3.0%
Remove Network	3.1%	0.058 GB	2.9%
Reserve an IP	4.5%	0.046 GB	2.3%
Reserve an IP in a Range	4.1%	0.058 GB	2.9%

RESOURCES

Go to the following locations on the Web to obtain the various Plug-Ins, Packages and executables used in this document:

- **Infoblox IPAM vCO Plug-in** –You download the Infoblox IPAM vCO Plug-In ZIP file and all relevant documents from the Infoblox Support web site at <http://support.infoblox.com>. The Infoblox IPAM vCO Plug-In is delivered as a Zip archive file containing the VMware-compatible .DAR file. Consult the README file in the Zip archive for full information on the files in the download.
- If necessary, download the **VMware vCenter Orchestrator Plug-In for vCloud Director 5.1** from: https://my.vmware.com/web/vmware/details?downloadGroup=VCD_VCO_PLUGIN_510&productId=289
- Obtain the Erlang/OTP programming language interpreter, version 15b or above (for example, otp_win32_R15B), from <http://www.erlang.org/>.
- Obtain the RabbitMQ distributable for Windows, version 2.8.2 or above (for example, rabbitmq-server-2.8.2.exe), from <http://www.rabbitmq.com/install-windows.htm>.
- Obtain the **VMware vCenter Orchestrator AMQP Plug-In**, version 1.0.2, from https://my.vmware.com/web/vmware/details?downloadGroup=VCO_AMQP_PLUGIN_102&productId=268
- Obtain the **vCD Notifications Support for Blocking Tasks** Package from the VMware documentation page <http://communities.vmware.com/docs/DOC-20446>.