



IaaS Reference Guide

Revision 1.0

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Purpose

The purpose of this document is to catalog a group of processes having to do with GreenCloud's Infrastructure as a Service (IaaS), and enable GreenCloud Partners to perform common tasks associated with that service. Clients can leverage GreenCloud's IaaS without any extra infrastructure or networking hardware. The virtual environment is accessible through the vCloud Director interface.

What is IaaS?

IaaS is a service offered by GreenCloud which enables clients to host servers in a virtual environment, control the access of those servers, and integrate those servers with their current environment. Each server is created as a Virtual Machine (VM) and hosted on GreenCloud's Cisco powered infrastructure. The end result is a fully virtualized datacenter environment which the client can access and manage from their existing environment.

IaaS Infrastructure

GreenCloud's infrastructure is hosted at several different datacenters throughout the US. This infrastructure consists of a large amount of resources such as RAM, CPU cores, and storage space. These resources are managed using VMware's vSphere software running on an ESXi host. This resource management is controlled from a client perspective through VMware's vCloud Director environment. Connections between the virtual environment and the internet are governed by either an Edge Gateway or a Cisco ASA, each of which function as a firewall, router, and connection broker.

Common IaaS Procedures

Common operations for IaaS include accessing and configuring vCloud director, creating VMs, and managing resources.

vCloud Director Terminology

Organization (Org)

The logical security boundary created by vCloud Director to separate customers in a multi-tenant environment.

Virtual Machine (VM)

The container for a guest operating system such as Windows or Linux.

vApp

A Container for VMs. VMs can be grouped into vApps or separated into standalone vApps. vApps allow Org Administrators to define startup order for contained VMs, as well as create internal isolated networks.

Networks (External, Isolated, vApp)

- External Networks allow VMs to connect to the internet. Each Org will contain at least one of these. They also allow access to physical devices hosted by GreenCloud, if any.
- Isolated networks are used to provide connectivity between vApps within a vDC. These networks are managed through the same firewall as the External networks.
- vApp networks are private networks within a specific vApp. No other vApp in a vDC is able to access a vApp network. These are used for heartbeat or witness networks for cluster resources.

Virtual Data Center (vDC)

The resource allocation of CPU/Memory/Disk set aside for a client. Support tickets may be submitted to GreenCloud Support to change vDC allocations on the fly.

Catalog

An organizational resource used to store images (ISOs, FLP files, etc.) that may need to be attached to individual VMs or vApp templates for fast deployment of standardized VMs. Catalog resources do not count towards the vDC's used storage. GreenCloud/Cirrity public catalogs should be used when possible to avoid unnecessary storage utilization.

Accessing vCloud Director

1. Browser Requirements

Mozilla Firefox and Google Chrome are the preferred browsers for vCloud Director. Internet Explorer may be used, but the vCloud page must be added to Trusted Sites. Ensure that Pop-Ups are allowed for the vCloud page.

2. Locate vCloud URL

Your vCloud URL is available from the handoff email sent by GreenCloud support upon instantiation of your service. That email will also include credentials for login. Please save these credentials elsewhere as the link containing them will expire after a set amount of time.

3. Navigate to vCloud

Use the link in the email and log in to vCloud director through the screen shown below.

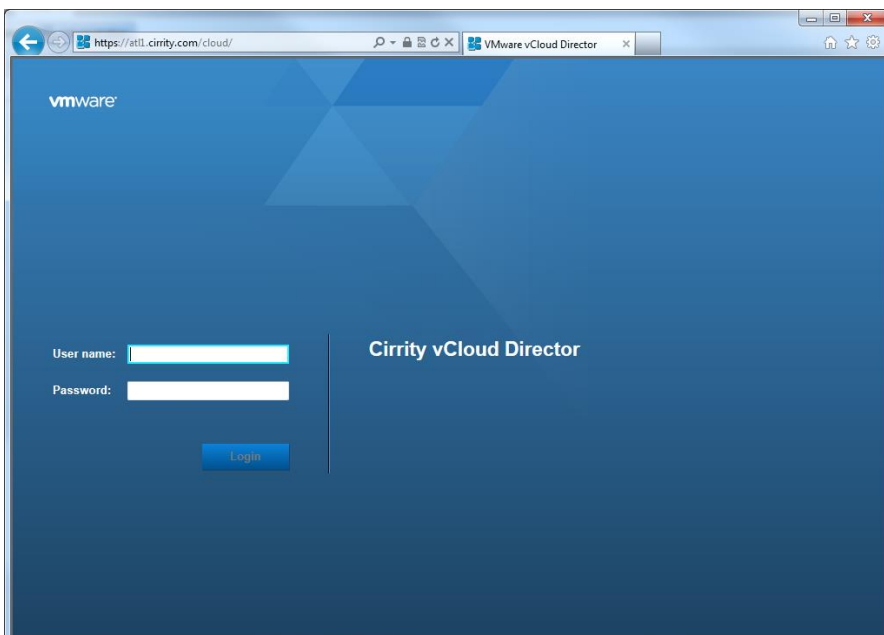


Figure 1 - vCloud Login Screen

Once you are logged into the vCloud Director, you will be able to perform tasks such as adding users, configuring networks, and adding VMs.

Creating Users and Managing Permissions

1. Log in to vCloud

See [Accessing vCloud Director](#) for more information on logging into vCloud.

2. Navigate to Users

Select the Administration tab, and select Users from the Members drop down on the left.

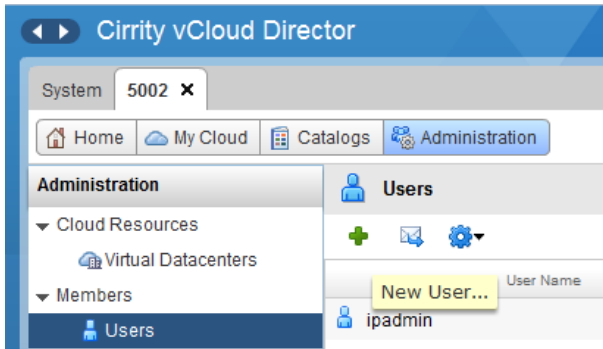


Figure 3 - vCloud Users

3. Creating a New User

Select the green "Plus" symbol shown above to create a new user. The New User dialog to the right is an example of an Organization Administrator, which includes permissions to perform networking changes as well as full catalog and vApp permissions.

4. Removing a User

To remove a user, first right-click on that user's entry in the Users section and select Disable. Then right-click and select Delete. Always transfer that user's objects when prompted in order to retain access to all vApps and VMs.

5. Permissions and Roles

User accounts may be restricted access to specific vApps or Catalogs by right clicking the object and choosing the Share option. Incorrect configurations limiting Org users from a certain resource may be resolved by contacting GreenCloud support. Default Roles exist to limit user access within the Org. Customized Roles may be requested by contacting GreenCloud support.

Figure 2 - New vCloud User

Email Alert and Notification Configuration

1. Log in to vCloud

See [Accessing vCloud Director](#) for more information on logging into vCloud.

2. Navigate to Email Settings

Select the Administration tab, and select Email from the Settings dropdown on the left.

The screenshot displays the vCloud Director Administration interface. The top navigation bar includes 'System 10553', 'Home', 'My Cloud', 'Catalogs', and 'Administration'. The left sidebar shows the 'Administration' menu with 'Email' selected. The main content area is titled 'Email' and contains two sections: 'SMTP Server' and 'Notification Settings'. In the 'SMTP Server' section, 'Set organization SMTP server' is selected, with fields for 'SMTP server name' (smtp01gsp.grncld.com), 'SMTP server port' (25), 'User name', and 'Password'. In the 'Notification Settings' section, 'Set organization notification settings' is selected, with fields for 'Sender's email address' (phx-vcd@gogreencloud.com), 'Email subject prefix' (PHX vCD Alert), and 'Send system notification to' (These email addresses). A 'Test destination' field and a 'Test Email Settings' button are at the bottom.

Figure 4 - vCloud Email Settings

3. Configure Email Settings

From the screen shown above, select "Set organization notification settings". Enter a "from" email address for the notifications, and ensure that email is whitelisted in the recipient's mail server. Select which email addresses will receive notifications. If using "These email addresses", separate addresses with a comma.

Org VDC Network Management

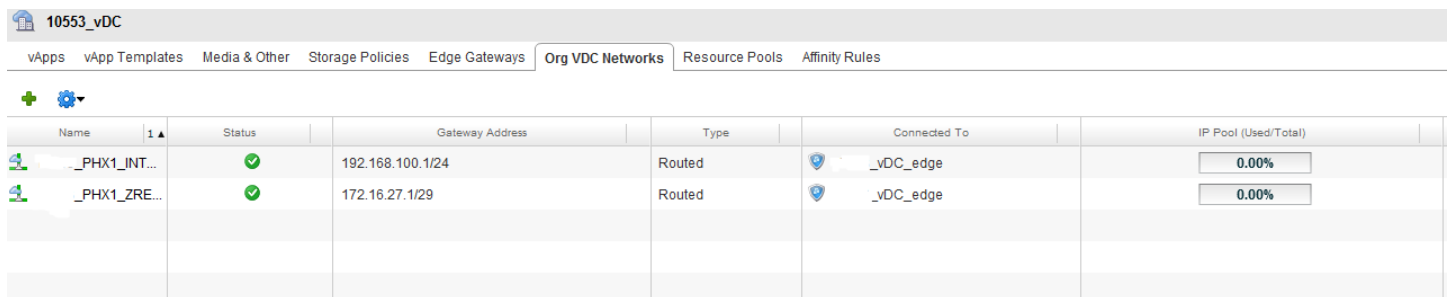
Edge Gateway vs. Cisco ASA

GreenCloud IaaS environments are deployed with either an Edge Gateway router or a Cisco ASA firewall.

1. Overview of differences
2. Org VDC network differences
3. Reference each document (Edge Gwy and ASA reference guides)

View Org VDC Networks

To view the Org VDC networks on a VDC, log in to vCloud, select the Administration tab, double-click on a vDC, and select the Org VDC Networks tab.



Name	Status	Gateway Address	Type	Connected To	IP Pool (Used/Total)
_PHX1_INT...	OK	192.168.100.1/24	Routed	_vDC_edge	0.00%
_PHX1_ZRE...	OK	172.16.27.1/29	Routed	_vDC_edge	0.00%

Figure 5 - Org VDC Networks

Types of Org VDC Networks

There are three types of Org VDC networks in vCloud:

- Isolated networks are for private IP subnets.
 - These networks can be used to allow vApps to communicate with one another, and can be used to create IP pools on which VMs can be addressed.
 - These can be used to allow internal communication to the external internet through a Cisco ASA. For more information on Cisco ASAs, please see the Cisco ASA Reference Guide.
- Routed networks are connected directly to an Edge Gateway.
 - They can be used to allow internal communication to the external internet.
 - These should be used in place of isolated networks when an Edge Gateway is present in the vDC. For more information on Edge Gateways, please see the Edge Gateway Reference Guide.
- External network direct connections are only used to connect a private VLAN to a customer environment.
 - Please do not connect directly to an external network without instruction to do so. It will not work.
 - More information on Org VDC external network connections can be retrieved by contacting GreenCloud Support.

Org VDC Network Creation

To create a new Org VDC Network, select the green plus symbol from the Org VDC Networks tab. In the dialog, select the type of network to be created.

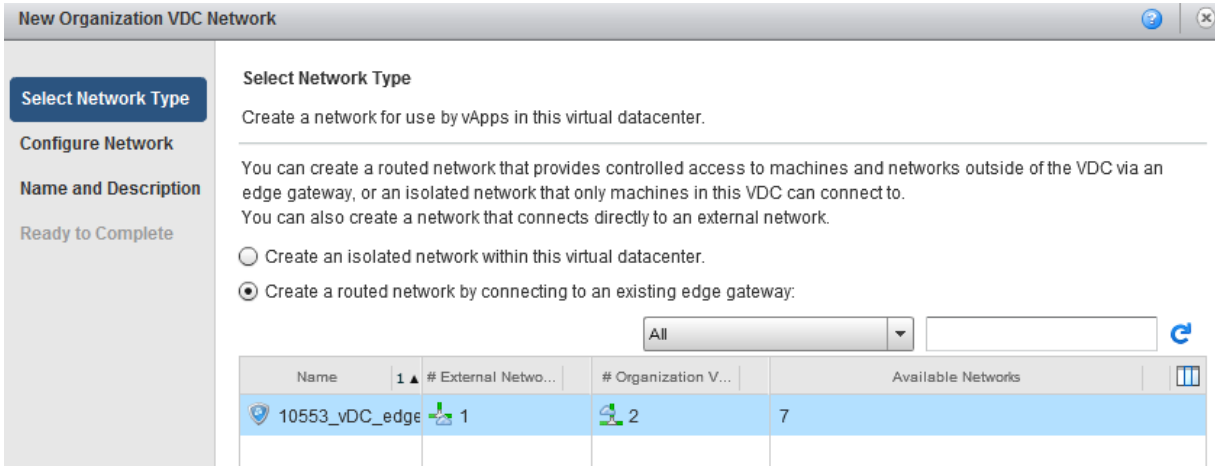


Figure 6 - Org VDC Network Creation

If an Edge Gateway is present, create a routed network and select the existing Edge Gateway as shown above, then select Next. Otherwise a new isolated network can be created.

At the next page, enter the relevant network information. To allocate IPs to the Static IP Pool, enter a range in the box and select "Add". The example below includes a subnet on 192.168.5.0/24, and allocates 192.168.5.100-192.168.5.199.

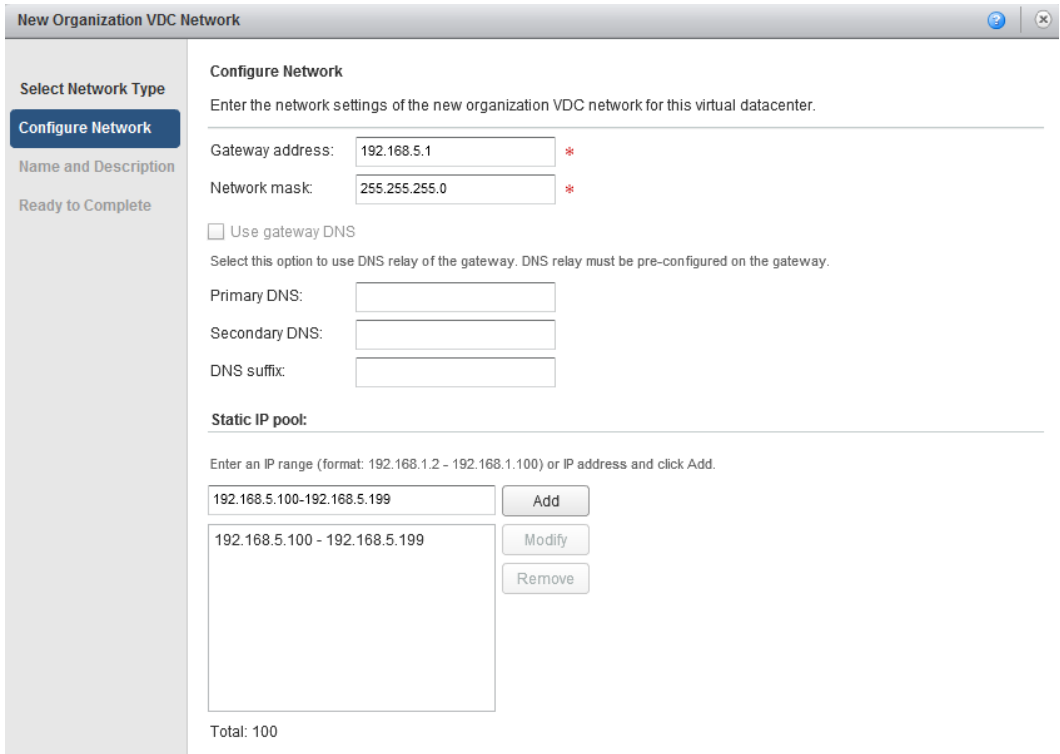


Figure 7 - Org VDC Network Configuration

Select "Next" when the IP configuration is correct. At the following screen, enter the name of the new Org VDC network and select "Finish". Verify that all information is correct.

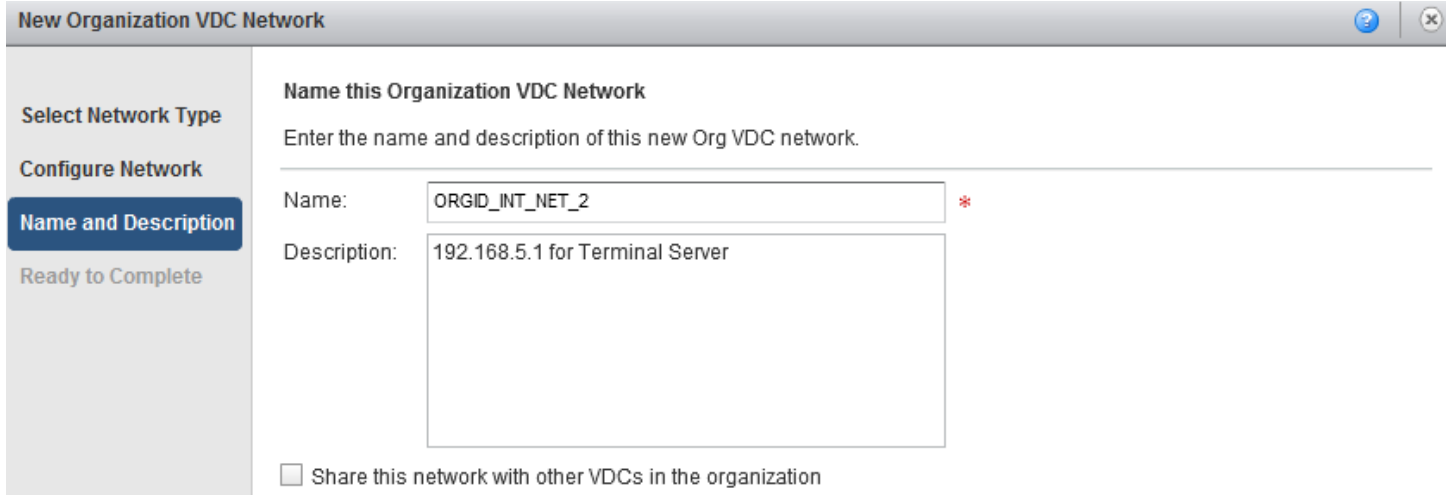


Figure 8 - Org VDC Network Finalization

At this point the Org VDC network is complete. If you reach the network quota for a vDC you will not be able to create any more networks, but there will be no error until this point in the process. The network quota can be increased by contacting GreenCloud support.

Connecting a VM to an Org VDC Network

In order to reach the internet, each VM must be connected to an Org VDC network with internet access. This will be either a Routed network with access to an Edge Gateway, or an Isolated network with access to an ASA. Right-click on a VM and select Properties, then go to the Hardware tab. Scroll down to the NICs section. See [VM Management](#) for more details.

Select the Network dropdown and click on "Add Network..." to open the dialog.

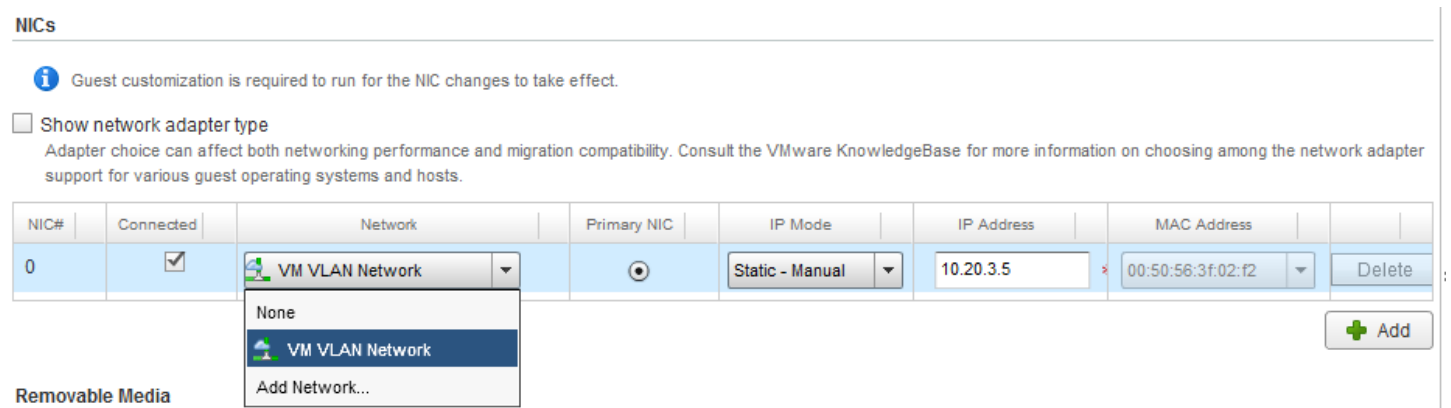
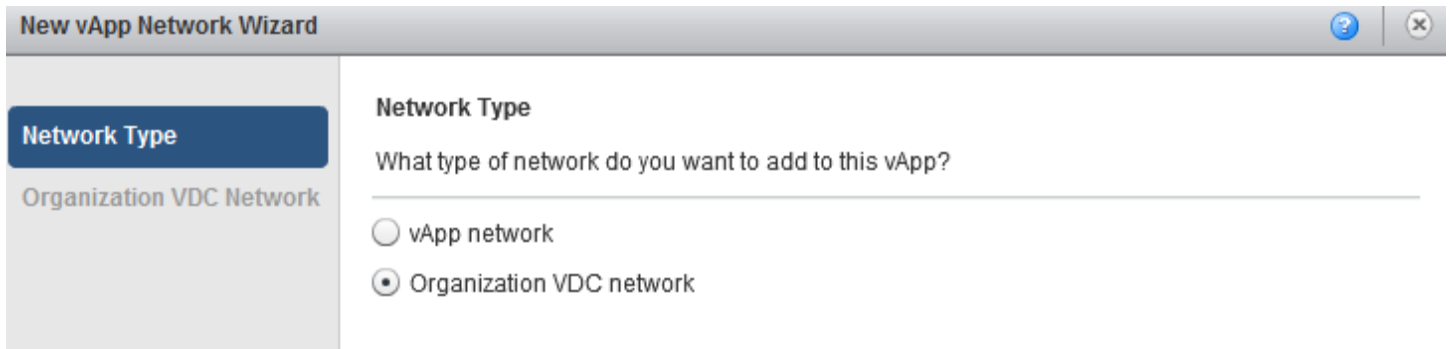


Figure 9 - Add Org VDC Network to VM

Select "Organization VDC network" at the next screen as shown:



New vApp Network Wizard

Network Type

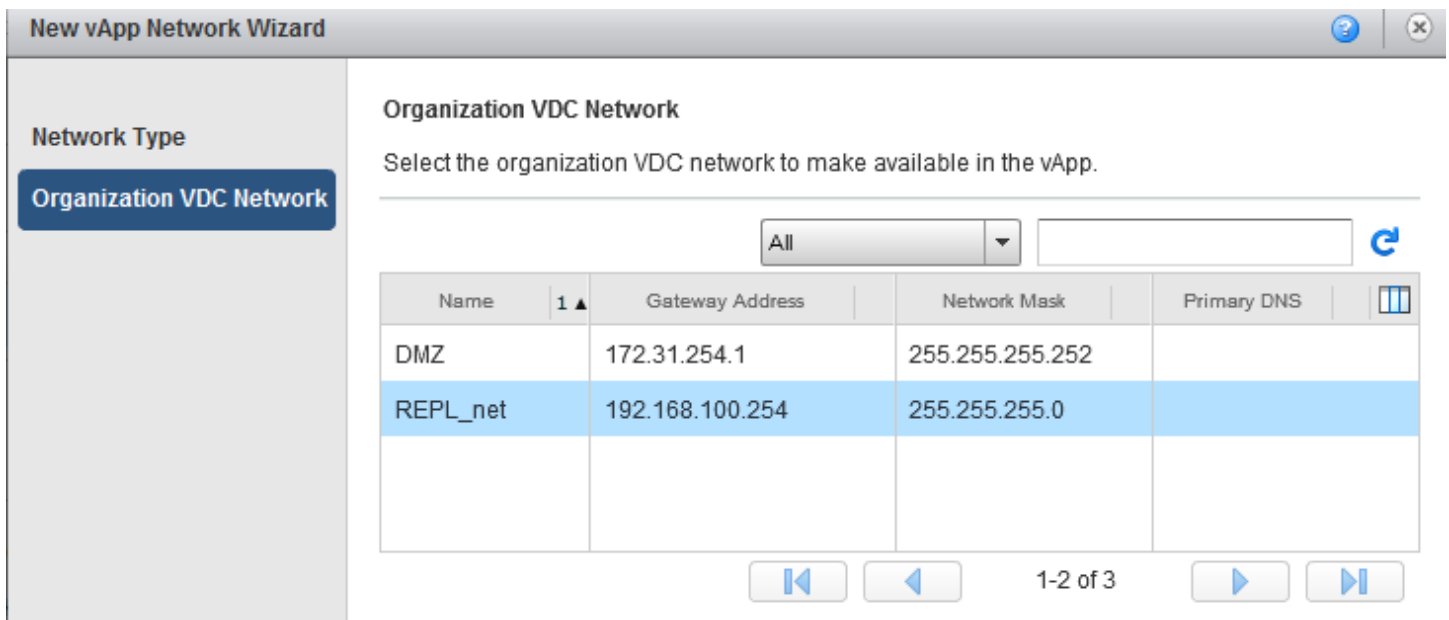
What type of network do you want to add to this vApp?

vApp network

Organization VDC network

Figure 10 - VM Add Network Type

Select the appropriate Org VDC network, and select Finish.



New vApp Network Wizard

Organization VDC Network

Select the organization VDC network to make available in the vApp.

All

Name	Gateway Address	Network Mask	Primary DNS
DMZ	172.31.254.1	255.255.255.252	
REPL_net	192.168.100.254	255.255.255.0	

1-2 of 3

Figure 11 - VM Add Network Selection

The VM will now have connectivity to that Org VDC network, and will have the ability to use IPs from that network. If the Org VDC network is routed to an Edge Gateway or connected to a Cisco ASA, the VM should be able to communicate with the internet. Please note that the proper NAT and Firewall rules will need to be configured in order to allow communication. Documentation on Edge Gateways or Cisco ASAs can be retrieved by contacting GreenCloud support.

vApp/VM Creation

1. Log in to vCloud

See "Accessing vCloud Director" on p. 4 for more information on logging into vCloud.

2. Add New vApp From Catalog

Navigate to My Cloud, and select the green plus symbol to "Add vApp from catalog".

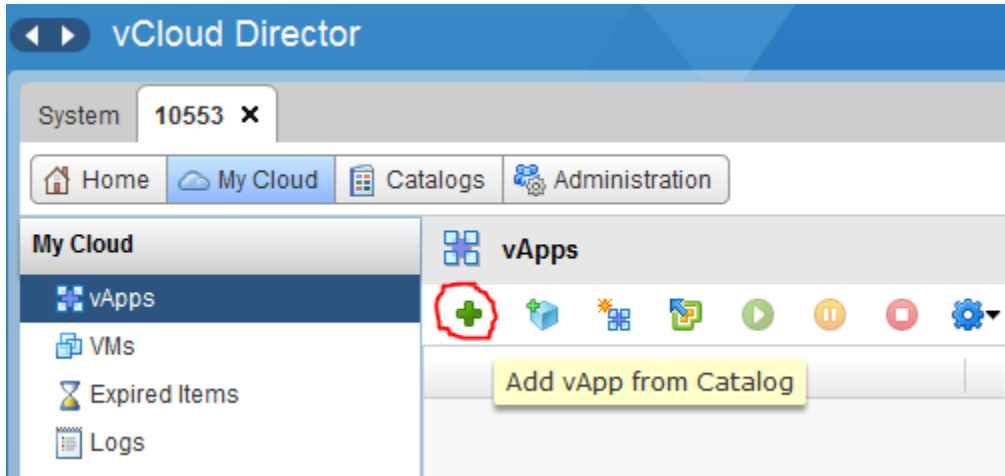


Figure 12 - Add vApp From Catalog

3. Select vApp Template

Drop the "Look In" dropdown to display "Public Catalogs", and select "All Templates" below that to display all available templates.

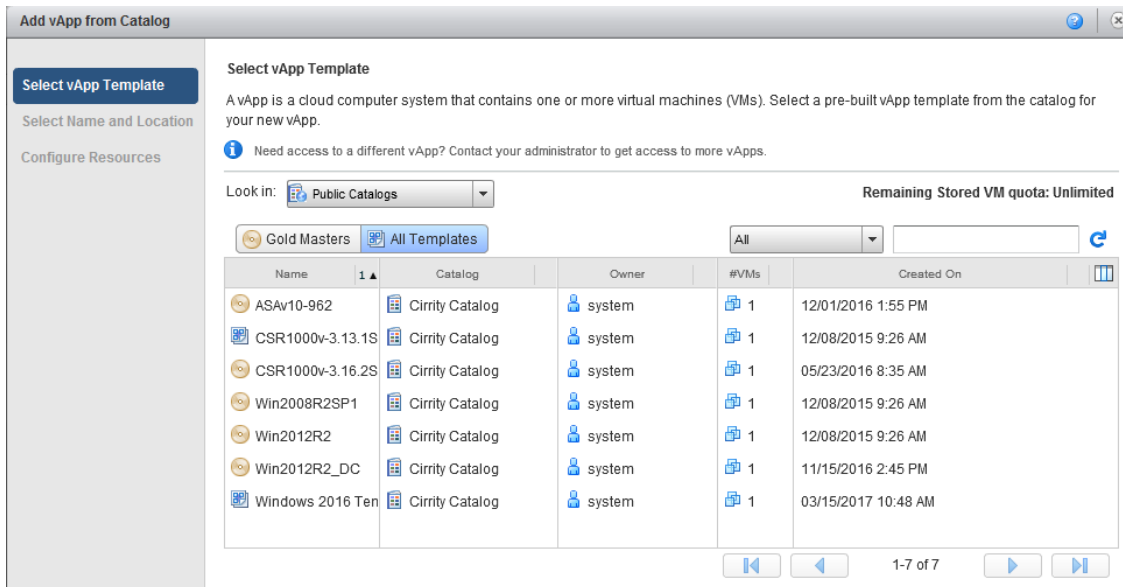


Figure 13 - Select vApp Template

4. Select Name and Location

Name the vApp and select the vDC for the appropriate client.

The screenshot shows the 'Add vApp from Catalog' wizard. The left sidebar contains the following steps: 'Select vApp Template', 'Select Name and Location' (highlighted), 'Configure Resources', 'Configure Networking', 'Customize Hardware', and 'Ready to Complete'. The main area is titled 'Select Name and Location' and contains the following text: 'A vApp is a cloud computer system that contains one or more virtual machines. Describe this vApp and select its Virtual Datacenter.' Below this, there are two input fields: 'Name:' with the value 'CLIENT-VMNAME' and a red asterisk, and 'Description:' with the value 'VM containing \$application for \$client'. Below these fields is a section titled 'Virtual Datacenter' with the text 'Select the Virtual Datacenter (VDC) in which this vApp is stored and runs when it is started.' and a dropdown menu showing '10553_vDC'.

Figure 14 - Select Name and Location (Template)

5. Configure Resources

Name the VM and select the Storage Policy. The Storage Policy determines the performance and snapshot rules for that VM's hard disk. This was configured when the vDC was provisioned by GreenCloud. Storage may be changed or added to a vDC by contacting GreenCloud Support.

The screenshot shows the 'Add vApp from Catalog' wizard. The left sidebar contains the following steps: 'Select vApp Template', 'Select Name and Location', 'Configure Resources' (highlighted), 'Configure Networking', 'Customize Hardware', and 'Ready to Complete'. The main area is titled 'Configure Resources' and contains the text: 'Select what Storage Policies this vApp's virtual machines will use when deployed.' Below this is a table with three columns: 'Virtual Machine', 'Storage Policy', and 'Template VM Default Storage Policy'. The first row contains the following data:

Virtual Machine	Storage Policy	Template VM Default Storage Policy
CLIENT-VMNAME *	vStream	Performance

Figure 15 - Configure Resources (Template)

6. Configure Networking

Name the computer (Hostname) and select the network to attach to the NIC on creation. If an Org VDC network has not yet been created, leave the dropdown on "None". Otherwise select the Org VDC network for the client.

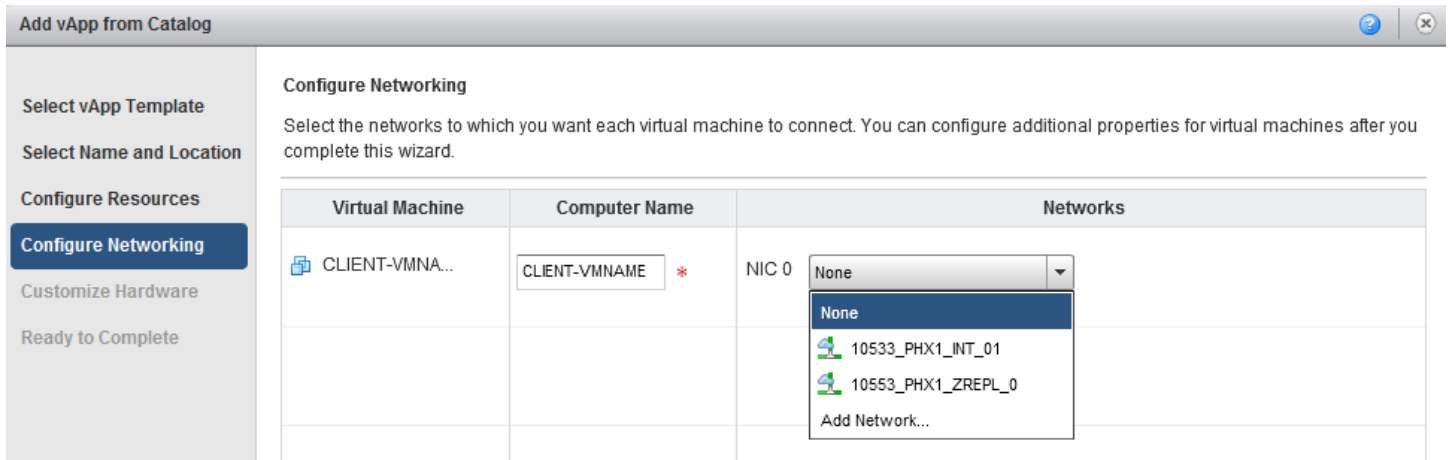


Figure 16 - Configure Networking (Template)

7. Customize Hardware

Enter the resources for the VM per the necessary for operation. All GreenCloud VMs operate under the Allocation model, which means that the entire VDC is given a CPU speed (e.g. 12 GHz, or six 2GHz CPUs), and that speed is spread across all VMs. Your CPU and RAM settings may not exceed the allocated limits. See below for a VM with six CPUs at 2GHz each, 4GB RAM, and 40GB HDD space. Please double-check the total disk allocation for the vDC before continuing as the total allocation cannot be exceeded, and VM deployment will fail.

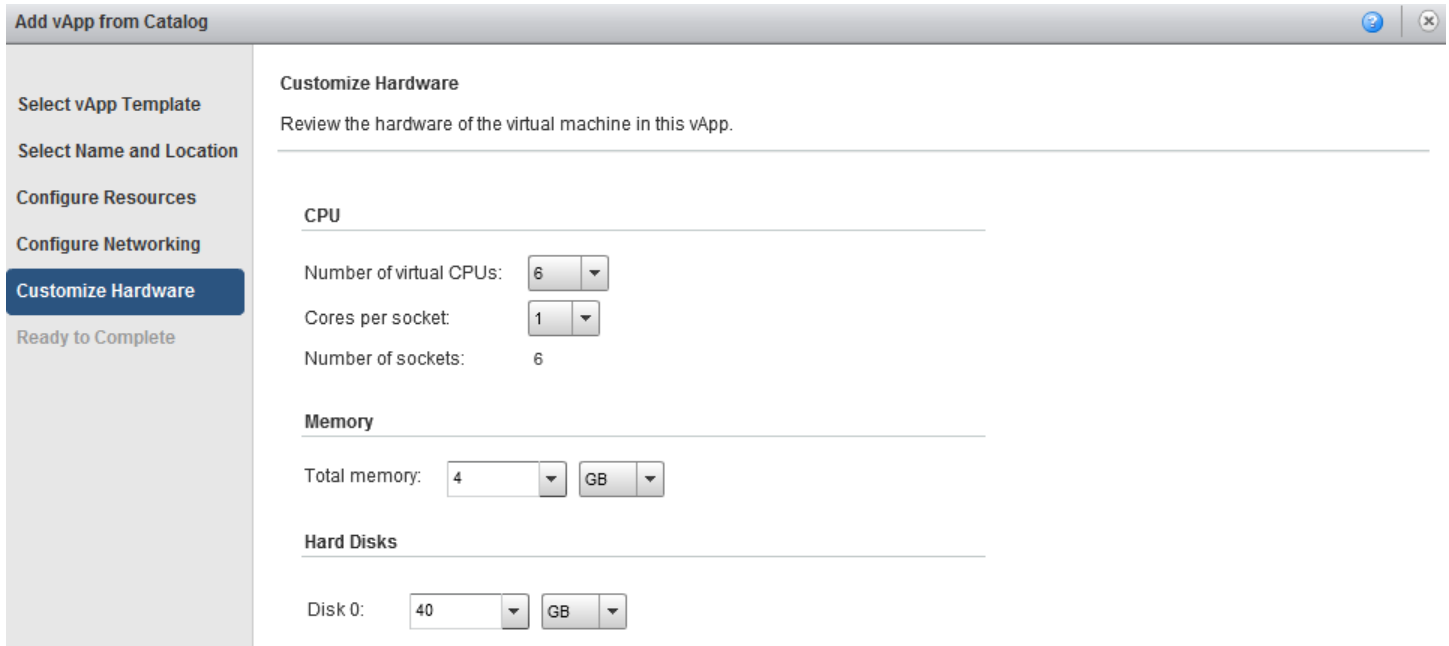


Figure 17 - Customize Hardware (Template)

8. Finalize VM Creation

Finalize the creation of the VM from the next screen. Verify that all resources are correct and select "Finish".

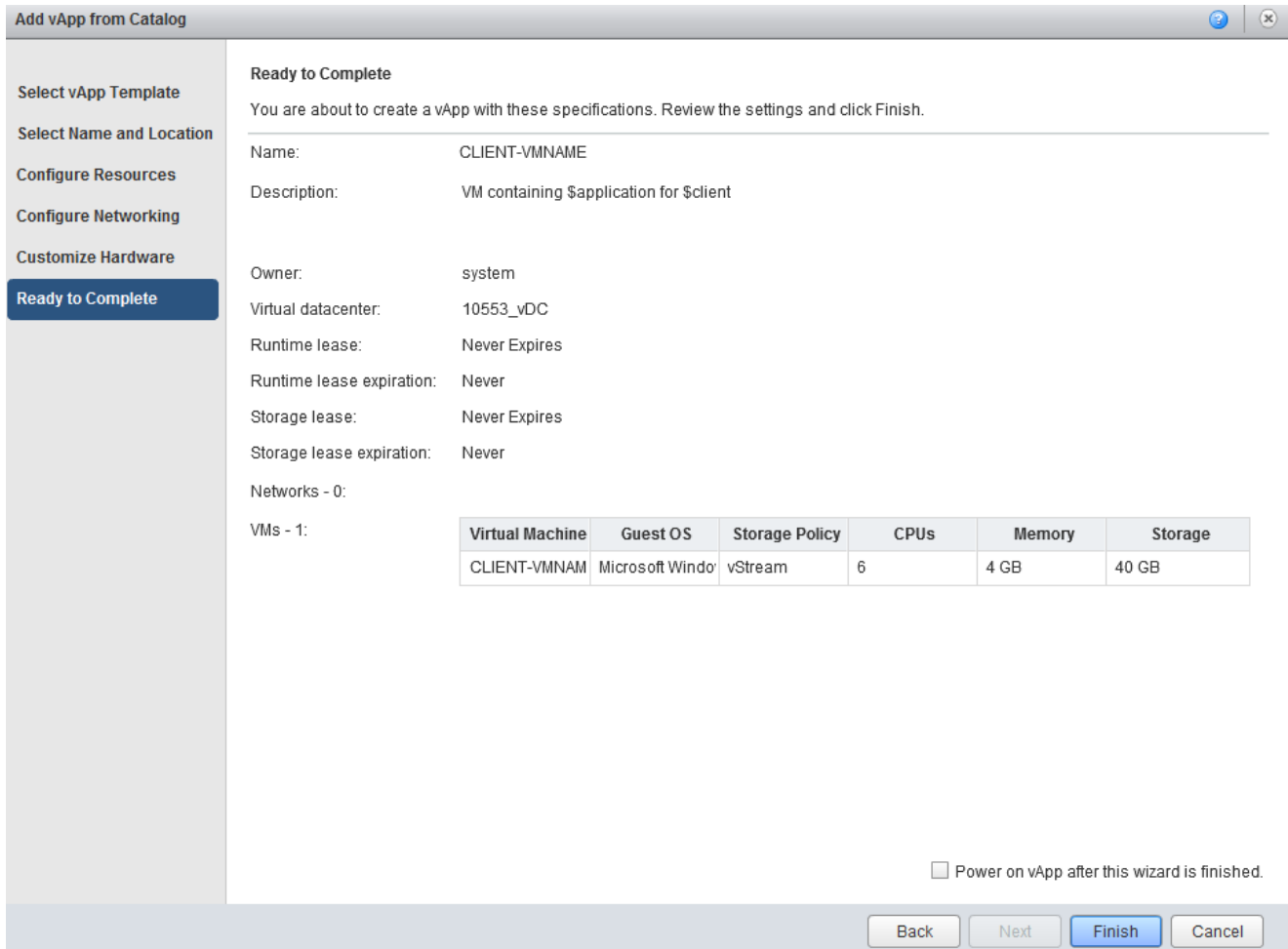


Figure 18 - Finalize VM (Template)

The creation process will take anywhere from 5 to 30 minutes. Once the vApp has been created, before powering on, select "VMs" from the left-hand bar, right-click and select "Properties" to view the VM properties. Ensure all hardware settings are correct before powering on.

9. Guest OS Customization

Please review the [Guest OS Customization](#) section in this document before powering on the VM.

10. VM Creation Complete

The VM is now available for use. Please note that networking will need to be set up either through the client's Edge Gateway or their ASAv to allow network traffic out of the VDC. If something prevents the vApp from powering on, please see the VM Management section below, or contact GreenCloud support.

VM Management

Resource Verification

Organization Administrators are able to monitor vDC resource consumption before making resource changes to a VM. Under the Administration tab, select "Virtual Datacenters" and switch to the "Monitor" tab. This will display the current level of allocated resources assigned to powered on VMs. More resources may be added by opening a ticket with GreenCloud support, or contacting a GreenCloud sales representative.

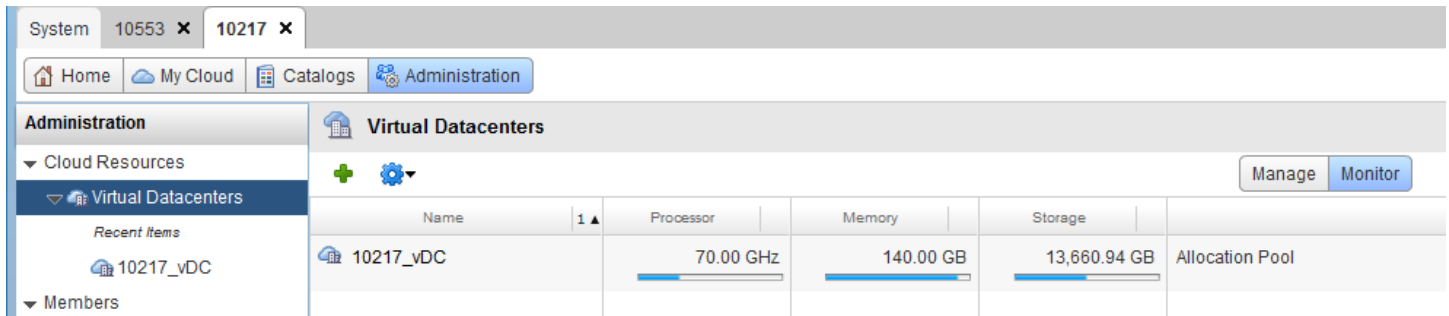


Figure 19 - Monitor vDC Resources

VM Resource Changes

The following changes require the VM to be shut down:

- Modify CPU/Memory
- Change Network Connection
- Move to a different vApp or vDC
- vApp Template creation

To make changes to a VM, right-click and select Properties, then select the Hardware tab at the top.

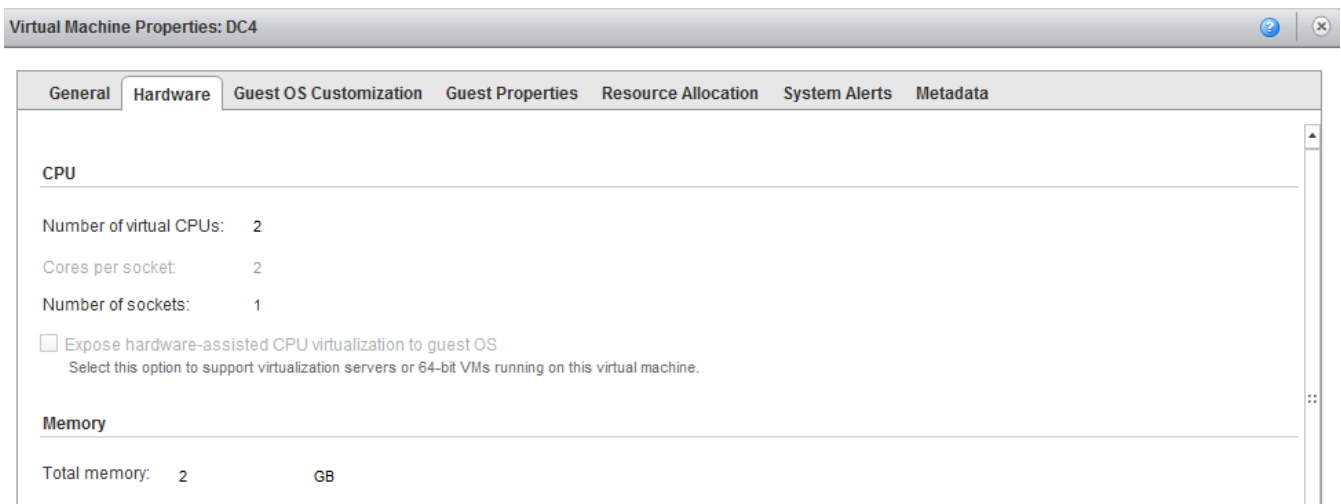



Figure 20 - Modify VM CPU/Memory

At the top of the Hardware tab, the CPU and Memory can be modified once the VM is powered down. To view the rest of the Hardware tab, scroll down.

Hard Disks

 Some hard drive properties cannot be modified while the virtual machine is powered on.

Name	Storage			Bus Type	Bus Number	Unit Number	
Disk 0	40	GB	(Use VM default)	LSI Logic SAS (SCSI)	0	0	Delete



 Add

Figure 21 - Modify VM Hard Disks

Disks can be added and removed from the VM from the Hard Disks section. Disk sizes can also be changed here. Please note that disks can only be expanded. To remove space from a disk, you will need to create a new, smaller disk, copy the data to it, and delete the original large disk. For this reason, GreenCloud recommends having a dedicated boot disk with the OS and adding separate disks as opposed to expanding the boot disk and using partitions. Disk additions of more than 2TB require a VM shutdown.

NICs

 Guest customization is required to run for the NIC changes to take effect.

Show network adapter type

Adapter choice can affect both networking performance and migration compatibility. Consult the VMware KnowledgeBase for more information on choosing among the network adapter support for various guest operating systems and hosts.

NIC#	Connected	Network	Primary NIC	IP Mode	IP Address	MAC Address	
0	<input checked="" type="checkbox"/>	VM VLAN Network	<input checked="" type="radio"/>	Static - Manual	10.20.3.5	00:50:56:3f:02:f2	Delete

 Add

Figure 22 - Modify VM NICs

A VM’s NIC can be modified from the NICs section. The Network dropdown shows the Org VDC network to which the NIC is currently connected. The IP mode (Manual, Pool, or DHCP) can be set, and the IP address can be viewed. The IP can also be set here if the IP mode is manual. Should the MAC address need to be modified, it can be refreshed here while the VM is powered off.

After making any changes, a running task will appear in the vCloud interface. Once the task is complete, the changes will have been applied and the VM can be powered on.

Guest OS Customization

Guest OS Customization is a VMware tool which forces changes to the VM's network settings, host name, administrator password, and domain membership, and can run customization scripts. However, **it is not recommended to run Guest OS Customization more than once**. Guest Customization should be run once to change the SID on a new VM for licensing purposes, and to reset the initial administrator password, and should be disabled after this.

To change Guest OS Customization settings, right-click a powered off VM and select Properties, then go to the Guest OS Customization tab. See below for an example. The "Enable guest customization" and "Change SID" checkboxes should be checked on first startup, as well as the "Allow local administrator password". Make sure to specify a strong password.

The VM will restart multiple times after applying Guest OS Customization. The process will take 10-15 minutes. **Once the process is complete, shut the VM down and disable Guest OS Customization. Otherwise there is a risk that the hostname may accidentally change or the administrator password may randomly reset at a later date.**

The screenshot shows the 'Guest OS Customization' tab in a VMware interface. The 'General' section includes a checked checkbox for 'Enable guest customization' and an unchecked checkbox for 'Change SID'. The 'Password Reset' section has 'Allow local administrator password' checked, with 'Specify password' selected. The 'Join Domain' section has 'Enable this VM to join a domain' unchecked.

Figure 23 - Guest OS Customization

Importing and Exporting VMs

Importing VMs from Images (OVA, OVF)

VMs can be uploaded to vCloud through the vCloud Client Integration Plugin. Please note that FireFox Extended Service Release (ESR) is the only supported browser for this plugin. To import a VM from an existing OVF, navigate to the My Cloud tab, and select "Add vApp from OVF" as shown below:

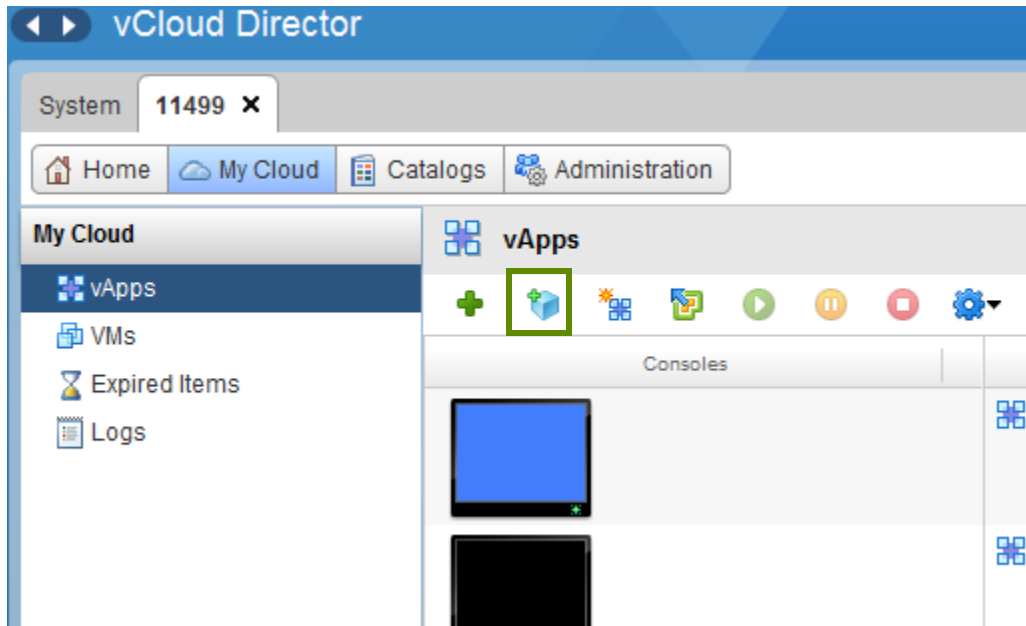


Figure 24 - Add vApp from OVF

At this point, if the Client Integration Plugin is not installed, a prompt will appear to download and install as shown below:

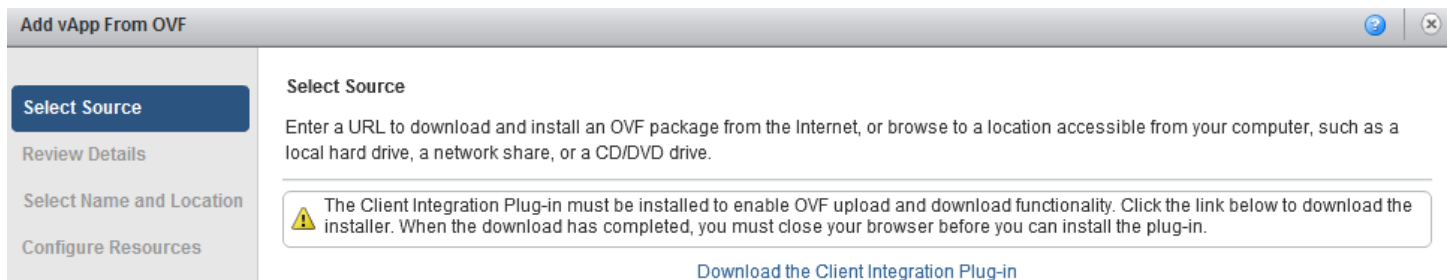


Figure 25 - Download Client Integration Plug-in

Otherwise, the Client Integration Plugin window will appear and allow a vApp upload. At this point the vApp deployment process is identical to the [vApp/VM Creation](#) process outlined previously in this document. Please note, as previously stated, that only Firefox ESR is known to be compatible with this upload plugin. Templates can also be transferred to GreenCloud support for manual upload to the Org Catalog. See [Catalog Management](#) below for more information on Catalog images.

Exporting VM Images

In order to create a VM image, navigate to the My Cloud tab and select a vApp. Right-click and select “Add to Catalog...” as shown:

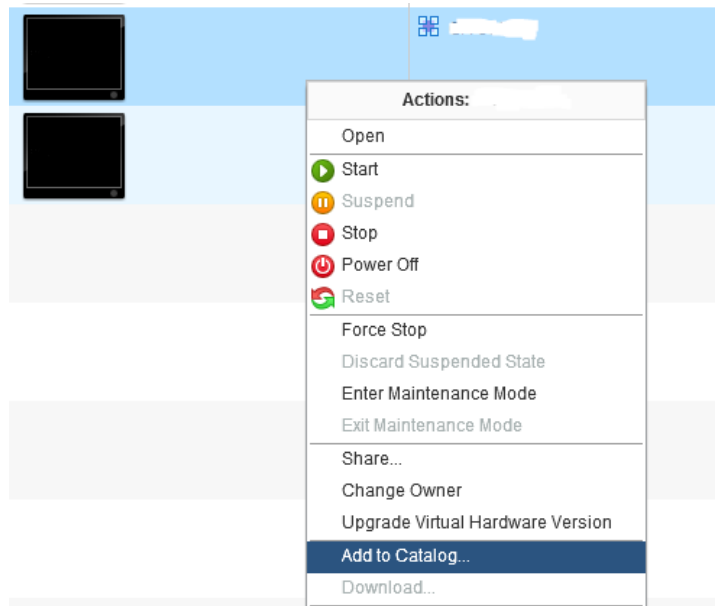


Figure 26 - Add vApp to Catalog

Add the vApp to a catalog local to the organization. Generally, selecting “Customize VM Settings” is the preferred option. See below for an example:

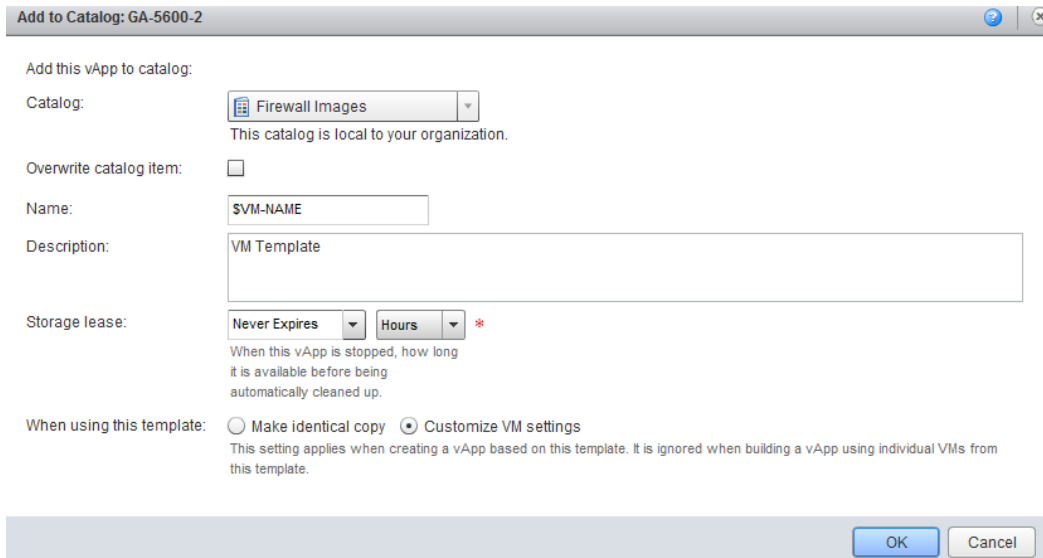


Figure 27 - Add vApp To Catalog Menu

After the Catalog addition is complete. Navigate to the Catalogs tab and select the Catalog to which the vApp was added. At this point the media in the catalog can be downloaded, added to "My Cloud" as a new VM, or removed through the right-click menu. See below for an example.

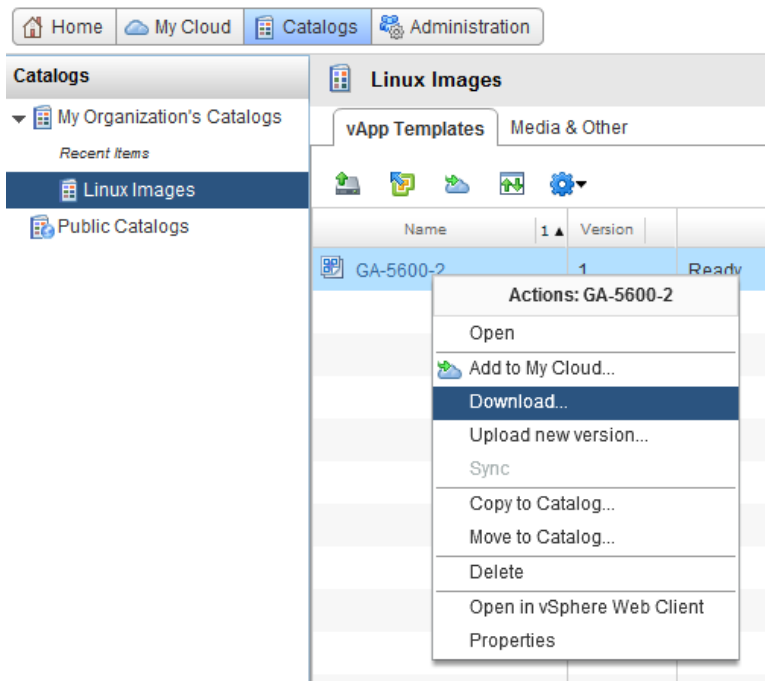


Figure 28 - Download vApp Image

See [Catalog Management](#) below for more information on media management within the Org Catalog.

For larger VMs, VMware's OVF Tool may be a more stable option. Please see [VMware's OVF Tool Documentation](#) for more information.

Catalog Management

Viewing Catalog Contents

The vCloud Catalog contains all digital media accessible to an Org. This may include media such as VM Images (OVA or OVF), and disk images (ISO). To view the Org Catalog, navigate to the Catalogs tab and select My Organization's Catalogs.

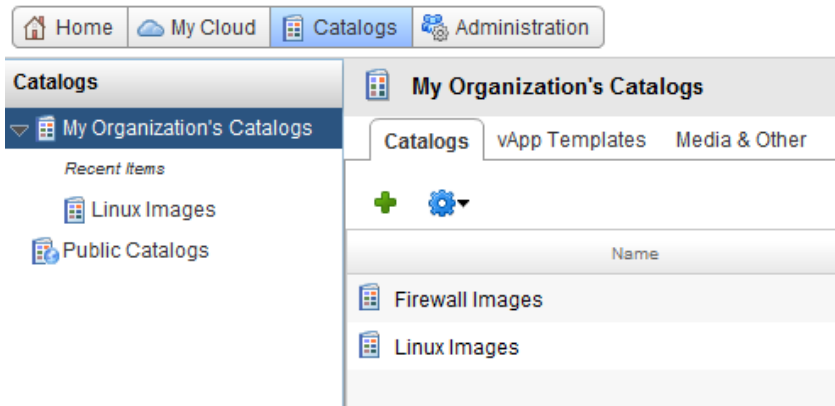


Figure 29 - My Organization's Catalogs

These catalogs can be created using the green plus symbol. Catalogs can be used to organize different types of vApp images and ISO images. Select the Media & Other tab in order to view ISO disk images.

Adding Content to Catalog

To add content to an Org Catalog, double-click that catalog in the "My Organization's Catalogs" view.

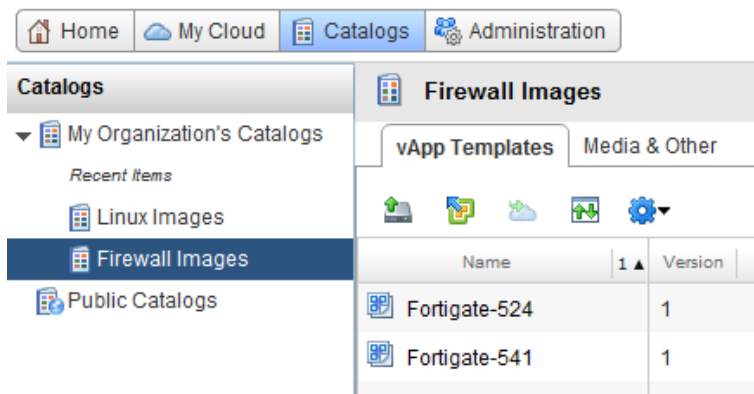


Figure 30 - Add Media to Catalog

Then use the Upload button in order to begin a Client Integration Plug-in upload. Please see [Importing VMs from Images](#) for more information on Client Integration Plug-In Requirements. Once the upload is complete, the media will be accessible from the Org Catalog.

Please note that vApp and ISO images in the Catalog take up vDC Storage space.

Mounting Media to VMs

ISO images in the Org Catalog can be mounted to active VMs. Navigate to My Cloud, then select VMs from the left-hand bar. Right-click on a VM and select "Insert CD/DVD from Catalog..." as shown below:

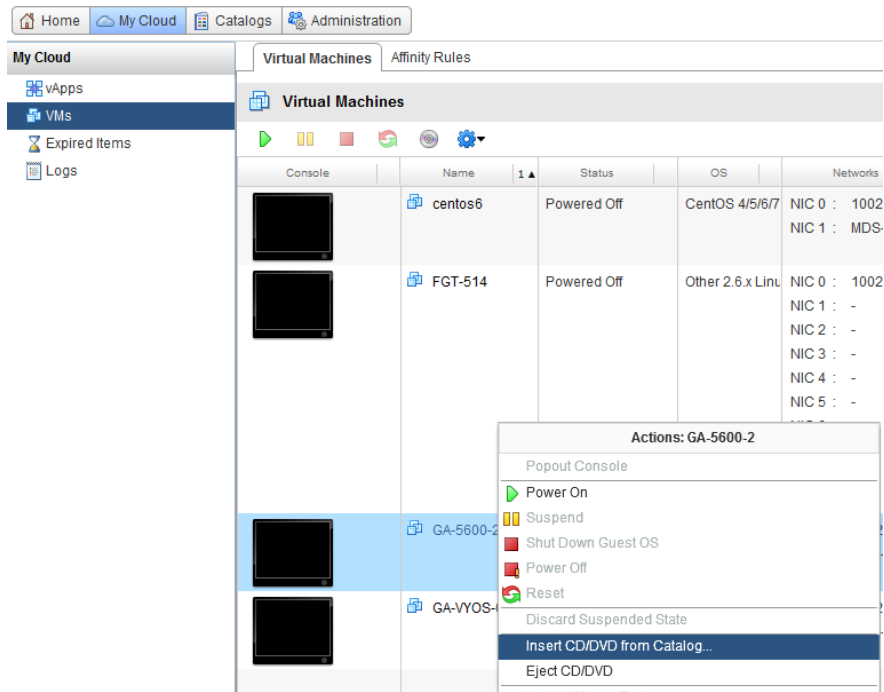


Figure 31 - Insert CD/DVD from Catalog

All available media in both the Org Catalog and the Public Catalog (GreenCloud's Public media) will appear. To select the relevant ISO image, type the name into the upper-right hand search bar and click the blue refresh arrow.

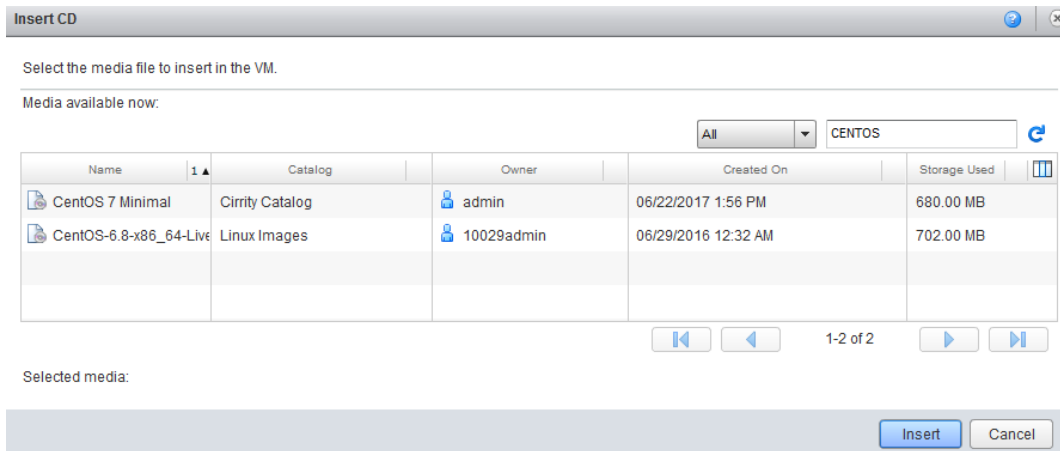


Figure 32 - Insert CD

Only the relevant media will be left. Select an ISO and click Insert. Once the VM is ready the ISO will appear as a CD drive on the VM. Please note that GreenCloud defaults to booting to hard disk. Please use the "Enter BIOS Setup" check box in VM General Properties to boot to an ISO image.

Appendix A – Revision History

AUTHOR	DATE	COMMENTS	VER.
Tyler Misel	2013-01-21	Initial Contribution	
Alex Reid	2017-04-29	GreenCloud Content update	
Alex Reid	2017-07-31	GreenCloud Template update, format/graphics overhaul	
Alex Reid	2017-08-14	Org VDC Networks	0.1
Alex Reid	2017-08-25	Reorganization, added Import/Export and Catalog Management	0.2
Alex Reid	2017-08-30	Initial Publication	1.0