VMware Cloud Foundation on Dell EMC VxRail Guide

VMware Cloud Foundation 4.3

You can find the most up-to-date technical documentation on the VMware website at:

https://docs.vmware.com/

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About VMware Cloud Foundation on Dell EMC VxRail

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The *VMware Cloud Foundation on Dell EMC VxRail Guide* provides information on managing the integration of VMware Cloud Foundation and Dell EMC VxRail. As this product is an integration of VMware Cloud Foundation and Dell EMC VxRail, the expected results are obtained only when the configuration is done from both the products. This guide covers all the information regarding the VMware Cloud Foundation workflows. For the instructions on configuration to be done on Dell EMC VxRail, this guide provides links to the Dell EMC VxRail documentation.

Intended Audience

The *VMware Cloud Foundation on Dell EMC VxRail Guide* is intended for the system administrators of the VxRail environments who want to adopt VMware Cloud Foundation. The information in this document is written for experienced data center system administrators who are familiar with:

- Concepts of virtualization, software-defined data centers, and virtual infrastructure (VI).
- VMware virtualization technologies, such as VMware ESXi™, the hypervisor
- Software-defined networking using VMware NSX-T™ Data Center
- Software-defined storage using VMware vSAN™
- IP networks

Additionally, you should be familiar with these software products, software components, and their features:

- Dell EMC VxRail Manager
- VMware vSphere®
- VMware vCenter Server® and VMware vCenter Server® Appliance™
- VMware vRealize® Log Insight™
- VMware vSphere® with VMware Tanzu™

Related Publications

The *Planning and Preparation Workbook* provides detailed information about the software, tools, and external services that are required to deploy VMware Cloud Foundation on Dell EMC VxRail.

The *VMware Cloud Foundation on Dell EMC Release Notes* provide information about each release, including:

- What's new in the release
- Software components and versions included in the Bill of Materials (BOM)
- Resolved issues
- Known issues

The *VMware Cloud Foundation on Dell EMC VxRail API Reference Guide* provides information about using the API.

VMware Cloud Foundation on Dell EMC VxRail

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VMware Cloud Foundation on Dell VMC VxRail enables VMware Cloud Foundation on top of the Dell EMC VxRail platform.

An administrator of a VMware Cloud Foundation on Dell EMC VxRail system performs tasks such as:

- Deploy VMware Cloud Foundation on Dell EMC VxRail.
- Manage certificates.
- Add capacity to your system.
- Configure and provision workload domains.
- Manage provisioned workload domains.
- Monitor alerts and the health of the system.
- Troubleshoot issues and prevent problems across the physical and virtual infrastructure.
- Perform life cycle management on the software components.

Prepare a VxRail Environment for Cloud Builder Appliance Deployment

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Before you can deploy the VMware Cloud Builder Appliance on the VxRail cluster, you must complete the following tasks.

Procedure

1. Imaging the VxRail Management Nodes

   Image the VxRail management nodes by using Dell EMC RASR (Rapid Appliance Self Recovery) process. Ensure that you update the RASR image in each server node SD card before you start the imaging process.

2. VxRail First Run for the Management Cluster

Imaging the VxRail Management Nodes

Image the VxRail management nodes by using Dell EMC RASR (Rapid Appliance Self Recovery) process. Ensure that you update the RASR image in each server node SD card before you start the imaging process.

For detailed information about how to image the VxRail management nodes, contact Dell EMC Support.

VxRail First Run for the Management Cluster

The VxRail first run for the management cluster consists of the following tasks:

- The discovery of the VxRail Nodes occurs. All the nodes that were imaged are detected.
- Upload the JSON configuration file. Trigger the validation.
- All the configuration inputs are validated.

The following components are deployed and enabled:

- vCenter
- VSAN
- VxRail Manager

Click **Manage VxRail** to log in to the VMware vCenter server.

For information on VxRail First Run, contact Dell EMC Support.

Deploy VMware Cloud Builder Appliance

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The VMware Cloud Builder appliance is a VM that you use to deploy and configure the management domain and transfer inventory and control to SDDC Manager. During the deployment process, the VMware Cloud Builder validates network information you provide in the deployment parameter workbook such as DNS, network (VLANS, IPs, MTUs), and credentials.

This procedure describes deploying the VMware Cloud Builder appliance to the cluster that was created during the VxRail first run.

Prerequisites

The VMware Cloud Builder requires the following resources.

Component	Requirement
CPU	4 vCPUs
Memory	4 GB
Storage	150 GB

The VMware Cloud Builder appliance must be on the same management network as the hosts to be used. It must also be able to access all required external services, such as DNS and NTP.

Procedure

1. Download the VMware Cloud Builder appliance OVA.
2. Log in to vCenter Server using the vSphere Client.
3. In the navigator, select the cluster that was created during the VxRail first run.
4. Click **Actions > Deploy OVF Template**.
5. Select **Local file** and click **Upload Files**.
6. Browse to the VMware Cloud Builder appliance OVA, select it, and click **Open**.
7. Click **Next**.
8. Enter a name for the virtual machine, select a target location, and click **Next**.
9. Select the cluster you created during the VxRail first run and click **Next**.
10. Review the details and click **Next**.
11. Accept the license agreement and click **Next**.

12 On the Select Storage page, select the storage for the VMware Cloud Builder appliance and click **Next**.

13 On the Select networks dialog box, select the management network and click **Next**.

14 On the Customize template page, enter the following information for the VMware Cloud Builder appliance and click **Next**:

Setting	Details
Admin Username	The admin user name cannot be one of the following pre-defined user names: ■ root ■ bin ■ daemon ■ messagebus ■ systemd-bus-proxy ■ systemd-journal-gateway ■ systemd-journal-remote ■ systemd-journal-upload ■ systemd-network ■ systemd-resolve ■ systemd-timesync ■ nobody ■ sshd ■ named ■ rpc ■ tftp ■ ntp ■ smmsp ■ cassandra
Admin Password/Admin Password confirm	The admin password must be a minimum of 8 characters and include at least one uppercase, one lowercase, one digit, and one special character.
Root password/Root password confirm	The root password must be a minimum of 8 characters and include at least one uppercase, one lowercase, one digit, and one special character.
Hostname	Enter the hostname for the VMware Cloud Builder appliance.
Network 1 IP Address	Enter the IP address for the VMware Cloud Builder appliance.
Network 1 Subnet Mask	For example, `255.255.255.0`.
Default Gateway	Enter the default gateway for the VMware Cloud Builder appliance.
DNS Servers	IP address of the primary and secondary DNS servers (comma separated). Do not specify more than two servers.
DNS Domain Name	For example, `vsphere.local`.
DNS Domain Search Paths	Comma separated. For example `vsphere.local, sf.vsphere.local`.
NTP Servers	Comma separated.

15 Review the deployment details and click **Finish**.

Note Make sure your passwords meet the requirements specified above before clicking **Finish** or your deployment will not succeed.

16 After the VMware Cloud Builder appliance is deployed, SSH in to the VM with the admin credentials provided in step 14.

17 Ensure that you can ping the ESXi hosts.

18 Verify that the VMware Cloud Builder appliance has access to the required external services, such as DNS and NTP by performing forward and reverse DNS lookups for each host and the specified NTP servers.

Deploy the Management Domain Using VMware Cloud Builder

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The VMware Cloud Foundation deployment process is referred to as bring-up. You specify deployment information specific to your environment such as networks, hosts, license keys, and other information in the deployment parameter workbook and upload the file to the VMware Cloud Builder appliance to initiate bring-up.

During bring-up, the management domain is created on the ESXi hosts specified in the deployment parameter workbook. The VMware Cloud Foundation software components are automatically deployed, configured, and licensed using the information provided.

The following procedures describe how to perform bring-up of the management domain using the deployment parameter workbook. You can also perform bring-up using a custom JSON specification. See the VMware Cloud Foundation API Reference Guide for more information.

Externalizing the vCenter Server that gets created during the VxRail first run is automated as part of the bring-up process.

Download and Complete the Deployment Parameter Workbook

The deployment parameter workbook provides a mechanism to specify infrastructure information specific to your environment. This includes information about your networks, hosts, license keys, and other information.

The deployment parameter workbook is downloaded from the VMware Cloud Builder appliance and the completed workbook is uploaded back to the VM. The deployment parameter workbook can be reused to deploy multiple VMware Cloud Foundation instances of the same version.

Procedure

1. In a web browser, log in to the VMware Cloud Builder appliance administration interface: `https://`*`Cloud_Builder_VM_FQDN`*.

2. Enter the admin credentials you provided when you deployed the VMware Cloud Builder appliance and then click **Log In**.

3. On the **End-User License Agreement** page, select the **I Agree to the End User License Agreement** check box and click **Next**.

4. On the **Select Platform** page, select **VMware Cloud Foundation on VxRail** and click **Next**.

5 On the **Review Prerequisites** page, review the checklist to ensure the requirements are met, and click **Next**.

   If there are any gaps, ensure they are fixed before proceeding to avoid issues during the bring-up process. You can download or print the prerequisite list for reference.

6 On the **Prepare Configuration** page, in the Download Workbook step, click **Download**.

7 Complete the deployment parameter workbook. See About the Deployment Parameter Workbook.

About the Deployment Parameter Workbook

The deployment parameter workbook contains worksheets categorizing the information required for deploying VMware Cloud Foundation. The information provided is used to create the management domain using the VMware Cloud Builder appliance.

The fields in yellow contain sample values that you should replace with the information for your environment. If a cell turns red, the required information is missing, or validation input has failed.

Important The deployment parameter workbook is not able to fully validate all inputs due to formula limitations of Microsoft Excel. Some validation issues may not be reported until you upload the deployment parameter workbook to the VMware Cloud Builder appliance.

Note Do not copy and paste content between cells in the deployment parameter workbook, since this may cause issues.

The Introduction worksheet in the deployment parameter workbook contains an overview of the workbook and guidance on how to complete it. For information about the prerequisites for deploying the management domain, see the *Planning and Preparation Workbook*.

VxRail Prerequistes

- The VxRail first run is completed and vCenter Server and VxRail Manager VMs are deployed.
- The vCenter Server version matches the build listed in the Cloud Foundation Bill of Materials (BOM). See the *VMware Cloud Foundation Release Notes* for the BOM.

Credentials Worksheet

The Credentials worksheet details the accounts and initial passwords for the VMware Cloud Foundation components. You must provide input for each yellow box. A red cell may indicate that validations on the password length has failed.

Input Required

Update the Default Password field for each user (including the automation user in the last row). Passwords can be different per user or common across multiple users. The tables below provide details on password requirements.

Table 5-1. Password Complexity

Password	Requirements
VxRail Manager root account	Standard
VxRail Manager service account (mystic)	Standard. The service account password must be different than the VxRail Manager root account password.
ESXi Host root account	This is the password which you configured on the hosts during ESXi installation.
Default Single-Sign on domain administrator user	1 Length 8-20 characters 2 Must include: ■ mix of upper-case and lower-case letters ■ a number ■ a special character, such as @ ! # $ % ^ or ? 3 Must not include * { } [ ] ( ) / \ ' " ` ~ , ; : . < >
vCenter Server virtual appliance root account	1 Length 8-20 characters 2 Must include: ■ mix of upper-case and lower-case letters ■ a number ■ a special character, such as @ ! # $ % ^ or ? 3 Must not include: * { } [ ] ( ) / \ ' " ` ~ , ; : . < >
NSX-T virtual appliance root account	1 Length 12-127 characters 2 Must include: ■ mix of uppercase and lowercase letters ■ a number ■ a special character, such as @ ! # $ % ^ or ? ■ at least five different characters 3 Must not include: * { } [ ] ( ) / \ ' " ` ~ , ; : . < >
NSX-T user interface and default CLI admin account	1 Length 12-127 characters 2 Must include: ■ mix of uppercase and lowercase letters ■ a number ■ a special character, such as @ ! # $ % ^ or ? ■ at least five different characters 3 Must not include: * { } [ ] ( ) / \ ' " ` ~ , ; : . < >
NSX-T audit CLI account	1 Legnth 12-127 characters 2 Must include: ■ mix of uppercase and lowercase letters ■ a number ■ a special character, such as @ ! # $ % ^ or ? ■ at least five different characters 3 Must not include: * { } [ ] ( ) / \ ' " ` ~ , ; : . < >

Table 5-1. Password Complexity (continued)

Password	Requirements
SDDC Manager appliance root account	1 Length 8-20 characters 2 Must include: ■ mix of uppercase and lowercase letters ■ a number ■ a special character, such as @ ! # $ % ^ or ? 3 Must not include: * { } [ ] ( ) / \ ' " ` ~ , ; : . < >
SDDC Manager super user (vcf)	1 Length 8-20 characters 2 Must include: ■ mix of uppercase and lowercase letters ■ a number ■ a special character, such as @ ! # $ % ^ or ? 3 Must not include: * { } [ ] ( ) / \ ' " ` ~ , ; : . < >
SDDC Manager local account (admin@local)	1 Length 12-20 characters 2 Must include: ■ mix of uppercase and lowercase letters ■ a number ■ a special character, such as @ ! # $ % ^ or ? 3 Must not include: * { } [ ] ( ) / \ ' " ` ~ , ; : . < >

Hosts and Networks Worksheet

The Hosts and Networks worksheet specifies the details for all networks and hosts. This information is configured on the appropriate VMware Cloud Foundation components.

Management Domain Networks

This section covers the VLANs, gateways, MTU, and expected IP ranges and subnet mask for each network you have configured on the Top of Rack switches in your environment.

Network Type	VLAN	Portgroup Name	CIDR Notation	Gateway	MTU
Management Network	Enter the VLAN ID. The VLAN ID can be between 0 and 4094. **Note** Enter 0 for the management VLAN if you imaged the servers with VIA. VLAN 0 means the management network is untagged. **Note** The VLAN ID for Uplink 1 and Uplink 2 Networks must be unique and not used by any other network type.	Enter a portgroup name.	Enter the CIDR notation for the network.	Enter the gateway IP for network.	Enter MTU for management network. The MTU can be between 1500 and 9000.
vMotion Network					
vSAN Network					

System vSphere Distributed Switch Used for NSX-T Overlay Traffic

In VxRail Manager, you can choose to create one or two vSphere Distributed Switches (vDS) for system traffic and to map physical NICs (pNICs) to those vSphere Distributed Switches. The following fields are used to specify which system vDS and vmnics to use for overlay traffic (Host Overlay, Edge Overlay, and Uplink networks). You can also choose to create a new vDS to use for overlay traffic.

System vSphere Distributed Switch - Name	Enter the name of the vDS to use for overlay traffic.
System vSphere Distributed Switch - vmnics to be used for overlay traffic	Enter the vmnics to use for overlay traffic.

Create Separate vSphere Distributed Switch for NSX-T Overlay Traffic

If you want to use one of the system vSphere Distributed Switches that you created in VxRail Manager for overlay traffic (Host Overlay, Edge Overlay, and Uplink networks), choose **No**. Choose **Yes** to create a new vDS for overlay traffic.

Secondary vSphere Distributed Switch - Name	Enter a name for the secondary vSphere Distributed Switch (vDS).
Secondary vSphere Distributed Switch - vmnics	Enter the vmnics to assign to the secondary vDS. For example: `vmnic4, vmnic5`
Secondary vSphere Distributed Switch - MTU Size	Enter the MTU size for the secondary vDS. Default value is 9000.

Management Domain ESXi Hosts

Specify the IP addresses of the ESXi hosts for the management domain. In a standard deployment, only four hosts are required in the management domain. VMware Cloud Foundation can also be deployed with a consolidated architecture. In a consolidated deployment, all workloads are deployed in the management domain instead of to separate workload domains. As such, additional hosts may be required to provide the capacity needed. In this section, only enter values for the number of hosts desired in the management domain.

Host Name	IP Address
Enter host names for each of the four ESXi hosts.	Enter IP Address for each of the four ESXi hosts.

ESXi Host Security Thumbprints

If you want bring-up to validate the SSH fingerprints of the ESXi hosts and the SSH fingerprint and SSL thumbprint of the vCenter Server and VxRail Manager to reduce the chance of Man In The Middle (MiTM) attack, select **Yes** in the **Validate Thumbprints** field.

If you set **Validate Thumbprints** to **Yes**, follow the steps below.

1. Connect to the VMware Cloud Builder appliance using an SSH client such as Putty.
2. Enter the admin credentials you provided when you deployed the VMware Cloud Builder appliance.
3. Retrieve the SSH fingerprint by entering the following command replacing *hostname* with the FQDN of the first ESXi host:

   ```
   ssh-keygen -lf <(ssh-keyscan hostname 2>/dev/null)
   ```

4. Repeat for the remaining ESXi hosts, vCenter Server, and VxRail Manager and then enter the information in the deployment parameter workbook.
5. Retrieve the SSL thumbprint by entering the following command replacing *hostname* with the FQDN of your vCenter Server:

   ```
   openssl s_client -connect hostname:443 < /dev/null 2> /dev/null | openssl x509 -sha256
   -fingerprint -noout -in /dev/stdin
   ```

6. Repeat to retrieve the SSL thumbprint for the VxRail Manager and then enter the information in the deployment parameter workbook.

NSX-T Host Overlay Network

By default, VMware Cloud Foundation uses DHCP for the management domain Host Overlay Network TEPs. For this option, a DHCP server must be configured on the NSX-T host overlay (Host TEP) VLAN of the management domain. When NSX creates TEPs for the VI workload domain, they are assigned IP addresses from the DHCP server.

Caution For L3 aware or stretch clusters, DHCP is required for Host Overlay Network TEP IP assignment.

For the management domain and VI workload domains with uniform L2 clusters, you can choose to use static IP addresses instead. Make sure the IP range includes enough IP addresses for the number of hosts that will use the static IP Pool. The number of IP addresses required depends on the number of pNICs on the ESXi hosts that are used for the vSphere Distributed Switch that handles host overlay networking. For example, a host with four pNICs that uses two pNICs for host overlay traffic requires two IP addresses in the static IP pool..

Caution If you use static IP addresses for the management domain Host Overlay Network TEPs, you cannot stretch clusters in the management domain or any VI workload domains.

Table 5-2. DHCP Settings

Parameter	Value
VLAN ID	Enter a VLAN ID for the NSX-T host overlay network. The VLAN ID can be between 0 and 4094.
Configure NSX-T Host Overlay Using a Static IP Pool	Select **No** to use DHCP.

Table 5-3. Static IP Pool Settings

Parameter	Value
VLAN ID	Enter a VLAN ID for the NSX-T host overlay network. The VLAN ID can be between 0 and 4094.
Configure NSX-T Host Overlay Using a Static IP Pool	Select **Yes** to use a static IP pool.
Pool Description	Enter a description for the static IP pool.
Pool Name	Enter a name for the static IP pool.
CIDR Notation	Enter CIDR notation for the NSX-T Host Overlay network.
Gateway	Enter the gateway IP address for the NSX-T Host Overlay network.
NSX-T Host Overlay Start IP	Enter the first IP address to include in the static IP pool.
NSX-T Host Overlay End IP	Enter the last IP address to include in the static IP pool.

Deploy Parameters Worksheet: Existing Infrastructure Details

Your existing DNS infrastructure is used to provide forward and reverse name resolution for all hosts and VMs in the VMware Cloud Foundation SDDC. External NTP sources are also utilized to synchronize the time between the software components.

Table 5-4. Infrastructure

Parameter	Value
DNS Server #1	Enter IP address of first DNS server.
DNS Server #2	Enter IP address of second DNS server. **Note** If you have only one DNS server, enter **n/a** in this cell.
NTP Server #1	Enter IP address or FQDN of first NTP server.
NTP Server #2	Enter IP address or FQDN of second NTP server. **Note** If you have only one NTP server, enter **n/a** in this cell.

Table 5-5. DNS Zone

Parameter	Value
DNS Zone Name	Enter root domain name for your SDDC management components. **Note** VMware Cloud Foundation expects all components to be part of the same DNS zone.

Table 5-6. Customer Experience Improvement Program

Parameter	Value
Enable Customer Experience Improvement Program (“CEIP”)	Select an option to enable or disable CEIP across vSphere, NSX-T Data Center, and vSAN during bring-up.

Table 5-7. Enable FIPS Security Mode on SDDC Manager

Parameter	Value
Enable FIPS Security Mode on SDDC Manager	Select an option to enable or disable FIPS security mode during bring-up. VMware Cloud Foundation supports Federal Information Processing Standard (FIPS) 140-2. FIPS 140-2 is a U.S. and Canadian government standard that specifies security requirements for cryptographic modules. When you enable FIPS compliance, VMware Cloud Foundation enables FIPS cipher suites and components are deployed with FIPS enabled. To learn more about support for FIPS 140-2 in VMware products, see https://www.vmware.com/security/certifications/fips.html. **Note** This option is only available for new VMware Cloud Foundation installations and the setting you apply during bring-up will be used for future upgrades. You cannot change the FIPS security mode setting after bring-up.

Deploy Parameters Worksheet: VxRail Manager Details

The VxRail Manager Details section of the Deploy Parameters Worksheet specifies the details for VxRail Manager.

VxRail Manager Details

Enter a host name and an IP address for VxRail Manager.

Deployment Parameters Worksheet: License Keys

Enter license keys for the VMware Cloud Foundation components.

In the License Keys section, update the red fields with your license keys. Ensure the license key matches the product listed in each row and that the license key is valid for the version of the product listed in the VMware Cloud Foundation BOM. The license key audit during bring-up validates both the format of the key entered and the validity of the key.

During the bring-up process, you can provide the following license keys:

- ESXi
- vSAN
- vCenter Server
- NSX-T Data Center
- SDDC Manager

Note The ESXi license key is the only mandatory key. If the other license keys are left blank, then VMware Cloud Builder applies a temporary OEM license for vSAN, vCenter Server, and NSX-T Data Center.

Important If you do not enter license keys for these products, you will not be able to create or expand VI workload domains.

Deploy Parameters Worksheet: vSphere Infrastructure

The vSphere infrastructure section of the Deploy Parameters Worksheet details how you want to configure the vCenter Server and its related objects.

This section of the deployment parameter workbook contains sample configuration information, but you can update them with names that meet your naming standards.

Note All host names entries within the deployment parameter workbook expect the short name. VMware Cloud Builder takes the host name and the DNS zone provided to calculate the FQDN value and performs validation prior to starting the deployment. The specified host names and IP addresses must be resolvable using the DNS servers provided, both forward (hostname to IP) and reverse (IP to hostname), otherwise the bring-up process will fail.

Table 5-8. Management Cluster

Parameter	Host Name	IP Address
vCenter Server	Enter a host name for the vCenter Server.	Enter the IP address for the vCenter Server that is part of the management VLAN. **Note** This is the same VLAN and IP address space where the ESXi management VMKernels reside.

Table 5-9. vCenter Datacenter and Cluster

Parameter	Value
Datacenter Name	Enter a name for the management datacenter.
Cluster Name	Enter a name for the management cluster.

Note Enhanced vMotion Compatibility (EVC) is automatically enabled on the VxRail management cluster.

Select the architecture model you plan to use. If you choose **Consolidated**, specify the names for the vSphere resource pools. You do not need to specify resource pool names if you are using the standard architecture model. See *Introducing VMware Cloud Foundation* for more information about these architecture models.

Table 5-10. vSphere Resource Pools

Parameter	Value
Resource Pool SDDC Management	Specify the vSphere resource pool name for management VMs.
Resource Pool SDDC Edge	Specify the vSphere resource pool name for NSX-T VMs.
Resource Pool User Edge	Specify the vSphere resource pool name for user deployed NSX-T VMs in a consolidated architecture.
Resource Pool User VM	Specify the vSphere resource pool name for user deployed workload VMs.

Table 5-11. vSphere Datastore

Parameter	Value
vSAN Datastore Name	Enter vSAN datastore name for your management components.

Deploy Parameters Worksheet: NSX-T Data Center

The NSX-T Data Center section of the Deploy Parameters Worksheet specifies the details you want to use for deploying NSX-T Data Center components.

Table 5-12. NSX-T Management Cluster

Parameter	Value
NSX-T Management Cluster VIP	Enter the host name and IP address for the NSX Manager VIP. The host name can match your naming standards but must be registered in DNS with both forward and reverse resolution matching the specified IP. **Note** This is the same VLAN and IP address space where the vCenter and ESXi management VMKernels reside.
NSX-T Virtual Appliance Node #1	Enter the host name and IP address for the first node in the NSX Manager cluster.
NSX-T Virtual Appliance Node #2	Enter the host name and IP address for the second node in the NSX Manager cluster.
NSX-T Virtual Appliance Node #3	Enter the host name and IP address for the third node in the NSX Manager cluster.
NSX-T Virtual Appliance Size	Select the size for the NSX Manager virtual appliances. The default is medium.

Deploy Parameters Worksheet: SDDC Manager

The SDDC Manager section of the Deploy Parameters Worksheet specifies the details for deploying SDDC Manager.

Table 5-13. SDDC Manager

Parameter	Value
SDDC Manager Hostname	Enter a host name for the SDDC Manager VM.
SDDC Manager IP Address	Enter an IP address for the SDDC Manager VM.
Cloud Foundation Management Domain Name	Enter a name for the management domain. This name will appear in **Inventory > Workload Domains** in the SDDC Manager UI.

Upload the Deployment Parameter Workbook and Deploy the Management Domain

After you populate all the required configuration values in the Deployment Parameters Workbook, you upload it to the VMware Cloud Builder appliance to start the deployment of the management domain.

Procedure

1 On the **Prepare Configuration** page, in the **Download Workbook** step click **Next**.

2 On the **Prepare Configuration** page, in the **Complete Workbook** step, click **Next**.

3 On the **Prepare Configuration** page, in the **Upload File** step, click **Select File**. Navigate to your completed deployment parameters workbook and click **Open**.

4 After the file is uploaded, click **Next** to begin validation of the uploaded file. You can download or print the validation list.

   To access the bring-up log file, SSH to the VMware Cloud Builder appliance as **`admin`** and open the `/opt/vmware/bringup/logs/vcf-bringup-debug.log` file.

   If there is an error during the validation and the **Next** button is grayed out, you can either make corrections to the environment or edit the deployment parameter workbook and upload it again. Then click **Retry** to perform the validation again.

   If any warnings are displayed and you want to proceed, click **Acknowledge** and then click **Next**.

5 Click **Deploy SDDC**.

   During the bring-up process, the following tasks are completed. After bring-up is completed, a green bar is displayed indicating that bring-up was successful. A link to the SDDC Manager UI is also displayed. If there are errors during bring-up, see
   During the bring-up process, the vCenter Server, NSX-T Data Center and SDDC Manager appliances are deployed and the management domain is created. The status of the bring-up tasks is displayed in the UI.

   After bring-up is completed, a green bar is displayed indicating that bring-up was successful. A link to the SDDC Manager UI is also displayed. If there are errors during bring-up, see Chapter 6 Troubleshooting VMware Cloud Foundation Deployment.

6 Click **Download** to download a detailed deployment report. This report includes information on assigned IP addresses and networks that were configured in your environment.

7 After bring-up is completed, click **Finish**.

8 In the SDDC Deployment Completed dialog box, click **Launch SDDC Manager**.

9 Power off the VMware Cloud Builder appliance.

   The VMware Cloud Builder appliance includes the VMware Imaging Appliance service, which you can use to install ESXi on additional servers after bring-up is complete. You can delete the VMware Cloud Builder appliance to reclaim its resources or keep it available for future server imaging.

What to do next

If you have multiple instances of SDDC Manager that are joined to the same Single Sign-On (SSO) domain, you must take steps to ensure that certificates are installed correctly. See Configure Certificates for a Shared Single Sign-On Domain.

Upgrade VMware vCenter Server Appliance for VMware Cloud Foundation 4.3

After you deploy the management domain, you must upgrade the VMware vCenter Server Appliance to the version that is supported with VMware Cloud Foundation 4.3.

During the VxRail first run, VxRail Manager 7.0.202 deploys vCenter Server 7.0 Update 2b (build 17958471). However, the VMware Cloud Foundation 4.3 BOM requires vCenter Server 7.0 Update 2c (build 18356314). Until you upgrade vCenter Server, you will not be able to deploy a VI workload domain.

Procedure

- Download and apply the upgrade bundle for vCenter Server. See Download VMware Cloud Foundation on Dell EMC VxRail Bundles.

Troubleshooting VMware Cloud Foundation Deployment

6

During the deployment stage of VMware Cloud Foundation you can use log files and the Supportability and Serviceability (SoS) Tool to help with troubleshooting.

Read the following topics next:

- Using the SoS Utility on VMware Cloud Builder
- VMware Cloud Builder Log Files

Using the SoS Utility on VMware Cloud Builder

You can run the Supportability and Serviceability (SoS) Utility on the VMware Cloud Builder appliance to generate a support bundle, which you can use to help debug a failed bring-up of VMware Cloud Foundation.

Note After a successful bring-up, you should only run the SoS Utility on the SDDC Manager appliance. See Supportability and Serviceability (SoS) Tool in the *VMware Cloud Foundation Operations and Administration Guide*.

The SoS Utility is not a debug tool, but it does provide health check operations that can facilitate debugging a failed deployment.

To run the SoS Utility in VMware Cloud Builder, SSH in to the VMware Cloud Builder appliance using the **`admin`** administrative account, then enter **`su`** to switch to the root user, and navigate to the `/opt/vmware/sddc-support` directory and type `./sos` followed by the options required for your desired operation.

```
./sos --option-1 --option-2 ... --option-n
```

SoS Utility Help Options

Use these options to see information about the SoS tool itself.

Option	Description
`--help` `-h`	Provides a summary of the available SoS tool options
`--version` `-v`	Provides the SoS tool's version number.

SoS Utility Generic Options

These are generic options for the SoS Utility.

Option	Description
`--configure-sftp`	Configures SFTP for logs.
`--debug-mode`	Runs the SoS tool in debug mode.
`--force`	Allows SoS operations from theVMware Cloud Builder appliance after bring-up. **Note** In most cases, you should not use this option. Once bring-up is complete, you can run the SoS Utility directly from the SDDC Manager appliance.
`--history`	Displays the last twenty SoS operations performed.
`--log-dir` *`LOGDIR`*	Specifies the directory to store the logs.
`--log-folder` *`LOGFOLDER`*	Specifies the name of the log directory.
`--setup-json` *`SETUP_JSON`*	Custom setup-json file for log collection. SoS prepares the inventory automatically based on the environment where it is running. If you want to collect logs for a pre-defined set of components, you can create a `setup.json` file and pass the file as input to SoS. A sample JSON file is available on the VMware Cloud Builder in the `/opt/vmware/sddc-support/` directory.
`--skip-known-host-check`	Skips the specified check for SSL thumbprint for host in the known host.
`--zip`	Creates a zipped tar file for the output.

SoS Utility Log File Options

Option	Description
`--api-logs`	Collects output from APIs.
`--cloud-builder-logs`	Collects Cloud Builder logs.
`--esx-logs`	Collects logs from the ESXi hosts only. Logs are collected from each ESXi host available in the deployment.

Option	Description
`--no-clean-old-logs`	Use this option to prevent the tool from removing any output from a previous collection run. By default, before writing the output to the directory, the tool deletes the prior run's output files that might be present. If you want to retain the older output files, specify this option.
`--no-health-check`	Skips the health check executed as part of log collection.
`--nsx-logs`	Collects logs from the NSX Manager instances only.
`--rvc-logs`	Collects logs from the Ruby vSphere Console (RVC) only. RVC is an interface for ESXi and vCenter. **Note** If the Bash shell is not enabled in vCenter, RVC log collection will be skipped . **Note** RVC logs are not collected by default with ./sos log collection.
`--sddc-manager-logs`	Collects logs from the SDDC Manager only.
`--test`	Collects test logs by verifying the files.
`--vc-logs`	Collects logs from the vCenter Server instances only. Logs are collected from each vCenter server available in the deployment.
`--vm-screenshots`	Collects screen shots from all VMs.

SoS Utility JSON Generator Options

The JSON generator options within the SoS Utility provide a method to execute the creation of the JSON file from a completed deployment parameter workbook. To run the JSON generator, you must provide, as a minimum, a path to the deployment parameter workbook and the design type using the following syntax:

```
./sos --jsongenerator --jsongenerator-input JSONGENERATORINPUT --jsongenerator
JSONGENERATORDESIGN
```

Option	Description
`--jsongenerator`	Invokes the JSON generator utility.
`--jsongenerator-input` *`JSONGENERATORINPUT`*	Specify the path to the input file to be used by the JSON generator utility. For example: `/tmp/vcf-ems-deployment-parameter.xlsx`.
`--jsongenerator-design` *`JSONGENERATORDESIGN`*	Use **`vcf-vxrail`** for VMware Cloud Foundation on Dell EMC VxRail.
`--jsongenerator-supress`	Supress confirmation to force cleanup directory. (optional)
`--jsongenerator-logs` *`JSONGENERATORLOGS`*	Set the directory to be used for logs. (optional)

SoS Utility Health Check Options

The SoS Utility can be used to perform health checks on various components or services, including connectivity, compute, and storage.

Note The health check options are primarily designed to run on the SDDC Manager appliance. Running them on the VMware Cloud Builder appliance requires the `--force` parameter, which instructs the SoS Utility to identify the SDDC Manager appliance deployed by VMware Cloud Builder during the bring-up process, and then execute the health check remotely. For example:

```
./sos --health-check --force
```

Option	Description
`--certificate-health`	Verifies that the component certificates are valid (within the expiry date).
`--connectivity-health`	Performs a connectivity health check to inspect whether the different components of the system such as the ESXi hosts, vCenter Servers, NSX Manager VMs, and SDDC Manager VM can be pinged.
`--compute-health`	Performs a compute health check.
`--general-health`	Verifies ESXi entries across all sources, checks the Postgres DB operational status for hosts, checks ESXi for error dumps, and gets NSX Manager and cluster status.
`--get-host-ips`	Returns server information.
`--health-check`	Performs all available health checks.
`--ntp-health`	Verifies whether the time on the components is synchronized with the NTP server in the VMware Cloud Builder appliance.
`--services-health`	Performs a services health check to confirm whether services are running
`--run-vsan-checks`	Runs proactive vSAN tests to verify the ability to create VMs within the vSAN disks.

Sample Output

The following text is a sample output from an `--ntp-health` operation.

```
root@cloud-builder [ /opt/vmware/sddc-support ]# ./sos --ntp-health --skip-known-host --force
Welcome to Supportability and Serviceability(SoS) utility!

User passed --force flag, Running SOS from Cloud Builder VM, although Bringup is completed
and SDDC Manager is available. Please expe           ct failures with SoS operations.
Health Check : /var/log/vmware/vcf/sddc-support/healthcheck-2020-02-11-23-03-53-24681
Health Check log : /var/log/vmware/vcf/sddc-support/healthcheck-2020-02-11-23-03-53-24681/
sos.log
SDDC Manager : sddc-manager.vrack.vsphere.local
NTP : GREEN
```

```
+-----+-----------------------------------------+------------+-------+
| SL# |                   Area                  |   Title    | State |
+-----+-----------------------------------------+------------+-------+
|  1  |    ESXi : esxi-1.vrack.vsphere.local    |  ESX Time  | GREEN |
|  2  |    ESXi : esxi-2.vrack.vsphere.local    |  ESX Time  | GREEN |
|  3  |    ESXi : esxi-3.vrack.vsphere.local    |  ESX Time  | GREEN |
|  4  |    ESXi : esxi-4.vrack.vsphere.local    |  ESX Time  | GREEN |
|  5  | vCenter : vcenter-1.vrack.vsphere.local | NTP Status | GREEN |
+-----+-----------------------------------------+------------+-------+

Legend:

 GREEN - No attention required, health status is NORMAL
 YELLOW - May require attention, health status is WARNING
 RED - Requires immediate attention, health status is CRITICAL


Health Check completed successfully for : [NTP-CHECK]
```

The following text is sample output from a `--vm-screenshots` log collection operation.

```
root@cloud-builder [ /opt/vmware/sddc-support ]# ./sos --vm-screenshots
     --skip-known-host --force
Welcome to Supportability and Serviceability(SoS) utility!

User passed --force flag, Running SOS from Cloud Builder VM, although Bringup is completed
and SDDC Manager is available. Please expect failures with SoS operations.
Logs : /var/log/vmware/vcf/sddc-support/sos-2018-08-24-10-50-20-8013
Log file : /var/log/vmware/vcf/sddc-support/sos-2018-08-24-10-50-20-8013/sos.log
Log Collection completed successfully for : [VMS_SCREENSHOT]
```

VMware Cloud Builder Log Files

VMware Cloud Builder contains various log files for different components of the system.

VMware Cloud Builder has a number of components which are used during the bring-up process, each component generates a log file which can be used for the purpose of troubleshooting. The components and their purpose are:

- JsonGenerator: Used to convert the deployment parameter workbook into the required configuration file (JSON) that is used by the Bringup Validation Service and Bringup Service.
- Bringup Service: Used to perform the validation of the configuration file (JSON), the ESXi hosts and infrastructure where VMware Cloud Foundation will be deployed, and to perform the deployment and configuration of the management domain components and the first cluster.
- Supportability and Serviceability (SoS) Utility: A command line utility for troubleshooting deployment issues.

The following table describes the log file locations:

Component	Log Name	Location
JsonGenerator	`jsongenerator-`*`timestamp`*	`/var/log/vmware/vcf/sddc-support/`
Bringup Service	`vcf-bringup.log`	`/var/log/vmware/vcf/bringup/`
	`vcf-bringup-debug.log`	`/var/log/vmware/vcf/bringup/`
	`rest-api-debug.log`	`/var/log/vmware/vcf/bringup/`
SoS Utility	`sos.log`	`/var/log/vmware/vcf/sddc-support/sos-`*`timestamp/`*

Getting Started with SDDC Manager

7

You use SDDC Manager to perform administration tasks on your VMware Cloud Foundation instance. The SDDC Manager UI provides an integrated view of the physical and virtual infrastructure and centralized access to manage the physical and logical resources.

You work with the SDDC Manager UI by loading it in a web browser. For the list of supported browsers and versions, see the *Release Notes*.

Read the following topics next:

- Log in to the SDDC Manager User Interface
- Tour of the SDDC Manager User Interface
- Log out of the SDDC Manager User Interface

Log in to the SDDC Manager User Interface

Connect to the SDDC Manager appliance by logging into the SDDC Manager UI using a supported web browser.

Prerequisites

To log in, you need the SDDC Manager IP address or FQDN and the password for the single-sign on user (for example **`administrator@vsphere.local`**). You added this information to the deployment parameter workbook before bring-up.

Procedure

1 In a web browser, type one of the following.

   - `https://`*FQDN* where *FQDN* is the fully-qualified domain name of the SDDC Manager appliance.
   - `https://`*IP_address* where *IP_address* is the IP address of the SDDC Manager appliance.

2 Log in to the SDDC Manager UI with vCenter Server Single Sign-On user credentials.

Results

You are logged in to SDDC Manager UI and the Dashboard page appears in the web browser.

Tour of the SDDC Manager User Interface

The SDDC Manager UI provides a single point of control for managing and monitoring your VMware Cloud Foundation instance and for provisioning workload domains.

You use the navigation bar to move between the main areas of the user interface.

Navigation Bar

The navigation bar is available on the left side of the interface and provides a hierarchy for navigating to the corresponding pages.

Category	Functional Areas
Dashboard	The Dashboard provides the high-level administrative view for SDDC Manager in the form of widgets. There are widgets for Solutions; Workload Domains; Host Types and Usage; Ongoing and Scheduled Updates; Update History; CPU, Memory, Storage Usage; and Recent Tasks. You can control the widgets that are displayed and how they are arranged on the dashboard. ■ To rearrange widgets, click the heading of the widget and drag it to the desired position. ■ To hide a widget, hover the mouse anywhere over the widget to reveal the **X** in the upper-right corner, and click the **X**. ■ To add a widget, click the three dots in the upper right corner of the page and select **Add New Widgets**. This displays all hidden widgets. Select a widget and click **Add**.
Solutions	Solutions include the following section: ■ Kubernetes - Workload Management enables you to start a Workload Management deployment and view Workload Management cluster details.

Category	Functional Areas
Inventory	Inventory includes the following sections: - **Workload Domains** takes you to the Workload Domains page, which displays and provides access to all workload domains. This page includes summary information about all workload domains, including domain type, storage usage, configuration status, owner, clusters, hosts and update availability. It also displays CPU, memory, and storage utilization for each workload domain, and collectively across all domains. - **Hosts** takes you to the Hosts page, which displays and provides access to current hosts and controls for managing hosts. This page includes detailed information about all hosts, including FQDN, host IP, network pool, configuration status, host state, cluster, and storage type. It also displays CPU and memory utilization for each host, and collectively across all hosts.
Lifecycle Management	Lifecycle Management includes the following sections: **Bundle Management** displays the available install, update, and upgrade bundles for your environment, and your bundle download history. **Note** To access bundles, you must be logged in to your My VMware account through the **Administration > Repository Settings** page.

Category	Functional Areas
Administration	Administration includes the following sections: ■ **Licensing** enables you to manage VMware product licenses. You can also add licenses for the component products in your VMware Cloud Foundation deployment. ■ **Users** enables you to manage VMware Cloud Foundation users and groups, including adding users and groups and assigning roles. ■ **Repository Settings** enables you to log in to your My VMware and Dell EMC accounts. ■ **vRealize Suite** enables you to deploy vRealize Suite Lifecycle Manager. ■ **Security** enables you to integrate with your Microsoft Certificate Authority Server and perform password management actions, such as rotation, updates and remediation. ■ **Backup** enables you to register an external SFTP server with SDDC Manager for backing up SDDC Manager and NSX Managers. You can also configure the backup schedule for SDDC Manager. ■ **VMware CEIP** to join or leave the VMware Customer Experience Improvement Program.
Developer Center	The VMware Cloud Foundation Developer Center includes the following sections: ■ **Overview**: API reference documentation. Includes information and steps for all the Public APIs supported by VMware Cloud Foundation. ■ **API Explorer**: Lists the APIs and allows you to invoke them directly on your VMware Cloud Foundation system. ■ **Code Samples**: Sample code to manage a VMware Cloud Foundation instance.

Log out of the SDDC Manager User Interface

Log out of the SDDC Manager UI when you have completed your tasks.

Procedure

1. In the SDDC Manager UI, click the logged-in account name in the upper right corner.
2. Click **Log out**.

Configuring Customer Experience Improvement Program

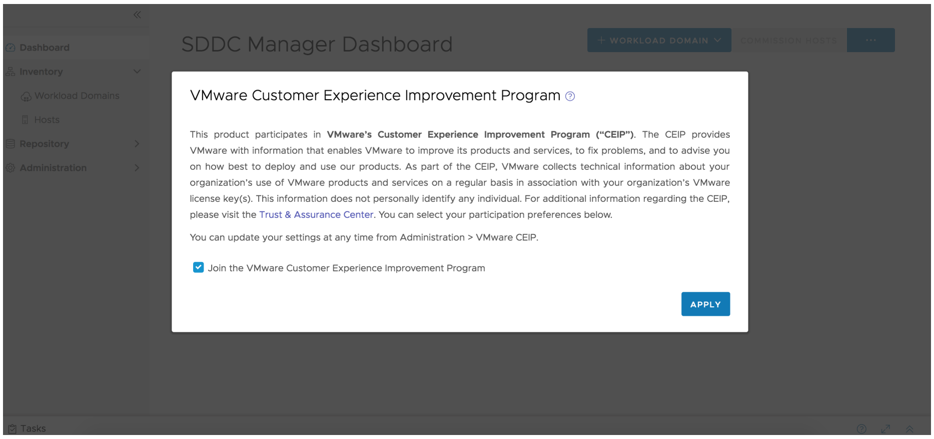
8

VMware Cloud Foundation participates in the VMware Customer Experience Improvement Program (CEIP). You can choose to enable or disable CEIP for your VMware Cloud Foundation instance.

The Customer Experience Improvement Program provides VMware with information that enables VMware to improve its products and services, to fix problems, and to advise you on how best to deploy and use our products. As part of the CEIP, VMware collects technical information about your organization's use of the VMware products and services regularly in association with your organization's VMware license keys. This information does not personally identify any individual. For additional information regarding the CEIP, refer to the Trust & Assurance Center at http://www.vmware.com/trustvmware/ceip.html.

You can enable or disable CEIP across all the components deployed in VMware Cloud Foundation by the following methods:

- When you log into SDDC Manager for the first time, a pop-up window appears. The **Join the VMware Customer Experience Program** option is selected by default. Deselect this option if you do not want to enable CEIP. Click **Apply**.



VMware Customer Experience Improvement Program

This product participates in **VMware's Customer Experience Improvement Program ("CEIP")**. The CEIP provides VMware with information that enables VMware to improve its products and services, to fix problems, and to advise you on how best to deploy and use our products. As part of the CEIP, VMware collects technical information about your organization's use of VMware products and services on a regular basis in association with your organization's VMware license key(s). This information does not personally identify any individual. For additional information regarding the CEIP, please visit the Trust & Assurance Center. You can select your participation preferences below.

You can update your settings at any time from Administration > VMware CEIP.

☑ Join the VMware Customer Experience Improvement Program

APPLY

- You can enable or disable CEIP from the Administration tab in the SDDC Manager UI.

Procedure

1 In the navigation pane, click **Administration > VMware CEIP**.

2 To enable CEIP, select the **Join the VMware Customer Experience Improvement Program** option.

3 To disable CEIP, deselect the **Join the VMware Customer Experience Improvement Program** option.

Certificate Management

9

You can manage certificates for all user interface and API endpoints in a VMware Cloud Foundation instance, including integrating a certificate authority, generating and submitting certificate signing requests (CSR) to a certificate authority, and downloading and installing certificates.

This section provides instructions for using either:

- OpenSSL as a certificate authority, which is a native option in SDDC Manager.
- Integrating with Microsoft Active Directory Certificate Services.
- Providing signed certificates from another external Certificate Authority.

You can manage the certificates for the following components.

- vCenter Server
- NSX Manager
- SDDC Manager
- VxRail Manager
- vRealize Suite Lifecycle Manager

  Note Use vRealize Suite Lifecycle Manager to manage certificates for the other vRealize Suite components.

You replace certificates for the following reasons:

- A certificate has expired or is nearing its expiration date.
- A certificate has been revoked by the issuing certificate authority.
- You do not want to use the default VMCA-signed certificates.
- Optionally, when you create a new workload domain.

It is recommended that you replace all certificates after completing the deployment of the VMware Cloud Foundation management domain. After you create a new VI workload domain, you can replace certificates for the appropriate components as needed.

Read the following topics next:

- View Certificate Information

- Configure VMware Cloud Foundation to Use Microsoft CA-Signed Certificates
- Configure VMware Cloud Foundation to Use OpenSSL CA-Signed Certificates
- Install Third-Party CA-Signed Certificates
- Remove Old or Unused Certificates from SDDC Manager
- Configure Certificates for a Shared Single Sign-On Domain

View Certificate Information

You can view details of an applied certificate for a resource directly through the SDDC Manager UI.

Procedure

1 In the navigation pane, click **Inventory > Workload Domains**.

2 On the **Workload Domains** page, from the table, in the domain column click the domain you want to view.

3 On the domain summary page, click the **Security** tab.

   This tab lists the certificates for each resource type associated with the workload domain. It displays the following details:

   - Resource type
   - Issuer, the certificate authority name
   - Resource hostname
   - Valid From
   - Valid Until
   - Certificate status: Active, Expiring (will expire within 15 days), or Expired.
   - Certificate operation status

4 To view certificate details, expand the resource next to the Resource Type column.

Configure VMware Cloud Foundation to Use Microsoft CA-Signed Certificates

VMware Cloud Foundation supports the ability to manage certificates by integrating with Microsoft Active Directory Certificate Services (Microsoft CA). Before you can perform certificate operations using the SDDC Manager UI you must ensure that the Microsoft Certificate Authority is configured correctly.

Complete the below tasks to manage Microsoft CA-Signed certificates using SDDC Manager.

Prepare Your Microsoft Certificate Authority to Enable SDDC Manger to Manage Certificates

To ensure secure and operational connectivity between the SDDC components, you apply signed certificates provided by a Microsoft Certificate Authority for the SDDC components.

You use SDDC Manager to generate the certificate signing request (CSRs) and request a signed certificate from the Microsoft Certificate Authority. SDDC Manager is then used to install the signed certificates to SDDC components it manages. In order to achieve this the Microsoft Certificate Authority must be configured to enable integration with SDDC Manager.

Install Microsoft Certificate Authority Roles

Install the Certificate Authority and Certificate Authority Web Enrollment roles on the Microsoft Certificate Authority server to facilitate certificate generation from SDDC Manager.

Note When connecting SDDC Manager to Microsoft Active Directory Certificate Services, ensure that Web Enrollment role is installed on the same machine where the Certificate Authority role is installed. SDDC Manager can't request and sign certificates automatically if the two roles (Certificate Authority and Web Enrollment roles) are installed on different machines.

Procedure

1 Log in to the Microsoft Certificate Authority server by using a Remote Desktop Protocol (RDP) client.

FQDN	*Active Directory Host*
User	Active Directory administrator
Password	*ad_admin_password*

2 Add roles to Microsoft Certificate Authority server.

a Click **Start > Run**, enter `ServerManager`, and click **OK**.

b From the **Dashboard**, click **Add roles and features** to start the **Add Roles and Features** wizard.

c On the **Before you begin** page, click **Next**.

d On the **Select installation type** page, click **Next**.

e On the **Select destination server** page, click **Next**.

f On the **Select server roles** page, under **Active Directory Certificate Services**, select **Certification Authority** and **Certification Authority Web Enrollment** and click **Next**.

g On the **Select features** page, click **Next**.

h On the **Confirm installation selections** page, click **Install**.

Configure the Microsoft Certificate Authority for Basic Authentication

Configure the Microsoft Certificate Authority with basic authentication to allow SDDC Manager the ability to manage signed certificates.

Procedure

1 Log in to the Active Directory server by using a Remote Desktop Protocol (RDP) client.

FQDN	*Active Directory Host*
User	Active Directory administrator
Password	*ad_admin_password*

2 Add Basic Authentication to the Web Server (IIS).

  a Click **Start > Run**, enter `ServerManager`, and click **OK**.

  b From the **Dashboard**, click **Add roles and features** to start the **Add Roles and Features** wizard.

  c On the **Before you begin** page, click **Next**.

  d On the **Select installation type** page, click **Next**.

  e On the **Select destination server** page, click **Next**.

  f On the **Select server roles** page, under **Web Server (IIS) > Web Server > Security**, select **Basic Authentication** and click **Next**.

  g On the **Select features** page, click **Next**.

  h On the **Confirm installation selections** page, click **Install**.

3 Configure the certificate service template and CertSrv web site, for basic authentication.

  a Click **Start > Run**, enter `Inetmgr.exe` and click **OK** to open the **Internet Information Services Application Server Manager**.

  b Navigate to ***your_server*** **> Sites > Default Web Site > CertSrv**.

  c Under **IIS**, double-click **Authentication**.

  d On the **Authentication** page, right-click **Basic Authentication** and click **Enable**.

  e In the navigation pane, select **Default Web Site**.

  f In the **Actions** pane, under **Manage Website**, click **Restart** for the changes to take effect.

Create and Add a Microsoft Certificate Authority Template

You must set up a certificate template in the Microsoft Certificate Authority. The template contains the certificate authority attributes for signing certificates for the VMware Cloud

Foundation components. After you create the template, you add it to the certificate templates of the Microsoft Certificate Authority.

Procedure

1. Log in to the Active Directory server by using a Remote Desktop Protocol (RDP) client.

FQDN	*Active Directory Host*
User	Active Directory administrator
Password	*ad_admin_password*

2. Click **Start > Run**, enter **`certtmpl.msc`**, and click **OK**.
3. In the **Certificate Template Console** window, under **Template Display Name**, right-click **Web Server** and select **Duplicate Template**.
4. In the **Properties of New Template** dialog box, click the **Compatibility** tab and configure the following values.

Setting	Value
Certification Authority	Windows Server 2008 R2
Certificate recipient	Windows 7 / Server 2008 R2

5. In the **Properties of New Template** dialog box, click the **General** tab and enter a name for example, **`VMware`** in the **Template display name** text box.
6. In the **Properties of New Template** dialog box, click the **Extensions** tab and configure the following.
    a. Click **Application Policies** and click **Edit**.
    b. Click **Server Authentication**, click **Remove**, and click **OK**.
    c. Click **Basic Constraints** and click **Edit**.
    d. Click the **Enable this extension** check box and click **OK**.
    e. Click **Key Usage** and click **Edit**.
    f. Click the **Signature is proof of origin (nonrepudiation)** check box, leave the defaults for all other options and click **OK**.
7. In the **Properties of New Template** dialog box, click the **Subject Name** tab, ensure that the **Supply in the request** option is selected, and click **OK** to save the template.

8 Add the new template to the certificate templates of the Microsoft CA.

   a Click **Start > Run**, enter `certsrv.msc`, and click **OK**

   b In the **Certification Authority** window, expand the left pane, right-click **Certificate Templates**, and select **New > Certificate Template to Issue**.

   c In the **Enable Certificate Templates** dialog box, select **VMware**, and click **OK**.

Assign Certificate Management Privileges to the SDDC Manager Service Account

Before you can use the Microsoft Certificate Authority and the pre-configured template, it is recommended to configure least privilege access to the Microsoft Active Directory Certificate Services using an Active Directory user account as a restricted service account.

Prerequisites

- Create a user account in Active Directory with Domain Users membership. For example, **`svc-vcf-ca`**.

Procedure

1 Log in to the Microsoft Certificate Authority server by using a Remote Desktop Protocol (RDP) client.

FQDN	*Active Directory Host*
User	Active Directory administrator
Password	*ad_admin_password*

2 Configure least privilege access for a user account on the Microsoft Certificate Authority.

   a Click **Start > Run**, enter `certsrv.msc`, and click **OK**.

   b Right-click the certificate authority server and click **Properties**.

   c Click the **Security** tab, and click **Add**.

   d Enter the name of the user account and click **OK**.

   e In the **Permissions for ....** section configure the permissions and click **OK**.

Setting	Value (Allow)
Read	Deselected
Issue and Manage Certificates	Selected
Manage CA	Deselected
Request Certificates	Selected

3 Configure least privilege access for the user account on the Microsoft Certificate Authority Template.

   a Click **Start > Run**, enter `certtmpl.msc`, and click **OK**.

   b Right-click the VMware template and click **Properties**.

   c Click the **Security** tab, and click **Add**.

   d Enter the `svc-vcf-ca` service account and click **OK**.

   e In the **Permissions for ....** section configure the permissions and click **OK**.

Setting	Value (Allow)
Full Control	Deselected
Read	Selected
Write	Deselected
Enroll	Selected
Autoenroll	Deselected

Configure a Microsoft Certificate Authority in SDDC Manager

You configure a connection between SDDC Manager and the Microsoft Certificate Authority by entering your service account credentials.

Prerequisites

- Verify connectivity between SDDC Manager and the Microsoft Certificate Authority Server. See VMware Ports and Protocols.
- Verify that the Microsoft Certificate Authority Server has the correct roles installed on the same machine where the Certificate Authority role is installed. See Install Microsoft Certificate Authority Roles.
- Verify the Microsoft Certificate Authority Server has been configured for basic authentication. See Configure the Microsoft Certificate Authority for Basic Authentication.
- Verify a valid certificate template has been configured on the Microsoft Certificate Authority. See Create and Add a Microsoft Certificate Authority Template.
- Verify least privileged user account has been configured on the Microsoft Certificate Authority Server and Template. See Assign Certificate Management Privileges to the SDDC Manager Service Account.
- Verify that time is synchronized between the Microsoft Certificate Authority and the SDDC Manager appliance. Each system can be configured with a different timezone, but it is recommended that they receive their time from the same NTP source.

Procedure

1 In the navigation pane, click **Administration > Security**.

2 Click the **Certificate Management** tab and click **Edit**.

3 Configure the settings and click **Save**.

Setting	Value
Certificate Authority	Microsoft
CA Server URL	Specify the URL for the issuing certificate authority. This address must begin with `https://` and end with `certsrv`. For example, https://ca.rainpole.io/certsrv.
Username	Enter a least privileged service account. For example, svc-vcf-ca.
Password	Enter the password for the least privileged service account.
Template Name	Enter the issuing certificate template name. You must create this template in Microsoft Certificate Authority. For example, VMware.

4 In the **CA Server Certificate Details** dialog box, click **Accept**.

Install Microsoft CA-Signed Certificates using SDDC Manager

Replace the self-signed certificates with signed certificates from the Microsoft Certificate Authority by using SDDC Manager.

Procedure

1 In the navigation pane, click **Inventory > Workload Domains**.

2 On the **Workload Domains** page, from the table, in the domain column click the workload domain you want to view.

3 On the domain summary page, click the **Security** tab.

4 Generate CSR files for the target components.

   a From the table, select the check box for the resource type for which you want to generate a CSR.

   b Click **Generate CSRs**.

c On the **Details** dialog, configure the settings and click **Next**.

Option	Description
Algorithm	Select the key algorithm for the certificate.
Key Size	Select the key size (2048 bit, 3072 bit, or 4096 bit) from the drop-down menu.
Email	Optionally, enter a contact email address.
Organizational Unit	Use this field to differentiate between divisions within your organization with which this certificate is associated.
Organization Name	Type the name under which your company is known. The listed organization must be the legal registrant of the domain name in the certificate request.
Locality	Type the city or locality where your company is legally registered.
State	Type the full name (do not abbreviate) of the state, province, region, or territory where your company is legally registered.
Country	Type the country name where your company is legally registered. This value must use the ISO 3166 country code.

d (Optional) On the **Subject Alternative Name** dialog, enter the subject alternative name(s) and click **Next**.

e On the **Summary** dialog, click **Generate CSRs**.

5 Generate signed certificates for each component.

a From the table, select the check box for the resource type for which you want to generate a signed certificate for.

b Click **Generate Signed Certificates**.

c In the **Generate Certificates** dialog box, from the **Select Certificate Authority** drop-down menu, select **Microsoft**.

d Click **Generate Certificates**.

6 Install the generated signed certificates for each component.

a From the table, select the check box for the resource type for which you want to install a signed certificate.

b Click **Install Certificates**.

Configure VMware Cloud Foundation to Use OpenSSL CA-Signed Certificates

VMware Cloud Foundation supports the ability to manage certificates using OpenSSL configured on the SDDC Manager appliance.

Complete the following tasks to be able to manage OpenSSL-signed certificates issued by SDDC Manager.

Configure OpenSSL-signed Certificates in SDDC Manager

To generate OpenSSL-signed certificates for the VMware Cloud Foundation components you must first configure the certificate authority details.

Procedure

1 In the navigation pane, click **Administration > Security**.

2 Click the **Certificate Management** tab and click **Edit**.

3 Configure the settings and click **Save**.

Setting	Value
Certificate Authority	OpenSSL
Common Name	Specify the FQDN of the SDDC Manager appliance.
Organizational Unit	Use this field to differentiate between the divisions within your organization with which this certificate is associated.
Organization	Specify the name under which your company is known. The listed organization must be the legal registrant of the domain name in the certificate request.
Locality	Specify the city or the locality where your company is legally registered.
State	Enter the full name (do not abbreviate) of the state, province, region, or territory where your company is legally registered.
Country	Select the country where your company is registered. This value must use the ISO 3166 country code.

Install OpenSSL-signed Certificates using SDDC Manager

Replace the self-signed certificates with OpenSSL-signed certificates generated by SDDC Manager.

Procedure

1 In the navigation pane, click **Inventory > Workload Domains**.

2 On the **Workload Domains** page, from the table, in the domain column click the workload domain you want to view.

3 On the domain summary page, click the **Security** tab.

4 Generate CSR files for the target components.

   a From the table, select the check box for the resource type for which you want to generate a CSR.

   b Click **Generate CSRs**.

   The **Generate CSRs** wizard opens.

   c On the **Details** dialog, configure the settings and click **Next**.

Option	Description
Algorithm	Select the key algorithm for the certificate.
Key Size	Select the key size (2048 bit, 3072 bit, or 4096 bit) from the drop-down menu.
Email	Optionally, enter a contact email address.
Organizational Unit	Use this field to differentiate between divisions within your organization with which this certificate is associated.
Organization Name	Type the name under which your company is known. The listed organization must be the legal registrant of the domain name in the certificate request.
Locality	Type the city or locality where your company is legally registered.
State	Type the full name (do not abbreviate) of the state, province, region, or territory where your company is legally registered.
Country	Type the country name where your company is legally registered. This value must use the ISO 3166 country code.

   d (Optional) On the **Subject Alternative Name** dialog, enter the subject alternative name(s) and click **Next**.

   You can enter multiple values separated by comma (,), semicolon (;), or space ( ). For NSX-T, you can enter the subject alternative name for each node along with the Virtual IP (master) node.

   Note Wildcard subject alternate name, such as *.example.com is not recommended.

   e On the **Summary** dialog, click **Generate CSRs**.

5 Generate signed certificates for each component.

   a From the table, select the check box for the resource type for which you want to generate a signed certificate.

   b Click **Generate Signed Certificates**.

   c In the **Generate Certificates** dialog box, from the **Select Certificate Authority** drop-down menu, select **OpenSSL**.

   d Click **Generate Certificates**.

6 Install the generated signed certificates for each component.

   a From the table, select the check box for the resource type for which you want to install a signed certificate.

   b Click **Install Certificates**.

Install Third-Party CA-Signed Certificates

VMware Cloud Foundation supports the ability to install third-party certificates. You must download the certificate signing request (CSR) from SDDC Manager and then have it signed by a third-party Certificate Authority. You can then use the controls in the SDDC Manager UI to install the certificate.

Prerequisites

Uploading CA-Signed certificates from a Third Party Certificate Authority requires that you collect the relevant certificate files in the correct format and then create a single .tar.gz file with the contents. It's important that you create the correct directory structure within the .tar.gz file as follows:

- The name of the top-level directory must exactly match the name of the workload domain as it appears in the list on the **Inventory > Workload Domains**. For example, **`sfo-m01`**.

    - The PEM-encoded root CA certificate chain file (must be named `rootca.crt`) must reside inside this top-level directory. The `rootca.crt` chain file contains a root certificate authority and can have `n` number of intermediate certificates.

      For example:

      ```
      -----BEGIN CERTIFICATE-----
      <Intermediate1 certificate content>
      -----END CERTIFICATE------
      -----BEGIN CERTIFICATE-----
      <Intermediate2 certificate content>
      -----END CERTIFICATE------
      -----BEGIN CERTIFICATE-----
      <Root certificate content>
      -----END CERTIFICATE-----
      ```

  In the above example, there are two intermediate certificates, *intermediate1* and *intermediate2*, and a root certificate. *Intermediate1* must use the certificate issued by *intermediate2* and intermediate2 must use the certificate issued by Root CA.

  - The root CA certificate chain file, intermediate certificates, and root certificate must contain the `Basic Constraints` field with value **`CA:TRUE`**.
  - This directory must contain one sub-directory for each component resource for which you want to replace the certificates.

- Each sub-directory must exactly match the resource hostname of a corresponding component as it appears in the Resource Hostname column in the **Inventory > Workload Domains > Security** tab.

  For example, **`nsxManager.vrack.vsphere.local`**, **`vcenter-1.vrack.vsphere.local`**, and so on.

  - Each sub-directory must contain the corresponding .csr file, whose name must exactly match the resource as it appears in the Resource Hostname column in the **Inventory > Workload Domains > Security** tab.
  - Each sub-directory must contain a corresponding .crt file, whose name must exactly match the resource as it appears in the Resource Hostname column in the **Inventory > Workload Domains > Security** tab. The content of the .crt files must end with a newline character.

    For example, the **`nsxManager.vrack.vsphere.local`** sub-directory would contain the **`nsxManager.vrack.vsphere.local.crt`** file.

- All certificates including `rootca.crt` must be in UNIX file format.
- Additional requirements for NSX-T certificates:
  - Server certificate (*`NSXT_FQDN`*`.crt`) must contain the `Basic Constraints` field with value **`CA:FALSE`**.
  - If the NSX-T certificate contains HTTP or HTTPS based CRL Distribution Point it must be reachable from the server.
  - The extended key usage (EKU) of the generated certificate must contain the EKU of the CSR generated.

Note All resource and hostname values can be found in the list on the **Inventory > Workload Domains > Security** tab.

Procedure

1 In the navigation pane, click **Inventory > Workload Domains**.

2 On the **Workload Domains** page, from the table, in the domain column click the workload domain you want to view.

3 On the domain summary page, click the **Security** tab.

4 Generate CSR files for the target components.

   a From the table, select the check box for the resource type for which you want to generate a CSR.

   b Click **Generate CSRs**.

      The **Generate CSRs** wizard opens.

   c On the **Details** dialog, configure the settings and click **Next**.

Option	Description
Algorithm	Select the key algorithm for the certificate.
Key Size	Select the key size (2048 bit, 3072 bit, or 4096 bit) from the drop-down menu.
Email	Optionally, enter a contact email address.
Organizational Unit	Use this field to differentiate between divisions within your organization with which this certificate is associated.
Organization Name	Type the name under which your company is known. The listed organization must be the legal registrant of the domain name in the certificate request.
Locality	Type the city or locality where your company is legally registered.
State	Type the full name (do not abbreviate) of the state, province, region, or territory where your company is legally registered.
Country	Type the country name where your company is legally registered. This value must use the ISO 3166 country code.

   d (Optional) On the **Subject Alternative Name** dialog, enter the subject alternative name(s) and click **Next**.

      You can enter multiple values separated by comma (,), semicolon (;), or space ( ). For NSX-T, you can enter the subject alternative name for each node along with the Virtual IP (primary) node.

      Note Wildcard subject alternative name, such as *.example.com are not recommended.

   e On the **Summary** dialog, click **Generate CSRs**.

5 Download and save the CSR files to the directory by clicking **Download CSR**.

6 Complete the following tasks outside of the SDDC Manager UI:

   a Verify that the different .csr files have successfully generated and are allocated in the required directory structure.

   b Request signed certificates from a Third-party Certificate authority for each .csr.

   c. Verify that the newly acquired .crt files are correctly named and allocated in the required directory structure.
   d. Create a new .tar.gz file of the directory structure ready for upload to SDDC Manager. For example: `<domain name>.tar.gz`.

7. Click **Upload and Install**.
8. In the **Upload and Install Certificates** dialog box, click **Browse** to locate and select the newly created `<domain name>.tar.gz` file and click **Open**.
9. Click **Upload**.
10. If the upload is successful, click **Install Certificate**. The Security tab displays a status of Certificate Installation is in progress.

Remove Old or Unused Certificates from SDDC Manager

Old or unused certificates are stored in a trust store in SDDC Manager. You can delete old certificates directly on the SDDC Manager appliance.

Procedure

1. Log in to SDDC Manager by using a Secure Shell (SSH) client.

Setting	Value
User name	vcf
Password	*vcf_password*

2. Enter su to switch to the root user.
3. Using the sddcmanager-ssl-util.sh script retrieve a list of the names of the certificates in the trust store.

   ```
   /opt/vmware/vcf/operationsmanager/scripts/cli/sddcmanager-ssl-util.sh -list | grep 'Alias
   name'
   ```

4. Using the name of the certificate, delete the old or unused certificate.

   ```
   /opt/vmware/vcf/operationsmanager/scripts/cli/sddcmanager-ssl-util.sh -delete <certificate
   alias name from list>
   ```

5. (Optional) Clean out root certificates in VMware Endpoint Certificate Store from the Platform Services Controller node.

Configure Certificates for a Shared Single Sign-On Domain

When you deploy multiple instances of SDDC Manager that are joined to the same Single Sign-On (SSO) domain, you must take steps to ensure that certificates are installed correctly.

By default, each vCenter Server that you deploy uses VMCA-signed certificates. VMware recommends that you replace the default VMCA-signed certificates for each management domain vCenter Server, across all SDDC Manager instances, with certificates signed by the same external Certificate Authority (CA). After you deploy a new VI workload domain in any of the SDDC Manager instances, install a certificate in the VI workload domain vCenter Server that is signed by the same external CA as the management domain vCenter Servers.

If you plan to use the default VMCA-signed certificates for each vCenter Server across all SDDC Manager instances, you must take the following steps every time an additional vCenter Server Appliance is introduced to the SSO domain by any SDDC Manager instance:

- Import the VMCA machine certificate for the new vCenter Server Appliance into the trust store of all other SDDC Manager instances participating in that SSO domain.

An additional vCenter Server Appliance is introduced to the SSO domain when:

- You deploy a new SDDC Manager instance that shares the same SSO domain as an existing SDDC Manager instance.
- You deploy a new VI workload domain in any of the SDDC Manager instances that share an SSO domain.

Procedure

1. Get the certificate for the new management or VI workload domain vCenter Server.

   a SSH to the new vCenter Server Appliance using the **root** user account.

   b Enter **Shell**.

   c Retrieve the certificate from the VMware Certificate Store (VECS) and send it to an output file.

   ```
   /usr/lib/vmware-vmafd/bin/vecs-cli entry getcert --store MACHINE_SSL_CERT --alias
   __MACHINE_CERT --output /tmp/<new-vcenter>.cer
   ```

2. Copy the certificate (`<new-vcenter>.cer`) to a computer that has access to the SDDC Manager instance(s) to which you want to import the certificate.

3. Import the certificate to the trust store of the SDDC Manager instance(s).

   a Copy the certificate to the SDDC Manager appliance.

   For example, `/tmp/<new-vcenter>.cer`.

   b SSH in to the SDDC Manager appliance using the **vcf** user account.

   c Enter **su** to switch to the root user.

d Run the following commands:

```
trustedKey=$(cat /etc/vmware/vcf/commonsvcs/trusted_certificates.key)
```

```
(echo $trustedKey; sleep 1; echo "Yes") | keytool -importcert -alias <new-vcenter>
-file /tmp/<newvcenter>.
cer -keystore /etc/vmware/vcf/commonsvcs/trusted_certificates.store
```

```
echo "Yes" | keytool -importcert -alias <new-vcenter> -file /tmp/<new-vcenter>.cer
-keystore
/etc/alternatives/jre/lib/security/cacerts --storepass changeit
```

e Validate the keystore entries.

```
keytool -list -v -keystore /etc/vmware/vcf/commonsvcs/trusted_certificates.store
-storepass $trustedKey
```

4 Restart all SDDC Manager services on each SDDC Manager instance to which you imported a trusted certificate.

```
echo "Y" | /opt/vmware/vcf/operationsmanager/scripts/cli/sddcmanager_restart_services.sh
```

License Management 10

When deploying management components, VMware Cloud Foundation requires access to valid license keys. You add license keys to the SDDC Manager inventory so that they can be consumed at deployment time, but they are not synchronized between SDDC Manager and the underlying components.

In the deployment parameter workbook that you completed before bring-up, you entered license keys for the following components:

- VMware vSphere
- VMware vSAN
- VMware NSX-T Data Center
- VMware vCenter Server

After bring-up, these license keys appear in the Licensing screen of the SDDC Manager UI.

You must have adequate license units available before you create a VI workload domain, add a host to a vSphere cluster, or add a vSphere cluster to a workload domain. Add license keys as appropriate before you begin any of these tasks.

Read the following topics next:

- Add a License Key
- Edit License Description
- Delete License Key

Add a License Key

You can add licenses to the SDDC Manager inventory.

Procedure

1 In the navigation pane, click **Administration > Licensing**.

2 Click **+ License Key**.

3 Select a product from the drop-down menu.

4 Enter the license key.

5 Enter a description for the license.

   A description can help in identifying the license.

6 Click **Add**.

What to do next

If you want to replace an existing license with a newly added license, you must add and assign the new license in the management UI (for example, vSphere Client or NSX Manager) of the component whose license you are replacing.

Edit License Description

If you have multiple license keys for a product, the description can help in identifying the license. For example, you may want to use one license for high-performance workload domains and the other license for regular workload domains.

Procedure

1 In the navigation pane, click **Administration > Licensing**.

2 Click the vertical ellipsis (three dots) next to the license key and click **Edit Description**.

3 On the **Edit License Key Description** dialog, edit the description and click **Save**.

Delete License Key

Deleting a license key removes the license from the SDDC Manager inventory. If the license has been applied to any workload domain, host, or vSphere cluster, the license is not removed from them, but it cannot be applied to new workload domains, hosts, or vSphere clusters.

Procedure

1 In the navigation pane, click **Administration > Licensing**.

2 Click the vertical ellipsis (three dots) next to the license key you want to delete and click **Remove**.

3 In the **Remove License key** dialog, click **Remove**.

Results

The license is removed from the SDDC Manager inventory

ESXi Lockdown Mode

11

You can enable or disable normal lockdown mode in VMware Cloud Foundation to increase the security of your ESXi hosts.

To enable or disable normal lockdown mode in VMware Cloud Foundation, you must perform operations through the vCenter Server. For information on how to enable or disable normal lockdown mode, see "Lockdown Mode" in *vSphere Security* at https://docs.vmware.com/en/VMware-vSphere/index.html.

You can enable normal lockdown mode on a host after the host is added to workload domain. VMware Cloud Foundation creates service accounts that can be used to access the hosts. Service accounts are added to the Exception Users list during the bring-up or host commissioning. You can rotate the passwords for the service accounts using the password management functionality in the SDDC Manager UI.

Storage Management 12

To create and manage a workload domain, VMware Cloud Foundation requires at least one shared storage type for all ESXi hosts within a cluster. This initial shared storage type, known as principal storage, is configured during VxRail first run. Additional shared storage, known as supplemental storage, can be added using the vSphere Client after a cluster has been created.

Although the management domain requires vSAN as its principal storage, vSAN is not required for VI workload domains or vSphere clusters.

For a VI workload domain, the initial storage type can be one of the following:

- vSAN
- Fibre Channel (FC)

This initial shared storage type is known as principal storage. Principal storage is configured during the VxRail first run. Once created, the principal storage type for a cluster cannot be changed. However, a VI workload domain can include multiple clusters with unique principal storage types.

Additional shared storage types can be added to a cluster in the management domain or a VI workload domain after it has been created. The additional supported shared storage options include:

- vSAN
- Fibre Channel (FC)

Additional shared storage types are known as supplemental storage. All supplemental storage must be listed in the VMware Compatibility Guide. Supplemental storage can be manually added or removed after a cluster has been created using the vSphere Client. Multiple supplemental storage types can be presented to a cluster in the management domain or any VI workload domain.

Read the following topics next:

- vSAN Storage with VMware Cloud Foundation
- Fibre Channel Storage with VMware Cloud Foundation
- Sharing Remote Datastores with HCI Mesh for VI Workload Domains

vSAN Storage with VMware Cloud Foundation

vSAN is the preferred principal storage type for VMware Cloud Foundation. It is an enterprise-class storage integrated with vSphere and managed by a single platform. vSAN is optimized for flash storage and can non-disruptively expand capacity and performance by adding hosts to a cluster (scale-out) or by adding disks to a host (scale-up).

vSAN is typically used as principal storage, however it can be used as supplemental storage in a cluster when HCI Mesh is implemented.

Storage Type	Consolidated Workload Domain	Management Domain	VI Workload Domain
Principal	Yes	Yes	Yes
Supplemental	No	No	Yes

Prerequisites for vSAN Storage

In order to create a VI workload domain that uses vSAN as principal storage you must ensure the following:

- A minimum of three ESXi hosts that meet the vSAN hardware, cluster, software, networking and license requirements. For information, see the vSAN Planning and Deployment Guide.
- Perform a VxRail first run specifying the vSAN configuration settings. For information on the VxRail first run, contact Dell EMC Support.
- A valid vSAN license. See Chapter 10 License Management.

In some instances SDDC Manager may be unable to automatically mark the host disks as capacity. Follow the Mark Flash Devices as Capacity Using ESXCLI procedure in the vSAN Planning and Deployment Guide.

Procedures for vSAN Storage

- To use vSAN as principal storage for a new VI workload domain, perform the VxRail first run and then add the primary VxRail cluster. See Add the Primary VxRail Cluster to a VI Workload Domain Using the SDDC Manager UI.
- To use vSAN as principal storage for a new cluster, perform the VxRail first run and then add the VxRail cluster. See Add a VxRail Cluster to a Workload Domain Using the SDDC Manager UI.

Fibre Channel Storage with VMware Cloud Foundation

Fibre Channel (FC) is a storage protocol that the SAN uses to transfer data traffic from ESXi hosts to shared storage. The protocol packages SCSI commands into FC frames. To connect to the FC SAN, the ESXi host uses Fibre Channel host bus adapters (HBAs).

Fibre Channel can only be used as supplemental storage for the initial cluster in the management domain and consolidated workload domain, however it can be used as principal storage for subsequent clusters in these domains or in any VI workload domain.

Storage Type	Consolidated Workload Domain	Management Domain	VI Workload Domain
Principal	No	No	Yes
Supplemental	Yes	Yes	Yes

Prerequisites for FC Storage

- A minimum of three ESXi hosts. Review the ESXi Fibre Channel SAN Requirements in the vSphere Storage Guide.
- Perform a VxRail first run specifying the VMFS on FC configuration settings. For information on the VxRail first run, contact Dell EMC Support.
- A pre-created VMFS datastore.

Procedures for FC Storage

- To use Fibre Channel as principal storage for a new VI workload domain, perform the VxRail first run and then add the primary VxRail cluster. See Add the Primary VxRail Cluster to a VI Workload Domain Using the SDDC Manager UI.
- To use Fibre Channel as principal storage for a new cluster, perform the VxRail first run and then add the VxRail cluster. See Add a VxRail Cluster to a Workload Domain Using the SDDC Manager UI
- To use Fibre Channel as supplemental storage follow the *Create an NFS Datastore* procedure in the vSphere Storage Guide.

Sharing Remote Datastores with HCI Mesh for VI Workload Domains

HCI Mesh is a software-based approach for disaggregation of compute and storage resources in vSAN. HCI Mesh brings together multiple independent vSAN clusters by enabling cross-cluster utilization of remote datastore capacity within vCenter Server. HCI Mesh enables you to efficiently utilize and consume data center resources, which provides simple storage management at scale.

VMware Cloud Foundation supports sharing remote datastores with HCI Mesh for VI workload domains.

You can create HCI Mesh by mounting remote vSAN datastores on vSAN clusters and enable data sharing from the vCenter Server. It can take upto 5 minutes for the mounted remote vSAN datastores to appear in the .

It is recommended that you do not mount or configure remote vSAN datastores for vSAN clusters in the management domain.

For more information on sharing remote datastores with HCI Mesh, see "Sharing Remote Datastores with HCI Mesh" in *Administering VMware vSAN 7.0* at https://docs.vmware.com/en/VMware-vSphere/index.html.

Note You cannot mount remote vSAN datastores on stretched clusters.

Note After enabling HCI Mesh by mounting remote vSAN datastores, you can migrate VMs from the local datastore to a remote datastore. Since each cluster has its own VxRail Manager VM, you should not migrate VxRail Manager VMs to a remote datastore.

Workload Domain Management 13

Workload domains are logical units that carve up the compute, network, and storage resources of the VMware Cloud Foundation system. The logical units are groups of ESXi hosts managed by vCenter Server instances with specific characteristics for redundancy and VMware best practices.

The first workload domain, referred to as the management domain, is created by during bring-up. The VMware Cloud Foundation software stack is deployed within the management domain. Additional infrastructure virtual machines which provide common services, such as backup or security appliances, can also be deployed in the management domain.

Each workload domain include these VMware capabilities by default:

- vCenter Server Appliance
- vSphere High Availability (HA)
- vSphere Distributed Resource Scheduler (DRS)
- vSphere Distributed Switch
- VMware vSAN
- NSX Manager Cluster

Read the following topics next:

- NSX Edge Cluster Management

Adding Virtual Machines to the Management Domain

If you deployed VMware Cloud Foundation using a consolidated architecture, you can deploy user virtual machines to the management domain. To prevent resource conflicts between the VMware Cloud Foundation management components, these additional virtual machines should be added to the resource pool created for this purpose during bring-up (the Resource Pool User VM value in the deployment parameter workbook).

You must be careful when adding virtual machines to the management domain. You do not want to consume excessive resources that would obstruct standard management operations. Excess capacity consumption can prevent successful virtual machine fail overs in the event of a host failure or maintenance action.

You can add capacity to the management domain by adding a host(s). To expand the management domain, see Expand a Workload Domain.

Procedure

1 In the navigation pane, click **Inventory > Workload Domains.**

2 In the workload domains table, click the name of the management domain.

3 Click the **Services** tab.

4 Click the vCenter Server link.

This opens the vSphere Client for the management domain.

5 Create a new virtual machine within correct resource pool (Resource Pool User VM).

Note Do not move any of the VMware Cloud Foundation management virtual machines out of the resource pools they were placed in during bring-up.

About VI Workload Domains

When deploying a workload domain, you specify the name, compute, and networking details for the VI workload domain. You then select the hosts and licenses for the VI workload domain and start the workflow.

The workflow automatically:

- Deploys a vCenter Server Appliance for the new VI workload domain within the management domain. By using a separate vCenter Server instance per VI workload domain, software updates can be applied without impacting other VI workload domains. It also allows for each VI workload domain to have additional isolation as needed.
- Configures networking on each host.
- Configures vSAN storage on the ESXi hosts.

- For the first VI workload domain, the workflow deploys a cluster of three NSX Managers in the management domain and configures a virtual IP (VIP) address for the NSX Manager cluster. The workflow also configures an anti-affinity rule between the NSX Manager VMs to prevent them from being on the same host for high availability. Subsequent VI workload domains can share an existing NSX Manager cluster or deploy a new one.
- By default, VI workload domains do not include any NSX Edge clusters and are isolated. To provide north-south routing and network services, add one or more NSX Edge clusters to a VI workload domain. See NSX Edge Cluster Management .

Note You can only perform one VI workload domain operation at a time. For example, while you are deploying a new VI workload domain, you cannot add a cluster to any other VI workload domain.

Prerequisites for a Workload Domain

Review the prerequisites before you deploy a VI workload domain.

- If you plan to use DHCP for the NSX host overlay network, a DHCP server must be configured on the NSX host overlay VLAN for the VI workload domain. When NSX-T Data Center creates NSX Edge tunnel endpoints (TEPs) for the VI workload domain, they are assigned IP addresses from the DHCP server.

  Note If you do not plan to use DHCP, you can use a static IP pool for the NSX host overlay network. The static IP pool is created or selected as part of VI workload domain creation.

- A minimum of three hosts available for the VI workload domain.
- If the management domain in your environment has been upgraded to a version different from the original installed version, you must download a VI workload domain install bundle for the current version before you can create a VI workload domain.
- Decide on a name for your VI workload domain. Each VI workload domain must have a unique name. It is good practice to include the region and site information in the name because resource object names (such as host and vCenter names) are generated based on the VI workload domain name. The name can be three to 20 characters long and can contain any combination of the following:
  - Lowercase alphabetic characters
  - Numbers

  Note Spaces are not allowed in any of the names you specify when creating a VI workload domain.

- Decide on the following passwords:
  - vCenter Server root password
  - NSX Manager admin password

  Although the individual VMware Cloud Foundation components support different password requirements, you must set passwords following a common set of requirements across all components:

  - Minimum length: 12
  - Maximum length: 16
  - At least one lowercase letter, one uppercase letter, a number, and one of the following special characters: `! @ # $ ^ *`
  - Must NOT include:
    - A dictionary word
    - A palindrome
    - More than four monotonic character sequences
    - Three of the same consecutive characters

- Verify that you have the completed Planning and Preparation Workbook with the VI workload domain deployment option included.
- The IP addresses and Fully Qualified Domain Names (FQDNs) for the vCenter Server and NSX Manager instances must be resolvable by DNS.
- You must have valid license keys for the following products:
  - NSX-T Data Center
  - vSAN
  - vSphere

    Because vSphere and vSAN licenses are per CPU, ensure that you have sufficient licenses for the ESXi hosts to be used for the VI workload domain. See Chapter 10 License Management.

Creating VxRail VI Workload Domains

You can create a VxRail VI workload domain using the SDDC Manager and VxRail Manager UIs, or using the Workflow Optimization script.

When you use the product UIs, you complete some of the steps in the SDDC Manager UI and some of the steps in the VxRail Manager UI:

- Create a VxRail VI workload domain (SDDC Manager UI)
- VxRail first run (VxRail Manager UI)
- Add the primary VxRail cluster to the VI workload domain (SDDC Manager UI)

This following documentation describes the process of creating a workload domain using the product UIs.

Alternatively, you can use the Workflow Optimization script to perform all of the steps to create a VI workload domain in one place. See Create a VxRail VI Workload Domain Using the Workflow Optimization Script.

Create a VxRail VI Workload Domain in the SDDC Manager UI

Use the VxRail VI Configuration wizard to create a VI workload domain.

Procedure

1. In the navigation pane, click **+ Workload Domain** and then select **VI-VxRail Virtual Infrastructure Setup**.
2. Type a name for the VxRail VI workload domain, such as **`sfo01`**.

   The name must contain between 3 and 20 characters. It is a good practice to include location information in the name as resource object names (such as host and vCenter names) are generated on the basis of the VI workload domain name.
3. Type a name for the organization that requested or will use the virtual infrastructure, such as **`Finance`** and click **Next**.

   The name must contain between 3 and 20 characters.
4. On the Compute page of the wizard, enter the vCenter Server DNS name.
5. Type the vCenter Server subnet mask and default gateway.
6. Type and re-type the vCenter Server root password and click **Next**.
7. Review the details and click **Next**.
8. On the **Validation** page, wait until all of the inputs have been successfully validated and then click **Finish**.

   If validation is unsuccessful, you cannot proceed. Use the **Back** button to modify your settings and try again.

What to do next

Add the primary VxRail cluster to the workload domain. The status of the VI workload domain creation task will be `Activating` until you do so. See Add the Primary VxRail Cluster to a VI Workload Domain Using the SDDC Manager UI.

Adding the Primary VxRail Cluster to a VI Workload Domain

In order to finish creating a VxRail VI workload domain, you must add the primary VxRail cluster to the workload domain.

There are two ways to add the primary VxRail cluster to a workload domain, depending on your use case.

Use Case	Method
You have a single system vSphere Distributed Switch (vDS) used for both system and overlay traffic.	SDDC Manager UI
You have two system vSphere Distributed Switches. One is used for system traffic and one is used for overlay traffic.	MultiDvsAutomator script
You have one or two system vSphere Distributed switches for system traffic and a separate vDS for overlay traffic.	MultiDvsAutomator script

Add the Primary VxRail Cluster to a VI Workload Domain Using the SDDC Manager UI

You can add the primary VxRail cluster to a VI workload domain using the SDDC Manager UI.

Prerequisites

- Create a local user in vCenter Server. This is required for the VxRail first run.
- Image the VI workload domain nodes. For information on imaging the nodes, refer to Dell EMC VxRail documentation.
- Perform a VxRail first run of the VI workload domain nodes using the vCenter Server for that workload domain. For information on VxRail first run, refer to the Dell EMC VxRail documentation.

Procedure

1. In the SDDC Manager UI, click **Inventory > Workload Domains**.
2. In the workload domains table, click the vertical ellipsis (three dots) next to the VI workload domain in the `Activating` state and click **Add VxRail Cluster**.
3. On the **Discovered Clusters** page, select a VxRail cluster and click **Next**.
4. On the **Discovered Hosts** page, enter the SSH password for the discovered hosts and click **Next**.
5. On the **VxRail Manager** page, enter the Admin and Root user names and passwords.
6. On the **Thumbprint Verification** page, click ✓ to confirm the SSH thumbprints for VxRail Manager and the ESXi hosts.
7. The **Networking** page displays all the networking details for the cluster.

   a. Choose to create a new NSX Manager cluster or reuse an existing one.

      For the first VI workload domain, you must create an NSX Manager cluster.

   b. If you are reusing an existing NSX Manager cluster, select the cluster and click **Next**.

      The networking information for the selected cluster displays and cannot be edited.

   c. If you are creating a new NSX Manager cluster, enter the VLAN ID for the NSX-T host overlay (host TEP) network.

d Select the IP allocation method.

Note You can only use a static IP pool for the management domain and VI workload domains with uniform L2 clusters. For L3 aware or stretch clusters, DHCP is required for Host Overlay Network TEP IP assignment.

Option	Description
DHCP	With this option VMware Cloud Foundation uses DHCP for the Host Overlay Network TEPs. A DHCP server must be configured on the NSX-T host overlay (Host TEP) VLAN. When NSX creates TEPs for the VI workload domain, they are assigned IP addresses from the DHCP server.
Static IP Pool	With this option VMware Cloud Foundation uses a static IP pool for the Host Overlay Network TEPs. You can re-use an existing IP pool or create a new one. To create a new static IP Pool provide the following information: ■ Pool Name ■ Description ■ CIDR ■ IP Range. ■ Gateway IP Make sure the IP range includes enough IP addresses for the number of hosts that will use the static IP Pool. The number of IP addresses required depends on the number of pNICs on the ESXi hosts that are used for the vSphere Distributed Switch that handles host overlay networking. For example, a host with four pNICs that uses two pNICs for host overlay traffic requires two IP addresses in the static IP pool. **Note** You cannot stretch a cluster that uses static IP addresses for the NSX-T Host Overlay Network TEPs.

e Provide the NSX Manager cluster details:

- NSX Manager Virtual IP (VIP) address and FQDN
- IP addresses and FQDNs for three NSX Managers (nodes)
- NSX Manager Admin password

f Click **Next**.

8 Enter the license keys for NSX-T Data Center and VMware vSAN and click **Next**.

9 Review the details and click **Next**.

10 On the **Validation** page, wait until all of the inputs have been successfully validated.

If validation is unsuccessful, you cannot proceed. Use the **Back** button to modify your settings and try again.

11 Click **Finish**.

What to do next

If you have multiple instances of SDDC Manager that are joined to the same Single Sign-On (SSO) domain, you must take steps to ensure that certificates are installed correctly. See Configure Certificates for a Shared Single Sign-On Domain.

Add the Primary VxRail Cluster to a VI Workload Domain Using the MultiDvsAutomator Script

Use the MultiDvsAutomator script to add the primary VxRail cluster if:

- You have two system vSphere Distributed Switches. One is used for system traffic and one is used for overlay traffic.
- Or, you have one or two system vSphere Distributed switches for system traffic and a separate vDS for overlay traffic.

Prerequisites

- Create a local user in vCenter Server. This is required for the VxRail first run.
- Image the VI workload domain nodes. For information on imaging the nodes, refer to Dell EMC VxRail documentation.
- Perform a VxRail first run of the VI workload domain nodes using the vCenter Server for that workload domain. For information on VxRail first run, refer to the Dell EMC VxRail documentation.
- Download the `Multi-Dvs-Script-master.zip` file from https://code.vmware.com/samples?id=7663. Copy the `Multi-Dvs-Automator-VCF-4.3.0-master.zip` file to the /home/vcf directory on the SDDC Manager VM and unzip it.

Procedure

1. Using SSH, log in to the SDDC Manager VM with the user name `vcf` and the password you specified in the deployment parameter sheet.
2. Enter `su` to switch to the root account.
3. In the `/home/vcf/Multi-Dvs-Automator-VCF-4.3.0-master` directory, run `python vxrailworkloadautomator.py`.
4. Enter the SSO user name and password.
5. When prompted, select a workload domain to which you want to import the cluster.
6. Select a cluster from the list of clusters that are ready to be imported.
7. Enter passwords for the discovered hosts.
   - Enter a single password for all the discovered hosts.
   - Enter passwords individually for each discovered host.

8. Choose the vSphere Distributed Switch (vDS) to use for overlay traffic.
   - Create new DVS
     1. Enter a name for the new vSphere Distributed Switch.
     2. Enter a comma-separated list of the vmnics to use.
   - Use existing DVS
     1. Select an existing vSphere Distributed Switch.
     2. Select a portgroup on the vDS. The vmnics mapped to the selected port group are used to configure overlay traffic.
9. Enter the Geneve VLAN ID.
10. Choose the NSX Manager cluster.
    - Use existing NSX Manager cluster
      1. Enter VLAN ID for the NSX-T host overlay network.
      2. Select an existing NSX Manager cluster.
    - Create a new NSX Manager cluster
      1. Enter VLAN ID for the NSX-T host overlay network.
      2. Enter the NSX Manager Virtual IP (VIP) address and FQDN.
      3. Enter the FQDNs for the NSX Managers (nodes).

11 Select the IP allocation method for the Host Overlay Network TEPs.

Option	Description
DHCP	With this option VMware Cloud Foundation uses DHCP for the Host Overlay Network TEPs. A DHCP server must be configured on the NSX-T host overlay (Host TEP) VLAN. When NSX creates TEPs for the VI workload domain, they are assigned IP addresses from the DHCP server.
Static IP Pool	With this option VMware Cloud Foundation uses a static IP pool for the Host Overlay Network TEPs. You can re-use an existing IP pool or create a new one. To create a new static IP Pool provide the following information: ■ Pool Name ■ Description ■ CIDR ■ IP Range. ■ Gateway IP Make sure the IP range includes enough IP addresses for the number of hosts that will use the static IP Pool. The number of IP addresses required depends on the number of pNICs on the ESXi hosts that are used for the vSphere Distributed Switch that handles host overlay networking. For example, a host with four pNICs that uses two pNICs for host overlay traffic requires two IP addresses in the static IP pool. **Note** You cannot stretch a cluster that uses static IP addresses for the NSX-T Host Overlay Network TEPs.

12 Enter and confirm the VxRail Manager root and admin passwords.

13 Confirm the SSH thumbprints for VxRail Manager and the ESXi hosts.

14 Select the license keys for VMware vSAN and NSX-T Data Center.

15 Press Enter to begin the validation process.

16 When validation succeeds, press Enter to import the primary VxRail cluster.

What to do next

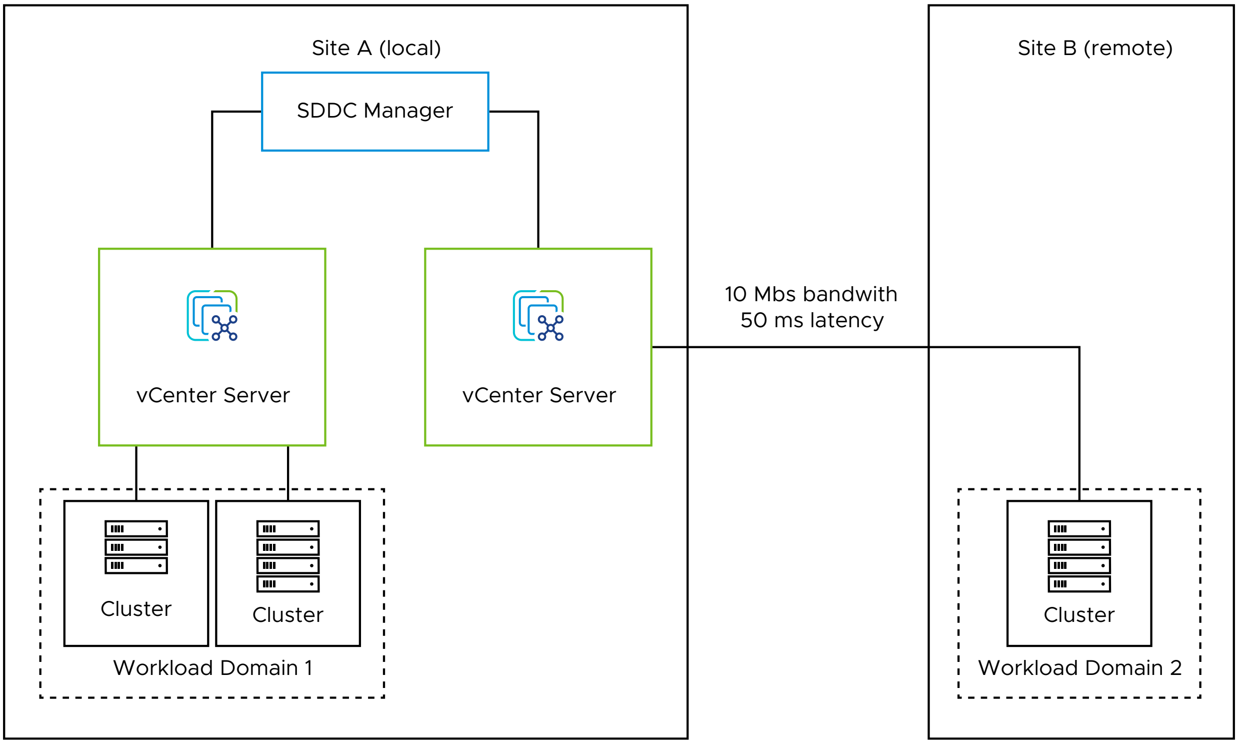
If you have multiple instances of SDDC Manager that are joined to the same Single Sign-On (SSO) domain, you must take steps to ensure that certificates are installed correctly. See Configure Certificates for a Shared Single Sign-On Domain.

Deploying a VI Workload Domain with a Remote Cluster

With VMware Cloud Foundation Remote Clusters, you can deploy a VI workload domain that has its vSphere cluster at a remote location. You can also enable VMware Cloud Foundation with Tanzu on a cluster deployed at a remote site. The remote cluster is managed by the VMware Cloud Foundation instance at the central site. You can perform a full-stack life cycle management for the remote sites from the central SDDC Manager UI.

VMware Cloud Foundation Remote Clusters have the following limitations:

- VMware Cloud Foundation supports a single remote cluster per VMware Cloud Foundation instance.
- A VI workload domain can include local clusters or a remote cluster, but not both.



The prerequisites for deploying a VI workload domain with a remote cluster are:

- Ensure that you meet the general prerequisites for deploying a VI workload domain. See Prerequisites for a Workload Domain.
- VMware Cloud Foundation Remote Clusters supports a minimum of 3 and maximum of 4 hosts.
- Dedicated WAN connectivity is required between central site and VMware Cloud Foundation Remote Clusters site.
- Primary and secondary active WAN links are recommended for connectivity from the central site to the VMware Cloud Foundation Remote Clusters site. The absence of WAN links can lead to two-failure states, WAN link failure, or NSX Edge node failure, which can result in unrecoverable VMs and application failure at the VMware Cloud Foundation Remote Clusters site.
- Minimum bandwidth of 10 Mbps and latency of 50 Ms is required between the central VMware Cloud Foundation instance and VMware Cloud Foundation Remote Clusters site.
- The network at the VMware Cloud Foundation Remote Clusters site must be able to reach the management network at the central site.

- DNS and NTP server must be available locally at or reachable from the VMware Cloud Foundation Remote Clusters site

For information on enabling Workload Management (vSphere with Tanzu) on a cluster deployed at a remote site, see Chapter 14 Workload Management .

Delete a VI Workload Domain

You can delete a VI workload domain from SDDC Manager UI.

Deleting a VI workload domain also removes the components associated with the VI workload domain from the management domain. This includes the vCenter Server instance and the NSX Manager cluster instances.

Note If the NSX Manager cluster is shared with any other VI workload domains, it will not be deleted.

Caution Deleting a workload domain is an irreversible operation. All clusters and virtual machines within the VI workload domain are deleted and the underlying datastores are destroyed.

It can take up to 20 minutes for a VI workload domain to be deleted. During this process, you cannot perform any operations on workload domains.

Prerequisites

- If remote vSAN datastores are mounted on a cluster in the VI workload domain, then the VI workload domain cannot be deleted. To delete such VI workload domains, you must first migrate any virtual machines from the remote datastore to the local datastore and then unmount the remote vSAN datastores from vCenter Server.
- If you require access after deleting a VI workload domain, back up the data. The datastores on the VI workload domain are destroyed when it is deleted.
- Migrate the virtual machines that you want to keep to another workload domain using cross vCenter vMotion.
- Delete any workload virtual machines created outside VMware Cloud Foundation before deleting the VI workload domain.
- Delete any NSX Edge clusters hosted on the VI workload domain. See KB 78635.

Procedure

1. In the navigation pane, click **Inventory > Workload Domains**.
2. Click the vertical ellipsis (three dots) next to the VI workload domain you want to delete and click **Delete Domain**.

3 On the **Delete Workload Domain** dialog box, click **Delete Workload Domain**.

A message indicating that the VI workload domain is being deleted appears. When the removal process is complete, the VI workload domain is removed from the domains table.

View Workload Domain Details

The Workload Domains page displays high level information about the workload domains in a VMware Cloud Foundation instance. CPU, memory, and storage utilized by the workload domain is also displayed here.

Procedure

1 In the navigation pane, click **Inventory > Workload Domains**.

2 In the workload domains table, click the name of the workload domain.

The workload domain details page displays CPU, memory, and storage allocated to the workload domain. The tabs on the page display additional information as described in the table below.

Tab	Information Displayed
Summary	Summary details for: ■ Nsx-T Data Center components. ■ Storage types by cluster. ■ Application Virtual Network configuration (if deployed).
Services	SDDC software stack components deployed for the workload domain's virtual environment and their IP addresses. Click a component name to navigate to that aspect of the virtual environment. For example, click vCenter Server to reach the vSphere Client for that workload domain. All the capabilities of a VMware SDDC are available to you in the VI workload domain's environment, such as creating, provisioning, and deploying virtual machines, configuring the software-defined networking features, and so on.
Updates/Patches	Available updates for the workload domain.
Update History	Updates applied to this workload domain.
Hosts	Names, IP addresses, status, associated clusters, and capacity utilization of the hosts in the workload domain and the network pool they are associated with.
Clusters	Names of the clusters, number of hosts in the clusters, and their capacity utilization.
Edge Clusters	Names of the NSX Edge clusters, NSX Edge nodes, and their status.
Security	Default certificates for the VMware Cloud Foundation components. For more information, see Chapter 9 Certificate Management.

Expand a Workload Domain

You can expand a workload domain by adding VxRail clusters using the SDDC Manager and VxRail Manager UIs, or using the Workflow Optimization script.

When you use the product UIs, you complete some of the steps in the SDDC Manager UI and some of the steps in the VxRail Manager UI:

- After imaging the workload domain nodes, perform the VxRail first run (VxRail Manager UI)
- Add the VxRail cluster to the workload domain (SDDC Manager UI)

The following documentation describes the process of expanding a workload domain using the product UIs.

Alternatively, you can use the Workflow Optimzation script to perform all of the steps to expand a workload domain in one place. See Add a VxRail Cluster Using the Workflow Optimization Script.

Adding a VxRail Cluster to a Workload Domain

You can add a VxRail cluster to a workload domain to expand the workload domain.

There are two ways to add a new VxRail cluster to a workload domain, depending on your use case.

Use Case	Method
You have a single system vSphere Distributed Switch (vDS) used for both system and overlay traffic.	SDDC Manager UI
You have two system vSphere Distributed Switches. One is used for system traffic and one is used for overlay traffic.	MultiDvsAutomator script
You have one or two system vSphere Distributed switches for system traffic and a separate vDS for overlay traffic.	MultiDvsAutomator script

Add a VxRail Cluster to a Workload Domain Using the SDDC Manager UI

You can expand an existing workload domain by adding a VxRail cluster using the SDDC Manager UI.

Use the SDDC Manager UI to add a VxRail cluster if you have a single system vSphere Distributed Switch (vDS) used for both system and overlay traffic.

Prerequisites

- Create a local user in vCenter Server as this is an external server deployed by VMware Cloud Foundation. This is required for the VxRail first run.
- Image the workload domain nodes. For information on imaging the nodes, refer to Dell EMC VxRail documentation.

- Perform a VxRail first run of the workload domain nodes using the vCenter Server for that workload domain. For information on VxRail first run, refer to the Dell EMC VxRail documentation.

Procedure

1. In the navigation pane, click **Inventory > Workload Domains**. The **Workload Domains** page displays information for all workload domains.
2. In the workload domains table, hover your mouse in the VxRail workload domain row.

   A set of three dots appears on the left of the workload domain name.
3. Click these three dots. Click **Add VxRail Cluster**.
4. On the **Discovered Clusters** page, the VxRail cluster in the vCenter is discovered. Click **Next**.
5. On the **Discovered Hosts** page, enter the SSH password for the discovered hosts and click **Next**.
6. On the **VxRail Manager** page, enter the Admin and Root user names and passwords.
7. On the **Thumbprint Verification** page, click ✓ to confirm the SSH thumbprints for VxRail Manager and the ESXi hosts.
8. On the **Networking** page, enter the NSX-T host overlay (Host TEP) VLAN of the management domain

9 Select the IP allocation method, provide the required information, and click **Next**.

Note You can only use a static IP pool for the management domain and VI workload domains with uniform L2 clusters. For L3 aware or stretch clusters, DHCP is required for Host Overlay Network TEP IP assignment.

Option	Description
DHCP	With this option VMware Cloud Foundation uses DHCP for the Host Overlay Network TEPs.
Static IP Pool	With this option VMware Cloud Foundation uses a static IP pool for the Host Overlay Network TEPs. You can re-use an existing IP pool or create a new one. To create a new static IP Pool provide the following information: ■ Pool Name ■ Description ■ CIDR ■ IP Range. ■ Gateway IP Make sure the IP range includes enough IP addresses for the number of hosts that will use the static IP Pool. The number of IP addresses required depends on the number of pNICs on the ESXi hosts that are used for the vSphere Distributed Switch that handles host overlay networking. For example, a host with four pNICs that uses two pNICs for host overlay traffic requires two IP addresses in the static IP pool. Note You cannot stretch a cluster that uses static IP addresses for the NSX-T Host Overlay Network.

10 Enter the license keys for NSX-T Data Center and VMware vSAN. Click **Next**.

11 Review the details and click **Next**.

12 On the **Validation** page, wait until all of the inputs have been successfully validated.

If validation is unsuccessful, you cannot proceed. Use the **Back** button to modify your settings and try again.

13 Click **Finish**.

The add VxRail cluster task is triggered.

Add a VxRail Cluster to a Workload Domain Using the MultiDvsAutomator Script

You can expand an existing workload domain by adding a VxRail cluster using the MultiDvsAutomator Script.

Use the MultiDvsAutomator script to add a VxRail cluster if:

- You have two system vSphere Distributed Switches. One is used for system traffic and one is used for overlay traffic.

- Or, you have one or two system vSphere Distributed switches for system traffic and a separate vDS for overlay traffic.

Prerequisites

- Create a local user in vCenter Server as this is an external server deployed by VMware Cloud Foundation. This is required for the VxRail first run.
- Image the workload domain nodes. For information on imaging the nodes, refer to Dell EMC VxRail documentation.
- Perform a VxRail first run of the workload domain nodes using the vCenter Server for that workload domain. For information on VxRail first run, refer to the Dell EMC VxRail documentation.
- Download the `Multi-Dvs-Automator-VCF-4.3.0-master.zip` file from https://code.vmware.com/samples?id=7663. Copy the `Multi-Dvs-Automator-VCF-4.3.0-master.zip` file to the /home/vcf directory on the SDDC Manager VM and unzip it.

Procedure

1. Using SSH, log in to the SDDC Manager VM with the user name `vcf` and the password you specified in the deployment parameter sheet.
2. Enter `su` to switch to the root account.
3. In the `/home/vcf/Multi-Dvs-Automator-VCF-4.3.0-master` directory, run `python vxrailworkloadautomator.py`.
4. Enter the SSO user name and password.
5. When prompted, select a workload domain to which you want to import the cluster.
6. Select a cluster from the list of clusters that are ready to be imported.
7. Enter passwords for the discovered hosts.
   - Enter a single password for all the discovered hosts.
   - Enter passwords individually for each discovered host.
8. Choose the vSphere Distributed Switch (vDS) to use for overlay traffic.
   - Create new DVS
     1. Enter a name for the new vSphere Distributed Switch.
     2. Enter a comma-separated list of the vmnics to use.
   - Use existing DVS
     1. Select an existing vSphere Distributed Switch.
     2. Select a portgroup on the vDS. The vmnics mapped to the selected port group are used to configure overlay traffic.
9. Enter the Geneve VLAN ID.

10 Select the IP allocation method for the Host Overlay Network TEPs.

Option	Description
DHCP	With this option VMware Cloud Foundation uses DHCP for the Host Overlay Network TEPs. A DHCP server must be configured on the NSX-T host overlay (Host TEP) VLAN. When NSX creates TEPs for the VI workload domain, they are assigned IP addresses from the DHCP server.
Static IP Pool	With this option VMware Cloud Foundation uses a static IP pool for the Host Overlay Network TEPs. You can re-use an existing IP pool or create a new one. To create a new static IP Pool provide the following information: ■ Pool Name ■ Description ■ CIDR ■ IP Range. ■ Gateway IP Make sure the IP range includes enough IP addresses for the number of hosts that will use the static IP Pool. The number of IP addresses required depends on the number of pNICs on the ESXi hosts that are used for the vSphere Distributed Switch that handles host overlay networking. For example, a host with four pNICs that uses two pNICs for host overlay traffic requires two IP addresses in the static IP pool. **Note** You cannot stretch a cluster that uses static IP addresses for the NSX-T Host Overlay Network TEPs.

11 Enter and confirm the VxRail Manager root and admin passwords.

12 Confirm the SSH thumbprints for VxRail Manager and the ESXi hosts.

13 Select the license keys for VMware vSAN and NSX-T Data Center.

14 Press Enter to begin the validation process.

15 When validation succeeds, press Enter to import the cluster.

Expand the VxRail Cluster

Once a cluster has been added to a workload domain, you can expand it further by adding hosts.

The process of expanding the VxRail cluster for a workload domain involves three steps:

1 Image the new node.

2 Discover and add new node to the cluster using the VxRail Manager plugin for vCenter Server. See the Dell EMC documentation.

3 Add the host to the VMware Cloud Foundation domain cluster. The next section provides more details about this task.

Add the VxRail Hosts to the Cluster in VMware Cloud Foundation

Once the hosts have been added to the VxRail cluster, you can add them to the cluster in VMware Cloud Foundation.

If the vSphere cluster hosts an NSX-T Edge cluster, you can only add new hosts with the same management, uplink, host TEP, and Edge TEP networks (L2 uniform) as the existing hosts.

If the cluster to which you are adding hosts uses a static IP pool for the Host Overlay Network TEPs, that pool must include enough IP addresses for the hosts you are adding. The number of IP addresses required depends on the number of pNICs on the ESXi hosts that are used for the vSphere Distributed Switch that handles host overlay networking. For example, a host with four pNICs that uses two pNICs for host overlay traffic requires two IP addresses in the static IP pool.

Procedure

1 In the navigation pane, click **Inventory > Workload Domains**.

2 In the workload domains table, click the name of the workload domain that you want to expand.

3 Click the **Clusters** tab.

4 Click the name of the cluster where you want to add a host.

5 Click **Actions > Add VxRail Hosts**.

6 Select the cluster expansion type.

This option only appears if the vSphere cluster hosts an NSX-T Edge cluster.

Option	Description
L2 Uniform	Select if all hosts you are adding to the vSphere cluster have the same management, uplink, host TEP, and Edge TEP networks as the existing hosts in the vSphere cluster.
L2 non-uniform and L3	You cannot proceed if you any of the hosts you are adding to the vSphere cluster have different networks than the existing hosts in the vSphere cluster. VMware Cloud Foundation does not support adding hosts to **L2 non-uniform and L3** vSphere clusters that host an NSX-T Edge cluster.

7 On the **Discovered Hosts** page, enter the SSH password for the host and click **Add**.

8 On the **Thumbprint Verification** page, click ✓ to confirm the SSH thumbprints for the ESXi hosts.

9 On the **Validation** page, wait until all of the inputs have been successfully validated.

If validation is unsuccessful, you cannot proceed. Use the **Back** button to modify your settings and try again.

10 Click **Finish**.

Reduce a Workload Domain

You can reduce a workload domain by removing a host from a cluster in the workload domain or by deleting a cluster.

Remove a Host from a Cluster in a Workload Domain

You can remove a host from a cluster in a workload domain through the **Workload Domains** page in SDDC Manager UI.

When a host is removed, the vSAN members are reduced. Ensure that you have enough hosts remaining to facilitate the configured vSAN availability. Failure to do so might result in the datastore being marked as read-only or in data loss.

Prerequisites

Use the vSphere Client to make sure that there are no critical alarms on the cluster from which you want to remove the host.

Procedure

1. In the navigation pane, click **Inventory > Workload Domains**.
2. In the workload domains table, click the name of the workload domain that you want to modify.
3. Click the **Clusters** tab.
4. Click the name of the cluster from which you want to remove a host.
5. Click the **Hosts** tab.
6. Select the host(s) to remove and click **Remove Selected Hosts**.
7. Click **Remove** to confirm the action.

   The details page for the cluster appears with a message indicating that the host is being removed. When the removal process is complete, the host is removed from the hosts table and deleted from vCenter Server.

Delete a VxRail Cluster

You can delete a VxRail cluster from the management domain or from a VI workload domain. Datastores on the ESXi hosts in the deleted cluster are destroyed.

You cannot delete the last cluster in a workload domain. Instead, delete the workload domain.

Prerequisites

- If vSAN remote datastores are mounted on the cluster, the cluster cannot be deleted. To delete such clusters, you must first migrate any VMs from the remote datastore to the local datastore and then unmount the vSAN remote datastores from vCenter Server.

- Delete any workload VMs created outside of VMware Cloud Foundation before deleting the cluster.
- Migrate or backup the VMs and data on the datastore associated with the cluster to another location.
- Delete the NSX Edge clusters hosted on the VxRail cluster or shrink the NSX Edge cluster by deleting Edge nodes hosted on the VxRail cluster. You cannot delete Edge nodes if doing so would result in an Edge cluster with fewer than two Edge nodes. For information about deleting an NSX Edge cluster, see KB 78635.

Procedure

1. In the navigation pane, click **Inventory > Workload Domains**.

   The Workload Domains page displays information for all workload domains.
2. Click the name of the workload domain that contains the cluster you want to delete.
3. Click the **Clusters** tab to view the clusters in the workload domain.
4. Hover your mouse in the cluster row you want to delete.
5. Click the three dots next to the cluster name and click **Delete VxRail Cluster**.
6. Click **Delete Cluster** to confirm that you want to delete the cluster.

   The details page for the workload domain appears with a message indicating that the cluster is being deleted. When the removal process is complete, the cluster is removed from the clusters table.

Using the Workflow Optimization Script to Create a VxRail VI Workload Domain or Add a VxRail Cluster

The Workflow Optimization script takes advantage of new APIs that allow VMware Cloud Foundation to work with VxRail Manager to create a VI workload domain or add a VxRail cluster to a VI workload domain.

Use the script to avoid jumping back and forth between the SDDC Manager UI and the VxRail Manager UI to complete these tasks.

Create a VxRail VI Workload Domain Using the Workflow Optimization Script

You can create a VxRail VI workload domain using the Workflow Optimization script, in order to avoid having to complete some tasks in the VxRail Manager UI and other tasks in the SDDC Manager UI.

The Workflow Optimzation script uses the VMware Cloud Foundation on Dell EMC VxRail API to perform all of the steps to create a VI workload domain in one place. See https://developer.vmware.com/apis/vcf-for-vxrail/4.3.1/clusters/ for more information about the API.

Prerequisites

In addition to the standard Prerequisites for a Workload Domain, using the Workflow Optimization script requires the following:

- Change the VxRail Manager IP Address
- Update the VxRail Manager Certificate

Procedure

1. Download the `.zip` file from https://code.vmware.com/samples?id=7647.
2. Unzip the file and copy the `WorkflowOptimization` directory to the `/home/vcf` directory on the SDDC Manager VM.
3. Using SSH, log in to the SDDC Manager VM with the user name **`vcf`** and the password you specified in the deployment parameter sheet.
4. In the `/home/vcf/WorkflowOptimization` directory, run `python vxrail_workflow_optimization_automator.py`.
5. Follow the prompts to create a VI workload domain.

   The `README.md` file in the `WorkflowOptimization` directory provides detailed instructions on how to use the script.

Add a VxRail Cluster Using the Workflow Optimization Script

You can add a VxRail cluster using the Workflow Optimization script, in order to avoid having to complete some tasks in the VxRail Manager UI and other tasks in the SDDC Manager UI.

The Workflow Optimzation script uses the VMware Cloud Foundation on Dell EMC VxRail API to perform all of the steps to add a VxRail cluster in one place. See https://developer.vmware.com/apis/vcf-for-vxrail/4.3.1/clusters/ for more information about the API.

Prerequisites

- Image the workload domain nodes. For information on imaging the nodes, refer to Dell EMC VxRail documentation.
- The IP addresses and Fully Qualified Domain Names (FQDNs) for the ESXi hosts, VxRail Manager, and NSX Manager instances must be resolvable by DNS.
- If you are using DHCP for the NSX Host Overlay Network, a DHCP server must be configured on the NSX Host Overlay VLAN of the management domain. When NSX-T Data Center creates TEPs for the VI workload domain, they are assigned IP addresses from the DHCP server.
- Change the VxRail Manager IP Address
- Update the VxRail Manager Certificate

Procedure

1. Download the `.zip` file from https://code.vmware.com/samples?id=7647.
2. Unzip the file and copy the `WorkflowOptimization` directory to the `/home/vcf` directory on the SDDC Manager VM.
3. Using SSH, log in to the SDDC Manager VM with the user name **`vcf`** and the password you specified in the deployment parameter sheet.
4. In the `/home/vcf/WorkflowOptimization` directory, run `python vxrail_workflow_optimization_automator.py`.
5. Follow the prompts to add a cluster.

   The `README.md` file in the `WorkflowOptimization` directory provides detailed instructions on how to use the script.

Change the VxRail Manager IP Address

In order to use the Workflow Optimzation script to trigger VxRail APIs from the SDDC Manager VM, you must change the static IP address of the VxRail Manager to an IP address that is in the management network subnet.

Prerequisites

- Ensure that a free IP address is available in the management network subnet
- Configure forward and reverse DNS settings for VxRail Manager
- The VxRail Manager static IP, 192.168.10.200, must be reachable and the UI available

Procedure

1. Enter the following address in a web browser on your host **`https://192.168.10.200/rest/vxm/api-doc.html`**.
2. Select Network.
3. From the **Servers** drop-down menu, select **/rest/vxm - VxRail Manager Server**.
4. Click **Network > POST /v1/network/vxrail-manager**.
5. Click **Try it out**.
6. Update the sample request body.

Option	Description
ip	Enter the new IP address for the VXRail Manager.
gateway	Enter the network gateway address for VxRail Manager.
netmask	Enter the subnet mask for VxRail Manager.
vlan_id	Enter the management network VLAN ID

7. Click **Execute**.
8. Verify that the new IP address is reachable.

What to do next

Update the VxRail Manager certificate. See Update the VxRail Manager Certificate.

Update the VxRail Manager Certificate

After you change the VxRail Manager IP address to support using the Workflow Optimization script, you must update the VxRail Manager certificate.

Prerequisites

Change the VxRail Manager IP Address

Procedure

1. Download `generate_ssl.sh` from https://code.vmware.com/samples?id=7656.
2. Copy the file to the `/home/mystic` directory on the VxRail Manager VM.
3. Using SSH, log in to VxRail Manager VM using the management IP address, with the user name **`mystic`** and default mystic password.
4. Type **`su`** to switch to the root account and enter the default root password.
5. Navigate to the `/home/mystic` and set 777 permissions on `generate_ssl.sh`.
6. Run the script:

   ```
   ./generate_ssl.sh VxRail-Manager-FQDN
   ```

   Replace *VxRail-Manager-FQDN* with the VxRail Manager hostname.

Rename a Workload Domain

You can rename any workload domain from within the SDDC Manager UI.

Procedure

1. In the navigation pane, click **Inventory > Workload Domains**.
2. Click the vertical ellipsis (three dots) in the Domain row for the workload domain you want to rename and click **Rename Domain**.
3. Enter a new name for the workload domain and click **Rename**.

vSphere Cluster Management

You can view vSphere cluster details from the SDDC Manager UI and rename the vSphere Cluster using the vSphere Client if required.

View vSphere Cluster Details

The cluster summary page displays high level information about the vSphere cluster as well as the hosts that form that cluster. CPU, memory, and storage utilization are also displayed.

Procedure

1. In the navigation pane, click **Inventory > Workload Domain**.
2. In the workload domains table, click the name of a workload domain.
3. Click the **Clusters** tab.
4. In the clusters table, click the name of a vSphere cluster.

   The cluster detail page appears. The tabs on the page display additional information as described in the table below.

Tab	Information Displayed
Summary	Organization, vSAN storage parameters, and overlay networking VLAN ID.
Hosts	Summary details about each host in the vSphere cluster. You can click a name in the FQDN column to access the host summary page.

What to do next

You can add or remove a host, or access the vSphere Client from this page.

Rename a Cluster

You can use the vSphere Client to rename a cluster managed by SDDC Manager. The SDDC Manager UIis updated with the new name.

Prerequisites

Ensure that you do not rename a cluster in the following conditions:

- When the cluster belongs to a workflow that is in progress.
- When the cluster belongs to a failed VI workload domain workflow, cluster workflow or host workflow. If you try to rename a cluster that belongs to a failed workflow, restart of the failed workflow will not be supported.

Procedure

1. In the navigation pane, click **Inventory > Workload Domains**.
2. Click a workload domain.
3. Click the **Clusters** tab.
4. Click the name of the cluster that you want to rename.
5. Click **Actions > Open in vSphere Client**.

6 In the vSphere Client, right-click the cluster and then click **Rename**.

7 Enter a new name for the cluster and click **OK**.

Note It takes up to two minutes for the new name to appear on the SDDC Manager UI.

NSX Edge Cluster Management

You can deploy NSX Edge clusters with 2-tier routing to provide north-south routing and network services in the management domain and VI workload domains.

An NSX Edge cluster is a logical grouping of NSX Edge nodes run on a vSphere cluster. NSX-T Data Center supports a 2-tier routing model.

Component	Connectivity	Description
Tier-0 logical router	Northbound	The tier-0 logical router connects to one or more physical routers or layer 3 switches and serves as a gateway to the physical infrastructure.
	Southbound	The tier-0 logical router connects to one or more tier-1 logical routers or directly to one or more logical switches.
Tier-1 logical router	Northbound	The tier-1 logical router connects to a tier-0 logical router.
	Southbound	The tier-1 logical router connects to one or more logical switches.

By default, workload domains do not include any NSX Edge clusters and workloads are isolated, unless VLAN-backed networks are configured in vCenter Server. Add one or more NSX Edge clusters to a workload domain to provide software-defined routing and network services.

Note You must create an NSX Edge cluster on the default management vSphere cluster in order to deploy vRealize Suite products.

You can add multiple NSX Edge clusters to the management or VI workload domains for scalability and resiliency. VMware Cloud Foundation supports creating a maximum of 32 Edge clusters per NSX Manager cluster and 16 Edge clusters per vSphere cluster for Edge clusters deployed through SDDC Manager or the VMware Cloud Foundation API. For scaling beyond these limits, you can deploy additional NSX Edge clusters through NSX Manager and scale up-to the NSX-T Data Center supported maximums limits. For VMware Cloud Foundation configuration maximums refer to the VMware Configuration Maximums website.

Note Unless explicitly stated in this matrix, VMware Cloud Foundation supports the configuration maximums of the underlying products. Refer to the individual product configuration maximums as appropriate.

The north-south routing and network services provided by an NSX Edge cluster created for a workload domain are shared with all other workload domains that use the same NSX Manager cluster.

Prerequisites for an NSX Edge Cluster

Before you deploy an NSX Edge cluster you should review the prerequisites.

- Verify that separate VLANs and subnets are available for the NSX host overlay VLAN and NSX Edge overlay VLAN. You cannot use DHCP for the NSX Edge overlay VLAN.
- Verify that the NSX host overlay VLAN and NSX Edge overlay VLAN are routed to each other.
- For dynamic routing, set up two Border Gateway Protocol (BGP) peers on Top of Rack (ToR) switches with an interface IP, BGP autonomous system number (ASN), and BGP password.
- Reserve a BGP ASN to use for the NSX Edge cluster’s Tier-0 gateway.
- Verify that DNS entries for the NSX Edge nodes are populated in the customer-managed DNS server.
- The vSphere cluster hosting an NSX Edge cluster must include hosts with identical management, uplink, NSX Edge overlay TEP, and NSX Edge overlay TEP networks (L2 uniform).
- You cannot deploy an NSX Edge cluster on a vSphere cluster that is stretched. You can stretch an L2 uniform vSphere cluster that hosts an NSX Edge cluster.
- The management network and management network gateway for the NSX Edge nodes must be reachable from the NSX host overlay and NSX Edge overlay VLANs.

Deploy an NSX Edge Cluster

Deploy an NSX Edge cluster to provide north-south routing and network services to a workload domain.

SDDC Manager does not enforce rack failure resiliency for NSX Edge clusters. Make sure that the number of NSX Edge nodes that you add to an NSX Edge cluster, and the vSphere clusters to which you deploy the NSX Edge nodes, are sufficient to provide NSX Edge routing services in case of rack failure.

After you create an NSX Edge cluster, you can use SDDC Manager to expand or shrink it by adding or deleting NSX Edge nodes.

This procedure describes how to use SDDC Manager to create an NSX Edge cluster with NSX Edge node virtual appliances. If you have latency intensive applications in your environment, you can deploy NSX Edge nodes on bare-metal servers. See Deployment of VMware NSX-T Edge Nodes on Bare-Metal Hardware for VMware Cloud Foundation 4.0.x.

Prerequisites

See Prerequisites for an NSX Edge Cluster.

Procedure

1. In the navigation pane, click **Inventory > Workload Domains**.
2. In the **Workload Domains** page, click a domain name in the Domain column.
3. Select **Actions > Add Edge Cluster**.
4. Verify the prerequisites, select **Select All**, and click **Begin**.
5. Enter the configuration settings for the NSX Edge cluster and click **Next**.

Setting	Description
Edge Cluster Name	Enter a name for the NSX Edge cluster.
MTU	Enter the MTU for the NSX Edge cluster. The MTU can be 1600-9000.
ASN	Enter an autonomous system number (ASN) for the NSX Edge cluster.
Tier-0 Router Name	Enter a name for the tier-0 gateway.
Tier-1 Router Name	Enter a name for the tier-1 gateway.
Edge Cluster Profile Type	Select **Default** or, if your environment requires specific Bidirectional Forwarding Detection (BFD) configuration, select **Custom**.
Edge Cluster Profile Name	Enter an NSX Edge cluster profile name. (Custom Edge cluster profile only)
BFD Allowed Hop	Enter the number of multi-hop Bidirectional Forwarding Detection (BFD) sessions allowed for the profile. (Custom Edge cluster profile only)
BFD Declare Dead Multiple	Enter the number of number of times the BFD packet is not received before the session is flagged as down. (Custom Edge cluster profile only)
BFD Probe Interval (milliseconds)	BFD is detection protocol used to identify the forwarding path failures. Enter a number to set the interval timing for BFD to detect a forwarding path failure. (Custom Edge cluster profile only)
Standby Relocation Threshold (minutes)	Enter a standby relocation threshold in minutes. (Custom Edge cluster profile only)
Edge Root Password	Enter and confirm the password to be assigned to the root account of the NSX Edge appliance.
Edge Admin Password	Enter and confirm the password to be assigned to the admin account of the NSX Edge appliance.
Edge Audit Password	Enter and confirm the password to be assigned to the audit account of the NSX Edge appliance.

NSX Edge cluster passwords must meet the following requirements:

- At least 12 characters
- At least one lower-case letter
- At least one upper-case letter
- At least one digit
- At least one special character (!, @, ^, =, *, +)
- At least five different characters

- No dictionary words
- No palindromes
- More than four monotonic character sequence is not allowed

6 Specify the use case details and click **Next**.

Setting	Description
Use Case	■ Select **Kubernetes - Workload Management** to create an NSX Edge cluster that complies with the requirements for deploying vSphere with Tanzu. See Chapter 14 Workload Management . If you select this option, you cannot modify the NSX Edge form factor or Tier-0 service high availability settings. ■ Select **Application Virtual Networks** to create an NSX Edge cluster that complies with the requirements deploying vRealize Suite components. See Deploy Application Virtual Networks for vRealize Suite Components. **Note** Management domain only. ■ Select **Custom** if you want an NSX Edge cluster with a specific form factor or Tier-0 service high availability setting.
Edge Form Factor	■ Small: 4 GB memory, 2 vCPU, 200 GB disk space. The NSX Edge Small VM appliance size is suitable for lab and proof-of-concept deployments. ■ Medium: 8 GB memory, 4 vCPU, 200 GB disk space. The NSX Edge Medium appliance size is suitable for production environments with load balancing. ■ Large: 32 GB memory, 8 vCPU, 200 GB disk space. The NSX Edge Large appliance size is suitable for production environments with load balancing. ■ XLarge: 64 GB memory, 16 vCPU, 200 GB disk space. The NSX Edge Extra Large appliance size is suitable for production environments with load balancing.
Tier-0 Service High Availability	In the active-active mode, traffic is load balanced across all members. In active-standby mode, all traffic is processed by an elected active member. If the active member fails, another member is elected to be active. Workload Management requires **Active-Active**. Some services are only supported in **Active-Standby**: NAT, load balancing, stateful firewall, and VPN. If you select **Active-Standby**, use exactly two NSX Edge nodes in the NSX Edge cluster.
Tier-0 Routing Type	Select **Static** or **EBGP** to determine the route distribution mechanism for the tier-0 gateway. If you select **Static**, you must manually configure the required static routes in NSX Manager. If you select **EBGP**, VMware Cloud Foundation configures eBGP settings to allow dynamic route distribution.

7 Enter the configuration settings for the first NSX Edge node and click **Add Edge Node**.

Setting	Description
Edge Node Name (FQDN)	Enter the FQDN for the NSX Edge node. Each node must have a unique FQDN.
Management IP (CIDR)	Enter the management IP for the NSX Edge node in CIDR format. Each node must have a unique management IP.

Setting	Description
Management Gateway	Enter the IP address for the management network gateway.
Edge TEP 1 IP (CIDR)	Enter the CIDR for the first NSX Edge TEP. Each node must have a unique Edge TEP 1 IP.
Edge TEP 2 IP (CIDR)	Enter the CIDR for the second NSX Edge TEP. Each node must have a unique Edge TEP 2 IP. The Edge TEP 2 IP must be different than the Edge TEP 1 IP.
Edge TEP Gateway	Enter the IP address for the NSX Edge TEP gateway.
Edge TEP VLAN	Enter the NSX Edge TEP VLAN ID.
Cluster	Select a vSphere cluster to host the NSX Edge node.
Cluster Type	Select **L2 Uniform** if all hosts in the vSphere cluster have identical management, uplink, host TEP, and Edge TEP networks. Select **L2 non-uniform and L3** if any of the hosts in the vSphere cluster have different networks. **Important** VMware Cloud Foundation does not support Edge cluster creation on**L2 non-uniform and L3** vSphere clusters.
First NSX VDS Uplink	Click **Advanced Cluster Settings** to map the first NSX Edge node uplink network interface to a physical NIC on the host, by specifying the ESXi uplink. The default is `uplink1`. When you create an NSX Edge cluster, SDDC Manager creates two trunked VLAN port groups. The information you enter here determines the active uplink on the first VLAN port group. If you enter `uplink3`, then uplink3 is the active uplink and the uplink you specify for the second NSX VDS uplink is the standby uplink. The uplink must be prepared for overlay use.
Second NSX VDS Uplink	Click **Advanced Cluster Settings** to map the second NSX Edge node uplink network interface to a physical NIC on the host, by specifying the ESXi uplink. The default is `uplink2`. When you create an NSX Edge cluster, SDDC Manager creates two trunked VLAN port groups. The information you enter here determines the active uplink on the second VLAN port group. If you enter `uplink4`, then uplink4 is the active uplink and the uplink you specify for the first NSX VDS uplink is the standby uplink. The uplink must be prepared for overlay use.
First Tier-0 Uplink VLAN	Enter the VLAN ID for the first uplink. This is a link from the NSX Edge node to the first uplink network.
First Tier-0 Uplink Interface IP (CIDR)	Enter the CIDR for the first uplink. Each node must have unique uplink interface IPs.
Peer IP (CIDR)	Enter the CIDR for the first uplink peer. (EBGP only)
Peer ASN	Enter the ASN for the first uplink peer. (EBGP only)
BGP Peer Password	Enter and confirm the BGP password. (EBGP only).
Second Tier-0 Uplink VLAN	Enter the VLAN ID for the second uplink. This is a link from the NSX Edge node to the second uplink network.

Setting	Description
Second Tier-0 Uplink Interface IP (CIDR)	Enter the CIDR for the second uplink. Each node must have unique uplink interface IPs. The second uplink interface IP must be different than the first uplink interface IP.
Peer IP (CIDR)	Enter the CIDR for the second uplink peer. (EBGP only)
ASN Peer	Enter the ASN for the second uplink peer. (EBGP only)
BGP Peer Password	Enter and confirm the BGP password. (EBGP only).

8 Click **Add More Edge Nodes** to enter configuration settings for additional NSX Edge nodes.

A minimum of two NSX Edge nodes is required. NSX Edge cluster creation allows up to 8 NSX Edge nodes if the Tier-0 Service High Availability is Active-Active and two NSX Edge nodes per NSX Edge cluster if the Tier-0 Service High Availability is Active-Standby.

9 When you are done adding NSX Edge nodes, click **Next**.

10 Review the summary and click **Next**.

SDDC Manager validates the NSX Edge node configuration details.

11 If validation fails, use the **Back** button to edit your settings and try again.

To edit or delete any of the NSX Edge nodes, click the three vertical dots next to an NSX Edge node in the table and select an option from the menu.

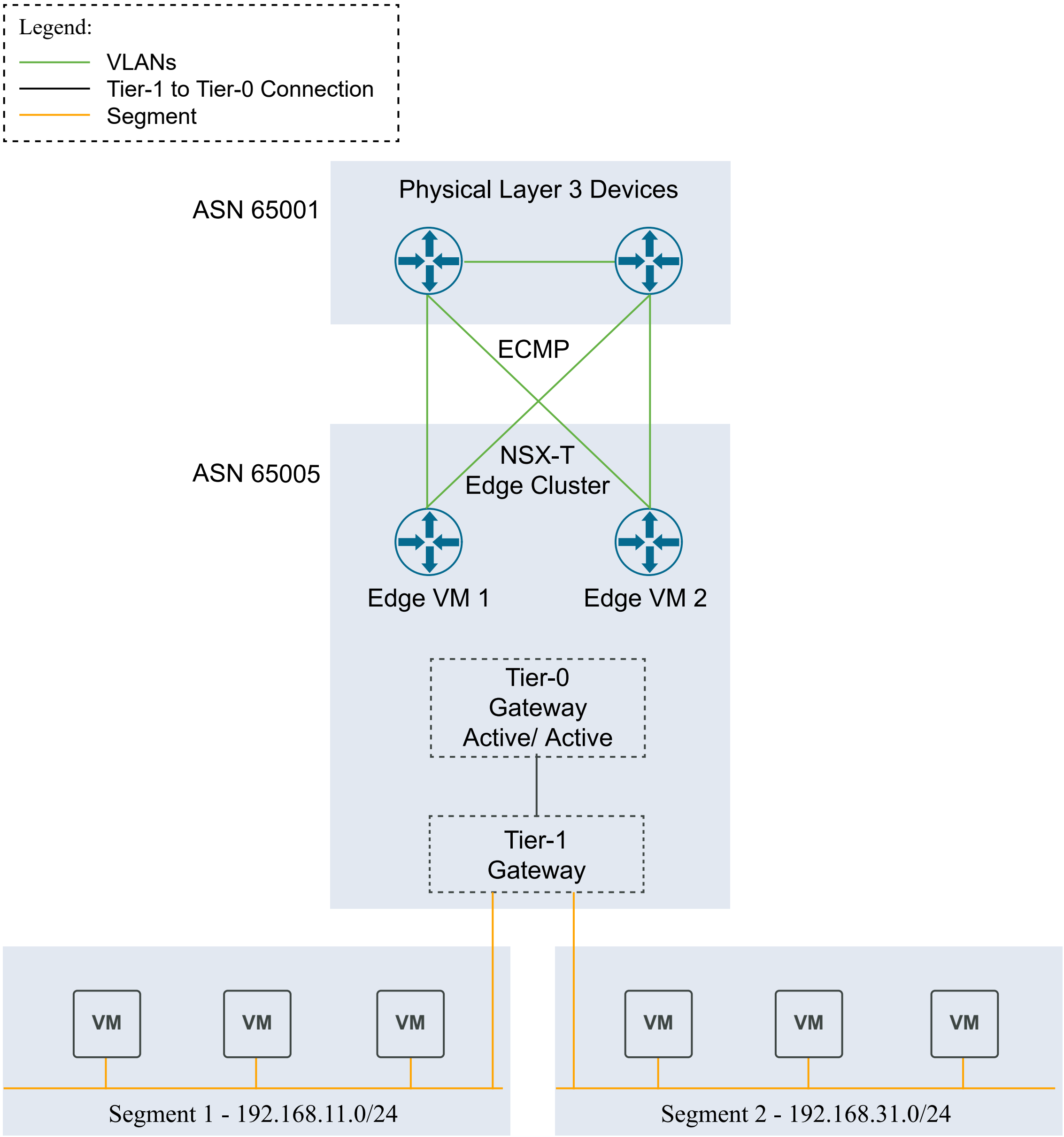
12 If validation succeeds, click **Finish** to create the NSX Edge cluster.

You can monitor progress in the Tasks panel.

Example

The following example shows a scenario with sample data. You can use the example to guide you in creating NSX Edge clusters in your environment.

Figure 13-1. Two-node NSX Edge cluster in a single rack



What to do next

In NSX Manager, you can create segments connected to the NSX Edge cluster's tier-1 gateway. You can connect workload virtual machines to these segments to provide north-south and east-west connectivity.

Add Edge Nodes to an NSX Edge Cluster

You can add NSX Edge nodes to an NSX Edge Cluster that you created with SDDC Manager.

You might want to add NSX Edge nodes to an NSX Edge cluster, for:

- Rack failure resiliency

- When the Tier-0 Service High Availability is Active-Standby and you require more than two NSX Edge nodes for services.
- When the Tier-0 Service High Availability is Active-Active and you require more than 8 NSX Edge nodes for services.
- When you add Supervisor Clusters to a Workload Management workload domain and need to support additional tier-1 gateways and services.

The available configuration settings for a new NSX Edge node vary based on:

- The Tier-0 Service High Availability setting (Active-Active or Active-Standby) of the NSX Edge cluster.
- The Tier-0 Routing Type setting (static or EBGP) of the NSX Edge cluster.
- Whether the new NSX Edge node is going to be hosted on the same vSphere cluster as the existing NSX Edge nodes (in-cluster) or on a different vSphere cluster (cross-cluster).

  Note Stretched clusters only support in-cluster expansion.

Prerequisites

- Verify that separate VLANs and subnets are available for the NSX host overlay VLAN and NSX Edge overlay VLAN. You cannot use DHCP for the NSX Edge overlay VLAN.
- Verify that the NSX host overlay VLAN and NSX Edge overlay VLAN are routed to each other.
- For dynamic routing, set up two Border Gateway Protocol (BGP) peers on Top of Rack (ToR) switches with an interface IP, BGP autonomous system number (ASN), and BGP password.
- Reserve a BGP ASN to use for the NSX Edge cluster's Tier-0 gateway.
- Verify that DNS entries for the NSX Edge nodes are populated in the customer-managed DNS server.
- The vSphere cluster hosting the NSX Edge nodes must include hosts with identical management, uplink, NSX Edge overlay TEP, and NSX Edge overlay TEP networks (L2 uniform).
- The vSphere cluster hosting the NSX Edge nodes must have the same pNIC speed for NSX-enabled VDS uplinks chosen for Edge overlay.
- All NSX Edge nodes in an NSX Edge cluster must use the same set of NSX-enabled VDS uplinks. These uplinks must be prepared for overlay use.
- The NSX Edge cluster must be **Active**.
- The NSX Edge cluster must be hosted on one or more vSphere clusters from the same workload domain.

Procedure

1 In the navigation pane, click **Inventory > Workload Domains**.

2 In the **Workload Domains** page, click a domain name in the Domain column.

3 Click the **Edge Clusters** tab.

4 Click the vertical ellipsis menu for the Edge Cluster you want to expand and select **Expand Edge Cluster**.

5 Verify the prerequisites, select **Select All**, and click **Begin**.

6 Enter and confirm the passwords for the NSX Edge cluster.

7 (Optional) Enter a name to create a new tier-1 gateway.

8 Enter the configuration settings for the new NSX Edge node and click **Add Edge Node**.

Setting	Description
Edge Node Name (FQDN)	Enter the FQDN for the NSX Edge node. Each node must have a unique FQDN.
Management IP (CIDR)	Enter the management IP for the NSX Edge node in CIDR format. Each node must have a unique management IP.
Management Gateway	Enter the IP address for the management network gateway.
Edge TEP 1 IP (CIDR)	Enter the CIDR for the first NSX Edge TEP. Each node must have a unique Edge TEP 1 IP.
Edge TEP 2 IP (CIDR)	Enter the CIDR for the second NSX Edge TEP. Each node must have a unique Edge TEP 2 IP. The Edge TEP 2 IP must be different than the Edge TEP 1 IP.
Edge TEP Gateway	Enter the IP address for the NSX Edge TEP gateway.
Edge TEP VLAN	Enter the NSX Edge TEP VLAN ID.
Cluster	Select a vSphere cluster to host the NSX Edge node. If the workload domain has multiple vSphere clusters, you can select the vSphere cluster hosting the existing NSX Edge nodes (in-cluster expansion) or select a different vSphere cluster to host the new NSX Edge nodes (cross-cluster expansion).
Cluster Type	Select **L2 Uniform** if all hosts in the vSphere cluster have identical management, uplink, host TEP, and Edge TEP networks. Select **L2 non-uniform and L3** if any of the hosts in the vSphere cluster have different networks. **Important** VMware Cloud Foundation does not support Edge cluster creation on**L2 non-uniform and L3** vSphere clusters.

Setting	Description
First NSX VDS Uplink	Specify an ESXi uplink to map the first NSX Edge node uplink network interface to a physical NIC on the host. The default is `uplink1`. The information you enter here determines the active uplink on the first VLAN port group used by the NSX Edge node. If you enter `uplink3`, then uplink3 is the active uplink and the uplink you specify for the second NSX VDS uplink is the standby uplink. (cross-cluster only) **Note** For in-cluster NSX Edge cluster expansion, new NSX Edge nodes use the same NSX VDS uplinks as the other Edge nodes hosted on the vSphere cluster.
Second NSX VDS Uplink	Specify an ESXi uplink to map the second NSX Edge node uplink network interface to a physical NIC on the host. The default is `uplink2`. The information you enter here determines the active uplink on the second VLAN port group used by the NSX Edge node. If you enter `uplink4`, then uplink4 is the active uplink and the uplink you specify for the first NSX VDS uplink is the standby uplink. (cross-cluster only) **Note** For in-cluster NSX Edge cluster expansion, new NSX Edge nodes use the same NSX VDS uplinks as the other Edge nodes hosted on the vSphere cluster.
Add Tier-0 Uplinks	Optional. Click **Add Tier-0 Uplinks** to add tier-0 uplinks. (Active-Active only)
First Tier-0 Uplink VLAN	Enter the VLAN ID for the first uplink. This is a link from the NSX Edge node to the first uplink network. (Active-Active only)
First Tier-0 Uplink Interface IP (CIDR)	Enter the CIDR for the first uplink. Each node must have unique uplink interface IPs. (Active-Active only)
Peer IP (CIDR)	Enter the CIDR for the first uplink peer. (EBGP only)
Peer ASN	Enter the ASN for the first uplink peer. (EBGP only)
BGP Peer Password	Enter and confirm the BGP password. (EBGP only)
Second Tier-0 Uplink VLAN	Enter the VLAN ID for the second uplink. This is a link from the NSX Edge node to the second uplink network. (Active-Active only)
Second Tier-0 Uplink Interface IP(CIDR)	Enter the CIDR for the second uplink. Each node must have unique uplink interface IPs. The second uplink interface IP must be different than the first uplink interface IP. (Active-Active only)
Peer IP (CIDR)	Enter the CIDR for the second uplink peer. (EBGP only)

Setting	Description
ASN Peer	Enter the ASN for the second uplink peer. (EBGP only)
BGP Peer Password	Enter and confirm the BGP password. (EBGP only)

9 Click **Add More Edge Nodes** to enter configuration settings for additional NSX Edge nodes.

An NSX Edge cluster can contain a maximum of 10 NSX Edge nodes.

- For an NSX Edge cluster with a Tier-0 Service High Availability setting of Active-Active, up to 8 of the NSX Edge nodes can have uplink interfaces.
- For an NSX Edge cluster with a Tier-0 Service High Availability setting of Active-Standby, up to 2 of the NSX Edge nodes can have uplink interfaces.

10 When you are done adding NSX Edge nodes, click **Next**.

11 Review the summary and click **Next**.

SDDC Manager validates the NSX Edge node configuration details.

12 If validation fails, use the **Back** button to edit your settings and try again.

To edit or delete any of the NSX Edge nodes, click the three vertical dots next to an NSX Edge node in the table and select an option from the menu.

13 If validation succeeds, click **Finish** to add the NSX Edge node(s) to the NSX Edge cluster.

You can monitor progress in the Tasks panel.

Remove Edge Nodes from an NSX Edge Cluster

You can remove NSX Edge nodes from an NSX Edge Cluster that you created with SDDC Manager if you need to scale down to meet business needs.

Prerequisites

- The NSX Edge cluster must be available in the SDDC Manager inventory and must be **Active**.
- The NSX Edge node must be available in the SDDC Manager inventory.
- The NSX Edge cluster must be hosted on one or more vSphere clusters from the same workload domain.
- The NSX Edge cluster must contain more than two NSX Edge nodes.
- The NSX Edge cluster must not be federated or stretched.
- If the NSX Edge cluster was deployed with a Tier-0 Service High Availability of Active-Active, the NSX Edge cluster must contain two or more NSX Edge nodes with two or more Tier-0 routers (SR component) after the NSX Edge nodes are removed.

- If selected edge cluster was deployed with a Tier-0 Service High Availability of Active-Standby, you cannot remove NSX Edge nodes that are the active or standby node for the Tier-0 router.

Procedure

1. In the navigation pane, click **Inventory > Workload Domains**.
2. In the **Workload Domains** page, click a domain name in the Domain column.
3. Click the **Edge Clusters** tab.
4. Click the vertical ellipsis menu for the Edge Cluster you want to expand and select **Shrink Edge Cluster**.
5. Select the Edge node(s) to remove and click **Next**.
6. Review the summary and click **Next**.

   SDDC Manager validates the request.
7. If validation fails, use the **Back** button to edit your settings and try again.

   Note You cannot remove the active and standby Edge nodes of a Tier-1 router at the same time. You can remove one and then remove the other after the first operation is complete.
8. If validation succeeds, click **Finish** to remove the NSX Edge node(s) from the NSX Edge cluster.

   You can monitor progress in the Tasks panel.

Workload Management

14

VMware Cloud Foundation™ with VMware Tanzu™ enables you to deploy and operate the compute, networking, and storage infrastructure for vSphere with Tanzu workloads. vSphere with Tanzu transforms vSphere to a platform for running Kubernetes workloads natively on the hypervisor layer.

When enabled on a vSphere cluster, vSphere with Tanzu provides the capability to run Kubernetes workloads directly on ESXi hosts and to create upstream Kubernetes clusters within dedicated resource pools. vSphere with Tanzu can also be enabled on the management domain default cluster.

You validate the underlying infrastructure for vSphere with Tanzu from the SDDC Manager UI and then complete the deployment in the vSphere Client. The SDDC Manager UI refers to the vSphere with Tanzu functionality as Kubernetes - Workload Management.

For more information on vSphere with Tanzu, see What Is vSphere with Tanzu?.

Read the following topics next:

- Sizing Compute and Storage Resources for Workload Management
- Create a Subscribed Content Library
- Enable Workload Management
- View Workload Management Cluster Details
- Update Workload Management License

Sizing Compute and Storage Resources for Workload Management

Compute and storage requirements for each component are key considerations when you size the solution.

Virtual Machine	Nodes	Total vCPUs	Total Memory	Total Storage
Supervisor Cluster control plane (small nodes - up to 2000 pods per Supervisor cluster)	3	12	48 GB	200 GB
Registry Service	N/A	7	7 GB	200 GB
Tanzu Kubernetes Cluster control plane (small nodes)	3 (per cluster)	6	12 GB	48 GB
Tanzu Kubernetes Cluster worker nodes (small nodes)	3 (per cluster)	6	12 GB	48 GB
NSX Edge node	2	16	64 GB	400 GB

Create a Subscribed Content Library

Before you can deploy a Tanzu Kubernetes cluster, create a Subscribed Content Library to store virtual machine images that the VMware Tanzu™ Kubernetes Grid™ Service uses to create Tanzu Kubernetes Cluster nodes.

You can create a Subscribed Content Library using the vSphere Client or using PowerShell.

Procedure

1 To create a Subscribed Content Library using the vSphere Client:

   a In a web browser, log in to the workload domain vCenter Server by using the vSphere Client (https://`<vcenter_server_fqdn>`/ui).

   b Select **Menu > Content Libraries**.

   c In the **Content Libraries** inventory, click **+Create**.

   d On the **Name and location** page, configure the settings and click **Next**.

Setting	Value
Name	**`Kubernetes`**
vCenter Server	Select the workload domain vCenter Server.

   e On the **Configure content library** page, select **Subscribed content library**, configure the settings and click **Next**.

Setting	Value
Subscription URL	https://wp-content.vmware.com/v2/latest/lib.json
Enable Authentication	Deselected
Download Content	Immediately

f In the **Kubernetes - Unable to verify authenticity** dialog box, click **Yes** to accept the SSL certificate thumbprint.

g On the **Add Storage** page, select your vSAN datastore, click **Next**.

h On the **Ready to Complete** page, review the settings and click **Finish**.

2 To create a Subscribed Content Library using PowerShell:

a Open a PowerShell Console, define variables for the inputs by entering the following commands:

```
$sddcManagerFqdn = "sfo-vcf01.sfo.rainpole.io"
$sddcManagerUsername = "administrator@vsphere.local"
$sddcManagerPassword = "VMw@re1!"
$wldName = "sfo-w01"
$contentLibraryUrl = "https://wp-content.vmware.com/v2/latest/lib.json"
$contentLibraryName = "Kubernetes"
$wldDatastoreName = "sfo-w01-cl01-ds-vsan01"
```

b Perform the configuration by entering the following commands:

```
Add-ContentLibrary -Server $sddcManagerFqdn -User $sddcManagerUsername -Pass
$sddcManagerPassword -Domain $wldName -ContentLibraryName $contentLibraryName
-Datastore $wldDatastoreName -SubscriptionUrl $contentLibraryUrl
```

Enable Workload Management

With Workload Management, you validate the underlying infrastructure for vSphere with Tanzu. You then complete the deployment using the vSphere Client.

Prerequisites

- A VI workload domain must be deployed.
- An Workload Management ready NSX Edge cluster must be deployed on the workload domain.

  You must select Workload Management on the Use Case page of the Add Edge Cluster wizard. See step 6 in Deploy an NSX Edge Cluster.
- All hosts in the vSphere cluster for which you enable Workload Management must have a vSphere with Tanzu license.
- The following IP address subnets must be defined:
  - A non-routable subnet for pod networking, minimum of a /22 subnet.
  - A non-routable subnet for Service IP addresses, minimum of a /24 subnet
  - A routable subnet for ingress, minimum of a /27 subnet
  - A routable subnet for egress, minimum of a /27 subnet

Procedure

1. In the navigation pane, click **Solutions**.
2. In the Kubernetes - Workload Management section, click **Deploy**.
3. Review the Workload Management prerequisites, click **Select All**, and click **Begin**.
4. Select the workload domain associated with the vSphere cluster where you want to enable Workload Management.

   The Workload Domain drop-down menu displays all Workload Management ready workload domains, including the management domain.

   vSphere clusters in the selected workload domain that are compatible with Workload Management are displayed in the Compatible section. Incompatible clusters are displayed in the Incompatible section, along with the reason for the incompatibility. If you want to get an incompatible cluster to a usable state, you can exit the Workload Management deployment wizard while you resolve the issue.
5. From the list of compatible clusters on the workload domain, select the cluster where you want to enable Workload Management and click **Next**.
6. On the Validation page, wait for validation to complete successfully and click **Next**.

   The following validations are performed.

   - vCenter Server validation (vCenter Server credentials, vSphere cluster object, and version)
   - Network validation (NSX Manager credentials and version)
   - Compatibility validation (vSphere cluster and content library)
7. On the Review page, review your selections and click **Complete in vSphere**.

   You are automatically redirected to the vSphere Client.

What to do next

Follow the deployment wizard within the vSphere Client to complete the Workload Management deployment and configuration steps.

View Workload Management Cluster Details

The Workload Management page displays clusters with Workload Management. The status of each cluster, number of hosts in the cluster, and associated workload domain is also displayed.

Procedure

1. In the navigation pane, click **Solutions**.
2. In the Kubernetes - Workload Management section, click **View Details**.
3. Click vSphere Workload Management Clusters to see cluster details in vSphere.

Update Workload Management License

Once you enable Workload Management on a cluster, you must assign a Tanzu edition license to the cluster before the evaluation license expires.

Prerequisites

You must have added the vSphere with Tanzu license key to the Cloud Foundation license inventory. See Add a License Key.

Procedure

1. In the navigation pane, click **Solutions**.
2. Click the dots to the left of the cluster for which you want to update the license and click **Update Workload Management license**.
3. Select the appropriate license and click **Apply**.

   After the license update processing is completed, the Workload Management page is displayed. The task panel displays the licensing task and its status.

Working with vRealize Suite Lifecycle Manager 15

When VMware Cloud Foundation mode is enabled in vRealize Suite Lifecycle Manager, the behavior of vRealize Suite Lifecycle Manager is aligned with the VMware Cloud Foundation architecture.

vRealize Suite Lifecycle Manager in VMware Cloud Foundation mode introduces the following features:

- Binary mapping optimization. When vRealize Suite Lifecycle Manager runs in VMware Cloud Foundation mode, it can poll and use the vRealize Suite product binaries directly from SDDC Manager's downloaded bundles.
- Automatic load balancer configuration. Load balancer preparation and configuration are no longer a prerequisite when you use vRealize Suite Lifecycle Manager to deploy or perform a cluster expansion on Workspace ONE Access, vRealize Operations, or vRealize Automation. Load balancer preparation and configuration take place as part of the deploy or expand operation.
- Automatic infrastructure selection in vRealize Suite Lifecycle Manager's deployment wizards. When you deploy a vRealize Suite product through vRealize Suite Lifecycle Manager, infrastructure objects such as clusters and networks are pre-populated. They are fixed and cannot be changed to ensure alignment with the VMware Cloud Foundation architecture.
- Cluster deployment for a new environment. You can deploy vRealize Log Insight, vRealize Operations, or vRealize Automation in clusters. You can deploy Workspace ONE Access either as a cluster or a single node. If you deploy Workspace ONE Access as a single node, you can expand it to a cluster later.
- Consistent Bill Of Materials (BOM). vRealize Suite Lifecycle Manager in VMware Cloud Foundation mode only displays product versions that are compatible with VMware Cloud Foundation to ensure product interoperability.
- Inventory synchronization between vRealize Suite Lifecycle Manager and SDDC Manager. vRealize Suite Lifecycle Manager can detect changes made to vRealize Suite products and update its inventory through inventory synchronization. When VMware Cloud Foundation mode is enabled in vRealize Suite Lifecycle Manager, inventory synchronization in vRealize Suite Lifecycle Manager also updates SDDC Manager's inventory to get in sync with the current state of the system.

- Product versions. You can only access the versions for the selected vRealize products that are specifically supported by VMware Cloud Foundation itself.
- Resource pool and advanced properties. The resources in the Resource Pools under the Infrastructure Details are blocked by the vRealize Suite Lifecycle Manager UI, so that the VMware Cloud Foundation topology does not change. Similarly, the Advanced Properties are also blocked for all products except for Remote Collectors. vRealize Suite Lifecycle Manager also auto-populates infrastructure and network properties by calling VMware Cloud Foundation deployment API.
- Federal Information Processing Standard (FIPS) compliance.
- Watermark.

Read the following topics next:

- vRealize Suite Lifecycle Manager Implementation
- Clustered Workspace ONE Access Implementation

vRealize Suite Lifecycle Manager Implementation

You deploy vRealize Suite Lifecycle Manager in VMware Cloud Foundation mode by using SDDC Manager. After that, you perform the necessary post-deployment configurations.

By default, VMware Cloud Foundation uses NSX-T Data Center to create NSX segments and deploys vRealize Suite Lifecycle Manager and the vRealize Suite products to these NSX segments. Starting with VMware Cloud Foundation 4.3, NSX segments are no longer configured during the management domain bring-up process, but instead are configured using the SDDC Manager UI. The new process offers the choice of using either overlay-backed or VLAN-backed segments. See Deploy Application Virtual Networks for vRealize Suite Components.

vRealize Suite Lifecycle Manager runs in VMware Cloud Foundation mode, the integration ensures awareness between the two components. You launch the deployment of vRealize Suite products from the SDDC Manager UI and are redirected to the vRealize Suite Lifecycle Manager UI where you complete the deployment process.

Prerequisites

- Download the VMware Software Install Bundle for vRealize Suite Lifecycle Manager from the VMware Depot to the local bundle repository. See Download VMware Cloud Foundation on Dell EMC VxRail Bundles.
- Allocate an IP address for the vRealize Suite Lifecycle Manager virtual appliance on the cross-instance NSX segment and prepare both forward (A) and reverse (PTR) DNS records.
- Allocate an IP address for the NSX-T Data Center standalone Tier-1 Gateway on the cross-instance NSX segment. This address is used for the service interface of the standalone NSX-T Data Center Tier 1 Gateway created during the deployment. The Tier 1 Gateway is used for load-balancing of specific vRealize Suite products and Workspace ONE Access.

- Ensure you have enough storage capacity:
  - Required storage: 178 GB
  - Virtual disk provisioning: Thin
- Verify that the management domain vCenter Server is operational.
- Verify that the cross-instance NSX segment is available.
- Verify that NSX Manager is operational.
- Verify the **Prerequisite Checklist** sheet in the *Planning and Preparation Workbook*.

Deploy Application Virtual Networks for vRealize Suite Components

Before you can deploy vRealize Suite components, you must deploy Application Virtual Networks in the management domain.

An Application Virtual Network (AVN) is a software-defined networking concept based on NSX-T Data Center that allows the hosting of management applications on NSX segments. In NSX-T Data Center, segments are virtual layer-2 domains.

You can create overlay-backed NSX segments or VLAN-backed NSX segments. Both options create two NSX segments (Region-A and X-Region) on the NSX Edge cluster deployed in the default management vSphere cluster. Those NSX segments are used when you deploy the vRealize Suite products. Region-A segments are local instance NSX segments and X-Region segments are cross-instance NSX segments.

Overlay-Backed NSX Segments

Overlay-backed segments provide flexibility for workload placement by removing the dependence on traditional data center networks. Using overlay-backed segments improves the security and mobility of management applications and reduces the integration effort with existing networks. Overlay-backed segments are created in an overlay transport zone.

In an overlay-backed segment, traffic between two VMs on different hosts but attached to the same overlay segment have their layer-2 traffic carried by a tunnel between the hosts. NSX-T Data Center instantiates and maintains this IP tunnel without the need for any segment-specific configuration in the physical infrastructure. As a result, the virtual network infrastructure is decoupled from the physical network infrastructure. That is, you can create segments dynamically without any configuration of the physical network infrastructure.

VLAN-Backed NSX Segments

VLAN-backed segments leverage the physical data center networks to isolate management applications, while still taking advantage of NSX-T Data Center to manage these networks. VLAN-backed network segments ensure the security of management applications without requiring support for overlay networking. VLAN-backed segments are created in a VLAN transport zone.

A VLAN-backed segment is a layer-2 broadcast domain that is implemented as a traditional VLAN in the physical infrastructure. This means that traffic between two VMs on two different hosts but attached to the same VLAN-backed segment is carried over a VLAN between the two hosts. The resulting constraint is that you must provision an appropriate VLAN in the physical infrastructure for those two VMs to communicate at layer-2 over a VLAN-backed segment.

vRealize Suite Components and NSX Segments

When you deploy the vRealize Suite components, they use the NSX segments that you created.

vRealize Suite Component	NSX Segment
vRealize Log Insight	Region-A
vRealize Operations Manager	X-Region
Workspace ONE Access	X-Region
vRealize Automation	X-Region
vRealize Suite Lifecycle Manager	X-Region

Deploy Overlay-Backed NSX Segments

Create overlay-backed NSX segments, also known as Application Virtual Networks (AVNs), for use with vRealize Suite components.

This procedure describes creating overlay-backed NSX segments. If you want to create VLAN-backed NSX segments instead, see Deploy VLAN-Backed NSX Segments.

Prerequisites

Create an NSX Edge cluster for Application Virtual Networks, using the recommended settings, in the default management vSphere cluster. See Deploy an NSX Edge Cluster.

Procedure

1 In the navigation page, click **Inventory > Workload Domains**.

2 Click on the management domain.

3 Select **Actions > Add AVNs**.

4 Select **Overlay-backed network segment** and click **Next**.

5 Select an NSX Edge cluster and a Tier-1 gateway.

6 Enter information for each of the NSX segments (Region-A and X-Region):

Option	Description
Name	Enter a name for the NSX segment. For example, **`Mgmt-RegionA01`**.
Subnet	Enter a subnet for the NSX segment.
Subnet mask	Enter a subnet mask for the NSX segment.

Option	Description
Gateway	Enter a gateway for the NSX segment.
MTU	Enter an MTU for the NSX segment.

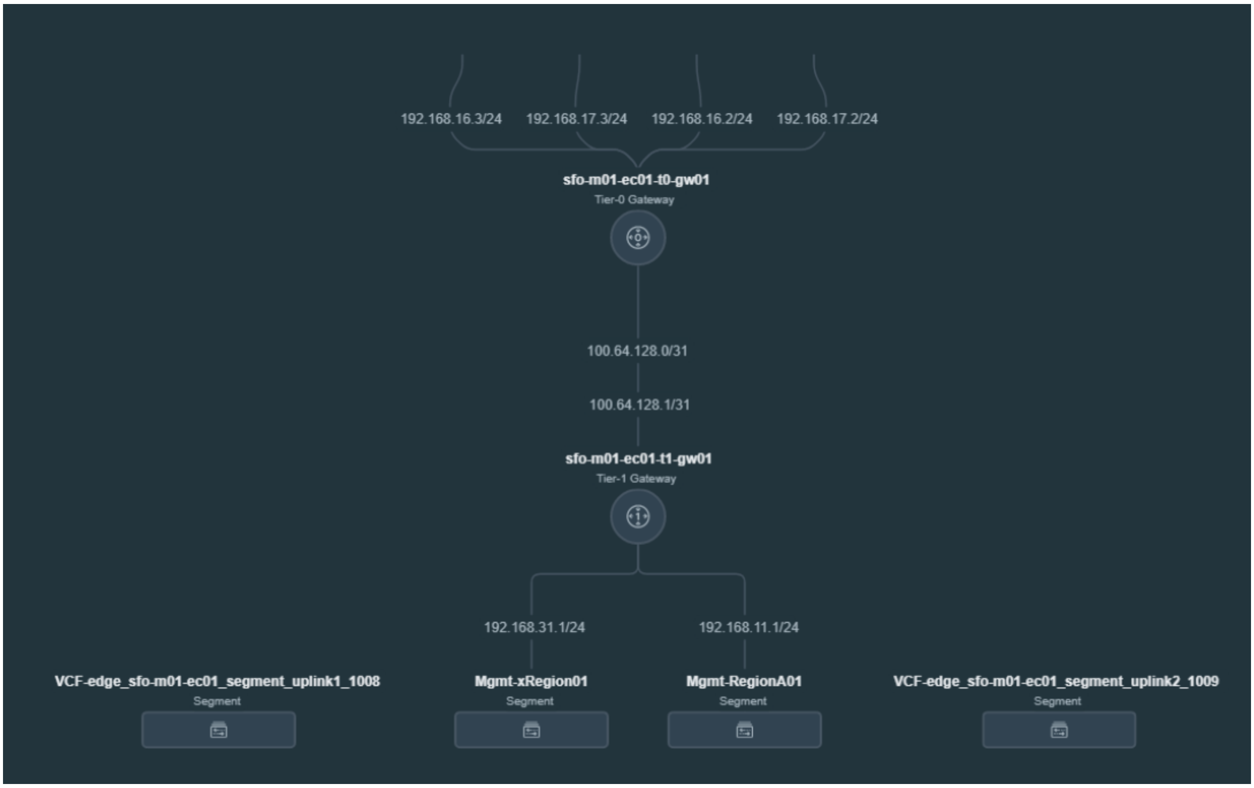
7 Click **Validate Settings** and then click **Next**.

If validation does not succeed, verify and update the information you entered for the NSX segments and click **Validate Settings** again.

8 Review the settings and click **Finish**.

Example

Example Network Topology for Overlay-Backed NSX Segments



Deploy VLAN-Backed NSX Segments

Create VLAN-backed NSX segments, also known as Application Virtual Networks (AVNs), for use with vRealize Suite components.

This procedure describes creating VLAN-backed NSX segments. If you want to create overlay-backed NSX segments instead, see Deploy Overlay-Backed NSX Segments.

Prerequisites

Create an NSX Edge cluster for Application Virtual Networks, using the recommended settings, in the default management vSphere cluster. See Deploy an NSX Edge Cluster.

You must have an available VLAN ID for each NSX segment.

Procedure

1. In the navigation page, click **Inventory > Workload Domains**.
2. Click on the management domain.
3. Select **Actions > Add AVNs**.
4. Select **VLAN-backed network segment** and click **Next**.
5. Select an NSX Edge cluster.
6. Enter information for each of the NSX segments (Region-A and X-Region):

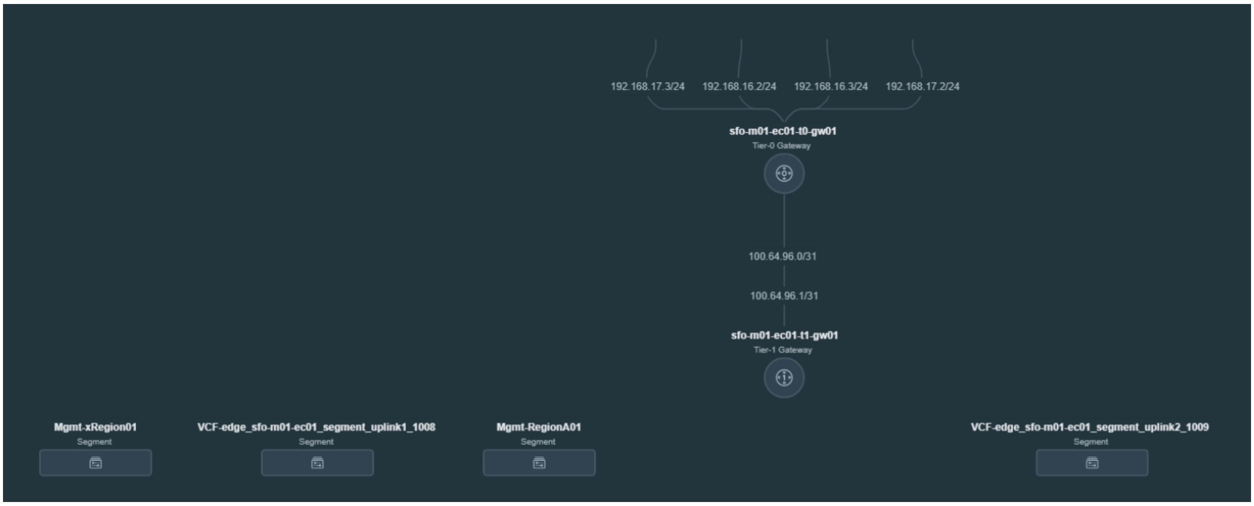
Option	Description
Name	Enter a name for the NSX segment. For example, `Mgmt-RegionA01`.
Subnet	Enter a subnet for the NSX segment.
Gateway	Enter a gateway for the NSX segment.
MTU	Enter an MTU for the NSX segment.
VLAN ID	Enter the VLAN ID for the NSX segment.

7. Click **Validate Settings** and then click **Next**.

   If validation does not succeed, verify and update the information you entered for the NSX segments and click **Validate Settings** again.
8. Review the settings and click **Finish**.

Example

Example Network Topology for VLAN-Backed NSX Segments



Deploy vRealize Suite Lifecycle Manager

You deploy the vRealize Suite Lifecycle Manager in VMware Cloud Foundation mode by using the SDDC Manager UI.

Procedure

1 In the navigation pane, click **Administration > vRealize Suite**.

2 Click **Deploy**.

3 Review and verify the prerequisites.

Click each prerequisite check box and then click **Begin**.

4 On the **Network Settings** page, review the settings and click **Next**.

5 On the **Virtual Appliance Settings** page, enter the settings and click **Next**.

Setting	Description
Virtual Appliance: FQDN	The FQDN for the vRealize Suite Lifecycle Manager virtual appliance. **Note** The reverse (PTR) DNS record of this fully qualified domain name is used as the IP address for the virtual appliance.
NSX-T Tier 1 Gateway: IP Address	A free IP Address within the cross-instance virtual network segment. **Note** Used to create a service interface on the NSX-T Data Center Tier 1 Gateway, where VMware Cloud Foundation automatically configures the load-balancer for the vRealize Suite.
System Administrator	Create and confirm the password for the vRealize Suite Lifecycle Manager administrator account, **vcfadmin@local**. The password created is the credential that allows SDDC Manager to connect to vRealize Suite Lifecycle Manager. **Note** When vRealize Suite Lifecycle Manager is deployed by SDDC Manager it is enabled for VMware Cloud Foundation mode. As a result, the administrator account for is **vcfadmin@local** instead of **admin@local**.
SSH Root Account	Create and confirm a password for the vRealize Suite Lifecycle Manager virtual appliance **root** account.

6 On the **Review Summary** page, review the installation configuration settings and click **Finish**.

SDDC Manager validates the values and starts the deployment.

The **vRealize Suite** page displays the following message: `Deployment in progress`.

If the deployment fails, this page displays a deployment status of `Deployment failed`. In this case, you can click **Restart Task** or **Rollback.**

7 **(Optional)** To view details about the individual deployment tasks, in the **Tasks** panel at the bottom, click each task.

Replace the Certificate of the vRealize Suite Lifecycle Manager Instance

To establish a trusted connection to vRealize Suite Lifecycle Manager, you replace the SSL certificate on the appliance by using the SDDC Manager UI.

Procedure

1. In the navigation pane, click **Inventory > Workload Domains**.
2. On the **Workload Domain** page, from the table, in the domain column click the management domain.
3. On the domain summary page, click the **Security** tab.
4. From the table, select the check box for the **vrslcm** resource type, and click **Generate CSRs**.
5. On the **Details** page, enter the following settings and click **Next**.

Settings	Description
Algorithm	Select the key algorithm for the certificate.
Key Size	Select the key size (2048 bit, 3072 bit, or 4096 bit) from the drop-down menu.
Email	Optionally, enter a contact email address.
Organizational Unit	Use this field to differentiate between divisions within your organization with which this certificate is associated.
Organization Name	Type the name under which your company is known. The listed organization must be the legal registrant of the domain name in the certificate request.
Locality	Type the city or locality where your company is legally registered.
State	Type the full name (do not abbreviate) of the state, province, region, or territory where your company is legally registered.
Country	Type the country name where your company is legally registered. This value must use the ISO 3166 country code.

6. On the **Subject Alternative Name** page, leave the default SAN and click **Next**.
7. On the **Summary** page, click **Generate CSRs**.
8. After the successful return of the operation, click **Generate signed certificates**.
9. In the **Generate Certificates** dialog box, from the **Select Certificate Authority** drop-down menu, select **Microsoft**.
10. Click **Generate certificates**.

11 After the successful return of the operation, click **Install certificates**.

Wait for the successful return of the operation.

Update vRealize Suite Lifecycle Manager to vSphere Integration

You create a new user in vCenter Single Sign-On and update the vRealize Suite Lifecycle Manager to vSphere integration.

Create a vCenter Single Sign-On User

Before you can update the vRealize Suite Lifecycle Manager data center to use a new account, you must first create the account in vCenter Single Sign-On.

Procedure

1 Log in to the management domain vCenter Server at https://<management_vcenter_server_fqdn>/ui as a user with **Administrator** role.

2 Navigate to **Administration**, under **Single Sign On**, select **Users and Groups**.

3 In the **Users and Groups** pane, under Users, select **vsphere.local** from the Domain drop down, and click **Add**.

4 On the **Add User** page enter the following and click **Add**.

Setting	Value
Username	svc-vrslcm-vsphere-<management_vcenter_name>
Password	Enter a password
Confirm Password	Re-enter the password

Configure Service Account Permissions in vSphere for Integration with vRealize Suite Lifecycle Manager

To allow deploying and managing SDDC components on the Management domain vCenter Server inventory, you assign account permissions to the service account for communication from vRealize Suite Lifecycle Manager to vSphere.

Procedure

1 Log in to the management domain vCenter Server at https://<management_vcenter_server_fqdn>/ui as a user with **Administrator** role.

2 Assign global permissions to the service account.

   a Select **Menu** > **Administration**.

   b Under **Access control**, click **Global permissions.**

   c Click the **Add permission** icon, enter these values, and click **OK**.

Setting	Value
Domain	vsphere.local
User/Group	svc-vrslcm-vsphere-<management_vcenter_name>
Role	vRealize Suite Lifecycle Manager to vSphere Integration
Propagate to children	Selected

Create New Password Alias in the vRealize Suite Lifecycle Manager Locker

You create a new password alias in vRealize Suite Lifecycle Manager that maps to the user created in vCenter Single-Sign On.

Procedure

1 In a web browser, log in to vRealize Suite Lifecycle Manager with the **vcfadmin@local** user by using the user interface (https://`<vrslcm_fqdn>`).

2 On the **My services** page, click **Locker**.

3 In the navigation pane, click **Passwords**.

4 Add a new password alias

   a On the Passwords page, click **Add**.

   b Enter the following and click **Add**

Setting	Value
Password Alias	svc-vrslcm-vsphere_<management_vcenter_name>
Password	Enter a password
Confirm Password	Re-enter the password
Password Description	Optionally, enter a description
User name	svc-vrslcm-vsphere_<management_vcenter_name>@vsphere.local

Reconfigure Data Centers and vCenter Server in vRealize Suite Lifecycle Manager

Before you can create a local environment for product deployments, you must update the credentials for the management domain vCenter Server that is associated with the region-specific data center in vRealize Suite Lifecycle Manager.

Prerequisites

During the vRealize Suite Lifecycle Manager deployment, SDDC Manager adds the instance-specific management data center to vRealize Suite Lifecycle Manager. SDDC Manager associates the instance-specific data center with the management domain vCenter Server by using the svc-vrslcm-vsphere@vsphere.local account. You reconfigure the integration to the management domain vCenter Server in the instance-specific data center to use the svc-vrslcm-vsphere_<management_vcenter_name> account for the deployment of the instance-specific components, such as vRealize Log Insight. This ensures a unique account is used per vCenter Server and enables scale out to additional VMware Cloud Foundation instances.

Procedure

1 In a Web browser, log in to vRealize Suite Lifecycle Manager by using the administration interface.

2 On the My services page, click Lifecycle operations.

3 In the navigation pane, click Datacenters.

4 Reconfigure integration to the management domain vCenter Server in the region-specific data center to use the svc-vrslcm-vsphere_<management_vcenter_name> account.

   a On the Datacenters page, expand the managment data center.

   b In the row for the management vCenter, click Edit vCenter.

   c Update these values and click Validate.

Setting	Value
vCenter credentials	**svc-vrslcm-vsphere_<management_vcenter_name>**

   d After the successful vCenter Server validation, click Save.

Configure Data Center and vCenter Server in vRealize Suite Lifecycle Manager

Before you can create a global environment for product deployments, you must add a cross-instance data center and the associated management domain vCenter Server to vRealize Suite Lifecycle Manager.

You add the cross-instance data center, and the associated management domain vCenter Server for the deployment of the global components, such as the clustered Workspace ONE Access.

Procedure

1 In a web browser, log in to vRealize Suite Lifecycle Manager with the **vcfadmin@local** user by using the user interface (https://`<vrslcm_fqdn>`).

2 On the **My Services** page, click **Lifecycle Operations**.

3 In the navigation pane, click **Datacenters**.

4 Click **Add datacenter**, enter the values for the global data center, and click **Save**.

Setting	Value
Datacenter name	Name for cross-instance datacenter
Use custom location	Disabled
Location	Location of datacenter

5 Add the management domain vCenter Server to the global data center.

a On the **Datacenters** page, expand the global data center and click **Add vCenter**.

b Enter the management domain vCenter Server information and click **Validate**.

Setting	Value
vCenter name	Enter a name for the vCenter Server
vCenter FQDN	Enter the FQDN of the vCenter Server
vCenter credentials	Select the `svc-vrslcm-vsphere-<management_vcenter_name>` credential.
vCenter type	Management

6 After the successful vCenter Server validation, click **Save**.

7 In the navigation pane, click **Requests** and verify that the state of the **vCenter data collection request** is `Completed`.

Clustered Workspace ONE Access Implementation

Identity and access management services for the vRealize Suite of products is provided by Workspace ONE Access. You use vRealize Suite Lifecycle Manager to deploy a 3-node clustered Workspace ONE Access instance. You then perform the necessary post-deployment configurations and customization.

Prerequisites

- Downloaded the VMware Software Install Bundle for Workspace ONE Access from the VMware Depot to the local bundle repository. See Download VMware Cloud Foundation on Dell EMC VxRail Bundles.

- Allocate 5 IP addresses from the cross-instance NSX segment and prepare both forward (A) and reverse (PTR) DNS records.
  - 3 IP addresses for the clustered Workspace ONE Access
  - An IP address for embedded Postgres database for Workspace ONE Access instance
  - An IP address for the NSX-T Data Center external load balancer virtual server for clustered Workspace ONE Access instance.
- Ensure you have enough storage capacity:
  - Required storage per node: 100 GB
  - Virtual disk provisioning: Thin
- Verify that the management domain vCenter Server is operational.
- Verify that the cross-instance NSX segment is available
- Verify that the NSX Manager is operational.
- Verify the **Prerequisite Checklist** sheet in the *Planning and Preparation Workbook*.
- Verify that required Active Directory bind service account is created.

  Verify that required Active Directory security groups are created.
- Download the `CertGenVVS` tool and generate the signed certificate for the clustered Workspace ONE Access instance. See KB 85527.

Import the Clustered Workspace ONE Access Certificate to vRealize Suite Lifecycle Manager

In vRealize Suite Lifecycle Manager, import the clustered Workspace ONE Access certificate that you generated with the CertGenVVS utility.

For details on using the CertGenVVS utility, see https://kb.vmware.com/s/article/85527.

Procedure

1. In a web browser, log in to vRealize Suite Lifecycle Manager with the **vcfadmin@local** user by using the user interface (https://`<vrslcm_fqdn>`).
2. On the **My Services** page, click **Locker**.
3. In the navigation pane, click **Certificates**.
4. On the **Certificates** page, click **Import**.

5 On the **Import certificate** page, configure the settings and click **Import**.

Setting	Value
Name	*Clustered Workspace One Access*
Select Certificate file	Click **Browse file**, navigate to the clustered Workspace ONE Access certificate PEM file, and click **Open**.

Add Clustered Workspace ONE Access Passwords to vRealize Suite Lifecycle Manager

To enable life cycle management and configuration management, you set the passwords for the vRealize Suite Lifecycle Manager cross-instance environment administrator account and for the Workspace ONE Access administrator and configuration administrator accounts.

You add the following passwords for the corresponding local administrative accounts.

Setting	Value for Global Environment Administrator	Value for Local Administrator	Value for Local Configuration Administrator
Password alias	global-env-admin	xint-wsa-admin	xint-wsa-configadmin
Password	*global_env_admin_password*	*xreg_wsa_admin_password*	*xreg_wsa_configadmin_password*
Confirm password	*global_env_admin_password*	*xreg-wsa_admin_password*	*xreg_wsa_configadmin_password*
Password description	vRealize Suite Lifecycle Manager global environment administrator password	Clustered Workspace ONE Access administrator	Clustered Workspace ONE Access configuration administrator
User name	admin	admin	configadmin

Procedure

1 In a web browser, log in to vRealize Suite Lifecycle Manager with the **vcfadmin@local** user by using the user interface (https://`<vrslcm_fqdn>`).

2 On the **My Services** page, click **Locker**.

3 In the navigation pane, click **Passwords**.

4 On the **Passwords** page, click **Add**.

5 On the **Add password** page, configure the settings and click **Add**.

6 Repeat this procedure for all the remaining credentials.

Deploy Clustered Workspace ONE Access Instance Using vRealize Suite Lifecycle Manager

To provide identity and access management services to the cross-instance SDDC components, you create a global environment in vRealize Suite Lifecycle Manager in which you deploy a 3-node clustered Workspace ONE Access instance.

Procedure

1 In a web browser, log in to vRealize Suite Lifecycle Manager with the **vcfadmin@local** user by using the user interface (https://`<vrslcm_fqdn>`).

2 On the **My Services** page, click **Lifecycle Operations**.

3 On the **Dashboard** page, click **Create environment**.

4 On the **Create environment** page, configure the settings and click **Next**.

Setting	Value
Install Identity Manager	Selected
Default password	global-env-admin
Datacenter	Select the cross-instance datacenter.
JSON configuration	Disabled
Join the VMware customer experience improvement program	Selected

5 On the **Select product** page, select the check box for **VMware Identity Manager**, configure these values, and click **Next**.

Setting	Value
Installation type	New install
Version	3.3.5
Deployment type	Cluster

6 On the **Accept license agreements** page, scroll to the bottom and accept the license agreement, and then click **Next**.

7 On the **Certificate** page, from the **Select certificate** drop-down menu, select the *Clustered Workspace One Certificate*, and click **Next**.

8 On the **Infrastructure** page, verify and accept the default settings, and click **Next**.

9 On the **Network** page, verify and accept the default settings, and click **Next**.

10 On the **Products** page, configure the deployment properties of clustered Workspace ONE Access and click **Next**.

   a In the **Product properties** section, configure the settings.

Setting	Value
Certificate	*Clustered Workspace One Certificate*
Node size	Medium (vRealize Automation recommended size)
Admin password	Select the *xint-wsa-admin*
Default configuration admin email	Enter a default email.
Default configuration admin user name	configadmin
Default configuration admin password	Select the *xint-wsa-configadmin*
Sync group members	Selected

   b In the **Cluster VIP FQDN** section, configure the settings.

Setting	Value
FQDN	Enter the FQDN of the NSX-T Data Center load balancer virtual server for clustered Workspace ONE Access instance.
Locker certificate	Clustered Workspace ONE Access Certificate
Database IP address	Enter the IP address for the embedded Postgres database. **Note** The IP address must be a valid IP address for the cross-instance NSX segment.

   c In the **Components** section, configure the three cluster node.

Setting	Value for vidm-primary	Value for vidm-secondary-1	Value for vidm-secondary-2
VM Name	Enter a VM Name for vidm-primary.	Enter a VM Name for vidm-secondary-1.	Enter a VM Name for vidm-secondary-2.
FQDN	Enter the FQDN for vidm-primary	Enter the FQDN for vidm-secondary-1.	Enter the FQDN for vidm-secondary-2.
IP address	Enter the IP Address for vidm-primary.	Enter the IP Address for vidm-secondary-1.	Enter the IP Address for vidm-secondary-2.

11 On the **Precheck** page, click **Run precheck**.

12 On the **Manual validations** page, select the **I took care of the manual steps above and am ready to proceed** check box and click **Run precheck**.

13 Review the validation report, remediate any errors, and click **Re-run precheck**.

14 Wait for all prechecks to complete with `Passed` messages and click **Next**.

15 On the **Summary** page, review the configuration details. To back up the deployment configuration, click **Export configuration**.

16 To start the deployment, click **Submit**.

The **Request details** page displays the progress of deployment.

17 Monitor the steps of the deployment graph until all stages become `Completed`.

Configure an Anti-Affinity Rule and a Virtual Machine Group for the Clustered Workspace ONE Access Instance

To protect the clustered Workspace ONE Access nodes from a host-level failure, configure an anti-affinity rule to run the virtual machines on different hosts in the default management vSphere cluster. You then configure a VM group to define the startup order to ensure that vSphere High Availability powers on the clustered Workspace ONE Access nodes in the correct order.

Procedure

1 In a web browser, log in to the management domain vCenter Server by using the vSphere Client (https://`<vcenter_server_fqdn>`/ui).

2 Select **Menu > Hosts and Clusters**.

3 In the inventory expand <vCenter Server> Datacenter.

4 Select the cluster and click the **Configure** tab.

5 Create the anti-affinity rule for the clustered Workspace ONE Access virtual machines.

a Navigate to **Configuration > VM/Host rules** and click **Add**.

b Configure the settings and click **OK**.

Setting	Value
Name	`<management-domain-name>`-anti-affinity-rule-wsa
Enable rule	Selected
Type	Separate Virtual Machines
Members	Click **Add**, select the clustered Workspace ONE Access nodes, and click **OK**. ■ `vidm-primary_VM` ■ `vidm-secondary-1_VM` ■ `vidm-secondary-2_VM`

6 Create a virtual machine group for the clustered Workspace ONE Access nodes.

   a Navigate to **Configuration > VM/Host groups** and click **Add**.

   b Configure the settings and click **OK**.

Setting	Value
Name	**`Clustered Workspace ONE Access Appliances`**
Type	VM Group
Members	Click **Add**, select the clustered Workspace ONE Access nodes, and click **OK**. ■ `vidm-primary_VM` ■ `vidm-secondary-1_VM` ■ `vidm-secondary-2_VM`

Configure NTP on the Clustered Workspace ONE Access Instance

To keep NTP synchronized with the other SDDC components, configure NTP on each Workspace ONE Access node.

You configure the time synchronization for all nodes in the clustered Workspace ONE Access instance.

Table 15-1. Global Workspace ONE Access Instance Nodes

Role	FQDN
Node 1	`vidm-primary_VM`
Node 2	`vidm-secondary-1_VM`
Node 3	`vidm-secondary-2_VM`

Procedure

1 In a web browser, log in to the Workspace ONE Access instance with the **admin** user by using the appliance configuration interface (https://`<wsa_node_fqdn>`:8443/cfg/login).

2 In the navigator pane, click **Time synchronization**.

3 Configure the settings and click **Save**.

Setting	Description
Time sync	NTP selected
NTP Server	Enter the FQDN of the NTP server.

4 Repeat this procedure for the remaining clustered Workspace ONE Access nodes.

Configure Identity Source for the Clustered Workspace ONE Access Instance

To enable identity and access management in the SDDC, you integrate your Active Directory with the clustered Workspace ONE Access instance and configure attributes to synchronize users and groups.

Procedure

1 In a web browser, log in to the clustered Workspace ONE Access instance by using the administration interface to the **System Domain** with **configadmin** user (https://`<wsa_cluster_fqdn>`/admin).

2 On the main navigation bar, click **Identity and access management**.

3 Click the **Directories** tab, and from the **Add directory** drop-down menu, select **Add Active Directory over LDAP/IWA**.

4 On the **Add directory** page, configure the following settings, click **Test connection** and click **Save and next**.

Setting	Value
Directory name	Enter a name for directory. For example, **`sfo.rainpole.io`**.
Active Directory over LDAP	Selected
Sync connector	Select the FQDN of `vidm-primary`
Do you want this connector to also perform authentication?	Yes
Directory search attribute	SAMAccountName
This Directory requires all connections to use STARTTLS (Optional)	If you want to secure communication between Workspace ONE Access and Active Directory select this option and paste the Root CA certificate in the SSL Certificate box.
Base DN	Enter the Base Distinguished Name from which to start user searches. For example, **`cn=Users,dc=sfo,dc=rainpole,dc=io`**.
Bind DN	Enter the DN for the user to connect to Active Directory. For example, **`cn=svc-wsa-ad,ou=Service Accounts,dc=sfo,dc=rainpole,dc=io`**.
Bind user password	Enter the password for the Bind user. For example: *svc-wsa-ad_password*.

5 On the **Select the domains** page, review the domain name and click **Next**.

6 On the **Map user attributes** page, review the attribute mappings and click **Next**.

7 On the **Select the groups (users) you want to sync** page, enter the distinguished name for the folder containing your groups (For example **`OU=Security Groups,DC=sfo,DC=rainpole,DC=io`**) and click **Select**.

8 For each **Group DN** you want to include, select the group to use by the clustered Workspace ONE Access instance for each of the roles, and click **Save** then **Next**.

Product	Role Assigned via Group
Workspace ONE Access	**`Super Admin`**
	`Directory Admin`
	`ReadOnly Admin`
vRealize Suite Lifecycle Manager	**`VCF Role`**
	`Content Admin`
	`Content Developers`

9 On the **Select the Users you would like to sync** page, enter the distinguished name for the folder containing your users (e.g. **`OU=Users,DC=sfo,DC=rainpole,DC=io`**) and click **Next**.

10 On the **Review** page, click **Edit**, from the **Sync frequency** drop-down menu, select **Every 15 minutes**, and click **Save**.

11 To initialize the directory import, click **Sync directory**.

Add the Clustered Workspace ONE Access Cluster Nodes as Identity Provider Connectors

To provide high availability for the identity and access management services of the clustered Workspace ONE Access instance, you add the cluster nodes as directory connectors.

Procedure

1 In a web browser, log in to the clustered Workspace ONE Access instance by using the administration interface to the **System Domain** with **configadmin** user (https://`<wsa_cluster_fqdn>`/admin).

2 On the main navigation bar, click **Identity and access management**.

3 Click the **Identity Providers** tab.

4 Click the **WorkspaceIDP__1** identity provider.

5 On the **WorkspaceIDP__1 details** page, under **Connector(s)** from the **Add a connector** drop-down menu, select `vidm-secondary-1_VM`, configure the settings, and click **Add connector**.

Setting	Value
Connector	`vidm-secondary-1_VM`
Bind to AD	Checked
Bind user password	*svc-wsa-ad_password*

6 Repeat this step for the `vidm-secondary-2_VM` connector.

7 In the **IdP Hostname** text box, enter the FQDN of the NSX-T Data Center load balancer virtual server for Workspace ONE Access cluster.

8 Click **Save**.

Assign Roles to Active Directory Groups for the Clustered Workspace ONE Access Instance

Workspace ONE Access uses role-based access control to manage delegation of roles. You assign the **Super Admin**, **Directory Admin** and **ReadOnly** roles to Active Directory groups to manage access to the clustered Workspace ONE Access instance.

You assign the following administrator roles to the corresponding user groups.

Workspace ONE Access Role	Example Active Directory Group Name
Super Admin	wsa-admins
Directory Admin	wsa-directory-admin
ReadOnly Admin	wsa-read-only

Procedure

1 In a web browser, log in to the clustered Workspace ONE Access instance by using the administration interface to the System Domain with **configadmin** user (https://`<wsa_cluster_fqdn>`/admin).

2 On the main navigation bar, click **Roles**.

3 Assign Workspace ONE Access roles to Active Directory groups.

   a Select the **Super Admin** role and click **Assign**.

   b In the **Users / User Groups** search box, enter the name of the Active Directory group you want to assign the role to, select the group, and click **Save**.

   c Repeat this step to configure the **Directory Admin** and the **ReadOnly Admin** roles.

Assign Roles to Active Directory Groups for vRealize Suite Lifecycle Manager

To enable identity and access management for vRealize Suite Lifecycle Manager, you integrate the component with the clustered Workspace ONE Access instance.

You assign the following administrative roles to corresponding Active Directory groups.

vRealize Suite Lifecycle Manager Role	Example Active Directory Group Name
VCF Role	vrslcm-admins
Content Release Manager	vrslcm-release-manager
Content Developer	vrlscm-content-developer

Procedure

1 In a web browser, log in to vRealize Suite Lifecycle Manager with the **vcfadmin@local** user by using the user interface (https://`<vrslcm_fqdn>`).

2 On the **My Services** page, click **Identity and Tenant Management**.

3 In the navigation pane, click **User management** and click **Add user / group**.

4 On the **Select users / groups** page, in the search box, enter the name of the group you want to assign the role too, select the Active Directory group, and click **Next**.

5 On the **Select roles** page, select the **`VCF Role`** role, and click **Next**.

6 On the **Summary** page, click **Submit**.

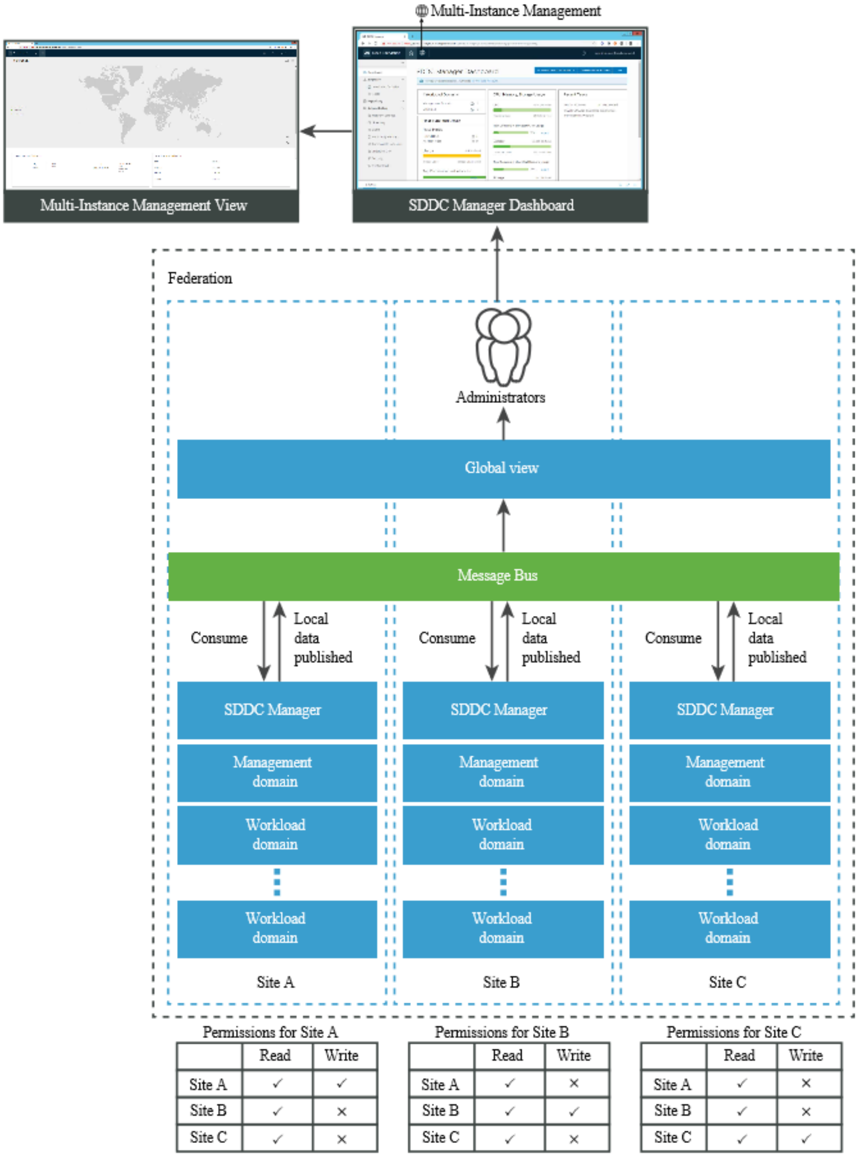
7 Repeat this procedure to assign roles to the **Content Release Manager** and **Content Developer** user groups.

Multi-Instance Management 16

With the Multi-Instance Management feature, you can monitor multiple SDDC Manager instances from a single console.

Multiple SDDC Manager instances can be monitored together by grouping them into a federation, such that each member can view information about the entire federation and the individual instances within it. Federation members can view inventory across the SDDC Manager instances in the federation as well as the available and used capacity (CPU, memory, and storage). This allows you to maintain control over the different sites and ensure that they are operating with the right degree of freedom and meeting compliance regulations for your industry. It also simplifies patch management by showing the number of patches available across sites in the global view.

Federation members communicate with each other via a message bus. Each participant publishes their local data to the message bus and the remaining participants can read this data for global visibility across the federation.



Permissions for Site A

	Read	Write
Site A	✓	✓
Site B	✓	×
Site C	✓	×

Permissions for Site B

	Read	Write
Site A	✓	×
Site B	✓	✓
Site C	✓	×

Permissions for Site C

	Read	Write
Site A	✓	×
Site B	✓	×
Site C	✓	✓

An SDDC Manager instance can see details about the federation only if it is a member of the federation, and can belong only to a single federation at a time. It is possible to create multiple federations within an organization; however, there is no global visibility between federations. For example, it might be desirable to have a dev-test federation and a production federation. In such an example, members of dev-test can see other dev-test members but they are not able to see production members.

Federation members can either be controllers or regular members. A controller member has capabilities of a regular member and runs some additional message bus components to allow multi-instance management to work.

A controller member can invite other instances to become members as controller or regular members. The controller role can be granted to a maximum of three instances within a federation. High availability of multi-instance management functionality is only possible when there are exactly three controllers in the federation. Though the controller members can be at any three sites in the federation, it is recommended that each controller is in a different availability zone. The SDDC Manager instance that created the federation is automatically granted the controller role. If you only have two instances in the federation, there is no need to create both as controllers. Multi-Instance management works with two VMware Cloud Foundation sites; however, if one fails then the multi-instance capability is not available on the other site.

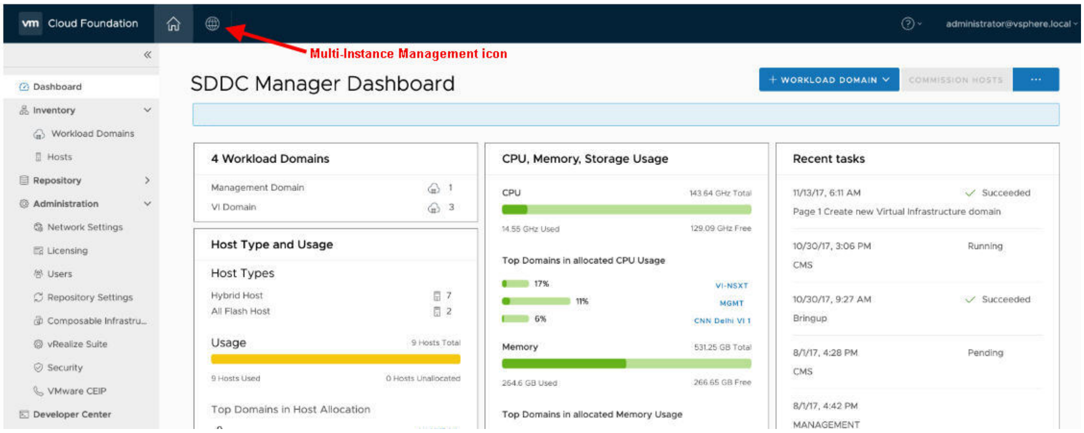
Read the following topics next:

- About the Multi-Instance Management Dashboard
- Create a Federation
- Invite an SDDC Manager Instance to Join a Federation
- Join a Federation
- Leave a Federation
- Dismantle a Federation

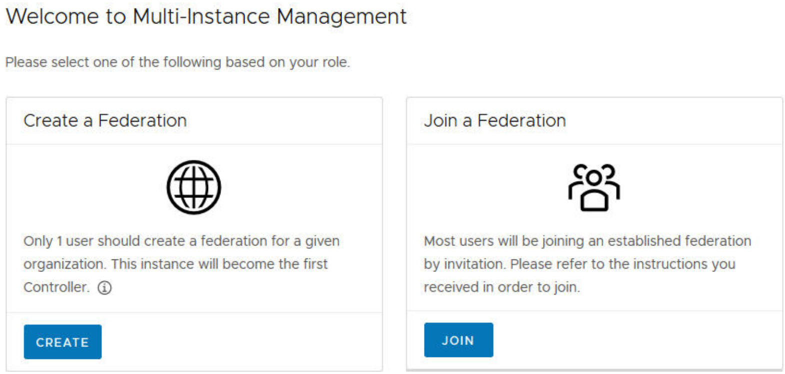
About the Multi-Instance Management Dashboard

The Multi-Instance Management Dashboard displays the inventory and capacity across the federation.

You access the Multi-Instance Management Dashboard by clicking the Multi-Instance View icon in the top left corner of the SDDC Manager UI.



Before a federation is created, the dashboard displays the create and join options.



Welcome to Multi-Instance Management

Please select one of the following based on your role.

Create a Federation

Only 1 user should create a federation for a given organization. This instance will become the first Controller. ⓘ

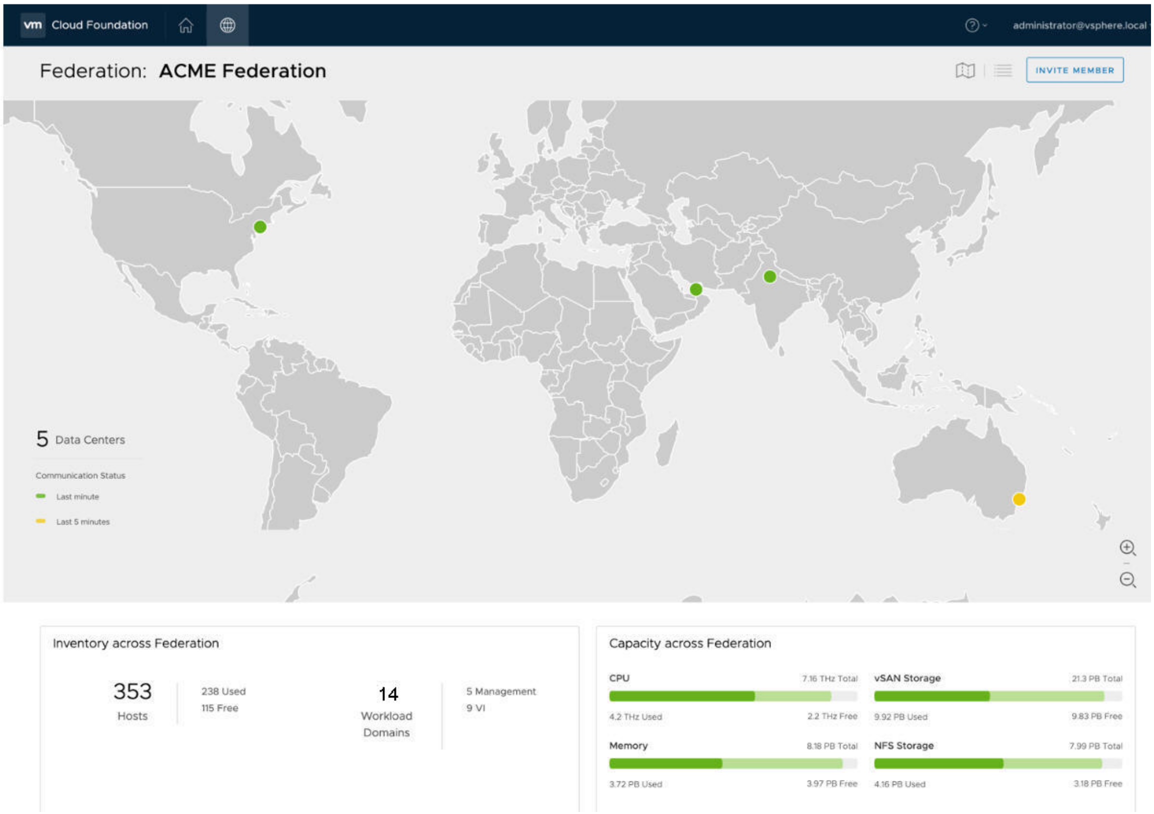
CREATE

Join a Federation

Most users will be joining an established federation by invitation. Please refer to the instructions you received in order to join.

JOIN

After a federation is created, the Multi-Instance Management Dashboard displays a world map showing the federation members as dots on the map.



Federation: **ACME Federation**

5 Data Centers

Communication Status

🟩 Last minute

🟨 Last 5 minutes

Inventory across Federation

353 Hosts — 238 Used, 115 Free

14 Workload Domains — 5 Management, 9 VI

Capacity across Federation

CPU — 7.16 THz Total — 4.2 THz Used — 2.2 THz Free

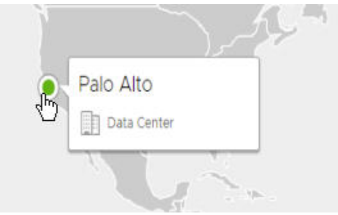
vSAN Storage — 21.3 PB Total — 9.92 PB Used — 9.83 PB Free

Memory — 8.18 PB Total — 3.72 PB Used — 3.97 PB Free

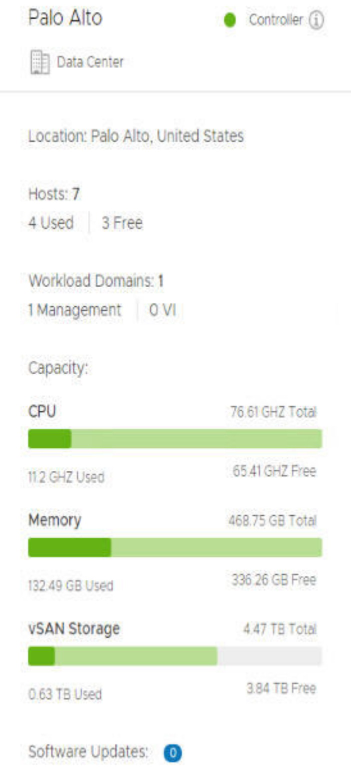
NFS Storage — 7.99 PB Total — 4.16 PB Used — 3.18 PB Free

The dot color depends on the communication status between the federation members - green if they communicated within the last two minutes, yellow if they communicated within the previous five minutes, and red if they have not communicated for more than ten minutes. You can see the following information here:

- Hover over a dot to see the member name and location.



- Click the member location dot to open a panel on the right side with detailed information about the SDDC Manager instance. The panel also displays available software updates.



Palo Alto ● Controller ⓘ

Data Center

Location: Palo Alto, United States

Hosts: 7

4 Used | 3 Free

Workload Domains: 1

1 Management | 0 VI

Capacity:

CPU 76.61 GHZ Total

11.2 GHZ Used 65.41 GHZ Free

Memory 468.75 GB Total

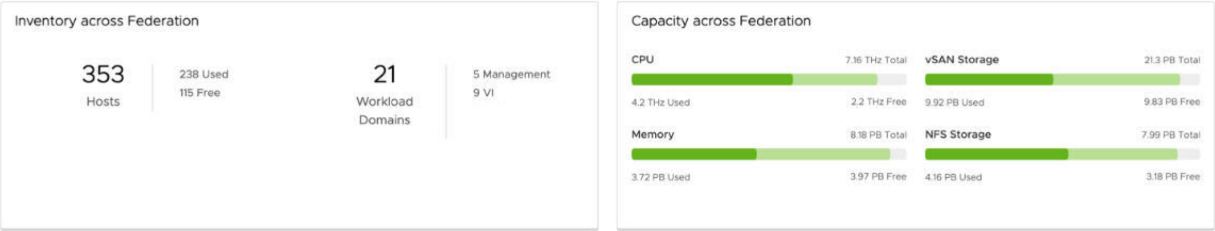
132.49 GB Used 336.26 GB Free

vSAN Storage 4.47 TB Total

0.63 TB Used 3.84 TB Free

Software Updates: 0

The Inventory section in the bottom half of the dashboard displays the number of hosts and workload domains along with a breakdown of the workload domain type. The capacity section displays the used and available CPU, memory, and storage across the federation.



Inventory across Federation

353 Hosts | 238 Used
115 Free

21 Workload Domains | 5 Management
9 VI

Capacity across Federation

CPU 7.16 THz Total

4.2 THz Used 2.2 THz Free

vSAN Storage 21.3 PB Total

9.92 PB Used 9.83 PB Free

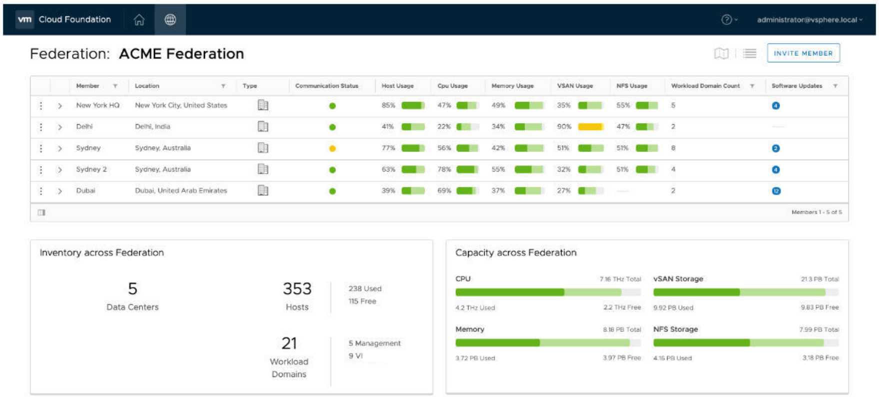
Memory 8.18 PB Total

3.72 PB Used 3.97 PB Free

NFS Storage 7.99 PB Total

4.16 PB Used 3.18 PB Free

Click the Table icon at the top right of the dashboard to display member information in a grid format. Information for all federation members is displayed in a tabular format.



Federation: **ACME Federation**

		Member	Location	Type	Communication Status	Host Usage	Cpu Usage	Memory Usage	VSAN Usage	NFS Usage	Workload Domain Count	Software Updates
⋮	>	New York HQ	New York City, United States	▥	●	85%	47%	49%	35%	55%	5	4
⋮	>	Delhi	Delhi, India	▥	●	41%	22%	34%	90%	47%	2	—
⋮	>	Sydney	Sydney, Australia	▥	●	77%	56%	42%	51%	51%	8	2
⋮	>	Sydney 2	Sydney, Australia	▥	●	63%	78%	55%	32%	51%	4	4
⋮	>	Dubai	Dubai, United Arab Emirates	▥	●	39%	69%	37%	27%	—	2	12

Members 1 - 5 of 5

Inventory across Federation

5 Data Centers

353 Hosts: 238 Used, 115 Free

21 Workload Domains: 5 Management, 9 VI

Capacity across Federation

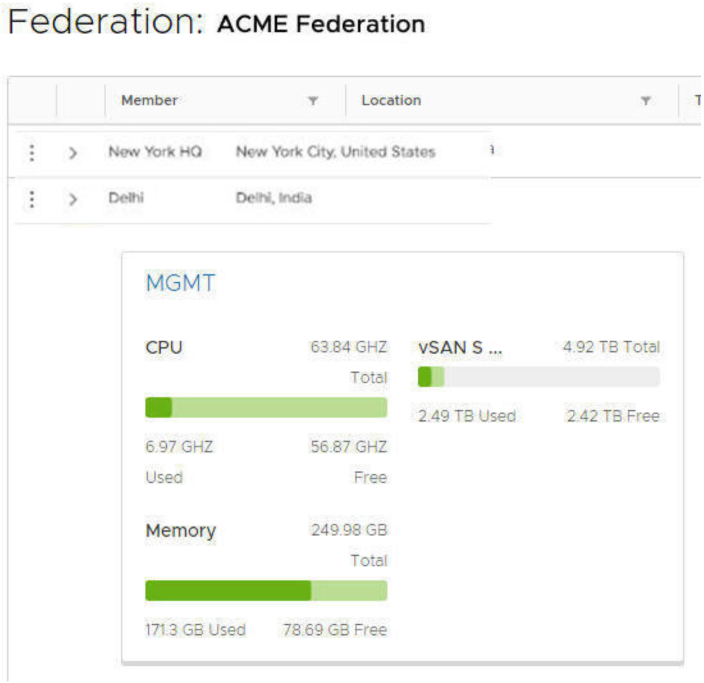
CPU: 7.16 THz Total; 4.2 THz Used; 2.2 THz Free

vSAN Storage: 21.3 PB Total; 9.92 PB Used; 9.83 PB Free

Memory: 8.18 PB Total; 3.72 PB Used; 3.97 PB Free

NFS Storage: 7.99 PB Total; 4.16 PB Used; 3.18 PB Free

Clicking the arrow (>) next to the member name displays the CPU, memory, and storage usage for that member.



Federation: **ACME Federation**

		Member	Location
⋮	>	New York HQ	New York City, United States
⋮	>	Delhi	Delhi, India

MGMT

CPU: 63.84 GHZ Total; 6.97 GHZ Used; 56.87 GHZ Free

vSAN S ...: 4.92 TB Total; 2.49 TB Used; 2.42 TB Free

Memory: 249.98 GB Total; 171.3 GB Used; 78.69 GB Free

Clicking MGMT takes you to the management domain of that member.

Create a Federation

A federation is a group of SDDC Manager instances, such that each member can view information about the other SDDC Manager instances in the group. The federation creator is granted the controller role by default.

You can create multiple federations within your organization, but global visibility is available only within a federation. Members can belong to only a single federation at a time.

See VMware Configuration Maximums for information about the maximum number of SDDC Manager instances that can be managed using Multi-Instance Management

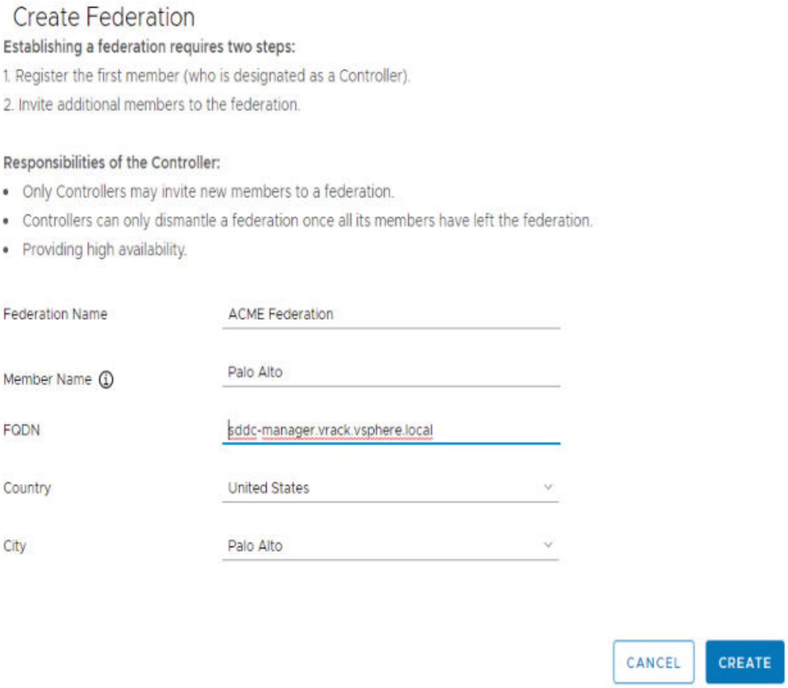
Prerequisites

- The SDDC Manager certificate requires TLS Web server authentication and TLS Web client authentication extended key usage (EKU). If you are using Microsoft CA or a third-party CA, you must ensure that the Certificate Authority template is configured with both these EKUs.
- Retrieve the FQDN of your SDDC Manager.

Procedure

1 In the SDDC Manager UI, click the Multi-Instance View (🌐) icon at the top of the window.

2 Click **Create**.



Create Federation

Establishing a federation requires two steps:

1. Register the first member (who is designated as a Controller).
2. Invite additional members to the federation.

Responsibilities of the Controller:

- Only Controllers may invite new members to a federation.
- Controllers can only dismantle a federation once all its members have left the federation.
- Providing high availability.

Federation Name	ACME Federation
Member Name ⓘ	Palo Alto
FQDN	sddc-manager.vrack.vsphere.local
Country	United States
City	Palo Alto

3 Enter a name for the federation.

4 Enter a display name for the member. You may want to base this on the location of this SDDC Manager instance.

5 Type the FQDN of the SDDC Manager.

6 Select the city and country of this SDDC Manager instance and click **Create**.

Results

It can take a few minutes for the federation to be created. After the federation is created, the Multi-Instance Management Dashboard is displayed. The federation location is marked with a green dot on the world map. You can zoom in or out of the map.

The dashboard also displays the inventory (hosts and workload domains) and capacity (CPU, memory, and storage) across the federation. These details are updated when additional members join the federation.

What to do next

Invite an SDDC Manager instance to join the federation.

Invite an SDDC Manager Instance to Join a Federation

You can invite SDDC Manager instances to join a federation. They can be invited as a controller or a regular member. High availability of multi-instance management functionality is only possible when there are exactly three controllers in the federation. Though the controller members can be at any three sites in the federation, it is recommended that each controller is in a different availability zone.

Prerequisites

You must be a controller in the federation and have the FQDN of the member you are inviting.

Procedure

1 On the top right corner of the Multi-Instance Management dashboard, click **Invite Member**.

2 Enter the SDDC Manager FQDN of the member you are inviting and click **Check Certificate**.

The invited member's certificate thumbprint is displayed.

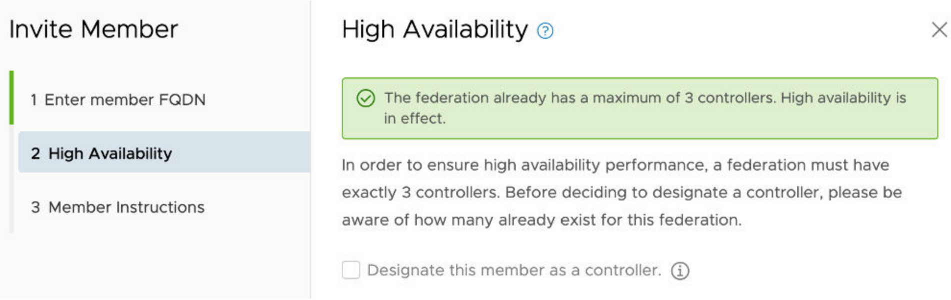
3 Validate the thumbprint and click **Confirm fingerprint**.

4 Click **Next**.

5 Select the check box on the High Availability page if you want to designate the controller role to the member.

6 Click **Next**.

The Instructions page displays the URL that the invited member needs to access.



Invite Member

1 Enter member FQDN

2 High Availability

3 Member Instructions

High Availability

The federation already has a maximum of 3 controllers. High availability is in effect.

In order to ensure high availability performance, a federation must have exactly 3 controllers. Before deciding to designate a controller, please be aware of how many already exist for this federation.

□ Designate this member as a controller.

7 Click **Copy Info** to copy the information displayed on this page or copy the URL manually and send it to the member through an offline method.

What to do next

The invitation and joining process is a coordinated effort between the invitee controller and joining member. An additional dot on your Multi-Instance Management Dashboard indicates that the member you invited is joining the federation. When a controller joins a federation, it can take a few minutes for the federation to stabilize.

Join a Federation

You can join a federation as a controller or member depending on the assigned role in the invitation. An invitation is valid for ten days. You must request a new invitation after this period. If a new invitation is generated for the same site, only the latest invite is valid.

Prerequisites

- Verify that the federation is healthy - there should be no red dots on the world map of the Multi-Instance Management Dashboard. A red dot indicates that SDDC Manager is unable to communicate with that member.
- The SDDC Manager certificate requires TLS Web server authentication and TLS Web client authentication extended key usage (EKU). If you are using Microsoft CA or a third-party CA, you must ensure that the Certificate Authority template is configured with both these EKUs.
- Retrieve the FQDN of your SDDC Manager.

Join a Federation by Clicking an Invitation

If you join a federation by clicking the invitation you received, federation details are pre-populated in the SDDC Manager UI.

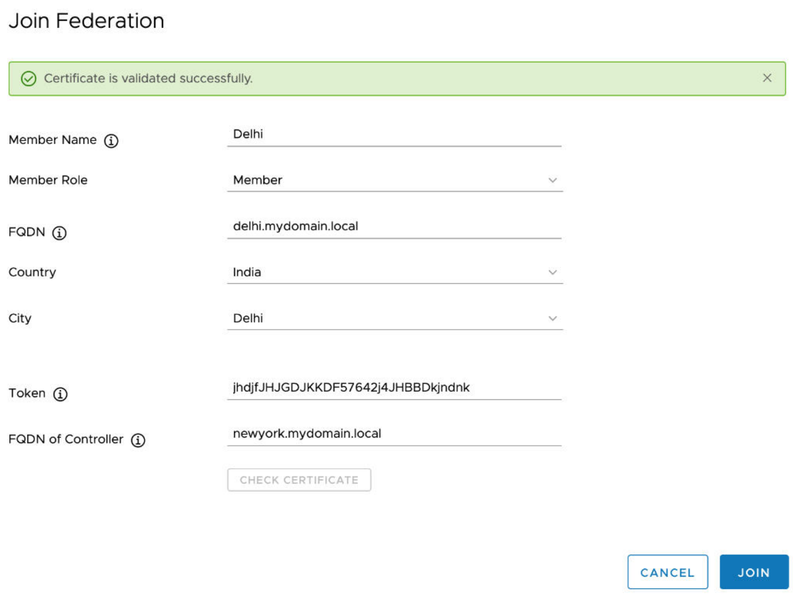
Prerequisites

Retrieve the invitation you received.

Procedure

1 Click the URL in the invitation you received.

  The Join Federation window displays the role assigned in the invitation, the FQDN of the invited member, token, and the FQDN of the controller member who invited you to join the federation.



Join Federation

Certificate is validated successfully.

Member Name	Delhi
Member Role	Member
FQDN	delhi.mydomain.local
Country	India
City	Delhi
Token	jhdjfJHJGDJKKDF57642j4JHBBDkjndnk
FQDN of Controller	newyork.mydomain.local

2 Click **Join**.

Results

The join process is initiated. If you see an error, resolve the issue and then request a new invitation and follow the steps described above. After the join process is successful, your SDDC Manager instance becomes a member of the federation.

After a controller joins or leaves a federation, Kafka is restarted on all controllers in the federation. It can take several minutes for the federation to stabilize even after the dashboard is refreshed. If an operation performed on the dashboard during this time fails, re-try the operation.

Join a Federation through the Multi-Instance Management Dashboard

You can join a federation through the Multi-Instance Management Dashboard.

Procedure

1 Click **Join Federation** on the Multi-Instance Management Dashboard.

2 Type a display name for the site to be added.

3 Select the member role as indicated in the invitation you received.

4 Type the FQDN of your SDDC Manager.

5 Select the country and city for your site.

6 Type the token as indicated in the invitation you received.

7 Type the FQDN of the controller who invited you.

8 Click **Join**.

Results

The join process is initiated. If you see an error, resolve the issue and then request a new invitation and follow the steps described above. After the join process is successful, your SDDC Manager instance becomes a member of the federation.

After a controller joins or leaves a federation, Kafka is restarted on all controllers in the federation. It can take several minutes for the federation to stabilize even after the dashboard is refreshed. If an operation performed on the dashboard during this time fails, re-try the operation.

Leave a Federation

Leaving a federation removes the Multi-Instance Management view from the SDDC Manager UI.

If you are a controller, you can leave a federation only if there is at least one more controller in the federation. If you are the only controller member in a federation, you must dismantle a federation instead of leaving it.

Prerequisites

Verify that the federation is healthy - there should be no red dots on the world map of the Multi-Instance Management Dashboard. A red dot indicates that SDDC Manager is unable to communicate with that member. A controller must remove the member using the leave API. See the *VMware Cloud Foundation API Reference Guide*.

Procedure

1. Click the Grid icon at the top right of the Multi-Instance Management Dashboard.
2. In the member table, click the dot icon next to your member name and click **Leave Federation**.
3. Type the federation name and click **Leave**.

What to do next

Do not perform any operation for a few minutes after leaving a federation.

Dismantle a Federation

You can dismantle a federation if you are the last controller member in the federation. Only members with the controller role can dismantle a federation.

Procedure

1. Click the Grid icon at the top right of the Multi-Instance Management Dashboard.
2. In the member table, click the dot icon next to your member name and click **Dismantle Federation**.
3. Type the federation name and click **Dismantle**.

What to do next

After the federation is dismantled, the Create Federation screen is displayed instead of the Multi-Instance Management Dashboard.

Stretching Clusters

17

You can stretch an NSX-T cluster in the management domain or in a VI workload domain across two availability zones within a region. Both availability zones must contain an equal number of hosts to ensure failover in case any of the availability zones goes down.

The default management cluster must be stretched before a workload domain cluster can be stretched. This ensures that the NSX control plane and management VMs (vCenter, NSX, SDDC Manager) remain accessible if the stretched cluster in the second availability zone goes down.

Note You cannot stretch a cluster in the following conditions:

- If a cluster uses static IP addresses for the NSX-T Host Overlay Network TEPs.
- If remote vSAN datastores are mounted on any cluster.

You may want to stretch a cluster for the following reasons.

- Planned maintenance

  You can perform a planned maintenance on an availability zone without any downtime and then migrate the applications after the maintenance is completed.

- Automated recovery

  Stretching a cluster automatically initiates VM restart and recovery, and has a low recovery time for the majority of unplanned failures.

- Disaster avoidance

  With a stretched cluster, you can prevent service outages before an impending disaster.

This release of Cloud Foundation does not support unstretching a cluster.

About Availability Zones and Regions

This section describes availability zones and regions as used for stretch clusters.

Availability Zones

An availability zone is a collection of infrastructure components. Each availability zone runs on its own physically distinct, independent infrastructure, and is engineered to be highly reliable. Each zone should have independent power, cooling, network, and security.

Additionally, these zones should be physically separate so that disasters affect only one zone. The physical distance between availability zones is short enough to offer low, single-digit latency (less than 5 ms) and large bandwidth (10 Gbps) between the zones.

Availability zones can either be two distinct data centers in a metro distance, or two safety or fire sectors (data halls) in the same large-scale data center.

Regions

Regions are in two distinct locations - for example, region A can be in San Francisco and region B in Los Angeles (LAX). The distance between regions can be rather large. The latency between regions must be less than 150 ms.

VxRail Stretched Cluster Requirements

In an environment with multiple availability zones, Layer 2 networks must be stretched between the availability zones by the physical infrastructure. You also must provide a Layer 3 gateway that is highly available between availability zones. The method for stretching these Layer 2 networks and providing a highly available Layer 3 gateway is vendor-specific.

VLANs and Subnets for Multiple Available Zones

This section displays a sample configuration for an environment with multiple availability zones. The management, Uplink 01, Uplink 02, and Edge Overlay networks in each availability zone must be stretched to facilitate failover of the NSX-T Edge appliances between availability zones. The Layer 3 gateway for the management and Edge Overlay networks must be highly available across the availability zones.

Note The management network VLAN can be the same for the management domain and VI workload domains, although the table below shows an example where these VLANs are different (1611 vs 1631).

Table 17-1. Management Domain VLAN and IP Subnet Requirements

Function	Availability Zone 1	Availability Zone 2	VLAN ID	IP Range	HA Layer 3 Gateway	Recommended MTU
Management (AZ1 and AZ2)	✓	✓	1611 (Stretched)	172.16.11.0/24	✓	1500
vSphere vMotion	✓	X	1612	172.16.12.0/24	✓	9000
vSAN	✓	X	1613	172.16.13.0/24	✓	9000
NSX-T Host Overlay	✓	X	1614	172.16.14.0/24	✓	9000
NSX-T Edge Uplink01	✓	✓	2711 (Stretched)	172.27.11.0/24	X	9000
NSX-T Edge Uplink02	✓	✓	2712 (Stretched)	172.27.12.0/24	X	9000

Table 17-1. Management Domain VLAN and IP Subnet Requirements (continued)

Function	Availability Zone 1	Availability Zone 2	VLAN ID	IP Range	HA Layer 3 Gateway	Recommended MTU
NSX-T Edge Overlay	✓	✓	2713 (Stretched)	172.27.13.0/24	✓	9000
vSphere vMotion	X	✓	1622	172.16.22.0/24	✓	9000
vSAN	X	✓	1623	172.16.23.0/24	✓	9000
Host Overlay	X	✓	1624	172.16.24.0/24	✓	9000

Note If a VLAN is stretched between AZ1 and AZ2, then the data center needs to provide appropriate routing and failover of the gateway for that network.

Table 17-2. Workload Domain VLAN and IP Subnet Requirements

Function	Availability Zone 1	Availability Zone 2	VLAN ID	IP Range	HA Layer 3 Gateway
Management (AZ1 and AZ2)	✓	✓	1631	172.16.31.0/24	✓
vSphere vMotion	✓	X	1632	172.16.32.0/24	✓
vSAN	✓	X	1633	172.16.33.0/24	✓
Host Overlay	✓	X	1634	172.16.34.0/24	✓
vSphere vMotion	X	✓	2732	172.27.32.0/24	✓
vSAN	X	✓	2733	172.16.33.0/24	✓
Host Overlay	X	✓	1621	172.16.21.0/24	✓

Networking for Multiple Availability Zones

There are specific physical data center network requirements for a topology with multiple availability zones.

Table 17-3. Physical Network Requirements for Multiple Availability Zone

Component	Requirement
MTU	■ VLANs which are stretched between availability zones must meet the same requirements as the VLANs for intra-zone connection including MTU. ■ MTU value must be consistent end-to-end including components on the inter zone networking path. ■ Set MTU for all VLANs and SVIs (management, vMotion, Geneve, and Storage) to jumbo frames for consistency purposes. Geneve overlay requires an MTU of 1600 or greater.
Layer 3 gateway availability	For VLANs that are stretched between available zones, configure data center provided method, for example, VRRP or HSRP, to failover the Layer 3 gateway between availability zones.
DHCP availability	For VLANs that are stretched between availability zones, provide high availability for the DHCP server so that a failover operation of a single availability zone will not impact DHCP availability. **Note** You cannot stretch a cluster that uses static IP addresses for the NSX-T Host Overlay Network TEPs.
BGP routing	Each availability zone data center must have its own Autonomous System Number (ASN).
Ingress and egress traffic	■ For VLANs that are stretched between availability zones, traffic flows in and out of a single zone. Local egress is not supported. ■ For VLANs that are not stretched between availability zones, traffic flows in and out of the zone where the VLAN is located. ■ For NSX-T virtual network segments that are stretched between regions, traffic flows in and out of a single availability zone. Local egress is not supported.
Latency	■ Maximum network latency between NSX-T Managers is 10 ms. ■ Maximum network latency between the NSX-T Manager cluster and transport nodes is 150 ms.

Deploy and Configure vSAN Witness Host

Each vSAN stretched cluster requires a witness host deployed in a vSAN witness zone, which must be different from the location of both availability zones.

You deploy the vSAN witness host using an appliance instead of using a dedicated physical ESXi host as a witness host. The witness host does not run virtual machines and must run the same version of ESXi as the ESXi hosts in the stretched cluster. It must also meet latency and Round Trip Time (RRT) requirements.

See the Physical Network Requirements for Multiple Availability Zone table within VxRail Stretched Cluster Requirements.

Deploy vSAN Witness Host

You deploy the vSAN witness host for a stretched cluster at a site away from the existing availability zones to prevent propagation of outage in the data center.

Prerequisites

Download the vSAN witness host virtual appliance `.ova` file.

Procedure

1. In a web browser, log in to vCenter Server at `https://`*vcenter_server_fqdn*`/ui`.
2. Select **Menu > Hosts and Clusters**.
3. In the inventory panel, expand **vCenter Server > Datacenter**.
4. Right-click the cluster and select **Deploy OVF template**.
5. On the **Select an OVF template** page, select **Local file**, click **Upload files**, browse to the location of the vSAN witness host `OVA` file, and click **Next**.
6. On the **Select a name and folder** page, enter a name for the virtual machine and click **Next**.
7. On the **Select a compute resource** page, click **Next**.
8. On the **Review details** page, review the settings and click **Next**.
9. On the **License agreements** page, accept the license agreement and click **Next**.
10. On the **Configuration** page, select **Medium** and click **Next**.
11. On the **Select storage** page, select a datastore and click **Next.**
12. On the **Select networks** page, select a portgroup for the wintess and management network, and click **Next**.
13. On the **Customize template** page, enter the root password for the witness and click **Next**.
14. On the **Ready to complete** page, click **Finish** and wait for the process to complete.
15. Power on the vSAN witness host.
    a. In the inventory panel, navigate to **vCenter Server > Datacenter > Cluster**.
    b. Right-click the vSAN witness host and from the **Actions** menu, select **Power > Power on**.

Configure the Management Network on the vSAN Witness Host

Configure the management network for the vSAN witness host in the ESXi Direct Console User Interface (DCUI).

Procedure

1 In the inventory panel of the vCenter Server Client, select **vCenter Server > Datacenter**.

2 Open the DCUI of the ESXi host.

   a Right-click the vSAN witness host and click **Open remote console**.

   b Press F2 to enter the DCUI.

   c Log in with the ***vsan_witness_root_password***.

3 Configure the network.

   a Select **Configure Management Network** and press Enter.

   b Select **IPv4 Configuration** and press Enter.

   c Select **Set static IPv4 address and network configuration** and press the Space bar.

   d Enter **IPv4 Address**, **Subnet Mask** and **Default Gateway** and press Enter.

   e Select **DNS Configuration** and press Enter.

   f Select **Use the following DNS Server address and hostname** and press the Space bar.

   g Enter **Primary DNS Server**, **Alternate DNS Server** and **Hostname** and press Enter.

   h Select **Custom DNS Suffixes** and press Enter.

   i Ensure that there are no suffixes listed and press Enter.

4 Press Escape to exit and press Y to confirm the changes.

Configure NTP and SSH on the Witness Host

To prevent time synchronization issues, configure the NTP service and enable SSH on the vSAN witness host to add static routes for access to availability zone 1 and availability zone 2 networks.

Procedure

1 In the inventory panel of the vCenter Server Client, select **vCenter Server > Datacenter**.

2 Select the vSAN witness host and click the **Configure** tab.

3 Configure the NTP client on the vSAN witness host.

   a In the **System** section, click **Time configuration** and click the **Edit** button.

   b Select **Use Network Time Protocol (enable NTP client)**.

   c Configure the following settings and click **OK**.

Setting	Value
NTP Servers	NTP server address
Start NTP Service	Selected
NTP Service Startup Policy	Start and stop with host

4 Enable the SSH service on the vSAN witness host.

   a In the **System** section, click **Services** and select **SSH**.

   b Click the **Edit startup policy** button.

   c On the **Edit startup policy** page, select **Start and stop with host** and click **OK**.

Configure the VMkernel Adapters on the vSAN Witness Host

To enable vSAN data network communication between the availability zones, configure the witness network on the vSAN witness host.

Procedure

1 In the inventory panel of the vCenter Server Client, select **vCenter Server > Datacenter**.

2 Select the vSAN witness host and click the **Configure** tab.

3 Remove the dedicated witness traffic VMkernel adapter on the vSAN Witness host.

   a In the **Networking** section, click **VMkernel adapters**.

   b Select the kernel adapter **vmk1** with `secondaryPg` as **Network label** and click **Remove**.

   c On the **Remove VMkernel adapter** dialog box, click **Remove**

4 Remove the virtual machine network port group on the vSAN witness host.

   a In the left pane, select **Networking > Virtual switches**.

   b Expand the **Standard switch: secondary switch** section.

   c Click the vertical ellipsis and from the drop-down menu, select **Remove**.

   d On the **Remove standard switch** dialog box, click **Yes**.

   e Expand the **Standard switch: vSwitch0** section.

   f In the **VM Network** pane, click the vertical ellipsis and from the drop-down menu, select **Remove**.

   g On the **Remove port group** dialog box, click **Yes**.

5 Enable witness traffic on the VMkernel adapter for the management network of the vSAN witness host.

   a On the **VMkernel adapters** page, select the **vmk0** adapter and click **Edit**.

   b In the **vmk0 - edit settings** dialog box, click **Port properties**, select the **vSAN** check box, and click **OK**.

Stretch a VxRail Cluster

This procedure describes how to stretch a VxRail cluster across two availability zones.

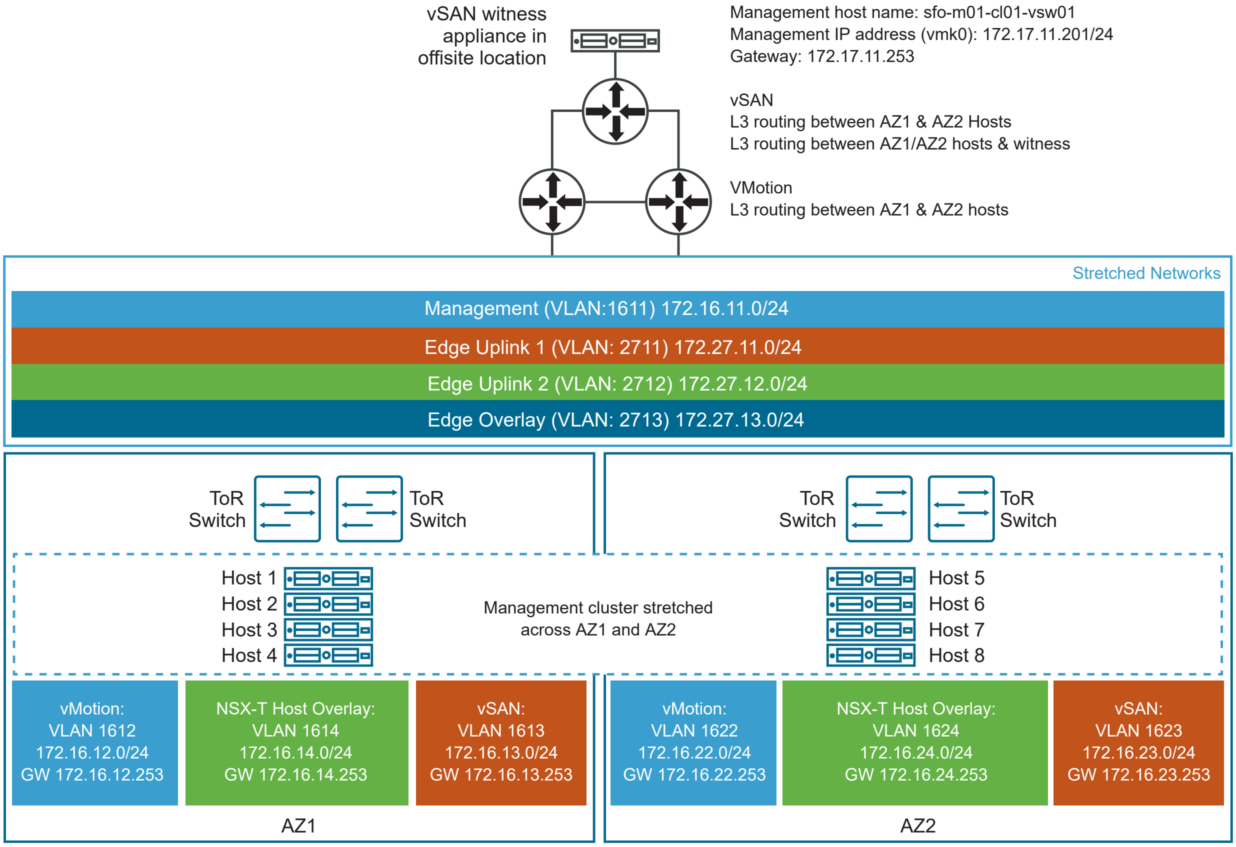
This example use case has two availability zones in two buildings in an office campus - AZ1 and AZ2. Each availability zone has its own power supply and network. The management domain is on AZ1 and contains the default cluster, SDDC-Cluster1. This cluster contains four ESXi hosts.

vSAN network	VLAN ID=1623
	MTU=9000
	Network=172.16.234.0
	netmask 255.255.255.0
	gateway 172.16.23.253
	IP range=172.16.23.11 - 172.16.234.59
vMotion network	VLAN ID=1622
	MTU=9000
	Network=172.16.22.0
	netmask 255.255.255.0
	gateway 172.16.22.253
	IP range=172.16.22.11 - 172.16.22.59

There are four ESXi hosts in AZ2 that are not in the VMware Cloud Foundation inventory yet.

We will stretch the default cluster `SDDC-Cluster1` in the management domain from AZ1 to AZ2.

Figure 17-1. Stretch Cluster Example


vSAN witness appliance in offisite location
Management host name: sfo-m01-cl01-vsw01
Management IP address (vmk0): 172.17.11.201/24
Gateway: 172.17.11.253
vSAN
L3 routing between AZ1 & AZ2 Hosts
L3 routing between AZ1/AZ2 hosts & witness
VMotion
L3 routing between AZ1 & AZ2 hosts
Stretched Networks
Management (VLAN:1611) 172.16.11.0/24
Edge Uplink 1 (VLAN: 2711) 172.27.11.0/24
Edge Uplink 2 (VLAN: 2712) 172.27.12.0/24
Edge Overlay (VLAN: 2713) 172.27.13.0/24
ToR Switch
ToR Switch
ToR Switch
ToR Switch
Host 1
Host 2
Host 3
Host 4
Management cluster stretched across AZ1 and AZ2
Host 5
Host 6
Host 7
Host 8
vMotion: VLAN 1612 172.16.12.0/24 GW 172.16.12.253
NSX-T Host Overlay: VLAN 1614 172.16.14.0/24 GW 172.16.14.253
vSAN: VLAN 1613 172.16.13.0/24 GW 172.16.13.253
vMotion: VLAN 1622 172.16.22.0/24 GW 172.16.22.253
NSX-T Host Overlay: VLAN 1624 172.16.24.0/24 GW 172.16.24.253
vSAN: VLAN 1623 172.16.23.0/24 GW 172.16.23.253
AZ1
AZ2

To stretch a cluster for VMware Cloud Foundation on Dell EMC VxRail, perform the following steps:

Prerequisites

- Verify that vCenter Server is operational.
- Verify that you have completed the Planning and Preparation Workbook with the management domain or VI workload domain deployment option included.
- Verify that your environment meets the requirements listed in the Prerequisite Checklist sheet in the Planning and Preparation Workbook.
- Ensure that you have enough hosts such that there is an equal number of hosts on each availability zone. This is to ensure that there are sufficient resources in case an availability zone goes down completely.
- Deploy and configure a vSAN witness host. See Deploy and Configure vSAN Witness Host.
- If you are stretching a cluster in a VI workload domain, the default management vSphere cluster must have been stretched.
- Download initiate_stretch_cluster_vxpail.py.

Important You cannot deploy an NSX Edge cluster on a vSphere cluster that is stretched. If you plan to deploy an NSX Edge cluster, you must do so before you execute the stretch cluster workflow.

Note You cannot stretch a cluster in the following conditions:

- If a cluster uses static IP addresses for the NSX-T Host Overlay Network TEPs
- If remote vSAN datastores are mounted on any cluster
- If it is enabled for Workload Management

Procedure

1. Using an SSH File Transfer tool, copy `initiate_stretch_cluster_vxrail.py` to the `/home/vcf/` directory on the SDDC Manager appliance.

2. Using SSH, log in to the SDDC Manager appliance with the user name `vcf` and the password you specified in the deployment parameter workbook.

3. Run the script with `-h` option for details about the script options.

   ```
   python initiate_stretch_cluster_vxrail.py -h
   ```

4. Run the following command to prepare the cluster to be stretched. The command creates affinity rules for the VMs to run on the preferred site:

   ```
   python initiate_stretch_cluster_vxrail.py --workflow prepare-stretch --sc-domain <SDDC-valid-domain-name> --sc-cluster <valid-cluster-name>
   ```

Replace *<SDDC-valid-domain-name>* and *<valid-cluster-name>* with the correct values for your environment. For example:

```
python initiate_stretch_cluster_vxrail.py --workflow prepare-stretch --sc-domain
wdc1-workflowspec-vxrail --sc-cluster VxRail-Virtual-SAN-Cluster-8d2c9f37-e230-4238-ab35-
cafd5033a59e
```

Enter the SSO user name and password when prompted to do so.

Once the workflow is triggered, track the task status in the SDDC Manager UI. If the task fails, debug and fix the issue and retry the task from the SDDC Manager UI. Do not run the script again.

5. Use the VxRail vCenter plug-in to add the additional hosts in Availability Zone 2 to the cluster by performing the VxRail Manager cluster expansion work flow.

6. Run the following command to stretch the cluster:

```
python initiate_stretch_cluster_vxrail.py --workflow stretch-vsan --sc-domain <SDDC-valid-
domain-name> --sc-cluster <valid cluster name which is a part of the domain to be
stretched> --sc-hosts <valid host names> --witness-host-fqdn <witness host/appliance IP
or fqdn> --witness-vsan-ip <witness vsan IP address> --witness-vsan-cidr <witness-vsan-
network-IP-address-with-mask>
```

Replace *<SDDC-valid-domain-name>*, *<valid cluster name which is a part of the domain to be stretched>*, *<valid host names>*, *<witness vsan IP address>*, *<witness host/appliance IP or fqdn>*, *<witness vsan IP address>*, and *<witness-vsan-network-IP-address-with-mask>* with the correct values for your environment. For example:

```
python initiate_stretch_cluster_vxrail.py --workflow stretch-vsan --sc-domain
wdc1-workflowspec-vxrail --sc-cluster VxRail-Virtual-SAN-Cluster-8d2c9f37-e230-4238-ab35-
cafd5033a59e --sc-hosts wdc3-005-proxy.vxrail.local --witness-host-fqdn 172.16.10.235 --
witness-vsan-ip 172.16.20.235 --witness-vsan-cidr 172.16.20.0/24
```

7. When prompted, enter the following information:

   - SSO user name and password
   - Root user password for ESXi hosts
   - vSAN gateway IP for the preferred (primary) and non-preferred (secondary) site
   - vSAN CIDR for the preferred (primary) and non-preferred (secondary) site
   - VLAN ID for the non-preferred site overlay VLAN
   - Confirm the SSH thumbprints for the hosts

   Once the workflow is triggered, the task is tracked in the SDDC Manager UI. If the task fails, debug and fix the issue and retry from SDDC Manager UI. Do not run the script again.

8. Monitor the progress of the AZ2 hosts being added to the cluster.

   a In the SDDC Manager UI, click **View All Tasks**.

   b Refresh the window to monitor the status.

9 Validate that stretched cluster operations are working correctly by logging in to the vSphere Web Client.

   a Verify vSAN Health.

      1 On the home page, click **Host and Clusters** and then select the stretched cluster.

      2 Click **Monitor > vSAN > Skyline Health**.

      3 Click **Retest**.

      4 Fix errors, if any.

   b Verify the vSAN Storage Policy.

      1 On the home page, click **Policies and Profiles > VM Storage Policies > vSAN Default Storage Policies**.

      2 Select the policy associated with the vCenter Server for the stretched cluster and click **Check Compliance**.

      3 Click **VM Compliance** and check the **Compliance Status** column for each VM.

      4 Fix errors, if any.

NSX-T Data Center Configuration for Availability Zone 2

To provide the necessary networking services for fail-over of SDDC components from availability zone 1 to availability zone 2 in the management domain, you configure NSX-T Data Center for availability zone 2.

Configure IP Prefixes in the Tier-0 Gateway for Availability Zone 2

You configure default and any IP prefixes on the tier-0 gateway to permit access to route advertisement by any network and by the 0.0.0.0/0 network. These IP prefixes are used in route maps to prepend a path to one or more autonomous systems (AS-path prepend) for BGP neighbors and to configure local-reference on the learned default-route for BGP neighbors in availability zone 2.

Procedure

1 In a web browser, log in to NSX Manager for the management or workload domain to be stretched at `https://`*nsx_manager_fqdn*`/login.jsp?local=true`.

2 On the main navigation bar, click **Networking**.

3 In the navigation pane, click **Tier-0 gateways**.

4 Select the gateway and from the ellipsis menu, click **Edit**.

5 Create the Any IP prefix list.

   a Expand the **Routing** section and in the **IP prefix list** section, click **Set**.

   b In the **Set IP prefix list** dialog box, click **Add IP prefix list**.

c Enter `Any` as the prefix name and under **Prefixes**, click **Set**.

d In the **Set prefixes** dialog box, click **Add Prefix** and configure the following settings.

Setting	Value
Network	any
Action	Permit

e Click **Add** and then click **Apply**.

6 Repeat step 5 to create the default route IP prefix set with the following configuration.

Setting	Value
Name	Default Route
Network	0.0.0.0/0
Action	Permit

7 On the **Set IP prefix list** dialog box, click **Close**.

Configure Route Maps in the Tier-0 Gateway for Availability Zone 2

To define which routes are redistributed in the domain, you configure route maps in the tier-0 gateway.

Procedure

1 On the NSX Manager main navigation bar, click **Networking**.

2 In the navigation pane, click **Tier-0 gateways**.

3 Select the gateway, and from the ellipsis menu, click **Edit**.

4 Create a route map for traffic incoming to availability zone 2.

a Expand the **Routing** section and in the **Route maps** section, click **Set**.

b In the **Set route maps** dialog box, click **Add route map**.

c Enter a name for the route map.

d In the **Match criteria** column, click **Set**.

e On the **Set match criteria** dialog box, click **Add match criteria** and configure the following settings.

Setting	Value for Default Route	Value for Any
Type	IP Prefix	IP Prefix
Members	Default Route	Any
Local Preference	80	90
Action	Permit	Permit

f Click **Add** and then click **Apply**.

g In the **Set route maps** dialog box, click **Save**.

5 Repeat step 4 to create a route map for outgoing traffic from availability zone 2 with the following configuration.

Setting	Value
Route map name	rm-out-az2
Type	IP Prefix
Members	Any
As Path Prepend	*bgp_asn*
Local Preference	100
Action	Permit

6 In the **Set route maps** dialog box, click **Close**.

Configure BGP in the Tier-0 Gateway for Availability Zone 2

To enable fail-over from availability zone 1 to availability zone 2, you configure BGP neighbors on the tier-0 gateway in the management or workload domain to be stretched. You add route filters to configure `localpref` on incoming traffic and `prepend of AS` on outgoing traffic.

You configure two BGP neighbors with route filters for the uplink interfaces in availability zone 2.

Table 17-4. BGP Neighbors for Availability Zone 2

Setting	BGP Neighbor 1	BGP Neighbor 2
IP address	*ip_bgp_neighbor1*	*ip_bgp_neighbor2*
BFD	Disabled	Disabled
Remote AS	*asn_bgp_neighbor1*	*asn_bgp_neighbor2*
Hold downtime	12	12

Table 17-4. BGP Neighbors for Availability Zone 2 (continued)

Setting	BGP Neighbor 1	BGP Neighbor 2
Keep alive time	4	4
Password	*bgp_password*	*bgp_password*

Table 17-5. Route Filters for BGP Neighbors for Availability Zone 2

Setting	BGP Neighbor 1	BGP Neighbor 2
IP Address Family	IPV4	IPV4
Enabled	Enabled	Enabled
Out Filter	rm-out-az2	rm-out-az2
In Filter	rm-in-az2	rm-in-az2
Maximum Routes	-	-

Procedure

1 On the NSX Manager main navigation bar, click **Networking**.

2 In the navigation pane, click **Tier-0 gateways**.

3 Select the gateway and from the ellipsis menu, click **Edit**.

4 Add the uplink interfaces to the NSX Edge nodes.

   a Expand **BGP** and in the **BGP neighbors** section, click **2**.

   b In the **Set BGP neighbors** dialog box, click **Add BGP neighbor** and configure the following settings.

Setting	Value
IP address	*ip_bgp_neighbor1*
BFD	Disabled **Note** Enable BFD only if the network supports and is configured for BFD.
Remote AS	*asn_bgp_neighbor1*
Hold downtime	12
Keep alive time	4
Password	*bgp_password*

   c In the **Route filter** section, click **Set**.

d In the Set route filter dialog box, click **Add route filter** and configure the following settings.

Setting	Value
IP Address Family	IPV4
Enabled	Enabled
Out Filter	`rm-out-az2`
In Filter	`rm-in-az2`
Maximum Routes	-

e Click **Add** and then click **Apply**.

5 Repeat step 4 to configure BGP neighbor *ip_bgp_neighbor2*and the corresponding route filter.

6 On the **Tier-0 gateway** page, click **Close editing**.

Configure Witness Traffic Separation for VMware Cloud Foundation on Dell EMC VxRail

Witness traffic separation allows you to use a VMkernel adapter for vSAN witness traffic that is different from the adapter for vSAN data traffic.

By default, when you stretch a cluster, the vSAN-tagged VMkernel adapter is used to carry traffic destined for the vSAN witness host. With witness traffic separation, you can use a separately tagged VMkernel adapter instead of extending the vSAN data network to the witness host. This feature allows for a more flexible network configuration by allowing for separate networks for node-to-node and node-to-witness communication.

Prerequisites

You must have a stretched cluster before you can configure it for witness traffic separation.

Procedure

1 Create Distributed Port Groups for Witness Traffic

Create a distributed port group for each availability zone on the vSphere Distributed Switch.

2 Delete Routes to the Witness Host

When you stretch a cluster, a route to the witness host is added to each ESXi host in the stretched cluster. You must delete these routes to use witness traffic separation.

3 Add VMkernel Adapters for Witness Traffic

Add VMkernel adapters for witness traffic to each availability zone's distributed port group.

4 Configure the VMkernel Adapters for Witness Traffic

   Enable witness traffic for the witness traffic VMkernel adapter on each ESXi host

Create Distributed Port Groups for Witness Traffic

Create a distributed port group for each availability zone on the vSphere Distributed Switch.

Procedure

1. Log in to the vSphere Client.
2. Click **Menu > Networking**.
3. Right-click the vSphere distributed switch for the cluster and select **Distributed Port Group > New Distributed Port Group**.
4. Enter a name for the port group for the first availability zone and click **Next**.

   For example, **`AZ1_WTS_PG`**.
5. Change the VLAN type to **VLAN** and enter a VLAN ID.
6. Select **Customize default policies** and click **Next**.
7. On the **Security** page, click **Next**.
8. On the **Traffic shaping** page, click **Next**.
9. On the **Teaming and failover** page, modify the failover order of the uplinks to match the existing failover order of the management traffic and click **Next**.
10. On the **Monitoring** page, click **Next**.
11. On the **Miscellaneous** page, click **Next**.
12. On the **Ready to Complete** page, review your selections and click **Finish**.
13. Repeat these steps for the second availability zone.

Delete Routes to the Witness Host

When you stretch a cluster, a route to the witness host is added to each ESXi host in the stretched cluster. You must delete these routes to use witness traffic separation.

Procedure

1. Open an SSH connection to the first ESXi host in the stretched cluster.
2. Log in as **`root`**.
3. Run the following command:

   ```
   esxcli network ip route ipv4 list
   ```

The output returns something like:

```
Network      Netmask        Gateway       Interface  Source
-----------  -------------  ------------  ---------  ------
default      0.0.0.0        172.18.15.1   vmk2       MANUAL
169.254.0.0  255.255.255.0  0.0.0.0       vmk1       MANUAL
172.18.7.0   255.255.255.0  0.0.0.0       vmk3       MANUAL
172.18.13.0  255.255.255.0  0.0.0.0       vmk5       MANUAL
172.18.14.0  255.255.255.0  172.18.7.253  vmk3       MANUAL
172.18.15.0  255.255.255.0  0.0.0.0       vmk2       MANUAL
172.18.21.0  255.255.255.0  172.18.7.253  vmk3       MANUAL
```

4. Delete the route to the witness host. For example:

   ```
   esxcfg-route -d 172.18.14.0/24 172.18.7.253
   ```

5. Repeat these steps for each ESXi host in the stretched cluster.

Add VMkernel Adapters for Witness Traffic

Add VMkernel adapters for witness traffic to each availability zone's distributed port group.

Procedure

1. Log in to the vSphere Client.
2. Click **Menu > Networking**.
3. Right-click the witness distributed port group for the first availability zone, for example, **`AZ1_WTS_PG`**, and select **Add VMkernel Adapters**.
4. Click **+ Attached Hosts**, select the availability zone 1 hosts from the list, and click OK.
5. Click **Next**.
6. Accept the default VMkernel port settings and click **Next**.

   Note Do not select any services.

7. Select **Use static IPv4 settings** and enter the IP addresses and the subnet mask to use for the witness traffic separation network.
8. Click **Next**.
9. Review your selections and click **Finish**.
10. Repeat these steps for the witness distributed port group for the second availability zone.

Configure the VMkernel Adapters for Witness Traffic

Enable witness traffic for the witness traffic VMkernel adapter on each ESXi host

Procedure

1. Log in to the vSphere Client.

2 Click **Menu > Hosts and Clusters**.

3 For each host in the stretched cluster, click **Configure > Networking > VMkernel adapters** to determine which VMkernel adapter to use for witness traffic. For example, **`vmk5`**.

4 SSH to the first ESXi host in the stretched cluster.

5 Log in as root and run the following command:

```
esxcli vsan network ip add -i <vmkernel_adapter> -T=witness
```

For example:

```
esxcli vsan network ip add -i vmk5 -T=witness
```

6 Verify that the VMkernel adapter is configured for witness traffic:

```
esxcli vsan network list
```

7 Verify that the ESXi host can access the witness host:

```
vmkping -I <vmkernel_adapter> <witness_host_ip_address>
```

Replace *<vmkernel_adapter>* with the VMkernel adapter configured for witness traffic, for example **`vmk5`**. Replace *<witness_host_ip_address>* with the witness host IP address.

8 Repeat for each ESXi host in the stretched cluster.

Expand a Stretched VxRail Cluster

You can expand a stretched cluster by adding more VxRail nodes to the preferred and non-preferred sites.

Prerequisites

You must have a stretched cluster.

Procedure

1 Use the VxRail vCenter plug-in to add the additional hosts in availability zone 1 or availability zone 2 to the cluster by performing the VxRail Manager cluster expansion work flow.

Refer to the Dell EMC VxRail documentation for more details.

2 Log in to SDDC Manager and run the script to trigger the workflow to import the newly added hosts in the SDDC Manager inventory.

In the script, provide the root credentials for each host and specify which fault domain the host should be added to.

3 Using SSH, log in to the SDDC Manager VM with the username **`vcf`** and the password you specified in the deployment parameter workbook.

4. Run the following command to expand the stretched cluster:

   ```
   python initiate_stretch_cluster_vxrail.py --workflow expand-stretch-cluster --sc-domain
   <SDDC-valid-domain-name> --sc-cluster <valid cluster name which is a part of the domain
   to be stretched> --sc-hosts <valid host names> --witness-host-fqdn <witness host/appliance
   IP or fqdn> --witness-vsan-ip <witness vsan IP address> --witness-vsan-cidr <witness-vsan-
   network-IP-address-with-mask>
   ```

   Replace *<SDDC-valid-domain-name>*, *<valid cluster name which is a part of the domain to be stretched>*, *<valid host names>*, *<witness vsan IP address>*, *<witness host/appliance IP or fqdn>*, *<witness vsan IP address>*, and *<witness-vsan-network-IP-address-with-mask>* with the correct values for your environment.

5. When prompted, enter the following information:

   - SSO user name and password
   - Root user password for ESXi hosts
   - Fault domain for ESXi hosts
   - vSAN gateway IP for the preferred (primary) and non-preferred (secondary) site
   - vSAN CIDR for the preferred (primary) and non-preferred (secondary) site
   - Confirm the SSH thumbprints for the hosts

6. Once the workflow is triggered, track the task status in the SDDC Manager UI.

   If the task fails, debug and fix the issue and retry from SDDC Manager UI. Do not run the script again.

What to do next

If you add hosts to a stretched cluster configured for witness traffic separation, perform the following tasks for the added hosts:

- Add VMkernel Adapters for Witness Traffic
- Delete Routes to the Witness Host
- Configure the VMkernel Adapters for Witness Traffic

Replace a Failed Host in a Stretched VxRail Cluster

If a host or host component in a stretched cluster fails, it is recommended that you replace the host with a new host.

Prerequisites

- Check the health of the cluster.

  See "Check vSAN Health" in *Administering VMware vSAN*.

Procedure

1. Remove the failed host from the cluster.

   See Remove a Host from a Cluster in a Workload Domain.

2. Expand the cluster to add the new host to the cluster.

   See Expand a Stretched VxRail Cluster .

Results

vSAN automatically rebuilds the stretch cluster.

Monitoring Capabilities in the VMware Cloud Foundation System

18

The VMware Cloud Foundation system provides built-in capabilities to help you perform effective operations monitoring, troubleshooting, performance management, infrastructure capacity planning, and compliance monitoring and auditing.

You use the built-in monitoring capabilities for these typical scenarios.

Scenario	Examples
Are the systems online?	A host or other component shows a failed or unhealthy status.
Why did a storage drive fail?	Hardware-centric views spanning inventory, configuration, usage, and event history to provide for diagnosis and resolution.
Is the infrastructure meeting tenant service level agreements (SLAs)?	Analysis of system and device-level metrics to identify causes and resolutions.
At what future time will the systems get overloaded?	Trend analysis of detailed system and device-level metrics, with summarized periodic reporting.
What person performed which action and when?	History of secured user actions, with periodic reporting. Workflow task history of actions performed in the system.

The monitoring capabilities involve these features:

Read the following topics next:

- Viewing Tasks and Task Details

Viewing Tasks and Task Details

From SDDC Manager UI, you can access all tasks. By default, the Dashboard displays the Recent Tasks widget, providing general information at a glance about the most recent tasks. A task is a unit of work or a series of subtasks that perform an overall goal, such as creating a workload domain.

In addition to the most recent tasks, you can view and search for all tasks by clicking **View All Tasks** at the bottom of the Recent Tasks widget. This opens the Tasks panel.

Note For more information about controlling the widgets that appear on the Dashboard page of SDDC Manager UI, see Tour of the SDDC Manager User Interface.

Viewing and Filtering Task Details

The Tasks panel provides a high level view all tasks, displaying the descriptive task name, task status (for example, running, succeeded, or failed), and the timestamp for the last change in task status. You can also filter and search the task information as follows:

- Search tasks by clicking the filter icon in the Task column header and entering a search string.
- Filter tasks by status by clicking the filter icon in Status column. Select by category **All**, **Failed**, **Successful**, **Running**, or **Pending**.

  Note Each category also displays the number of tasks with that status.

- Clear all filters by clicking **Reset Filter** at the top of the Tasks panel.
- Click **Refresh** to refresh the task list.

Note You can also sort the table by the contents of the Status and Last Occurrence columns.

Managing Tasks and Subtask Details

Expand a task to view details including the subtasks that comprise the task and their individual statuses.

- If a task is in a Failed state, you can also attempt to restart it by clicking **Restart Task**.

  Note Not all tasks are restartable.

- If a task is in a Failed state, click on the icon next to the Failed status to view a detailed report on the cause.
- To view subtasks and their details, click **View Subtasks**.

  Note You can filter subtasks in the same way you filter tasks.

Note You can also sort the table by the contents of the Status and Last Occurrence columns.

Resizing the Task Panel

Use the icons on the task panel to increase or decrease the panel size, or to close or reopen it.

Updating VMware Cloud Foundation DNS and NTP Servers 19

If you need to update the DNS or NTP servers that VMware Cloud Foundation uses, you can update the servers with the VMware Cloud Foundation API.

When you initially deploy VMware Cloud Foundation, you complete the deployment parameter workbook to provide the system with the information required for bring-up. This includes up to two DNS servers and up to two NTP servers. You can reconfigure these settings at a later date, using the VMware Cloud Foundation API.

Read the following topics next:

- Update DNS Server Configuration
- Update NTP Server Configuration

Update DNS Server Configuration

Use this procedure to update the DNS server configuration across VMware Cloud Foundation components.

SDDC Manager uses DNS servers to provide name resolution for the components in the system. When you update the DNS server configuration, SDDC Manager performs DNS configuration updates for the following components:

- SDDC Manager
- vCenter Servers
- ESXi hosts
- NSX Managers
- NSX Edge nodes
- vRealize Suite Lifecycle Manager
- vRealize Log Insight
- vRealize Operations
- vRealize Automation

Note To update the DNS settings for VxRail Manager, see the Dell EMC documentation.

If the update fails, SDDC Manager rolls back the DNS settings for the failed component. Fix the underlying issue and retry the update starting with the failed component.

Note There is no rollback for vRealize Suite Lifecycle Manager. Check the logs, resolve any issues, and retry the update.

Updating the DNS server configuration can take some time to complete, depending on the size of your environment. Schedule DNS updates at a time that minimizes the impact to the system users.

This procedure uses the VMware Cloud Foundation API using the Developer Center from within the SDDC Manager UI.

Prerequisites

- Verify that both forward and reverse DNS resolution is functional for each VMware Cloud Foundation component using the updated DNS server information.
- Verify that the new DNS server is reachable from each of the VMware Cloud Foundation components.
- Verify all VMware Cloud Foundation components are reachable from SDDC Manager.
- Verify that all VMware Cloud Foundation components are in an `Active` state.

Procedure

1 In a text editor, create a JSON specification with the following content:

```
{
    "dnsServers": [
        { "ipAddress": " IP of Primary DNS Server ", "isPrimary": true },
        { "ipAddress": " IP of Secondary DNS Server ", "isPrimary": false }
    ]
}
```

2 In the SDDC Manager UI, click **Developer Center > API Explorer**.

3 Validate the DNS configuration JSON specification and ensure the system is healthy.

   a Expand the **APIs for managing DNS & NTP configuration** section, and click **POST /v1/system/dns-configuration/validations**.

   b In the **dnsConfiguration** text box, paste the contents of the JSON specification, and click **Execute**.

   c In the **Response** section, click **Validation** to expand the task and copy the **id**.

   d Expand the **APIs for managing DNS & NTP configuration** section, and click **GET /v1/system/dns-configuration/validations**.

e In the **executeStatus** text box, paste the validation **id** and click **Execute**.

f In the **Response** section, click **Validation** and verify that **resultStatus** states **SUCCEEDED**.

If the **resultStatus** indicates that validation failed, expand **validationChecks** and review which component failed.

4 Perform the DNS configuration using the validated JSON specification.

a Expand the **APIs for managing DNS & NTP configuration** section and click **PUT /v1/system/dns-configuration**.

b In the **dnsConfiguration** text box, paste the contents of the JSON specification and click **Execute**.

c On the **Are you sure dialog**, click **Continue**.

Update NTP Server Configuration

Use this procedure to update the NTP server configuration across VMware Cloud Foundation components.

SDDC Manager uses NTP servers to synchronize time between the components in the system. You must have at least one NTP server. When you update the NTP server configuration, SDDC Manager performs NTP configuration updates for the following components:

- SDDC Manager
- vCenter Servers
- ESXi hosts
- NSX Managers
- NSX Edge nodes
- vRealize Suite Lifecycle Manager
- vRealize Log Insight
- vRealize Operations
- vRealize Automation

Note To update the NTP settings for VxRail Manager, see the Dell EMC documentation.

If the update fails, SDDC Manager rolls back the NTP settings for the failed component. Fix the underlying issue and retry the update starting with the failed component.

Note There is no rollback for the vRealize Suite Lifecycle Manager. Check the logs, resolve any issues, and retry the update.

Updating the NTP server configuration can take some time to complete, depending on the size of your environment. Schedule NTP updates at a time that minimizes the impact to the system users.

This procedure uses the VMware Cloud Foundation API using the Developer Center from within the SDDC Manager UI.

Prerequisites

- Verify the new NTP server is reachable from the VMware Cloud Foundation components.
- Verify the time skew between the new NTP servers and the VMware Cloud Foundation components is less than 5 minutes.
- Verify all VMware Cloud Foundation components are reachable from SDDC Manager.
- Verify all VMware Cloud Foundation components are in an `Active` state.

Procedure

1 In a text editor, create a JSON specification with the following content:

```
{
    "ntpServers": [
        { "ipAddress": " IP/FQDN of First NTP Server " },
        { "ipAddress": " IP/FQDN of Second NTP Server " }
    ]
}
```

2 In the SDDC Manager UI, click **Developer Center > API Explorer**.

3 Validate the NTP configuration JSON specification and ensure the system is healthy.

a Expand the **APIs for managing DNS & NTP configuration** section, and expand **POST /v1/system/ntp-configuration/validations**.

b In the **ntpConfiguration** text box, paste the contents of the JSON specification and click **Execute**.

c In the **Response** section, click **Validation** to expand the task and copy the **id**.

d Expand the **APIs for managing DNS & NTP configuration** section, and click **GET /v1/system/ntp-configuration/validations**.

e In the **executeStatus** text box, paste the validation **id** and click **Execute**.

f In the **Response** section, click **Validation** and verify that **resultStatus** states **SUCCEEDED**.

If the **resultStatus** indicates that validation failed, expand **validationChecks** and review which component failed.

4 Perform the NTP configuration using the validated JSON specification.

a Expand the **APIs for managing DNS & NTP configuration** section and click **PUT /v1/system/ntp-configuration**.

b In the **ntpConfiguration** text box, paste the contents of the JSON specification and click **Execute**.

c On the **Are you sure dialog**, click **Continue**.

Supportability and Serviceability (SoS) Utility 20

The SoS utility is a command-line tool that you can use to run health checks, collect logs for VMware Cloud Foundation components, and so on.

To run the SoS utility, SSH in to the SDDC Manager appliance using the **vcf** user account. For basic operations, enter the following command:

```
sudo /opt/vmware/sddc-support/sos --option-1 --option-2 --option-3 ... --option-n
```

To list the available command options, use the `--help` long option or the `-h` short option.

```
sudo /opt/vmware/sddc-support/sos --help
sudo /opt/vmware/sddc-support/sos -h
```

Note You can specify options in the conventional GNU/POSIX syntax, using -- for the long option and - for the short option.

For privileged operations, enter **su** to switch to the root user, and navigate to the `/opt/vmware/sddc-support` directory and type `./sos` followed by the options required for your desired operation.

Read the following topics next:

- SoS Utility Options
- Collect Logs for Your VMware Cloud Foundation System

SoS Utility Options

This section lists the specific options you can use with the SoS utility.

For information about collecting log files using the SoS utility, see Collect Logs for Your VMware Cloud Foundation System.

SoS Utility Help Options

Use these options to see information about the SoS utility itself. For these options, SSH in to the SDDC Manager VM using the **vcf** user account and enter the following command:

```
sudo /opt/vmware/sddc-support/sos --option-name
```

Enter the **vcf** password when prompted.

Option	Description
`--help` `-h`	Provides a summary of the available SoS utility options
`--version` `-v`	Provides the SoS utility's version number.

SoS Utility Generic Options

These are generic options for the SoS utility. For these options, SSH in to the SDDC Manager VM using the **vcf** user account and enter the following command:

```
sudo /opt/vmware/sddc-support/sos --option-name
```

Enter the **vcf** password when prompted.

Option	Description
`--history`	Displays the last 20 SoS operations performed.
`--force`	Allows SoS operations to be performed while workflows are running. **Note** It is recommended that you do not use this option.
`--configure-sftp`	Configures SFTP for logs.
`--setup-json` *`SETUPJSON`*	Custom setup-json file for log collection. SoS prepares the inventory automatically based on the environment where it is running. If you want to collect logs for a pre-defined set of components, you can create a `setup.json` file and pass the file as input to SoS. A sample JSON file is available on the SDDC Manager appliance at `/opt/vmware/sddc-support/setup.sample.json`.
`--log-folder` *`LOGFOLDER`*	Specifies the name of the log directory.
`--log-dir` *`LOGDIR`*	Specifies the directory to store the logs.
`--enable-stats`	Enable SoS execution stats collection.
`--debug-mode`	Runs the SoS utility in debug mode.
`--zip`	Creates a zipped TAR file for the output.
`--domain-name` *`DOMAINNAME`*	Specify the name of the workload domain name on which to perform the SoS operation. To run the operation on all workload domains, specify `--domain-name ALL`. **Note** If you omit the *--domain-name* flag and workload domain name, the SoS operation is performed only on the management domain.

Option	Description
`--clusternames` *`CLUSTERNAMES`*	Specify the vSphere cluster names associated with a workload domain for which you want to collect ESXi and Workload Management (WCP) logs. Enter a comma-separated list of vSphere clusters. For example, `--clusternames cluster1, cluster2`. **Note** If you specify *--domain-name ALL* then the `--clusternames` option is ignored.
`--skip-known-host-check`	Skips the specified check for SSL thumbprint for host in the known host.
`--include-free-hosts`	Collect logs for free ESXi hosts, in addition to in-use ESXi hosts.

SoS Utility VMware Cloud Foundation Summary Options

These options provide summary details of the SDDC Manager instance, including components, services, and tasks.. For these options, SSH in to the SDDC Manager VM using the **vcf** user account and enter the following command:

```
sudo /opt/vmware/sddc-support/sos --option-name
```

Enter the **vcf** password when prompted.

Option	Description
`--get-vcf-summary`	Returns information about your VMware Cloud Foundation system, including CEIP,workload domains, vSphere clusters, ESXi hosts, licensing, network pools, SDDC Manager, and VCF services.
`--get-vcf-tasks-summary`	Returns information about VMware Cloud Foundation tasks, including the time the task was created and the status of the task.
`--get-vcf-services-summary`	Returns information about SDDC Manager uptime and when VMware Cloud Foundation services (for example, LCM) started and stopped.

SoS Utility Fix-It-Up Options

Use these options to manage ESXi hosts and vCenter Servers, including enabling SSH and locking down hosts. For these options, SSH in to the SDDC Manager VM using the **vcf** administrative user account, enter **su** to switch to the root user, navigate to the `/opt/vmware/sddc-support` directory, and type the following command:

```
./sos --option-name
```

Note For Fix-It-Up options, if you do not specify a workload domain, the command affects only the management domain.

Option	Description
`--enable-ssh-esxi`	Enables SSH on ESXi nodes in the specified workload domains. ■ To enable SSH on ESXi nodes in a specific workload domain, include the flag `--domain-name DOMAINNAME`. ■ To enable SSH on ESXi nodes in all workload domains, include the flag `--domain-name ALL`.
`--disable-ssh-esxi`	Disables SSH on ESXi nodes in the specified workload domains. ■ To disable SSH on ESXi nodes in a specific workload domain, include the flag `--domain-name DOMAINNAME`. ■ To disable SSH on ESXi nodes in all workload domains, include the flag `--domain-name ALL`.
`--enable-ssh-vc`	Enables SSH on vCenter Server in the specified workload domains. ■ To enable SSH on vCenter in a specific workload domain, include the flag `--domain-name DOMAINNAME`. ■ To enable SSH on vCenter Servers in all workload domains, include the flag `--domain-name ALL`.
`--disable-ssh-vc`	Disables SSH on vCenter Servers in the specified workload domains. ■ To disable SSH on vCenter Server in a specific workload domain, include the flag `--domain-name DOMAINNAME`. ■ To disable SSH on vCenter Servers in all workload domains, include the flag `--domain-name ALL`.
`--enable-lockdown-esxi`	Enables lockdown mode on ESXi nodes in the specified workload domains. ■ To enable lockdown on ESXi nodes in a specific workload domain, include the flag `--domain-name DOMAINNAME`. ■ To enable lockdown on ESXi nodes in all workload domains, include the flag `--domain-name ALL`.
`--disable-lockdown-esxi`	Disables lockdown mode on ESXi nodes in the specified workload domains. ■ To disable lockdown on ESXi nodes in a specific workload domain, include the flag `--domain-name DOMAINNAME`. ■ To disable lockdown on ESXi nodes in all workload domains, include the flag `--domain-name ALL`.
`--ondemand-service`	Include this flag to execute commands on all ESXi hosts in a workload domain. **Warning** Contact VMware support before using this option.
`--ondemand-service` *`JSON file path`*	Include this flag to execute commands in the JSON format on all ESXi hosts in a workload domain. For example, `/opt/vmware/sddc-support/<JSON file name>`
`--refresh-ssh-keys`	Refreshes the SSH keys.

SoS Utility Health Check Options

These SoS commands are used for checking the health status of various components or services, including connectivity, compute, storage, database, workload domains, and networks. For these options, SSH in to the SDDC Manager VM using the **vcf** user account and enter the following command:

```
sudo /opt/vmware/sddc-support/sos --option-name
```

Enter the **vcf** password when prompted.

A green status indicates that the health is normal, yellow provides a warning that attention might be required, and red (critical) indicates that the component needs immediate attention.

Option	Description
`--health-check`	Performs all available health checks.
`--connectivity-health`	Performs a connectivity health check to inspect whether the different components of the system such as the ESXi hosts, vCenter Servers, NSX Managers, and SDDC Manager can be pinged.
`--services-health`	Performs a services health check to confirm whether services within the SDDC Manager (like Lifecycle Management Server) and vCenter Server are running.
`--compute-health`	Performs a compute health check, including ESXi host licenses, disk storage, disk partitions, and health status.
`--storage-health`	Performs a check on the vSAN disk health of the ESXi hosts and vSphere clusters. Also runs proactive vSAN tests to verify the ability to create VMs within the vSAN disks.
`--run-vsan-checks`	Runs proactive vSAN tests to verify the ability to create VMs within the vSAN disks.
`--ntp-health`	Verifies whether the time on the components is synchronized with the NTP server in the SDDC Manager appliance. It also ensures that the hardware and software time stamp of ESXi hosts are within 5 minutes of the SDDC Manager appliance.
`--dns-health`	Performs a forward and reverse DNS health check.
`--general-health`	Checks ESXi for error dumps and gets NSX Manager and cluster status.
`--certificate-health`	Verifies that the component certificates are valid (within the expiry date).
`--composability-infra-health`	Performs an API connectivity health check of the composable infrastructure. If no composable infrastructure exists, this flag is ignored. If found, the utility checks connectivity status through the composable infrastructure API, such as Redfish.
`--get-host-ips`	Returns host names and IP addresses of ESXi hosts.
`--get-inventory-info`	Returns inventory details for the VMware Cloud Foundation components, such as vCenter Server NSX-T Data Center, SDDC Manager, and ESXi hosts. Optionally, add the flag `--domain-name ALL` to return details for all workload domains.
`--password-health`	Returns the status of all current passwords, such as Last Changed Date, Expiry Date, and so on.

Option	Description
`--hardware-compatibility-report`	Validates ESXi hosts and vSAN devices and exports the compatibility report.
`--json-output-dir JSONDIR`	Outputs the results of any health check as a JSON file to the specified directory, `JSONDIR`.

Example Health Check Commands:

- Check the password health on the management domain only:

  ```
  ./sos --password-health
  ```

- Check the connectivity health for all workload domains:

  ```
  ./sos --connectivity-health --domain-name ALL
  ```

- Check the DNS health for the workload domain named `sfo-w01`:

  ```
  ./sos --dns-health --domain-name sfo-w01
  ```

Collect Logs for Your VMware Cloud Foundation System

Use the SoS utility to collect the logs for various software components in the system.

Use these options when retrieving support logs from your environment's various components.

- If you run the SoS utility from SDDC Manager without specifying any component-specific options, the SoS tool collects SDDC Manager, API, and VMware Cloud Foundation summary logs. To collect all logs, use the `--collect-all-logs` options.
- If you run the SoS utility from Cloud Builder without specifying any component-specific options, the SoS tool collects SDDC Manager, API, and Cloud Builder logs.
- To collect logs for a specific component, run the utility with the appropriate options.

  For example, the *--domain-name* option is important. If omitted, the SoS operation is performed only on the management domain. See SoS Utility Options.

After running the SoS utility, you can examine the resulting logs to troubleshoot issues, or provide to VMware Technical Support if requested. VMware Technical Support might request these logs to help resolve technical issues when you have submitted a support request. The diagnostic information collected using the SoS utility includes logs for the various VMware software components and software products deployed in your VMware Cloud Foundation environment.

Table 20-1. SoS Utility Log File Options

Option	Description
`--esx-logs`	Collects logs from the ESXi hosts only. Logs are collected from each ESXi host available in the deployment.
`--vc-logs`	Collects logs from the vCenter Server instances only. Logs are collected from each vCenter server available in the deployment.
`--sddc-manager-logs`	Collects logs from the SDDC Manager only. `sddc`*<timestamp>*`.tgz` contains logs from the SDDC Manager file system's `etc`, `tmp`, `usr`, and `var` partitions.
`--vxrail-manager-logs`	Collects logs from VxRail Manager instances only.
`--psc-logs`	Collects logs from the Platform Services Controller instances only.
`--nsx-logs`	Collects logs from the NSX Manager and NSX Edge instances only.
`--wcp-logs`	Collects logs from Workload Management clusters only.
`--vrealize-logs`	Collects logs from vRealize Suite Lifecycle Manager.
`--no-clean-old-logs`	Use this option to prevent the utility from removing any output from a previous collection run. By default, the SoS utility. By default, before writing the output to the directory, the utility deletes the prior run's output files that might be present. If you want to retain the older output files, specify this option.
`--test`	Collects test logs by verifying the files.
`--no-health-check`	Skips the health check executed as part of log collection.
`--api-logs`	Collects output from REST endpoints for SDDC Manager inventory and LCM.
`--rvc-logs`	Collects logs from the Ruby vSphere Console (RVC) only. RVC is an interface for ESXi and vCenter. **Note** If the Bash shell is not enabled in vCenter Server, RVC log collection will be skipped . **Note** RVC logs are not collected by default with ./sos log collection. You must enable RVC to collect RVC logs.
`--vm-screenshots`	Collects all VM screenshots.
`--system-debug-logs`	Collects system logs to help with debugging uncommon issues.
`--collect-all-logs`	Collects logs for all components, except Workload Management and system debug logs. By default, logs are collected for the management domain components. To collect logs for all workload domain, specify `--domain-name ALL`. To collect logs for a specific workload domain, specify `--domain-name` *`domain_name`*.
`--log-dir` *`LOGDIR`*	Specifies the directory to store the logs.

Table 20-1. SoS Utility Log File Options (continued)

Option	Description
`--log-folder` *`LOGFOLDER`*	Specifies the name of the log directory.
`--domain-name` *`DOMAINNAME`*	Specify the name of the workload domain name on which the SoS operation is to be performed. To run the operation on all domains, specify `--domain-name ALL`. **Note** If you omit the *--domain-name* flag and domain name, the SoS operation is performed only on the management domain.

Procedure

1 Using SSH, log in to the SDDC Manager appliance as the **`vcf`** user.

2 To collect the logs, run the SoS utility without specifying any component-specific options.

```
sudo /opt/vmware/sddc-support/sos
```

Enter the **`vcf`** password when prompted.

To collect logs for a specific component, run the utility with the appropriate options.

```
sudo /opt/vmware/sddc-support/sos --option-name
```

Note By default, before writing the output to the directory, the utility deletes the prior run's output files that might be present. If you want to retain the older output files, specify the `--no-clean-old-logs` option.

If you do not specify the `--log-dir` option, the utility writes the output to the `/var/log/vmware/vcf/sddc-support` directory in the SDDC Manager appliance

Results

The utility collects the log files from the various software components in all of the racks and writes the output to the directory named in the `--log-dir` option. Inside that directory, the utility generates output in a specific directory structure.

Example

```
vcf@sddc-manager [ ~ ]$ sudo /opt/vmware/sddc-support/sos --domain-name MGMT --skip-known-
host-check --log-dir /tmp/new
[sudo] password for vcf
Welcome to Supportability and Serviceability(SoS) utility!
Performing SoS operation for MGMT domain components
Logs : /tmp/new/sos-2019-09-03-21-04-40-11793
Log file : /tmp/new/sos-2019-09-03-21-04-40-11793/sos.log
Log Collection completed successfully for : [HEALTH-CHECK, SDDC-MANAGER, NSX_MANAGER, API-
LOGS, ESX, VMS_SCREENSHOT, VCENTER-SERVER, VCF-SUMMARY]
```

What to do next

Change to the output directory to examine the collected log files.

Component Log Files Collected by the SoS Utility

The SoS utility writes the component log files into an output directory structure within the file system of the SDDC Manager instance in which the command is initiated, for example:

```
vcf@sddc-manager [ ~ ]$ sudo /opt/vmware/sddc-support/sos
[sudo] password for vcf
Welcome to Supportability and Serviceability(SoS) utility!
Performing SoS operation for MGMT domain components
Logs : /var/log/vmware/vcf/sddc-support/sos-2019-09-03-20-55-41-10053
Log file : /var/log/vmware/vcf/sddc-support/sos-2019-09-03-20-55-41-10053/sos.log
NOTE : The Health check operation was invoked without --skip-known-host-check, and so will skip
Connectivity Health, Password Health and Certificate Health Checks because of security reasons.

Log Collection completed successfully for : [HEALTH-CHECK, SDDC-MANAGER, NSX_MANAGER, API-LOGS, ESX,
VMS_SCREENSHOT, VCENTER-SERVER, VCF-SUMMARY]
```

`esx` Directory Contents

In each rack-specific directory, the `esx` directory contains the following diagnostic files collected for each ESXi host in the rack:

File	Description
esx-*FQDN*.tgz	Diagnostic information from running the `vm-support` command on the ESXi host. An example file is `esx-esxi-1.vrack.vsphere.local.tgz`.
SmartInfo-*FQDN*.txt	S.M.A.R.T. status of the ESXi host's hard drive (Self-Monitoring, Analysis, and Reporting Technology). An example file is `SmartInfo-esxi-1.vrack.vsphere.local.txt`.
vsan-health-*FQDN*.txt	vSAN cluster health information from running the standard command `python /usr/lib/vmware/vsan/bin/vsan-health-status.pyc` on the ESXi host. An example file is `vsan-health-esxi-1.vrack.vsphere.local.txt`.

`nsx` Directory Contents

In each rack-specific directory, the `nsx` directory contains the diagnostic information files collected for the NSX Managers and NSX Edge instances deployed in that rack.

The number of files in this directory depends on the number of NSX Manager and NSX Edge instances that are deployed in the rack. In a given rack, each management domain has a cluster of three NSX Managers. The first VI workload domain has an additional cluster of three NSX Managers. Subsequent VI workload domains can deploy their own NSX Manager cluster, or use the same cluster as an existing VI workload domain. NSX Edge instances are optional.

File	Description
VMware-NSX-Manager-tech-support-*nsxmanagerIPaddr*.tar.gz	Standard NSX Manager compressed support bundle, generated using the NSX API `POST https://`*`nsxmanagerIPaddr`*`/api/1.0/appliance-management/techsupportlogs/NSX`, where *nsxmanagerIPaddr* is the IP address of the NSX Manager instance. An example is VMware-NSX-Manager-tech-support-10.0.0.8.tar.gz.
VMware-NSX-Edge-tech-support-*nsxmanagerIPaddr-edgeId*.tgz **Note** This information is only collected if NSX Edges are deployed.	Standard NSX Edge support bundle, generated using the NSX API to query the NSX Edge support logs: `GET https://`*`nsxmanagerIPaddr`*`/api/4.0/edges/`*`edgeId`*`/techsupportlogs`, where *nsxmanagerIPaddr* is the IP address of the NSX Manager instance and *edgeID* identifies the NSX Edge instance. An example is VMware-NSX-Edge-tech-support-10.0.0.7-edge-1.log.gz.

`vc` Directory Contents

In each rack-specific directory, the `vc` directory contains the diagnostic information files collected for the vCenter Server instances deployed in that rack.

The number of files in this directory depends on the number of vCenter Server instances that are deployed in the rack. In a given rack, each management domain has one vCenter Server instance, and any VI workload domains in the rack each have one vCenter Server instance.

File	Description
vc-*vcsaFQDN*-vm-support.tgz	Standard vCenter Server support bundle downloaded from the vCenter Server Appliance instance having a fully qualified domain name *vcsaFQDN*. The support bundle is obtained from the instance using the standard `vc-support.sh` command.

User and Group Management 21

You can allow the users and groups in your Microsoft Active Directory (AD) domain to use their credentials to log in to the SDDC Manager UI as well as the vCenter Server instances that are deployed in your VMware Cloud Foundation system.

You provided a password for the superuser account (user name `vcf`) in the deployment parameter workbook before bring-up. After VMware Cloud Foundation is deployed, you can log in with the superuser credentials and then add vCenter Server or AD users or groups to VMware Cloud Foundation. Authentication to the SDDC Manager UI uses the VMware vCenter® Single Sign-On authentication service that is installed during the bring-up process for your VMware Cloud Foundation system.

Users and groups can be assigned roles to determine what tasks they can perform from the UI and API.

In addition to user accounts, VMware Cloud Foundation includes the following accounts:

- Automation accounts for accessing VMware Cloud Foundation APIs. You can use these accounts in automation scripts.
- Local account for accessing VMware Cloud Foundation APIs when vCenter Server is down.

  For a VMware Cloud Foundation 4.1 deployment, you can specify the local account password in the deployment parameter workbook. If you upgraded to VMware Cloud Foundation 4.1, you configure the local account through VMware Cloud Foundation API.
- Service accounts are automatically created by VMware Cloud Foundation for inter-product interaction. These are for system use only.

Read the following topics next:

- Add a User or Group to VMware Cloud Foundation
- Remove a User or Group
- Create a Local Account
- Create an Automation Account

Add a User or Group to VMware Cloud Foundation

You can add users or groups so that they can log in to the SDDC Manager UI with their AD credentials.

Prerequisites

Only a user with the ADMIN role can perform this task.

Procedure

1 In the navigation pane, click **Administration > Users**.

2 Click **+ User or Group**.

3 Select one or more users or group by clicking the check box next to the user or group.

  You can either search for a user or group by name, or filter by user type or domain.

4 Select a Role for each user and group.

Role	Description
ADMIN	This role has access to all the functionality of the UI and API.
OPERATOR	This role cannot access user management, password management, or backup configuration settings.
VIEWER	This role can only view the SDDC Manager. User management and password management are hidden from this role.

5 Scroll down to the bottom of the page and click **Add**.

Remove a User or Group

You can remove a user or group, for example when an employee leaves the company. The removed user or group will not be able to log in to the SDDC Manager UI.

Prerequisites

Only a user with the ADMIN role can perform this task.

Procedure

1 In the navigation pane, click **Administration > Users**.

2 Click the vertical ellipsis (three dots) next to a user or group name and click **Remove**.

3 Click **Delete**.

Create a Local Account

A local account is used to access VMware Cloud Foundation APIs when the management vCenter Server is down. If you upgraded from a previous release or didn't configure the account when deploying using the API, you can set a password using VMware Cloud Foundation APIs.

Procedure

1 Log in to the SDDC Manager UI as a user with the ADMIN role.

   For more information about roles, see Chapter 21 User and Group Management.

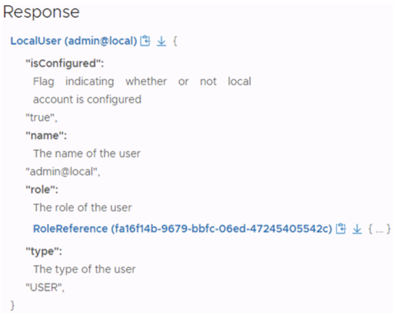
2 In the navigation pane, click **Developer Center > API Explorer**.

3 To verify if the local account is configured, perform the following tasks:

   a Expand **APIs for managing Users**.

   b Expand `GET /v1/users/local/admin` and click **EXECUTE**.

   c In the Response, click `LocalUser (admin@local)`.



Response

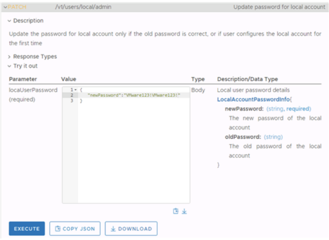
```
LocalUser (admin@local) {
    "isConfigured":
      Flag   indicating   whether   or   not   local
      account is configured
    "true",
    "name":
      The name of the user
    "admin@local",
    "role":
      The role of the user
      RoleReference (fa16f14b-9679-bbfc-06ed-47245405542c) { ... }
    "type":
      The type of the user
    "USER",
}
```

   You can also download the response by clicking the download icon to the right of `LocalUser (admin@local)`.

4 If the local account is not configured, perform the following tasks to configure the local account:

   a Expand `PATCH /v1/users/local/admin`.

   b Enter a password for the local account and click **EXECUTE**.



/v1/users/local/admin

Update password for local account

Description

Update the password for local account only if the old password is correct, or if user configures the local account for the first time

Parameter	Value	Type	Description/Data Type

locaUserPassword
(required)
	`{`
	`"newPassword":"VMware123!VMware123!"`
	`}`
		Body	Local user password details
			LocalAccountPasswordInfo{
			newPassword: (string, required)
			The new password of the local account
			oldPassword: (string)
			The old password of the local account
			}

Password requirements are described below:

- Minimum length: 12
- Maximum length: 127
- At least one lowercase letter, one uppercase letter, a number, and one of the following special characters **! % @ $ ^ # ? ***
- A character cannot be repeated more than three times consecutively
- Must not include three of the same consecutive characters

Note You must remember the password that you created because it cannot be retrieved. Local account passwords are used in password rotation.

Create an Automation Account

Automation accounts are used to access VMware Cloud Foundation APIs in automation scripts.

Procedure

1 Log in to the SDDC Manager UI as a user with the ADMIN role.

   For more about roles, see Chapter 21 User and Group Management.

2 In the navigation pane, click **Developer Center > API Explorer**.

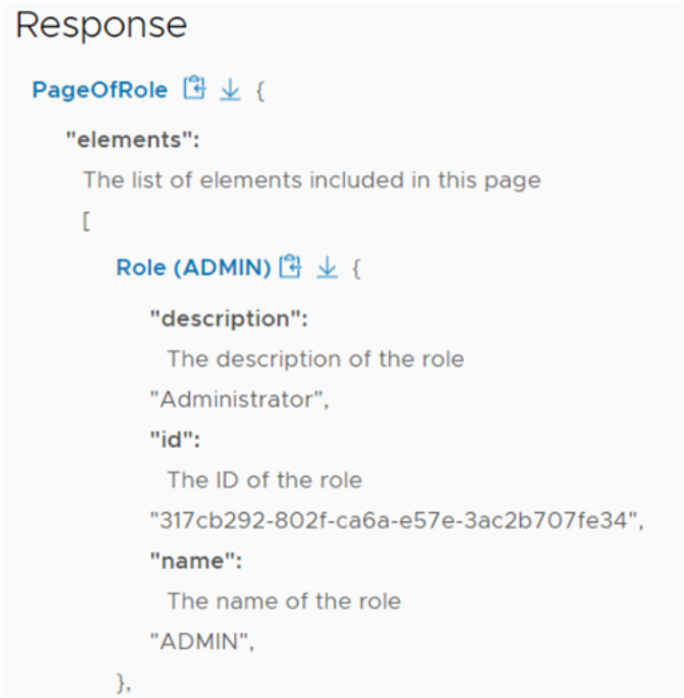
3 Get the ID for the ADMIN role.

   a Expand **APIs for managing Users**.

   b Expand `GET /v1/roles` and click **Execute**.

c In the Response, click `PageOfRole` and `Role (ADMIN)`.

d Copy the ID for the ADMIN role.



```
Response

PageOfRole {
  "elements":
   The list of elements included in this page
   [
     Role (ADMIN) {
       "description":
         The description of the role
       "Administrator",
       "id":
         The ID of the role
       "317cb292-802f-ca6a-e57e-3ac2b707fe34",
       "name":
         The name of the role
       "ADMIN",
     },
```

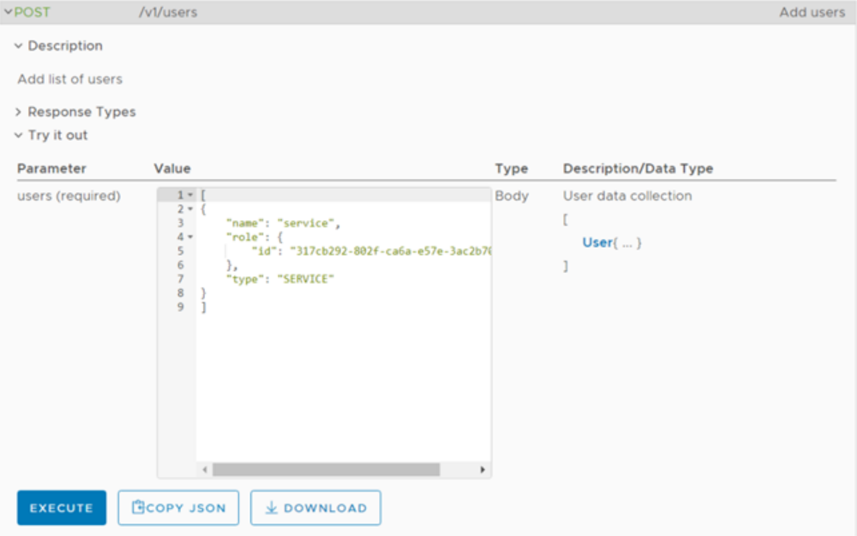
4 Create a service account with the ADMIN role and get the service account's API key.

   a Expand `POST /v1/users` and click **User**.

   b Replace the Value with:

```
[
  {
    "name": "service_account",
    "type": "SERVICE",
    "role":
      {
        "id": "317cb292-802f-ca6a-e57e-3ac2b707fe34"
      }
  }
]
```

   Paste the ADMIN role ID from step 3.



POST /v1/users Add users

Description

Add list of users

Response Types

Try it out

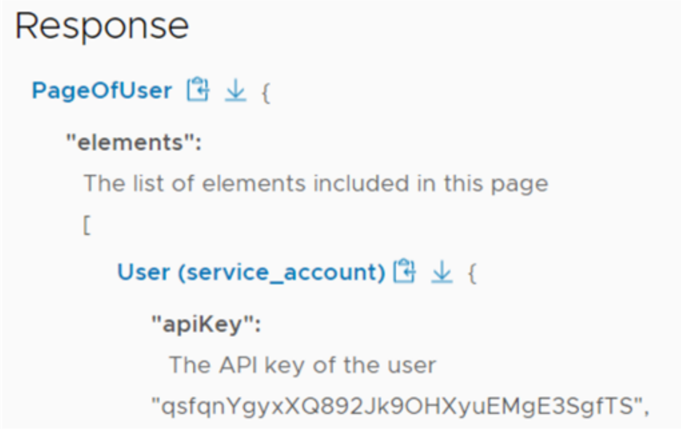
Parameter	Value	Type	Description/Data Type
users (required)	(see below)	Body	User data collection [User{ ... }]

```
[
{
    "name": "service",
    "role": {
       "id": "317cb292-802f-ca6a-e57e-3ac2b7
    },
    "type": "SERVICE"
}
]
```

   c Click **Execute**.

   d In the Response, click `PageOfUser` and `User (service_account)`.

   e Copy the API key for the service account.



Response

PageOfUser {

"elements":

The list of elements included in this page

[

User (service_account) {

"apiKey":

The API key of the user

"qsfqnYgyxXQ892Jk9OHXyuEMgE3SgfTS",

5 Use the service account's API key to generate an access token.

   a Expand **APIs for managing access and refresh tokens**.

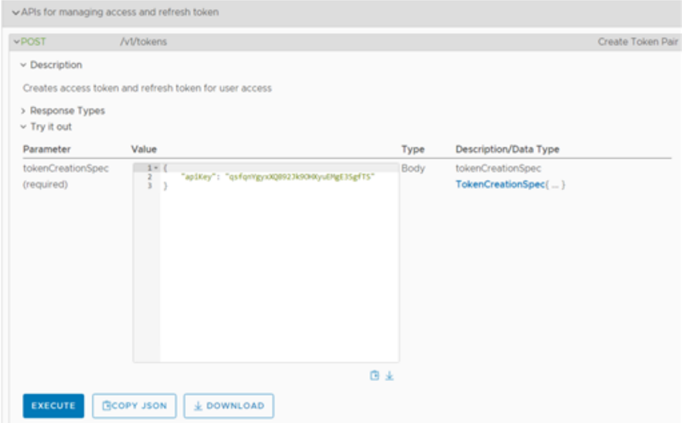
   b Expand `POST /v1/tokens`.

   c Click **TokenCreationSpec**.

   d Replace Value with:

```
{
    "apiKey": "qsfqnYgyxXQ892Jk90HXyuEMgE3SgfTS"
}
```

   Paste the service account's API key from step 4.



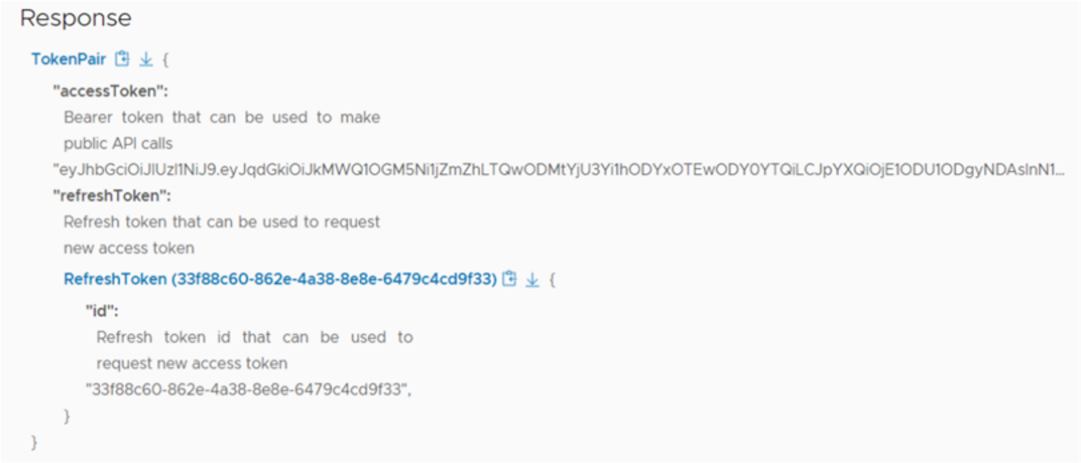
Creates access token and refresh token for user access

Parameter	Value	Type	Description/Data Type

tokenCreationSpec
(required)
	{
	"apiKey": "qsfqnYgyxXQ892Jk90HXyuEMgE3SgfTS"
	}
		Body	tokenCreationSpec
			TokenCreationSpec{ ... }

   e Click **Execute**.

   f In the Response, click `TokenPair` and `RefreshToken` and save the access and refresh tokens.



```
Response
TokenPair {
  "accessToken":
    Bearer token that can be used to make
    public API calls
  "eyJhbGciOiJIUzI1NiJ9.eyJqdGkiOiJkMWQ1OGM5Ni1jZmZhLTQwODMtYjU3Yi1hODYxOTEwODY0YTQiLCJpYXQiOjE1ODU1ODgyNDAsInN1...
  "refreshToken":
    Refresh token that can be used to request
    new access token
    RefreshToken (33f88c60-862e-4a38-8e8e-6479c4cd9f33) {
      "id":
        Refresh token id that can be used to
        request new access token
      "33f88c60-862e-4a38-8e8e-6479c4cd9f33",
    }
}
```

Manage Passwords

22

You specify the passwords for your VMware Cloud Foundation system's internal accounts as part of the bring-up procedure. You can also modify the passwords for these accounts using RESTful API calls.

You can update or rotate the password for the `root` and `mystic` users of the VxRail Manager and the `root` user of ESXi hosts using the SDDC Manager UI. To update or rotate the passwords for other users refer to the Dell EMC VxRail documentation.

To provide the optimal security and proactively prevent any passwords from expiring, you should rotate passwords every 80 days.

Read the following topics next:

- Rotate Passwords
- Manually Update Passwords
- Remediate Passwords
- Look Up Account Credentials
- Updating SDDC Manager Passwords

Rotate Passwords

As a security measure, you can rotate passwords for the logical and physical accounts on all racks in your system. The process of password rotation generates randomized passwords for the selected accounts. You can rotate passwords manually or set up auto-rotation for accounts managed by SDDC Manager. By default, auto-rotation is enabled for vCenter Server.

You can rotate passwords for the following accounts.

- VxRail Manager
- ESXi

  Note Auto-rotate is not suported for ESXi.

- vCenter Server

  By default, the vCenter Server root password expires after 90 days.

- vSphere Single-Sign On (PSC)
- NSX Edge nodes
- NSX Manager
- vRealize Suite Lifecycle Manager
- vRealize Log Insight
- vRealize Operations
- vRealize Automation
- Workspace ONE Access
- SDDC Manager **`backup`** user

The default password policy for rotated passwords are:

- 20 characters in length
- At least one uppercase letter, a number, and one of the following special characters: **`! @ # $ ^ *`**
- No more than two of the same characters consecutively

If you changed the vCenter Server password length using the vSphere Client or the ESXi password length using the VMware Host Client, rotating the password for those components from SDDC Manager generates a password that complies with the password length that you specified.

To update the SDDC Manager root, super user, and API passwords, see Updating SDDC Manager Passwords.

Prerequisites

- Verify that there are no currently failed workflows in SDDC Manager. To check for failed workflows, click **Dashboard** in the navigation pane and expand the **Tasks** pane at the bottom of the page.
- Verify that no active workflows are running or are scheduled to run during the brief time period that the password rotation process is running. It is recommended that you schedule password rotation for a time when you expect to have no running workflows.
- Only a user with the ADMIN role can perform this task.

Procedure

1 In the navigation pane, click **Administration > Security > Password Management**.

The Password Management page displays a table of the credentials that SDDC Manager is able to manage. For each account it lists username, FQDN of the component it belongs to, workload domain, last modified date, and rotation schedule and next rotation date if applicable.

You can click the filter icon next to the table header and filter the results by a string value. For example, click the icon next to **User Name** and enter `admin` to display only domains with that user name value.

2 Select the account for which you want to rotate passwords from the **Component** drop-down menu. For example, **ESXI**.

3 Select one or more accounts and click one of the following operation.

- **Rotate Now**
- **Schedule Rotation**

  You can set the password rotation interval (30 days, 60 days, or 90 days). You can also disable the schdeule.

  Note Auto-rotate schedule is configured to run at midnight on the scheduled date. If auto-rotate could not start due to any technical issue, there is a provision to auto-retry every hour till start of the next day. In case schedule rotation is missed due to technical issues the UI displays a global notification with failed task status. The status of the schedule rotation can also be checked on the Tasks panel.

A message appears at the top of the page showing the progress of the operation. The Tasks panel also shows detailed status for the password rotation operation. To view sub-tasks, click the task name. As each of these tasks is run, the status is updated. If the task fails, you can click **Retry**.

Results

Password rotation is complete when all sub-tasks are completed successfully.

Manually Update Passwords

You can manually change the password for a selected account. Unlike password rotation, which generates a randomized password, you provide the new password.

Note You can update passwords for `USER` and `SYSTEM` account types.

You can update only one password at a time.

Although individual VMware Cloud Foundation accounts support different password requirements, it is recommended that you set passwords following a common set of requirements across all accounts:

- Minimum length: 12
- Maximum length: 20
- At least one lowercase letter, one uppercase letter, a number, and one of the following special characters: `! @ # $ ^ *`

- Must NOT include:
  - A dictionary word
  - A palindrome
  - More than four monotonic character sequences
  - Three of the same consecutive characters

Prerequisites

- Verify that there are no currently failed workflows in your VMware Cloud Foundation system. To check for failed workflows, click **Dashboard** in the navigation pane and expand the **Tasks** pane at the bottom of the page.
- Verify that no active workflows are running or are scheduled to run during the manual password update.
- Only a user with the ADMIN role can perform this task. For more information about roles, see Chapter 21 User and Group Management.

Procedure

1 From the navigation pane, select **Administration > Security > Password Management**.

The Password Management page displays a table with detailed information about all domains, including their account, credential type, FQDN, IP address, and user name. This table is dynamic. Each column can be sorted.

You can click the filter icon next to the table header and filter the results by a string value. For example, click this icon next to **User Name** and enter **`admin`** to display only domains with that user name value.

2 Select the account whose password you want to update and click **Update** at the top of the page.

Note If you select more than one account, the **Update** button will be disabled.

The Update Password dialog box appears. This dialog box also displays the account name, account type, credential type, and user name, in case you must confirm you have selected the correct account.

3 Enter and confirm the new password.

If the passwords do not match, the dialog box displays a red alert.

4 Click **Update**.

A message appears at the top of the page showing the progress of the operation. The Tasks panel also shows detailed status of the password update operation. To view sub-tasks, click the task name.

If the Tasks panel shows the task as having failed, click **Retry**.

Results

Password updation is complete when all sub-tasks are completed successfully.

Remediate Passwords

When an error occurs, for example after a password expires, you must reset the password in the component. After you reset the password, you must remediate the password. Password remediation updates the new password in the SDDC Manager database and the dependent Cloud Foundation workflows.

To resolve any errors that might have occurred during password rotation or updation, you must use password remediation. Password remediation manually syncs the password of the component account stored in the SDDC Manager with the updated password in the component.

For **`USER`** and **`SYSTEM`** account types, you must manually enter the password set in the component. The SDDC Manager updates the stored password with the new password.

For the **`SERVICE`** account type, you must manually enter the password set in the component. The SDDC Manager updates the service account password with the new password. After password remediation, the password is rotated to a new password.

Note You can remediate password for only one account at a time.

Although the individual VMware Cloud Foundation components support different password requirements, you must set passwords following a common set of requirements across all components. For information on updating passwords manually, see Manually Update Passwords.

Prerequisites

- Verify that there are no currently failed workflows in your VMware Cloud Foundation system. To check for failed workflows, click **Dashboard** in the navigation pane and expand the **Tasks** pane at the bottom of the page.
- Verify that no active workflows are running or are scheduled to run during the manual password remediate.
- Only a user with the ADMIN role can perform this task. For more information about roles, see Chapter 21 User and Group Management.

Procedure

1 From the navigation pane, select **Administration > Security > Password Management**.

The Password Management page displays a table with detailed information about all domains, including their component, credential type, FQDN, IP address, and user name. This table is dynamic. Each column can be sorted.

You can click the filter icon next to the table header and filter the results by a string value. For example, click this icon next to **User Name** and enter **`admin`** to display only domains with that user name value.

2 Select the domain entity whose password you want to remediate, and click **Remediate** at the top of the page.

Note If you select more than one account, the **Remediate** button is disabled.

The Remediate Password dialog box appears. This dialog box also displays the entity name, account type, credential type, and user name, in case you must confirm you have selected the correct account.

3 Enter and confirm the new password set at the component.

If the passwords do not match, the dialog box displays a red alert.

4 Click **Remediate**.

A message appears at the top of the page showing the progress of the operation. The Task panel also shows detailed status of the password remediation operation. To view subtasks, you can click the task name.

If the Task panel shows the task as having failed, click **Retry**.

Results

Password remediation is complete when all sub-tasks are completed successfully.

Look Up Account Credentials

To look up the account credentials for the built-in accounts that are managed and rotated by SDDC Manager, you can log in to the SDDC Manager appliance using any SDDC Manager account credentials.

Prerequisites

Only a user with the **`ADMIN`** role can perform this task.

Procedure

1 SSH in to the SDDC Manager appliance using the **`vcf`** user account.

2 (Optional) Change to the `/usr/bin` directory.

Note Although the password management CLI commands are located in `/usr/bin`, you can run them from any directory.

3 Obtain the account credentials list by typing the command:

```
lookup_passwords
```

You must enter the user name and password for a user with the ADMIN role.

Note Accounts with type **`USER`** and **`SYSTEM`** will be displayed.

4 (Optional) Save the command output to a secure location with encryption so that you can access it later and use it to log in to the accounts as needed.

Updating SDDC Manager Passwords

The process for updating SDDC Manager passwords varies, depending on which account you are updating.

- Update SDDC Manager Root and Super User Passwords

  For security reasons, you can change passwords for the SDDC Manager root (**root**) and super user (**vcf**) accounts. Changing these passwords periodically or when certain events occur, such as an administrator leaving your organization, reduces the likelihood of security vulnerabilities.

- Update SDDC Manager Local Account Password

  The SDDC Manager local account is used to access VMware Cloud Foundation APIs when the management vCenter Server is down. For security reasons, you should periodically update the password for this account.

- Update Expired SDDC Manager Root Password

  This section describes the procedure for updating an expired password for the SDDC Manager root (**root**) user.

Update SDDC Manager Root and Super User Passwords

For security reasons, you can change passwords for the SDDC Manager root (**root**) and super user (**vcf**) accounts. Changing these passwords periodically or when certain events occur, such as an administrator leaving your organization, reduces the likelihood of security vulnerabilities.

The SDDC Manager **root** password expires after 365 days.

Procedure

1 SSH in to the SDDC Manager VM using the **vcf** user account.

2 Enter **su** to switch to the root user.

3 Enter one of the following commands:

Option	Description
passwd vcf	To change the super user password.
passwd root	To change the root password.

4 Enter and retype the new password. For example:

```
root@sddc-manager [ /home/vcf ]# passwd vcf
New password:
Retype new password:
passwd: password updated successfully
```

Results

The password is updated.

Update SDDC Manager Local Account Password

The SDDC Manager local account is used to access VMware Cloud Foundation APIs when the management vCenter Server is down. For security reasons, you should periodically update the password for this account.

Password requirements for the SDDC Manager local account:

- At least 12 characters
- No more than 127 characters
- At least one lowercase letter
- At least one uppercase letter
- At least one digit
- At least one special character, such as @ ! # $ % ^ or ?
- A character cannot be repeated more than 3 times consecutively

Procedure

1 Log in to the SDDC Manager UI as a user with the ADMIN role.

For more information about roles, see Chapter 21 User and Group Management.

2 Click **Developer Center > API Explorer**.

3 Expand **APIs for managing Users**.

4 Expand `PATCH /v1/users/local/admin`.

5 In the **Description/Data Type** column, click **LocalAccountPasswordInfo{...}**.

6 In the **Value** box, type the new and old passwords and click **Execute**.

7 Click **Continue** to confirm.

A response of `Status: 204, No Content` indicates that the password was successfully updated.

Update Expired SDDC Manager Root Password

This section describes the procedure for updating an expired password for the SDDC Manager root (`root`) user.

The password must meet the following requirements:

- Length 8-20 characters
- Must include:
  - mix of uppercase and lowercase letters
  - a number
  - a special character, such as @ ! # $ % ^ or ?
- Must not include:
  - `* { } [ ] ( ) / \ ' " ` ~ , ; : . < >`
  - A dictionary word (for example, `VMware1!`)

Procedure

1. In a web browser, log in to the management domain vCenter Server using the vSphere Client (**https://*<vcenter_server_fqdn>*/ui**).
2. In the VMs and Templates inventory, expand the management domain vCenter Server and the management virtual machines folder.
3. Right-click the SDDC Manager virtual machine, and select **Open Remote Console**.
4. Click within the console window and press **Enter** on the Login menu item.
5. Type **root** as the user name and enter the current password for the root user.
6. Type `passwd root`.
7. When prompted for a new password, enter a different password than the previous one and click **Enter**.

Backing Up and Restoring SDDC Manager and NSX Manager

23

Regular backups of the management VMs are important to avoid downtime and data loss in case of a system failure. If a VM does fail, you can restore it to the last backup.

You can backup and restore SDDC Manager with an image-based or a file-based solution. File-based backup is recommended for customers who are comfortable with configuring backups using APIs, and are not using composable servers.

For a file-based backup of SDDC Manager VM, the state of the VM is exported to a file that is stored in a domain different than the one where the product is running. You can configure a backup schedule for the SDDC Manager VM and enable task-based (state-change driven) backups. When task-based backups are enabled, a backup is triggered after each SDDC Manager task (such as workload domain and host operations or password rotation).

You can also define a backup retention policy to comply with your company's retention policy. For more information, see the *VMware Cloud Foundation on Dell EMC VxRail API Reference Guide*.

By default, NSX Manager file-based backups are taken on the SFTP server that is built into SDDC Manager. It is recommended that you configure an external SFTP server as a backup location for the following reasons:

- An external SFTP server is a prerequisite for restoring SDDC Manager file-based backups.
- Using an external SFTP server provides better protection against failures because it decouples NSX backups from SDDC Manager backups.

This section of the documentation provides instructions on backing up and restoring SDDC Manager, and on configuring the built-in automation of NSX backups. For information on backing up and restoring a full-stack SDDC, see *VMware Validated Design Backup and Restore*.

Read the following topics next:

- Reconfigure SFTP Backups for SDDC Manager and NSX-T Data Center
- File-Based Backups for SDDC Manager and vCenter Server
- File-Based Restore for SDDC Manager, vCenter Server, and NSX-T Data Center
- Image-Based Backup and Restore of VMware Cloud Foundation

Reconfigure SFTP Backups for SDDC Manager and NSX-T Data Center

By default, backups of SDDC Manager and NSX-T Data Center are stored in the SDDC Manager appliance. Change the destination of the backups to an external SFTP server.

Procedure

1 In the navigation pane, click **Administration > Backup**.

2 On the **Backup** page, click the **Site Settings** tab and then click **Register External**.

3 On the **Backup** page, enter the settings and click **Save**.

   To obtain the SSH Fingerprint of the target system to verify, connect to the SDDC Manager Appliance over ssh and run the following command:

   ```
   ssh-keygen -lf <(ssh-keyscan -p 22 -t rsa sftp_server_fqdn 2> /dev/null) |
   cut -d' ' -f2
   ```

Setting	Value
Host FQDN or IP	The FQDN or IP Address of the SFTP server.
Port	22
Transfer Protocol	SFTP
Username	A service account with privileges to the SFTP server. For example: **svc-vcf-bck**.
Password	The password for the username provided.
Backup Directory	The directory on the SFTP server where backups are saved. For example: **/backups/**.
SSH Fingerprint	The SSH Fingerprint is automatically retreived from the SFTP server, verify the SSH Fingerprint.
Confirm Fingerprint	Selected
Encryption Passphrase	The encryption passphrase used to encrypt the backup data. **Note** The encryption passphrase should be stored safely as it is required during the restore process.

4 In the **Confirm your changes to backup settings** dialog box, click **Confirm**.

File-Based Backups for SDDC Manager and vCenter Server

You use the native file-based backup capabilities of SDDC Manager, vCenter Server, and NSX-T Data Center. The NSX-T Data Center backup is configured by SDDC Manager during the bring-up process. You configure the file-based backup jobs for SDDC Manager and vCenter Server.

To ensure that all management components are backed up correctly, you must create a series of backup jobs that capture the state of a set of related components at a common point in time. With some components, simultaneous backups of the component nodes ensure that you can restore the component a state where the nodes are logically consistent with each other and eliminate the necessity for further logical integrity remediation of the component.

Table 23-1. File-Based Backup Jobs

Component	Recommended Frequency	Recommended Retention	Notes
SDDC Manager	Daily	7 days	You must configure the backup jobs for the SDDC Manager instance and all vCenter Server instances in the vCenter Single Sign-On domain to start within the same 5-minute window.
vCenter Server	Daily	7 days	
vSphere Distributed Switch	On-demand	Retain last 3 configurations.	-
NSX-T Data Center	Hourly	7 days	Configured by SDDC Manager during the bring-up process.

Note

- You must monitor the space utilization on the SFTP server to ensure that you have sufficient storage space to accommodate all backups taken within the retention period.
- Do not make any changes to the `/opt/vmware/vcf` directory on the SDDC Manager VM. If this directory contains any large files, backups may fail.

Prerequisites

Verify that you have an SFTP server on the network to serve as a target of the file-based backups.

Back Up SDDC Manager

You configure file-based daily backups of the SDDC Manager instances using the SDDC Manager administration interface.

Only a user with the **Admin** role can perform this task.

Procedure

1. In the navigation pane, click **Administration > Backup**.
2. On the **Backup** page, click the **SDDC Manager Configurations** tab.
3. Under **Backup Schedule**, click **Edit**.

4 On the **Backup Schedule** page, enter the settings and click **Save**.

Setting	Value
Automatic Backup	Enabled
Backup Frequency	Weekly
Days of the Week	All selected
Schedule Time	04:02 AM
Take Backup on State Change	Enabled
Retain Last Backups	7
Retain Hourly Backups for Days	1
Retain Daily Backups for Days	7

5 To verify the backup, click **Backup Now**.

Results

The status and the start time of the backup is displayed on the UI. You have set the SDDC Manager backup schedule to run daily at 04:02 AM and after each change of state.

Configure a Backup Schedule for vCenter Server

You configure file-based daily backups of the vCenter Server instances by using the vCenter Server Management Interface of each vCenter Server instance.

Procedure

1 In a web browser, log in to the vCenter Server Management Interface (`https://`***`appliance-IP-address-or-FQDN`***`:5480`).

2 In the left navigation pane, click **Backup**.

3 In the **Backup schedule** pane, click **Configure**.

4 In the **Create backup schedule** dialog box, enter these values and click **Create**.

Setting		Value
Backup location		Enter the backup location from SFTP server. For example: **`sftp://172.16.11.60/backups/`**
Backup server credentials	User name	A service account with privileges to the SFTP server. For example: **`svc-vcf-bck`**.
	Password	Enter the password for the username provided.

Setting		Value
Schedule		Daily 11:00 PM
Encrypt backup	Encryption password	*encryption_password*
	Confirm password	*encryption_password*
DB health check		Selected
Number of backups to retain		Retain last 7 backups
Data	Stats, events, and tasks	Selected
	Inventory and configuration	Selected

The backup schedule information appears in the **Backup schedule** pane.

5 Repeat the procedure for the other vCenter Server instances.

Results

Any complete and in-progress backup appears in the **Activity** pane.

Manually Back Up vCenter Server

Before you upgrade a vCenter Server instance, you should use the vCenter Server Management Interface to manually back it up.

Prerequisites

- In the vSphere Client, for each vSphere cluster that is managed by the vCenter Server, note the current vSphere DRS Automation Level setting and then change the setting to **Manual**. After the vCenter Server upgrade is complete, you can change the vSphere DRS Automation Level setting back to its original value. See KB 87631 for information about using VMware PowerCLI to change the vSphere DRS Automation Level.
- Ensure that there are not any active vMotion tasks.

Procedure

1 In a web browser, log in to the vCenter Server Management Interface (**`https://`*`appliance-IP-address-or-FQDN`*`:5480`**).

2 In the left navigation pane, click **Backup**.

3 Click **Backup Now**.

4 If you already have a backup schedule set up, select **Use backup location and user name from backup schedule** and click **Start**.

5 If you do not already have a backup schedule, enter the following information and click **Start**.

Setting		Value
Backup location		Enter the backup location from SFTP server. For example: **`sftp://172.16.11.60/backups/`**
Backup server credentials	User name	A service account with privileges to the SFTP server. For example: **`svc-vcf-bck`**.
	Password	Enter the password for the username provided.
Encrypt backup	Encryption password	*encryption_password*
	Confirm password	*encryption_password*
DB health check		Selected
Data	Stats, events, and tasks	Selected
	Inventory and configuration	Selected

What to do next

In order to restore vCenter Server, you will need the VMware vCenter Server Appliance ISO file that matches the version you backed up.

- Identify the required vCenter Server version. In the vCenter Server Management Interface, click **Summary** in the left navigation pane to see the vCenter Server version and build number.
- Download the VMware vCenter Server Appliance ISO file for that version from VMware Customer Connect.

Export the Configuration of the vSphere Distributed Switches

The vCenter Server backup includes the configuration of the entire vCenter Server instance. To have a backup only of the vSphere Distributed Switch and distributed port group configurations, you export a configuration file that includes the validated network configurations. If you want to recover only the vSphere Distributed Switch, you can import this configuration file to the vCenter Server instance.

You can use the exported file to create multiple copies of the vSphere Distributed Switch configuration on an existing deployment, or overwrite the settings of existing vSphere Distributed Switch instances and port groups.

You must backup the configuration of a vSphere Distributed Switch immediately after each change in configuration of that switch.

Procedure

1 In a web browser, log in to vCenter Server by using the vSphere Client.

2 Select **Menu > Networking**.

3 In the inventory expand **vCenter Server > Datacenter**.

4 Expand the **Management Networks** folder, right-click the distributed switch, and select **Settings > Export configuration**.

5 In the **Export configuration** dialog box, select **Distributed switch and all port groups**.

6 In the **Description** text box enter the date and time of export, and click **OK**.

7 Copy the backup zip file to a secure location from where you can retrieve the file and use it if a failure of the appliance occurs.

8 Repeat the procedure for the other vSphere Distributed Switches.

File-Based Restore for SDDC Manager, vCenter Server, and NSX-T Data Center

When SDDC Manager, vCenter Server, or NSX Manager in the SDDC fails, you can restore the component to a fully operational state by using its file-based backup. When an NSX Edge node fails, you redeploy the node from the NSX Manager instance.

Use this guidance as appropriate based on the exact nature of the failure encountered within your environment. Sometimes, you can recover localized logical failures by restoring individual components. In more severe cases, such as a complete and irretrievable hardware failure, to restore the operational status of your SDDC, you must perform a complex set of manual deployments and restore sequences. In failure scenarios where there is a risk of data loss, there has already been data loss or where it involves a catastrophic failure, contact VMware Support to review your recovery plan before taking any steps to remediate the situation.

Restore SDDC Manager

If SDDC Manager fails, you can restore it from its file-based backup.

Prerequisites

- Power off and rename the failed SDDC Manager instance.
- Verify that you have a valid file-based backup of the failed SDDC Manager instance.

  To be valid, the backup must be of the same version as the version of the SDDC Manager appliance on which you plan to restore the instance.
- Verify that you have the SFTP server details:
  - SFTP Server IP
  - SFTP Server Username

- SFTP Server Password
- Encryption Password

Procedure

1. Prepare for Restoring SDDC Manager

   Before restoring SDDC Manager, you must download and decrypt the encrypted backup file from the SFTP server.

2. Restore SDDC Manager from a File-Based Backup

   First, you deploy a new SDDC Manager appliance by using the OVA file that you downloaded during the preparation for the restore. After that, you restore the file-based backup on the newly deployed SDDC Manager appliance.

3. Validate the Status of SDDC Manager

   After a successful restore of SDDC Manager, you must validate its status. You run the health checks by using the `sos` tool.

What to do next

After a successful recovery, securely delete the decrypted backup files.

Prepare for Restoring SDDC Manager

Before restoring SDDC Manager, you must download and decrypt the encrypted backup file from the SFTP server.

The backup file contains sensitive data about your VMware Cloud Foundation instance, including passwords in plain text. As a best practice, you must control access to the decrypted files and securely delete them after you complete the restore operation.

Prerequisites

Verify that your host machine with access to the SDDC has OpenSSL installed.

Note The procedures have been written based on the host machine being a Linux-based operating system.

Procedure

1. Identify the backup file for the restore and download it from the SFTP server to your host machine.
2. On your host machine, open a terminal and run the following command to extract the content of the backup file.

   ```
   OPENSSL_FIPS=1 openssl enc -d -aes-256-cbc -md sha256 -in filename-of-restore-file | tar
   -xz
   ```

3. When prompted, enter the *encryption_password*.

4 In the extracted folder, locate and open the `metadata.json` file in a text editor.

5 Locate the `sddc_manager_ova_location` value and copy the URL.

6 In a web browser, paste the URL and download the OVA file.

7 In the extracted folder, locate and view the contents of the `security_password_vault.json` file.

8 Locate the `entityType BACKUP` value and record the backup password.

Restore SDDC Manager from a File-Based Backup

First, you deploy a new SDDC Manager appliance by using the OVA file that you downloaded during the preparation for the restore. After that, you restore the file-based backup on the newly deployed SDDC Manager appliance.

Procedure

1 In a web browser, log in to management domain vCenter Server by using the vSphere Client (https://**`<vcenter_server_fqdn>`**/ui).

2 Select **Menu > VMs and templates**.

3 In the inventory expand **vCenter Server > Datacenter**.

4 Right-click the management folder and select **Deploy OVF template**.

5 On the **Select an OVF template** page, select **Local file**, click **Upload files**, browse to the location of the SDDC Manager OVA file, click **Open**, and click **Next**.

6 On the **Select a name and folder** page, in the **Virtual machine name** text box, enter a virtual machine name, and click **Next**.

7 On the **Select a compute resource** page, click **Next**.

8 On the **Review details** page, review the settings and click **Next**.

9 On the **License agreements** page, accept the license agreement and click **Next**.

10 On the **Select storage** page, select the vSAN datastore and click **Next.**

The datastore must match the `vsan_datastore` value in the `metadata.json` file that you downloaded during the preparation for the restore.

11 On the **Select networks** page, from the **Destination network** drop-down menu, select the management network distributed port group and click **Next**.

The distributed port group must match the `port_group` value in the `metadata.json` file that you downloaded during the preparation for the restore.

12 On the **Customize template** page, enter the following values and click **Next**.

Setting	Description
Enter root user password	You can use the original **root** user password or a new password.
Enter login (vcf) user password	You can use the original **vcf** user password or a new password.
Enter basic auth user password	You can use the original **admin** user password or a new password.
Enter backup (backup) user password	The backup password that you saved during the preparation for the restore. This password can be changed later if desired.
Enter Local user password	You can use the original **Local user** password or a new password.
Hostname	The FQDN must match the `hostname` value in the `metadata.json` file that you downloaded during the preparation for the restore.
NTP sources	The NTP server details for the appliance.
Enable FIPs	Selected
Default gateway	The default gateway for the appliance.
Domain name	The domain name for the appliance.
Domain search path	The domain search path(s) for the appliance.
Domain name servers	The DNS servers for the appliance.
Network 1 IP address	The IP address for the appliance.
Network 1 netmask	The subnet mask for the appliance.

13 On the **Ready to complete** page, click **Finish** and wait for the process to complete.

14 When the SDDC Manager appliance deployment completes, expand the management folder.

15 Right-click the SDDC Manager appliance and select **Snapshots > Take Snapshot**.

16 Right-click the SDDC Manager appliance, select **Power > Power On**.

17 On the host machine, copy the encrypted backup file to the `/tmp` folder on the newly deployed SDDC Manager appliance by running the following command. When prompted, enter the *vcf_user_password*.

```
scp filename-of-restore-file vcf@sddc_manager_fqdn:/tmp/
```

18 On the host machine, obtain the authentication token from the SDDC Manager appliance in order to be able to execute the restore process by running the following command:

```
TOKEN=`curl https://<sddc_manager_fqdn>/v1/tokens -k -X POST -H "Content-Type: application/
json" -d '{"username": "admin@local","password": "<admin@local_password>"}' | awk -F "\""
'{ print $4}'`
```

19 On the host machine with access to the SDDC Manager, open a terminal and run the command to start the restore process.

```
curl https://<sddc_manager_fqdn>/v1/restores/tasks -k -X POST -H "Content-Type:
application/json" -H "Authorization: Bearer $TOKEN" \
    -d '{
  "elements" : [ {
    "resourceType" : "SDDC_MANAGER"
  } ],
  "backupFile" : "<backup_file>",
  "encryption" : {
    "passphrase" : "<encryption_password>"
  }
}'
```

The command output contains the ID of the restore task.

20 Record the ID of the restore task.

21 Monitor the restore task by using the following command until the status becomes `Successful`.

```
curl https://<sddc_manager_fqdn>/v1/restores/tasks/<restore_task_id> -k -X GET -H "Content-
Type: application/json" -H "Authorization: Bearer $TOKEN"
```

What to do next

Refresh the SSH keys that are stored in the SDDC Manager inventory. See VMware Cloud Foundation SDDC Manager Recovery Scripts (79004).

Validate the Status of SDDC Manager

After a successful restore of SDDC Manager, you must validate its status. You run the health checks by using the `sos` tool.

Procedure

1 Log in to SDDC Manager by using a Secure Shell (SSH) client.

2 Run the health checks by using the `SoS` tool.

```
sudo /opt/vmware/sddc-support/sos --health-check
```

3 When prompted, enter the *vcf_password*.

All tests show green when SDDC Manager is in healthy state.

Restore vCenter Server

If a vCenter Server instance fails, you can restore it from its file-based backup.

Prerequisites

- Power off the failed vCenter Server instance.
- Verify that you have a valid file-based backup of the failed vCenter Server instance.

  To be valid, the backup must be of the version of the vCenter Server Appliance on which you plan to restore the instance.
- Verify that you have the SFTP server details:
  - SFTP Server IP
  - SFTP Server Username
  - SFTP Server Password
  - Encryption Password

Procedure

1. Prepare for Restoring vCenter Server

   Before restoring a vCenter Server instance, you must retrieve the vCenter Server build number and deployment details, as well as vCenter Server and ESXi credentials from the SDDC Manager inventory.
2. Restore a vCenter Server Instance from a File-Based Backup

   If a vCenter Server instance fails, you can restore it from its file-based backup. If the management domain vCenter Server and the VI workload domain vCenter Server are both in a failed state, you must restore the management domain vCenter Server before restoring the VI workload domain vCenter Server.
3. Move the Restored vCenter Server Appliance to the Correct Folder

   After deploying and restoring a vCenter Server instance, you must move the new appliance to the correct folder.
4. Validate the vCenter Server State

   After restoring a vCenter Server instance, you must validate the state of the vCenter Server and vCenter Single Sign-On.
5. Validate the SDDC Manager State After a vCenter Server Restore

   After a successful vCenter Server restore, verify that the SDDC Manager inventory is consistent with the recovered VMs and that the vCenter Server instances are healthy. You use the Supportability and Serviceability tool (`SoS`) and the SDDC Manager patch/upgrade precheck function.

Prepare for Restoring vCenter Server

Before restoring a vCenter Server instance, you must retrieve the vCenter Server build number and deployment details, as well as vCenter Server and ESXi credentials from the SDDC Manager inventory.

Prerequisites

SDDC Manager must be available.

Retrieve the vCenter Server Deployment Details

Before restoring a vCenter Server instance, you must retrieve the vCenter Server build number and deployment details from the SDDC Manager inventory. The vCenter Server instances in your system might be running different build numbers if the backups are taken during an upgrade process. You must restore each vCenter Server instance to its correct version.

Because the Management domain vCenter Server might be unavailable to authenticate the login, you use the SDDC Manager API via the shell to retrieve this information.

Procedure

1 Log in to SDDC Manager by using a Secure Shell (SSH) client.

2 Run the command to get the list of vCenter Server instances.

```
curl http://localhost/inventory/vcenters -k | json_pp
```

3 For each vCenter Server instance, record the values of these settings.

Setting	Value
domainType	Name of the domain
vmName	VM name of the vCenter Server
managementIpAddress	IP address of the vCenter Server
datastoreForVmDeploymentName	Datastore name
hostName	FQDN of the vCenter Server
version	*version_number-build_number*
Size	Size of the deployment

4 Verify that the vCenter Server version retrieved from SDDC Manager is the same as the version associated with the backup file that you plan to restore.

Retrieve the Credentials for Restoring vCenter Server

Before restoring a vCenter Server instance, you must retrieve the vCenter Server root and vCenter Single Sign-On administrator credentials from the SDDC Manager inventory. Before restoring the Management domain vCenter Server, you must also retrieve the credentials of a healthy Management domain ESXi host.

Before you can query the SDDC Manager API, you must obtain an API access token by using **admin@local** account.

Prerequisites

Note If SDDC Manager is not operational, you can retrieve the required vCenter Server root, vCenter Single Sign-On administrator, and ESXi root credentials from the file-based backup of SDDC Manager. See Prepare for Restoring SDDC Manager.

Procedure

1 Log in to your host machine with access to the SDDC and open a terminal.

2 Obtain the API access token.

   a Run the command to obtain an access token by using the **admin@local** credentials.

   ```
   TOKEN=`curl https://<sddc_manager_fqdn>/v1/tokens -k -X POST -H "Content-Type:
   application/json" -d '{"username": "admin@local","password": "admin@local_password"}'
   | awk -F "\"" '{print $4}'`
   ```

   The command returns an access token and a refresh token.

   b Record the access token.

3 Retrieve the vCenter Server **root** credentials.

   a Run the following command to retrieve the vCenter Server **root** credentials.

   ```
   curl https://<sddc_manager_fqdn>/v1/credentials?resourceType=VCENTER -k -X GET \-H
   "Accept: application/json" -H "Authorization: Bearer $TOKEN" | json_pp
   ```

   The command returns the vCenter Server **root** credentials.

Setting	Value
domainName	Name of the domain
resourceName	FQDN of the vCenter Server
username	root
password	*vcenter_server_root_password*

   b Record the vCenter Server **root** credentials.

4 Retrieve the vCenter Single Sign-On administrator credentials.

a Run the following command to retrieve the vCenter Single Sign-On administrator credentials.

```
curl https://<sddc_manager_fqdn>/v1/credentials?resourceType=PSC -k -X GET \-H
"Accept: application/json" -H "Authorization: Bearer $TOKEN" | json_pp
```

The command returns the **administrator@vsphere.local** credentials.

Setting	Value
domainName	Name of hte domain
resourceName	FQDN of the vCenter Server
username	administrator@vsphere.local
password	*vsphere_admin_password*

b Record the **administrator@vsphere.local** credentials.

5 If you plan to restore the management domain vCenter Server, retrieve the credentials for a healthy management domain ESXi host.

a Run the following command to retrieve the credentials for a management domain ESXi host.

```
curl https://<sddc_manager_fqdn>/v1/credentials?resourceType=ESXI -k -X GET \-H
"Accept: application/json" -H "Authorization: Bearer $TOKEN" | json_pp
```

The command returns the ESXi **root** credentials.

Setting	Value for first ESXi host
domainName	management domain name
resourceName	FQDN of the first ESXi host
username	root
password	*esxi_root_password*

b Record the ESXi **root** credentials.

Restore a vCenter Server Instance from a File-Based Backup

If a vCenter Server instance fails, you can restore it from its file-based backup. If the management domain vCenter Server and the VI workload domain vCenter Server are both in a failed state, you must restore the management domain vCenter Server before restoring the VI workload domain vCenter Server.

You deploy a new vCenter Server appliance and perform a file-based restore. If you are restoring the management domain vCenter Server, you deploy the new appliance on a healthy ESXi host in the management domain vSAN cluster. If you are restoring the VI workload domain vCenter Server, you deploy the new appliance on the management domain vCenter Server.

Prerequisites

- Download the vCenter Server ISO file for the version of the failed instance. See Retrieve the vCenter Server Deployment Details.
- If you are recovering the VI workload domain vCenter Server, verify that the management vCenter Server is available.

Procedure

1 Mount the vCenter Server ISO image to your host machine with access to the SDDC and run the UI installer for your operating system.

   For example, for a Windows host machine, open the `*dvd-drive*:\vcsa-ui-installer\win32\installer` application file.

2 Click **Restore**.

3 Complete the **Restore - Stage 1: Deploy vCenter Server** wizard.

   a On the **Introduction** page, click **Next**.

   b On the **End user license agreement** page, select the **I accept the terms of the license agreement** check box and click **Next**.

   c On the **Enter backup details** page, enter these values and click **Next**.

Setting	Value for vCenter Server
Location or IP/hostname	sftp://`sftp_server_ip`/backups/vCenter/sn_`vc_fqdn`/*backup_folder/*
User name	vSphere service account user
Password	*vsphere-service-account-password*

   d On the **Review backup information** page, review the backup details, record the **vCenter Server configuration** information, and click **Next**.

   You use the vCenter Server configuration information at a later step to determine the deployment size for the new vCenter Server appliance.

e On the **vCenter Server deployment target** page, enter the values by using the information that you retrieved during the preparation for the restore, and click **Next**.

Setting	Value for Management Domain vCenter Server	Value for VI Workload Domain vCenter Server
ESXi host or vCenter Server name	FQDN of the first ESXi host	FQDN of the management vCenter Server
HTTPS port	443	443
User name	root	administrator@vsphere.local
Password	*esxi_root_password*	*vsphere_admin_password*

f In the **Certificate warning** dialog box, click **Yes** to accept the host certificate.

g On the **Set up a target vCenter Server VM** page, enter the values by using the information that you retrieved during the preparation for the restore, and click **Next**.

Setting	Value
VM name	vCenter Server VM name
Set root password	*vcenter_server_root_password*
Confirm root password	*vcenter_server_root_password*

h On the **Select deployment size** page, select the deployment size that corresponds with the vCenter Server configuration information from Step 3.d and click **Next**.

Refer to vSphere documentation to map CPU count recorded from Step 3.d to a vSphere Server configuration size.

i On the **Select datastore** page, select these values, and click **Next**.

Setting	Value
Datastore	Datastore name
Enable thin disk mode	Selected

j On the **Configure network settings** page, enter the values by using the information that you retrieved during the preparation for the restore, and click **Next**.

Setting	Value
Network	Name of the vSphere distributed switch
IP version	IPV4
IP assignment	static
FQDN	FQDN of the vCenter Server
IP address	IP address of the vCenter Server
Subnet mask or prefix length	24
Default gateway	Default gateway IP address
DNS servers	DNS server IP addresses with comma separated

k On the **Ready to complete stage 1** page, review the restore settings and click **Finish**.

l When stage 1 of the restore process completes, click **Continue**.

4 Complete the **Restore - Stage 2: vCenter Server** wizard.

a On the **Introduction** page, click **Next**.

b On the **Backup details** page, in the **Encryption password** text box, enter the encryption password of the SFTP server and click **Next**.

c On the **Single Sign-On configuration** page, enter these values and click **Next**.

Setting	Value
Single Sign-On user name	administrator@vsphere.local
Single Sign-On password	*vsphere_admin_password*

d On the **Ready to complete** page, review the restore details and click **Finish**.

e In the **Warning** dialog box, click **OK** to confirm the restore.

f When stage 2 of the restore process completes, click **Close**.

What to do next

Refresh the SSH keys that are stored in the SDDC Manager inventory. See VMware Cloud Foundation SDDC Manager Recovery Scripts (79004).

Move the Restored vCenter Server Appliance to the Correct Folder

After deploying and restoring a vCenter Server instance, you must move the new appliance to the correct folder.

Procedure

1 In a web browser, log in to the management domain vCenter Server by using the vSphere Client (https://**<vcenter_server_fqdn>**/ui).

2 Select **Menu > VMs and Templates**.

3 In the inventory expand **vCenter Server > Datacenter**.

4 Right-click the appliance of the restored vCenter Server instance and select **Move to folder**.

5 Select the management folder and click **OK**.

Validate the vCenter Server State

After restoring a vCenter Server instance, you must validate the state of the vCenter Server and vCenter Single Sign-On.

Procedure

1 In a web browser, log in to the management domain vCenter Server by using the vSphere Client (https://**<vcenter_server_fqdn>**/ui).

2 In the inventory, click the management domain vCenter Server inventory, click the **Summary** tab, and verify that there are no unexpected vCenter Server alerts.

3 Click the **Linked vCenter Server systems** tab and verify that the list contains all other vCenter Server instances in the vCenter Single Sign-On domain.

4 Log in to the recovered vCenter Server instance by using a Secure Shell (SSH) client.

5 Run the command to navigate to the `bin` directory.

```
cd /usr/lib/vmware-vmdir/bin
```

6 Validate the current replication status.

a Run the command to list the current replication partners of the vCenter Server instance with the current replication status between the nodes.

```
vdcrepadmin -f showpartnerstatus -h localhost -u administrator -w
vsphere_admin_password
```

b Verify that for each partner, the `vdcrepadmin` command output contains `Host available: Yes`, `Status available: Yes`, and `Partner is 0 changes behind`.

c If you observe significant differences, because the resyncing might take some time, wait five minutes and repeat this step.

7 Repeat the procedure for the other vCenter Server instance.

Validate the SDDC Manager State After a vCenter Server Restore

After a successful vCenter Server restore, verify that the SDDC Manager inventory is consistent with the recovered VMs and that the vCenter Server instances are healthy. You use the

Supportability and Serviceability tool (SoS) and the SDDC Manager patch/upgrade precheck function.

Procedure

1. Log in to SDDC Manager by using a Secure Shell (SSH) client.
2. Run the SoS health check and verify the output.

   ```
   sudo /opt/vmware/sddc-support/sos --get-health-check
   ```

   All tests show green when SDDC Manager is in a healthy state.
3. In a Web browser, log in to SDDC Manager using the user interface.
4. In the navigation pane, click **Inventory > Workload Domains**.
5. For each workload domain, validate the vCenter Server status.
   a. Click the workload domain name and click the **Updates/Patches** tab.
   b. Click **Precheck**.
   c. Click **View status** to review the precheck result for the vCenter Server instance and verify that the status is Succeeded.

Restore the Configuration of a vSphere Distributed Switch

To recover the configuration of a vSphere Distributed Switch, you can restore its settings from the configuration file that you previously exported.

This procedure restores only the vSphere Distributed Switch configuration of a vCenter Server instance.

The restore operation changes the settings on the vSphere Distributed Switch back to the settings saved in the configuration file. The operation overwrites the current settings of the vSphere Distributed Switch and its port groups. The operation does not delete existing port groups that are not a part of the configuration file.

The vSphere Distributed Switch configuration is part of the vCenter Server backup. If you want to restore the entire vCenter Server instance, see Restore vCenter Server.

Procedure

1. In a web browser, log in to the vCenter Server by using the vSphere Client (https://**<vcenter_server_fqdn>**/ui).
2. Select **Menu > Networking**.
3. In the inventory expand **vCenter Server > Datacenter**.
4. Expand the **Management networks** folder, right-click the distributed switch and select **Settings > Restore configuration**.

5 On the **Restore switch configuration** page, click **Browse**, navigate to the location of the configuration file for the distributed switch, and click **Open**.

6 Select the **Restore distributed switch and all port groups** radio-button and click **Next**.

7 On the **Ready to complete** page, review the changes and click **Finish**.

8 Repeat these steps for the other vSphere Distributed Switch.

9 Review the switch configuration to verify that it is as you expect after the restore.

Restore an NSX Manager Cluster Node

If an NSX Manager instance fails, you can restore it from its file-based backup.

Prerequisites

- Verify that you have a valid file-based backup of the failed NSX Manager instance.
- Verify that you have the SFTP server details:
  - SFTP Server IP
  - SFTP Server Username
  - SFTP Server Password
  - Encryption Password

Procedure

1 Prepare for Restoring an NSX Manager Cluster Node

Before restoring an NSX Manager node, you must retrieve the NSX Manager build number and deployment details, as well as the credentials from the SDDC Manager inventory.

2 Restore the First Node of a Failed NSX Manager Cluster

If all three NSX Manager nodes in an NSX Manager cluster are in a failed state, you begin the restore process by restoring the first cluster node.

3 Deactivate the NSX Manager Cluster

If two of the three NSX Manager cluster nodes are in a failed state or if you restored the first node of a failed NSX Manager cluster, you must deactivate the cluster.

4 Restore an NSX Manager Node to an Existing NSX Manager Cluster

If only one of the three NSX Manager cluster nodes is in a failed state, you restore the failed node to the existing cluster. If two of the three NSX Manager cluster nodes are in a failed state, you repeat this process for each of the failed nodes.

5 Update or Recreate the VM Anti-Affinity Rule for the NSX Manager Cluster Nodes

During the NSX Manager bring-up process, SDDC Manager creates a VM anti-affinity rule to prevent the VMs of the NSX Manager cluster from running on the same ESXi host. If you redeployed all NSX Manager cluster nodes, you must recreate this rule. If you redeployed one or two nodes of the cluster, you must add the new VMs to the existing rule.

6 Validate the SDDC Manager Inventory State

After a successful restore of an NSX Manager cluster, you must verify that the SDDC Manager inventory is consistent with the recovered virtual machines. You run this verification by using the `sos` tool.

Prepare for Restoring an NSX Manager Cluster Node

Before restoring an NSX Manager node, you must retrieve the NSX Manager build number and deployment details, as well as the credentials from the SDDC Manager inventory.

Procedure

1 Retrieve the NSX Manager Version from SDDC Manager

Before restoring a failed NSX Manager instance, you must retrieve its version from the SDDC Manager inventory.

2 Retrieve the Credentials for Restoring NSX Manager from SDDC Manager

Before restoring a failed NSX Manager instance, you must retrieve the NSX Manager **root** and **admin** credentials from the SDDC Manager inventory.

Retrieve the NSX Manager Version from SDDC Manager

Before restoring a failed NSX Manager instance, you must retrieve its version from the SDDC Manager inventory.

Procedure

1 In the navigation pane, click **Inventory > Workload Domains**.

2 Click the domain name of the failed NSX Manager instance.

3 Click the **Update/Patches** tab.

4 Under **Current versions**, in the **NSX** panel, locate and record the **NSX upgrade coordinator** value.

5 Verify that the NSX-T Data Center version retrieved from SDDC Manager is the same as the version associated with the backup file that you plan to restore.

Retrieve the Credentials for Restoring NSX Manager from SDDC Manager

Before restoring a failed NSX Manager instance, you must retrieve the NSX Manager **root** and **admin** credentials from the SDDC Manager inventory.

Before you can query the SDDC Manager API, you must obtain an API access token by using an API service account.

Procedure

1 Log in to your host machine with access to the SDDC and open a terminal.

2 Obtain the API access token.

   a Run the command to obtain an access token by using the **admin@local** account credentials.

   ```
   curl 'https://<sddc_manager_fqdn>/v1/tokens' -k -X POST -H 'Content-Type: application/
   json' -H 'Accept: application/json' -d '{"username" : "service_user","password" :
   "service_user_password"}'


   curl https://<sddc_manager_fqdn>/v1/credentials?resourceType=VCENTER -k -X GET \-H
   "Accept: application/json" -H "Authorization: Bearer $TOKEN" | json_pp
   ```

   The command returns an access token and a refresh token.

   b Record the access token.

3 Retrieve the NSX Manager **root** and **admin** credentials.

   a Run the command to retrieve the NSX Manager **root** and **admin** credentials.

   ```
   curl '<sddc_manager_fqdn>/v1/credentials?resourceType=NSXT_MANAGER' -i -X GET \-H
   'Accept: application/json' \ -H 'Authorization: Bearer access_token'


   curl https://<sddc_manager_fqdn>/v1/credentials?resourceType=NSXT_MANAGER -k -X GET \-
   H "Accept: application/json" -H "Authorization: Bearer $TOKEN" | json_pp
   ```

   The command returns the NSX Manager **root** and **admin** credentials.

   b Record the NSX Manager **root** and **admin** credentials for the instance you are restoring.

Restore the First Node of a Failed NSX Manager Cluster

If all three NSX Manager nodes in an NSX Manager cluster are in a failed state, you begin the restore process by restoring the first cluster node.

Important This procedure is not applicable in use cases when there are operational NSX Manager cluster nodes.

- If two of the three NSX Manager nodes in the NSX Manager cluster are in a failed state, you begin the restore process by deactivating the cluster. See Deactivate the NSX Manager Cluster.
- If only one of the three NSX Manager nodes in the NSX Manager cluster is in a failed state, you directly restore the failed node to the cluster. See Restore an NSX Manager Node to an Existing NSX Manager Cluster.

What to read next

Procedure

1 Redeploy the First Node of a Failed NSX Manager Cluster

You deploy a new NSX Manager instance by using the configuration of the first NSX Manager cluster node.

2 Restore the First Node in a Failed NSX Manager Cluster from a File-Based Backup

You restore the file-based backup of the first NSX Manager cluster node to the newly deployed NSX Manager instance.

3 Validate the Status of the First NSX Manager Cluster Node

After you restored the first NSX Manager cluster node, you validate the services state from the VM Web console of the restored node.

Redeploy the First Node of a Failed NSX Manager Cluster

You deploy a new NSX Manager instance by using the configuration of the first NSX Manager cluster node.

Prerequisites

- Download the NSX Manager OVA file for the version of the failed NSX Manager cluster. See Retrieve the NSX Manager Version from SDDC Manager.
- Verify that the backup file that you plan to restore is associated with the version of the failed NSX Manager cluster.

Procedure

1 In a web browser, log in to the management domain vCenter Server by using the vSphere Client (https://**`<vcenter_server_fqdn>`**/ui).

2 Select **Menu > VMs and Templates**.

3 In the inventory, expand **vCenter Server > Datacenter**.

4 Right-click the NSX folder and select **Deploy OVF Template**.

5 On the **Select an OVF template** page, select **Local file**, click **Upload files**, navigate to the location of the NSX Manager OVA file, click **Open**, and click **Next**.

6 On the **Select a name and folder** page, enter the VM name and click **Next**.

7 On the **Select a compute resource** page, click **Next**.

8 On the **Review details** page, click **Next**.

9 On the **Configuration** page, select the appropriate size and click **Next**.

For the management domain, select **Medium** and for workload domains, select **Large** unless you changed these defaults during deployment.

10 On the **Select storage** page, select the vSAN datastore, and click **Next**.

11 On the **Select networks** page, from the **Destination network** drop-down menu, select the management network distributed port group, and click **Next**.

12 On the **Customize template** page, enter these values and click **Next**.

Setting	Value for first NSX Manager cluster node
System root user password	*nsx-t_root_password*
CLI admin user password	*nsx-t_admin_password*
CLI audit user password	*nsx-t_audit_password*
Hostname	Enter hostname for the appliance using FQDN format.
Default IPv4 gateway	Enter the default gateway for the appliance.
Management network IPv4 address	Enter the IP Address for the appliance.
Management network netmask	Enter the subnet mask for the appliance.
DNS server list	Enter the DNS servers for the appliance.
NTP server list	Enter the NTP server for the appliance.
Enable SSH	Selected
Allow root SSH logins	Deselected

13 On the **Ready to complete** page, review the deployment details and click **Finish**.

Restore the First Node in a Failed NSX Manager Cluster from a File-Based Backup

You restore the file-based backup of the first NSX Manager cluster node to the newly deployed NSX Manager instance.

Procedure

1. In a web browser, log in to the NSX Manager node for the domain by using the user interface (https://**`<nsx_manager_node_fqdn>`**/login.jsp?local=true)
2. On the main navigation bar, click **System**.
3. In the left navigation pane, under **Lifecycle management**, click **Backup and restore**.
4. In the **NSX configuration** pane, under **SFTP server**, click **Edit**.
5. In the **Backup configuration** dialog box, enter these values, and click **Save**.

Setting	Value
FQDN or IP address	IP address of SFTP server
Protocol	SFTP
Port	22
Directory path	/backups
Username	Service account user name For example, svc-vcf-bck@rainpole.io
Password	*service_account_password*
SSH fingerprint	*SFTP_ssh_fingerprint*

6. Under **Backup history**, select the target backup, and click **Restore**.
7. During the restore, when prompted, reject adding NSX Manager nodes by clicking **I understand** and **Resume**.

Results

A progress bar displays the status of the restore operation with the current step of the process.

Validate the Status of the First NSX Manager Cluster Node

After you restored the first NSX Manager cluster node, you validate the services state from the VM Web console of the restored node.

Procedure

1. In a web browser, log in to the management domain vCenter Server by using the vSphere Client (https://**`<vcenter_server_fqdn>`**/ui).
2. Select **Menu > VMs and Templates**.
3. In the inventory expand **vCenter Server > Datacenter > NSX Folder**.

4 Click the VM name of the newly deployed first NSX Manager cluster node, click **Launch Web Console**, and log in by using administrator credentials.

Setting	Value
User name	admin
Password	*nsx-t_admin_password*

5 Run the command to view the cluster status.

```
get cluster status
```

The services on the single-node NSX Manager cluster appear as `UP`.

Deactivate the NSX Manager Cluster

If two of the three NSX Manager cluster nodes are in a failed state or if you restored the first node of a failed NSX Manager cluster, you must deactivate the cluster.

Important This procedure is not applicable in use cases when there are two operational NSX Manager cluster nodes.

If only one of the three NSX Manager nodes in the NSX Manager cluster is in a failed state, after you prepared for the restore, you directly restore the failed node to the cluster. See Restore an NSX Manager Node to an Existing NSX Manager Cluster.

Procedure

1 In a web browser, log in to the management domain vCenter Server by using the vSphere Client (https://**<vcenter_server_fqdn>**/ui).

2 Select **Menu** > **VMs and Templates**.

3 In the inventory expand **vCenter Server** > **Datacenter** > **NSX Folder**.

4 Click the VM of the operational NSX Manager node in the cluster, click **Launch Web Console**, and log in by using administrator credentials.

Setting	Value
User name	admin
Password	*nsx-t_admin_password*

5 Run the command to deactivate the cluster

```
deactivate cluster
```

6 On the **Are you sure you want to remove all other nodes from this cluster? (yes/no)**prompt, enter **yes**.

   You deactivated the cluster.

What to do next

Power off and delete the two failed NSX Manager nodes from inventory.

Restore an NSX Manager Node to an Existing NSX Manager Cluster

If only one of the three NSX Manager cluster nodes is in a failed state, you restore the failed node to the existing cluster. If two of the three NSX Manager cluster nodes are in a failed state, you repeat this process for each of the failed nodes.

Procedure

1 Detach the Failed NSX Manager Node from the NSX Manager Cluster

   Before you recover a failed NSX Manager node, you must detach the failed node from the NSX Manager cluster.

2 Redeploy the Failed NSX Manager Node

   You deploy a new NSX Manager instance by using the configuration of the failed node.

3 Join the New NSX Manager Node to the NSX Manager Cluster

   You join the newly deployed NSX Manager node to the cluster by using the virtual machine web console from the vSphere Client.

4 Validate the Status of the NSX Manager Cluster

   After you added the new NSX Manager node to the cluster, you must validate the operational state of the NSX Manager cluster.

5 Add an SSL Certificate to the NSX Manager Node

   After you added the new NSX Manager node to the cluster and validated the cluster status, you must add an SSL certificate to the new node.

6 Restart the NSX Manager Node

   After assigning the certificate, you must restart the new NSX Manager node.

7 Validate the Status of the NSX Manager Cluster

   After restoring an NSX Manager node, you must validate the system status of the NSX Manager cluster.

Detach the Failed NSX Manager Node from the NSX Manager Cluster

Before you recover a failed NSX Manager node, you must detach the failed node from the NSX Manager cluster.

Procedure

1 In a web browser, log in to the management domain vCenter Server by using the vSphere Client (https://**<vcenter_server_fqdn>**/ui).

2 Select **Menu** > **VMs and Templates**.

3 In the inventory expand **vCenter Server** > **Datacenter** > **NSX Folder**.

4 Click the VM of an operational NSX Manager node in the cluster, click **Launch Web Console**, and log in by using administrator credentials.

Setting	Value
User name	admin
Password	*nsx-t_admin_password*

5 Retrieve the UUID of the failed NSX Manager node.

a Run the command to view the details of the cluster members.

```
get cluster status
```

The status of the failed node is `Down`.

b Record the UUID of the failed NSX Manager node.

6 Run the command to detach the failed node from the cluster

```
detach node faild_node_uuid
```

The detach process might take some time.

7 When the detaching process finishes, run the command to view the cluster status.

```
get cluster status
```

The status of all cluster nodes is `Up`.

Redeploy the Failed NSX Manager Node

You deploy a new NSX Manager instance by using the configuration of the failed node.

Prerequisites

Download the NSX Manager OVA file for the version of the failed NSX Manager instance. See Retrieve the NSX Manager Version from SDDC Manager.

Procedure

1 In a web browser, log in to the management domain vCenter Server by using the vSphere Client (https://**<vcenter_server_fqdn>**/ui).

2 Select **Menu** > **VMs and Templates**.

3 In the inventory expand **vCenter Server > Datacenter**.

4 Right-click the NSX folder and select **Deploy OVF Template**.

5 On the **Select an OVF template** page, select **Local file**, click **Upload files**, navigate to the location of the NSX Manager OVA file, click **Open**, and click **Next**.

6 On the **Select a name and folder** page, in the **Virtual machine name** text box, enter VM name of the failed node, and click **Next**.

7 On the **Select a compute resource** page, click **Next**.

8 On the **Review details** page, click **Next**.

9 On the **Configuration** page, select **Medium**, and click **Next**.

10 On the **Select storage** page, select the vSAN datastore, and click **Next**.

11 On the **Select networks** page, from the **Destination network** drop-down menu, select the management network distributed port group, and click **Next**.

12 On the **Customize template** page, enter these values and click **Next**.

Setting	Value
System root user password	*nsx-t_root_password*
CLI admin user password	*nsx-t_admin_password*
CLI audit password	*nsx-t_audit_password*
Hostname	*failed_node_FQDN*
Default IPv4 gateway	Enter the default gateway for the appliance.
Management network IPv4 address	*failed_node_IP_address*
Management network netmask	Enter the subnet mask for the appliance.
DNS server list	Enter the DNS servers for the appliance.
NTP servers list	Enter the NTP services for the appliance.
Enable SSH	Selected
Allow root SSH logins	Deselected

13 On the **Ready to complete** page, review the deployment details and click **Finish**.

The NSX Manager virtual machine begins to deploy.

Join the New NSX Manager Node to the NSX Manager Cluster

You join the newly deployed NSX Manager node to the cluster by using the virtual machine web console from the vSphere Client.

Procedure

1 In a web browser, log in to the management domain vCenter Server by using the vSphere Client (https://**`<vcenter_server_fqdn>`**/ui).

2 Select **Menu > VMs and Templates**.

3 In the inventory expand **vCenter Server > Datacenter > NSX Folder**.

4 Click the VM of an operational NSX Manager node in the cluster, click **Launch web console**, and log in by using administrator credentials.

Setting	Value
User name	admin
Password	*nsx-t_admin_password*

5 Retrieve the ID of the NSX Manager cluster.

a Run the command to view the cluster ID.

```
get cluster config | find Id:
```

b Record the cluster ID.

6 Retrieve the API thumbprint of the NSX Manager API certificate.

a Run the command to view the certificate API thumbprint.

```
get certificate api thumbprint
```

b Record the certificate API thumbprint.

7 Exit the VM Web console.

8 In the vSphere Client, click the VM of the newly deployed NSX Manager node, click **Launch Web console**, and log in by using administrator credentials.

Setting	Value
User name	admin
Password	*nsx-t_admin_password*

9 Run the command to join the new NSX Manager node to the cluster.

```
join new_node_ip cluster-id cluster_id thumbprint api_thumbprint username admin
```

The new NSX Manager node joins the cluster.

Validate the Status of the NSX Manager Cluster

After you added the new NSX Manager node to the cluster, you must validate the operational state of the NSX Manager cluster.

To view the state of the NSX Manager cluster, you log in to the NSX Manager for the particular domain.

Procedure

1. In a web browser, log in to the NSX Manager cluster for the domain by using the user interface (https://**`<nsx_manager_cluster_fqdn>`**/login.jsp?local=true)
2. On the main navigation bar, click **System**.
3. In the left pane, under **Configuration**, click **Appliances**.
4. Verify that the **Cluster** status is green and `Stable` and that each cluster node is `Available`.

Add an SSL Certificate to the NSX Manager Node

After you added the new NSX Manager node to the cluster and validated the cluster status, you must add an SSL certificate to the new node.

In the following steps, replace *<node_FQDN>* with the FQDN of the new NSX Manager node.

Procedure

1. In a web browser, log in to the new NSX Manager node.

   ```
   https://<node_FQDN>/login.jsp?local=true
   ```

2 Generate a certificate signing request (CSR) for the new NSX Manager node.

   a Click **System > Certificates > CSRs > Generate CSR** and select **Generate CSR**.

   b Enter the CSR information and click **Save**.

Option	Description
Common Name	Enter the fully qualified domain name (FQDN) of the node. For example, **`nsx-wld-3.vrack.vsphere.local`**.
Name	Assign a name for the certificate. For example, **`nsx-wld-3.vrack.vsphere.local`**.
Organization Unit	Enter the department in your organization that is handling this certificate. For example, **`VMware Engineering`**.
Organization Name	Enter your organization name with applicable suffixes. For example, **`VMware`**.
Locality	Add the city in which your organization is located. For example, **`Palo Alto`**.
State	Add the state in which your organization is located. For example, **`California`**.
Country	Add your organization location. For example, **`United States (US)`**.
Message Algorithm	Set the encryption algorithm for your certificate. For example, **`RSA`**.
Key Size	Set the key bits size of the encryption algorithm. For example, **`2048`**.
Description	Enter specific details to help you identify this certificate at a later date.

   c Click **Save**.

3 Select the CSR then click **Actions** and select **Download CSR PEM**.

4 Rename the downloaded file to `<node_FQDN>.csr` and upload it to the root directory on the management domain vCenter Server.

5 SSH to the management domain vCenter Server as the **`root`** user and run the following command:.

```
bash shell
```

6 Run the following command:

```
openssl x509 -req -extfile  <(printf "subjectKeyIdentifier = hash
         nauthorityKeyIdentifier=keyid,issuer
         nkeyUsage = nonRepudiation, digitalSignature, keyEncipherment
         nextendedKeyUsage=serverAuth,clientAuth
```

```
        nbasicConstraints = CA:false
        nsubjectAltName = DNS:<node_FQDN>" )
        -days 365 -in <node_FQDN>.csr -CA /var/lib/vmware/vmca/root.cer -CAkey /var/lib/vmware/
vmca/privatekey.pem
        -CAcreateserial -out <node_FQDN>.crt -sha256
```

The expected output should look like the following example:

```
Signature ok
subject=/L=PA/ST=CA/C=US/OU=VMware Engineering/O=VMware/CN=nsx-wld-3.vrack.vsphere.local
Getting CA Private Key
```

7 Add the vCenter Server CA root key to the certificate.

```
cat /var/lib/vmware/vmca/root.cer >> <node_FQDN>.crt
```

8 Download the *<node_FQDN>*.crt file from the vCenter Server root directory.

9 Import *<node_FQDN>*.crt to the NSX Manager node.

   a In a web browser, log in to the new NSX Manager node.

   ```
   https://<node_FQDN>/login.jsp?local=true
   ```

   b Click **System > Certificates > CSRs**.

   c Select the CSR for the new node, click **Actions**, and select **Import Certificate for CSR**.

   d Browse to and select the *<node_FQDN>*.crt file you downloaded in step 8.

10 Apply the certificate to the NSX Manager node.

   a Click **System > Certificates > Certificates**.

   b Locate and copy the ID of the certificate for the new node.

   c From a system that has the curl command and has access to the NSX Manager nodes (for example, vCenter Server or SDDC Manager) and run the following command to install the CA-signed certificate on the new NSX Manager node.

   ```
   curl -H 'Accept: application/json' -H 'Content-Type: application/json' --insecure
   -u 'admin:<nsx_admin_password>' -X POST 'https://<node_FQDN>/api/v1/node/services/http?
   action=apply_certificate&certificate_id=<certificate_id>'
   ```

   Replace *<nsx_admin_password>* with the admin password for the NSX Manager node. Replace *<certificate_id>* with the certificate ID from step 10b.

11 In the SDDC Manager UI, replace the NSX Manager certificates with trusted CA-signed certificates from a Certificate Authority (CA). See Chapter 9 Certificate Management.

What to do next

Important If assigning the certificate fails because the certificate revocation list (CRL) verification fails, see https://kb.vmware.com/kb/78794. If you deactivate the CRL checking to assign the certificate, after assigning the certificate, you must re-enable the CRL checking.

Restart the NSX Manager Node

After assigning the certificate, you must restart the new NSX Manager node.

Procedure

1 In a web browser, log in to the management domain vCenter Server by using the vSphere Client (https://**<vcenter_server_fqdn>**/ui).

2 Select **Menu** > **VMs and Templates**.

3 In the inventory expand **vCenter Server** > **Datacenter** > **NSX Folder**.

4 Right click the new NSX Manager VM and select **Guest OS** > **Restart**.

Validate the Status of the NSX Manager Cluster

After restoring an NSX Manager node, you must validate the system status of the NSX Manager cluster.

To view the system status of the NSX Manager cluster, you log in to the NSX Manager for the particular domain.

Procedure

1 In a web browser, log in to the NSX Manager cluster for the domain by using the user interface (https://**<nsx_manager_cluster_fqdn>**/login.jsp?local=true)

2 On the **Home** page, click **Monitoring Dashboards** > **System**.

3 Verify that all components are healthy.

4 If the host transport nodes are in a `Pending` state, run **Configure NSX** on these nodes to refresh the UI.

What to do next

Refresh the SSH keys that are stored in the SDDC Manager inventory. See VMware Cloud Foundation SDDC Manager Recovery Scripts (79004).

Update or Recreate the VM Anti-Affinity Rule for the NSX Manager Cluster Nodes

During the NSX Manager bring-up process, SDDC Manager creates a VM anti-affinity rule to prevent the VMs of the NSX Manager cluster from running on the same ESXi host. If you redeployed all NSX Manager cluster nodes, you must recreate this rule. If you redeployed one or two nodes of the cluster, you must add the new VMs to the existing rule.

Procedure

1. In a web browser, log in to the management domain vCenter Server by using the vSphere Client (https://**`<vcenter_server_fqdn>`**/ui).
2. Select **Menu > Hosts and Clusters**.
3. In the inventory expand **vCenter Server > Datacenter**.
4. Click the cluster object.
5. Click the **Configure** tab and click **VM/Host Rules**.
6. Update or recreate the VM anti-affinity rule.
   - If you redeployed one or two nodes of the cluster, add the new VMs to the existing rule.
     1. Click the VM anti-affinity rule name and click **Edit**.
     2. Click **Add VM/Host rule member**, select the new NSX Manager cluster nodes, and click **Add**.
   - If you redeployed all NSX Manager cluster nodes, click **Add VM/Host rule**, enter these values to create the rule, and click **OK**.

Setting	Value
Name	Enter the name of the anti-affinity rule
Type	Separate virtual machines
Members	Click **Add VM/Host rule member**, select the NSX Manager cluster nodes, and click **Add**.

Validate the SDDC Manager Inventory State

After a successful restore of an NSX Manager cluster, you must verify that the SDDC Manager inventory is consistent with the recovered virtual machines. You run this verification by using the `sos` tool.

Procedure

1. Log in to SDDC Manager by using a Secure Shell (SSH).
2. Verify the SDDC Manager health.
   1. Run the command to view the details about the VMware Cloud Foundation system.

```
sudo /opt/vmware/sddc-support/sos --get-vcf-summary
```

   2. When prompted, enter the *vcf_password*.

   All tests show green state.

3 Run the command to collect the log files from the restore of the NSX Manager cluster.

```
sudo /opt/vmware/sddc-support/sos. --domain-name domain_name --nsx-logs
```

What to do next

Refresh the SSH keys that are stored in the SDDC Manager inventory. See VMware Cloud Foundation SDDC Manager Recovery Scripts (79004).

Restoring NSX Edge Cluster Nodes

If one or both NSX Edge cluster nodes fail due to a hardware or software issue, you must redeploy the failed NSX Edge instances. You do not restore the NSX Edge nodes from a backup.

Procedure

1 Prepare for Restoring NSX Edge Cluster Nodes

Before restoring an NSX Edge node, you must retrieve its deployment details from the NSX Manager cluster and retrieve the credentials of the failed NSX Edge node from SDDC Manager.

2 Replace the Failed NSX Edge Node with a Temporary NSX Edge Node

You deploy a temporary NSX Edge node in the domain, add it to the NSX Edge cluster, and then delete the failed NSX Edge node.

3 Replace the Temporary NSX Edge Node with the Redeployed NSX Edge Node

After you replaced and deleted the failed NSX Edge node, to return the NSX Edge cluster to its original state, you redeploy the failed node, add it to the NSX Edge cluster, and delete then temporary NSX Edge node.

Prepare for Restoring NSX Edge Cluster Nodes

Before restoring an NSX Edge node, you must retrieve its deployment details from the NSX Manager cluster and retrieve the credentials of the failed NSX Edge node from SDDC Manager.

Procedure

1 Retrieve the NSX Edge Node Deployment Details from NSX Manager Cluster

Before restoring a failed NSX Edge node, you must retrieve its deployment details from the NSX Manager cluster.

2 Retrieve the NSX Edge Node Credentials from SDDC Manager

Before restoring the failed NSX Edge node that is deployed by SDDC Manager, you must retrieve its credentials from the SDDC Manager inventory.

3 Retrieve the Workload Domain vSphere Cluster ID from SDDC Manager

If you are restoring a failed workload domain NSX Edge node, you must retrieve the ID of the vSphere cluster for the workload domain. During the restore process, you use this vSphere cluster ID to recreate the vSphere DRS rule name with its original name.

Retrieve the NSX Edge Node Deployment Details from NSX Manager Cluster

Before restoring a failed NSX Edge node, you must retrieve its deployment details from the NSX Manager cluster.

Procedure

1 In a web browser, log in to the NSX Manager cluster for the domain by using the user interface (https://**`<nsx_manager_cluster_fqdn>`**/login.jsp?local=true)

2 On the main navigation bar, click **System**.

3 In the left pane, under **Configuration**, click **Fabric > Nodes**.

4 Click the **Edge Transport Nodes** tab.

5 Select the check-box for the failed NSX Edge node.

6 Click **Actions** and select **Change node settings**.

7 Record the **Host name/FQDN** value and click **Cancel**.

8 Click **Actions** and select **Change Edge VM Resource Reservations**.

9 Record the **Existing form factor** value and click **Cancel**.

10 Click the name of the NSX Edge node that you plan to replace and record the following values.

- Name
- Management IP
- Transport Zones
- Edge Cluster

11 Click **Edit**, record the following values, and click **Cancel**.

- Edge Switch Name
- Uplink Profile
- IP Assignment
- Teaming Policy Uplink Mapping

Retrieve the NSX Edge Node Credentials from SDDC Manager

Before restoring the failed NSX Edge node that is deployed by SDDC Manager, you must retrieve its credentials from the SDDC Manager inventory.

Procedure

1 In the SDDC Manager user interface, from the navigation pane click **Developer center**.

2 Click the **API explorer** tab.

3 Expand **APIs for managing credentials** and click **GET /v1/credentials**.

4 In the **resourceName** text box, enter the FQDN of the failed NSX Edge node, and click **Execute**.

5 Under **Response**, click **PageOfCredential** and click each credential ID.

6 Record the user names and passwords for these credentials.

Credential Type	Username	Password
SSH	root	*edge_root_password*
API	admin	*edge_admin_password*
AUDIT	audit	*edge_audit_password*

Retrieve the Workload Domain vSphere Cluster ID from SDDC Manager

If you are restoring a failed workload domain NSX Edge node, you must retrieve the ID of the vSphere cluster for the workload domain. During the restore process, you use this vSphere cluster ID to recreate the vSphere DRS rule name with its original name.

You use the SDDC Manager user interface to retrieve the ID of the vSphere cluster for the workload domain.

Procedure

1 In the SDDC Manager user interface, from the navigation pane click **Developer center**.

2 Click the **API explorer** tab.

3 Expand **APIs for managing clusters**, click **GET /v1/clusters**, and click **Execute**.

4 Under **Response**, click **PageOfClusters** and click **Cluster**.

5 Record the **ID of the cluster** for the workload domain cluster ID.

Replace the Failed NSX Edge Node with a Temporary NSX Edge Node

You deploy a temporary NSX Edge node in the domain, add it to the NSX Edge cluster, and then delete the failed NSX Edge node.

Procedure

1 Deploy a Temporary NSX Edge Node

To avoid conflicts with the failed NSX Edge node, you deploy a temporary NSX Edge node with a new FQDN and IP address.

2 Replace the Failed NSX Edge Node with the Temporary NSX Edge Node

You add the temporary NSX Edge node to the NSX Edge cluster by replacing the failed NSX Edge node.

3 Delete the Failed NSX Edge Node from the NSX Manager Cluster

After replacing the failed NSX Edge node with the temporary NSX Edge node in the NSX Edge cluster, you delete the failed node.

4 Validate the Temporary State of the NSX Edge Cluster Nodes

After replacing the failed NSX Edge node with a temporary NSX Edge node, you must verify the state of the NSX Edge cluster nodes.

Deploy a Temporary NSX Edge Node

To avoid conflicts with the failed NSX Edge node, you deploy a temporary NSX Edge node with a new FQDN and IP address.

Prerequisites

Allocate the FQDN and IP address for the temporary NSX Edge node for the domain of the failed node.

Procedure

1 In a web browser, log in to the NSX Manager cluster for the domain by using the user interface (https://**`<nsx_manager_cluster_fqdn>`**/login.jsp?local=true)

2 On the main navigation bar, click **System**.

3 In the left pane, under **Configuration**, click **Fabric** > **Nodes**.

4 Click the **Edge transport nodes** tab.

5 Click **Add edge VM**.

6 On the **Name and description** page, enter these values and click **Next**.

Setting	Value
Name	Enter the VM name
Host name/FQDN	Enter the FQDN
Form factor	Medium

7 On the **Credentials** page, enter these values and the passwords recorded in the earlier steps and then click **Next**.

Setting	Value
CLI user name	admin
CLI password	*edge_admin_password*
CLI confirm password	*edge_admin_password*
Allow SSH login	Yes
System root password	*edge_root_password*
System root password confirm	*edge_root_password*
Allow root SSH login	No

Setting	Value
Audit user name	audit
Audit password	*edge_audit_password*
Audit confirm password	*edge_audit_password*

8 On the **Configure deployment** page, select the following and click **Next**.

Setting	Value
Compute manager	Enter the vCenter Server FQDN
Cluster	Select the cluster
Datastore	Select the vSAN datastore

9 On the **Configure node settings** page, enter these values and click **Next**.

Setting	Value
IP Assignment	Static
Management IP	Enter the management IP address.
Default Gateway	Enter the default gateway
Management interface	Select the management network distributed port group
Search domain names	Enter the search domain
DNS servers	Enter the DNS servers
NTP Servers	Enter the NTP servers

10 On the **Configure NSX** page, enter these values which are already recorded and click **Finish**.

Setting	Value
Edge switch name	Enter the edge switch name.
Transport zone	Enter the transport zone names.
Uplink profile	Enter the uplink profile name.
IP assignment	Use static IP list
Static IP list	Enter the static IP list.
Gateway	Enter the gateway IP
Subnet mask	Enter the subnet mask
Teaming policy switch mapping	Enter the values for Uplink1 and Uplink2.

Replace the Failed NSX Edge Node with the Temporary NSX Edge Node

You add the temporary NSX Edge node to the NSX Edge cluster by replacing the failed NSX Edge node.

Procedure

1 In a web browser, log in to the NSX Manager cluster for the domain by using the user interface (https://**`<nsx_manager_cluster_fqdn>`**/login.jsp?local=true)

2 On the main navigation bar, click **System**.

3 In the left pane, under **Configuration**, click **Fabric > Nodes**.

4 Click the **Edge clusters** tab.

5 Select the check-box for the NSX Edge cluster.

6 Click **Action** and select **Replace edge cluster member**.

7 From the **Replace** drop down menu, select the Failed edge node and from the **with** drop down menu, select the Temporary edge node and then click **Save**.

Delete the Failed NSX Edge Node from the NSX Manager Cluster

After replacing the failed NSX Edge node with the temporary NSX Edge node in the NSX Edge cluster, you delete the failed node.

Procedure

1 In a web browser, log in to the NSX Manager cluster for the domain by using the user interface (https://**`<nsx_manager_cluster_fqdn>`**/login.jsp?local=true)

2 On the main navigation bar, click **System**.

3 In the left pane, under **Configuration**, click **Fabric > Nodes**.

4 Click the **Edge transport nodes** tab.

5 Select the check-box for the failed NSX Edge node and click **Delete**.

6 In the confirmation dialog box, click **Delete**.

Validate the Temporary State of the NSX Edge Cluster Nodes

After replacing the failed NSX Edge node with a temporary NSX Edge node, you must verify the state of the NSX Edge cluster nodes.

You validate the state of the temporary NSX Edge node and the second NSX Edge node in the cluster.

Procedure

1 In a web browser, log in to the NSX Manager cluster for the domain by using the user interface (https://**`<nsx_manager_cluster_fqdn>`**/login.jsp?local=true)

2 On the main navigation bar, click **System**.

3 In the left pane, under **Configuration**, click **Fabric > Nodes**.

4 Click the **Edge transport nodes** tab.

5 Verify all edge transport nodes show these values.

Setting	Value
Configuration state	Success
Node status	Up
Tunnels	Upward arrow mark with number of tunnels

Replace the Temporary NSX Edge Node with the Redeployed NSX Edge Node

After you replaced and deleted the failed NSX Edge node, to return the NSX Edge cluster to its original state, you redeploy the failed node, add it to the NSX Edge cluster, and delete then temporary NSX Edge node.

Procedure

1 Redeploy the Failed NSX Edge Node

You deploy a new NSX Edge node by using the configurations of the failed NSX Edge node that you retrieved during the preparation for the restore.

2 Replace the Temporary NSX Edge Node with the Redeployed NSX Edge Node

After deploying the new NSX Edge node with the same configuration as the failed NSX Edge node, you replace the temporary NSX Edge node with the redeployed failed node in the NSX- Edge cluster.

3 Delete the Temporary NSX Edge Node

After replacing the temporary NSX Edge node with the new NSX Edge node in the NSX Edge cluster, you delete the temporary node.

4 Update or Recreate the VM Anti-Affinity Rule for the NSX Edge Cluster Nodes

During the NSX Edge deployment process, SDDC Manager creates a VM anti-affinity rule to prevent the nodes of the NSX Edge cluster from running on the same ESXi host. If you redeployed the two NSX Edge cluster nodes, you must recreate this rule. If you redeployed one node of the cluster, you must add the new VM to the existing rule.

5 Validate the State of the NSX Edge Cluster Nodes

After replacing the temporary NSX Edge node with the redeployed failed NSX Edge node, you must verify the state of the NSX Edge cluster nodes.

Redeploy the Failed NSX Edge Node

You deploy a new NSX Edge node by using the configurations of the failed NSX Edge node that you retrieved during the preparation for the restore.

To return the NSX Edge cluster to the original state, you must use the FQDN and IP address of the failed NSX Edge node that you deleted. This procedure ensures that the inventory in SDDC Manager is accurate.

Procedure

1 In a web browser, log in to the NSX Manager cluster for the domain by using the user interface (https://**`<nsx_manager_cluster_fqdn>`**/login.jsp?local=true)

2 On the main navigation bar, click **System**.

3 In the left pane, under **Configuration**, click **Fabric > Nodes**.

4 Click the **Edge transport nodes** tab.

5 Click **Add edge VM**.

6 On the **Name and description** page, enter these values and click **Next**.

Setting	Value
Name	Enter the VM name
Host name/FQDN	Enter the FQDN
Form factor	Medium

7 On the **Credentials** page, enter these values which are recorded earlier and click **Next**.

Setting	Value
CLI user name	admin
CLI password	*edge_admin_password*
CLI confirm password	*edge_admin_password*
Allow SSH login	Yes
System root password	*edge_root_password*
System root password confirm	*edge_root_password*
Allow root SSH login	No
Audit user name	audit
Audit password	*edge_audit_password*
Audit confirm password	*edge_audit_password*

8 On the **Configure deployment** page, select these values and click **Next**.

Setting	Value
Compute manager	Enter the vCenter Server FQDN
Cluster	Enter the cluster name
Resource pool	Enter the resource pool
Datastore	Enter the datastore

9 On the **Configure Node Settings** page, enter these values and click **Next**.

Setting	Value
IP assignment	Static
Management IP	Enter the management IP address.
Default gateway	Enter the default gateway
Management interface	Select the management network distributed port group
Search domain names	Enter the search domain
DNS servers	Enter the DNS servers
NTP servers	Enter the NTP servers

10 On the **Configure NSX** page, enter these values which are recorded earlier and click **Finish**.

Setting	Value
Edge switch name	Enter the edge switch name.
Transport zone	Enter the transport zone names.
Uplink profile	Enter the uplink profile name.
IP assignment	Use static IP list
Static IP list	Enter the static IP list.
Gateway	Enter the gateway IP
Subnet mask	Enter the subnet mask
Teaming policy switch mapping	Enter the values for Uplink1 and Uplink2.

Replace the Temporary NSX Edge Node with the Redeployed NSX Edge Node

After deploying the new NSX Edge node with the same configuration as the failed NSX Edge node, you replace the temporary NSX Edge node with the redeployed failed node in the NSX-Edge cluster.

Procedure

1 In a web browser, log in to the NSX Manager cluster for the domain by using the user interface (https://**`<nsx_manager_cluster_fqdn>`**/login.jsp?local=true)

2 On the main navigation bar, click **System**.

3 In the left pane, under **Configuration**, click **Fabric > Nodes**.

4 Click the **Edge clusters** tab.

5 Select the check-box for the NSX Edge cluster.

6 Click **Action** and select **Replace edge cluster member**.

7 From the **Replace** drop down menu, select the temporary node and from the **with** drop down menu, select the new node and then click **Save**.

Delete the Temporary NSX Edge Node

After replacing the temporary NSX Edge node with the new NSX Edge node in the NSX Edge cluster, you delete the temporary node.

Procedure

1 In a web browser, log in to the NSX Manager cluster for the domain by using the user interface (https://**`<nsx_manager_cluster_fqdn>`**/login.jsp?local=true)

2 On the main navigation bar, click **System**.

3 In the left pane, under **Configuration**, click **Fabric > Nodes > .**

4 Click the **Edge transport nodes** tab.

5 Select the check-box for the temporary NSX Edge node and click **Delete**.

6 In the confirmation dialog box, click **Delete**.

Update or Recreate the VM Anti-Affinity Rule for the NSX Edge Cluster Nodes

During the NSX Edge deployment process, SDDC Manager creates a VM anti-affinity rule to prevent the nodes of the NSX Edge cluster from running on the same ESXi host. If you redeployed the two NSX Edge cluster nodes, you must recreate this rule. If you redeployed one node of the cluster, you must add the new VM to the existing rule.

Procedure

1 In a web browser, log in to the domain vCenter Server by using the vSphere Client (https://<vcenter_server_fqdn>/ui).

2 Select **Menu > Hosts and Clusters**.

3 In the inventory expand **vCenter Server > Datacenter**.

4 Click the cluster object.

5 Click the **Configure** tab and click **VM/Host Rules**.

6 Update or recreate the VM anti-affinity rule.

- If you redeployed one of the nodes in the NSX Edge cluster, add the new VM to the existing rule.

  a Click the VM anti-affinity rule name and click **Edit**.

  b Click **Add VM/Host rule member**, select the new NSX Edge cluster node, and click **Add**.

- If you redeployed the two nodes in the NSX Edge cluster, click **Add VM/Host rule**, enter these values to create the rule, and click **OK**.

Setting	Value
Name	Enter the name of the anti-affinity rule
Type	Separate virtual machines
Members	Click **Add VM/Host rule member**, select the NSX Edge cluster nodes, and click **Add**.

Validate the State of the NSX Edge Cluster Nodes

After replacing the temporary NSX Edge node with the redeployed failed NSX Edge node, you must verify the state of the NSX Edge cluster nodes.

You validate the state of the redeployed NSX Edge node and the second NSX Edge node in the cluster.

Procedure

1 In a web browser, log in to the NSX Manager cluster for the domain by using the user interface (https://**`<nsx_manager_cluster_fqdn>`**/login.jsp?local=true)

2 On the main navigation bar, click **System**.

3 In the left pane, under **Configuration**, click **Fabric > Nodes**.

4 Click the **Edge transport nodes** tab.

5 Verify all edge transport nodes show these values.

Setting	Value
Configuration state	Success
Node status	Up
Tunnels	Upward arrow mark with number of tunnels

Image-Based Backup and Restore of VMware Cloud Foundation

For an image-based backup of the VMware Cloud Foundation, use a solution compatible with the VMware vSphere Storage APIs - Data Protection (formerly known as VMware vStorage APIs for Data Protection or VADP).

vSphere Storage APIs - Data Protection compatible backup software connects to the vCenter servers in the management domain to perform backups. In the event of failure, the backup software connects to the vCenter servers in the management domain to restore the VMs. If the management domain is lost, the vCenter servers are no longer available and must be restored first. Choosing a backup software that supports Direct Restore to an ESXi host allows restoring the vCenter Servers.

Connect your backup solution with the management domain vCenter Server and configure it. To reduce the backup time and storage cost, use incremental backups in addition to the full ones.

Quiesced backups are enabled for vRealize Suite Lifecycle Manager and Workspace ONE Access.

Lifecycle Management 24

Lifecycle Management (LCM) enables you to perform automated updates on VMware Cloud Foundation services (SDDC Manager and internal services), VMware software (NSX-T Data Center, vCenter Server, ESXi, and vRealize Suite Lifecycle manager), and Dell EMC VxRail in your environment. You can download the update bundles and apply them manually or schedule them within your maintenance window allowing for flexibility in your application.

The LCM bundles that are available are:

- VxRail Partner Bundle: You can download the Dell EMC VxRail partner bundle to update the VxRail appliance.
- Patch Update Bundle: A patch update bundle contains bits to update the appropriate Cloud Foundation software components in your management domain or VI workload domain. In most cases, a patch update bundle must be applied to the management domain before it can be applied to VI workload domains.
- Cumulative Update Bundle: With a cumulative update bundle, you can directly update the appropriate software in your workload domain to the version contained in the cumulative bundle rather than applying sequential updates to reach the target version.
- Install Bundle: If you have updated the management domain in your environment, you can download an install bundle with updated software bits for VI workload domains and vRealize Suite Lifecycle Manager.

Read the following topics next:

- Download VMware Cloud Foundation on Dell EMC VxRail Bundles
- Upgrade to VMware Cloud Foundation 4.3 on Dell EMC VxRail

Download VMware Cloud Foundation on Dell EMC VxRail Bundles

If SDDC Manager is configured to work with your VMware Customer Connect and Dell EMC accounts, LCM automatically polls the depots to access install and upgrade bundles. You receive a notification when a bundle is available and can then download the bundle.

If SDDC Manager does not have direct internet connectivity, you can either use a proxy server to access the depot, or download install and upgrade bundles manually using the Bundle Transfer Utility.

To download an async patch bundle, you must use the Async Patch Tool. For more information, see the Async Patch Tool documentation.

Download VMware Cloud Foundation on Dell EMC VxRail Bundles from SDDC Manager

If SDDC Manager has an internet connection, you can download bundles directly from SDDC Manager UI.

When upgrade bundles are available for your environment, a message is displayed in the SDDC Manager UI. Available install bundles are displayed on the **Bundle Management** page and on the **Updates/Patches** tab for each workload domain.

Prerequisites

In order to download bundles from the SDDC Manager UI, you must be connected to the My VMware and Dell EMC repositories.

1. In the navigation pane, click **Administration > Repository Settings**.
2. Click **Authenticate**.
3. Enter your user names and passwords and click **Authorize**.

Automatic polling of the manifest for bundles by SDDC Manager is enabled by default. If you have previously edited the `application-prod.properties` file on the SDDC Manager appliance to download upgrade bundles in an offline mode, you must edit it again before downloading bundles from SDDC Manager. Follow the steps below:

1. Using SSH, log in to the SDDC Manager appliance as the **`vcf`** user.
2. Enter **`su`** to switch to the root user.
3. Open the `/opt/vmware/vcf/lcm/lcm-app/conf/application-prod.properties` file.
4. Set `lcm.core.enableManifestPolling=true`.
5. Restart the LCM service:

   ```
   systemctl restart lcm
   ```

Procedure

1. In the navigation pane, click **Lifecycle Management > Bundle Management**.

   The Bundles page displays the bundles available for download. The Bundle Details section displays the bundle version and release date.

If the bundle can be applied right away, the Bundle Details column displays the workload domains to which the bundle needs to be applied and the Availability column displays **Available**. If another bundle needs to be applied before a particular bundle, the Availability column displays **Future**.

2 To view more information about the bundle, click **View Details**.

   The Bundle Details section displays the bundle version, release date, and additional details about the bundle.

3 Click **Exit Details**.

4 Specify when to download the bundle.

   - Click **Download Now** to start the download immediately.
   - Click **Schedule Download** to set the date and time for the bundle download.

Results

The Download Status section displays the date and time at which the bundle download has been scheduled. When the download begins, the status bar displays the download progress.

Download VMware Cloud Foundation on Dell EMC VxRail Bundles with a Proxy Server

If you do not have internet access, you can use a proxy server to download the LCM bundles. LCM only supports proxy servers that do not require authentication.

Procedure

1 Using SSH, log in to the SDDC Manager appliance with the user name `vcf` and password you specified in the deployment parameter sheet.

2 Type `su` to switch to the root account.

3 Open the `/opt/vmware/vcf/lcm/lcm-app/conf/application-prod.properties` file.

4 Add the following lines to the end of the file:

```
lcm.depot.adapter.proxyEnabled=true
lcm.depot.adapter.proxyHost=proxy IP address
lcm.depot.adapter.proxyPort=proxy port
```

5 Save and close the file.

6 Restart the LCM server by typing the following command in the console window:

```
systemctl restart lcm
```

7 Wait for 5 minutes and then download the bundles.

Download Bundles for VMware Cloud Foundation on Dell EMC VxRail with the Bundle Transfer Utility

Lifecycle Management polls the VMware depot to access install and update bundles. If you do not have internet connectivity in your VMware Cloud Foundation system, you can use the Bundle Transfer Utility to manually download the bundles from the depot on your local computer and then upload them to the SDDC Manager appliance.

When you download bundles, the Bundle Transfer Utility verifies that the file size and checksum of the downloaded bundles match the expected values.

Prerequisites

- A Windows or Linux computer with internet connectivity for downloading the bundles.
- The computer must have Java 8 or later.
- A Windows or Linux computer with access to the SDDC Manager appliance for uploading the bundles.
- To upload the manifest file from a Windows computer, you must have OpenSSL installed and configured.
- Configure TCP keepalive in your SSH client to prevent socket connection timeouts when using the Bundle Transfer Utility for long-running operations.

Note The Bundle Transfer Utility is the only supported method for downloading bundles. Do not use third-party tools or other methods to download bundles.

Procedure

1 Download the Bundle Transfer Utility on a computer with internet access.

   a Log in to VMware Customer Connect and browse to the Download VMware Cloud Foundation page.

   b In the **Select Version** field, select the version to which you are upgrading.

   c Click **Drivers & Tools**.

   d Expand VMware Cloud Foundation Supplemental Tools.

   e Click **Download Now** for the Bundle Transfer Utility.

2 Extract `lcm-tools-prod.tar.gz`.

3 Navigate to `lcm-tools-prod/bin/` and confirm that you have execute permission on all folders.

4 Copy the Bundle Transfer Utility to a computer with access to the SDDC Manager appliance and then copy the Bundle Transfer Utility to the SDDC Manager appliance.

   a SSH in to the SDDC Manager appliance using the **`vcf`** user account.

   b Enter **`su`** to switch to the root user.

c Create the `lcm-tools` directory.

```
mkdir /opt/vmware/vcf/lcm/lcm-tools
```

d Copy the bundle transfer utility file (`lcm-tools-prod.tar.gz`) that you downloaded in step 1 to the `/opt/vmware/vcf/lcm/lcm-tools` directory.

e Extract the contents of `lcm-tools-prod.tar.gz`.

f Set the permissions for the `lcm-tools` directory.

```
cd /opt/vmware/vcf/lcm/
          chown vcf_lcm:vcf -R lcm-tools
          chmod 750 -R lcm-tools
```

5 On the computer with internet access, download the manifest file.

This is a structured metadata file that contains information about the VMware Cloud Foundation product versions included in the release Bill of Materials.

```
 ./lcm-bundle-transfer-util --download --manifestDownload --depotUser Username --
depotUserPassword Password
```

6 Copy the manifest file and `lcm-tools-prod` directory to a computer with access to the SDDC Manager appliance.

7 Upload the manifest file to the SDDC Manager appliance.

```
./lcm-bundle-transfer-util --update --sourceManifestDirectory downloaded-manifest-
directory --sddcMgrFqdn FQDN --sddcMgrUser Username
```

Use your vSphere SSO credentials for the `--sddcMgrUser` credentials in the command.

8 On the computer with internet access, run the following command:

```
./lcm-bundle-transfer-util --download "downloadPartnerBundle" --outputDirectory absolute-
path-output-dir --depotUser customer_connect_email --sv current-vcf-version --p target-vcf-
version --pdu dell_emc_depot_email
```

absolute-path-output-dir	Path to the directory where the bundle files should be downloaded. This directory folder must have 777 permissions. If you do not specify the download directory, bundles are downloaded to the default directory with 777 permissions.
depotUser	VMware Customer Connect email address. You will be prompted to enter the depot user password. If there are any special characters in the password, specify the password within single quotes.
current-vcf-version	Current version of VMware Cloud Foundation. For example, **`4.3.1.1`**. If you do not specify a current version, the utility uses **`4.1.0.0`**.

target-vcf-version	Current version of VMware Cloud Foundation. For example, **`4.4.0.0`**.
dell_emc_depot_ email	Dell EMC depot email address.

After you enter you VMware Customer connect and Dell EMC Depot passwords, the utility asks `Do you want to download vRealize bundles?`. Enter **`Y`** or **`N`**.

The utility displays a list of the available bundles based on the current and target versions of VMware Cloud Foundation.

9 Specify the bundles to download.

Enter one of the following options:

- **`all`**
- **`install`**
- **`patch`**

You can also enter a comma-separated list of bundle names to download specific bundles. For example: **`bundle-38371, bundle-38378`**.

Download progress for each bundle is displayed. Wait until all bundles are downloaded.

10 If you downloaded VxRail bundles:

a Copy the partner bundle to the `/nfs/vmware/vcf/nfs-mount/bundle/depot/local/bundles` directory on the SDDC Manager appliance.

b Copy `partnerBundleMetadata.json` to the `/nfs/vmware/vcf/nfs-mount/bundle/depot/local` directory on the SDDC Manager appliance.

c Copy `softwareCompatibilitySets.json` to the `/nfs/vmware/vcf/nfs-mount/bundle/depot/local` directory on the SDDC Manager appliance.

d Run following commands on the SDDC Manager appliance:

```
chown -R vcf_lcm:vcf /nfs/vmware/vcf/nfs-mount/bundle/depot/local
```

```
chmod -R 755 /nfs/vmware/vcf/nfs-mount/bundle/depot/local
```

11 If you downloaded bundles for VMware Cloud Foundation and its components, copy the entire output directory to a computer with access to the SDDC Manager appliance, and then copy it to the SDDC Manager appliance.

For example:

```
scp -pr /root/upgrade-bundles vcf@SDDC_MANAGER_IP:/nfs/vmware/vcf/nfs-mount/
```

The scp command in the example above copies the output directory (`upgrade-bundles`) to the `/nfs/vmware/vcf/nfs-mount/` directory on the SDDC Manager appliance.

12 In the SDDC Manager appliance, upload the bundle directory to the internal LCM repository.

```
./lcm-bundle-transfer-util --upload "uploadPartnerBundle" --bundleDirectory
absolute-path-bundle-dir
```

where *absolute-path-bundle-dir* is the directory where the bundle files have been be uploaded, or `/nfs/vmware/vcf/nfs-mount/upgrade-bundles` as shown in the previous step.

The utility uploads the bundles and displays upload status for each bundle. Wait for all bundles to be uploaded before proceeding with an upgrade.

View VMware Cloud Foundation on Dell EMC VxRail Bundle Download History

The Download History page displays all bundles that have been downloaded.

Procedure

◆ In the navigation pane, click **Repository** > **Bundle Management** > **Download History**.

All downloaded bundles are displayed. Click **View Details** to see bundle metadata details.

Upgrade to VMware Cloud Foundation 4.3 on Dell EMC VxRail

The following procedures provide information about upgrading to VMware Cloud Foundation 4.3 on Dell EMC VxRail.

You can perform a sequential or skip-level upgrade toVMware Cloud Foundation 4.3 from VMware Cloud Foundation 4.2.1, 4.2, 4.1.0.1, or 4.1. If your environment is at a version earlier than 4.1, you must upgrade the management domain and all VI workload domains to VMware Cloud Foundation 4.1 and then upgrade to VMware Cloud Foundation 4.3.

Your environment may contain workload domains at different VMware Cloud Foundation releases. After upgrading to VMware Cloud Foundation 4.3, you can view the versions in your environment and the associated component versions in that release by navigating to **Lifecycle Management** > **Release Versions**. Note that the management domain and VI workload domains must be upgraded to the same release version. For example, suppose your environment is at VMware Cloud Foundation 4.2. If you are upgrading to VMware Cloud Foundation 4.3, the management domain and VI workload domains must be upgraded to this release.

Upgrades are applied on a workload domain basis. The management domain contains the core infrastructure, so you must upgrade the management domain before upgrading the other VI workload domains. You must upgrade all required components to keep your system in an optimum state.

- Upgrade Prerequisites for VMware Cloud Foundation on Dell EMC VxRail

  Ensure that the following prerequisites are met before starting an upgrade.

- Upgrade the Management Domain for VMware Cloud Foundation on Dell EMC on VxRail

  You must upgrade the management domain before upgrading VI workload domains in your environment. In order to upgrade to VMware Cloud Foundation 4.3, the management domain must be at VMware Cloud Foundation 4.2.1, 4.2, 4.1.0.1, or 4.1.
- Upgrade a VI Workload Domain for VMware Cloud Foundation on Dell EMC on VxRail

  The management domain in your environment must be upgraded before you upgrade VI workload domains.
- Upgrade vSAN Witness Host for VMware Cloud Foundation

  If your VMware Cloud Foundation environment contains stretched clusters, update and remediate the vSAN witness host.

Upgrade Prerequisites for VMware Cloud Foundation on Dell EMC VxRail

Ensure that the following prerequisites are met before starting an upgrade.

- Take a backup of the SDDC Manager appliance. This is required since the SDDC Manager appliance will be rebooted during the update.
- Take a snapshot of relevant VMs in your management domain.
- Do not run any domain operations while an update is in progress. Domain operations are creating a new VI domain, adding hosts to a cluster or adding a cluster to a workload domain, and removing clusters or hosts from a workload domain.
- Download the relevant bundles. See Download VMware Cloud Foundation on Dell EMC VxRail Bundles.
- If you applied an async patch to your current VMware Cloud Foundation instance you must use the Async Patch Tool to upgrade to a later version of VMware Cloud Foundation. For example, if you applied an async vCenter Server patch to a VMware Cloud Foundation 4.3.1 instance, you must use the Async Patch Tool to upgrade to VMware Cloud Foundation 4.4. See the Async Patch Tool documentation.
- Ensure that there are no failed workflows in your system and none of the VMware Cloud Foundation resources are in activating or error state. If any of these conditions are true, contact VMware Support before starting the upgrade.
- Confirm that the passwords for all VMware Cloud Foundation components are valid. An expired password can cause an upgrade to fail.
- Review the *VMware Cloud Foundation on Dell EMC Release Notes* for known issues related to upgrades.

Upgrade the Management Domain for VMware Cloud Foundation on Dell EMC on VxRail

You must upgrade the management domain before upgrading VI workload domains in your environment. In order to upgrade to VMware Cloud Foundation 4.3, the management domain must be at VMware Cloud Foundation 4.2.1, 4.2, 4.1.0.1, or 4.1.

The components in the management domain must be upgraded in the following order:

Components in the management domain must be upgraded in the following order:

1 SDDC Manager and VMware Cloud Foundation services.

2 vRealize Suite Lifecycle Manager, vRealize Suite products, and Workspace ONE Access (if applicable).

   a vRealize Suite Lifecycle Manager

   b vRealize Log Insight

   c vRealize Operations

   d vRealize Automation

   e Workspace ONE Access

   Note Note: All vRealize Suite upgrades are sequential. You may have to download and apply multiple bundles, depending on the current product versions in your environment.

3 NSX-T Data Center.

4 vCenter Server.

5 vSAN witness host (If you have stretched clusters in your environment).

6 VxRail Manager and ESXi.

The upgrade process is similar for all components. Information that is unique to a component is described in the following table.

Component	Additional Information
SDDC Manager and VMware Cloud Foundation services	The VMware Cloud Foundation software bundle to be applied depends on the current version of your environment. If you upgrading from VMware Cloud Foundation 4.2.1, 4.2, or 4.1.0.1, you must apply the following bundles to the management domain: ■ The VMware Cloud Foundation bundle upgrades SDDC Manager, LCM, and VMware Cloud Foundation services. ■ The Configuration Drift bundle applies configuration drift on software components. If you upgrading from VMware Cloud Foundation 4.1, you apply the VMware Cloud Foundation Update bundle, which upgrades SDDC Manager, LCM, and VMware Cloud Foundation services, and also applies the configuration drift.
vRealize Log Insight	After upgrading vRealize Log Insight, upgrade the vRealize Log Insight content packs. Content packs are plugins to vRealize Log Insight that provide pre-defined knowledge about specific types of events such as log messages. You must upgrade to the latest content packs for use with vRealize Log Insight. 1 Log in to the vRealize Log Insight user interface as the admin user. 2 Click the configuration drop-down menu icon ☰ and select **Content Pack**. 3 In the **Content Pack** pane, under **Content Pack Market Place**, click **Updates**. 4 In the **Log Insight Content Pack Marketplace** pane, click **Update All** to upgrade all content packs to the latest version. After you upgrade the content packs, click each of the items under **Installed Content Packs** and verify that the version number of each content pack is the same as or newer than the version listed in the Release Notes for your version of VMware Cloud Foundation.
Workspace ONE Access	If you had Workspace ONE Access in your pre-upgrade environment, you must upgrade it using vRealize Suite Lifecycle Manager. 1 On vRealize Suite Lifecycle Manager UI navigate to the **Lifecycle Operations** tab. Click **Settings > Binary Mapping**. 2 Select **Sync Binaries** to discover the upgrade image for Workspace ONE Access in SDDC Manager. 3 Click **Environments > Global Environment**. The global environment contains the Workspace ONE Access product. To upgrade the Workspace ONE Access product, see "Upgrade VMware Identity Manager" in *vRealize Suite Lifecycle Manager Installation, Upgrade, and Management*.

Component	Additional Information
NSX-T Data Center	Upgrading NSX-T Data Center involves the following components: ■ Upgrade Coordinator ■ NSX Edge clusters (if deployed) ■ Host clusters ■ NSX Manager cluster The upgrade wizard provides some flexibility when upgrading NSX-T Data Center for workload domains. By default, the process upgrades all NSX Edge clusters in parallel, and then all host clusters in parallel. Parallel upgrades reduce the overall time required to upgrade your environment. You can also choose to upgrade NSX Edge clusters and host clusters sequentially. The ability to select clusters allows for multiple upgrade windows and does not require all clusters to be available at a given time. The NSX Manager cluster is upgraded only if the **Upgrade all host clusters** setting is enabled on the NSX-T Host Clusters tab. New features introduced in the upgrade are not configurable until the NSX Manager cluster is upgraded. ■ If you have a single cluster in your environment, enable the **Upgrade all host clusters** setting. ■ If you have multiple host clusters and choose to upgrade only some of them, you must go through the NSX-T upgrade wizard again until all host clusters have been upgraded. When selecting the final set of clusters to be upgraded, you must enable the **Upgrade all host clusters** setting so that NSX Manager is upgraded. ■ If you upgraded all host clusters without enabling the **Upgrade all host clusters** setting, run through the NSX-T upgrade wizard again to upgrade NSX Manager.
vCenter Server	Take a file-based backup of the vCenter Server appliance before starting the upgrade. See Manually Back Up vCenter Server. **Note** After taking a backup, do not make any changes to the vCenter Server inventory or settings until the upgrade completes successfully. If the upgrade fails, resolve the issue and retry the failed task. If you cannot resolve the issue, restore vCenter Server using the file-based backup. See Restore vCenter Server. Once the upgrade successfully completes, use the vSphere Client to change the vSphere DRS Automation Level setting back to the original value for each vSphere cluster that is managed by the vCenter Server. See KB 87631 for information about using VMware PowerCLI to change the vSphere DRS Automation Level.

Component	Additional Information
vSAN witness host	See Upgrade vSAN Witness Host for VMware Cloud Foundation.
ESXi	By default, the upgrade process upgrades the ESXi hosts in all clusters in a domain in parallel. If you have multiple clusters in the management domain or in a VI workload domain, you can select which clusters to upgrade. You can also choose to upgrade the clusters in parallel or sequentially. If you are using external (non-vSAN) storage, updating and patching is a manual task and falls outside of SDDC Manager lifecycle management. To ensure supportability after an ESXi upgrade, consult the vSphere HCL and your storage vendor.

Procedure

1. Navigate to the **Updates/Patches** tab of the management domain.
2. Click **Precheck** to validate that the component is ready to be updated.

   Click **View Status** to see the update status for each component and the tests performed. Expand a test by clicking the arrow next to it to see further details.

   If any of the tests fail, fix the issue and click **Retry Precheck**.

   The precheck results are displayed below the **Precheck** button. Ensure that the precheck results are green before proceeding. A failed precheck may cause the update to fail.
3. Click **Update Now** or **Schedule Update** next to the relevant bundle.

   If you selected **Schedule Update**, select the date and time for the bundle to be applied.
4. The **Update Status** window displays the components that will be upgraded and the upgrade status. Click **View Update Activity** to view the detailed tasks.

   After the upgrade is completed, a green bar with a check mark is displayed.

Upgrade a VI Workload Domain for VMware Cloud Foundation on Dell EMC on VxRail

The management domain in your environment must be upgraded before you upgrade VI workload domains.

To upgrade to VMware Cloud Foundation 4.3, the components in a VI workload domain must be upgraded in the following order:

1. NSX-T Data Center.
2. vCenter Server.
3. vSAN witness host (If you have stretched clusters in your environment).
4. VxRail Manager and ESXi.

5 Workload Management on clusters that have vSphere with Tanzu. Workload Management can be upgraded through vCenter Server. See Working with vSphere Lifecycle Manager.

The upgrade process is similar for all components. Information that is unique to a component is described in the following table.

Component	Additional Information
NSX-T Data Center	Upgrading NSX-T Data Center involves the following components: ■ Upgrade Coordinator ■ NSX Edge clusters (if deployed) ■ Host clusters ■ NSX Manager cluster VI workload domains can share the same NSX Manager cluster and NSX Edge clusters. When you upgrade these components for one VI workload domain, they are upgraded for all VI workload domains that share the same NSX Manager or NSX Edge cluster. You cannot perform any operations on the VI workload domains while NSX-T Data Center is being upgraded. The upgrade wizard provides some flexibility when upgrading NSX-T Data Center for workload domains. By default, the process upgrades all NSX Edge clusters in parallel, and then all host clusters in parallel. Parallel upgrades reduce the overall time required to upgrade your environment. You can also choose to upgrade NSX Edge clusters and host clusters sequentially. The ability to select clusters allows for multiple upgrade windows and does not require all clusters to be available at a given time. The NSX Manager cluster is upgraded only if the **Upgrade all host clusters** setting is enabled on the NSX-T Host Clusters tab. New features introduced in the upgrade are not configurable until the NSX Manager cluster is upgraded. ■ If you have a single cluster in your environment, enable the **Upgrade all host clusters** setting. ■ If you have multiple host clusters and choose to upgrade only some of them, you must go through the NSX-T upgrade wizard again until all host clusters have been upgraded. When selecting the final set of clusters to be upgraded, you must enable the **Upgrade all host clusters** setting so that NSX Manager is upgraded. ■ If you upgraded all host clusters without enabling the **Upgrade all host clusters** setting, run through the NSX-T upgrade wizard again to upgrade NSX Manager.
vCenter Server	If your VI workload domain contains Workload Management enabled clusters, ensure that Workload Management is at version 1.18 or higher. If Workload Management is at a lower version, upgrade Workload Management to at least version 1.18 before upgradingvCenter Server.

Component	Additional Information
	Take a file-based backup of the vCenter Server appliance before starting the upgrade. See Manually Back Up vCenter Server. **Note** After taking a backup, do not make any changes to the vCenter Server inventory or settings until the upgrade completes successfully. If the upgrade fails, resolve the issue and retry the failed task. If you cannot resolve the issue, restore vCenter Server using the file-based backup. See Restore vCenter Server. Once the upgrade successfully completes, use the vSphere Client to change the vSphere DRS Automation Level setting back to the original value for each vSphere cluster that is managed by the vCenter Server. See KB 87631 for information about using VMware PowerCLI to change the vSphere DRS Automation Level.
vSAN witness host	See Upgrade vSAN Witness Host for VMware Cloud Foundation.
ESXi	By default, the upgrade process upgrades the ESXi hosts in all clusters in a domain in parallel. If you have multiple clusters in the management domain or in a VI workload domain, you can select which clusters to upgrade. You can also choose to upgrade the clusters in parallel or sequentially. If you are using external (non-vSAN) storage, updating and patching is a manual task and falls outside of SDDC Manager lifecycle management. To ensure supportability after an ESXi upgrade, consult the vSphere HCL and your storage vendor.

Procedure

1 Navigate to the **Updates/Patches** tab of the VI workload domain.

2 Click **Precheck** to validate that the component is ready to be updated.

Click **View Status** to see the update status for each component and the tests performed. Expand a test by clicking the arrow next to it to see further details.

If any of the tests fail, fix the issue and click **Retry Precheck**.

The precheck results are displayed below the **Precheck** button. Ensure that the precheck results are green before proceeding. A failed precheck may cause the update to fail.

3 Click **Update Now** or **Schedule Update** next to the relevant bundle.

If you selected **Schedule Update**, select the date and time for the bundle to be applied.

4 The **Update Status** window displays the components that will be upgraded and the upgrade status. Click **View Update Activity** to view the detailed tasks.

After the upgrade is completed, a green bar with a check mark is displayed.

Upgrade vSAN Witness Host for VMware Cloud Foundation

If your VMware Cloud Foundation environment contains stretched clusters, update and remediate the vSAN witness host.

Prerequisites

Download the ESXi ISO that matches the version listed in the the Bill of Materials (BOM) section of the *VMware Cloud Foundation Release Notes*.

Procedure

1 In a web browser, log in to vCenter Server at https://*vcenter_server_fqdn*/ui.

2 Upload the ESXi ISO image file to vSphere Lifecycle Manager.

   a Click **Menu > Lifecycle Manager**.

   b Click the **Imported ISOs** tab.

   c Click **Import ISO** and then click **Browse**.

   d Navigate to the ESXi ISO file you downloaded and click **Open**.

   e After the file is imported, click **Close**.

3 Create a baseline for the ESXi image.

   a On the Imported ISOs tab, select the ISO file that you imported, and click **New baseline**.

   b Enter a name for the baseline and specify the **Content Type** as Upgrade.

   c Click **Next**.

   d Select the ISO file you had imported and click **Next**.

   e Review the details and click **Finish**.

4 Attach the baseline to the vSAN witness host.

   a Click **Menu > Hosts and Clusters**.

   b In the Inventory panel, click **vCenter > Datacenter**.

   c Select the vSAN witness host and click the **Updates** tab.

   d Under Attached Baselines, click **Attach > Attach Baseline or Baseline Group**.

   e Select the baseline that you had created in step 3 and click **Attach**.

   f Click **Check Compliance**.

   After the compliance check is completed, the **Status** column for the baseline is displayed as Non-Compliant.

5 Remediate the vSAN witness host and update the ESXi hosts that it contains.

   a Right-click the vSAN witness and click **Maintenance Mode > Enter Maintenance Mode**.

   b Click **OK**.

c Click the **Updates** tab.

d Select the baseline that you had created in step 3 and click **Remediate**.

e In the End user license agreement dialog box, select the check box and click **OK**.

f In the Remediate dialog box, select the vSAN witness host, and click **Remediate**.

The remediation process might take several minutes. After the remediation is completed, the **Status** column for the baseline is displayed as Compliant.

g Right-click the vSAN witness host and click **Maintenance Mode > Exit Maintenance Mode**.

h Click **OK**.