

# VMware Cloud Foundation Operations and Administration Guide

VMware Cloud Foundation 3.7



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# About the VMware Cloud Foundation Operations and Administration Guide

The *VMware Cloud Foundation Operations and Administration Guide* provides information about managing a VMware Cloud Foundation™ system, including managing the system's virtual infrastructure, managing users, configuring and deploying service offerings, and upgrading and monitoring the system.

## Intended Audience

The *VMware Cloud Foundation Operations and Administration Guide* is intended for cloud architects, infrastructure administrators, and cloud administrators who are familiar with and want to use VMware software to quickly deploy and manage an SDDC. The information in this document is written for experienced data center system administrators who are familiar with:

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

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

- VMware vSphere®
- VMware vCenter Server® and VMware vCenter Server® Appliance™
- VMware Platform Services Controller™
- VMware vRealize® Log Insight™
- VMware Horizon®
- VMware App Volumes™

## Related Publications

The *VMware Cloud Foundation Planning and Preparation Guide* provides detailed information about the software, tools, and external services that are required for Cloud Foundation.



The *VMware Cloud Foundation Architecture and Deployment Guide* contains detailed information about a Cloud Foundation system, its components, and the network topology of a deployed system.

# Administering Cloud Foundation Systems

# 1

As an SDDC administrator, you use the information in the *VMware Cloud Foundation Operations and Administration* document to understand how to administer and operate your installed Cloud Foundation system.

An administrator of an Cloud Foundation system performs tasks such as:

- Manage certificates.
- Add capacity to your system.
- Configure and provision the systems and the workload domains that are used to provide service offerings.
- 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 Cloud Foundation software components.

See the *VMware Cloud Foundation Overview and Deployment* document for an introduction to the overview and architecture of a Cloud Foundation system, and detailed descriptions of the software that is deployed in the environment.

This chapter includes the following topics:

- [VMware Software Components Deployed in a Typical Cloud Foundation System](#)
- [Web Interfaces Used When Administering Your Cloud Foundation System](#)

## VMware Software Components Deployed in a Typical Cloud Foundation System

In a typical Cloud Foundation system, you will encounter specific VMware software that SDDC Manager deploys in the system.

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**Note** For information about which specific editions of each VMware product are licensed for use with the Cloud Foundation license, use the information resources at the Cloud Foundation product information page at <http://www.vmware.com/products/cloud-foundation.html>.

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For the exact version numbers of the VMware products that you might see in your Cloud Foundation system after the initial bring-up process, see the *Release Notes* document for your Cloud Foundation version. If the system has been updated after the initial bring-up process using the Life Cycle Management features, see [View Upgrade History](#) for details on how to view the versions of the VMware software components that are within your system.

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**Caution** Do not manually change any of the settings that SDDC Manager sets automatically. If you change the generated settings, like names of VMs, unpredictable results might occur. Do not change settings for the resources that are automatically created and deployed during workflows, the workload domain processes, assigned IP addresses or names, and so on.

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You can find the documentation for the following VMware software products and components at [docs.vmware.com](https://docs.vmware.com):

- vSphere (vCenter Server, Platform Services Controller, and ESXi)
- vSAN
- NSX for vSphere
- vRealize Log Insight
- vRealize Operations
- vRealize Automation

## Web Interfaces Used When Administering Your Cloud Foundation System

You use SDDC Manager loaded in a browser for the single-point-of-control management of your Cloud Foundation system. This user interface provides centralized access to and an integrated view of the physical and virtual infrastructure of your system.

In addition to using the SDDC Manager Dashboard, you can use the following user interfaces for administration tasks involving their associated VMware software components that are part of a VMware SDDC. All these interfaces run in a browser, and you can launch them from within the SDDC Manager Dashboard.

Launch links are typically identified in the user interface by the launch icon: .

VMware SDDC Web Interfaces	Description	Launch Link Location in SDDC Manager Dashboard
vSphere Web interface	This interface provides direct management of resources managed by the vCenter Server instances, for identity management, and for management of the NSX resources that provide the software-defined networking capabilities of the SDDC. You can also manage object level storage policies for distributed software-defined storage provided by vSAN.	<ol style="list-style-type: none"> <li>1 On the SDDC Manager Dashboard, click <b>Inventory &gt; Workload Domains</b>.</li> <li>2 In the Name column, click a workload domain name.</li> <li>3 Click the <b>Services</b> tab.</li> <li>4 Click the appropriate launch link.</li> </ol>
vRealize Log Insight Web interface	When the vRealize Log Insight instance is licensed for use in the system, this interface provides direct access to the logs and event data collected and aggregated in vRealize Log Insight for troubleshooting, trend analysis, and reporting.	<ol style="list-style-type: none"> <li>1 On the SDDC Manager Dashboard, click <b>Inventory &gt; Workload Domains</b>.</li> <li>2 In the Name column, click a workload domain name.</li> <li>3 Click the <b>Services</b> tab.</li> <li>4 Click the appropriate launch link.</li> </ol>

# Getting Started with SDDC Manager

# 2

You use SDDC Manager to perform administration tasks on your Cloud Foundation system. This user interface 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 Dashboard by loading it in a web browser. For the list of supported browsers and versions, see the *Release Notes*.

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**Note** When performing out-of-band (OOB) troubleshooting of hardware, some vendors may use Java-based consoles. Refer to the vendor documentation for supported browsers.

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This chapter includes the following topics:

- [Log In to the SDDC Manager Dashboard](#)
- [Tour of the SDDC Manager User Interface](#)
- [Log out of the SDDC Manager Dashboard](#)

## Log In to the SDDC Manager Dashboard

You access SDDC Manager through the SDDC Manager Dashboard in a supported browser.

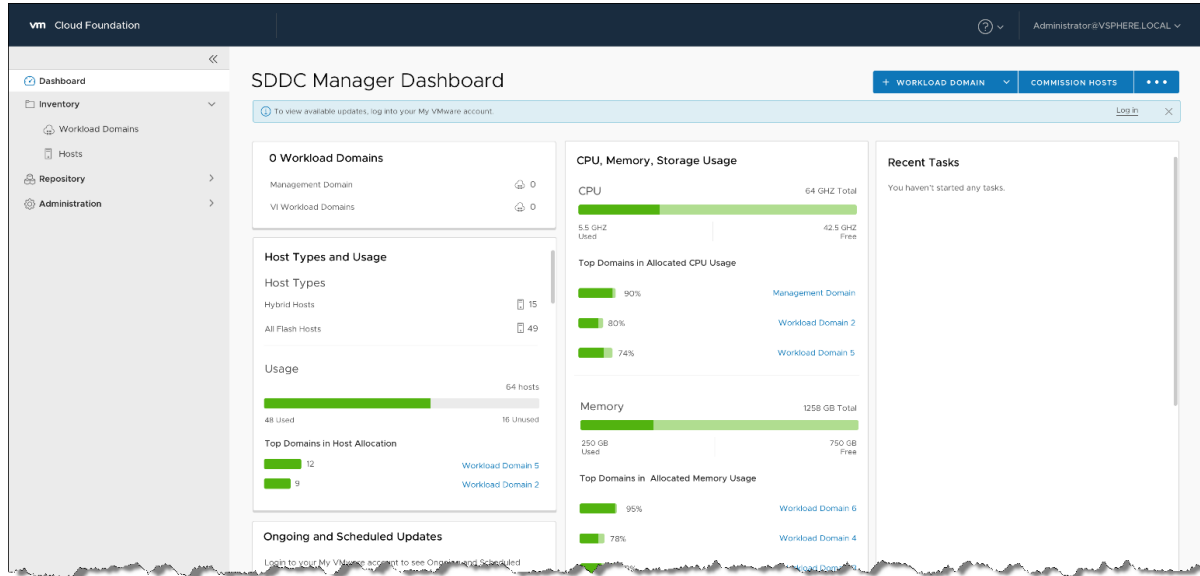
### Prerequisites

To log in, you need the SDDC Manager IP address or FQDN and the password for the vcf user. You had added this information to the deployment parameter worksheet before bring-up.

### Procedure

- 1 In a browser, type one of the following:
  - `https://FQDN` where *FQDN* is the host name of the SDDC Manager.
  - `https://IP_address` where *IP\_address* is the IP address of the SDDC Manager.
- 2 Log in with the following credentials:
  - User name: vcf
  - Password you provided on the deployment parameter worksheet before bring-up

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



## Tour of the SDDC Manager User Interface

SDDC Manager provides the user interface for your single point of control for managing and monitoring your Cloud Foundation system and for provisioning virtual environments.

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

### Navigation Bar

On the left side of the interface is the Navigation bar. The Navigation bar provides a hierarchy for navigating to the corresponding pages.

Category	Functional Areas
<b>Dashboard</b>	<p>The Dashboard provides the high-level administrative view for SDDC Manager features and functions in the form of widgets, including: Workload Domains; CPU, Memory, Storage Usage; Host Types and Usage; Recent Tasks; Ongoing and Scheduled Updates; Update History; and more.</p> <p>You can control which widgets display and how they are arranged on dashboard.</p> <ul style="list-style-type: none"> <li>■ To rearrange the widgets, click the heading of the widget and drag it into the desired position.</li> <li>■ To hide a widget, hover the mouse anywhere over the widget to reveal the <b>X</b> in the upper-right corner, and click the <b>X</b>.</li> <li>■ To add a widget to the dashboard, click the three dots adjacent to the Commission Hosts button in the upper right corner of the page and select <b>Add New Widgets</b>. This displays all hidden widgets and enables you to select them.</li> </ul>
<b>Inventory</b>	<p>The Inventory category directs you to the following destinations:</p> <ul style="list-style-type: none"> <li>■ Click <b>Workload Domains</b> to go directly to the Workload Domains page, which displays and provides access to all current workload domains and controls for managing workload domains.</li> </ul> <p>This page includes detailed status and information about all existing workload domains, including IP addresses, health status, owner, number of hosts, update status, and more. It also displays CPU, memory, and storage utilization for each workload domain, and collectively across all domains.</p> <ul style="list-style-type: none"> <li>■ Click <b>Hosts</b> to go directly to the Hosts page, which displays and provides access to all current hosts and controls for managing hosts.</li> </ul> <p>This page includes detailed status and information about all existing hosts, including IP addresses, network pool, health status, domain and cluster assignment, and storage type. It also displays CPU, memory, and storage utilization for each host, and collectively across all hosts.</p>

Category	Functional Areas
<b>Repository</b>	<p>The Repository category directs you to the following destinations:</p> <ul style="list-style-type: none"> <li>■ Click <b>Bundles</b> to view the Cloud Foundation product bundles in your current deployment.</li> <li>■ Click <b>Download History</b> to view the history of update bundle downloads, including version number, date, and other release details. If a bundle is available but has not yet been downloaded, controls for immediate or scheduled downloading appear next to the bundle.</li> </ul> <hr/> <p><b>Note</b> To access patches and bundles, you must be logged in to your myvmware account through the <b>Administration &gt; Update Management</b> page.</p>
<b>Administration</b>	<p>The Administration category directs you to the following destinations:</p> <ul style="list-style-type: none"> <li>■ Click <b>Network Settings</b> to view and manage network pool settings, including network pool configuration. You can create new pools, and view and modify existing pools. A network pool is a collection of network information with an IP inclusion range reserved for Cloud Foundation. See <a href="#">About Network Pools</a> for more information.</li> <li>■ Click <b>Licensing</b> to manage VMware product licenses. Add the licenses for the component products that comprise your Cloud Foundation deployment. See <a href="#">Select Licenses</a> for more information.</li> <li>■ Click <b>Users</b> to manage Cloud Foundation users and groups, including creating users and groups, setting privileges, assigning roles, and so on.</li> <li>■ Click <b>Update Management</b> to log in to your myvmware account, and gain access to patch and update bundles.</li> <li>■ Click <b>vRealize Suite</b> to deploy and manage vRealize Automation, vRealize Operations, and vRealize Log Insight as components of Cloud Foundation.</li> </ul> <p>See <a href="#">Chapter 11 vRealize Suite Products and Cloud Foundation</a> for details.</p> <ul style="list-style-type: none"> <li>■ Click <b>Security</b> to configure your certificate authorities. See <a href="#">Configure Certificate Authority</a>.</li> <li>■ Click <b>VMware CEIP</b> to enroll in the VMware Customer Improvement Plan. This plan 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).</li> </ul>



## Log out of the SDDC Manager Dashboard

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

### Procedure

- 1 In the SDDC Manager Dashboard, open the logged-in account menu by clicking the down arrow next to the account name in the upper right corner.
- 2 Click the menu choice to log out.

# Managing Users and Groups

# 3

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 Dashboard as well as the vCenter Server instances that are deployed in your Cloud Foundation system.

You had provided a password for the superuser account (user name vcf) in the deployment parameter sheet before bring-up. After Cloud Foundation is deployed, you can log in with the superuser credentials and then add vCenter Server or AD users or groups to Cloud Foundation. Authentication to the SDDC Manager Dashboard uses the VMware vCenter<sup>®</sup> Single Sign-On authentication service that is installed with the Platform Services Controller feature during the bring-up process for your Cloud Foundation system.

This chapter includes the following topics:

- [Assign Cloud Foundation Role to AD Users or Groups](#)
- [View Role Details](#)
- [Remove Cloud Foundation Role for a User or Group](#)

## Assign Cloud Foundation Role to AD Users or Groups

You can assign the Cloud Admin role to AD users or groups so that they can log in to SDDC Manager with their AD credentials.

### Procedure

- 1 Log in to the SDDC Manager Dashboard with your superuser credentials.
- 2 Click **Administration > Users**.
- 3 Click **+ User or Group**.
- 4 Select one or more user 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.
- 5 Scroll down to the bottom of the page and click **Add**.

The Cloud Admin role is assigned to the selected user or group.

## View Role Details

The Cloud Admin role has read, write, and delete privileges.

### Procedure

- 1 On the SDDC Manager, click **Administration > Users**.
- 2 In the Role column, click Cloud Admin.

The Role Details page displays privilege for the Cloud Admin role.

## Remove Cloud Foundation Role for a User or Group

You can remove the Cloud Admin role from an AD user or group. The removed user or group will not be able to log in to the SDDC Manager Dashboard.

### Procedure

- 1 On the SDDC Manager Dashboard, click **Administration > Users**.
- 2 Hover your mouse in the user or group row that you want to remove.  
Three dots appear to the left of the user/group name column.
- 3 Click the dots and click **Remove User**.

The Cloud Admin role is removed for the specified user.

# Managing Certificates for Cloud Foundation Components

# 4

You can manage certificates for all external-facing Cloud Foundation component resources, including configuring a certificate authority, generating and downloading CSRs, and installing them. This section provides instructions for using both Microsoft and non-Microsoft certificate authorities.

You can manage the certificates for the following components.

- Platform Services Controllers
- vCenter Server
- NSX Manager
- SDDC Manager
- vRealize Automation
- vRealize Log Insight
- vRealize Operations

You replace certificates for the following reasons:

- Certificate has expired or is close to expiring.
- Certificate has been revoked.
- You do not want to use the default VMCA certificate.
- Optionally, when you create a new workload domain.

However, it is recommended that you replace all certificates right after deploying Cloud Foundation. After you create new workload domains, you can replace certificates for the appropriate components as needed.

## Procedure

### 1 [View Certificate Information](#)

You can view details of a currently active certificate for a component resource directly in the SDDC Manager Dashboard.

### 2 [Configure Certificate Authority](#)

Before you can generate and install certificates, you must configure a certificate authority (CA).

### 3 Install Certificates with the Microsoft Certificate Authority

You can generate a CSR and signed certificates, and install them for selected resource components directly in the SDDC Manager Dashboard.

### 4 Install Certificates with Non-Microsoft Certificate Authority

If you intend to generate and install non-Microsoft CA certificates, you must download the certificate signing request (CSR) from the SDDC Manager Dashboard and have it manually signed by a third-party CA. You can then use the controls in the SDDC Manager Dashboard to install the certificate.

### 5 Clean Out Old or Unused Certificates

Old or unused certificates are stored in a trust store in SDDC Manager. You can delete old certificates through the SDDC Manager VM.

## View Certificate Information

You can view details of a currently active certificate for a component resource directly in the SDDC Manager Dashboard.

### Procedure

- 1 In the SDDC Manager Dashboard, click **Inventory > Workload Domains**.

The Workload Domains page displays information for all workload domains.

- 2 In the list of domains, click the name of the workload domain to open the details page for that domain.

The workload domain details page displays CPU, memory, and storage allocated to the domain.

- 3 Select the **Security Tab**.

This tab lists the certificates for each Cloud Foundation resource component, including the following details:

- Issuer, such as Certificate Authority.
- Start and finish dates for certificate validity.
- Current certificate status: Active, Expiring (will expire within 15 days), or Expired.
- Certificate operation status.

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

The expanded field displays certificate details including signature algorithm, public key, public key algorithm, certificate string, and more.

## Configure Certificate Authority

Before you can generate and install certificates, you must configure a certificate authority (CA).

Cloud Foundation supports only the Microsoft CA.

## Prerequisites

- Verify that you have created a Microsoft Active Directory certificate service (.certsrv) template in an IIS container on a CA address server.
- Verify that the certificate service template is properly configured for basic authentication.

To create the certificate service template with the proper authentication configuration, see [Prepare the Certificate Service Template](#).

## Procedure

- 1 Navigate to **Administration > Security > Certificate Management** to open the Configure Certificate Authority page.
- 2 Complete the following configuration settings.

Option	Description
<b>Certificate Authority</b>	Select the CA from the dropdown menu. The default is <b>Microsoft</b> .
<b>CA Server URL</b>	Specify the URL for the CA address server. This address must begin with <b>https://</b> and end with <b>certsrv</b> , for example <b>https://www.mymicrosoftca.com/certsrv</b>
<b>Username</b>	Provide a valid username to enable access to the address server.
<b>Password</b>	Provide a valid password to enable access to the address server.
<b>Template Name</b>	Enter the certsrv template name. You must create this template in Microsoft Certificate Authority.

- 3 Click **Save**.  
A dialog appears, asking you to review and confirm the CA server certificate details.
- 4 Click **Accept** to complete the configuration.

The CA is now available for use in generating and installing a certificate.

## Prepare the Certificate Service Template

To ensure that Cloud Foundation can successfully pass authentication when replacing certificates, you must create the certificate service template with the proper basic authentication configuration through the IIS manager.

## Procedure

- 1 Create a Microsoft Active Directory CA with the following features and settings.
  - a Navigate to **Select server roles**.
  - b Under **Active Director Certificate Services**, select **Certification Authority** and **Certification Authority Web Enrollment**.
  - c Under **Web Server (IIS) > Web Server > Security**, select **Basic Authentication**.

- 2 Configure and issue a VMware Certificate Template for **Machine SSL and Solution User certificates** on this CA server.

For step by step procedures, see Knowledge Base article 2112009 [Search Creating a Microsoft Certificate Authority Template for SSL certificate creation in vSphere 6.x](#) .

- 3 Configure the certificate service template and all sites (including default web site) for basic authentication.
  - a Access the IIS manager and navigate to **Server > Sites > Default Web Site > CertSrv**.
  - b Select the Authentication property in the IIS header.
  - c Select and enable **Basic Authentication**.
  - d Restart the site.

#### What to do next

Use this template when configuring the certificate authority in [Configure Certificate Authority](#).

## Add OpenSSL CA support

To generate the OpenSSL Certificate Authority (CA) signed certificates for the VMware Cloud Foundation environment:

#### Procedure

- 1 To configure the OpenSSL CA settings before generating the certificates, navigate to **Administration > Security > Certificate Management**.
- 2 In the Configure Certificate Authority page, select **OpenSSL** for **Certificate Authority**. Provide the required information.

**Table 4-1.**

Attribute	Description
Common Name	Specify the FQDN of OpenSSL CA.
Organization Unit	Use this field to differentiate between divisions within your organization with which this certificate is associated.
Organization	Specify the name under which your company is legally registered. 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.

**Table 4-1. (continued)**

Attribute	Description
State	Enter the full name (do not abbreviate) of the state, province, region, or territory where your company is legally registered.
Country	Enter the country name where your company is legally registered. This value must use the ISO 3166 as the country code.

Click **Save**.

- 3 To generate the OpenSSL CA signed certificates, navigate to **Inventory > Workload Domains > Select Domain**.
- 4 Under the **Security** tab, click **Generate Signed Certificates**.
- 5 The **Generate Signed Certificates** pop-up appears. Select **OpenSSL** as the Certificate Authority.
- 6 Click **Generate Certificates**.

## Install Certificates with the Microsoft Certificate Authority

You can generate a CSR and signed certificates, and install them for selected resource components directly in the SDDC Manager Dashboard.

### Prerequisites

- Verify that the bring-up process is complete and successful.
- Verify that you have configured the Certificate Authority, as described in [Configure Certificate Authority](#).

### Procedure

- 1 In the SDDC Manager Dashboard, click **Inventory > Workload Domains**.  
The Workload Domains page displays information for all workload domains.
- 2 In the list of domains, click the name of the workload domain to open the details page for that domain.  
The workload domain details page displays CPU, memory, and storage allocated to the domain.
- 3 Select the **Security Tab**.  
This tab lists the default certificates, among other details, for the Cloud Foundation resource components. It also provides controls for working with certificates.

**Note** You can view the current certificate and key information for a component by clicking the down-arrow icon next to the name.



#### 4 Generate the CSR.

- a Use the check boxes to select the resource components for which you want to generate the CSR.
- b Click **Generate CSR**.

The Generate CSRs dialog box opens.

- c Configure the following settings for the CSR.

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

- d Click **Generate CSR**.

The Generate CSRs dialog box closes. The Security tab displays a status of `CSR Generation is in progress`. When the CSR generation completes, the **Generate Signed Certificates** button becomes active.

#### 5 Generate the signed certificates.

- a Leave all the resource components selected.
- b Click **Generate Signed Certificates**.

The Generate Signed Certificates dialog box appears, listing the selected components.

- c For the Select Certificate Authority, select the desired authority, and click **Generate Certificate**.

The Generate Signed Certificates dialog box closes. The Security tab displays a status of `Certificates Generation is in progress`. When the certificate generation completes, the **Install Certificates** button becomes active.

## 6 Click **Install Certificates**.

The Security tab displays a status of Certificates Installation is in progress.

---

**Note** As installation completes, the Certificates Installation Status column for each selected resource component in the list changes to Successful with a green check mark.

---

**Important** If you selected SDDC Manager as one of the resource components, you must manually restart SDDC Manager services to reflect the new certificate and to establish a successful connection between Cloud Foundation services and other resources in the management domain.

---

**Important** If you selected vRealize Automation as one of the resource components, you must ensure that the vRealize Automation resource root certificate is trusted by all the vRealize Automation VMs in your deployment.

---

## 7 Restart all services using the provided `sddcmanager_restart_services.sh` script.

To restart the service:

- a Using SSH, log in to the SDDC Manager VM with the following credentials:

Username: **vcf**

Password: use the password specified in the deployment parameter sheet

- b Enter **su** to switch to the root user.

- c Run the following command:

```
sh /opt/vmware/vcf/operationsmanager/scripts/cli/sddcmanager_restart_services.sh
```

### What to do next

If you have replaced the certificate for the vRealize Operations Manager resource component, you must reconfigure the load balancer node. See [Configure SSL Passthrough for vRealize Operations Manager](#) .

## Install Certificates with Non-Microsoft Certificate Authority

If you intend to generate and install non-Microsoft CA certificates, you must download the certificate signing request (CSR) from the SDDC Manager Dashboard and have it manually signed by a third-party CA. You can then use the controls in the SDDC Manager Dashboard to install the certificate.

### Prerequisites

Verify that you have configured and packaged your certificate authority configuration files in the form of a `.tar.gz` file. The contents of this archive must adhere to the following structure:

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

- The PEM-encoded root CA certificate chain file (`rootca.crt`) must reside inside this top-level directory.
- This directory must contain one sub-directory for each component resource.

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

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

- Each sub-directory must contain a corresponding `.csr` file, whose name must exactly match the resource as it appears in the Resource Type column in the **Workload Domains > Security** tab.

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

- Each sub-directory must contain a corresponding `.crt` file, whose name must exactly match the resource as it appears in the Resource Type column in the **Workload Domains > Security** tab.

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

---

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

---

#### Procedure

- 1 In the SDDC Manager Dashboard, navigate to **Inventory > Workload Domains**.

The Workload Domains page displays information for all workload domains.

- 2 In the list of domains, click the name of the workload domain to open the details page for that domain.

The workload domain details page displays CPU, memory, and storage allocated to the domain.

- 3 Select the **Security Tab**.

This tab lists the default certificates, among other details, for the Cloud Foundation resource components. It also provides controls for working with certificates.

---

**Note** You can view the current certificate and key information for a component by clicking the down-arrow icon next to the name.

---

- 4 Generate the CSR.

- a Use the check boxes to select the resource components for which you want to generate the CSR.
- b Click **Generate CSR**.

The Generate CSRs dialog box opens.

- c Configure the following settings for the CSR.

Option	Description
<b>Algorithm</b>	Select the key type for the certificate. RSA (the default) is typically used. The key type defines the encryption algorithm for communication between the hosts.
<b>Key Size</b>	Select the key size (2048, 3072 or 4096 bit) from the dropdown list.
<b>Email</b>	Optionally, enter a contact email address.
<b>Organization Unit</b>	Use this field to differentiate between divisions within your organization with which this certificate is associated.
<b>Organization</b>	Type name under which your company is legally registered. The listed organization must be the legal registrant of the domain name in the certificate request.
<b>Locality</b>	Type the city or locality where your company is legally registered.
<b>State or Province Name</b>	Type the full name (do not abbreviate) of the state, province, region, or territory where your company is legally registered.
<b>Country</b>	Type the country name where your company is legally registered. This value must use the ISO 3166 country code.

- d Click **Generate CSR**.

The Generate CSRs dialog box closes. The Security tab displays a status of CSR Generation is in progress. When CSR generation is complete, the **Download CSR** button becomes active.

- 5 Click **Download CSR** to download and save the CSR files to the directory structure described in the Prerequisites section above.
- 6 External to the SDDC Manager Dashboard, complete the following tasks:
  - a Verify that the different `.csr` files have successfully generated and are allocated in the required file structure.
  - b Get the certificate requests signed.  
This will create the corresponding `.crt` files.
  - c Verify that the newly acquired `.crt` files are correctly named and allocated in the required file structure.
  - d Package the file structure as `<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.  
After you select the file, the **Upload** button becomes active.
- 9 Click **Upload**.  
When upload is complete, the **Install Certificate** button becomes active.

**10 Click Install Certificate.**

The Security tab displays a status of Certificates Installation is in progress.

**Note** As installation completes, the Certificates Installation Status column for the affected components in the list changes to Successful with a green check mark.

**Important** If you selected SDDC Manager as one of the resource components, you must manually restart SDDC Manager services to reflect the new certificate and to establish a successful connection between Cloud Foundation services and other resources in the management domain.

**Important** If you selected vRealize Automation as one of the resource components, you must ensure that the vRealize Automation resource root certificate is trusted by all the vRealize Automation VMs in your deployment.

**11 Restart all services using the provided `sddcmanager_restart_services.sh` script.**

To restart the service:

- a Using SSH, log in to the SDDC Manager VM with the following credentials:

Username: **vcf**

Password: use the password specified in the deployment parameter sheet

- b Enter **su** to switch to the root user.

- c Run the following command:

```
sh /opt/vmware/vcf/operationsmanager/scripts/cli/sddcmanager_restart_services.sh
```

**What to do next**

If you have replaced the certificate for the vRealize Operations Manager resource component, you must reconfigure the load balancer node. See [Configure SSL Passthrough for vRealize Operations Manager](#) .

## Clean Out Old or Unused Certificates

Old or unused certificates are stored in a trust store in SDDC Manager. You can delete old certificates through the SDDC Manager VM.

**Procedure**

- 1 Using SSH, log in to the SDDC Manager VM with the following credentials:

Username: **vcf**

Password: use the password specified in the deployment parameter sheet

- 2 Enter **su** to switch to the root user.

- 3 Change to the `/opt/vmware/vcf/operationsmanager/scripts/cli` directory.

```
cd /opt/vmware/vcf/operationsmanager/scripts/cli
```

- 4 From the `/opt/vmware/vcf/operationsmanager/scripts/cli` directory, use the following script and command to discover the names of the certificates in the trust store.

```
sddcmanager-ssl-util.sh -list
```

- 5 Using the name of the certificate, delete the old or unused certificate.

```
sddcmanager-ssl-util.sh -delete <certificate alias name from list>
```

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

See [Explore Certificate Stores from the vSphere Client](#) in the vSphere product documentation.

# License Management

# 5

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

- VMware vSphere
- VMware vSAN
- VMware NSX for vSphere
- vCenter
- VMware vRealize Log Insight for the management domain

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

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

This chapter includes the following topics:

- [Add License Keys for the Software in Your Cloud Foundation System](#)
- [Edit License Description](#)
- [Enable vRealize Log Insight Logging for Workload Domains](#)
- [Delete License Key](#)

## Add License Keys for the Software in Your Cloud Foundation System

You can add licenses to the Cloud Foundation license inventory.

### Procedure

- 1 On the SDDC Manager Dashboard, navigate to **Administration > Licensing**.
- 2 Click **+ License Key**.
- 3 Select the product key for which you are entering a license key.

- 4 Type the license key.
- 5 Type a description for the license.

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.

- 6 Click **Add**.

## 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 On the SDDC Manager Dashboard, navigate to **Administration > Licensing**.
- 2 Hover your mouse in the license row that you want to edit.  
A set of three dots appear on the left of the product name.
- 3 Click the dots and then click **Edit Description**.
- 4 On the Edit License Key Description window, edit the description as appropriate.
- 5 Click **Save**.

## Enable vRealize Log Insight Logging for Workload Domains

During the bring-up process, vRealize Log Insight is deployed and configured to collect logs from the management domain components (vSphere, NSX Manager, and SDDC Manager). To enable logging on VI workload domains, you must provide your own license for vRealize Log Insight. After you enter the license key on the vRealize Log Insight UI and enable logging in Cloud Foundation, workload domains are automatically connected to vRealize Log Insight.

Once logging is enabled for workload domains, you cannot disable this setting.

### Procedure

- 1 On the SDDC Manager Dashboard, click navigate to **Administration > vRealize Suite**.
- 2 Click **vRealize Log Insight**.
- 3 Click the **vRealize Log Insight** link.
- 4 Login to vRealize Log Insight with the admin credentials you provided in the deployment parameters sheet before bring-up.
- 5 Navigate to **Administration > Management > License**.



- 6 Click **Add New License**.
- 7 Enter the license key and click **Add License**.
- 8 Verify that the license you added is displayed in the license table and the status is active.  
Cloud Foundation connects vRealize Log Insight to workload domains.
- 9 On the SDDC Manager Dashboard, click **Enable** in the Enable Logging for all Workload Domains window.

Cloud Foundation connects the vSphere and NSX components for all existing workload domains to vRealize Log Insight. Workload domains created after enabling logging are automatically connected to vRealize Log Insight.

## Delete License Key

Deleting a license key removes the license from the Cloud Foundation license inventory. If the license has been applied to any workload domain, host, or cluster, the license continues to work for them.

### Procedure

- 1 On the SDDC Manager Dashboard, navigate to **Administration > Licensing**.
- 2 Hover your mouse in the license row that you want to edit.  
A set of three dots appear on the left of the product name.
- 3 Click the dots and then click **Remove Key**.
- 4 On the Remove Key dialog box, click **Remove**.

The license is removed from the Cloud Foundation license inventory

# Composability

# 6

With composability, you can dynamically configure servers to meet the needs of your workloads without physically moving any hardware components. You bind disaggregated hardware components (compute, network, storage, and offload components) together to create a logical system based on the needs of your applications. These logical systems function like traditional rack mount systems.

The Cloud Foundation composability feature is available for HPE Synergy and Dell MX servers and uses the Redfish translation layer to connect to the composable hardware infrastructure. Redfish Translation Layer supports data models used to get composable resources and zones restrictions from the hardware infrastructure. It is designed to be extensible and vendor agnostic. You must obtain and install the Redfish appliance from the composable hardware vendor.

It is recommended that you compose and decompose servers only through Cloud Foundation, and not through the vendor software.

---

**Note** Ensure that you follow the restriction on storage sled placement on Dell MX servers. Refer to vendor documentation for more information.

---

This chapter includes the following topics:

- [Configure Translation Layer](#)
- [Compose a Server](#)
- [View Composability Information](#)
- [Decompose a Server](#)

## Configure Translation Layer

Redfish translation layer is the interface between SDDC Manager and hardware vendor. You must configure this translation layer by providing the Redfish translation layer URL and credentials.

**Procedure**

- 1 As a best practise, increase the queue capacity for the thread pool.
  - a Open the `application-prod.properties` file:
 

```
vi /opt/vmware/vcf/operationsmanager/config/application-prod.properties
```
  - b Update the queue capacity line as follows:
 

```
om.executor.queuecapacity=300
```
  - c Save and close the file.
- 2 If you are using a self-signed certificate, import the Redfish certificate from the Redfish VM to SDDC Manager VM by following the steps below. If you are using a CA signed certificate, skip to step 3.
  - a Using SSH, log in to the SDDC Manager VM with the following credentials:
 

Username: `vcf`

Password: use the password specified in the deployment parameter sheet
  - b Enter `su` to switch to the root user.
  - c Import the Redfish certificate from the Redfish VM to SDDC Manager VM by running the following command:

```
/opt/vmware/vcf/commonsvcs/scripts/cert-fetch-import-refresh.sh --ip=redfish-ip --port=port --
service-restart=operationsmanager

ip Specify translation layer IP
port TLS/SSL port
```

The output displays information about the certificate to import including owner, issuer, serial number, validity, certificate fingerprints (md5, sha1, or sha256), signature algorithm name, subject, public key algorithm, and version. Verify this information.

- d Answer the prompt.
- 3 Restart Operations Manager:
 

```
systemctl restart operationsmanager
```

Wait for a few minutes before proceeding to the next step.
  - 4 On the SDDC Manager Dashboard, click **Administration > Composable Infrastructure**.
  - 5 Enter the URL for the Redfish translation layer.
  - 6 Enter the user name and password for the Redfish translation layer.
  - 7 Click **Connect**.

## Compose a Server

You can compose one or more servers by selecting the compute, network, and storage resources.

## Prerequisites

- The translation layer must have been configured.
- The composed server must meet the minimum hardware requirements. See the *VMware Cloud Foundation Planning and Preparation Guide*.

## Procedure

- 1 On the SDDC Manager Dashboard, click **Administration > Composable Infrastructure**.
- 2 From the Available Resources table, select the zone where you want to compose a server. A zone corresponds to a physical boundary.
- 3 Click **Compose**.
- 4 In the Allocate Resources dialog box, select the compute for the server.
- 5 Select the storage.
- 6 Select the network interface.

The Choose number of servers section displays the number of servers you can compose based on the selected resources.

- 7 Select the number of servers you want to compose.
- 8 Click **Next**.
- 9 On the Review page, review the allocated resources to the servers.  
Click **Back** to make any changes.
- 10 Click **Compose**.

The compose server task is displayed in the Tasks table at the bottom of the Composable Infrastructure page. Click the name of the task for more information. When the server is composed, it is added to the Server Composition Summary table.

If Cloud Foundation does not receive a response from Redfish due to an external error, an error message is displayed. The hardware resources in the compose request are locked and cannot be used. You must free up these resources using the vendor UI. For more information, refer to the vendor documentation.

## What to do next

- 1 Image the composed servers. See [Chapter 7 Installing ESXi Software on Cloud Foundation Servers](#).
- 2 Commission the composed servers. See [Commission Hosts](#).

## View Composability Information

The Composable Infrastructure page displays information about available resources and composed servers.

### Procedure

- ◆ On the SDDC Manager Dashboard, click **Administration > Composable Infrastructure**.

The Composable Infrastructure page appears. The Redfish translation layer information is displayed on the top of the page.

The Available Resources table displays the available zones and computer, storage, and network information available in each zone.

The Server Composition Summary table displays the composed servers.

The task panel at the bottom of the page shows the tasks performed and their status.

## Decompose a Server

You can decompose a server that has not been assigned to a VI workload domain.

### Prerequisites

The server to be decomposed must be unassigned.

### Procedure

- 1 On the SDDC Manager Dashboard, click **Administration > Composable Infrastructure**.
- 2 From the Server Composition Summary table, select the server to be decomposed.
- 3 Click **Decompose**.
- 4 In the Decompose Servers dialog box, click **Decompose**.

# Installing ESXi Software on Cloud Foundation Servers

# 7

You can use the VMware Imaging Appliance (VIA) included with the Cloud Builder VM to image servers for use in the management domain and VI workload domains.

You can use VIA to image servers prior to adding them to Cloud Foundation as part of the host commissioning process. For information about imaging servers prior to bring-up, see the *VMware Cloud Foundation Architecture and Deployment Guide*.

You must have access to the Cloud Builder VM to use the VMware Imaging Appliance. If you deleted VIA after bring-up, you can redeploy it as described in "Deploy Cloud Foundation Builder VM" in the *VMware Cloud Foundation Architecture and Deployment Guide*.

## Server Prerequisites

The servers that you image must meet certain prerequisites:

- PXE Boot is configured as primary boot option
- Install device is configured as the second boot option
- Legacy boot mode configured in BIOS (UEFI boot mode is not supported)
- Servers are in the same L2 domain as the Cloud Builder VM
- Servers are reachable over an untagged VLAN/Network (VLAN ID 0)
- The Cloud Builder VM is deployed on an untagged VLAN/Network
- Server hardware/firmware should be configured for virtualization and vSAN and match the Cloud Foundation BOM as described in the Release Notes
- Physical hardware health status should be "healthy" without any errors
- Any onboard NICs are disabled on the servers and only the two 10 GbE NICs reserved for use with Cloud Foundation are enabled in BIOS

The default root credentials for servers imaged with VIA are user **root**, password **EvoSddc!2016**.

This chapter includes the following topics:

- [Download ESXi Software and VIBs](#)
- [Provide Network Information for Imaging](#)
- [Upload ISOs and VIBs to the VMware Imaging Appliance](#)

- [Image Servers with ESXi and VIBs](#)
- [Post-Imaging Tasks](#)

## Download ESXi Software and VIBs

In order to image your servers, you need to download an ESXi ISO and any vSphere Installation Bundles (VIBs) required to get the servers to a supported version of ESXi. See the BOM section of the VMware Cloud Foundation Release Notes for information about ESXi support.

You can download the ISO and VIBs from My VMware (<https://my.vmware.com>) to any location on the Windows machine that is connected to the Cloud Builder VM. Make sure to record the MD5 or SHA-1 checksums. You will need them when you upload the ISO/VIB to the VMware Imaging Appliance.

## Provide Network Information for Imaging

You must provide the VMware Imaging Appliance with certain network information specific to your environment before you can image your servers. This information is contained in the `via.properties` file on the Cloud Builder VM.

### Procedure

- 1 SSH into the Cloud Builder VM using the credentials specified when you deployed the VM. See "Deploy Cloud Foundation Builder VM" in the *VMware Cloud Foundation Architecture and Deployment Guide*.
- 2 Type `su` to switch to the root user.
- 3 Navigate to the `/opt/vmware/evorack-imaging/config/` directory.

- 4 Update the `via.properties` file with your network information.
  - a If the Cloud Builder VM is using the `eth0` interface (default), then you do not need to modify any of the properties in Section A. If the Cloud Builder VM has multiple network interfaces and is not using `eth0`, you must update the following properties.

Property	Description
<code>via.network.interface</code>	Interface of the Cloud Builder VM configured in management network.
<code>via.web.url</code>	The IP address used to access the VMware Imaging Appliance UI. Update this with the IP address of Cloud Builder VM in the management network.
<code>via.network.ifaceaddr</code>	Update this with the IP address of Cloud Builder VM in the management network.
<code>via.dhcp.esxi.tftpServer</code>	IP address of the server where TFTP is running. Update this with the IP address of Cloud Builder VM in the management network.
<code>via.config.remote.pxe=false</code>	Do not modify.

- b Update Section B with the network information for your environment.

Property	Description
<code>via.dhcp.netmask</code>	Netmask of the management network.
<code>via.dhcp.subnet</code>	Subnet of the management network.
<code>via.dhcp.routers</code>	Gateway IP of the management network.
<code>via.esxi.firewall.allowed.network</code>	CIDR notation for subnet IP of the management network.

- 5 Type `systemctl restart imaging.service` to restart the imaging service.

Wait for the imaging service to restart.

- 6 Type `systemctl status imaging.service` to verify that the imaging service is running.

### What to do next

Log in to the VMware Imaging Appliance and upload software.

## Upload ISOs and VIBs to the VMware Imaging Appliance

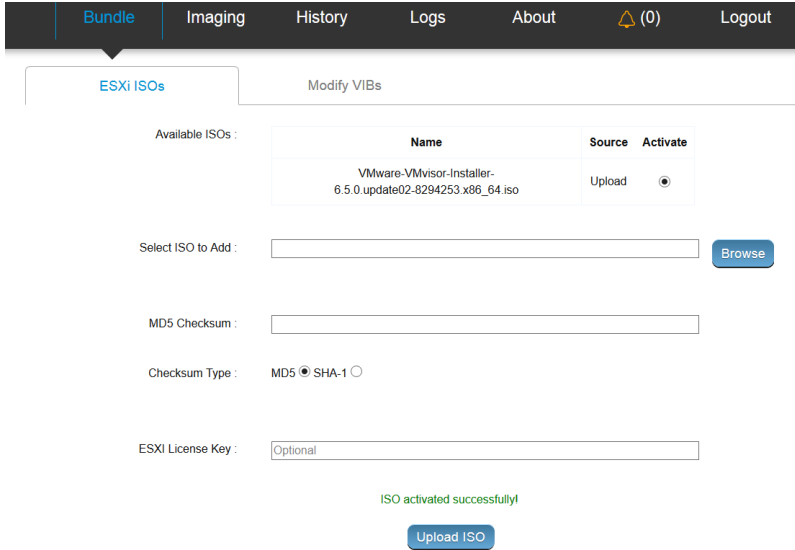
After you have downloaded the required software and updated `via.properties` with your network information, you can upload ISOs and VIBs to the VMware Imaging Appliance.

### Procedure

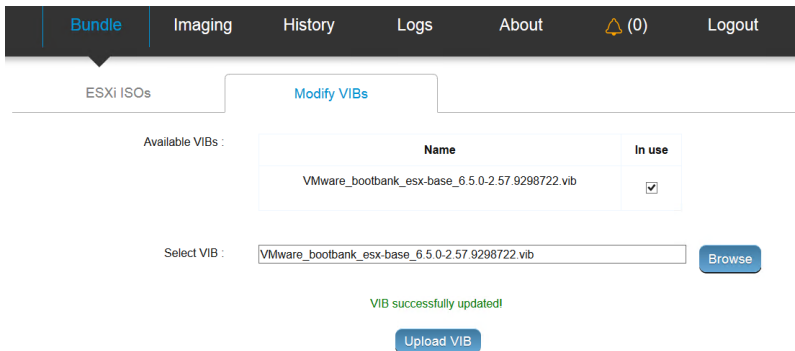
- 1 In a web browser on the Windows machine that is connected to the Cloud Builder VM, navigate to `https://Cloud_Builder_VM_IP:8445/via`.  
The VMware Imaging Appliance page displays.
- 2 Enter the admin credentials you provided when you deployed the Cloud Builder VM and click Log in.
- 3 Click **Bundle** and then click the **ESXi ISOs** tab.



- 4 Click **Browse** to locate and select the ISO.
- 5 Select the checksum type and enter the checksum.
- 6 Click **Upload ISO**.
- 7 When the uploaded ISO appears, select **Activate** to use the ISO for imaging servers.



- 8 Click the **Modify VIBs** tab.
- The steps for uploading VIBs are optional.
- 9 Click **Browse** to locate and select the VIB.
- 10 Click **Upload VIB**.
- 11 When the uploaded VIB appears, select **In use** to use the VIB for imaging servers.



### What to do next

Use the selected ISO and VIB(s) to image servers for use with Cloud Foundation.

# Image Servers with ESXi and VIBs

Once you have uploaded the required ESXi and VIB packages to the VMware Imaging Appliance, you can begin imaging servers. You can image an individual server, or multiple servers at the same time.

You can use VIA to image servers for use in the management domain and VI workload domains. The management domain requires a minimum of four servers. See the *VMware Cloud Foundation Planning and Preparation Guide* for more information about requirements.

**Note** When you image servers, VIA uses the ESXi ISO that you activated and the VIB(s) that you marked as **In use**.

## Procedure

- 1 In a web browser on the Windows machine that is connected to the Cloud Builder VM, navigate to `https://Cloud_Builder_VM_IP:8445/via`.

The VMware Imaging Appliance page displays.

- 2 Enter the admin credentials you provided when you deployed the Cloud Builder VM and click Log in.
- 3 Click Imaging.
- 4 Enter the required information.

Name

Description

ESXI SERVER

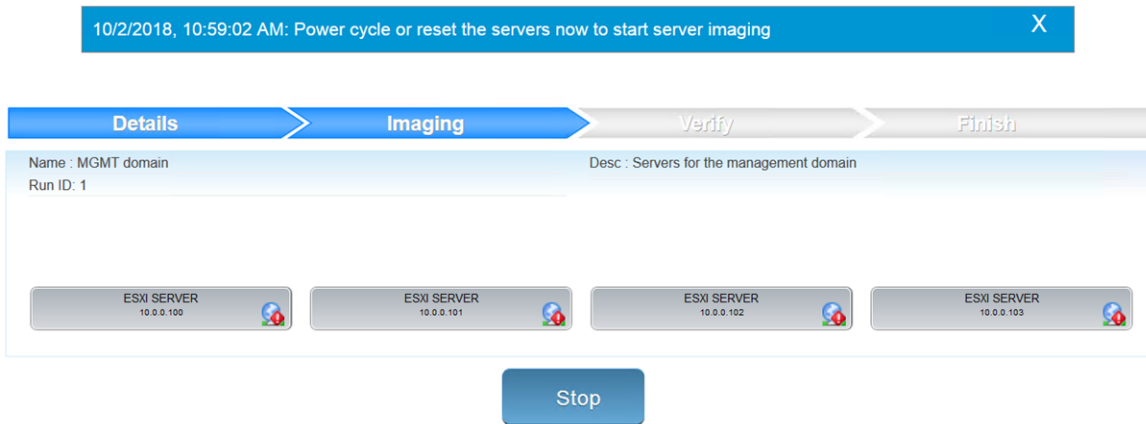
NTP Server:  Number:

①	IP: <input type="text" value="10.0.0.100"/>	MAC: <input type="text" value="02:00:46:d2:08:73"/>	Hostname: <input type="text" value="esxi-1.vrack"/>	Host FQDN: <input type="text" value="esxi-1.vrack.vsphere.local"/>
②	IP: <input type="text" value="10.0.0.101"/>	MAC: <input type="text" value="02:00:46:f6:0c:9c"/>	Hostname: <input type="text" value="esxi-2.vrack"/>	Host FQDN: <input type="text" value="esxi-2.vrack.vsphere.local"/>
③	IP: <input type="text" value="10.0.0.102"/>	MAC: <input type="text" value="02:00:46:7b:c5:0f"/>	Hostname: <input type="text" value="esxi-3.vrack"/>	Host FQDN: <input type="text" value="esxi-3.vrack.vsphere.local"/>
④	IP: <input type="text" value="10.0.0.103"/>	MAC: <input type="text" value="02:00:46:2c:19:4a"/>	Hostname: <input type="text" value="esxi-4.vrack.vsphere"/>	Host FQDN: <input type="text" value="esxi-4.vrack.vsphere.local"/>

Option	Description
<b>Name</b>	Enter a name for the imaging job.
<b>Number</b>	Enter the number of servers you want to image with the selected ISO and VIBs.
<b>Description</b>	Enter a description for the imaging job.
<b>NTP Server</b>	Enter the IP address for the NTP server.
<b>IP</b>	Enter the IP address for the server.
<b>MAC</b>	Enter the MAC address for the server.

Option	Description
Hostname	Enter the hostname for the server.
Host FQDN	Enter the FQDN for the server.

- 5 Click **Start Imaging**.
- 6 When prompted, power cycle the server(s) to continue imaging.



VIA displays information about the progress of imaging. Click a server to view details. Once imaging is complete, VIA performs verification of the servers.

- 7 When verification is finished, click **Complete**.

**What to do next**

Perform post-imaging tasks.

## Post-Imaging Tasks

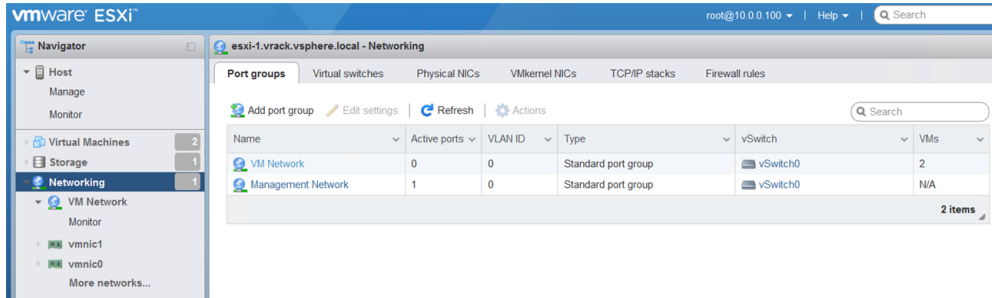
After you image your servers with ESXi and VIBs, you must perform some post-imaging tasks, depending on whether you use an untagged or a tagged management VLAN.

For imaging servers, the VMware Imaging Appliance requires an untagged VLAN. You can continue to use an untagged VLAN for management, or you can use a tagged VLAN.

## Untagged Management VLAN

In this scenario, you use the same network for provisioning and management.

- Ensure that the Management Network and VM Network port groups on each host use the untagged VLAN (VLAN ID 0)



## Tagged Management VLAN

In this scenario, you use an untagged VLAN for provisioning and a tagged VLAN for management.

- Modify the Management Network and VM Network port groups on each host to use the tagged VLAN
- Migrate the hosts from the provisioning network to the management network on the TOR switches

# Adding Hosts to Cloud Foundation

# 8

To add hosts to the Cloud Foundation inventory, you must first create a network pool or expand the default network pool created during bring-up.

For information on network pools, see [About Network Pools](#).

You then commission hosts to Cloud Foundation. During the commissioning process, you associate hosts with a network pool. Commissioned hosts are added to the Cloud Foundation inventory. You can add these hosts to the management domain or to a VI workload domain. When a host is added to a workload domain, an IP address from the network pool's IP inclusion range is assigned to it.

This chapter includes the following topics:

- [About Network Pools](#)
- [Commission Hosts](#)
- [Decommission Hosts](#)
- [Cleaning Up Decommissioned Hosts](#)
- [View Host Inventory](#)

## About Network Pools

Network pools automatically assign static IP addresses to vMotion, vSAN, and NFS vmkernel ports so that you don't need to enter IP addresses manually when creating a VI workload domain or adding a host or cluster to a workload domain.

A network pool is a collection of a set of subnets within an L2 domain. Depending on the storage option you are using, it includes information about subnets reserved for the vMotion and vSAN or NFS networks that are required for adding a host to the Cloud Foundation inventory.

**Table 8-1. Information Required for a Network Pool**

Storage Being Used	Required Networks in Network Pool
vSAN	vMotion and vSAN
NFS	vMotion and NFS
vSAN and NFS	vMotion, vSAN, and NFS

The network pool also contains a range of IP addresses, called an inclusion range. IP addresses from the inclusion ranges are assigned to the vMotion and vSAN or NFS vmkernel ports on the host. The use of inclusion ranges allows you to limit the IP addresses that will be consumed from a given subnet. You can add more inclusion ranges in order to expand the use of the provided subnet.

A default network pool (named `bringup-networkpool`) is created during bring-up. This network pool is automatically associated with the management domain. Network information for this network pool is based on the deployment parameter sheet you provided during bring-up. This network pool contains vMotion and vSAN networks only - an NFS network is not supported in this network pool. If you have a single L2 domain in your environment for management workload domain vSAN and vMotion networks or if you want to expand the management domain by adding a host, you can expand this default network pool.

In order to create a workload domain with hosts in a different L2 domain than the management domain, or if you want to use external NFS storage, you must create a new network pool. A network pool can contain both vSAN and NFS networks.

All hosts in a cluster must be associated with the same network pool. However, a workload domain can contain multiple clusters, each with its own network pool. You may want to have multiple clusters within a workload domain to provide separate fail over domains (i.e. a VM only fails over between hosts in a cluster). Multiple clusters also provide isolation for security reasons and are also useful for grouping servers of a particular type of configuration together. Multiple clusters can also be used to handle growth. Original servers used in the first cluster may get outdated at some point. Newer server models can then be added in a new cluster to the workload domain and workloads can be migrated at a leisurely pace.

## Sizing a Network Pool

Properly sizing a network pool is critical to prevent future issues in the environment due to insufficient IP addresses. Care must be taken when defining the subnets for a network pool as the subnet cannot be changed after it is deployed. The scope of IP addresses used from the defined subnet can be limited by the definition of one or more inclusion ranges. Thus, it is recommended that you begin with defining a larger subnet than what is initially required and utilize the inclusion ranges to limit use. This will provide you the capability to grow with demand as needed.

You begin sizing a network pool by determining the number of hosts that you will have in each cluster. A workload domain must contain a minimum of one cluster. As each cluster leverages vSAN for storage, the minimum number of hosts within a cluster is three. The exception to this rule is the management workload domain. It is recommended that the management workload domain contain a minimum of four hosts. This allows for an additional level of availability for the critical infrastructure components. A cluster can be expanded to the maximum number of hosts supported by vCenter, which is currently 64 hosts.

Allocate a minimum of one IP address per host plus enough additional IP addresses to account for growth and expansion of the environment. Ensure that the subnet defined provides enough unused IP addresses and that appropriate inclusion ranges are defined. Note that some of the IP addresses within the subnet will be used for other purposes, such as defining the gateway address, firewalls, or other entities. Use care not to conflict with these addresses.

Here are some important considerations for determining the size of your network pool:

- Type of network architecture
- Physical switch details
  - Are they managed or non-managed
  - Do they support L3 (this may require a license)
  - Number of ports
- Where the network switches are placed (at the top of the rack or at the end of a row)
- Where the default gateway is created
- Number of hosts that can be placed in each rack or L2 domain
- Number of hosts required in a cluster
- Whether the network switches will be shared with non-Cloud Foundation hosts
- Number of workload domains you plan on creating

## Create a Network Pool

A network pool must include vMotion and storage network information. Storage network information can be either vSAN or NFS. If you are using both storage types, you can have both networks in the same network pool, or create a separate network pool for vSAN and NFS.

The subnet in a network pool cannot overlap the subnet of another pool.

### Procedure

- 1 On the SDDC Manager Dashboard, click **Administration > Network Settings..**
- 2 Click **Create Network Pool.**
- 3 Enter a name for the network pool.
- 4 Select the storage network type.  
You can include both vSAN and NFS network information in the same network pool.
- 5 Provide the following network information for vMotion and the selected storage network type.
  - a Enter a VLAN ID between 1 and 4094.
  - b Enter an MTU between 1500 and 9216.
  - c In the **Network** field, enter a subnet IP address.
  - d Enter the subnet mask.

- e Enter the default gateway.
- f Enter an IP address range from which an IP address can be assigned to hosts that are associated with this network pool.

The IP address range must be from within the specified subnet. You cannot include the IP address of the default gateway in the IP address range. You can enter multiple IP address ranges.

---

**Note** Ensure that you have entered the correct IP address range. IP ranges cannot be edited after the network pool is created.

---

- 6 Click **Save**.

## View Network Pool Details

You can view vSAN and vMotion network details for a network pool as well as the total number of used and available IP addresses.

### Procedure

- 1 On the SDDC Manager Dashboard, click **Administration > Network Settings**.
- 2 Click the arrow to the left of the pool name.  
A high-level summary of the network pool's vSAN and vMotion network information is displayed.
- 3 Click the name of a network pool.  
Network pool details are displayed.

## Edit a Network Pool

You can add an IP inclusion range to a network pool. No other parameters can be modified.

### Procedure

- 1 On the SDDC Manager Dashboard, click **Administration > Network Settings**.
- 2 Hover your mouse in the network pool row that you want to edit.  
A set of three dots appear on the left of the pool name. Click these dots and then click **Edit**.
- 3 Enter an IP inclusion range and click **Add**.
- 4 Click **Save**.

## Delete a Network Pool

You can delete a network pool if none of the hosts with an IP address from this pool belong to a workload domain. The default pool created during bring-up cannot be deleted.



### Prerequisites

Ensure that the hosts in the network pool are not assigned to a workload domain. To verify this, navigate to **Administration > Network Settings** and confirm that the **Used IPs** for the network pool is 0.

### Procedure

- 1 On the SDDC Manager Dashboard, click **Administration > Network Settings**.
- 2 Hover your mouse in the network pool row that you want to delete.

A set of three dots appear on the left of the pool name. Click these dots and then click **Delete**.

## Commission Hosts

Adding hosts to the Cloud Foundation inventory is called commissioning. You can add hosts individually, or use a JSON template to add multiple hosts at once. You can commission a maximum of 32 hosts at a time.

The hosts that you want to commission must meet a set of criteria. After you specify host details and select the network pool to associate a host with, Cloud Foundation validates and commissions each host. Each host is added to the free pool and is available for workload domain creation.

### Prerequisites

Ensure that each host you are commissioning meets the following criteria.

- Host is vSAN compliant and certified on the VMware Hardware Compatibility Guide.
- Host is configured with appropriate gateway. The gateway must be part of the management subnet.
- Hardware health status is healthy without any errors.
- A supported version of ESXi is installed on the host. See the *VMware Cloud Foundation Release Notes* for information about supported versions.
- Host has the drivers and firmware versions specified in the VMware Hardware Compatibility Guide.
- Two NIC ports with a minimum 10 Gbps speed. One port must be free and the other port must be configured on a standard switch. This switch should be restricted to the management portgroup.
- Management IP address is configured on the first NIC port.
- SSH and syslog are enabled.
- DNS is configured for forward and reverse lookup and FQDN.
- All disk partitions on HDD and SSD are deleted.

---

**Note** You must have a network pool available in order to commission a host.

---

### Procedure

- 1 On the SDDC Manager Dashboard, click **Inventory > Hosts**.
- 2 Click **Commission Hosts**.

- 3 Confirm that hosts to be commissioned meet each criterion in the checklist and select the check boxes.
- 4 Click **Proceed**.

- 5 Select whether you want to add hosts one at a time, or import a JSON file to add multiple hosts at once.

The storage type you select for a host (vSAN or NFS), must be supported by its associated network pool. A network pool can support both vSAN and NFS. Hosts that use vSAN storage can only be used with vSAN-based workload domains and hosts that use NFS storage can only be used with NFS-based workload domains.

Option	Description
--------	-------------

<b>Add new</b>	Manually enter the following information for the host you want to add: <ul style="list-style-type: none"> <li>■ FQDN</li> <li>■ Network pool (choose an existing network pool from the list)</li> <li>■ User name and password (root credentials)</li> <li>■ Storage type (vSAN or NFS)</li> </ul>
----------------	--

### Host Addition and Validation ⓘ

You can either choose to add host one at a time or download [JSON](#) template and perform bulk commission.

#### ▼ Add Hosts

Add new  Import

Host FQDN

Network Pool Name ⓘ  ▼

User Name

Password  ⓘ

Storage Type  vSAN  NFS

**ADD**

Click **Add**.

You can now add more hosts or proceed to the next step.

<b>Import</b>	<ol style="list-style-type: none"> <li>a Click the link to download the JSON template.</li> <li>b Open the JSON template file and enter information about the hosts to add.                             <ul style="list-style-type: none"> <li>■ FQDN</li> <li>■ User name and password (root credentials)</li> <li>■ Storage type (vSAN or NFS)</li> <li>■ Network pool name</li> </ul> </li> </ol>
---------------	--

Option	Description
--------	-------------


```

1  {
2      "hostsSpec": [
3          {
4              "hostfqdn": "esxi-5.vrack.vsphere.local",
5              "username": "root",
6              "password": "Er5!x98b",
7              "storageType": "VSAN",
8              "networkPoolName": "bringup-networkpool"
9          },
10         {
11             "hostfqdn": "esxi-6.vrack.vsphere.local",
12             "username": "root",
13             "password": "B89x!5rE",
14             "storageType": "NFS",
15             "networkPoolName": "sfo-networkpool"
16         }
17     ]
18 }

```

- c Click **Browse** to locate and select the JSON file containing host information.
- d Click **Upload**.

The host or hosts appear in the **Hosts Added** section.

- 6 Verify that the server fingerprint is correct for each host and then click the confirm fingerprint icon .
- 7 Click **Validate All**.

Cloud Foundation validates the host information you provided. Each host is marked as **Valid** or **Invalid**.

For invalid hosts, you can correct the problem and validate again, or select the host and click **Remove** to proceed with commissioning the valid hosts.

- 8 Click **Next** to review the host information and then click **Commission** to begin commissioning.

The Hosts page appears and the status of the commission task is displayed. Click **View Status in Task** to display the task bar.

The commissioned hosts are added to the host table. The host belongs to a free pool until you assign it to a workload domain.

## Decommission Hosts

Removing hosts from the Cloud Foundation inventory is called decommissioning. You can decommission a host for maintenance work or if you want to add it to another network pool. If you want to re-use a host in a different workload domain, you must decommission the host and clean it up before adding it to the workload domain.

**Prerequisites**

The hosts that you want to decommission must not be assigned to a workload domain. If a host is assigned to a workload domain, you must remove it before you can decommission it. See [Remove a Host from a Cluster in a Workload Domain](#).

**Procedure**

- 1 On the SDDC Manager Dashboard, click **Inventory > Hosts**.
- 2 Click **Unassigned Hosts**.
- 3 In the hosts table, select the host(s) you want to decommission.
- 4 Click **Decommission Selected Hosts**.
- 5 Click **Confirm**.

The Hosts page appears and the status of the decommission task is displayed. Click **View Status in Task** to display the task bar.

**What to do next**

Clean the decommissioned host before adding it to a workload domain. See [Cleaning Up Decommissioned Hosts](#).

## Cleaning Up Decommissioned Hosts

Before you can add a decommissioned host to a workload domain, you must clean it up.

The best way to clean up a decommissioned host is by using the SoS utility on the SDDC Manager VM. If the SoS utility is unable to clean up the host for some reason, you can use the Direct Console User Interface (DCUI) on the host to perform the cleanup.

### Clean up a Decommissioned Host Using the SoS Utility

A decommissioned host must be cleaned up before it can be assigned to a workload domain. You can use the SoS utility on the SDDC Manager VM to perform host cleanup.

**Prerequisites**

Gather the following information for each host that you want to clean up:

- IP address
- User name and password (root credentials)

**Procedure**

- 1 Using SSH, log in to the SDDC Manager VM with the following credentials:
  - Username: **vcf**
  - Password: use the password specified in the deployment parameter sheet

- 2 Enter **su** to switch to the root user.
- 3 Change to the `/opt/vmware/sddc-support` directory.
- 4 Edit `decommissioned_host_cleanup_sample.json` to include information for the host(s) you want to clean up.
- 5 Type the following command:

```
./sos --cleanup-decommissioned-host
/opt/vmware/sddc-support/decommissioned_host_cleanup_sample.json
```

### What to do next

You can now commission the host to the Cloud Foundation inventory and add it to a workload domain.

## Clean up a Decommissioned Host Using the Direct Console User Interface

A decommissioned host must be cleaned up before it can be assigned to a workload domain. You can use the Direct Console User Interface (DCUI) on the host to perform host cleanup.

### Prerequisites

- You must have access to Direct Console User Interface (DCUI) on the host.
- Gather the following information for the decommissioned host:
  - IP address
  - root password
  - network configuration - netmask, gateway, and DNS
  - VLAN ID

### Procedure

- 1 Log in to the DCUI.
- 2 Navigate to the Troubleshooting Options page and enable ESXI shell.
- 3 Press Alt-F1 to get to the prompt to run command line steps.
- 4 Clean up vSAN with the following command.

```
#vdq -i
#esxcli vsan storage remove -s SSD Device Name
```

For example:

```
[root@esx-6:/tmp] vdq -i
[
  {
    "SSD" : "naa.55cd2e414dc36b15",
    "MD" : [
```

```

        "naa.55cd2e414d7abb5d",
        "naa.55cd2e414d7aa215",
        "naa.55cd2e414d7abb46",
    ]
},
{
  "SSD" : "naa.55cd2e414dc36d53",
  "MD" : [
    "naa.55cd2e414d705c35",
    "naa.55cd2e414d7aa1eb",
    "naa.55cd2e414d7abb10",
  ]
},
]
[root@esx-6:/tmp] esxcli vsan storage remove -s naa.55cd2e414dc36b15
[root@esx-6:/tmp] esxcli vsan storage remove -s naa.55cd2e414dc36d53
[root@esx-6:/tmp] vdq -i
[
]

```

- 5 Reset the system configuration and the root password by running the commands below.

```
/bin/firmwareConfig.sh --reset
```

When you reset the configuration, the software overrides all your network configuration changes, deletes the password for the administrator account (root), and reboots the host.

- 6 Press Alt-F2 to return to the DCUI.
- 7 Reset the root password. This password was deleted during step 5.
- 8 Configure the following network details to the same values that were set on the host before the factory reset.
  - VLAN
  - Set static IPv4 address
  - IP address
  - netmask
  - gateway
- 9 Apply the changes.
- 10 Restart the management network by selecting the Restart Management Network option on the main DCUI page.
- 11 On the Troubleshooting Options page, enable SSH on the host.
- 12 Disable ESXi shell.

### What to do next

You can now commission the host to the Cloud Foundation inventory and add it to a workload domain.

# View Host Inventory

The Hosts page displays details about all the hosts in your Cloud Foundation system, including CPU utilization and memory usage across all hosts, as well as the total number of hosts used and unallocated.

For each host, the Hosts page displays the following information:

- FQDN name
- IP address
- The network pool to which the host belongs
- Current status
- Host state, or the workload domain to which it is allocated
- Cluster or more specifically, the domain cluster to which it is assigned
- Host-specific CPU and memory usage
- Storage type

The Hosts page also provides controls for commissioning hosts.

## Procedure

- 1 From the the SDDC Manager Dashboard, navigate to **Inventory > Hosts**.

The Hosts page appears.

- 2 Navigate directly to pages related to a specific host.

For example:

- To jump to the details page for the domain to which a listed host belongs, click the domain name link in the Host State column. For information about viewing workload domains, see [View Workload Domain Details](#).
- To jump to the details page for the domain cluster to which a listed host belongs, click the cluster name in the Cluster column. For information about clusters, see [Expand a Workload Domain](#).
- To quickly view network assignment details for a specific host, click the info icon next to the value in the Network Pool column.

- 3 To view the details of a specific host, click the FQDN name in the list.

The host details page appears, displaying the following information:

- A chart showing total and used CPU capacity.
- A chart showing total and used memory capacity.
- A summary of the networks (vSAN, vMotion, and Management) to which the host belongs and its IP address on those networks.
- The manufacturer and model of the host.



- Storage information including capacity and cache tiers.

---

**Note** Below the page title, the host details page also provides quick links to the network pool and the workload domain cluster to which the host belongs.

---

- 4 (Optional) To decommission the host from the host details page, click **Actions** near the page name and select **Decommission**.

For details, see [Decommission Hosts](#).

- 5 (Optional) To view host VM details, click **Actions** near the page name and select **Open in ESXi Client**.

The ESXi Client opens.

# Working with the Management Domain and VI Workload Domains

## 9

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

For information on Horizon domains, see [Chapter 10 Working with Horizon Domains](#).

The management domain is created by default during bring-up. The Cloud Foundation software stack is deployed on the management domain. Additional infrastructure virtual machines which provide common services, such as backup or security appliances, can be deployed in the management domain as well.

The management domain and workload domains include these VMware capabilities by default:

### **VMware vSphere<sup>®</sup> High Availability (HA)**

This feature supports distributed availability services for a group of ESXi hosts to provide rapid recovery from outages and cost-effective high availability for applications running in virtual machines. Out of the box, Cloud Foundation provides a highly available environment for workload domains. There may be additional settings (not set by default) that can increase availability even further. For more information about vSphere HA, see the *vSphere Availability* documentation at <https://docs.vmware.com/en/VMware-vSphere/>.

### **VMware vSphere<sup>®</sup> Distributed Resource Scheduler<sup>™</sup> (DRS)**

This feature dynamically allocates and balances computing capacity across a group of hardware resources aggregated into logical resource pools or clusters. Clusters are the primary unit of operation in Cloud Foundation. DRS continuously monitors use across resource pools and allocates available resources among the virtual machines based on predefined rules that reflect business needs and changing priorities. When a virtual machine experiences an increased load, vSphere DRS automatically allocates additional resources by redistributing virtual machines among the physical servers in the resource pool. For more information about DRS, see the

*vSphere Resource Management* documentation at <https://docs.vmware.com/en/VMware-vSphere/>.

## VMware vSAN®

This component aggregates local storage disks in a group of ESXi hosts to create a storage pool shared across all hosts in that group. For more information about vSAN, see the *VMware vSAN* documentation at <https://docs.vmware.com/en/VMware-vSAN/>.

Each Cloud Foundation instance is one SSO domain to which all vCenter Servers are joined. The maximum number of supported workload domains and vCenter Servers per Cloud Foundation instance depends on the vSphere version in the management cluster. For more information, see the *Configuration Maximums vSphere* document.

---

**Note** if you use cross vCenter vMotion between two VI workload domains with dissimilar hardware, you must enable EVC on the corresponding clusters. See [Enable EVC on an Existing Cluster](#) in the vSphere product documentation.

---

This chapter includes the following topics:

- [Adding Virtual Machines to the Management Domain](#)
- [About VI Workload Domains](#)
- [View Workload Domain Details](#)
- [Delete a Workload Domain](#)
- [View Cluster Details](#)
- [Reduce a Workload Domain](#)
- [Expand a Workload Domain](#)

## Adding Virtual Machines to the Management Domain

You can add virtual machines to the management domain as desired. Commonly, these virtual machines provide infrastructure services such as backup or security throughout the solution. To prevent resource conflicts between the core Cloud Foundation services, these additional virtual machines are added to the Compute-ResourcePool. This resource pool is automatically created during bring-up for this purpose.

You must be careful when adding virtual machines to the management domain. You do not want to consume excessive resources that would obstruct standard operations. Excess capacity consumption can cause failures of 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) in order to expand the management workload domain. To expand the management domain, see [Expand a Workload Domain](#).

### Procedure

- 1 On the SDDC Manager Dashboard, navigate to **Inventory > Workload Domains**.
- 2 In the workload domains table, click **MGMT**.

3 On the MGMT page, click the **Services** tab.

4 Click the vCenter link.

This opens the vSphere Web Client for the management domain.

5 Create a VM.

See *Create a New Virtual Machine in vSphere Resource Management*.

---

**Note** Do not move any of the Cloud Foundation management VMs into the resource pool.

---

6 Move the VM to the resource pool.

See *Add a Virtual Machine to a Resource Pool in vSphere Resource Management*.

---

**Note** Do not move any of the Cloud Foundation management VMs to the newly created resource pool.

---

## About VI Workload Domains

In the VI Configuration wizard, you specify the storage, name, compute, and NSX platform details for the VI workload domain. Based on the selected storage, you provide vSAN parameters or NFS share details. You then select the hosts and licenses for the workload domain and start the creation workflow.

The workflow automatically:

- Deploys an additional vCenter Server Appliance for the new workload domain within the management domain.

By leveraging a separate vCenter Server instance per workload domain, software updates can be applied without impacting other workload domains. It also allows for each workload domain to have additional isolation as needed.

- Connects the specified ESXi servers to this vCenter Server instance and groups them into a cluster. Each host is configured with the port groups applicable for the workload domain.
- Configures networking on each host.
- Configures vSAN or NFS storage on the ESXi hosts.
- For each NSX for vSphere workload domain, the workflow deploys an NSX Manager in the management domain and three NSX controllers on the ESXi datastore. The workflow also configures an anti-affinity rule between the controller VMs to prevent them from being on the same host for High Availability.
- For the first NSX-T VI workload domain, the workflow deploys a cluster of three NSX-T Managers in the management domain. 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. All subsequent NSX-T workload domains share this NSX-T Manager cluster.

For an NSX-T workload domain, NSX Edges are needed to enable overlay VI networks and public networks for north-south traffic. NSX Edges are not deployed automatically for an NSX-T VI workload domain. You can deploy them manually after the VI workload domain is created. Subsequent NSX-T VI workload domains share the NSX-T Edges deployed for the first workload domain.

- Licenses and integrates the deployed components with the appropriate pieces in the Cloud Foundation software stack.

The result is a workload-ready SDDC environment.

---

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

---

## Procedure

### 1 [Limitations for an NSX-T Workload Domain](#)

This section lists the limitations of an NSX-T workload domain.

### 2 [Prerequisites for a Workload Domain](#)

This section lists pre-requisites for a VI workload domain.

### 3 [Additional Prerequisites for an NSX-T Based Workload Domain](#)

You must download the NSX-T binaries before creating the VI workload domain. The procedure you follow depends on the Cloud Foundation version in your environment.

### 4 [Start the VI Configuration Wizard and Select Storage Type](#)

Start the VI Configuration wizard and select the storage type for the workload domain.

### 5 [Deploy NSX Edges for NSX-T VI Workload Domains](#)

For an NSX-T VI workload domain, NSX Edges are required to enable overlay VI and public networks for north-south traffic. Follow the deployment procedure for the Cloud Foundation version in your environment.

## Limitations for an NSX-T Workload Domain

This section lists the limitations of an NSX-T workload domain.

- LCM does not upgrade NSX-T components which include the three NSX-T Manager appliances running in the management domain, the VIBS installed on the ESXi workload hosts and if deployed, the NSX-T Edges. These components need to be upgraded manually.
- An NSX-T workload domain is not integrated with vRealize Automation and vRealize Operations Manager yet.
- The NSX-T vSphere cluster within the NSX-T workload domain cannot be stretched to a second site.

## Prerequisites for a Workload Domain

This section lists pre-requisites for a VI workload domain.

NSX-T VI workload domains have additional pre-requisites. See [Additional Prerequisites for an NSX-T Based Workload Domain](#).

- A DHCP server must be configured on the VXLAN VLAN of the management domain. When NSX creates VXLAN VTEPs for the VI workload domain, they are assigned IP addresses from the DHCP server.
- A minimum of three hosts marked with the appropriate storage must be available in your Cloud Foundation inventory. To create a VI workload domain with NFS storage, the hosts must be commissioned with NFS as the storage type and must be associated with an NFS network pool. To create a VI workload domain with vSAN storage, the hosts must be commissioned with vSAN as the storage type and must be associated with an vSAN network pool. For information on adding hosts to your inventory, see [Chapter 8 Adding Hosts to Cloud Foundation](#).
- There must be a free uplink on each host to be used for the 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 region and site information in the name since resource object names (such as host and vCenter names) are generated on the basis of the VI workload domain name. The name can be three to twenty characters long and can contain any combination of the following:
  - Lowercase alphabetic characters
  - Uppercase 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 - refer to the appropriate table for the Cloud Foundation version in your environment.
  - vCenter root password
  - NSX Manager admin password
  - NSX Manager enable password to enable administrator privileges for NSX Manager (only for NSX-V)

**Table 9-1. Passwords for Cloud Foundation**

Account	Password Requirements
vCenter root	<ol style="list-style-type: none"> <li>1 Length 8-20 characters</li> <li>2 Must include: <ul style="list-style-type: none"> <li>■ mix of upper-case and lower-case letters</li> <li>■ a number</li> <li>■ a special character</li> </ul> </li> </ol>
NSX-V Manager admin and enable	<ol style="list-style-type: none"> <li>1 Length 8-12 characters</li> <li>2 Must include: <ul style="list-style-type: none"> <li>■ mix of upper-case and lower-case letters</li> <li>■ a number</li> <li>■ a special character</li> <li>■ exclude_char such as {}[]()/'" ` ~ , ; : . &lt; &gt;</li> </ul> </li> </ol>
NSX-T Manager	<ol style="list-style-type: none"> <li>1 Minimum length 12 characters</li> <li>2 Must include: <ul style="list-style-type: none"> <li>■ at least one lower case and one upper case letter</li> <li>■ a number</li> <li>■ a special character</li> <li>■ exclude_char such as {}[]()/'" ` ~ , ; : . &lt; &gt;</li> <li>■ at least five different characters</li> </ul> </li> <li>3 Must not include: <ul style="list-style-type: none"> <li>■ a dictionary word</li> <li>■ a palindrome</li> <li>■ more than four monotonic character sequences</li> </ul> </li> </ol>

- Based on the Cloud Foundation version in your environment, gather the information that you will need during the workload domain creation workflow.

vCenter IP address, DNS name, subnet mask, and default gateway

Three NSX Managers IP address, DNS name, subnet mask, and default gateway

NSX Manager Virtual IP (VIP) address

- The IP addresses and Fully Qualified Domain Names (FQDN) for the vCenter and NSX Manager instances to be deployed for the VI Workload domain must be resolvable by DNS.
- If you are using NFS storage for the workload domain, you need the following information:
  - Datastore name
  - Path to the NFS share
  - IP address of the NFS server

The NFS share and server must be accessible from the Cloud Foundation network. You must have read/write permission to the NFS share since NSX controllers will be deployed there.

- You must have specified valid license keys for the following products:
  - vCenter Server

- NSX for vSphere or NSX-T
- vSAN (No license required for NFS)
- vSphere

Since vSphere and vSAN licenses are per CPU, ensure that you have sufficient licenses for the ESXi hosts to be used for the workload domain. See [Chapter 5 License Management](#).

- (Optional) Enable vRealize Log Insight logging for workload domains. See [Enable vRealize Log Insight Logging for Workload Domains](#).
- If you have upgraded the management domain in your environment to a later release, download the VI workload domain install bundle to deploy later versions of the software components instead of the versions in your original Cloud Foundation installation. See [Download Bundles](#).

## Additional Prerequisites for an NSX-T Based Workload Domain

You must download the NSX-T binaries before creating the VI workload domain. The procedure you follow depends on the Cloud Foundation version in your environment.

### Procedure

- 1 Download the NSX-T Manager 2.5 install bundle. See [Download Bundles](#) in the *VMware Cloud Foundation Upgrade Guide*.

Although Cloud Foundation supports NSX-T 2.4.2 for existing workload domains, you must have NSX-T 2.5 to deploy a new NSX-T based workload domain.

- 2 Add an NSX-T license key to SDDC Manager. See [Add License Keys for the Software in Your Cloud Foundation System](#).

## Start the VI Configuration Wizard and Select Storage Type

Start the VI Configuration wizard and select the storage type for the workload domain.

### Procedure

- 1 On the SDDC Manager Dashboard, click **+ Workload Domain** and then click **VI Virtual Infrastructure**.
- 2 Select the storage type and click **Begin**.

## Specify Name

Provide a name for the VI workload domain, cluster, and organization.

### Prerequisites

Verify that you have met the prerequisites described in [About VI Workload Domains](#).



**Procedure**

- 1 Type a name for the VI workload domain, such as **sfo01**. The name must contain between 3 and 20 characters.

It is good practise to include location information in the name since resource object names (such as host and vCenter names) are generated on the basis of the VI workload domain name.

- 2 Type a name for the VI cluster. The name must contain between 3 and 20 characters.
- 3 (Optional) Type a name for the organization that requested or will use the virtual infrastructure, such as **Finance**. The name must contain between 3 and 20 characters.
- 4 Click **Next**.

**Specify Compute Details**

Specify the compute (vCenter) details for this workload domain.

**Procedure**

- 1 On the Compute page of the wizard, type the vCenter IP address and DNS name.
- 2 Type the vCenter subnet mask and default gateway.
- 3 Type and re-type the vCenter root password.
- 4 Click **Next**.

**Select NSX Platform and Provide NSX Details**

Select the NSX platform for this workload domain and provide corresponding details. The default platform is NSX-V.

**Procedure**

- 1 On the Networking page of the wizard, select the NSX platform.
- 2 For NSX-T, enter the VLAN ID for the overlay network.

For NSX for vSphere, enter the VLAN ID for VXLAN Networking.

---

**Note** This is the VXLAN VLAN of the management domain. A DHCP server must be configured to lease IPs in the specified VLAN. When NSX creates VXLAN VTEPs, they are assigned IP addresses from the DHCP server.

---

- 3 Provide NSX Manager details per the guidelines below.
  - For NSX for vSphere in Cloud Foundation, provide the following NSX Manager details:
    - IP address
    - Name
    - Subnet mask
    - Default gateway

- Admin password
  - Enable password (only for NSX-V)
  - For NSX-T in Cloud Foundation, provide the following NSX Manager details:
    - Cluster Virtual IP address and FQDN
    - Three IP addresses and the corresponding FQDN
    - Subnet mask
    - Default gateway
    - Admin password
- 4 For NSX for vSphere in Cloud Foundation , provide the following NSX Controller details:
- IP addresses for the three controllers
  - Subnet mask
  - Default gateway
  - Password

NSX-T deployment in Cloud Foundation does not include Controllers.

- 5 Click **Next**.

## Select the vSAN Parameters

At the Storage step of the creation wizard, specify the availability you want provisioned for the VI workload domain. This page appears only if you are using vSAN storage for this workload domain.

Based on your selections, SDDC Manager will determine:

- The minimum number of hosts that it needs to fulfill those selections
- Which specific hosts in your environment are available and appropriate to fulfill those selections
- The virtual infrastructure features and their specific configurations that are needed to fulfill those selections

---

**Note** You can modify the vSAN configuration in vSphere without negatively affecting the Cloud Foundation configuration.

---

## Procedure

- 1 Specify the level of availability you want configured for this virtual environment.

The availability level determines the level of redundancy that is set for the assigned resources. For more information, see *Managing Fault Domains in Virtual SAN Clusters* in *Administering VMware Virtual SAN*.

Option	Description
0	<p>With this choice, the following vSAN parameters are used:</p> <ul style="list-style-type: none"> <li>■ Number of failures to tolerate: zero (0).</li> </ul> <p>Because vSAN requires a minimum of three hosts by default, three hosts are assigned to the virtual infrastructure.</p>
1	<p>With this choice, the following vSAN parameters are used:</p> <ul style="list-style-type: none"> <li>■ Number of failures to tolerate: one (1).</li> </ul> <p>Because vSAN requires a minimum of three hosts by default, three hosts are assigned to the virtual infrastructure. This is the default value.</p>
2	<p>With this choice, the following vSAN parameters are used:</p> <ul style="list-style-type: none"> <li>■ Number of failures to tolerate: two (2).</li> </ul> <p>Because vSAN requires a minimum of five hosts by default for this setting, five hosts are assigned to the virtual infrastructure.</p>

- 2 Click **Next**.

## Select Hosts

The Host Selection page displays available hosts along with hosts details. Hosts that are powered off, cannot be accessed via SSH, or have not been properly commissioned are not displayed.

- Select only healthy hosts..

To check a host's health, SSH in to the SDDC Manager VM using the **vcf** administrative user account. Enter **su** to switch to the root user and navigate to the `/opt/vmware/sddc-support` directory and type the following command.

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

For more information, see [Chapter 16 Supportability and Serviceability \(SoS\) Utility](#)

- For optimum performance, you must select hosts that are identical in terms of memory, CPU types, and disks.

If you select unbalanced hosts, the UI displays a warning message, but you can proceed with the workload domain creation.

- You cannot select hosts that are in a dirty state. A host is in a dirty state when it has been removed from a cluster in a workload domain.

To clean a dirty host, see [Clean up a Decommissioned Host Using the Direct Console User Interface](#).

- All selected hosts must be associated with the same network pool.

## Procedure

- 1 Select the hosts for creating the VI workload domain.

For a vSAN VI workload domain with 0 or 1 availability, a minimum of three hosts is required. For a VI workload domain with 2 availability, a minimum of five hosts is required. When you select hosts with sufficient storage to form a VI cluster, the **Next** button is enabled.

The total resources based on the selected hosts are displayed.

- 2 Click **Next**.

## Specify NFS Storage Details

If you are using NFS storage for this workload domain, you must provide the NFS share folder and IP address of the NFS server.

### Procedure

- 1 On the NFS Storage page, enter a name for the NFS datastore name.
- 2 Enter the path to the NFS share.
- 3 Enter the IP address of the NFS server.

---

**Note** When creating additional datastores for an NFS share and server, use the same datastore name. If you use a different datastore name, vCenter overwrites the datastore name provided earlier.

---

- 4 Click **Next**.

## Select Licenses

The Licenses page displays the available licenses for vCenter, vSphere, vSAN, and NSX based on the information you provided.

### Prerequisites

You must have specified valid license keys for the following products:

- vSAN (if using vSAN as the storage option)
  - NFS does not require a license
- NSX for vSphere (for NSX-V VI workload domains) or NSX-T (for NSX-T VI workload domains)
- vSphere

Since vSphere and vSAN licenses are per CPU, ensure that you have sufficient licenses for the ESXi hosts to be used for the workload domain.

For information on adding license keys, see [Add License Keys for the Software in Your Cloud Foundation System](#).

### Procedure

- 1 Depending on the storage option and NSX platform being used, select the appropriate licenses to apply to the VI workload domain.
- 2 Click **Next**.

## View Object Names

The Object Names page displays the vSphere objects that will be generated for the VI workload domain. Object names are based on the VI workload domain name.

### Procedure

- 1 Review the syntax that will be used for the vSphere objects generated for this domain.
- 2 Click **Next**.

## Review Details and Start the Creation Workflow

At the Review step of the wizard, review the information about the workload domain and start the creation workflow. You can also print the information or download a printable version to print later. It can take up to two hours for the domain to be created.

The Review page displays information about the resources and their configurations that will be deployed when the workflow creates and deploys the virtual infrastructure for this workload domain.

The hosts that will be added to the workload domain are listed along with information such as the network pool they belong to, memory, CPU, and so on.

### Procedure

- 1 Scroll down the page to review the information.
- 2 Click **Finish** to begin the creation process.

The Workload Domains page appears and a notification is displayed letting you know that VI workload domain is being added. Click **View Task Status** to view the domain creation tasks and sub tasks.

If a task fails, you can fix the issue and re-run the task. If the workload domain creation fails, contact VMware Support.

When the VI workload domain is created, it is added to the workload domains table.

### What to do next

Enable vRealize Log Insight logging for the workload domain (if not done already).

For an NSX-T VI workload domain:

- NSX Edges are needed to enable overlay VI and public networks for north-south traffic. NSX Edges are not deployed automatically. To manually deploy the Edges, see [Deploy NSX Edges for NSX-T VI Workload Domains](#).

- Network I/O Control is not automated. To manually optimize traffic prioritization, follow step 4 in the following document:

[Create Uplink Profiles, Network I/O Control Profile, and Edge Cluster Profile for the Shared Edge and Compute Cluster](#)

## Deploy NSX Edges for NSX-T VI Workload Domains

For an NSX-T VI workload domain, NSX Edges are required to enable overlay VI and public networks for north-south traffic. Follow the deployment procedure for the Cloud Foundation version in your environment.

### Deploy NSX Edges in Cloud Foundation Version 3.7

- 1 Deploy NSX-T Edges by following the steps here:

[Install an NSX Edge on ESXi Using a vSphere GUI](#)

- 2 Join the NSX-T Edges to the management plane by following the steps here:

[Join NSX Edge with the Management Plane](#)

- 3 Follow the steps described in each of the sections below.

- a [Configure the Transport Zones for the Shared Edge and Compute Cluster](#)
- b [Create Uplink Profiles, Network I/O Control Profile, and Edge Cluster Profile for the Shared Edge and Compute Cluster](#)
- c [Create Logical Switches for the Shared Edge and Compute Cluster](#)
- d [Configure NSX-T Dynamic Routing in the Shared Edge and Compute Cluster](#)

#### Prerequisites

Ensure that you can access the following documents:

- [NSX-T Data Center Installation Guide](#)
- [Deployment of VMware NSX-T for Workload Domains](#)

### Deploy NSX Edges in Cloud Foundation Version 3.7.1

- 1 Deploy NSX-T Edges by following the steps here:

[Install an NSX Edge on ESXi Using a vSphere GUI](#)

- 2 Join the NSX-T Edges to the management plane by following the steps here:

[Join NSX Edge with the Management Plane](#)

- 3 Follow the steps described in each of the sections below.

- a [Create the Transport Zones for System and Overlay Traffic](#)
- b [Create Uplink Profiles and the Network I/O Control Profile](#)

- c [Create the NSX-T Segments for System, Uplink, and Overlay Traffic](#)
- d [Configure Dynamic Routing in the Shared Edge and Compute Cluster](#)

### Prerequisites

Ensure that you can access the following documents:

- [NSX-T Data Center Installation Guide](#)
- [Deployment of VMware NSX-T for Workload Domains](#)

## View Workload Domain Details

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

This section describes

### Procedure

- 1 On the SDDC Manager Dashboard, click **Inventory > Workload Domain**.
- 2 In the workload domains table, click the name of the workload domain.

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

Tab	Information Displayed
Summary	Clusters in the workload domain and availability level for each cluster.
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 to reach the vSphere Web 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. For more information, see <a href="#">Chapter 20 Patching and Upgrading Cloud Foundation</a> .
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.
Security	Default certificates for the Cloud Foundation components. For more information, see <a href="#">Chapter 4 Managing Certificates for Cloud Foundation Components</a> .

### What to do next

You can add a cluster to the workload domain from this page.

## Delete a Workload Domain

When you delete a workload domain, the clusters within that workload domain are deleted and the hosts are returned to the free pool.

Monitoring through Log Insight and vRealize Operations is removed and the components associated with the workload domain to be deleted contained within the management domain are removed. This includes the vCenter Server instance and NSX Manager.

The network pools used by the workload domain are not deleted as part of the workload domain deletion process and must be deleted separately.

---

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

---

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

### Prerequisites

- Back up the data on the workload domain. The datastores on the workload domain are destroyed when the workload domain is deleted.
- Migrate the VMs that you want to keep to another workload domain.

### Procedure

- 1 On the SDDC Manager Dashboard, click **Inventory > Workload Domains**.

The Workload Domains page displays information for all workload domains.

- 2 Hover your mouse in the workload domain row that where you want to delete.

When you select the workload domain, three vertical dots appear next to the name.

- 3 Click the dots and choose **Delete Domain**.

A confirmation window appears with details about the impact of deleting the workload domain, including how many hosts will be returned to the free pool.

- 4 Click **Delete Domain** to proceed.

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

## View Cluster Details

The cluster page displays high level information about the cluster as well as the hosts that form that cluster. CPU, memory, and storage utilization for this cluster is also displayed here.



**Procedure**

- 1 On the SDDC Manager Dashboard, 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 cluster.

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

Tab	Information Displayed
Summary	Storage parameter configured on the cluster and organization name.
Hosts	Details about each host in the cluster. You can click a name in the FQDN column to access the host detail page.

**What to do next**

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

## 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 the SDDC Manager Dashboard.

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.

**Procedure**

- 1 On the SDDC Manager Dashboard, click **Inventory > Workload Domains**.  
The Workload Domains page displays information for all workload domains.
- 2 In the workload domains table, click the name of the workload domain that you want to modify.  
The detail page for the selected workload domain appears.
- 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 to remove and click **Remove Selected Hosts**.

An alert appears, asking you to confirm or cancel the action. If the removal results in the number of hosts in the cluster being less than the minimum number of required hosts, you must click **Force Remove** to remove the host.

## 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.

The host is removed from the workload domain and added to the free pool.

### What to do next

Clean up the host so that you can use it again. See [Clean up a Decommissioned Host Using the Direct Console User Interface](#).

## Delete a Cluster from a Workload Domain

You can delete a cluster from a 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. See [Delete a Workload Domain](#).

### Prerequisites

Migrate or backup the VMs and data on the data store associated with the cluster to another location.

### Procedure

#### 1 On the SDDC Manager Dashboard, 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 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.

## Expand a Workload Domain

You can expand the management domain or a VI workload domain to add resources to support additional workloads or availability.

To expand a domain, you can:

- Add a host from the Cloud Foundation inventory to a cluster.  
By adding an individual host to an existing workload domain, you can expand the amount of resources contained within an existing cluster.
- Add a new cluster to a workload domain.  
As workload domains support multiple clusters, you can add an additional cluster to an existing workload domain to provide for increased capacity and VM failover isolation.

## Add a Host to a Cluster in a Workload Domain

Adding an individual host to a workload domain adds the resources of that host to the workload domain. You can add multiple hosts at a time to a workload domain.

### Prerequisites

- There must be a host available in the Cloud Foundation inventory. For information on adding a host to Cloud Foundation, see [Commission Hosts](#).
- Ensure that the host you want to add is in an active state.
- You must have a valid vSphere license specified in the Licensing tab of the SDDC Manager Dashboard with adequate sockets available for the host to be added. For more information, see [Add License Keys for the Software in Your Cloud Foundation System](#).
- Verify that the host to be added to the workload domain matches the configuration of the hosts in the cluster to which you want to add the domain. This allows the cluster configuration to remain balanced. If the host to be added does not match the pre-existing hosts in the cluster, the cluster will be unbalanced and a warning will be displayed. The warning will not prevent the expansion and can be dismissed if needed.

### Procedure

- 1 On the SDDC Manager Dashboard, click **Inventory > Workload Domains**.  
The Workload Domains page displays information for all workload domains.
- 2 In the workload domains table, click the name of the workload domain that you want to expand.  
The detail page for the selected workload domain appears.
- 3 Click the **Clusters** tab.
- 4 Click the name of the cluster where you want to add a host.
- 5 Click **Actions > Add Host**.  
The Add Hosts wizard appears.

**6** Select the host you want to add to the cluster.

The host you select must be associated with the same network pool as the other hosts in the cluster. For optimum performance, you should select hosts that are identical in terms of memory, CPU types, and disks to the other hosts in the cluster. If you select unbalanced hosts, the UI displays a warning message, but you can proceed with the workload domain creation.

**7** Click **Next**.**8** Select the vSphere license you want to apply to the host.**9** Click **Next**.**10** Review the host and license details, and click **Finish**.

The details page for the cluster appears with a message indicating that the host is being added. Wait until the action is complete before performing additional workload domain tasks.

## Add a Cluster to a Workload Domain

You can add a cluster to a workload domain through the Workload Domains page in the SDDC Manager Dashboard.

---

**Note** You cannot add a cluster to an NSX-T VI workload domain in version 3.5. Multiple clusters for an NSX-T VI workload domain are supported in version 3.5.1.

---

### Prerequisites

- There must be at least three hosts available in the Cloud Foundation inventory. For information on adding a host to Cloud Foundation, see [Commission Hosts](#).
- Ensure that the hosts you want to add to the cluster are in an active state.
- You must have a valid vSphere and vSAN (if using vSAN storage) license specified in the Licensing tab of the SDDC Manager Dashboard with adequate sockets available for the host to be added. For more information, see [Add License Keys for the Software in Your Cloud Foundation System](#).
- A DHCP server must be configured on the VXLAN VLAN of the management domain. When NSX creates VXLAN VTEPs for the VI workload domain, they are assigned IP addresses from the DHCP server.

### Procedure

**1** On the SDDC Manager Dashboard, click **Inventory > Workload Domains**.

The Workload Domains page displays information for all workload domains.

**2** Use one of the following methods to get started.

- ◆ From the high level workload domain page:

- a Hover your mouse in the workload domain row that where you want to add a cluster.

A set of three dots appear on the left of the workload domain name.

- b Click these dots and then click **Add Cluster**.

The Add Cluster wizard appears.

- ◆ From the workload domain details page:

- a Click the name of the workload domain to go to the details page for that workload domain.
- b Click **Actions > Add Cluster**.

The Add Cluster wizard appears.

- 3 Select the storage type for the cluster and click **Begin**.

- 4 Enter a name for the cluster and click **Next**.

- 5 On the Networking page, enter the VXLAN VLAN of the management domain and click **Next**.

This is the VXLAN VLAN of the management domain. A DHCP server must be configured to lease IPs in the specified VLAN. When NSX creates VXLAN VTEPs, they are assigned IP addresses from the DHCP server.

- 6 If you selected vSAN storage for the cluster, the vSAN parameters page appears. Specify the level of availability you want configured for this cluster. The specified Failures To Tolerate (FTT) value determines the number of hosts required the cluster.

- 7 Click **Next**.

- 8 On the Object Names page, review the syntax that will be used for the vSphere objects generated for this cluster and click **Next**.

- 9 On the Host Selection page, select hosts for the cluster.

All selected hosts must be associated with the same network pool. When you have selected the minimum number of hosts required for this cluster, the Next button is enabled.

- 10 Click **Next**.

- 11 If you selected NFS storage for the cluster, the NFS Storage page appears. Enter the datastore name, NFS share folder, and NFS server IP address.

- 12 Click **Next**.

- 13 On the Licenses page, select the vSphere and vSAN (if using vSAN storage) license to apply to this cluster.

- 14 Click **Next**.

- 15 On the Review page, review the cluster details and click **Finish**.

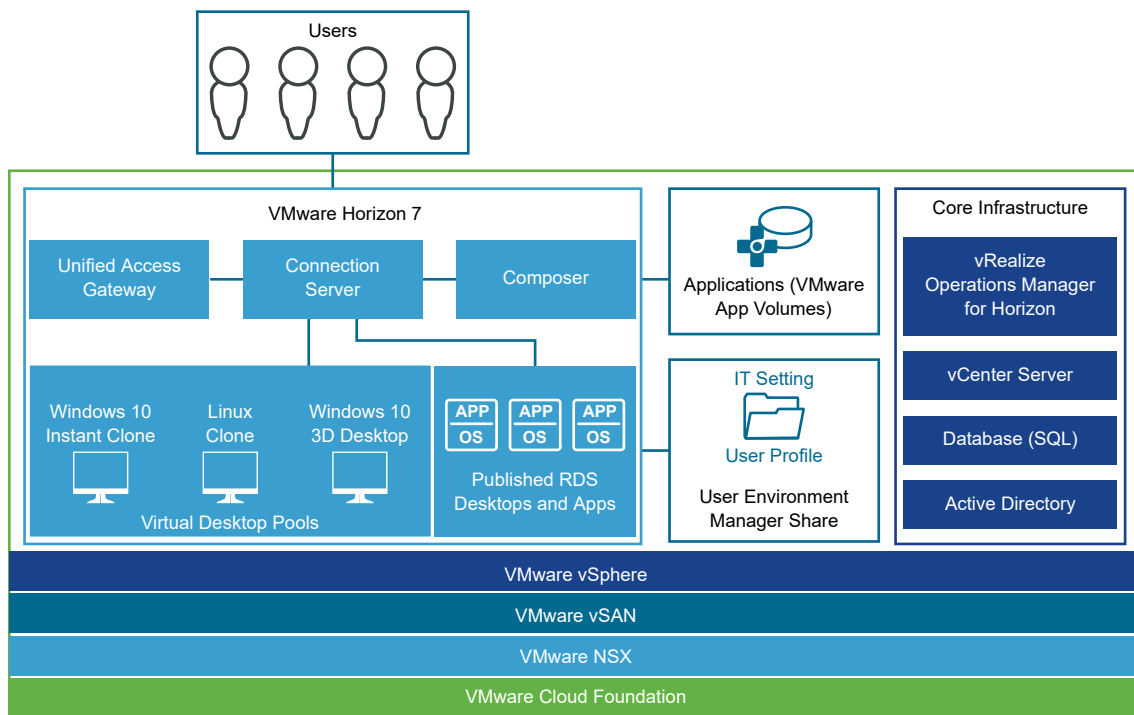
The details page for the workload domain appears with the following message: Adding a new cluster is in progress. When this process completes, the cluster appears in the Clusters tab in the details page for the workload domain.

# Working with Horizon Domains

# 10

A Horizon domain automates deployment of VMware Horizon components and supporting infrastructure to enable you to deliver Virtual Desktop Infrastructure (VDI) and Remote Desktop Session Host (RDSH) desktops and applications. These can be delivered as persistent, linked clone, or instant clone desktops. The Horizon domain can include VMware App Volumes for dynamic application mounting and User Environment Manager for a persistent end user experience.

**Figure 10-1. Components of a Horizon Domain**



The Horizon domain is decoupled from resource provisioning - one or more VI workload domains must be created before deploying a Horizon domain. During the domain deployment, one to three Connection Servers and a corresponding load balancer is deployed. In addition, you can choose the optional components that you want to deploy:

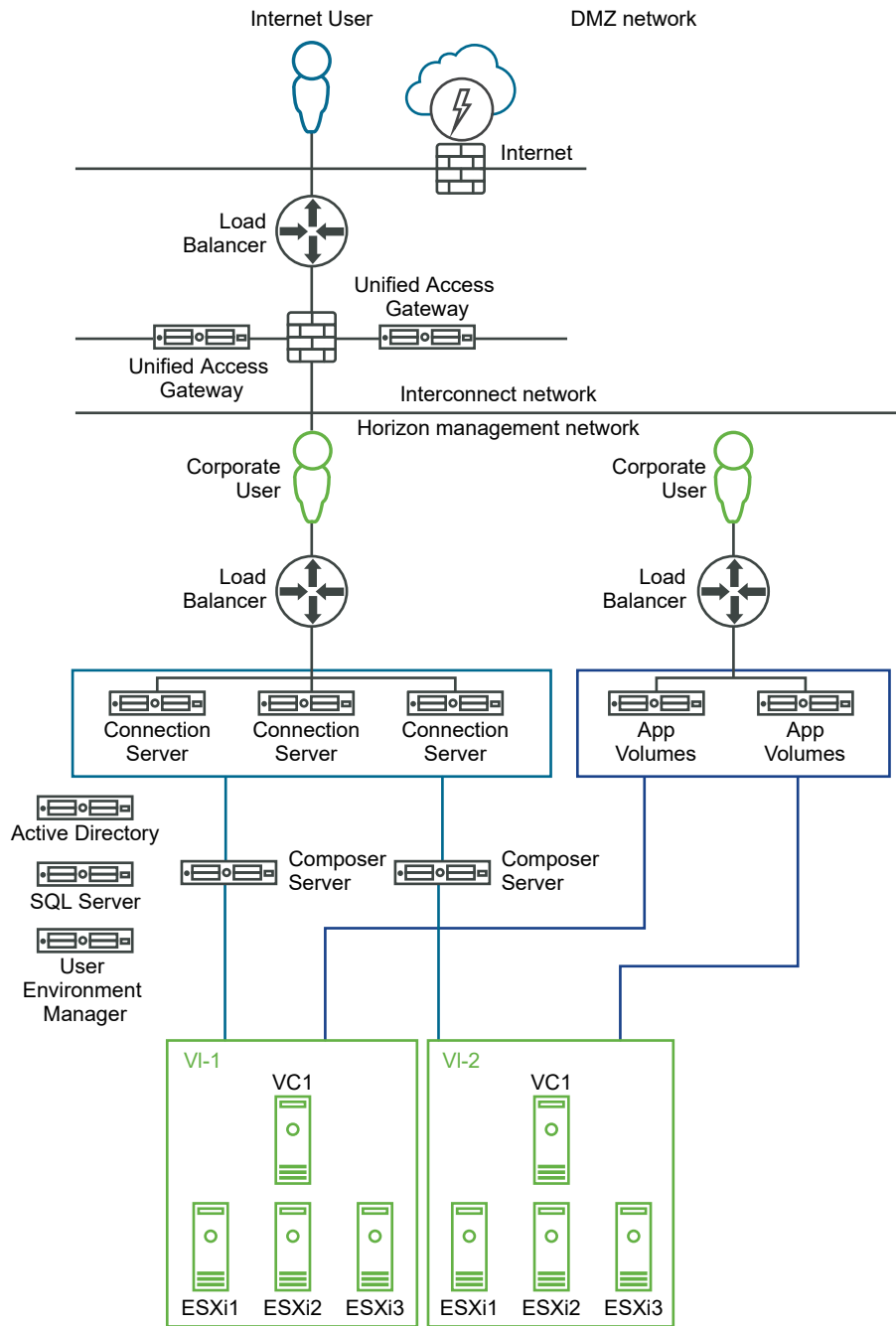
- Composer Server
- App Volumes
- User Environment Manager

- Unified Access Gateway

The architecture diagram below shows a Horizon domain deployed with the following components:

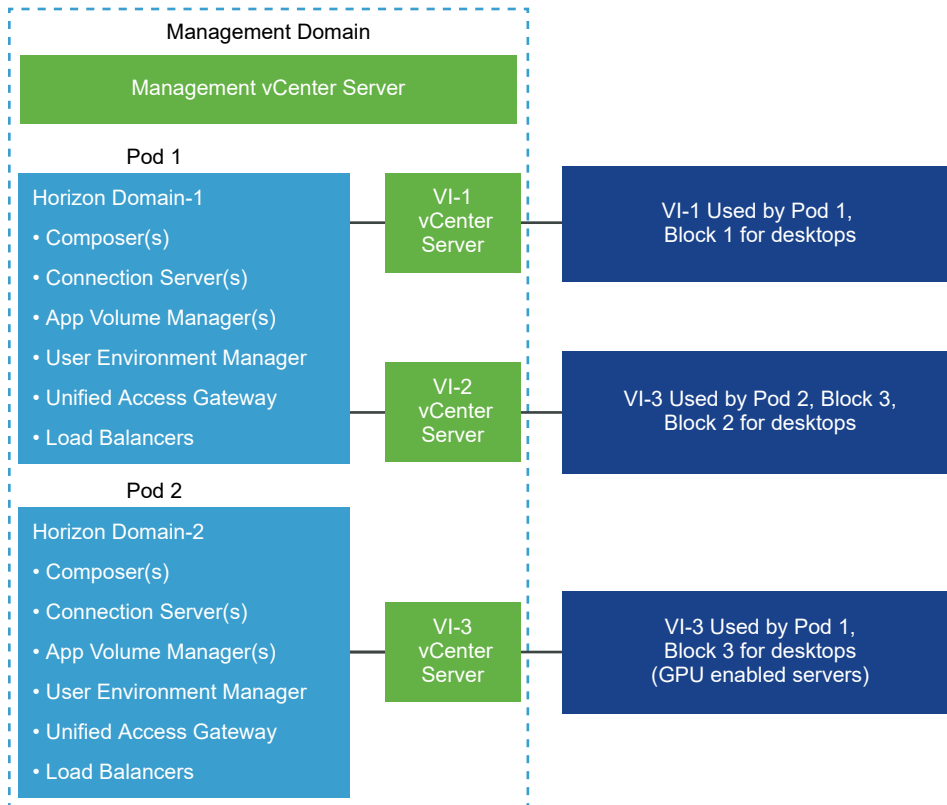
- three Connection Servers
- two VI workload domains
- two App Volumes Managers
- one User Environment Manager
- two Composer Servers
- two Unified Access Gateway appliances
- three Load Balancers (one for incoming WAN traffic across Unified Access Gateway, one across Connection Servers, and one across App Volumes Manager)

**Figure 10-2. Deployed Horizon Domain**



The Horizon domain is based on the Horizon Reference Architecture, which uses Pod Block architecture to enable you to scale as your use cases grow. For more information about the architecture and number of supported virtual machines, refer to the [Horizon 7 Pod and Block](#) section in the [VMware Workspace ONE and VMware Horizon 7 Enterprise Edition On-premises Reference Architecture](#) document. A Horizon domain maps to a single pod. To support multiple pods, you can deploy multiple Horizon domains (where each domain maps to a single pod). If Cloud Pod Architecture is required to connect the pods for advanced multi-site or scale out workflows, this can be done manually. See Cloud Pod Architecture Overview in the [Horizon 7 Architecture Planning](#) document.



**Figure 10-3. Horizon Domain Pod and Block**

This chapter includes the following topics:

- [Sizing Guidelines](#)
- [Prerequisites for a Horizon Domain](#)
- [Create a Horizon Domain](#)
- [Resume Horizon Domain Creation](#)
- [Exporting and Importing a Horizon Domain Configuration](#)
- [View Horizon Domain Details](#)
- [Expand a Horizon Domain](#)
- [Delete Horizon Domain](#)

## Sizing Guidelines

This section describes sizing considerations to be used when planning your Horizon domains.

## Sizing VI Workload Domain Capacity for Use With Horizon Domains

Sizing of hosts for a Horizon domain is complicated. Typically, this involves a user study to ensure that the workloads being used by your enterprise are well understood. For example, heavy graphical use versus simple web based applications can make a big difference to requirements.

The Digital Workspace Designer can size and estimate the hardware required to run desktop or RDSH workloads and provide server components numbers and specifications. You can then work with VMware or a certified partner to validate the input and unlock the detailed results. Refer to the [Digital Workspace Tech Zone](#) to use the online sizing tool.

### Sizing a Horizon Domain

The Horizon domain is based on the Horizon Reference Architecture, which uses the Pod and Block architecture to enable you to scale as your use cases grow. In Cloud Foundation, a Horizon domain is equivalent to a pod and a VI workload domain is equivalent to a block. Multiple VI workload domains can be associated with a single Horizon domain. This allows scale out to the recommended maximum of 10,000 desktops per Horizon domain.

A high level summary of scale considerations is as follows:

- A Horizon domain (pod) can deliver a recommended maximum of 10,000 desktops
- vCenter Server is the delimiter of a VI workload domain (block). The number of recommended VMs per vCenter Server (and therefore per block) depends on the types of VMs in use:
  - 5,000 instant clone VMs (without App Volumes)
  - 4,000 linked clone or full clone VMs (without App Volumes)
  - 2,000 VMs with App Volumes

Hence, for a Horizon domain to support the maximum recommended 10,000 desktops with App Volumes, you would need five VI workload domains.

Other sizing considerations are as follows:

- One Connection Server appliance per 2,000 Horizon server connections up to a maximum of seven servers
- One Unified Access Gateway appliance per 2,000 desktop connections
- One Composer Server per vCenter Server if traditional clones are used

It is recommended that you have two or more Connection Servers, Unified Access Gateway appliances, and App Volumes Manager instances to ensure high availability even if usage is less than the per-server maximum.

Cloud Foundation also supports multiple Horizon domains (multiple pods). However, Cloud Foundation does not provide automation for Cloud Pod Architecture to connect these pods. For information on manual steps, see Cloud Pod Architecture Overview in the [Horizon 7 Architecture Planning document](#). If Cloud Pod Architecture is required to connect the pods for advanced multi-site or scale out workflows, this can be done manually.

## SQL Server Sizing

A Horizon domain uses the SQL Server for storing logs and relatively static data, so there are no heavy performance requirements. For enterprise deployments, the reference architecture recommends clustered databases to be used for redundancy, especially for App Volumes and Composer Servers databases.

You can use one or more SQL Server instances for a Horizon domain. For example, you can use multiple clustered instances to separate event data from runtime data and entitlement information.

## Prerequisites for a Horizon Domain

Complete each prerequisite in this section before creating a Horizon domain.

### Horizon 7 License

You must have a valid Horizon 7 license key, purchased separately from the Cloud Foundation license. You must add this license key to Cloud Foundation. See [Add License Keys for the Software in Your Cloud Foundation System](#).

### Horizon 7 Install Bundle

Download the Horizon 7 install bundle. See [Download Horizon 7 Install Bundle for Cloud Foundation Version 3.7](#) or [Download Horizon 7 Install Bundle for Cloud Foundation Version 3.7.1](#).

## Networks

The following networks must be configured.

- DMZ network

The DMZ network is the intermediate network between the corporate network and the internet. The incoming interface of the Unified Access Gateway appliances and the DMZ load balancer are connected here.

- Interconnect network

This is an optional network for high security environments. The outgoing interface of the Unified Access Gateway appliances are connected with the management network here. This network must be routable to the Horizon management network.

Instead of having an interconnect network, you can also connect Unified Access Gateway appliances directly to the Horizon management network.

- Horizon management network

The Horizon management is the network dedicated to the Horizon components. All Horizon VMs (except Unified Access Gateway) must be on this network. All Connection Servers, Composer Servers, App Volumes, User Environment Manager and management interface of the Unified Access Gateway appliances must have IP addresses from this network. In addition, the load balancers deployed by Horizon domain in front of the Connection Servers and App Volumes must be in this network as well.

Unified Access Gateway has three interfaces - internal, external, and management:

- The internal interface can be either in the Horizon management or interconnect network. If it is on the interconnect network, it must be routable to the Horizon management network.
- External interface must be in the DMZ network.
- Management interface must be in the Horizon Management network.

## Load Balancers and IP Addresses

External IP addresses must be available for all VMs and load balancers. The following components need load balancers:

- Connection Servers
- App Volumes (optional component)
- Unified Access Gateway appliances (optional component)

Load balancers must in the same network as the VMs they serve (Connection Servers and App Volumes load balancers in the Horizon management network and Unified Access Gateway load balancer in the DMZ network).

## VXLAN Port Groups

VXLAN port groups must be created for the following:

- Horizon VMs in the Horizon management network
- Incoming interface (DMZ network)
- Outgoing interface (Interconnect network)

## DNS Records

DNS records for load balancers must be pre-created such that the DNS names assigned to the entry points for load balancers are resolvable to the IP addresses being assigned to the load balancers. This is validated during the Horizon domain creation.

If Secure Dynamic Update is enabled within your Active Directory, a DNS record for each deployed Windows server is added automatically. If Secure Dynamic Update is disabled, you must create a DNS record for each Windows server you are planning to deploy. User Environment Manager, Connection Servers, App Volumes, and Composer Servers are Windows servers.

## Custom Windows Image

You must provide a Windows Server image in OVA format for use with the Windows server components. This allows you to configure those server images according to your corporate guidelines. Cloud Foundation supports Windows 2016 and Windows 2012r2 images with the latest VMware tools installed and Windows Remote Management (WinRM) enabled. The template must have an administrator user account enabled.

## Active Directory

You need two groups in your Active Directory for a Horizon domain. During the Horizon domain creation, one group is assigned administrative privileges for the Connection Servers and the other group is assigned administrative privileges for App Volumes. You can use a single group with privileges for both. Note that you cannot use groups of Builtin Local type.

You also need two service accounts in your Active Directory. The first account is required for Composer Servers. You can either have a dedicated account for each Composer Server, or one account for all Composer Servers. The second service account must have read-write permissions for the Organizational Unit. This account is used to join the servers that are deployed by Horizon.

A Horizon administrator account is also required for logging in to Horizon and App Volumes. This user must be a member of both the Horizon and App Volumes groups.

All users must be added with the following syntax:

*domainName\username*

where the domain name is the FQDN of the domain and user name matches the user logon name in AD Users and Computers console (pre-Windows 2000). For example `horizon-1.local\vdadmin`.

## SQL Servers

You may either use one SQL Server for your entire environment, or use one SQL Server per deployed component. A user account with permissions to create databases is required for each SQL Server to be used. One account can be used for all SQL servers, or you can have a dedicated account per server. Each user account must be an SQL user.

Connection Servers, Composer Servers, and App Volumes require SQL databases. A dedicated SQL database is required for each Composer Server. All Connection Servers share one database, and all App Volumes can share one database. As an example, if you have five Composer Servers and an App Volumes in your environment, you will need seven SQL databases - five for the Composer Servers and one each for App Volumes and Connection Servers. All seven SQL databases can be inside a single SQL Server instance.

## VI Workload Domains

You must pre-create the required VI workload domains, which are then associated with the Horizon domain. The end user desktops are placed on the VI workload domains.

## Download Horizon 7 Install Bundle for Cloud Foundation Version 3.7

Download the Horizon 7 install bundle and upload it to LCM.

### Procedure

#### 1 Download the Horizon 7 install bundle.

a Download the Horizon 7 files on a computer with internet access:

- <https://depot.vmware.com/PROD2/evo/vmw/manifests/bundle-9927.manifest>
- <https://depot.vmware.com/PROD2/evo/vmw/manifests/bundle-9927.manifest.sig>
- <https://depot.vmware.com/PROD2/evo/vmw/bundles/bundle-9927.tar>

Provide your My VMware Account credentials when prompted to sign in.

b Using SSH, log in to the SDDC Manager VM with the following credentials:

Username: vcf

Password: use the password specified in the deployment parameter sheet

c Enter su to switch to the root user.

d Create a folder named /home/vcf/bundles.

```
mkdir /home/vcf/bundles
```

e Using a file transfer utility, copy the files you downloaded in step 1b from the local computer to the /home/vcf/bundles folder on the SDDC Manager VM.

f Set the correct ownership and permissions on the /home/vcf/bundles folder.

```
chown vcf_lcm:vcf /home/vcf/bundles
```

```
chmod -R 775 /home/vcf/bundles
```

#### 2 Upload the bundle files to LCM.

a While logged in to SDDC Manager VM as root, run the following command:

```
curl -k http://127.0.0.1/lcm/bundle/upload -X POST -d '{"bundle":"/home/vcf/bundles/bundle-9927.tar","manifest":"/home/vcf/bundles/bundle-9927.manifest","signature":"/home/vcf/bundles/bundle-9927.manifest.sig"}' -H 'Content-Type:application/json'
```

#### 3 On the SDDC Manager, navigate to **Repository > Bundles**.

The install bundle is displayed and the status is validating. Copy the bundle ID.

#### 4 Verify that the bundle files have been uploaded correctly.

■ Run the following command:

```
curl localhost/lcm/bundles/3d8f87a3-d120-443d-a789-184b0b73b7ae
```

The output must be "downloadStatus": "SUCCESS".

If a different status is displayed, run the command again.

- Navigate to **Repository > Download History**.

The Horizon 7 bundle must be visible here.

## Download Horizon 7 Install Bundle for Cloud Foundation Version 3.7.1

For information on downloading a Horizon 7 bundle in Cloud Foundation 3.7.1, see [Download Bundles](#).

## Create a Horizon Domain

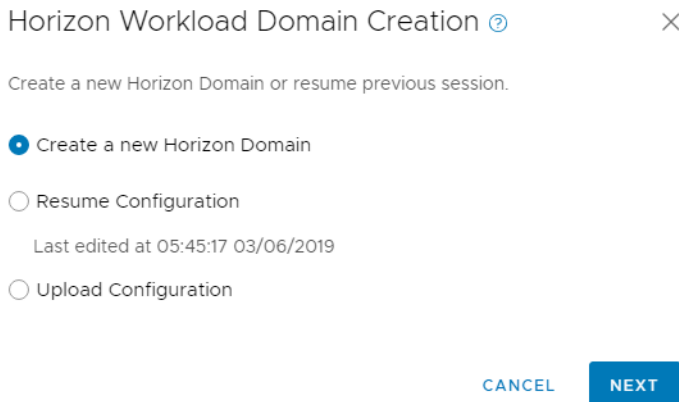
You configure a Horizon domain through the Horizon domain wizard. The databases are created during the domain creation process. If a database with the specified name exists, it is overwritten. The information you provide in the wizard is automatically saved when you proceed to a new page in the wizard so that you can resume configuration if you leave the wizard before completing the configuration.

### Prerequisites

Ensure that you have completed all prerequisites described in [Prerequisites for a Horizon Domain](#).

### Procedure

- 1 On the SDDC Manager Dashboard, click **+ Workload Domain** and then click **Horizon**.
- 2 On the Horizon Domain Creation page, select **Create a new Horizon Domain**.



- 3 Click **Next**.
- 4 On the Horizon Domain Configuration Checklist page, confirm that you have met all listed prerequisites by selecting the check boxes.
- 5 Click **Start Configuration Wizard**.

6 On the General page, enter the general parameters for the Horizon domain.

Field Name	Information to be Entered
Domain Name	Enter a name for the Horizon domain.
Domain VM Name Prefix	Enter a prefix for the management virtual machines created for this domain. This can be overridden later.
Windows File	<p>Select whether you want to upload a Windows image for the Windows based server components, or use an existing OVA template.</p> <p>To use an existing OVA template, the Windows image must have been uploaded to the management vCenter Server. In addition:</p> <ul style="list-style-type: none"> <li>■ VM name on vCenter Server where the OVA template was imported must start with vdi-vm-.</li> <li>■ VM must be powered off.</li> </ul>
Windows OVA Template	<p>This field appears if you selected <b>Upload OVA Template</b> in the Windows File field. Click <b>Upload</b> and browse to select the file. This image is used as the operating system for the Horizon management components.</p> <p>The upload progress is displayed. Since the image is a large file, the upload may take several minutes. You cannot proceed till the image is uploaded.</p>
Windows OVA Template Path	This field appears if you selected <b>Use Existing OVA Template</b> in the Windows File field. Select the template to be used.
Admin Username	Enter the administrator user name for the Windows image you uploaded. This user name must exist in the image you uploaded and be enabled. This user must always be the administrator.
OVA Windows Administrator Password	Enter a password for the administrator user on the VMs to be deployed using this template.
Confirm Password	Re-enter the administrator password.
Management Port Group	Select the management VXLAN port group on which the Horizon management components will be connected. You must have pre-created this port group for it to appear in this drop-down.

7 Click **Next**.

## Select VI Workload Domains for the Horizon Domain

A Horizon domain can deliver a recommended maximum of 10,000 desktops. You must select one or more pre-created VI workload domains where the desktops are to be placed. A VI workload domain can accommodate 5,000 desktops with traditional clones, 4,000 desktops with traditional clones, and 2,000 desktops with App Volumes.

### Procedure

- 1 On the Select Existing VI Domains page, select the VI workload domains for the Horizon domain.
- 2 Click **Next**.

## Provide Active Directory Details

Provide details for the Active Directory to which you want to connect the Horizon domain.



## Procedure

### 1 Provide the following information for the Active Directory.

Field Name	Information to be Entered
<b>FQDN</b>	Enter the Fully Qualified Domain Name (FQDN) for the Active Directory.
<b>Organizational Unit for Horizon VMs</b>	Enter the Organizational Unit where Horizon management VM are to be placed. The OU format must be as follows: <i>OU=aaa, DC=bbb, DC=ccc</i> For example, <i>ou=vdi,dc=horizon-1,dc=local</i>
<b>Administrator Username</b>	Enter a user name from the Active Directory with administrative privileges granted for the Horizon domain. The user must be a member to the Active Directory groups managing Horizon and App Volumes. This user is only used during the creation process - it can later be deleted or the password can be changed. Format must be as follows: <i>myDomain.local\myUserName</i> For example, <i>horizon-1.local\vdiadmin</i>
<b>Administrator Password</b>	Enter the password for the specified Administrator user.
<b>Read Write Account</b>	Enter an Active Directory account name with read and write permissions on the Active Directory. The user must have read and write permissions for the specified Organization Unit, and will join the servers under its context. Format must be as follows: <i>myDomain.local\myUserName</i> For example, <i>horizon-1.local\rwadmin</i>
<b>Read Write Account Password</b>	Enter the password for the specified read and write account.
<b>LDAPS</b>	Select this to use Secure LDAP (LDAPS) to connect to the Active Directory.
<b>DC 1 IP Address</b>	Enter the IP address for Domain Controller 1.
<b>Thumbprint</b>	If you are using LDAPS and are configuring Domain Controller 1, validate the thumbprint of Domain Controller 1.
<b>DC 2 IP Address</b>	Enter the IP address for Domain Controller 2. This is optional, but recommended.
<b>Thumbprint</b>	If you are using LDAPS and are configuring Domain Controller 2, validate the thumbprint of Domain Controller 2.

### 2 Click **Next**.

## Provide SQL Server Details

You can one or more SQL Server instance for the Horizon domain. For example, you can use a different SQL Server for events and runtime data.

## Procedure

- 1 In the Add SQL Servers section, select **Add manually** to add SQL Servers information manually or **Import from JSON template** to import SQL Servers from a JSON file.

- To add SQL Servers manually, follow the steps below.
  - a Provide the following information.

Field Name	Information to be Entered
Alias	Enter an alias for the SQL Server.
FQDN	Enter the FQDN for the SQL Server.
SQL Instance Name	Enter name of the the SQL Server instance to be used for the Horizon domain.
SQL Port	Enter the port number to connect to the SQL Server. The default port is 1433.
Database Username	Enter the user name to connect to the SQL Server.
Database Password	Enter the password for the database user name.
Confirm Database Password	Re-enter the password for the database user name.

- b Click **Add**.

The SQL Servers is added to the SQL Servers table.

- c Repeat steps a and b for additional SQL Servers as required.
- To import SQL Servers from a JSON file, click **Browse**, select the file, and click **Upload**.  
SQL Servers from the JSON file are added to the SQL Servers table.

- 2 Click **Next**.

## Add Load Balancers

Depending on the Horizon domain components being deployed, you must configure one to three load balancers.

Load balancers are required for the following.

- Load balance incoming internal requests (and Unified Access Gateway appliance south bound traffic) across the Connection Servers. This load balancer is mandatory.
- Load balance incoming WAN based requests across the Unified Access Gateway appliances. This load balancer is required only if you are deploying an Unified Access Gateway appliance.
- Load balance desktop connect requests across App Volumes Managers. This load balancer is required only if you are deploying App Volumes.

See Fig 2 in [Chapter 10 Working with Horizon Domains](#) for an example.

## Procedure

- 1 On the Load Balancers page, provide a prefix for the load balancer VM names.

2 In the Load Balancers section, select **Add manually** to add load balancers manually or **Import from JSON template** to import load balancers from a JSON file.

- To add load balancer manually, follow the steps below
  - a Provide the following information.

Field Name	Information to be Entered
Alias	Enter an alias for the load balancer.
FQDN	Enter the FQDN for the load balancer.
VM Name	Enter a name for the load balancer VM.
IP	Enter the IP address for the load balancer.
Subnet Mask	Enter the subnet mask for the load balancer.
Gateway	Enter the gateway for the load balancer.
CLI Password	Enter the CLI password for the load balancer. Specified password must meet the following guidelines: <ul style="list-style-type: none"> <li>■ subsequent identical characters.</li> <li>■ Contain at least 12 characters and no more than 255 characters.</li> <li>■ Start with an alphabetical character.</li> <li>■ Contain at least one lowercase character.</li> <li>■ Contain at least one uppercase character.</li> <li>■ Contain at least one digit.</li> <li>■ Contain at least one special character.</li> <li>■ Should not contain any whitespace.</li> </ul>
Confirm CLI Password	Re-enter the CLI password for the load balancer.

- b Click **Add**.

The load balancer is added to the Load Balancer table.

- c Repeat steps a and b for additional load balancers as required.

- To import load balancers from a JSON file, click **Browse**, select the file, and click **Upload**.  
Load balancers from the JSON file are added to the Load Balancer table.

3 Click **Next**.

## Add Connection Servers

Connection Servers are mandatory for a Horizon domain. It is recommended that you have a minimum of two Connection Servers for high availability; the maximum number supported by a Horizon domain is seven. A Connection Server can scale to a maximum of 2000 active sessions. You can reach the maximum recommended 10,000 sessions with five Connection Servers but two servers are required for high availability. Hence, seven Connection Servers are recommended for the 10,000 sessions.

## Procedure

- 1 On the Horizon Connection Servers page, provide general information about the Connection Server.

**Table 10-1. Horizon Connection Servers General**

Field Name	Information to be Entered
Horizon License	Select the Horizon license key to use for this Horizon domain.
VM Name Prefix	Enter a prefix for the Connection Servers VM names.
Admin Group Name	Enter the administrator group name that has administrator access to the Horizon environment. This group must exist in the Active Directory. For example, horizonAdmin.
Load Balancer Alias	Select the load balancer to for the Horizon Connection Servers. The selected load balancer must be in the same network as the Connection Servers.
SQL Server Alias	Select the SQL Server to use with the Horizon Connection Servers.
Database Name	Enter the database name to use with Horizon Connection Servers. If a database with this name exists, it will be overwritten.

- 2 In the Add Connection Servers section, select **Add manually** to add Connection Servers manually or **Import from JSON template** to import Connection Servers from a JSON file.
  - To add the Connection Servers manually, follow the steps below
    - a Provide the following information.

Field Name	Information to be Entered
Computer Name	Enter a computer name for the Connection Server.
FQDN	The FQDN for the Connection Server is auto-generated using the computer name and the Active Directory FQDN.
VM Name	Enter a Virtual Machine name for the Connection Server.
IP Address	Enter an IP address for the Connection Server.
Subnet Mask	Enter the subnet mask for the Connection Server.
Gateway	Enter a gateway for the Connection Server.

- b Click **Add**.  
The Connection Server is added to the Connection Servers table.
    - c Repeat steps a and b for additional Connection Servers as required.
  - To import Connection Servers from a JSON file, click **Browse**, select the file, and click **Upload**.  
Connection Servers from the JSON file are added to the Connection Servers table.
- 3 Click **Next**.

## Add Composer Servers

A Composer Server is an optional component.

A Composer Server manages traditional clones using linked-clone technology. Each Composer server is paired with a vCenter Server. A block architecture with one vCenter Server per 4,000 linked clone VMs would require one Composer server. High availability is provided by VMware vSphere High Availability (HA), which restarts the Composer VM in the case of a vSphere host outage.

Composer Servers are not required if you plan to use only instant clones.

### Procedure

- 1 Slide the Deploy Composer Servers toggle option to green.
- 2 In the Add Composer Servers section, select **Add manually** to add Composer Servers manually or **Import from JSON template** to import Composer Servers from a JSON file.
  - To add Composer Servers manually, follow the steps below.
    - a Provide the following information.

Field Name	Information to be Entered
VM Name Prefix	Enter a prefix for the Composer Server VMs.
IP Address	Enter an IP address for the Composer Server.
Subnet Mask	Enter the subnet mask for the Composer Server.
Gateway	Enter a gateway for the Composer Server.
Computer Name	Enter a computer name for the Composer Server.
FQDN	The FQDN for the Composer Server is auto-generated using the computer name and the Active Directory FQDN.
VM Name	Enter a name the Composer Server VM.
Composer Service Account	Enter the user name for the Composer Service Account. For example, ComposerAdmin.
Composer Service Password	Enter the password for the Composer Service Account.
SQL Server Alias	Select the SQL Server to use with the Composer Server.
Database Name	Enter a name for the Composer Server database. If a database with the specified name exists, it will be overwritten.
Manage vCenter	Select the vCenter Server to pair with the Composer Server.

- b Click **Add**.
 

The Composer Server is added to the Composer Servers table.
    - c Repeat steps a and b for additional Composer Servers as required.
      - To import Composer Servers from a JSON file, click **Browse**, select the file, and click **Upload**.  
Composer Servers from the JSON file are added to the Composer Servers table.
- 3 Click **Next**.

## Add Unified Access Gateway Appliances

The Unified Access Gateway appliance is an optional component. If you do not deploy this while creating a domain, you can add it later by expanding the domain.

Unified Access Gateway appliances provide a secure means to allow WAN based user traffic to connect to Horizon desktops running in a Cloud Foundation datacenter. Unified Access Gateway appliances are also used for HTML access on Horizon desktops (browser based connectivity to desktops and applications).

Maximum active connections recommended per Unified Access Gateway appliance is 2000.

### Procedure

- 1 Slide the Deploy Unified Access Gateway toggle option to green.
- 2 On the Horizon Unified Access Gateway page, provide general information about the appliance.

**Table 10-2. Unified Access Gateway General**

Field Name	Information to be Entered
VM Name Prefix	Enter a prefix for the Unified Access Gateway appliance VM names.
Load Balancer Alias	Select the load balancer to use with the Unified Access Gateway appliance. This must be a different load balancer than the one used for Connection Servers or App Volumes.
External (DMZ) Port Group	Select the DMZ port group.
Internal Port Group	Select the internal port group.
Management Port Group	The management port group you selected on the General tab of the wizard is displayed here. You cannot change this here.

- 3 In the Add Unified Access Gateway Appliances section, select **Add manually** to add Unified Access Gateway appliances manually or **Import from JSON template** to import Unified Access Gateway appliances from a JSON file.
  - To add Unified Access Gateway appliances manually, follow the steps below
    - a Provide the following information.

Field Name	Information to be Entered
VM Name	Enter a name for the Unified Access Gateway appliance VM.
Default Gateway	Enter the default gateway for the Unified Access Gateway appliance.
Admin Password	Enter a password for the Unified Access Gateway appliance.
External IP Address	Enter the external facing IP address for the Unified Access Gateway appliance.
External Subnet Mask	Enter the external subnet mask for the Unified Access Gateway appliance.
Internal IP Address	Enter the internal IP address for the Unified Access Gateway appliance.
Internal Subnet Mask	Enter the internal subnet mask for the Unified Access Gateway appliance.
Management IP Address	Enter the management IP address for the Unified Access Gateway appliance.
External Subnet Mask	Enter the management subnet mask for the Unified Access Gateway appliance.

- b Click **Add**.

The Unified Access Gateway appliance is added to the Unified Access Gateway appliance table.

- c Repeat steps a and b for additional Unified Access Gateway appliances as required.

- To import Unified Access Gateway appliances from a JSON file, click **Browse**, select the file, and click **Upload**.

Unified Access Gateway appliances from the JSON file are added to the Connection Servers table.

- 4 Click **Next**.

## Add App Volumes

App Volumes is an optional component. If you do not deploy this while creating a domain, you can add it later by expanding the domain.

App Volumes supports dynamic attachment of applications (AppStacks) to Horizon desktops based on user entitlement. It is recommended that you add two App Volumes for each VI workload domain associated with the Horizon domain.

### Procedure

- 1 Slide the Deploy App Volumes toggle option to green.
- 2 In the App Volumes section, provide general information about the appliance.

Field Name	Information to be Entered
<b>VM Name Prefix</b>	Enter a prefix for the App Volumes appliance VM names.
<b>Load Balancer Alias</b>	Select the load balancer to use with the App Volumes. The load balancer must be in the same network as the App Volumes servers.
<b>Admin Group</b>	Enter the Active App Volumes Directory group that will be used to allow administrative access to the App Volumes management console. For example, AppVolAdmins.  This does not have to be unique - it can be the same group as the one that administers the Connection Servers.
<b>SQL Connection Alias</b>	Select the SQL Server to use with App Volumes.
<b>Database Name</b>	Enter a database name for App Volumes. If a database with this name exists, it will be overwritten

3 In the Add App Volumes section, select **Add manually** to add App Volumes manually or **Import from JSON template** to import App Volumes from a JSON file.

- To add App Volumes Unified Access Gateway manually, follow the steps below
  - a Provide the following information.

**Table 10-3.**

Field Name	Information to be Entered
IP Address	Enter the App Volumes IP address.
Subnet Mask	Enter the subnet mask for App Volumes.
Default Gateway	Enter the default gateway for App Volumes.
Computer Name	Enter a computer name for the App Volumes.
FQDN	The FQDN for App Volumes is auto-generated using the computer name and the Active Directory FQDN.
VM Name	Enter a name for the App Volumes VMs.

- b Click **Add**.

App Volumes is added to the App Volumes table.

- c Repeat steps a and b for additional App Volumes as required.

- To import App Volumes from a JSON file, click **Browse**, select the file, and click **Upload**.  
App Volumes from the JSON file are added to the App Volumes table.

4 Click **Next**.

## Add User Environment Manager

User Environment Manager is an optional component. If you do not deploy this while creating a domain, you can add it later by expanding the domain.

User Environment Manager enables per-user customization for desktops.

### Procedure

- 1 Slide the Deploy User Environment Manager toggle option to green.
- 2 Provide the following information.

Field Name	Information to be Entered
VM Name Prefix	Enter a prefix for the User Environment Manager VM names.
IP Addresss	Enter an IP address for the User Environment Manager.
Subnet Mask	Enter the subnet mask for the User Environment Manager.
Gateway	Enter a gateway for the User Environment Manager.
FQDN	Enter the FQDN for User Environment Manager.
Computer Name	Enter a computer name for the User Environment Manager.



Field Name	Information to be Entered
VM Name	Enter a name the User Environment Manager VM.
Profile Folder	Enter the folder path for the home share of the profile.
Profile Sharename	Enter the profile sharename to use with User Environment Manager.
Configuration Folder	Enter the full path of the configuration folder to be used with User Environment Manager.
Configuration Sharename	Enter the configuration fileshare name.
Data Drive Size	Enter the required data drive disk size.

3 Click **Next**.

## Review Horizon Domain Configuration

The Review page displays the Horizon domain configuration details.

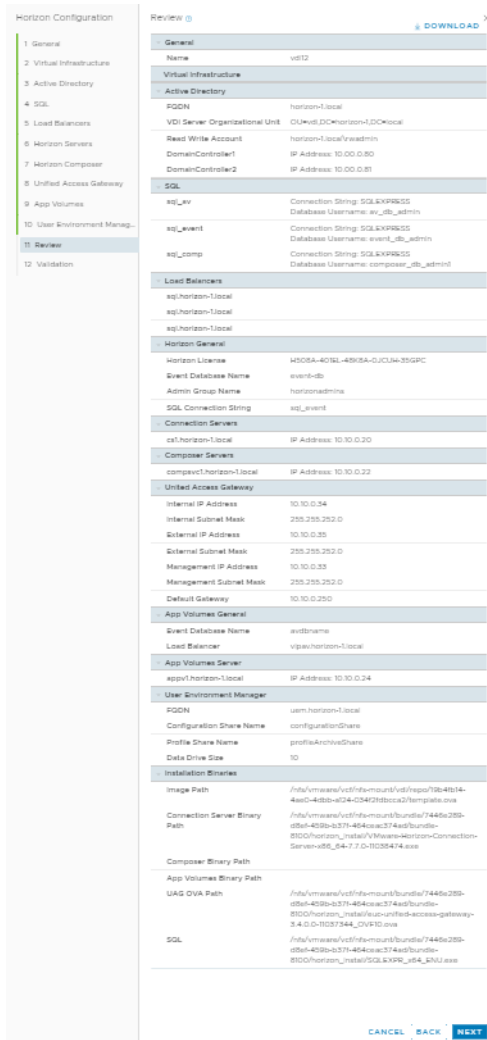
### Procedure

- 1 Review the domain configuration. Click **Back** to make edits to any section.
- 2 Click **Download** to download the domain configuration as a JSON file.

You can upload this JSON file to create a new Horizon domain.

3 Click **Next**.

The data you provided (credentials, FQDNs, portgroups, permissions, networking, etc.) is verified.



If there are any errors, you can resolve them and click **Retry** to run the validation again. For additional troubleshooting, review the log file on the SDDC Manager VM at `/var/log/vmware/vcf/solutionmanager/solutionmanager.log`.

After the validation is complete, the Horizon domain is added to the Horizon table on the Workload Domains page. The Tasks table displays details of the tasks being performed and the status of each task. The domain creation takes some time to complete depending on the number of components being deployed.

## Resume Horizon Domain Creation

The Horizon Domain wizard saves the information you entered. If you exited the wizard before completing the domain configuration, you can resume configuration from the time you left the wizard.

### Procedure

- 1 On the SDDC Manager Dashboard, click **+ Workload Domain** and then click **Horizon**.

- 2 On the Horizon Domain Creation page, click **Resume Configuration**.

The date and time that you last edited the configuration is displayed.

Horizon Workload Domain Creation ⓘ ×

Create a new Horizon Domain or resume previous session.

Create a new Horizon Domain

Resume Configuration

Last edited at 05:45:17 03/06/2019

Upload Configuration

CANCEL NEXT

- 3 Click **Next**.
- 4 On the Horizon Domain Configuration Checklist page, confirm that you have met all listed prerequisites by selecting the check boxes.
- 5 Click **Next**.
- 6 The General page displays the information you had entered earlier, but you must upload the Windows image again.
- 7 Click **Next** till you reach the page where you had left the wizard and then complete entering the remaining information. For more information on the required information, see [Create a Horizon Domain](#).

## Exporting and Importing a Horizon Domain Configuration

You can export the configuration of a Horizon domain as a JSON file. You can use this file to create a similar Horizon domain configuration. The modified configuration file can be imported in Cloud Foundation to create a new Horizon domain.

### Export a Horizon Domain Configuration

#### Procedure

- 1 On the SDDC Manager Dashboard, click **Inventory > Workload Domain**.
- 2 In the Horizon area, click **View Details**.
- 3 Click ⓘ next to the Horizon domain whose configuration you want to export and click **Download Config**.

The configuration is downloaded as a JSON file. You can modify the JSON file to provide unique values for fields such as FQDNs, names, IP addresses, etc.

## Import a Horizon Domain Configuration

You can import a configuration JSON file to create a new Horizon domain.

### Procedure

- 1 On the SDDC Manager Dashboard, click **+ Workload Domain** and then click **Horizon**.
- 2 On the Horizon Domain Creation page, select **Upload Configuration**.

Horizon Workload Domain Creation ⊗

Create a new Horizon Domain or resume previous session.

Create a new Horizon Domain

Resume Configuration

Last edited at 05:45:17 03/06/2019

Upload Configuration

**UPLOAD CONFIGURATION FILE**

CANCEL NEXT

- 3 Click **Upload Configuration File**.
- 4 Select the JSON file to be uploaded and click **Open**.
- 5 Click **Next**.
- 6 Progress through the domain creation wizard, making edits as required. For details on required information, see [Create a Horizon Domain](#).

### Example: Sample Configuration JSON File

```
{
  "id": "1",
  "name": "vdi",
  "managementVcenters": [
    {
      "managementPortgroup": "VDI-DPortGroup-Mgmt",
      "dmzPortgroup": "dmz",
      "interconnectPortgroup": "VDI-DPortGroup-interconnect",
      "uagManagementPortgroup": "VDI-DPortGroup-Mgmt",
      "clusterName": "SDDC-Cluster1",
      "datastoreName": "sfo01-m01-vsan",
      "datacenterName": "SDDC-Datacenter",
      "nsx": {
        "host": "nsxManager.vrack.vsphere.local",
        "password": "VMware1!"
      },
      "username": "administrator@vsphere.local",
      "password": "VMware123!",
    }
  ]
}
```

```

    "host": "vcenter-1.vrack.vsphere.local",
    "psc": {
      "host": "psc-1.vrack.vsphere.local"
    }
  },
  "resourceVcenters": [
    {
      "state": "DEPLOYED",
      "datacenters": [
        {
          "name": "new-vi-DC",
          "datastores": [
            {
              "name": "new-vi-vcenter-2-via-cluster1-vsan-01",
              "id": "sddc-ds-1",
              "hostIds": [
                "c7945622-d8c1-494e-aa76-180a720c1606",
                "801d55ec-156a-4b54-94fa-5019cd5a7d83",
                "203866dc-4ef3-42a8-880b-9d20656aa7de"
              ]
            }
          ]
        }
      ],
      "clusters": [
        {
          "name": "via-cluster1",
          "hosts": [
            {
              "name": "esxi-7.vrack.vsphere.local",
              "id": "c7945622-d8c1-494e-aa76-180a720c1606",
              "username": "root",
              "password": "EvoSddc!2016"
            },
            {
              "name": "esxi-6.vrack.vsphere.local",
              "id": "801d55ec-156a-4b54-94fa-5019cd5a7d83",
              "username": "root",
              "password": "EvoSddc!2016"
            },
            {
              "name": "esxi-5.vrack.vsphere.local",
              "id": "203866dc-4ef3-42a8-880b-9d20656aa7de",
              "username": "root",
              "password": "EvoSddc!2016"
            }
          ]
        }
      ]
    }
  ],
  "username": "administrator@vsphere.local",
  "password": "VMware123!",
  "host": "vcenter-2.vrack.vsphere.local",
  "psc": {
    "host": "psc-1.vrack.vsphere.local"
  }
}

```

```

    }
  }
],
"peripheralServices":{
  "loadBalancers":[
    {
      "ipAddress":"10.10.0.25",
      "certificatePath":"/tmp/AppVCertificate7006187265877059244.p12",
      "certificatePassword":"LoEpxXC4",
      "fqdn":"lb1.horizon-1.local",
      "state":"DEPLOYED",
      "deployDetails":{
        "vmName":"lb1",
        "subnetMask":"255.255.255.0",
        "gateway":"10.10.0.250",
        "portgroup":"VDI-DPortGroup-Mgmt"
      }
    },
    {
      "ipAddress":"10.10.0.26",
      "certificatePath":"/tmp/ConServCertificate8496572034532614986.p12",
      "certificatePassword":"leHOTEZ9",
      "fqdn":"lb2.horizon-1.local",
      "state":"DEPLOYED",
      "deployDetails":{
        "vmName":"lb2",
        "subnetMask":"255.255.255.0",
        "gateway":"10.10.0.250",
        "portgroup":"VDI-DPortGroup-Mgmt"
      }
    },
    {
      "ipAddress":"10.20.0.27",
      "certificatePath":"/tmp/UagCertificate1734475760559824715.p12",
      "certificatePassword":"9EZhzEm0",
      "fqdn":"lb3.horizon-1.local",
      "state":"DEPLOYED",
      "deployDetails":{
        "vmName":"lb3",
        "subnetMask":"255.255.255.0",
        "gateway":"10.20.0.250",
        "portgroup":"dmz"
      }
    }
  ],
  "activeDirectory":{
    "fqdn":"horizon-1.local",
    "netBiosName":"horizon-1",
    "vdiAdminUsername":"horizon-1.local\vdiadmin",
    "vdiAdminPassword":"VMware123!",
    "vdiServerOu":"OU\u003dvdi,DC\u003dhorizon-1,DC\u003dlocal",
    "ouRwUsername":"horizon-1.local\rwadmin",
    "ouRwPassword":"VMware123!",
    "securedAD":false,
    "domainControllers":[

```

```

        {
            "fqdn":"dc1.horizon-1.local",
            "ipAddress":"10.10.0.80"
        },
        {
            "fqdn":"dc2.horizon-1.local",
            "ipAddress":"10.10.0.81"
        }
    ]
},
"installDetails":{
    "imagePath":"/home/vcf/template.ova",
    "connectionServerBinaryPath":"/home/vcf/VMware-Horizon-Connection-Server-
x86_64-7.7.0-11038474.exe",
    "composerServerBinaryPath":"/home/vcf/VMware-viewcomposer-7.7.0-11038293.exe",
    "appVolumesServerBinaryPath":"/home/vcf/App Volumes Manager.msi",
    "uagOvaPath":"/home/vcf/euc-unified-access-gateway-3.4.0-11037344_OVF10.ova",
    "sqlExpressPath":"/home/vcf/SQLEXP_x64_ENU.exe",
    "uemBinaryPath":"/home/vcf/VMware User Environment Manager 9.6.0.855 x64.msi",
    "connectionServerVersion":"7.5.5",
    "composerServerVersion":"4.5",
    "appVolumesServerVersion":"2.14",
    "uagOvaVersion":"buf",
    "sqlExpressVersion":"2017",
    "uemVersion":"uem",
    "ova":{
        "administratorUsername":"administrator",
        "administratorPassword":"VMware123!"
    },
    "updateKb2919442BinaryPath":"/home/vcf/download/Windows8.1-KB2919442-x64.msu",
    "updateKb2919355BinaryPath":"/home/vcf/download/Windows8.1-KB2919355-x64.msu",
    "dotNet462BinaryPath":"/home/vcf/download/NDP462-KB3151800-x86-x64-ALL0S-ENU.exe"
},
"sqlConnections":[
    {
        "fqdn":"sql.horizon-1.local",
        "id":"sqlxt",
        "sqlInstanceName":"SQLEXPRESS",
        "sqlPort":1433,
        "state":"DEPLOYED",
        "dbUsername":"av_db_admin",
        "dbPassword":"VMware123!"
    }
]
},
"horizon":{
    "pods":[
        {
            "eventDbName":"event-db-ext",
            "sqlId":"sqlxt",
            "vcFqdns":[
                "vcenter-2.vrack.vsphere.local"
            ],
            "uagAppliances":[
                {

```

```

        "vmName": "uag1",
        "mgmtSubnetMask": "255.255.255.0",
        "mgmtIpAddress": "10.10.0.33",
        "externalSubnetMask": "255.255.255.0",
        "internalSubnetMask": "255.255.255.0",
        "defaultGateway": "10.0.0.253",
        "internalIpAddress": "10.10.0.34",
        "externalIpAddress": "10.20.0.35",
        "administratorPassword": "VMware123!",
        "state": "DEPLOYED"
    }
],
"connectionServers": [
    {
        "fqdn": "cs1.horizon-1.local",
        "certificatePath": "/tmp/ConServCertificate8496572034532614986.p12",
        "certificatePassword": "leHOTEZ9",
        "state": "DEPLOYED",
        "deployDetails": {
            "ipAddress": "10.10.0.20",
            "gateway": "10.10.0.250",
            "subnetMask": "255.255.255.0",
            "vmName": "cs1",
            "computerName": "cs1"
        }
    }
],
"composerServers": [
    {
        "fqdn": "comp01.horizon-1.local",
        "composerServiceAccount": "horizon-1.local\\compsvc1",
        "composerServicePassword": "VMware123!",
        "sqlId": "sqlext",
        "internalDbUsername": "internal-db-ext",
        "internalDbPassword": "idb-password",
        "dbName": "internal-db-ext",
        "certificatePath": "/tmp/CompServerCertificate6739599294661772272.p12",
        "certificatePassword": "IbZy8a0a",
        "vcFqdn": "vcenter-2.vrack.vsphere.local",
        "state": "DEPLOYED",
        "deployDetails": {
            "ipAddress": "10.10.0.22",
            "gateway": "10.10.0.250",
            "subnetMask": "255.255.255.0",
            "vmName": "comp01",
            "computerName": "comp01"
        }
    }
]
}
],
"internalLbFqdn": "lb2.horizon-1.local",
"externalLbFqdn": "lb3.horizon-1.local",
"adminGroupName": "horizonadmins",
"uemDetails": {

```



```

    "uems": [
      {
        "fqdn": "uem.horizon-1.local",
        "configurationShare": "/share/drive",
        "profileArchiveShare": "profileshare",
        "state": "DEPLOYED",
        "deployDetails": {
          "dataDriveSizeGb": 10,
          "configurationShareLocation": "/share/location",
          "profileArchiveShareLocation": "/profile/location",
          "ipAddress": "10.10.0.23",
          "gateway": "10.10.0.250",
          "subnetMask": "255.255.255.0",
          "vmName": "uem-vm",
          "computerName": "uem"
        }
      }
    ]
  },
  "appVolumesDetails": {
    "adminGroupName": "avadmins",
    "dbName": "appvol-db-ext",
    "sqlId": "sqlext",
    "lbFqdn": "lb1.horizon-1.local",
    "datastores": [
      {
        "id": "sddc-ds-1",
        "isPrimary": true
      }
    ]
  },
  "appVolumes": [
    {
      "fqdn": "appvol.horizon-1.local",
      "state": "DEPLOYED",
      "deployDetails": {
        "ipAddress": "10.10.0.24",
        "gateway": "10.10.0.250",
        "subnetMask": "255.255.255.0",
        "vmName": "app-vm",
        "computerName": "appvol"
      }
    }
  ]
}

```

## View Horizon Domain Details

The Horizon Domain summary page displays all Horizon domains in your environment with a summary of the basic capacity information. You can select a domain to view the domain details, download the configuration, or expand or delete the domain.

**Procedure**

1 On the SDDC Manager Dashboard, click **Inventory > Workload Domain**.

2 In the Horizon area, click **View Details**.

The summary page displays all Horizon domains and a summary of CPU, memory and storage usage.

3 Click the name of a Horizon domain.

The Horizon domain details page shows the status of the Horizon domain and the overall utilization summary for the domain. The Summary section displays the components of the Horizon domain (and their quantities).

4 Click the appropriate tab to see more information about service VMs, VI workload domains, and configuration details.

Tab	Information Displayed
Service VMs	Links to the administration consoles for each of the components that are used to manage the domain and the IP address of the component VMs.
VI	Summary and links to the VI workload domains associated with the Horizon domain.
Configuration Details	Configuration details for the Horizon domain.

## Expand a Horizon Domain

You can expand a Horizon domain to add additional components (such as Connection Server), deploy optional components (such as App Volumes), or add VI workload domains to extend available desktop capacity.

**Procedure**

1 On the SDDC Manager Dashboard, click **Inventory > Workload Domain**.

2 In the Horizon area, click **View Details**.

3 Click  next to the Horizon domain whose configuration you want to export and click **Expand**.

The Horizon Domain Expansion window appears.

4 Proceed through the wizard pages and make the required updates. You can add additional elements, associate new VI workload domains, or add new components. For details on required information, see [Create a Horizon Domain](#).

## Delete Horizon Domain

Deleting an active Horizon domain may affect desktops or RDSH server users, so be careful when deleting a Horizon domain.


A Horizon domain consists of two parts:

- VI desktop capacity in the VI workload domains
- Horizon management infrastructure

When you delete a Horizon domain, the Horizon management components (load balancers, Connection Servers, Composer Servers, and deployed optional components) are deleted. However, VI workload domains associated with the Horizon domain are not deleted, and desktops and RDSH servers in those VI workload domains are not deleted.

If you want to delete desktops, data, and management components, delete the VI workload domains associated with the Horizon domain before following this procedure. For information on deleting VI workload domains, see [Delete a Workload Domain](#).

### Procedure

- 1 On the SDDC Manager Dashboard, click **Inventory > Workload Domain**.
- 2 In the Horizon area, click **View Details**.
- 3 Click  next to the Horizon domain whose configuration you want to export and click **Delete**.  
The Delete Domain window appears.
- 4 Type the name of the Horizon domain that you want to delete.
- 5 Click Delete Domain.

If you deleted only the Horizon domain, the management components are deleted. Active Horizon sessions are interrupted and users will not be able to connect. The desktops and data are not deleted.

If you deleted the VI workload domains associated with the Horizon domain and the Horizon domain, all desktops, data, and management components are deleted.

# vRealize Suite Products and Cloud Foundation

# 11

Using SDDC Manager, you can deploy vRealize Operations and vRealize Automation and connect them to workload domains in your Cloud Foundation system.

You can also enable vRealize Log Insight for all workload domains and expand the analytics cluster for vRealize Operations.

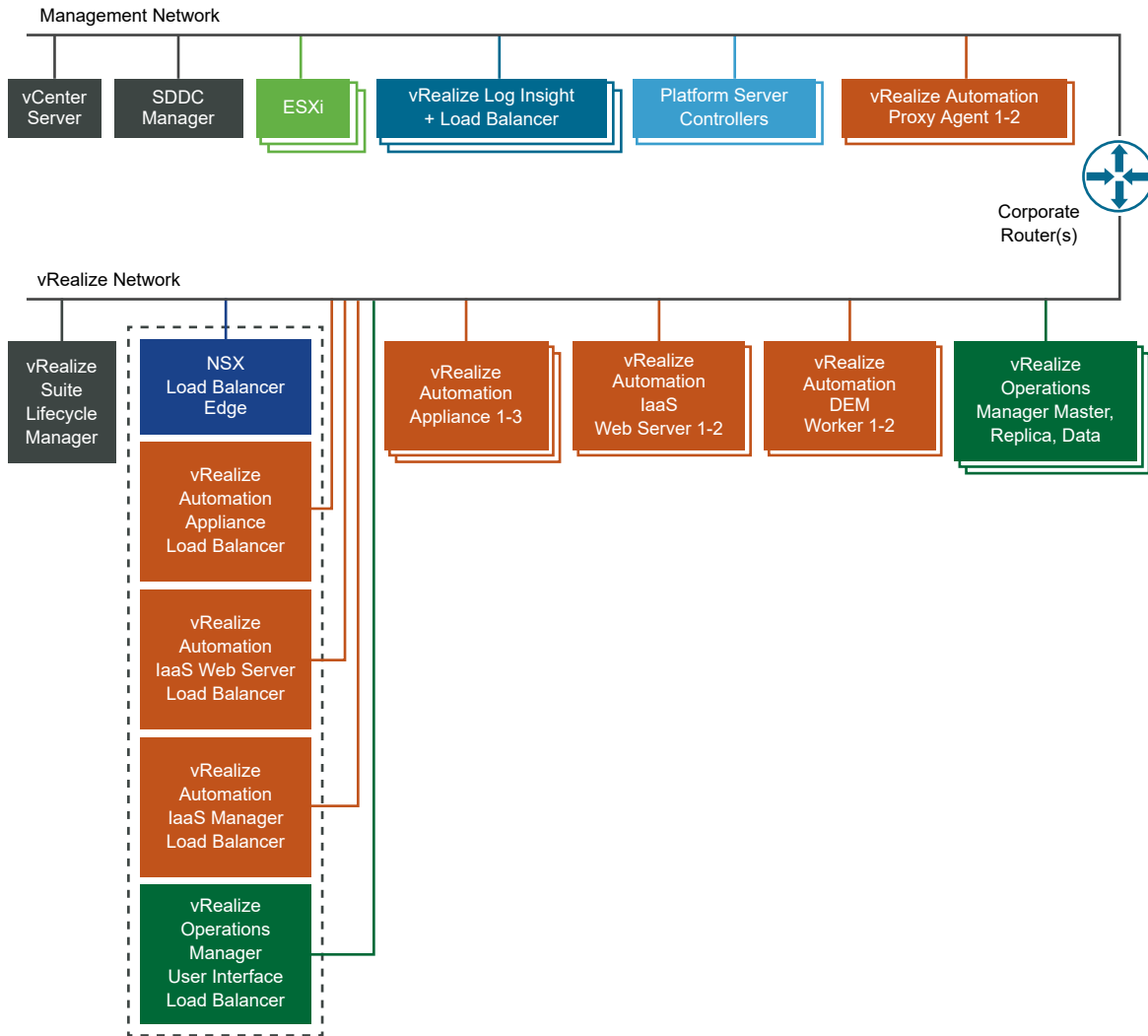
All vRealize Suite products require licenses purchases separately from Cloud Foundation.

---

**Note** For detailed information on prerequisites and preliminary procedures for adding vRealize Suite products to your Cloud Foundation deployment, see the *VMware Cloud Foundation Planning and Preparation Guide*.

---

**Figure 11-1. vRealize Suite Components in the Cloud Foundation Context**



**Procedure**

**1 Deploy vRealize Suite Lifecycle Manager in Cloud Foundation**

Before you can deploy vRealize Operations or vRealize Automation, you must deploy vRealize Suite Lifecycle Manager.

**2 Adding vRealize Automation to Cloud Foundation**

vRealize Automation provides a secure portal where authorized administrators, developers, and business users can request new IT services and manage specific cloud and IT resources according to business policies. Requests for IT service, including infrastructure, applications, desktops, and many others, are processed by using a common service catalog to provide a consistent user experience. SDDC Manager automates the deployment of vRealize Automation in Cloud Foundation.

### 3 Adding vRealize Operations to Cloud Foundation

vRealize Operations tracks and analyzes the operation of multiple data sources in Cloud Foundation by using specialized analytic algorithms. These algorithms help vRealize Operations learn and predict the behavior of every object it monitors. Users access this information by using views, reports, and dashboards. SDDC Manager automates the deployment of vRealize Operations in Cloud Foundation.

### 4 Connect vRealize Suite Products to Workload Domains in Cloud Foundation

You can connect your vRealize Automation and vRealize Operations deployments to workload domains in Cloud Foundation.

## Deploy vRealize Suite Lifecycle Manager in Cloud Foundation

Before you can deploy vRealize Operations or vRealize Automation, you must deploy vRealize Suite Lifecycle Manager.

### Prerequisites

- Download the vRealize Suite Lifecycle Manager installation package from the VMware Depot to the local bundle repository.
- Configure a new vRealize VLAN on the switches and verify that the vRealize subnet is routable to the management network.
- Allocate an IP address for the vRealize Suite Lifecycle Manager virtual appliance and prepare forward/reverse DNS records.

### Procedure

- 1 On the **SDDC Manager Dashboard**, navigate to **Administration > vRealize Suite**.

The **vRealize Suite** navigation appears, listing the vRealize Suite products available for your Cloud Foundation system deployment.

- 2 Click **vRealize Suite Lifecycle Manager**.

The **vRealize Suite Lifecycle Manager** page displays.

- 3 Click **Deploy**.

The **vRealize Lifecycle Manager Installation Prerequisites** page displays the prerequisites that you must complete before beginning the installation.

- 4 Review the readiness of each prerequisite and verify by selecting each adjacent check box.

When all the boxes are selected, the **Begin** button is activated.

- 5 Click **Begin**.

The **vRealize Lifecycle Manager Installation** wizard opens.

6 On the **Network Settings** page, enter the settings and **Next** to continue.

Setting	Description
VLAN ID	Enter a valid VLAN ID between 0 and 4094 for the dedicated network.
Subnet Mask	Provide a valid subnet mask for the dedicated network.
Gateway	Provide a valid gateway address for the dedicated network.

7 On the **Virtual Appliance Settings** page, enter the settings and **Next** to continue.

Setting	Description
FQDN	Enter the FQDN for the vRealize Suite Lifecycle Manager virtual appliance.
System Administrator	Create and confirm a password for the vRealize Suite Lifecycle Manager system administrator (for example, admin@localuser). This is the credential that allows SDDC Manager to connect to the vRealize Suite Lifecycle Manager system.
SSH Root Account	Create and confirm a password for the vRealize Suite Lifecycle Manager virtual appliance root account.

8 On the **Review Summary** page, review the installation configuration settings.

9 Click **Finish**.

SDDC Manager validates the inputs and reports any errors or warnings.

**Note** If necessary, you can use the **Back** button to return to preceding pages and modify settings.

10 Address any validation issues and then click **Finish**.

The **vRealize Suite Lifecycle Manager** page displays with the following message: Deployment in progress . If the deployment fails, this page displays a deployment status of Failed. In this case, you can **Restart Task** or **Uninstall**.

11 (Optional) Click **View Status in Tasks** to view the details of the deployment in progress or a deployment failure.

The **Tasks** panel opens at the bottom page. You can open individual tasks to view details.

12 (Optional) After the successful deployment of vRealize Suite Lifecycle Manager, click the vRealize Suite Lifecycle Manager link below the page title.

The vRealize Suite Lifecycle Manager user interface opens in a new browser tab.

### What to do next

You can now deploy vRealize Operations or vRealize Automation.

## Adding vRealize Automation to Cloud Foundation

vRealize Automation provides a secure portal where authorized administrators, developers, and business users can request new IT services and manage specific cloud and IT resources according to business policies. Requests for IT service, including infrastructure, applications, desktops, and many others, are

processed by using a common service catalog to provide a consistent user experience. SDDC Manager automates the deployment of vRealize Automation in Cloud Foundation.

## Add a vRealize Automation License Key to Cloud Foundation

Before you can deploy vRealize Automation for use with Cloud Foundation you must add a license.

### Procedure

1 On the SDDC Manager Dashboard, navigate to **Administration > Licensing**.

2 Click **+ License Key**.

3 Select **VMware vRealize Automation** as the product name.

4 Type the license key.

You can enter a license key for vRealize Automation or a suite license for a product that includes vRealize Automation. For example, vCloud Suite or vRealize Suite.

5 Type a description for the license.

If you have multiple license keys for a product, the description can help in identifying the license.

6 Click **Add**.

## Deploy vRealize Automation in Cloud Foundation

You deploy vRealize Automation in Cloud Foundation using the SDDC Manager user interface.

### Prerequisites

- Deploy vRealize Suite Lifecycle Manager. See [Deploy vRealize Suite Lifecycle Manager in Cloud Foundation](#).
- Verify you have a valid license key for vRealize Automation, which is purchased separately from Cloud Foundation. You must add the license key to Cloud Foundation before deploying vRealize Automation. See [Add a vRealize Automation License Key to Cloud Foundation](#).
- Verify you have downloaded the vRealize Suite bundles from the VMware Depot.
- Verify that IP allocation and forward/reverse DNS records are prepared for the vRealize Automation components.
- Verify you have created the required Active Directory (AD) service account for vRealize Automation.
- Verify that you have configured a certificate authority in SDDC Manager. See [Configure Certificate Authority](#).
- Verify the multi-SAN certificate and private key generated by a trusted certificate authority is available for vRealize Automation.
- Verify Microsoft SQL Server is properly deployed and configured for vRealize Automation.
- Verify you have created and exported a Microsoft Windows Server OVA template for the vRealize Automation IaaS components.



For more information, see the *VMware Cloud Foundation Planning and Preparation Guide*.

### Procedure

- 1 On the **SDDC Manager Dashboard**, navigate to **Administration > vRealize Suite**.

The **vRealize Suite** navigation appears, listing the vRealize Suite products available for your Cloud Foundation system deployment.

- 2 Click **vRealize Automation**.

The **vRealize Automation** page displays.

- 3 Click **Deploy**.

The **vRealize Automation Installation Prerequisites** page displays the prerequisites that you must complete before beginning the installation.

- 4 Review the readiness of each prerequisite and verify by selecting each adjacent check box.

When all the boxes are selected, the **Begin** button is activated.

- 5 Click **Begin**.

The **vRealize Automation Installation** wizard opens.

- 6 On the **Deployment Details** page, enter the settings and **Next** to continue.

All settings are required.

Setting	Description
vRealize Automation License Key	<p><b>License Key</b></p> <p>Select a valid license for vRealize Automation. This license may be for vRealize Automation, vRealize Suite, or vCloud Suite. If no key is available, you can add one in <b>Administration &gt; Licensing</b>.</p>
Certificate Details	<p><b>Certificate Chain</b></p> <p>Enter the full certificate chain, including each -----BEGIN CERTIFICATE----- header and -----END CERTIFICATE----- footer.</p> <p>The certificate chain is a combination of the server certificate and the root CA certificate, in that order.</p> <p><b>Certificate Private Key</b></p> <p>Enter the private key for the certificate, including the -----BEGIN RSA PRIVATE KEY----- header and the -----END RSA PRIVATE KEY----- footer.</p> <p><b>Create/Confirm Passphrase</b></p> <p>Create and confirm a passphrase for the certificate protection on the vRealize Automation IaaS Windows servers.</p>
IaaS Windows Template	<p>Select one of the following options from the drop-down options:</p> <p><b>Upload OVA Template</b></p> <p>Select to upload a new Windows Server OVA template. Click <b>Upload</b> to navigate to and upload the OVA template. The filename must be less than 60 characters in length, including the extension.</p> <p><b>Use Existing OVA Template</b></p> <p>Select to use and specify an existing Windows Server OVA template. The OVA template path automatically displays the path to an existing template uploaded to SDDC Manager using SCP, if any.</p> <p>The file path must have the following permissions:</p> <p><b>owner:</b> vcf_commonsvcs</p> <p><b>group:</b> vcf</p> <p>The directories in the path must be readable and executable for the user and the group.</p> <p>For example:</p> <pre>chmod 0750 -R /upload chown vcf_commonsvcs:vcf -R /upload</pre>

7 On the **FQDNs** page, enter the settings and **Next** to continue.

**Important** The installation derives the Active Directory domain name for the computer account from the DNS suffix provided in the FQDN for each vRealize Automation IaaS component. For example, an FQDN of `vra01iws01a.rainpole.local` derives the Active Directory domain `rainpole.local`. If the DNS suffix is different from Active Directory domain name, the installation will be unsuccessful. For more information, see [Knowledge Base article 59128](#).

**Note** All settings are required.

Setting	Description
vRealize Automation Appliances	<p><b>Appliance 1</b> Enter the FQDN as provided in the certificate.</p> <p><b>Appliance 2</b> Enter the FQDN as provided in the certificate.</p> <p><b>Appliance 3</b> Enter the FQDN as provided in the certificate.</p>
IaaS Web Servers	<p><b>IaaS Web Server 1</b> Enter the FQDN as provided in the certificate.</p> <p><b>IaaS Web Server 2</b> Enter the FQDN as provided in the certificate.</p> <p><b>Note</b> Host names for Windows IaaS VMs should be 15 characters or less due to limitations in the Windows OS. If the host names are longer they will be trimmed during the installation and installation will fail.</p>
IaaS Manager Service and DEM Orchestrators	<p><b>IaaS Manager 1</b> Enter the FQDN as provided in the certificate.</p> <p><b>IaaS Manager 2</b> Enter the FQDN as provided in the certificate.</p> <p><b>Note</b> Host names for Windows IaaS VMs should be 15 characters or less due to limitations in the Windows OS. If the host names are longer they will be trimmed during the installation and installation will fail.</p>
DEM Workers	<p><b>DEM Worker 1</b> Enter the FQDN as provided in the certificate.</p> <p><b>DEM Worker 2</b> Enter the FQDN as provided in the certificate.</p> <p><b>Note</b> Host names for Windows IaaS VMs should be 15 characters or less due to limitations in the Windows OS. If the host names are longer they will be trimmed during the installation and installation will fail.</p>
Proxy Agents	<p><b>Proxy Agent 1</b> Enter the FQDN.</p> <p><b>Proxy Agent 2</b> Enter the FQDN.</p> <p><b>Note</b> Host names for Windows IaaS VMs should be 15 characters or less due to limitations in the Windows OS. If the host names are longer they will be trimmed during the installation and installation will fail.</p>
vRealize Suite Lifecycle Manager	<p><b>Hostname</b> Displays the FQDN.</p>

Setting	Description
Load Balancers	<p>When you deploy vRealize Automation, an NSX Edge Service Gateway is deployed as a one-armed load balancer. This load balancer is shared between vRealize Operations and vRealize Automation. If you already deployed vRealize Operations, the <b>NSX Edge Service Gateway</b> FQDN displays as read-only.</p> <p><b>NSX Edge Services Gateway</b> Displays the FQDN.</p> <p><b>IaaS Web Server Virtual Server</b> Enter the FQDN as provided in the certificate.</p> <p><b>IaaS Manager Virtual Server</b> Enter the FQDN as provided in the certificate.</p> <p><b>vRealize Automation Appliance Virtual Server</b> Enter the FQDN as provided in the certificate.</p>
Microsoft SQL Server	<p><b>Hostname</b> Provide the FQDN for the Microsoft SQL Server virtual appliance.</p>

8 On the **Account Information** page, enter the settings and **Next** to continue.

**Note** All settings are required.

Setting	Description
Active Directory	<p>Use these settings to provide the service account that is used for services on the IaaS VMs. This account must have administrative permissions to join Windows VMs to Active Directory.</p> <p><b>Username</b> Provide the service account user name in the "domain \username" format.</p> <p><b>Password / Confirm Password</b> Provide and confirm a valid password.</p>
Microsoft SQL Server	<p>Use these settings to create the connection to the database.</p> <p><b>Database Name</b> Specify the case-sensitive database name.</p> <p><b>Username</b> Specify the database owner user name. This setting is optional. If no user name is specified, Cloud Foundation applies the the Active Directory account used when the database was joined to Active Directory.</p> <p><b>Password / Confirm Password</b> Provide and confirm a valid password for the specified user. This is required only if you also provide a username, as described above.</p>

Setting	Description	
Local Tenant Administrator	Use these settings to create a new user for the default vRealize Automation tenant. This user will be assigned the Tenant Administrator role.	
	<b>First Name</b>	Enter the administrator's first name.
	<b>Last Name</b>	Enter the administrator's last name.
	<b>Email</b>	Enter the administrator's email.
	<b>Username</b>	Define a user name for the tenant administrator.
	<b>Create Password / Confirm Password</b>	Create and confirm a password for the tenant administrator.
Windows Template Local Administrator	<b>Create Password / Confirm Password</b>	Create and confirm the local administrator password for the Windows system that is deployed through the Windows IaaS VM template.
Default Tenant Administrator	<b>Create Password / Confirm Password</b>	Create and confirm the password for the vRealize Automation system administrator. This is the credential that allows SDDC Manager to connect to the vRealize Automation system.
vRealize Automation SSH Root Account	<b>Create Password / Confirm Password</b>	Create and confirm a password for the vRealize Automation virtual appliance root account.

**9** On the **Review Summary** page, review a summary of the installation configuration settings.

This page displays any validation errors that require attention.

**Note** If necessary, you can use the **Back** button to return to preceding pages and modify settings. You can also proceed without validation.

**10** Click **Finish**.

The **vRealize Automation** page displays with the following message: Deployment in progress. If the deployment fails, this page displays a deployment status of Failed. In this case, you can **Retry** or **Uninstall**.

**Important** The uninstall operation does not remove the computer accounts from Active Directory. As a result, this could cause a reinstallation to fail. Manually remove the computer accounts from Active Directory and recreate the Microsoft SQL Server database for vRealize Automation. See the *VMware Cloud Foundation Planning and Preparation Guide*.

- 11 (Optional) Click **View Status in Tasks** to view the details of the deployment in progress or a deployment failure.

The **Tasks** panel opens at the bottom page. You can open individual tasks to view details.

- 12 (Optional) After the successful deployment of vRealize Automation, click the vRealize Automation link below the page title.

The vRealize Automation user interface opens in a new browser tab.

After the successful deployment of vRealize Automation, the **vRealize Automation** page in **SDDC Manager > Administration > vRealize Suite** displays an ACTIVE status and displays controls that enable you to connect vRealize Automation to workload domains.

#### What to do next

You must manually start the vRealize Orchestrator configuration service. See [Start the vRealize Orchestrator Configurator Service in Cloud Foundation](#).

## Post-Deployment Tasks for vRealize Automation in Cloud Foundation

After you complete the procedure to add vRealize Automation to Cloud Foundation, verify that the following configurations are established.

### Start the vRealize Orchestrator Configurator Service in Cloud Foundation

After deploying vRealize Automation in Cloud Foundation, you must manually start the vRealize Orchestrator Configurator service to access the vRealize Orchestrator configuration interface.

#### Procedure

- 1 Log in to the first vRealize Automation appliance by using Secure Shell (SSH) client to configure the embedded vRealize Orchestrator Configurator service.
- 2 Verify that the vRealize Orchestrator user interface service is running.
  - a Run the following command to verify that the service is set to automatically start.

```
chkconfig vco-configurator
```

- b If the service reports Off, run the following command to enable an automatic restart of the vRealize Orchestrator Configurator service upon subsequent reboots of the vRealize Automation appliance.

```
chkconfig vco-configurator on
```

- c Verify the status of the vRealize Orchestrator Configurator service by running the following command .

```
service vco-configurator status
```

- d Repeat the procedure to configure vRealize Orchestrator for the other vRealize Automation appliances.

## Create VM Groups to Define the Startup Order of vRealize Automation in Cloud Foundation

Define the startup order of vRealize Automation components with VM Groups. The startup order ensures that vSphere HA powers on virtual machines in the correct order,

### Procedure

- 1 On the SDDC Manager Dashboard, select **Inventory > Workload Domains** from the **Navigation** pane.
- 2 Click on the **MGMT** Management Domain.
- 3 Select the **Services** tab on the Management Domain.
- 4 Under the **VMware Cloud Foundation Components** section, click on the link for the vCenter Server. A new browser window launch the landing page for the vSphere Web Client.
- 5 On the **Welcome to VMware vSphere** browser windows, click the link for **vSphere Web Client (Flash)**.  
The vSphere Web Client will open.
- 6 In the **Navigator**, select **Host and Clusters** and expand the tree for the Management Domain vCenter Server instance..
- 7 Create a VM Group for the vRealize Automation IaaS database.
  - a Select the Management Domain cluster and click the **Configure** tab.
  - b On the **Configure** page, click **VM/Host Groups**.
  - c On the **VM/Host Groups** page, click the **Add** button.
  - d In the **Create VM/Host Group** dialog box, enter **vRealize Automation IaaS Database** in the **Name** text box, select **VM Group** from the **Type** drop-down menu, and click the **Add** button.
  - e In the **Add VM/Host Group Member** dialog box, select virtual machine for the Microsoft SQL Server (for example, **vra01mssql01**) and click **OK**.
  - f Click **OK** to save the VM/Host Group.

## 8 Repeat *Step 3* to create the following VM/Host Groups

VM/Host Group Name	VM/Host Group Member
vRealize Automation Virtual Appliances	vRealize Automation Appliance 1
-	vRealize Automation Appliance 2
-	vRealize Automation Appliance 3
vRealize Automation IaaS Web Servers	vRealize Automation IaaS Web Server 1
-	vRealize Automation IaaS Web Server 2
vRealize Automation IaaS Manager Servers	vRealize Automation IaaS Manager Server 1
-	vRealize Automation IaaS Manager Server 2
vRealize Automation IaaS DEM Workers	vRealize Automation IaaS DEM Worker 1
-	vRealize Automation IaaS DEM Worker 2
vRealize Automation Proxy Agents	vRealize Automation Proxy Agent 1
-	vRealize Automation Proxy Agent 2

## 9 Create a rule to power on the vRealize Automation IaaS database virtual machine before the vRealize Automation virtual appliances and vRealize Automation IaaS virtual machines..

- a Select the Management Domain cluster and click the **Configure** tab.
- b On the **Configure** page, click **VM/Host Rules**.
- c On the **VM/Host Rules** page, click the **Add** button.
- d In the **Create VM/Host Rule** dialog box, enter **SDDC Cloud Management Platform 01** in the **Name** text box, ensure the **Enable Rule** check box is selected, and select **Virtual Machines to Virtual Machines** from the **Type** drop-down menu.
- e Select **vRealize Automation IaaS Database** from the **First restart VMs in VM group** drop-down menu.
- f Select **vRealize Automation Virtual Appliances** from the **Then restart VMs in VM group** drop-down menu, and click **OK**.

## 10 Repeat *Step 5* to create the following VM/Host Rules to ensure the correct restart order for your Cloud Management Platform.

VM/Host Rule Name	First restart VMs in VM group	Then restart VMs in VM group
SDDC Cloud Management Platform 02	vRealize Automation Virtual Appliances	vRealize Automation IaaS Web Servers
SDDC Cloud Management Platform 03	vRealize Automation IaaS Web Servers	vRealize Automation IaaS Manager Servers
SDDC Cloud Management Platform 04	vRealize Automation IaaS Manager Servers	vRealize Automation IaaS DEM Workers
SDDC Cloud Management Platform 05	vRealize Automation IaaS Manager Servers	vRealize Automation Proxy Agents



## Adding vRealize Operations to Cloud Foundation

vRealize Operations tracks and analyzes the operation of multiple data sources in Cloud Foundation by using specialized analytic algorithms. These algorithms help vRealize Operations learn and predict the behavior of every object it monitors. Users access this information by using views, reports, and dashboards. SDDC Manager automates the deployment of vRealize Operations in Cloud Foundation.

### Add a vRealize Operations License Key to Cloud Foundation

Before you can deploy vRealize Operations for use with Cloud Foundation you must add a license.

#### Procedure

- 1 On the SDDC Manager Dashboard, navigate to **Administration > Licensing**.
- 2 Click **+ License Key**.
- 3 Select **VMware vRealize Operations** as the product name.
- 4 Type the license key.

You can enter a license key for vRealize Operations or a suite license for a product that includes vRealize Operations. For example, vCloud Suite or vRealize Suite.

- 5 Type a description for the license.  
If you have multiple license keys for a product, the description can help in identifying the license.
- 6 Click **Add**.

### Deploy vRealize Operations in Cloud Foundation

You deploy vRealize Operations in Cloud Foundation using the SDDC Manager user interface.

#### Prerequisites

- Deploy vRealize Suite Lifecycle Manager. See [Deploy vRealize Suite Lifecycle Manager in Cloud Foundation](#).
- Verify you have a valid license key for vRealize Operations, which is purchased separately from Cloud Foundation. You must add the license key to Cloud Foundation before deploying vRealize Operations. See [Add a vRealize Operations License Key to Cloud Foundation](#).
- Verify you have downloaded the vRealize Suite bundles from the VMware Depot. The bundle is obtained separately from the Cloud Foundation installation download.
- Verify that IP allocation and forward/reverse DNS records are prepared the vRealize Operations components.

For more information, see the *VMware Cloud Foundation Planning and Preparation Guide*.

- Verify that you have determined the size of the vRealize Operations deployment to provide enough resources to accommodate the analytics operations for monitoring the expected number of workloads and SDDC management packs in the Cloud Foundation system.

For more information, use the online [vRealize Operations Sizing](#) utility.

## Procedure

- 1 On the **SDDC Manager Dashboard**, navigate to **Administration > vRealize Suite**.

The **vRealize Suite** navigation appears, listing the vRealize Suite products available for your Cloud Foundation system deployment.

- 2 Click **vRealize Operations**.

The **vRealize Operations** page displays.

- 3 Click **Deploy**.

The **vRealize Operations Installation Prerequisites** page displays the prerequisites that you must complete before beginning the installation.

- 4 Review the readiness of each prerequisite and verify by selecting each adjacent check box.

When all the boxes are selected, the **Begin** button is activated.

- 5 Click **Begin**.

- 6 On the **Deployment Details** page, enter the settings and **Next** to continue.

All settings are required.

Setting	Description
License Key	Select a valid license for vRealize Operations. This license may be for vRealize Operations, vRealize Suite, or vCloud Suite. If no key is available, you can add one in <b>Administration &gt; Licensing</b> .
High Availability	Optionally, move the button to green to deploy vRealize Operations with high availability configured.
Node Size	Select a <b>Node Size</b> based on your requirements. <b>Note</b> If you enable <b>High Availability</b> , you must specify a <b>Node Size</b> of <b>Medium</b> or larger.
Node Count	Select a <b>Node Count</b> for based on your requirements. <b>Note</b> If you enable <b>High Availability</b> , you must specify a <b>Node Count</b> of <b>2</b> or more.

**Note** The **Node Size** limits the number of nodes you can specify. Review the vRealize Operations Sizing Guidelines in VMware Knowledge Base article [54370](#).

- 7 On the **FQDNs** page, enter the settings and **Next** to continue.

**Note** All settings are required.

Setting	Description
Load Balancers	<p>When you deploy vRealize Operations, an NSX Edge Service Gateway is deployed as a one-armed load balancer. This load balancer is shared between vRealize Operations and vRealize Automation. If you already deployed vRealize Automation, the <b>NSX Edge Service Gateway</b> FQDN displays as read-only.</p> <p><b>NSX Edge Service Gateway</b> Enter the FQDN.</p> <p><b>vRealize Operations</b> Enter the FQDN for the vRealize Operations virtual server on the NSX Edge load balancer.</p>
vRealize Operations Nodes	<p><b>Node 1</b> Enter the FQDN.</p> <p><b>Node n</b> Enter the FQDN for each <b>Node n</b>.</p> <p>For example, if you specify 3 nodes:</p> <ul style="list-style-type: none"> <li>■ Without <b>High Availability</b> enabled. <ul style="list-style-type: none"> <li>■ Node 1 = Master Node FQDN</li> <li>■ Node 2 = Data Node 1 FQDN</li> <li>■ Node 3 = Data Node 2 FQDN</li> </ul> </li> <li>■ With <b>High Availability</b> enabled. <ul style="list-style-type: none"> <li>■ Node 1 = Master Node FQDN</li> <li>■ Node 2 = Replica Node FQDN</li> <li>■ Node 3 = Data Node FQDN</li> </ul> </li> </ul>
vRealize Suite Lifecycle Manager	<b>vRealize Suite Lifecycle Manager</b> Displays the FQDN.

8 On the **Account Information** page, enter the settings and **Next** to continue.

**Note** All settings are required.

Setting	Description
vRealize Operations Systems Administrator	<p><b>Create Password / Confirm Password</b> Create and confirm a password for the vRealize Operations system administrator. This is the credential that allows SDDC Manager to connect to the vRealize Operations system.</p>

9 On the **Review Summary** page, review a summary of the installation configuration settings.

This page displays any validation errors that require attention.

**Note** If necessary, you can use the **Back** button to return to preceding pages and modify settings. You can also proceed without validation.

10 Click **Finish**.

The **vRealize Operations** page displays with the following message: Deployment in progress. If the deployment fails, this page displays a deployment status of Failed and prompts you to **Uninstall**.

Click **Uninstall** to return to the **vRealize Operations** page. Confirm your configuration settings, and retry the deployment operation.

- 11 After deploying vRealize Operations on Cloud Foundation, you must replace the security certificate.

See [Chapter 4 Managing Certificates for Cloud Foundation Components](#).

- 12 (Optional) Click **View Status in Tasks** to view the details of the deployment in progress or a deployment failure.

The **Tasks** panel opens at the bottom page. You can open individual tasks to view details.

- 13 (Optional) After the successful deployment of vRealize Operations, click the vRealize Operations link below the page title.

The vRealize Operations user interface opens in a new browser tab.

After the successful deployment of vRealize Operations, the **vRealize Operations** page in **SDDC Manager > Administration > vRealize Suite** displays an ACTIVE status and displays controls that enable you to connect vRealize Operations to workload domains.

## Post-Deployment Tasks for vRealize Operations in Cloud Foundation

After you complete the procedure to add vRealize Operations to Cloud Foundation, verify that the following configurations are established.

---

**Important** In addition to the below procedures, after deploying vRealize Operations on Cloud Foundation, you must replace the security certificate. See [Chapter 4 Managing Certificates for Cloud Foundation Components](#).

---

### Configure SSL Passthrough for vRealize Operations Manager

By default, the vRealize Operations Manager node's load balancer is configured for SSL Termination. If you plan to use a custom certificate with vRealize Operations Manager, it is recommended that you replace the certificate on the vRealize Operations Manager cluster and configure the load balancer for SSL Passthrough.

#### Prerequisites

Verify that you have successfully replaced the vRealize Operations Manager certificate using the workflow described in [Chapter 4 Managing Certificates for Cloud Foundation Components](#).

#### Procedure

- 1 Log in into the management vCenter Server and navigate to **Home > Networking & Security**.
- 2 Select **NSX Edges** in the Navigator.
- 3 Confirm that the IP address in the **NSX Manager** field is identical to the IP address for the NSX Manager for the management domain in Cloud Foundation.
- 4 Double-click the NSX Edge labeled **vrealize-edge**.

- 5 Select the **Manage** tab, then the **Load Balancer** tab.
- 6 Open **Application Profiles**.
- 7 Find and click the profile named **vrops-https**, and click **Edit**.
- 8 Select **Enable SSL Passthrough** and click OK.
- 9 Log into the vRealize Operations Manager Master node as root via SSH or Console.
- 10 Open `/usr/lib/vmware-vcopssuite/utilities/conf/vcops-apache.conf` in a text editor.
- 11 Find the `ServerName ${VCOPS_APACHE_SERVER_NAME}` line and insert a new line after it.
- 12 On the new line enter the following:

```
ServerAlias vrops-lb.vrack.vsphere.local vrops-master.vrack.vsphere.local
```

Replace `vrops-lb.vrack.vsphere.local` with the FQDN of vRealize Operations Manager load balancer and replace `vrops-master.vrack.vsphere.local` with the FQDN of the vRealize Operations Manager master node.

- 13 Save and close the file.
- 14 Restart the `apache2` service:

```
service apache2 restart
```

- 15 Repeat steps 9-14 for all nodes in the vRealize Operations Manager cluster.

## Connect vRealize Suite Products to Workload Domains in Cloud Foundation

You can connect your vRealize Automation and vRealize Operations deployments to workload domains in Cloud Foundation.

When connected, vRealize Automation and vRealize Operations monitor and collect data on the workload domains in Cloud Foundation.

---

**Note** This version of Cloud Foundation does not support vRealize Automation or vRealize Operations for NSX-T workload domains. NSX for vSphere workload domains are supported.

---

By default, the management workload domain is connected to vRealize Operations. You can also enable log collection by enabling vRealize Log Insight within SDDC Manager.

---

**Note** You can create only one connection at a time.

---

**Important** Once you enable a connection between vRealize Automation and a workload domain, and then complete the connection wizard, you cannot disable the connection.

---

**Prerequisites**

- Verify that one or more workload domains has been created.
- Verify that vRealize Automation and vRealize Operations are deployed and operational.

**Procedure****1** [Connect vRealize Suite Products to Workload Domains in Cloud Foundation](#)

You can connect vRealize Operations and vRealize Automation product deployments in Cloud Foundation to your workload domains in the SDDC Manager user interface

**2** [Connect Workload Domains to vRealize Suite Products in Cloud Foundation](#)

You can connect workload domains to vRealize Operations and vRealize Automation product deployments in Cloud Foundation using the SDDC Manager user interface

**3** [Enable vRealize Log Insight in Cloud Foundation](#)

You can connect vRealize Log Insight in Cloud Foundation to all workload domains in the SDDC Manager user interface.

## Connect vRealize Suite Products to Workload Domains in Cloud Foundation

You can connect vRealize Operations and vRealize Automation product deployments in Cloud Foundation to your workload domains in the SDDC Manager user interface

---

**Note** This version of Cloud Foundation does not support vRealize Automation or vRealize Operations for NSX-T workload domains. NSX for vSphere workload domains are supported.

---

**Prerequisites**

- Before you can connect the management domain or workload domains to vRealize Operations, it must be deployed. For more information, see [Deploy vRealize Operations in Cloud Foundation](#).
- Before you can connect workload domains to vRealize Automation, it must be deployed. For more information, see [Deploy vRealize Automation in Cloud Foundation](#).

**Procedure**

**1** On the **SDDC Manager Dashboard**, navigate to **Administration > vRealize Suite**.

**2** To connect your vRealize Operations deployment to workload domains:

- a Select **vRealize Operations**.
- b Under **Connect Workload Domains...**, click **Connect**.

The **Connect to Workload Domains** wizard opens to the **Modify Connection** page. This page lists all currently configured workload domains and enables you to connect vRealize Operations to each

3 To connect your vRealize Automation deployment to workload domains:

- a Select **vRealize Automation**.
- b Under **Connect Workload Domains...**, click **Connect**.

The **Connect to Workload Domains** wizard opens to the **Modify Connection** page. This page lists all currently configured workload domains and enables you to connect vRealize Automation to each.

---

**Important** If you enable a connection between vRealize Automation and a workload domain, and then complete the **Connect to Workload Domains** wizard, you cannot disable the connection.

---

- 4 Select **Enable** for the desired workload domains.
- 5 If prompted, provide the Active Directory credentials used during the deployment of vRealize Automation and click **Next**. See [Deploy vRealize Automation in Cloud Foundation](#).
- 6 Review the connection and click **Finish**.
- 7 (Optional) Confirm the modified connection in vRealize Operations or vRealize Automation.

- a On the **vRealize Operations** or **vRealize Automation** page, click the product name link below the page title.

The vRealize Operations or vRealize Automation administrative opens to the Home page.

- b For vRealize Operations, navigate to **Administration > Solutions**.

The **Solutions** page displays the status of adapters for solutions connected to vRealize Operations. When successfully connected, the status indicates Data Receiving.

---

**Note** You may need to refresh the **Solutions** page to update the status.

---

## Connect Workload Domains to vRealize Suite Products in Cloud Foundation

You can connect workload domains to vRealize Operations and vRealize Automation product deployments in Cloud Foundation using the SDDC Manager user interface

---

**Note** This version of Cloud Foundation does not support vRealize Automation or vRealize Operations for NSX-T workload domains. NSX for vSphere workload domains are supported.

---

### Prerequisites

- Before you can connect the management domain or workload domains to vRealize Operations, it must be deployed. For more information, see [Deploy vRealize Operations in Cloud Foundation](#).
- Before you can connect workload domains to vRealize Automation, it must be deployed. For more information, see [Deploy vRealize Automation in Cloud Foundation](#).

**Procedure**

- 1 On the **SDDC Manager Dashboard**, navigate to **Inventory > Workload Domains**.

The **Workload Domains** page displays information for all workload domains.

- 2 Select the **Security** tab.

- 3 Click **Connect to vRealize Products**.

The **Connect to vRealize Products** wizard opens to the **Modify Connection** page. This page lists all currently configured workload domains and enables you to connect workload domains to either your vRealize Operations and vRealize Automation deployments.

- 4 Select **Enable** for the desired workload domain.

- 5 If prompted, provide the Active Directory credentials used during the deployment of vRealize Automation and click **Next**. See [Deploy vRealize Automation in Cloud Foundation](#).

- 6 Review the connection and click **Finish**.

---

**Important** If you enable a connection between vRealize Automation and a workload domain, and then complete the **Connect to Workload Domains** wizard, you cannot disable the connection.

---

## Enable vRealize Log Insight in Cloud Foundation

You can connect vRealize Log Insight in Cloud Foundation to all workload domains in the SDDC Manager user interface.

Once enabled, you cannot disable the connection to vRealize Log Insight. All subsequently created workload domains will automatically connect and send logs to the vRealize Log Insight cluster.

**Prerequisites**

- Verify you have a valid license key for vRealize Log Insight, which is purchased separately from Cloud Foundation.

You can view your license in the vRealize Log Insight interface by navigating to **Management > License**.

- Verify that the vRealize Log Insight cluster is online and operational.

**Procedure**

- 1 On the **SDDC Manager Dashboard**, navigate to **Administration > vRealize Suite**.

The **vRealize Suite** navigation appears, listing the vRealize Suite products available for your Cloud Foundation system deployment.

- 2 Click **vRealize Log Insight**.

The **vRealize Log Insight** page displays.

The top portion of the page allows you to enable log collection for all workload domains. If not enabled, the **Enable** button is active.



The lower portion of the page displays the configuration details, including load balancer hostname, node size, and node count.

**3** Click **Enable**.

After a moment, the page will update with a message indicating **Connect Workload Domains to vRealize Log Insight in Progress**. In **Tasks**, monitor the **Status** of the **Connect Workload Domains to vRealize Log Insight** action. Once **Successful**, vRealize Log Insight will collect logs from both the management workload domain and all additional workload domains.

# Stretching Clusters

# 12

You can stretch a cluster in the management domain or in a VI workload domain across two availability zones.

This section describes how to stretch an NSX for vSphere cluster. To stretch an NSX-T cluster, see the *VMware Cloud Foundation Information* section in the VMware Validated Design documentation.

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 objective for the majority of unplanned failures.
- **Disaster avoidance**  
With a stretched cluster, you can prevent service outages before an impending disaster such as a hurricane or rising flood levels.

This chapter includes the following topics:

- [About Availability Zones and Regions](#)
- [Prerequisites for Stretching a Cluster](#)
- [Stretch a Cluster](#)
- [Unstretch a Cluster](#)
- [Expand a Stretched Cluster](#)
- [Replace a Failed Host in a Stretched Cluster](#)

## About Availability Zones and Regions

An availability zone is a collection of infrastructure components. Each availability zone is isolated from other availability zones to prevent the propagation of failure or outage across the data center. An 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 even uncommon 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. Hence, 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.

The recommended minimum number of hosts in each availability zone is 4 hosts and the maximum is 15 hosts. If you are expanding a cluster, you must add hosts in pairs. Each host in the pair must have the same CPU, memory, and storage.

A region is a Cloud Foundation instance.

---

**Note** Cloud Foundation supports stretching a cluster across two availability zone within a region.

---

## Prerequisites for Stretching a Cluster

Before you can stretch a cluster, you must meet the prerequisites.

- Download the [Deployment for Multiple Availability Zones](#) document and read it to understand the requirements.
- Ensure a vSAN Enterprise license has been applied to the cluster to be stretched. A vSAN Enterprise license is required for stretching a cluster. See [KB 70328](#) for information about a known licensing issue.
- The management VLAN between the two availability zones must be stretched.
- All VMs on an external network must be on a virtual wire. If they are on a VLAN, that VLAN must be stretched as well.
- Each availability zone must have its own vMotion, vSAN, and VXLAN networks.
- The vMotion, vSAN, and VXLAN networks require L3 routing between the availability zones. vSAN networks must also have L3 routing to the vSAN network of the witness host.
- The VLAN IDs must be identical on both availability zones.
- Each stretched cluster requires a vSAN witness appliance in a third party location. The maximum RTT on the witness is 200ms. Follow the steps described in "[Deploy and Configure the vSAN Witness Host in Region B](#)" to add and configure a vSAN witness.
- If you are stretching a cluster in a VI workload domain, you must stretch the management domain cluster first. vCenter Servers for all workload domains are in the management domain. Hence, you must protect the management domain to ensure that you can access and manage the workload domains.
- 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.

- TCP port and UDP Ports needs to be open for witness traffic between the witness host and the vSAN cluster data nodes. See KB article [52959](#).

## Cloud Foundation Networks

Network Name	Connectivity to AZ2	Minimum MTU	Maximum MTU
vSAN	L3	1500	9000
vMotion	L3	1500	9000
VXLAN (VTEP)	L3	1600	9000
Management	L2	1500	9000
Witness Management	L3	1500	9000
Witness vSAN	L3	1500	9000

## Stretch a Cluster

This procedure describes how to stretch a cluster across two availability zones.

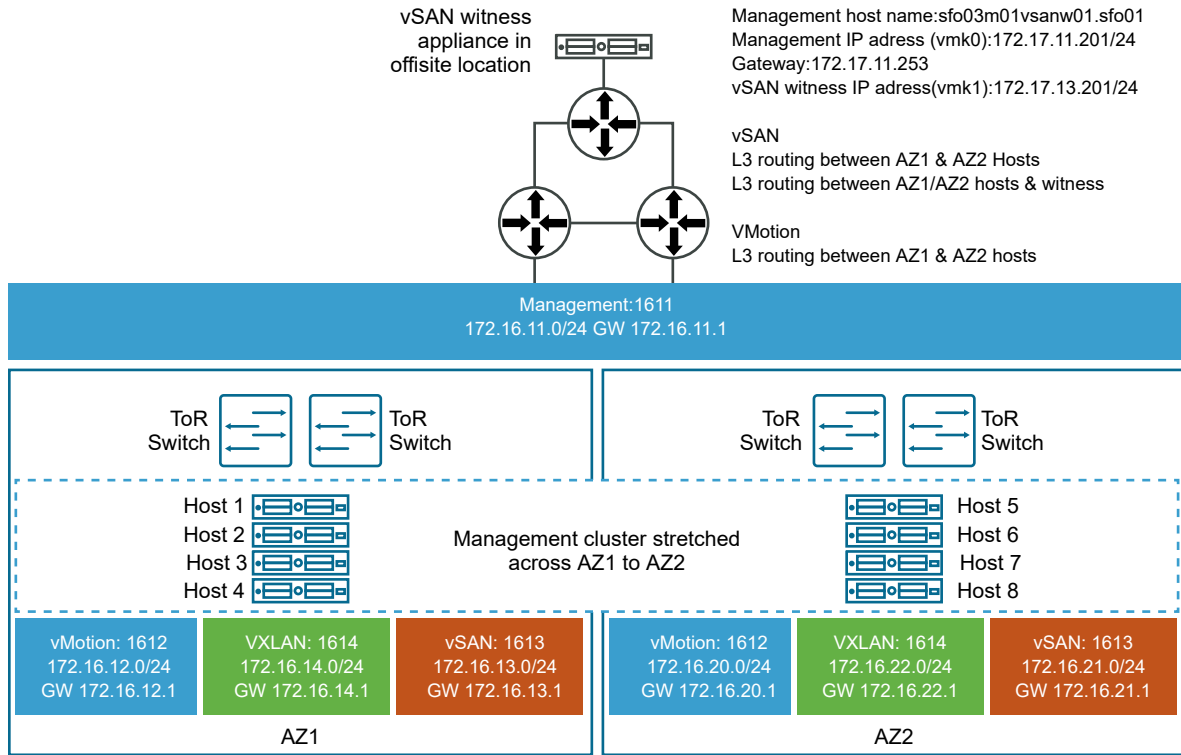
As an example, we will follow a use case with two availability zones in two buildings in an office campus - AZ1 and AZ2. Each availability zone has its own power supply and network. The management domain is on AZ1 and contains the default cluster, SDDC-Cluster1. This cluster contains four ESXi hosts. AZ1 also contains the default bring-up pool, bringup-networkpool.

vSAN network	VLANID=1613
	MTU=9000
	Network=172.16.13.0
	netmask 255.255.255.0
	gateway 172.16.13.1
	IP range=172.16.13.11 - 172.16.13.59
vMotion network	VLANID=1612
	MTU=9000
	Network=172.16.12.0
	netmask 255.255.255.0
	gateway 172.16.12.1
	IP range=172.16.12.11 - 172.16.12.59

There are four ESXi hosts in AZ2 that are not in the Cloud Foundation inventory yet.

We will stretch the default cluster SDDC-Cluster1 in the management domain from AZ1 to AZ2.

**Figure 12-1. Stretch Cluster Example**



**Prerequisites**

Ensure you have completed the steps listed in [Prerequisites for Stretching a Cluster](#).

**Procedure**

- 1 Create a network pool, AZ2-networkpool, on AZ2. See [Create a Network Pool](#).

Based on our example, here are the network details for the network pool.

vSAN network	VLANID=1613
	MTU=9000
	Network=172.16.21.0
	Netmask=255.255.255.0
	Gateway=172.16.21.1
	IP range= 172.16.21.11 - 172.16.21.59
vMotion network	VLANID=1612
	MTU=9000
	Network=172.16.20.0
	netmask 255.255.255.0
	gateway 172.16.20.1
	IP range= 172.16.20.11 - 172.16.20.59

- 2 Commission the four hosts in AZ2 and associate them with AZ2-networkpool. In our example, these are 172.16.11.105, 172.16.11.106, 172.16.11.107, 172.16.11.108.

See [Commission Hosts](#).

- 3 Retrieve the FQDNs of the hosts in AZ2.
  - a On the SDDC Manager Dashboard, click **Hosts**.
  - b Note down the FQDNs for the hosts in AZ2.
- 4 SSH in to the SDDC Manager VM using the **vcf** administrative user account.
- 5 Enter **su** to switch to the root user and navigate to the `/opt/vmware/sddc-support` directory.
- 6 Enter the following command:

Option	Description
For Cloud Foundation 3.7	<code>./sos --stretch-vsan --sc-domain &lt;DOMAIN NAME&gt; --sc-cluster &lt;CLUSTER NAME&gt; --sc-hosts &lt;HOSTFQDN,HOSTDQND2,...&gt; --witness-fqdn &lt;WITNESS HOST FQDN&gt; --witness-vsan-ip &lt;WITNESS VSAN IP&gt; --witness-vsan-cidr &lt;WITNESS VSAN CIDR&gt; --esxi-license-key &lt;LICENSE KEY&gt;</code>
For Cloud Foundation 3.7.1	<code>./sos --stretch-vsan --sc-domain &lt;DOMAIN NAME&gt; --sc-cluster &lt;CLUSTER NAME&gt; --sc-hosts &lt;HOSTFQDN,HOSTDQND2,...&gt; --witness-host-fqdn &lt;WITNESS HOST FQDN&gt; --witness-vsan-ip &lt;WITNESS VSAN IP&gt; --witness-vsan-cidr &lt;WITNESS VSAN CIDR&gt; --esxi-license-key &lt;LICENSE KEY&gt;</code>

Example input and response for Cloud Foundation 3.7.1:

```
root@sddc-manager [ /opt/vmware/sddc-support ]# ./sos --stretch-vsan --sc-domain MGMT --sc-cluster SDDC-Cluster1 --sc-hosts esxi-5.vrack.vsphere.local,esxi-6.vrack.vsphere.local --witness-host-fqdn esxi-11.vrack.vsphere.local --witness-vsan-ip 10.0.12.96 --witness-vsan-cidr 10.0.12.0/24 --esxi-license-key AAAAA-BBBBB-CCCCC-DDDDD-EEEE
Welcome to Supportability and Serviceability(SoS) utility!
Logs : /var/log/vmware/vcf/sddc-support/stretchCluster-2019-02-13-08-51-34-12479
Stretch Cluster operation log : /var/log/vmware/vcf/sddc-support/stretchCluster-2019-02-13-08-51-34-12479/sos.log
Starting vSAN stretched cluster operations..
Api Response:{
  "taskId": "d670ff00-24a3-4739-b5ff-b5317d709f36",
  "resourceId": "0f8d112d-aa3f-4ca8-a8bd-b95e0e1ea2f5",
  "resourceType": "ESXI",
  "state": "IN_PROGRESS",
  "description": "Stretch vSAN Cluster - SDDC-Cluster1 in VMware Cloud Foundation",
  "timestamp": 1550047894872,
  "id": "d670ff00-24a3-4739-b5ff-b5317d709f36"
}
```

- 7 Monitor the state of the task in the SDDC Manager Dashboard.

- 8 When the task completes successfully, validate that stretched cluster operations are working correctly by logging in to the vSphere Web Client.

The time it takes to complete a policy compliance check depends on the number of VMs in the cluster.

- a Check the vSAN Health page.
  - 1 On the home page, click **Host and Clusters** and then select the stretched cluster (SDDC-Cluster1 in our example).
  - 2 Click **Monitor > vSAN > Health**.
  - 3 Click **Retest**.
  - 4 Fix errors, if any.
- b Check the vSAN Storage Policy page.
  - 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.
  - 3 Click **Monitor > VMs and Virtual Disks**.
  - 4 Click **Refresh**.
  - 5 Click **Trigger VM storage policy compliance check**.
  - 6 Check the **Compliance Status** column for each VM component.
  - 7 Fix errors, if any.

## Unstretch a Cluster

This procedure describes how to unstretch a vSAN cluster which is stretched across two availability zones and convert it to a standard vSAN cluster.

As an example, we will consider a use case in which there two availability zones, AZ1 and AZ2, in two buildings in an office campus. Each availability zone has its own power supply and network. The management domain is on AZ1 and contains the default cluster, SDDC-Cluster1, which is stretched between AZ1 and AZ2. There are four ESXi hosts each in AZ1 and AZ2, which are categorized into the primary fault domain and secondary fault domain. This example unstretches the default cluster in the management domain and converts the stretched cluster to standard vSAN cluster.

### Prerequisites

You must have a stretched cluster.

### Procedure

- 1 SSH in to the SDDC Manager VM using the **vcf** administrative user account.
- 2 Enter **su** to switch to the root user and navigate to the `/opt/vmware/sddc-support` directory.

### 3 Enter the following command:

Option	Description
For Cloud Foundation 3.7	<code>./sos --unstretch-vsan &lt;CLUSTER NAME&gt;</code>
For Cloud Foundation 3.7.1	<code>./sos --unstretch-vsan --sc-cluster &lt;CLUSTER NAME&gt; --sc-domain &lt;DOMAIN NAME&gt;</code>

#### Example input and response for Cloud Foundation 3.7.1:

```

root@sddc-manager [ /opt/vmware/sddc-support ]# ./sos --unstretch-vsan --sc-cluster SDDC-Cluster1
--sc-domain MGMT
Welcome to Supportability and Serviceability(SoS) utility!
Logs : /var/log/vmware/vcf/sddc-support/stretchCluster-2019-02-21-07-36-18-66388
Stretch Cluster operation log : /var/log/vmware/vcf/sddc-support/
stretchCluster-2019-02-21-07-36-18-66388/sos.log
Starting vSAN stretched cluster operations..
vSAN un-stretch operation started..
Api Response:{
  "taskId": "9c3b0975-be3c-42f2-8d1a-3d708c2c3263",
  "resourceId": "5f6cac74-6fbb-4570-b240-1a0ed5a54118",
  "resourceType": "ESXI",
  "state": "IN_PROGRESS",
  "description": "Un-Stretch vSAN Stretched Cluster - SDDC-Cluster1 in VMware Cloud Foundation",
  "timestamp": 1550734579412,
  "id": "9c3b0975-be3c-42f2-8d1a-3d708c2c3263"
}

```

### 4 Monitor the state of the task in the SDDC Manager Dashboard.

When the task completes, all the hosts from the AZ2 are removed from the cluster and cluster is converted to standard vSAN cluster.



- 5 Validate that vSAN cluster operations are working correctly by logging in to the vSphere Web Client.
  - a Check the vSAN Health page.
    - 1 On the home page, click **Host and Clusters** and then select the vSAN cluster (SDDC-Cluster1 in our example).
    - 2 Click **Monitor > vSAN > Health**.
    - 3 Click Retest.
    - 4 Fix errors, if any.
  - b Check the vSAN Storage Policy page.
    - 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 vSAN cluster.
    - 3 Click **Monitor > VMs and Virtual Disks**.
    - 4 Click **Refresh**.
    - 5 Click **Trigger VM storage policy compliance check** .
    - 6 Check the **Compliance Status** column for each VM component.
    - 7 Fix errors, if any.

## Expand a Stretched Cluster

You can expand a stretched cluster by adding hosts. The hosts need to be added in pairs (such as two, four, six, or eight). Half of the hosts you add to the cluster will be added to the first availability zone and the other half will be added to the second availability zone.

### Prerequisites

You must have a stretched cluster and available hosts.

### Procedure

- 1 Commission the additional hosts to Cloud Foundation. For each pair of hosts, associate one with the network pool in AZ1 and the other with the network pool in AZ2.

See [Commission Hosts](#).

- 2 SSH in to the SDDC Manager VM using the **vcf** administrative user account.
- 3 Enter **su** to switch to the root user and navigate to the `/opt/vmware/sddc-support` directory.
- 4 Enter the following command:

```
./sos --expand-stretch-cluster --sc-domain <DOMAIN NAME> --sc-cluster <CLUSTER NAME> --sc-hosts <HOSTFQDN,HOSTDQND2,...> --esxi-license-key <LICENSE KEY>
```

Example input and response:

```

root@sddc-manager [ /opt/vmware/sddc-support ]# ./sos --expand-stretch-cluster --sc-domain MGMT --
sc-cluster SDDC-Cluster1 --sc-hosts esxi-9.vrack.vsphere.local, esxi-10.vrack.vsphere.local --
esxi-license-key AAAAA-BBBBB-CCCC-DDDD-EEEE
Welcome to Supportability and Serviceability(SoS) utility!
Logs : /var/log/vmware/vcf/sddc-support/stretchCluster-2019-02-20-10-04-32-123007
Stretch Cluster operation log : /var/log/vmware/vcf/sddc-support/
stretchCluster-2019-02-20-10-04-32-123007/sos.log
Starting vSAN stretched cluster operations..
expand vSAN stretched cluster operation started
Api Response:{
  "taskId": "6e4b13d9-ead-408b-a595-4e89ef885a3e",
  "resourceId": "0c518498-b302-40ae-abc4-10addead7bc2",
  "resourceType": "ESXI",
  "state": "IN_PROGRESS",
  "description": "Prepare vSAN Cluster - SDDC-Cluster1 for Stretch in VMware Cloud Foundation",
  "timestamp": 1550657073615,
  "id": "6e4b13d9-ead-408b-a595-4e89ef885a3e"
}

```

- 5 Monitor the state of the task in the SDDC Manager Dashboard.
- 6 If required, SSH in to each newly added hosts and add a static route to the vSAN network of the witness host. Add static routes in the witness if it could not reach the vSAN network of the newly added hosts.
- 7 Move the added host to the appropriate availability zone so that the cluster is back to containing two fault domains again.
  - a On the SDDC Manager Dashboard, click **Inventory > Workload Domains** and then click **View Details**.
  - b Click the name of the domain containing the stretched cluster, for example, MGMT.
  - c Click the **Services** tab and click the vCenter Server launch icon and log in to the vSphere Web Client.
  - d In the vSphere Web Client, select the stretched cluster. Then select **Configure > vSAN > Fault Domains & Stretched Cluster**.
  - e Select the first newly added host associated with the network pool on AZ1 and drag it to AZ1.
  - f Select the second newly added host associated with the network pool on AZ2 and drag it to AZ2.
- 8 Add these hosts to the VMHost rule so that you can deploy VMs on all hosts.
  - a In the vSphere Web Client, select **Hosts and Clusters** and then select the stretched cluster.
  - b Select **Configure > VM/Host Rules**.
  - c Select the `<cluster_name>` rule and click **Add**.
  - d Select the ESXi hosts newly added to availability zone 1 and click **OK**.

- 9 Update the value for **Host failure cluster tolerates** to the number of hosts in AZ1 after the expansion.
  - a Log in to the management vCenter Server in the vSphere Web Client.
  - b From the **Home** menu, select **Hosts and Clusters** and expand the stretched cluster.
  - c Select the stretched cluster and click the **Configure** tab.
  - d Under **Services**, click **vSphere Availability**, and click **Edit**.
  - e On the Admission Control page of the Edit Cluster Settings dialog box, set **Host failures cluster tolerates** to the number of hosts in AZ1 and click **OK**.

## Replace a Failed Host in a Stretched 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

- Image the replacement host with the same ESXi version as the other hosts in the cluster.
- 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 Decommission the host.  
See [Decommission Hosts](#).
- 3 Commission the replacement host to the same network pool as the removed host.  
See [Commission Hosts](#).
- 4 SSH in to the SDDC Manager VM using the **vcf** administrative user account.
- 5 Enter **su** to switch to the root user and navigate to the `/opt/vmware/sddc-support` directory.
- 6 Enter the following command:

```
./sos --expand-stretch-cluster --sc-domain <DOMAIN NAME> --sc-cluster <CLUSTER NAME> --sc-hosts
<REPLACEMENT HOSTFQDN> --esxi-license-key <LICENSE KEY>
```

Example input and response:

```
root@sddc-manager [ /opt/vmware/sddc-support ]# ./sos --expand-stretch-cluster --sc-domain MGMT --
sc-cluster SDDC-Cluster1 --sc-hosts esxi-11.vrack.vsphere.local --esxi-license-key AAAAA-BBBBB-
CCCCC-DDDDD-EEEEEE
Welcome to Supportability and Serviceability(SoS) utility!
```

```

Logs : /var/log/vmware/vcf/sddc-support/stretchCluster-2019-02-20-10-04-32-123007
Stretch Cluster operation log : /var/log/vmware/vcf/sddc-support/
stretchCluster-2019-02-20-10-04-32-123007/sos.log
Starting vSAN stretched cluster operations..
expand vSAN stretched cluster operation started
Api Response:{
  "taskId": "6e4b13d9-eead-408b-a595-4e89ef885a3e",
  "resourceId": "0c518498-b302-40ae-abc4-10addead7bc2",
  "resourceType": "ESXI",
  "state": "IN_PROGRESS",
  "description": "Prepare vSAN Cluster - SDDC-Cluster1 for Stretch in VMware Cloud Foundation",
  "timestamp": 1550657073615,
  "id": "6e4b13d9-eead-408b-a595-4e89ef885a3e"
}

```

- 7 Monitor the state of the task in the SDDC Manager Dashboard.  
Wait until the task completes successfully.
- 8 If required, SSH in to the newly added host and add a static route to the vSAN network of the witness host. Add static routes in the witness if it could not reach the vSAN network of the newly added host.
- 9 In the vSphere Web Client, move the host to the appropriate availability zone.
  - a On the SDDC Manager Dashboard, click **Inventory > Workload Domains** and then click **View Details**.
  - b Click the name of the domain containing the stretched cluster, for example, MGMT.
  - c Click the **Services** tab and click the vCenter Server launch icon and log in to the vSphere Web Client.
  - d In the vSphere Web Client, select the stretched cluster. Then select **Configure > vSAN > Fault Domains & Stretched Cluster**.
  - e Select the newly added host and drag it to the appropriate availability zone.
- 10 If the host belongs to AZ1, add the host to the AZ1 VMHost rule. If the host belongs to AZ2, no operation is required.
  - a In the vSphere Web Client, select **Hosts and Clusters** and then select the stretched cluster.
  - b Select **Configure > VM/Host Rules**.
  - c Select the appropriate rule and click **Add**.
  - d Select the newly added host and click **OK**.

vSAN automatically rebuilds the stretch cluster.

# Monitoring Capabilities in the Cloud Foundation System

# 13

The 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:

## Tasks and subtasks

A task is a unit of work or a series of subtasks that perform an overall goal, such as creating a workload domain.

## vRealize Log Insight instance deployed by Cloud Foundation

Use of the vRealize Log Insight instance deployed by Cloud Foundation is licensed separately. When this deployed vRealize Log Insight instance is licensed for use in your environment, and enabled in the SDDC Manager Dashboard, log content for the physical resources and the VMware SDDC virtual infrastructure are sent to the vRealize Log Insight instance. As a result, when you log in to the vRealize Log Insight Web interface, you can obtain a unified view of event and syslog information to assist with troubleshooting. Data from the events and audit events raised by Cloud Foundation is also sent to vRealize Log Insight. You can use the searching, query, and reporting features of vRealize Log Insight to create trend reports and auditing reports from the event history. See [Using vRealize Log Insight Capabilities in Your Cloud Foundation System](#).

This chapter includes the following topics:

- [Viewing Tasks and Task Details](#)
- [Using vRealize Log Insight Capabilities in Your Cloud Foundation System](#)

## Viewing Tasks and Task Details

From the SDDC Manager Dashboard, 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 the SDDC Manager Dashboard, 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.

## Using vRealize Log Insight Capabilities in Your Cloud Foundation System

The vRealize Log Insight instance that is deployed by SDDC Manager is licensed separately. When the vRealize Log Insight instance is licensed for use in your Cloud Foundation environment, you can use the capabilities of vRealize Log Insight to work with the event and log data that is collected from the various hardware devices and SDDC virtual infrastructure.

vRealize Log Insight is a log aggregator that provides simplified log viewing and analysis. The vRealize Log Insight instance collects and indexes log content for the environment's physical resources and virtual infrastructure, and provides unified querying and analysis of the log content for problem diagnosis and repair. Similarly, SDDC Manager is configured by default to send all logs to vRealize Log Insight, enabling users to browse and search logs to troubleshoot SDDC Manager failures.

You can configure the vRealize Log Insight instance for remote syslog forwarding to an instance of vRealize Log Insight that is external to the Cloud Foundation system or to another syslog server. To configure vRealize Log Insight to forward events to a syslog target, see [Add vRealize Log Insight Event Forwarding Destination](#) in the vRealize Log Insight documentation.

To log in to the vRealize Log Insight Web interface from the SDDC Manager Dashboard, see [Enable vRealize Log Insight in Cloud Foundation](#).

## Content Packs

The vRealize Log Insight instance includes a set of content packs. Content packs are read-only plug-ins to vRealize Log Insight that provide pre-defined knowledge about specific types of events such as log messages. The purpose of a content pack is to provide knowledge about a specific set of events in a format that is easily understandable by administrators, monitoring teams, and executives. A content pack consists of information that can be saved from either the Dashboards or Interactive Analytics pages in the vRealize Log Insight Web interface. Such information typically includes:

- Queries
- Fields
- Aggregations
- Alerts
- Dashboards

The vRealize Log Insight instance includes a number of VMware content packs, including the Cloud Foundation content pack. In the vRealize Log Insight web interface, these content packs display as widgets in the **Dashboards > VMware-VCF** page.

Content Pack	Overview
General	This content pack includes multiple subcategories of dashboards and analytics including overview, problems, event types, statistics, and agents.
VMware - NSX for vSphere	This content pack provides various dashboards and filters to give you insight into the data that is sent by the NSX for vSphere virtual infrastructure in the management and workload domains' vCenter Server instances.
VMware - Cloud Foundation	This content pack includes an overview dashboard that gives overall summary views of the data sent by the Cloud Foundation, and also provides detailed views for the various levels of interest, such as rack-level, server-level, switch-level, device-level, and so on.
VMware - vSAN	This content pack provides various dashboards and filters to give you insight into the logs that are sent by the management and workload domains' vSAN features.
VMware - vSphere	This content pack provides various dashboards and filters to give you insight into the data that is sent by the management and workload domains' vCenter Server instances.
VMware - vROPs	This content pack provides various dashboards and filters to give you insight into the logs that are sent by the management and workload domains' vRealize Operations features.

To see the dashboards for one of the content packs in the vRealize Log Insight Web interface, select **Dashboards** and then select the specific content pack dashboard in the left hand navigation bar.

## Get Started Using the vRealize Log Insight Instance

Use of the vRealize Log Insight instance that is deployed by SDDC Manager is licensed separately. vRealize Log Insight delivers real-time log management for VMware environments, providing visibility of logs and easier troubleshooting across the physical and virtual infrastructure in your Cloud Foundation system.

During bring-up, SDDC Manager deploys and configures the vRealize Log Insight virtual appliance. From your deployed vRealize Log Insight instance, you can view and analyze logs to assist in troubleshooting, trend analysis, and so on.

The bring-up process also installs and configures content packs in the vRealize Log Insight instance. A content pack provides dashboards, extracted fields, predefined queries, and alerts that are related to the content pack's specific product or set of logs. When you launch the vRealize Log Insight Web interface, the installed content packs are ready for use. For an overview of these content packs, see [Using vRealize Log Insight Capabilities in Your Cloud Foundation System](#). For detailed information on how to use the dashboards, predefined queries, and collected log data in vRealize Log Insight, see the [vRealize Log Insight product documentation](#).

You can open the vRealize Log Insight interface directly from the SDDC Manager Dashboard. For details, see [Enable vRealize Log Insight in Cloud Foundation](#).



If this is the first time after the initial bring-up process that the vRealize Log Insight Web interface is launched, type the system-assigned credentials into the login screen and then click **Login**. Then use the vRealize Log Insight Web interface to assign permissions to your superuser account and other user accounts.

---

**Note** You can look up the system-assigned credentials for the vRealize Log Insight Web interface by logging in to the SDDC Manager VM and running the `/home/vrack/bin/lookup-password` command.

---

**Important** Do not change the password of the admin account from within the vRealize Log Insight Web interface, or unpredictable results can occur. To change the admin account's password without rotating all account passwords, see [Manually Update Passwords](#).

---

### Procedure

- 1 Open the vRealize Log Insight Web interface.
- 2 If the vRealize Log Insight login screen appears, log in with the appropriate credentials.
  - If this is the first time logging in to vRealize Log Insight after the initial bring-up process, use the username **admin** and the randomized password that was set when the passwords were rotated at the end of the bring-up process.
  - If you are using an account that was set up for you in vRealize Log Insight, use those credentials to log in.

When you are logging in to the vRealize Log Insight Web interface with the **admin** account after updating passwords, you must use the randomized password that is set for that account by the rotation procedure. For details about passwords, see [Manually Update Passwords](#).

The vRealize Log Insight web interface appears with the display filtered to the **Dashboards > VMware-VCF > Overview** page to show the various event widgets.

# Configuring Customer Experience Improvement Program

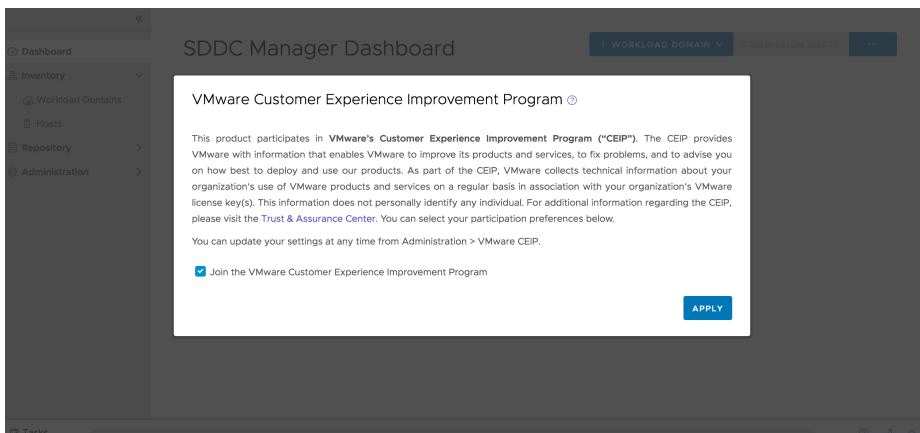
# 14

This product participates in VMware 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 the 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 SDDC 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**.



- You can enable or disable CEIP from the Administration tab on the SDDC Manager dashboard.

**Note** When you join CEIP, the **Enable VMware Customer Experience Improvement Program** task is shown in the floating task bar of the SDDC dashboard. Similarly when you leave CEIP, the **Disable VMware Customer Experience Improvement Program** task is displayed. This task bar is available on all the screens of VMware Cloud Foundation.

To enable or disable CEIP from the **Administration** tab, perform the following steps:

### Procedure

- 1 On the SDDC Manager Dashboard, click **Administration > VMware CEIP**.
- 2 To enable CEIP, select the **Join the VMware Customer Experience Improve Program** option.
- 3 To disable CEIP, deselect the **Join the VMware Customer Experience Improve Program** option.

# Updating Cloud Foundation DNS and NTP Servers

# 15

If you need to make changes to the DNS or NTP server information that you provided during Cloud Foundation bring-up, you can use the SDDC Manager VM to update the servers starting from Cloud Foundation 3.7.2.

When you initially deploy Cloud Foundation, you complete the deployments parameter sheet 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 change this server information at a later date, using the SDDC Manager VM.

This chapter includes the following topics:

- [Update DNS Server Configuration](#)
- [Update NTP Server Configuration](#)

## Update DNS Server Configuration

Use this procedure to update the DNS server information that you provided during Cloud Foundation bring-up.

Cloud Foundation uses DNS servers to provide name resolution for various components in the system. You must provide root DNS domain information. Optionally, you can provide subdomain information. When you update the DNS server configuration, Cloud Foundation updates the components in a specific order:

- Platform Services Controllers
- SDDC Manager
- vCenter Servers
- ESXi hosts
- NSX Managers
- NSX-T Managers
- vRealize Suite Lifecycle Manager
- vRealize Log Insight
- vRealize Operations
- vRealize Automation

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 the vRealize components. Check the logs, resolve any issues, and retry the update.

---

Updating the DNS server configuration is a disruptive process and 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.

### Prerequisites

- Ensure that both forward and reverse DNS resolution is functional for each component using the updated DNS server.
- All Cloud Foundation components must be in an Active state.

### Procedure

- 1 Using SSH, log in to the SDDC Manager VM using the **vcf** user account.
- 2 Get the current DNS server configuration information.

```
curl localhost/inventory/system-info | json_pp
```

- 3 Validate the new DNS server configuration information.

```
curl -H 'Content-Type: application/json' -X POST http://localhost/system/configurations/dns-servers/validator -d '{"dnsServers":[{"server":"<dns-server-ip>","isPrimary":"true"}]}' | json_pp
```

Replace *<dns-server-ip>* with the IP address of the new DNS server. Specify *true* or *false* for *isPrimary*, depending on whether or not the new DNS server is the primary DNS server.

The validator verifies forward and reverse name resolution for Cloud Foundation components using the new DNS server.

- 4 Monitor the status of the validation task.

```
curl http://localhost/operationsmanager/system/configurations/dns-servers/validator/status | json_pp
```

- 5 Check the result of the validation task.

```
curl http://localhost/operationsmanager/system/configurations/dns-servers/validator/result | json_pp
```

If validation succeeds, you can proceed to change the DNS server configuration. If validation fails, correct any issues and try again.

## 6 Change the DNS server configuration information.

```
curl -H 'Content-Type: application/json' -X POST http://localhost/system/configurations/dns-servers -d '{"dnsServers":[{"server":"<dns-server-ip>","isPrimary":"true"}]}' | json_pp
```

Replace *<dns-server-ip>* with the IP address of the new DNS server. Specify `true` or `false` for `isPrimary`, depending on whether or not the new DNS server is the primary DNS server.

Note the *<id>* that gets returned.

## 7 Track the status of the DNS update.

```
curl http://localhost/operationsmanager/workflows/<id> | json_pp
```

Replace *<id>* with the ID from the previous step. Wait for the task to complete.

## 8 Verify that the DNS configuration was updated.

```
curl localhost/inventory/system-info | json_pp
```

# Update NTP Server Configuration

Use this procedure to update the NTP server information that you provided during Cloud Foundation bring-up.

Cloud Foundation uses NTP servers to synchronize time between the various components in the system. You must have at least one NTP server. When you update the NTP server configuration, Cloud Foundation updates the components in a specific order:

- Platform Services Controllers
- SDDC Manager
- vCenter Servers
- ESXi hosts
- NSX Managers
- NSX-T Managers
- vRealize Suite Lifecycle Manager
- vRealize Log Insight
- vRealize Operations
- vRealize Automation

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 components. Check the logs, resolve any issues, and retry the update.

---

Updating the NTP server configuration is a disruptive process and 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.

### Prerequisites

- Any new NTP server is reachable by all components.
- Time skew between new NTP servers is less than 5 minutes.

### Procedure

- 1 Using SSH, log in to the SDDC Manager VM using the `vcf` user account.
- 2 Get the current NTP server configuration information.

```
curl localhost/inventory/system-info | json_pp
```

- 3 Validate the new NTP server configuration information.

```
curl -H 'Content-Type: application/json' -X POST http://localhost/system/configurations/ntp-servers/validator -d '{"ntpServers":[{"server":"<ntp-server-ip>}]}' | json_pp
```

Replace `<ntp-server-ip>` with the IP address of the new NTP server. To enter multiple NTP servers, use the following format: `{"ntpServers":[{"server":"<ntp-server-ip-1>", {"server":"<ntp-server-ip-2>"}]}`.

The validator verifies that the Cloud Foundation components can communicate with the new NTP server.

- 4 Monitor the status of the validation task.

```
curl http://localhost/operationsmanager/system/configurations/ntp-servers/validator/status | json_pp
```

- 5 Check the result of the validation task.

```
curl http://localhost/operationsmanager/system/configurations/ntp-servers/validator/result | json_pp
```

If validation succeeds, you can proceed to change the NTP server configuration. If validation fails, correct any issues and try again.

- 6 Change the NTP server configuration information.

```
curl -H 'Content-Type: application/json' -X POST http://localhost/system/configurations/ntp-servers -d '{"ntpServers":[{"server":"<ntp-server-ip>}]}' | json_pp
```

Replace `<ntp-server-ip>` with the IP address of the new NTP server. To enter multiple NTP servers, use the following format: `{"ntpServers":[{"server":"<ntp-server-ip-1>", {"server":"<ntp-server-ip-2>"}]}`.

Note the `<id>` that gets returned.

**7** Track the status of the NTP update.

```
curl http://localhost/tasks/registrations/<id> | json_pp
```

Replace *<id>* with the ID from the previous step. Note the *<taskURL>*.

```
curl <taskURL> | json_pp
```

Wait for the task to complete.

**8** Verify that the NTP configuration was updated.

```
curl localhost/inventory/system-info | json_pp
```



# Supportability and Serviceability (SoS) Utility

# 16

The SoS utility is a command-line Python tool that can be used for the following:

- Run health checks.
- On-demand vSAN partition cleanup.
- Collect logs for Cloud Foundation components.
- On-demand host cleanup.

To run the SoS utility, SSH in to the SDDC Manager VM using the **vcf** administrative user account, 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-3 ... --option-n
```

To list the available command options, use the `--help` long option or the `-h` short option.

```
./sos --help  
./sos -h
```

---

**Note** You can specify some options in the conventional GNU/POSIX syntax, using `--` for the long option and `-` for the short option.

---

This chapter includes the following topics:

- [SoS Utility Options](#)
- [Collect Logs for Your Cloud Foundation System](#)

## SoS Utility Options

This section lists the specific options you can use with the SoS utility.

### SoS Utility Help Options

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

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

## SoS Utility VMware Cloud Foundation Summary Options

These options provide information about the Cloud Foundation system and tasks.

Option	Description
--get-vcf-summary	Returns information about your Cloud Foundation system, including CEIP, domains and clusters, hosts, licensing, network pools, SDDC Manager, VCF services, and solutions (vRealize Log Insight, vRealize Automation, and so on).
--get-vcf-tasks-summary	Returns information about Cloud Foundation tasks, including the time the task was created and the status of the task.

## SoS Utility Generic Options

These are generic options for the SoS utility.

**Note** For generic options related to log collection, see [Collect Logs for Your Cloud Foundation System](#).

Option	Description
--ceip-tagging-get	Returns setting for the VMware CEIP program. For information about the program, see <a href="#">Chapter 14 Configuring Customer Experience Improvement Program</a> .
--ceip-tagging-set	Enrolls your deployment in the CEIP program.
--configure-sftp	Configures SFTP for logs.
--debug-mode	Runs the SoS utility in debug mode.
--domain-name <i>DOMAINNAME</i>	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 <code>--domain-name ALL</code> .
	<b>Note</b> If you omit the <code>--domain-name</code> flag and domain name, the SoS operation is performed only on the management domain.
--force	Allows SoS operations to be formed while workflows are running.
	<b>Note</b> It is recommended that you do not use this option.
--history	Displays the last 20 SoS operations performed.
--ondemand-service	Include this flag to execute commands on all ESXi hosts in a domain.
	<b>Warning</b> Contact VMware support before using this option.
--ondemand-service-json <i>JSON file path</i>	Include this flag to execute commands in the JSON format on all ESXi hosts in a domain. For example, <code>/opt/vmware/sddc-support/&lt;JSON file name&gt;</code>

Option	Description
<code>--setup-json <i>SETUPJSON</i></code>	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 <code>setup.json</code> file and pass the file as input to SoS. A sample JSON file is available on the SDDC Manager VM in the <code>/opt/vmware/sddc-support/</code> directory.
<code>--skip-known-host-check</code>	Skips the specified check for SSL thumbprint for host in the known host.
<code>--zip</code>	Creates a zipped TAR file for the output.

## SoS Utility Options for Health Check

These SoS commands are used for checking the health status of various components or services, including connectivity, compute, storage, database, domains, and networks.

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
<code>--json-output-dir <i>JSONDIR</i></code>	Outputs the results of any health check as a JSON file to the specified directory, <code>JSONDIR</code> .
<code>--certificate-health</code>	Verifies that the component certificates are valid (within the expiry date).
<code>--connectivity-health</code>	Performs a connectivity health check to inspect whether the different components of the system such as the ESXi hosts, Virtual Center Servers, Inventory Service VMs, Log Insight VM, NSX Manager VMs, PSC VMs, SDDC Manager VM can be pinged.
<code>--composability-infra-health</code>	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.
<code>--compute-health</code>	Performs a compute health check.
<code>--general-health</code>	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.
<code>--get-host-ips</code>	Returns server information.
<code>--get-inventory-info</code>	Returns in a tabular format inventory details for the specified Cloud Foundation component, such as Platform Services ControllervCenter Server NSX, and ESXi. Optionally, add the flag <code>--domain name ALL</code> to return all details.
<code>--health-check</code>	Performs all available health checks.
<code>--ntp-health</code>	Verifies whether the time on the components is synchronized with the NTP server in the SDDC Manager VM. It also ensures that the hardware and software timestamp of ESXi hosts are within 5 minutes of the SDDC Manager VM.
<code>--password-health</code>	Returns the status of all current passwords, such as Last Changed Date, Expiry Date, and so on.
<code>--services-health</code>	Performs a services health check to confirm whether services within the Inventory Service VM and within SDDC Manager (like Lifecycle Management Server) are running.
<code>--storage-health</code>	Performs a check on the vSAN disk health of the ESXi hosts and vCenter clusters. Also runs proactive vSAN tests to verify the ability to create VMs within the vSAN disks.
<code>--run-vsan-checks</code>	Runs proactive vSAN tests to verify the ability to create VMs within the vSAN disks.

## SoS Utility Options for vSAN Stretched Clusters

Use create a vSAN stretched cluster, convert a vSAN stretch cluster to a standard vSAN cluster, and add/replace hosts in a vSAN stretched cluster. See [Chapter 12 Stretching Clusters](#).

Option	Description
<code>--expand-stretch-cluster</code>	Add hosts to or replace a host in a vSAN stretch cluster. Used with <code>--sc-domain</code> <code>--sc-cluster</code> <code>--sc-hosts</code> <code>--esxi-license-key</code> . For example, <code>--expand-stretch-cluster --sc-domain MGMT --sc-cluster SDDC-Cluster1 --sc-hosts esxi-9.vrack.vsphere.local, esxi-10.vrack.vsphere.local --esxi-license-key AAAAA-BBBBB-CCCCC-DDDDD-EEEE</code> .
<code>--show-clusters</code>	Shows all domains and clusters.
<code>--show-free-hosts</code>	Shows all free hosts.
<code>--stretch-vsan</code>	Create a vSAN stretch cluster. Used with <code>--sc-domain</code> <code>--sc-cluster</code> <code>--sc-hosts</code> <code>--witness-host-fqdn</code> (for Cloud Foundation 3.7.1) <code>--witness-fqdn</code> (for Cloud Foundation 3.7) <code>--witness-vsan-ip</code> <code>--witness-vsan-cidr</code> <code>--esxi-license-key</code> . For example, <code>--stretch-vsan --sc-domain MGMT --sc-cluster SDDC-Cluster1 --sc-hosts esxi-5.vrack.vsphere.local,esxi-6.vrack.vsphere.local --witness-host-fqdn esxi-11.vrack.vsphere.local --witness-vsan-ip 10.0.12.96 --witness-vsan-cidr 10.0.12.0/24 --esxi-license-key AAAAA-BBBBB-CCCCC-DDDDD-EEEE</code> , where AAAAA-BBBBB-CCCCC-DDDDD-EEEE is a valid ESXi license key.
<code>--sc-domain SCDOMAIN</code>	Specify the domain, SCDOMAIN, to use for stretched vSAN. For example, <code>--sc-domain MGMT</code> .
<code>--sc-cluster SCCLUSTER</code>	Specify the cluster, SCCLUSTER, to use for stretched vSAN. For example, <code>--sc-cluster SDDC-Cluster1</code> .
<code>--sc-hosts SCHOSTS [SCHOST1, SCHOST2 ...]</code>	Specify the hosts, SCHOSTS, to use for stretched vSAN. For example, <code>--sc-hosts esxi-5.vrack.vsphere.local,esxi-6.vrack.vsphere.local</code> .
<code>--witness-host-fqdn WITNESSHOSTFQDN</code>	For Cloud Foundation 3.7.1, specify the fully qualified domain name, WITNESSHOSTFQDN, of the witness host. For example, <code>--witness-host-fqdn esxi-11.vrack.vsphere.local</code> .
<code>--witness-fqdn WITNESSHOSTFQDN</code>	For Cloud Foundation 3.7, specify the fully qualified domain name, WITNESSHOSTFQDN, of the witness host. For example, <code>--witness-fqdn esxi-11.vrack.vsphere.local</code> .
<code>--witness-vsan-ip WITNESSHOSTVSANIP</code>	Specify the IP address, WITNESSHOSTVSANIP, of the witness host. For example, <code>--witness-vsan-ip 10.0.12.96</code> .
<code>--witness-vsan-cidr WITNESSHOSTVSANICDR</code>	Specify the Classless Inter-Domain Routing (CIDR) block, WITNESSHOSTVSANICDR, of the witness host. For example, <code>--witness-vsan-cidr 10.0.12.0/24</code> .
<code>--esxi-license-key ESXILICENSEKEY</code>	Specify the license key, ESXILICENSEKEY, to use for ESXi hosts. For example, <code>--esxi-license-key AAAAA-BBBBB-CCCCC-DDDDD-EEEE</code> .

## SoS Utility Options for Fixing vSAN Partitions

Use this option to clean up vSAN partitions on one or more ESXi hosts. These options can be run only from the SDDC Manager VM

Option	Description
<code>--cleanup-vsan</code>	Cleans up vSAN Partitions in ESXi hosts. Optionally, you can specify the ESXi hosts, by IP address, to run the vSAN cleanup. Use commas (with no spaces) to separate multiple IP addresses.

## SoS Utility Options for Managing ESXi Hosts

Use these options to clean up and manage ESXi hosts, including enabling SSH, cleaning up dirty hosts, and locking down hosts.

Option	Description
<code>--cleanup-decommissioned-host</code>	Performs clean-up on the specified, decommissioned ESXi hosts by passing the JSON. For example: <code>--cleanup-decommissioned-host /opt/vmware/sddc-support/decommissioned_host_cleanup_sample.json</code>
<code>--cleanup-host</code>	Performs clean-up on all or specified dirty ESXi hosts. <ul style="list-style-type: none"> <li>■ To clean up all dirty hosts, include ALL: <code>--cleanup-host ALL</code>.</li> <li>■ To specify multiple dirty hosts, separate the IP addresses with a comma: <code>--cleanup-host 10.0.0.4,10.0.0.5,10.0.0.6</code>.</li> </ul> <p><b>Note</b> A dirty host is a host that has been removed from a cluster in a workload domain. A dirty host cannot be assigned to another workload domain until it is cleaned up.</p>
<code>--disable-lockdown-esxi</code>	Disables lockdown mode on ESXi nodes in the specified domains. <ul style="list-style-type: none"> <li>■ To disable lockdown on ESXi nodes in a specific domain, include the flag <code>--domain-name DOMAINNAME</code>.</li> <li>■ To disable lockdown on ESXi nodes in all domains, include the flag <code>--domain-name ALL</code>.</li> </ul> <p><b>Note</b> If you do not specify domain, this command affects only the MGMT domain by default.</p>
<code>--enable-lockdown-esxi</code>	Enables lockdown mode on ESXi nodes in the specified domains. <ul style="list-style-type: none"> <li>■ To enable lockdown on ESXi nodes in a specific domain, include the flag <code>--domain-name DOMAINNAME</code>.</li> <li>■ To enable lockdown on ESXi nodes in all domains, include the flag <code>--domain-name ALL</code>.</li> </ul> <p><b>Note</b> If you do not specify domain, this command affects only the MGMT domain by default.</p>
<code>--disable-ssh-esxi</code>	Disables SSH on ESXi nodes in the specified domains. <ul style="list-style-type: none"> <li>■ To disable SSH on ESXi nodes in a specific domain, include the flag <code>--domain-name DOMAINNAME</code>.</li> <li>■ To disable SSH on ESXi nodes in all domains, include the flag <code>--domain-name ALL</code>.</li> </ul> <p><b>Note</b> If you do not specify domain, this command affects only the MGMT domain by default.</p>
<code>--enable-ssh-esxi</code>	Enables SSH on ESXi nodes in the specified domains. <ul style="list-style-type: none"> <li>■ To enable SSH on ESXi nodes in a specific domain, include the flag <code>--domain-name DOMAINNAME</code>.</li> <li>■ To enable SSH on ESXi nodes in all domains, include the flag <code>--domain-name ALL</code>.</li> </ul> <p><b>Note</b> If you do not specify domain, this command affects only the MGMT domain by default.</p>

## SoS Utility Options for vRealize Suite Lifecycle Manager

Use these options to redeploy vRealize Suite Lifecycle Manager and monitor the redeployment.

**Note** You should only redeploy vRealize Suite Lifecycle Manager when directed to do so by VMware Support.

Option	Description
<code>--vrs lcm-redeploy</code>	Redeploys vRealize Suite Lifecycle Manager. Provides a taskID for the operation.
<code>--get-vrs lcm-redeploy-task-status &lt;taskID&gt;</code>	Returns vRealize Suite Lifecycle Manager redeployment status for the specified taskID.

## SoS Utility Options for SDDC Manager NTP Servers

Use this option to update the NTP server(s) for SDDC Manager.

Option	Description
<code>--update-sddc-manager-ntp NTPSERVERS</code>	Updates the SDDC Manager NTP server(s), NTPSERVERS. To add multiple NTP servers, use a comma-separated list. For example, <code>--update-sddc-manager-ntp 10.0.0.250,10.0.0.251</code> . To update the NTP server(s) for all Cloud Foundation components (including SDDC Manager), see <a href="#">Update NTP Server Configuration</a> .

## Collect Logs for Your 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.

- To collect all logs from all components, you can run the SoS utility without specifying any component-specific options.
- 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](#).

Log files for the vRealize Log Insight agent in vCenter Server are collected when vCenter Server log files are collected.

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 Cloud Foundation environment.

### Procedure

- 1 Using SSH, log in to the SDDC Manager VM with the following credentials:
  - Username: **vcf**
  - Password: use the password specified in the deployment parameter sheet
- 2 Enter **su** to switch to the root user.
- 3 Change to the `/opt/vmware/sddc-support` directory.

- 4 To collect the logs, run the SoS utility without specifying any component-specific options. To collect logs for a specific component, run the utility with the appropriate options.

**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 VM.

**Table 16-1. SoS Utility Log File Options**

Option	Description
<code>--api-logs</code>	Collects output from REST endpoints for SDDC Manager inventory and LCM.
<code>--cassandra-logs</code>	Collects logs from the Apache Cassandra database only. <code>cassandra-bundle.tgz</code> contains Cassandra nodetool and debug logs. Apache Cassandra processes run in each of the infrastructure virtual machines.
<code>--dump-only-sddc-java-threads</code>	Collects only the Java thread information from the SDDC Manager.
<code>--esx-logs</code>	Collects logs from the ESXi hosts only. Logs are collected from each ESXi host available in the deployment.
<code>--li-logs</code>	Collects logs from vRealize Log Insight VMs only.
<code>--log-dir LOGDIR</code>	Specifies the directory to store the logs.
<code>--log-folder LOGFOLDER</code>	Specifies the name of the log directory.
<code>--no-clean-old-logs</code>	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.
<code>--no-health-check</code>	Skips the health check executed as part of log collection.
<code>--nsx-logs</code>	Collects logs from the NSX Manager, NSX Controller, and NSX Edge instances only.
<code>--psc-logs</code>	Collects logs from the Platform Services Controller instances only.
<code>--rvc-logs</code>	Collects logs from the Ruby vSphere Console (RVC) only. RVC is an interface for ESXi and vCenter. <b>Note</b> If the Bash shell is not enabled in vCenter, RVC log collection will be skipped . <b>Note</b> RVC logs are not collected by default with <code>./sos</code> log collection. You must enable RVC to collect RVC logs.
<code>--sddc-manager-logs</code>	Collects logs from the SDDC Manager only. <code>sddc&lt;timestamp&gt;.tgz</code> contains logs from the SDDC Manager file system's etc, tmp, usr, and var partitions.
<code>--test</code>	Collects test logs by verifying the files.
<code>--vc-logs</code>	Collects logs from the vCenter Server instances only. Logs are collected from each vCenter server available in the deployment.
<code>--vdi-logs</code>	Collects logs for Horizon domain management components .
<code>--vrealize-logs</code>	Collects logs from vRealize components deployed in the system (vRealize Suite Lifecycle Manager, vRealize Log Insight, vRealize Operations, and vRealize Automation).

The utility displays `Welcome to SoS log collection utility!`, the output directory, `sos.log` file location, and messages about the utility's progress, for example:

```
root@sddc-manager [ /opt/vmware/sddc-support ]# ./sos --domain-name MGMT --skip-known-host
--log-dir /tmp/new
Welcome to Supportability and Serviceability(SoS) utility!
Performing SoS operation for MGMT domain components
Logs : /tmp/new/sos-2018-08-24-10-49-14-27480
Log file : /tmp/new/sos-2018-08-24-10-49-14-27480/sos.log
Progress : 100%, Completed tasks : [SDDC-MANAGER, SDDC-CASSANDRA, NSX_MANAGER, PSC, HEALTH-CHECK,
API-LOGS, ESX, LOGINSIGHT, VMS_SCREENSHLog Collection completed successfully for : [HEALTH-CHECK,
SDDC-MANAGER, SDDC-CASSANDRA, NSX_MANAGER, PSC, API-LOGS, ESX, LOGINSIGHT, VMS_SCREENSHOT,
VCENTER-SERVER]
```

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.

### 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 filesystem of the SDDC Manager instance in which the command is initiated, for example:

```
root@sddc-manager [ /opt/vmware/sddc-support ]# ./sos
Welcome to Supportability and Serviceability(SoS) utility!
Performing SoS operation for ALL domain components
Logs : /var/log/vmware/vcf/sddc-support/sos-2018-08-21-22-49-09-61442
Log file : /var/log/vmware/vcf/sddc-support/sos-2018-08-21-22-49-09-61442/sos.log
Log Collection completed successfully for : [SDDC-MANAGER, SDDC-CASSANDRA]
```

### 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
<code>esx-IP-address.tgz</code>	Diagnostic information from running the <code>vm-support</code> command on the ESXi host. An example file is <code>esx-192.168.100.101.tgz</code> .
<code>SmartInfo-IP-address.txt</code>	S.M.A.R.T. status of the ESXi host's hard drive (Self-Monitoring, Analysis, and Reporting Technology). An example file is <code>SmartInfo-192.168.100.101.txt</code> .
<code>vsan-health-IP-address.txt</code>	vSAN cluster health information from running the standard command <code>python /usr/lib/vmware/vsan/bin/vsan-health-status.py</code> on the ESXi host. An example file is <code>vsan-health-192.168.100.101.txt</code> .



## loginsight Directory Contents

The loginsight directory contains diagnostic information files collected from the vRealize Log Insight cluster. The support bundle for each node is collected from the cluster's load balancer VM.

File	Description
load-balancer.vrack.vsphere.local-loginsight-support.tgz	Compressed TAR file consisting of support bundles collected from each node in the vRealize Log Insight cluster. For example: loginsight-loginsight-node- <i>&lt;node-number&gt;</i> .vrack.vsphere.local- <i>&lt;time-stamp&gt;</i> .
loginsight-loginsight-node- <i>&lt;node-number&gt;</i> .vrack.vsphere.local- <i>&lt;time-stamp&gt;</i>	Contains the following: README, boot, error.log, etc, proc, usr, action.log, commands, errors-ignored.log, opt, storage, and var.

## nsx Directory Contents

In each rack-specific directory, the nsx directory contains the diagnostic information files collected for the NSX Manager, NSX Controller, and NSX Edge instances deployed in that rack.

The number of files in this directory depends on the number of NSX Manager, NSX Controller, and NSX Edge instances that are deployed in the rack. In a given rack, each management domain has one NSX Manager instance and a minimum of three NSX Controller instances, and any VI workload domains in the rack each have one NSX Manager instance and at least three NSX Controller instances. NSX Edge instances are only deployed to support vRealize Operations and vRealize Automation, which are optional components.

File	Description
VMware-NSX-Manager-tech-support- <i>nsxmanagerIPAddr</i> .tar.gz	Standard NSX Manager compressed support bundle, generated using the NSX for vSphere API POST <a href="https://nsxmanagerIPAddr/api/1.0/appliance-management/techsupportlogs/NSX">https://nsxmanagerIPAddr/api/1.0/appliance-management/techsupportlogs/NSX</a> , where <i>nsxmanagerIPAddr</i> 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-Controller-tech-support- <i>nsxmanagerIPAddr</i> -controller- <i>controllerId</i> .tgz	Standard NSX Controller compressed support bundle, generated using the NSX for vSphere API to query the NSX Controller technical support logs: GET <a href="https://nsxmanagerIPAddr/api/2.0/vdn/controller/controllerId/techsupportlogs">https://nsxmanagerIPAddr/api/2.0/vdn/controller/controllerId/techsupportlogs</a> , where <i>nsxmanagerIPAddr</i> is the IP address of the NSX Manager instance and <i>controllerId</i> identifies the NSX Controller instance.  Examples are VMware-NSX-Controller-tech-support-10.0.0.8-controller-1.tgz, VMware-NSX-Controller-tech-support-10.0.0.8-controller-2.tgz, VMware-NSX-Controller-tech-support-10.0.0.8-controller-3.tgz.
VMware-NSX-Edge-tech-support- <i>nsxmanagerIPAddr</i> -edgeId.tgz	Standard NSX Edge support bundle, generated using the NSX for vSphere API to query the NSX Edge support logs: GET <a href="https://nsxmanagerIPAddr/api/4.0/edges/edgeId/techsupportlogs">https://nsxmanagerIPAddr/api/4.0/edges/edgeId/techsupportlogs</a> , where <i>nsxmanagerIPAddr</i> is the IP address of the NSX Manager instance and <i>edgeId</i> identifies the NSX Edge instance.  An example is VMware-NSX-Edge-tech-support-10.0.0.7-edge-1.log.gz.

**Note** This information will only be collected if NSX Edges are deployed.

## psc Directory Contents

In the rack-1 directory, the psc directory contains the diagnostic information files collected for the Platform Services Controller instances deployed in that rack.

File	Description
<code>vm-support-psclPaddr.tar.gz</code>	Standard Platform Services Controller support bundle downloaded from the Platform Services Controller instance with IP address <code>psclPaddr</code> .

## 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
<code>vc-vcsaFQDN-timestamp.tgz</code>	Standard vCenter Server support bundle downloaded from the vCenter Server Appliance instance having a fully-qualified domain name <code>vcsaFQDN</code> . The support bundle is obtained from the instance using the standard <code>vc-support.sh</code> command.

# Managing Shutdown and Startup of Cloud Foundation

# 17

You might have situations in which you want to shut down and start up the system. In such situations, you must start up and shut down the management virtual machines according to a predefined order.

The following situations require shutting down and starting up the Cloud Foundation system:

- Performing patch or upgrade operations of SDDC Manager applications.
- Performing recovery or failover operations of SDDC Manager applications.
- Performing imaging at one location and shipping the rack for deployment at another location.

This chapter includes the following topics:

- [Shut Down a Cloud Foundation System](#)
- [Start Up a Cloud Foundation System](#)

## Shut Down a Cloud Foundation System


You must shut down the system components in a strict order to avoid data loss and faults in the components.


### Prerequisites

- Verify that you have direct console access to the switches and ESXi hosts in the system.
- Coordinate the shutdown in advance with business stakeholders to minimize any impact.
- Verify that no VMs are running on snapshots.
- Verify that you have saved the account passwords to a location external from the Cloud Foundation system you are shutting down. See [Look Up Account Credentials](#) .
- Verify that valid backups of all management VMs, tenant VMs, and switch configurations are available and saved to a location external from the Cloud Foundation system you are shutting down.
- If a data protection solution is running on any of the domains, verify that it is properly shut down according to the vendor instructions.

- See Knowledge Base article 2142676 [Shutting down and powering on a vSAN 6.x Cluster when vCenter Server is running on top of vSAN](#) for information about verifying the state of the vSAN cluster before a shutdown.

## Procedure

- 1 Before starting the shutdown procedure, note down the following information:
  - The hostname and IP address of the ESXi hosts that are members of the management domain. To see the hosts in the management domain, navigate to the **Hosts** tab on the **Domain Details** page in the SDDC Manager Dashboard.
  - The hostname and IP address of the ESXi hosts that are members of each workload domain. To see the hosts in the VI workload domains, for each domain navigate to the **Hosts** tab on the **Domain Details** page in the SDDC Manager Dashboard.
- 2 Shut down the VMs in each Horizon domain (if any).
  - a On the SDDC Manager Dashboard, navigate to the Horizon domain.
  - b Click the launch link  for the vCenter Server instance that is displayed in the **Service** tabs in the domain details window for that Horizon domain.

A new browser tab opens and displays the vSphere Web Client.
  - c Locate the VMs for that Horizon domain.
  - d Shut down these VMs.
  - e Perform the above steps for each Horizon domain.
- 3 Shut down the workload VMs in each VI workload domain.
  - a On the SDDC Manager Dashboard, navigate to the workload domain.
  - b Click the launch link  for the vCenter Server instance that is displayed in the **Service** tabs in the domain details window for that workload domain.

A new browser tab opens and displays the vSphere Web Client.
  - c Locate the VMs for that workload domain.
  - d Shut down these VMs.

---

**Note** Each workload domain includes a three-node NSX Controller cluster. Shut down these VMs last.

---
- e Perform the above steps for each VI workload domain.

#### 4 Place the hosts for each workload domain in maintenance mode.

You must use the ESXCLI command, which supports setting the vSAN mode when entering maintenance mode.

- a For each ESXi host, connect and log in to the ESXi console using SSH.
- b Place each host into maintenance mode using the following command, with the `noAction` option included.

```
esxcli system maintenanceMode set -e true -m noAction
```

- c After a few minutes, confirm each host is in maintenance mode by repeating the command.

```
esxcli system maintenanceMode set -e true -m noAction
```

It should return the following:

```
Maintenance mode is already enabled.
```

- d Shut down all the ESXi hosts in the VI workload domain.

```
# poweroff
```

- e Repeat the above steps for each VI workload domain.

#### 5 Shut down the vRealize Suite Lifecycle Manager appliance in the management domain.

#### 6 Shut down the vRealize Log Insight virtual appliances in the management domain in the following order:

---

**Important** Verify that the console of each virtual appliance and its services are fully shut down before proceeding to the next step.

---

- All vRealize Log Insight Worker nodes.
- The vRealize Log Insight Master node.

#### 7 Shut down the vRealize Operations Manager virtual appliances in the management domain in the following order:

---

**Important** Verify that the console of each virtual appliance and its services are fully shut down before proceeding to the next step.

---

- All vRealize Operations Manager Remote Collector nodes.
- All vRealize Operations Manager Data nodes.
- The vRealize Operations Manager Replica node.
- The vRealize Operations Manager Master node.

- 8 Shut down the vRealize Automation virtual appliance and IaaS components in the management domain in the following order:

---

**Important** Verify that the console of each virtual appliance or VM and its services are fully shut down before proceeding to the next step.

---

- All vRealize Automation IaaS Distributed Execution Management (DEM) VMs.
- All vRealize Automation IaaS Proxy Agent VMs.
- All vRealize Automation IaaS Manager Server VMs.

---

**Note** Shut down the secondary IaaS Manager Server VM first; shut down the primary IaaS Manager Server VM second.

---

- All vRealize Automation IaaS Web Server VMs.

---

**Note** Shut down the secondary IaaS Web Server VM first; shut down the primary IaaS Web Server VM second.

---

- All vRealize Automation virtual appliances.
- The vRealize Automation IaaS SQL Server VM.

- 9 Shut down the infrastructure management virtual appliances in the management domain in the following sequence.

- a Shut down the following virtual appliances using the SSH console, verifying that the console of each virtual appliance and its services are fully shut down before proceeding to the next step.
  - All NSX Edge Service Gateway virtual appliances.
  - The NSX Manager virtual appliances for the VI workload domains.
  - The NSX Manager virtual appliance for the management domain.
  - All NSX Controller cluster virtual appliances for the management domain.
- b Shut down the remaining virtual appliances or VMs from their hosts in the ESXi Host Client on each management ESXi host.
  - The vCenter Server virtual appliance for the management domain.
  - The SDDC Manager VM.
  - The Platform Services Controller virtual appliances.

**10** Place the management domain ESXi hosts in maintenance mode.

You must use the ESXCLI command that supports setting the vSAN mode when entering maintenance mode.

- a For each ESXi host, connect and log in to the ESXi console using SSH.
- b Put each host into maintenance mode using the following command, with the `noAction` option included.

```
# esxcli system maintenanceMode set -e true -m noAction
```

- c After a few minutes, confirm each host is in maintenance mode by repeating the command.

```
esxcli system maintenanceMode set -e true -m noAction
```

It should return the following:

```
Maintenance mode is already enabled.
```

- d Shut down all the ESXi hosts in the management domain.

```
# poweroff
```

**11** Shut down the unassigned ESXi hosts in the Cloud Foundation system, if any.

- a For each unassigned ESXi host, connect and log in to the ESXi console using SSH.
- b Shut down each unassigned ESXi host.

```
# poweroff
```

## Start Up a Cloud Foundation System

You must start up the system components of the system in a strict order to avoid data loss and faults in the components.

### Prerequisites

- Verify that you have direct console access to the switches and ESXi hosts in the system.
- Verify that you have the host names and IP addresses of the ESXi hosts that are members of the management domain.

You can obtain this information in the Domain Details pages in the SDDC Manager Dashboard.

- Verify that you have the host names and IP addresses of the ESXi hosts that are members of each VI workload domain.

You can obtain this information in the Domain Details pages in the SDDC Manager Dashboard.

- See Knowledge Base article 2142676 [Shutting down and powering on a vSAN 6.x Cluster when vCenter Server is running on top of vSAN](#) for information about starting up hosts and exiting maintenance mode.

### Procedure

- 1 Power on each ESXi host in the management domain, and exit maintenance mode.

- a Use SSH to connect and log in to the ESXi console.
- b Use the following CLI command to exit maintenance mode.

```
# esxcli system maintenanceMode set -e false
```

- c Perform the above steps on each ESXi host until none are in maintenance mode.

- 2 Power on each ESXi host in the first VI workload domain, and exit maintenance mode.

- a Use SSH to connect and log in to the ESXi console.
- b Use the following CLI command to exit maintenance mode.

```
# esxcli system maintenanceMode set -e false
```

- c Perform the above steps on each ESXi host until none are in maintenance mode.

- d Repeat the above steps for each VI workload domain.

- 3 Power on the infrastructure management VMs in the management domain.

---

**Important** You must power on the VMs using the ESXi host client on each management ESXi host.

---

**Important** You must wait until each VM is powered on and all its services started before powering on the next VM.

---

Power on the VMs in the following order:

- Platform Services Controller virtual appliances.
- vCenter Server for the management domain.
- SDDC Manager VM.
- NSX Manager virtual appliance for the management domain.
- NSX Controller cluster virtual appliances for the management domain.
- NSX Edge Service Gateway virtual appliances.
- vCenter Server for each VI workload domain.
- NSX Manager virtual appliance for each VI workload domain.



- 4 Log in to the SDDC Manager Dashboard to verify that it displays correctly.
  - a On the SDDC Manager Dashboard, navigate to the management domain.
  - b In the domain details panel, click the launch for the vCenter Server instance.

A new browser tab opens and displays the vSphere Web Client.

- 5 Power on the vRealize Automation virtual appliance and IaaS components in the management domain.

---

**Important** You must wait until each VM or virtual appliance is powered on and all of its services started before running on the next VM.

---

Power on the VMs in the following order:

- The vRealize Automation IaaS SQL Server VM.
- All vRealize Automation virtual appliances.
- All vRealize Automation IaaS Web Server VMs.

---

**Note** Power on the primary IaaS Web Server VM first.

---

- All vRealize Automation IaaS Manager Services.

---

**Note** Power on the primary IaaS Manager Server VM first.

---

- All vRealize Automation IaaS proxy agents.
- All vRealize Automation IaaS Distributed Execution Management (DEM) hosts.

- 6 Power on the vRealize Operations Manager virtual appliances in the management domain.

---

**Important** You must wait until each VM or virtual appliance is powered on and all of its services running before powering on the next VM.

---

Power on the VMs in the following order:

- The vRealize Operations Manager master node.
- The vRealize Operations Manager master replica node.
- All vRealize Operations Manager data nodes.
- All vRealize Operations Manager remote collector nodes.

- 7 Power on the vRealize Log Insight virtual appliances in the management domain.

---

**Important** You must wait until each VM or virtual appliance is powered on and all of its services running before powering on the next VM.

---

Power on the VMs in the following order:

- The vRealize Log Insight master node.

- All vRealize Log Insight worker nodes.
- 8 Power on the vRealize Suite Lifecycle Manager appliance in the management domain.
  - 9 Power on the VMs in the first VI workload domain.

---

**Important** Each workload domain includes a three-node NSX Controller cluster. Power on these VMs first.

---

- a On the SDDC Manager Dashboard, navigate to the management domain.
  - b In the domain details panel, click the launch for the vCenter Server instance.  
A new browser tab opens and displays the vSphere Web Client.
  - c In the vSphere Web Client, power on the VMs in the following order:
    - The three-node NSX Controller cluster.
    - The workload domain VMs.
  - d Repeat this procedure on each VI workload domain.
- 10 Power on the VMs in the Horizon domains (if any).
    - a On the SDDC Manager Dashboard, navigate to the first Horizon domain.
    - b In the domain details panel, launch the vCenter Server instance.  
A new browser tab opens and displays the vSphere Web Client.
    - c In the vSphere Web Client, power on the Horizon domain VMs.
    - d Repeat this procedure on each Horizon domain.
  - 11 Using SSH, log in as root to the SDDC Manager VM and run the `/opt/vmware/sddc-support./sos --health-check` command to verify that everything works correctly.

# Manage Passwords

# 18

For security reasons, you can change passwords for the accounts that are used by your Cloud Foundation system. Changing these passwords periodically or when certain events occur, such as an administrator leaving your organization, reduces the likelihood of security vulnerabilities.

You specified passwords for your Cloud Foundation system as part of the bring-up procedure. You can rotate and update some of these passwords using the password management functionality in the SDDC Manager Dashboard or by using cURL API requests. For example:

- Accounts used for service consoles, such as the ESXi root account.
- The single sign-on administrator account.
- The default administrative user account used by virtual appliances.

To update the passwords for the SDDC Manager accounts (**vcf**, **root**, and **admin**), you must SSH into the SDDC Manager VM and change the passwords there.

This chapter includes the following topics:

- [Rotate Passwords for Managed Entities](#)
- [Manually Update Passwords](#)
- [Look Up Account Credentials](#)
- [Password Management cURL API Reference](#)

## Rotate Passwords for Managed Entities

As a security measure, you can rotate passwords for the logical and physical entities on all racks in your system. The process of password rotation generates randomized passwords for the selected accounts.

You can change passwords for the following entities:

- ESXi
- PSC
- vCenter Server
- NSX Manager (NSX for vSphere and NSX-T)
- NSX Controllers (NSX for vSphere and NSX-T)

- vRealize Log Insight

Password rotation does not change the password of the SDDC Manager VM's root account. Also, the lookup password command does not report this password.

#### Prerequisites

- Verify that there are no currently failed workflows in your 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 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.

#### Procedure

- 1 From the navigation pane, choose **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 one or more domains whose password(s) you want to rotate.
- 3 Click **Rotate** at the top of the page.

When asked to confirmed, click **Rotate** or **Cancel** as appropriate in the alert box.

If you proceeded with the rotation, 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 rotation operation. Click on the task name to view sub-tasks.

As each of these tasks are run, the status is updated. If the Tasks panel shows the task as having failed, click **Retry**.

Password rotation is complete when all sub-tasks are completed successfully.

## Manually Update Passwords

You can manually change the password for a selected domain account. Unlike password rotation, which generates a randomized password, you provide the new password.

You can modify only one password at a time.

---

**Note** You cannot use these controls to update the NSX-T password. You can only update the NSX-T password from the NSX-T Manager product interface.

---

### Prerequisites

- Verify that there are no currently failed workflows in your 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.

### Procedure

- 1 From the navigation pane, choose **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 whose password you want to rotate and click **Update** at the top of the page.

---

**Note** If you select more than one domain, the **Update** button is disabled.

---

The Update Password dialog box appears. This dialog box also displays the entity name, credential type, and user name in case you need to confirm you have selected the correct domain.

- 3 Enter and confirm the new password.

If the passwords, do not match, the dialog 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. Click on the task name to view sub-tasks.

If the Tasks panel shows the task as having failed, click **Retry**.

Password update 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 log in to the SDDC Manager VM using the root account credentials.

### Prerequisites

You must have the root account credentials to log in to the SDDC Manager VM. See [Log In to the SDDC Manager Dashboard](#).

**Procedure**

- 1 Using SSH, log in as root to the SDDC Manager VM.
- 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
```

To display the output in JSON format, use the command:

```
curl "https://localhost/security/password/vault" -k -u "<administrative user name>:<password>"
```

The output displays the account credentials and IP addresses for the physical and logical entities on all racks in your environment. The username and password for each account is displayed.

- 4 (Optional) Save the command output to a secure location so that you can access it later and use it to log in to the components as needed.

## Password Management cURL API Reference

You can perform basic password management operations using cURL API requests. SSH in to the SDDC Manager VM and log in as the root user to use the cURL API.

### cURL Password Operation API Requests

Some of the above operations can be run using cURL API requests.

#### Look up passwords - JSON format

Retrieves and lists in JSON format the account credentials for the built-in accounts that are managed and rotated by SDDC Manager.

```
# curl 'http://localhost/security/password/vault' \
-i -H 'Accept: application/json'
```

#### Look up passwords - plain text format

Retrieves and lists in plain text format the account credentials for the built-in accounts that are managed and rotated by SDDC Manager.

```
# curl 'http://localhost/security/password/vault' \
-i -H 'Accept: text/plain'
```

#### Update password

Updates the password of the specified domain component.

```
# curl 'http://localhost/security/password/vault' -i -X POST \
-H 'Content-Type: application/json' \
-H 'Accept: application/json' \
-d '{
```

```
"entities": [{
  "credentialType" : "<credential type such SSH or API>",
  "entityIpAddress" : "<IP address>",
  "entityType" : "<component, such as ESXI>",
  "entityId" : "<node ID value>",
  "password" : "<password>",
  "domainName" : "<domain name>",
  "entityName" : "<FQDN>",
  "username" : "root"
}],
"type":"UPDATE"
}'
```

**Rotate password**

Rotates the password of the specified domain component.

```
# curl 'http://localhost/security/password/vault' -i -X POST \
-H 'Content-Type: application/json' \
-H 'Accept: application/json' \
-d '{
  "entities": [{
    "credentialType" : "<credential type such SSH or API>",
    "entityIpAddress" : "<IP address>",
    "entityType" : "<component, such as ESXI>",
    "entityId" : "<node ID value>",
    "password" : "<password>",
    "domainName" : "<domain name>",
    "entityName" : "<FQDN>",
    "username" : "root"
  }],
  "type":"ROTATE"
}'
```

**Password operation history**

Returns in JSON format the password history recorded in the password management database.

```
# curl 'https://localhost/security/password/vault/transactions' \
-i -H 'Accept: application/json' \
-k -u "<administrative user name>:<password>"
```

**Password operation status**

Returns in JSON format the latest (or current) workflow, which is an asynchronous job running in SDDC Manager. It polls the status of the workflow and reports percentage completed until the workflow finishes, at which time it reports its status.

```
# curl 'https://localhost/security/password/vault/transactions/2002' \
-i -H 'Accept: application/json' \
-k -u "<administrative user name>:<password>"
```

**Retry failed password operation**

Retries the specified failed operation and returns results in JSON format

```
# curl 'http://localhost/security/password/vault/transactions/2002' \
-i -X PATCH \
-H 'Content-Type: application/json' \
-H 'Accept: application/json' \
-d '{
  "entities": [{
    "credentialType" : "<credential type such SSH or API>",
    "entityIpAddress" : "<IP address>",
    "entityType" : "<component, such as ESXI>",
    "entityId" : "<node ID value>",
    "password" : "<password>",
    "domainName" : "<domain name>",
    "entityName" : "<FQDN>",
    "username" : "root"
  }],
  "type": "<specify ROTATE or UPDATE>"
}'
```

**Cancel password operation**

Cancels failed password operations and returns results in JSON format

```
# curl 'https://localhost/security/password/vault/transactions/2002' \
-i -X DELETE -H 'Accept: application/json' \
-k -u "<administrative user name>:<password>"
```



# Replace Host Components

# 19

The replacement procedure depends on the component being replaced and the condition of the component.

- [Replacing Components of a Host Running in Degraded Mode](#)

The procedures for replacing components of hosts in degraded depend on whether the host is part of a workload domain.

- [Replace a Dead Host](#)

If you need to replace a dead host, you must remove the host from the physical rack. You can then add a new host or replace the failed component on the host and add it back.

- [Replace Boot Disk on a Host](#)

This section describes the replacement procedure for a failed boot disk on a host.

## Replacing Components of a Host Running in Degraded Mode

The procedures for replacing components of hosts in degraded depend on whether the host is part of a workload domain.

These procedures apply to the following components:

- CPU
- Memory
- BMC
- Power supply
- RAID 1 boot disk

## Replace Components of a Workload Domain Host Running in Degraded Mode

This procedure shows you how to replace the component of a degraded host that is part of a workload domain.

### Prerequisites

- Verify that the host is operational and is accessible by VMware Host Client.
- Verify that the Management, vSAN, and vMotion networks are available on the host. This can be viewed through the **Inventory > Hosts** page.
- Verify that the HDD and SSD disks on the host are in a good state.

### Procedure

- 1 Log in to vSphere Web Client.
- 2 Right-click the affected host and click **Enter Maintenance Mode**.
- 3 If the host belongs to a domain, click **Full Data Migration**.
- 4 Right-click the affected host and select **Shutdown**.
- 5 Pull the host out of the physical rack.  
Note the ports on the switches it was connected to.
- 6 Service the appropriate part following the OEM vendor documentation.
- 7 Put the host back in the physical rack and connect it back to the appropriate switches.
- 8 Power on the host.
- 9 In vSphere Web Client, right-click the host and click **Exit Maintenance Mode**.

## Replace Components of an Unassigned Host Running in Degraded Mode

This procedure shows you how to replace the component of a degraded host that is not part of a workload domain.

### Prerequisites

- Verify that the host is operational and is accessible by VMware Host Client.
- Verify that the HDD and SSD disks on the host are in a good state.

### Procedure

- 1 Log in to vSphere Web Client.
- 2 Right-click the affected host and select **Shutdown**.
- 3 Pull the host out of the physical rack.  
Note the ports on the switches it was connected to.
- 4 Service the appropriate part following the OEM vendor documentation.
- 5 Put the host back in the physical rack and connect it back to the appropriate switches.
- 6 Power on the host.

7 In the SDDC Manager Dashboard, verify that the host is available in the free pool.

## Replace a Dead Host

If you need to replace a dead host, you must remove the host from the physical rack. You can then add a new host or replace the failed component on the host and add it back.

This procedure applies chiefly to the following components:

- Storage controllers
- Motherboards
- Boot disks

### Prerequisites

If the host belongs to a workload domain, verify that there are at least 4 hosts in the management or workload domain to which the faulty host belongs. If there are less than 4 hosts, add a host to the domain from the capacity pool if possible.

### Procedure

- 1 Decommission the host.  
See [Decommission Hosts](#).
- 2 Power off the host and remove it from the physical rack.
- 3 Replace and reconfigure, as follows.
  - a Replace the failed component on the host.
  - b Perform a fresh reinstall of ESXi.
  - c Commission the host.  
See [Commission Hosts](#).

## Replace Boot Disk on a Host

This section describes the replacement procedure for a failed boot disk on a host.

### Prerequisites

Verify that there are at least 4 hosts in the management or workload domain to which the faulty host belongs. If there are less than 4 hosts, add a host to the domain from the capacity pool, if possible.

### Procedure

- 1 If there are dual boot disks in the host setup as RAID 1 and only one of them fails:
  - See [Replacing Components of a Host Running in Degraded Mode](#) to replace the failed disk.

The RAID 1 feature will rebuild the disks as needed. For more details, refer to the OEM vendor documentation.

- 2 If there is a single boot disk in the host and it fails, see [Replace a Dead Host](#).

# Patching and Upgrading Cloud Foundation

# 20

Lifecycle Management (LCM) enables you to perform automated updates on Cloud Foundation services (SDDC Manager and internal services) and VMware software (NSX for vSphere, vCenter Server, ESXi, and vRSCLM) in your environment. Update bundles can be downloaded and applied manually or scheduled within your maintenance window, allowing for flexibility in your application.

vRealize Suite and NSX-T components need to be upgraded manually.

## LCM Bundle Types

There are three types of LCM bundles.

### Upgrade Bundles

An upgrade bundle contains bits to update the appropriate Cloud Foundation software components in your management domain or VI workload domain. In most cases, an upgrade bundle must be applied to the management domain before it can be applied to workload domains.

Some upgrade bundles are cumulative bundles. With a cumulative upgrade bundle, you can directly upgrade the appropriate software in your workload domain to the version contained in the cumulative bundle rather than applying sequential upgrades to reach the target version. Cumulative bundles are available only for vCenter Server, Platform Services Controller, and ESXi.

Note that you can apply a cumulative bundle to a workload domain only if the target release in the bundle is lower than or at the same version as the management domain. If the cumulative bundle is available for both the management domain and VI workload domains, you must apply it to the management domain before applying it to VI workload domains.

### Install Bundles

Cloud Foundation includes the following install bundles.

- VI workload domain install bundle is used to deploy later versions of the software components instead of the versions in your original Cloud Foundation installation. It includes software bits for vCenter Server and NSX for vSphere.
- vRealize install bundle is used for deploying vRealize components.

- NSX-T install bundle is used for deploying an NSX-T based VI workload domain.
- Horizon 7 install bundle is used for creating a Horizon domain.

## Download Bundles

If are logged in to your My VMware account, LCM automatically polls the depot to access the bundles. You receive a notification when a bundle is available and can then download the bundle. You can download all required bundles before your maintenance window begins.

If you do not have internet connectivity, you can either use a proxy server to access the depot, or download the bundles manually.

### Online Bundle Download

You can either download bundles through the SDDC Manager dashboard or through a proxy server.

#### Download Bundles from the SDDC Manager Dashboard

You must login to your My VMware account before downloading a bundle.

##### Log In Your My VMware Account

You must be logged in to your My VMware Account to download update bundles.

##### Procedure

- 1 In the SDDC Manager Dashboard, click **Administration > Repository Settings** .
- 2 Click **Authenticate**.

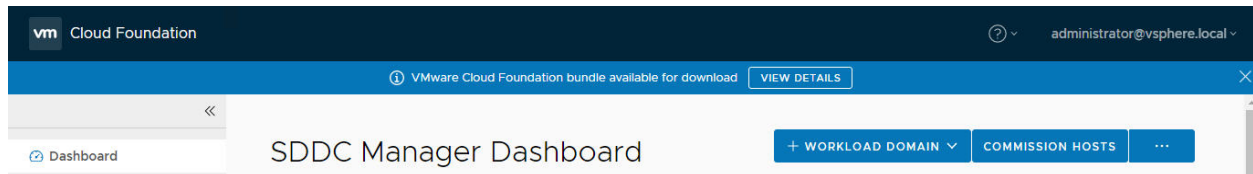
The My VMware Account Authentication page appears.

The screenshot shows a modal dialog box titled "My VMware Account Authentication". It contains two input fields: "User Name" with a placeholder "Enter user name" and "Password" with a placeholder "Password" and a toggle icon. At the bottom right, there are two buttons: "CANCEL" and "AUTHORIZE".

- 3 Type your user name and password.
- 4 Click **Authorize**.

#### Download Bundles from SDDC Manager

When upgrade bundles are available for your environment, a message is displayed on the SDDC Manager Dashboard.



To download an install bundle, navigate to **Repository > Bundles** on the SDDC Manager Dashboard to view the available bundles. Then follow the instructions in step 4 below.

### Prerequisites

If you have previously edited the application-prod.properties file on SDDC Manager VM 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 VM with the following credentials:
  - Username: vcf
  - Password: use the password specified in the deployment parameter sheet
- 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 LCM service with the command below:
 

```
systemctl restart lcm
```

### Procedure

- 1 Log in to your My VMware Account.
  - a On the SDDC Manager Dashboard, click **Administration > Repository Settings**.
  - b Click **Authenticate**.

The My VMware Account Authentication page appears.

## My VMware Account Authentication ✕

User Name

Enter user name

Password

Password 👁

CANCEL

AUTHORIZE

- c Type your user name and password.

d Click **Authorize**.

- 2 To download a bundle, navigate to **Repository > Bundles** on the SDDC Manager Dashboard to view the available bundles.

**Bundles**

To view available updates, Authorize My VMware Account.

Bundle Details	Availability Status
<p>VMware Cloud Foundation Update 3.8.0.0</p> <p>Released 07/18/2019. 273 MB</p> <p>Before applying the upgrade bundle, ensure that there are no failed workflows in your system and none of the Cloud Foundation resources are in activating or error state. If any of these conditions are true, contact VMware Support before starting the upgrade. This VMware Cloud Foundation Upgrade contains update and fixes required for SDDC Manager migration upgrade.</p> <p><a href="#">View Details</a></p> <p>Applies to MGMT</p>	Available

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 to, and the Availability column says Available. If another bundle needs to be applied before a particular bundle, the Availability field displays Future.

- 3 Click View Details for more information about the bundle.

VMware Cloud Foundation Update 3.8.0.0

Released 07/18/2019 273 MB

Before applying the upgrade bundle, ensure that there are no failed workflows in your system and none of the Cloud Foundation resources are in activating or error state. If any of these conditions are true, contact VMware Support before starting the upgrade. This VMware Cloud Foundation Upgrade contains update and fixes required for SDDC Manager migration upgrade.

[Exit Details](#)

Additional Bundle Details

Version	3.6.0-114161
Severity	Critical
Vendor	VMware
Bundle ID	a165fa0a-5210-4db4-9f74-5d2b50f81363
Software Component 1	LCM
Description	LCM update
Update to Version	3.8.0-RELEASE-14136202
Required Version	3.7.2-RELEASE-13773680
Release Date	07/18/2019
Vendor	VMware
Software Component 2	SDDC Manager UI App
Description	SDDC Manager UI update
Update to Version	3.8.0-RELEASE-14135429
Required Version	3.7.2-RELEASE-13773626
Release Date	07/18/2019
Vendor	VMware

The bundle page displays the version, bundle ID, and software components to be updated by this bundle.

- 4 Click **Exit Details**.
- 5 Do one of the following:
  - Click **Download Now**.

The bundle download begins right away.



- Click **Schedule Download**.

Select the date and time for the bundle download and click **Schedule**.

The Download Status section on the Bundles page 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 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 VM 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 Update 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.

## Offline Bundle Download

LCM polls the VMware depot to access update bundles. If you do not have internet connectivity in your 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 SDDC Manager. The utility identifies applicable bundles based on the current software versions in your environment based on a marker file generated on the SDDC Manager VM.

You must download and apply the first bundle (SDDC Manager bundle) before downloading the remaining upgrade bundles.

### Prerequisites

Ensure you have access to a Windows or Linux computer with internet connectivity for downloading the bundles. The computer must have Java 8 or later.

## Procedure

- 1 Using SSH, log in to the SDDC Manager VM with the user name `vcf` and password you specified in the deployment parameter sheet.

- 2 Change directories:

```
cd /opt/vmware/vcf/lcm/lcm-tools/bin
```

- 3 Generate a marker file:

```
./lcm-bundle-transfer-util --generateMarker
```

The marker file (`markerFile`) is a JSON file that contains information on the current software versions running on SDDC Manager. It also contains the bundles IDs for bundles that were downloaded before this file was generated. The `markerFile.md5` contains the checksum for the `markerFile`.

The output contains the directory where the marker file is generated.

- 4 Copy the `/opt/vmware/vcf/lcm/lcm-tools` directory, and the `markerFile` and `markerFile.md5` files from the location displayed in the output of step 3 to a computer with internet access.

The `/opt/vmware/vcf/lcm/lcm-tools` directory includes the bundle transfer utility required for the next step.

- 5 On the computer with internet access, run the following command.

```
./lcm-bundle-transfer-util -download
  -outputDirectory ${absolute-path-output-dir}
  -sku ${sku}
  -depotUser ${depotUser}
  -markerFile ${absolute-path-markerFile}
  -markerMd5File ${absolute-path-markerFile.md5}
```

where

<code>absolute-path-output-dir</code>	Path to the directory where the bundle files are to 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.
<code>sku</code>	Optional. SKU or Service Provider of the index file.
<code>depotUser</code>	User name for myVMware depot. You are prompted to enter the depot user password. If there are any special characters in the password, specify the password within single quotes.
<code>markerFile</code>	Absolute path to the marker file, as generated in the above step. If you do not specify the path to the marker file, all update bundles on the depot are downloaded.
<code>markerMd5File</code>	Absolute path to the marker MD5 checksum file, as generated in the above step.

The utility generates a delta file (`deltaFileDownloaded`) in the download directory based on the software versions in the marker file and the update bundles available on the depot. The applicable bundles identified in the delta file are downloaded. Download progress for each bundle is displayed. Initially, only the SDDC Manager bundle will be available.

- 6 Copy the update bundle directory from the external computer to the SDDC Manager VM.

For example:

```
scp -pr /root/vcf372tovcf38Bundle vcf@SDDC_MANAGER_IP:/nfs/vmware/vcf/nfs-mount/
```

The `scp` command in the example above creates a directory named `vcf372tovcf38Bundle` in the `/nfs/vmware/vcf/nfs-mount/` directory.

- 7 In the SDDC Manager VM, change the ownership and permissions of the uploaded bundle.

```
chmod -R 0777 /nfs/vmware/vcf/nfs-mount/vcf372tovcf38Bundle
```

- 8 In the SDDC Manager VM, upload the bundle files to the internal LCM repository. You must upload the upgrade and install bundles.

```
cd /opt/vmware/vcf/lcm/lcm-tools/bin
./lcm-bundle-transfer-util -upload -bundleDirectory ${absolute-path-output-dir}
```

where *absolute-path-output-dir* is the directory where the bundle files have been be uploaded, or `/nfs/vmware/vcf/nfs-mount/vcf372tovcf38Bundle` as shown in the previous step.

The utility uploads the bundles specified in the `deltaFileDownloaded` file. The console displays upload status for each bundle.

## Download Specific Bundles in 3.7.1

Bundle transfer utility is a command line tool which is specifically used to identify the bundles applicable to the current domain, download the bundles using the credentials, and upload them to SDDC Manager.

In Release 3.7.1, additional options have been introduced for the bundle transfer utility tool.

- You can selectively download the bundles based on the product version:

- a Display the list of the applicable bundles along with the product version.

```
./lcm-bundle-transfer-util --markerFile ${absolte-path-markerFile} --markerMd5File
${absolte-path-markerFile.md5} --depotUser ${depotUser} --listBundles
(OR)
./lcm-bundle-transfer-util --markerFile ${absolte-path-markerFile} --markerMd5File
${absolte-path-markerFile.md5} --depotUser ${depotUser} -l
```

Sample applicable bundle list  
Below are applicable bundles:

```
*****
```

Bundle	Product Version	Bundle Size (in MB)	Patch/Install Softwares
bundle-10668	3.7.1.0	432.0 MB	ESX_HOST-6.7.0-12871208-PATCH

- b Download the applicable bundles based on the selection of the product version.

```
./lcm-bundle-transfer-util --download --outputDirectory ${absolute-path-output-dir}
--depotUser ${depotUser} --markerFile ${absolute-path-markerFile} --markerMd5File
${absolute-path-markerFile.md5} --productVersion ${product_version}
```

(OR)

```
./lcm-bundle-transfer-util --download --outputDirectory ${absolute-path-output-dir}
--depotUser ${depotUser} --markerFile ${absolute-path-markerFile} --markerMd5File
${absolute-path-markerFile.md5} -p ${product_version}
```

For example, to download all the bundles released for the 3.7.1 version, run the tool as follows:

```
./lcm-bundle-transfer-util --download --depotUser 'test_depot_user@vmware.com'
--outputDirectory /Users/${userName}/downloadedBundle -p 3.7.1.0
```

- c Upload all the bundles specific to the product version.

```
./lcm-bundle-transfer-util --upload --bundleDirectory ${absolute-path-bundles-dir}
--productVersion ${product_version}
```

(OR)

```
./lcm-bundle-transfer-util --upload --bundleDirectory ${absolute-path-bundles-dir}
-p ${product_version}
```

To upload all bundles released for the 3.7.1.0 version, run the tool as follows:

```
./lcm-bundle-transfer-util --upload --bundleDirectory
/nfs/vmware/vcf/nfs-mount/downloadedBundles -p 3.7.1.0
```

- You can download only a single applicable bundle .

- a Download the single bundle.

```
./lcm-bundle-transfer-util --download --outputDirectory ${absolute-path-output-dir}
--depotUser ${depotUser} --bundle ${bundle_name}
```

(OR)

```
./lcm-bundle-transfer-util --download --outputDirectory ${absolute-path-output-dir}
--depotUser ${depotUser} -b ${bundle_name}
```

For example:

```
./lcm-bundle-transfer-util --download --outputDirectory
/nfs/vmware/vcf/nfs-mount/downloadedBundles
--depotUser 'test_depot_user@vmware.com' --bundle bundle-8203
```

- b Upload it to LCM.

```
./lcm-bundle-transfer-util --upload --bundleDirectory ${absolute-path-bundles-dir}
--bundle ${bundle_name}
(OR)

./lcm-bundle-transfer-util --upload --bundleDirectory ${absolute-path-bundles-dir}
-b ${bundle_name}
```

For example:

```
./lcm-bundle-transfer-util --upload --bundleDirectory
/nfs/vmware/vcf/nfs-mount/downloadedBundles -b bundle-8203
```

**Note** The above additional options can be run only on the SDDC Manager machines. For these options on SDDC Manager, you should always run the tool as `vrack` user.

## Upgrade Cloud Foundation

Cloud Foundation upgrades are sequential. So in order to upgrade to a release, your environment must be on the version before that 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 workload domains.

It is recommended that you upgrade the management domain and all workload domains so that all components in your Cloud Foundation environment are in synch.

### Upgrade Prerequisites

Meet the following prerequisites before starting an upgrade.

- 1 Take a backup of the SDDC Manager VM.
- 2 Take a snapshot of each VM in your environment.
- 3 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.
- 4 You must have downloaded the upgrade bundles. See [Download Bundles](#).

### Upgrade to Cloud Foundation 3.7

You can upgrade to Cloud Foundation 3.7 only from 3.5.1. If you are at a version earlier than 3.5.1, refer to the 3.5.1 documentation for information on how to upgrade to 3.5.1.

LCM makes update bundles available as they become applicable. The components within the management domain are upgraded in the following order:

## Upgrade Management Domain to Cloud Foundation 3.7

The components within the management domain are upgraded in the following order:

- 1 SDDC Manager
- 2 NSX for vSphere (NSX-T in VI workload domains must be upgraded manually)
- 3 vCenter Server
- 4 ESXi
- 5 vRSLCM

This is required only if you have a vRealize product in your environment.

You must complete upgrading the management domain before upgrading workload domains.

### Upgrade SDDC Manager and Cloud Foundation Services

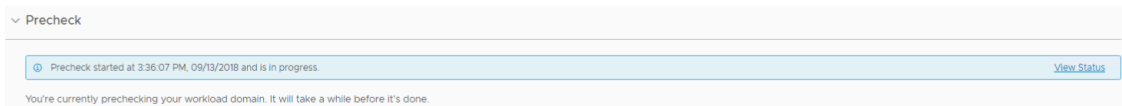
The SDDC Manager and Cloud Foundation services are upgraded first.

#### Prerequisites

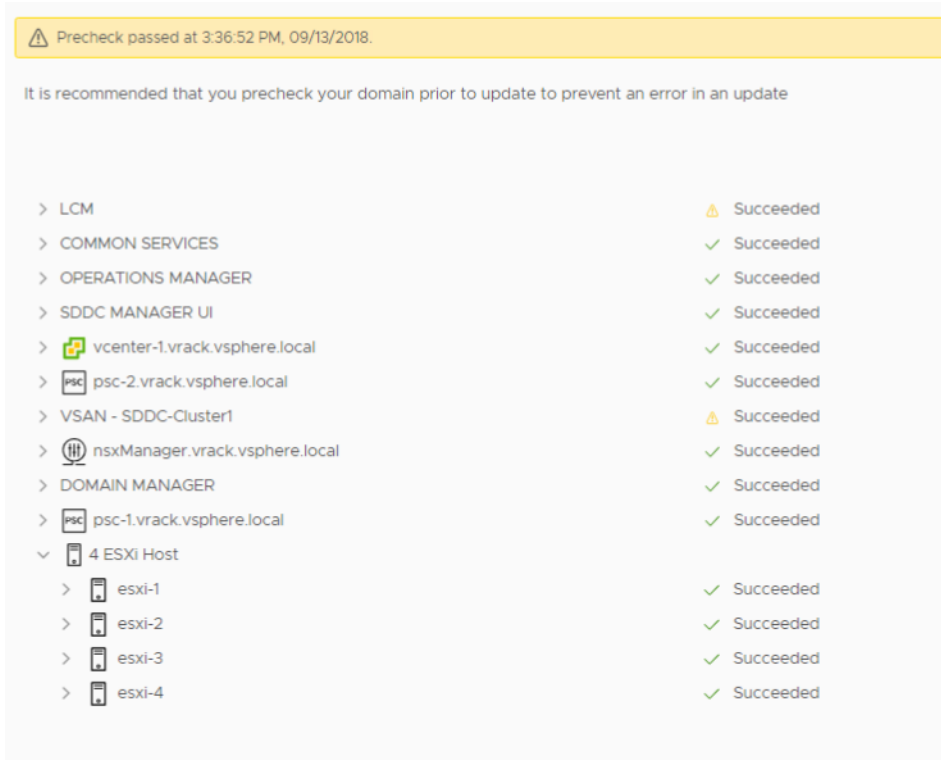
Download the upgrade bundle. See [Download Bundles](#).

#### Procedure

- 1 Ensure that the [Upgrade Prerequisites](#) are met.
- 2 On the SDDC Manager Dashboard, click **Inventory > Workload Domains**.
- 3 Click the management domain and then click the **Updates/Patches** tab.
- 4 Click **Precheck** to validate that SDDC Manager 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.

- 5 Click **Update Now** to start the first update or click **Schedule Update** to schedule the update for a specific date and time depending on your maintenance window.
- 6 Monitor the update. See [Monitor Upgrade](#).
- 7 When the upgrade completes, click **Finish**.

You are logged out of the old SDDC Manager Dashboard and logged back in to the new SDDC Manager Dashboard.

#### What to do next

Delete the VM snapshots that you took before starting the upgrade.

#### Upgrade vCenter Server and Platform Services Controllers

After you upgrade SDDC Manager and Cloud Foundation services, the vCenter Server and Platform Services Controllers upgrade bundle becomes available.

During the upgrade process, you provide a temporary IP address. LCM uses this IP address to deploy a new appliance and then copies over the data from the source appliance to the newly deployed appliance. After the upgrade, the new appliance inherits the IP address and networking configuration of the source appliance.

The source appliances are powered off and left in inventory. These VMs can be deleted. They should not be powered on with their network cards connected as this will cause a conflict with the appliances.

### Prerequisites

Download the upgrade bundle. See [Download Bundles](#).

### Procedure

- 1 In the SDDC Manager Dashboard click **Inventory > Workload Domains**.
- 2 Click **View Details** in the **Virtual Infrastructure** section.
- 3 Click the management domain and then click **Update/Patches**.
- 4 Click **Precheck** to validate that vCenter Server is ready to be upgraded.

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.

- 5 Click **Schedule** to schedule the update for a specific date and time depending on your maintenance window.
- 6 On the **Introduction** page, read the text and click **Next**.
- 7 On the **Configure Target Appliance** page, enter an available IP address from the management domain IP range.

This IP address is used only during the upgrade process.

- 8 Enter the subnet mask and gateway IP address of the management domain.
- 9 Click **Next**.
- 10 Select a date and time and click **Next**.
- 11 Review the information displayed and click **Finish**.

The upgrade is scheduled at the specified date and time.

- 12 Monitor the update. See [Monitor Upgrade](#).

### Upgrade ESXi

If you want to skip any hosts while applying an ESXi update to the management domain or a VI workload domain, you must add these hosts to the `application-prod.properties` file before you begin the update. See [Skip Hosts During ESXi Update](#).

### Prerequisites

Download the upgrade bundle. See [Download Bundles](#).



**Procedure**

- 1 In the SDDC Manager Dashboard click **Inventory > Workload Domains**.
- 2 Click **View Details** in the **Virtual Infrastructure** section.
- 3 Click the management domain and then click **Update/Patches**.
- 4 Click **Precheck** to validate that ESXi 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.

- 5 Click **Upgrade Now** to start the update or click **Schedule** to schedule the update for a specific date and time depending on your maintenance window.
- 6 Monitor the update. See [Monitor Upgrade](#).
- 7 Repeat these steps for each VI workload domain.

**Upgrade vRealize Suite Lifecycle Manager**

If you have a vRealize product installed in your Cloud Foundation environment, upgrade vRealize Suite Lifecycle Manager on the management domain.

**Prerequisites**

Download the upgrade bundle. See [Download Bundles](#).

**Procedure**

- 1 In the SDDC Manager Dashboard click **Inventory > Workload Domains**.
- 2 Click **View Details** in the **Virtual Infrastructure** section.
- 3 Click the management domain and then click **Update/Patches**.
- 4 Click **Precheck** to validate that vRealize Suite Lifecycle Manager 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.

- 5 Click **Upgrade Now** to start the update or click **Schedule** to schedule the update for a specific date and time depending on your maintenance window.
- 6 Monitor the update. See [Monitor Upgrade](#).

## Upgrade Workload Domains to Cloud Foundation 3.7

Upgrade each workload domain in your environment using the procedure described here.

The components within each workload domain are upgraded in the following order:

- 1 NSX for vSphere (NSX-T in VI workload domains must be upgraded manually)
- 2 vCenter Server
- 3 ESXi

### Procedure

- 1 In the SDDC Manager Dashboard click **Inventory > Workload Domains**.
- 2 Click **View Details** in the **Virtual Infrastructure** section.
- 3 Click the workload domain to be upgraded and then click **Update/Patches**.
- 4 Upgrade vCenter Server and Platform Controller Services. See [Upgrade vCenter Server and Platform Services Controllers](#).
- 5 Upgrade ESXi. See [Upgrade ESXi](#).

## Upgrade to Cloud Foundation 3.7.1

You can upgrade to Cloud Foundation 3.7.1 only from 3.7. If you are at a version earlier than 3.7, refer to the 3.7 documentation for information on how to upgrade to 3.7.

## Upgrade Management Domain to Cloud Foundation 3.7.1

The components within the management domain are upgraded in the following order:

- 1 SDDC Manager
- 2 ESXi

You must complete upgrading the management domain before upgrading workload domains.

## Upgrade SDDC Manager and Cloud Foundation Services to 3.7.1

The SDDC Manager and Cloud Foundation services are upgraded first.

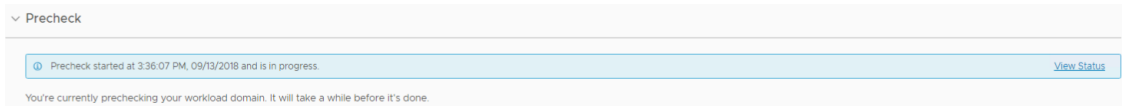
### Prerequisites

Download both SDDC Manager upgrade bundles. They become available in the order in which they need to be applied. See [Download Bundles](#).

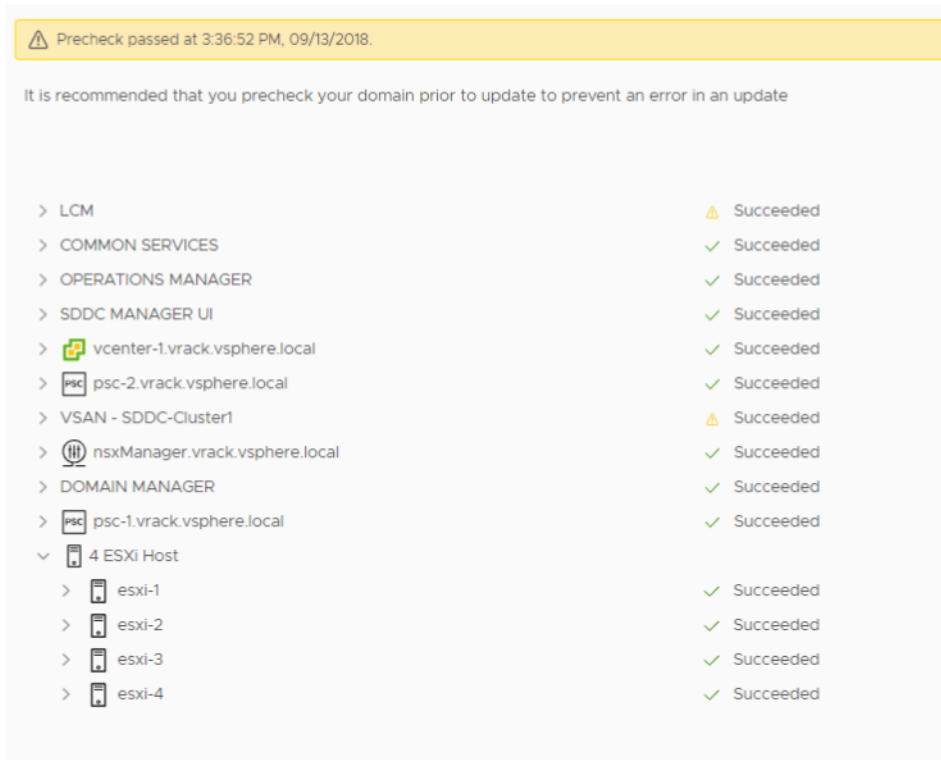
### Procedure

- 1 Ensure that the [Upgrade Prerequisites](#) are met.
- 2 On the SDDC Manager Dashboard, click **Inventory > Workload Domains**.
- 3 Click the management domain and then click the **Updates/Patches** tab.

- Click **Precheck** to validate that SDDC Manager 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.

- Click **Update Now** to start the first update or click **Schedule Update** to schedule the update for a specific date and time depending on your maintenance window.
- Monitor the update. See [Monitor Upgrade](#).
- When the upgrade completes, click **Finish**.

You are logged out of the old SDDC Manager Dashboard and logged back in to the new SDDC Manager Dashboard. The second SDDC Manager bundle becomes available to be applied now.

- Repeat the steps 4, 5, and 6 to install the second SDDC Manager bundle.

## Upgrade ESXi

If you want to skip any hosts while applying an ESXi update to the management domain or a VI workload domain, you must add these hosts to the `application-prod.properties` file before you begin the update. See [Skip Hosts During ESXi Update](#).

### Prerequisites

Download the upgrade bundle. See [Download Bundles](#).

### Procedure

- 1 In the SDDC Manager Dashboard click **Inventory > Workload Domains**.
- 2 Click **View Details** in the **Virtual Infrastructure** section.
- 3 Click the management domain and then click **Update/Patches**.
- 4 Click **Precheck** to validate that ESXi 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.

- 5 Click **Upgrade Now** to start the update or click **Schedule** to schedule the update for a specific date and time depending on your maintenance window.
- 6 Monitor the update. See [Monitor Upgrade](#).
- 7 Repeat these steps for each VI workload domain.

## Upgrade Cloud Foundation to 3.7.2

You can upgrade to Cloud Foundation 3.7.2 only from 3.7.1. If you are at a version earlier than 3.7.1, you must upgrade to 3.7.1 before upgrading to 3.7.2.

### Upgrade Management Domain to 3.7.2

You must complete the management domain upgrade before upgrading the workload domains.

### Upgrade SDDC Manager and Cloud Foundation Services to Cloud Foundation 3.7.2

The SDDC Manager and Cloud Foundation services are upgraded first.

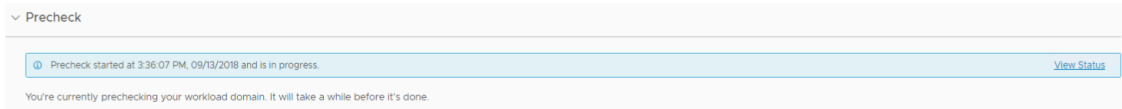
### Prerequisites

Download the upgrade bundle. See [Download Bundles](#).

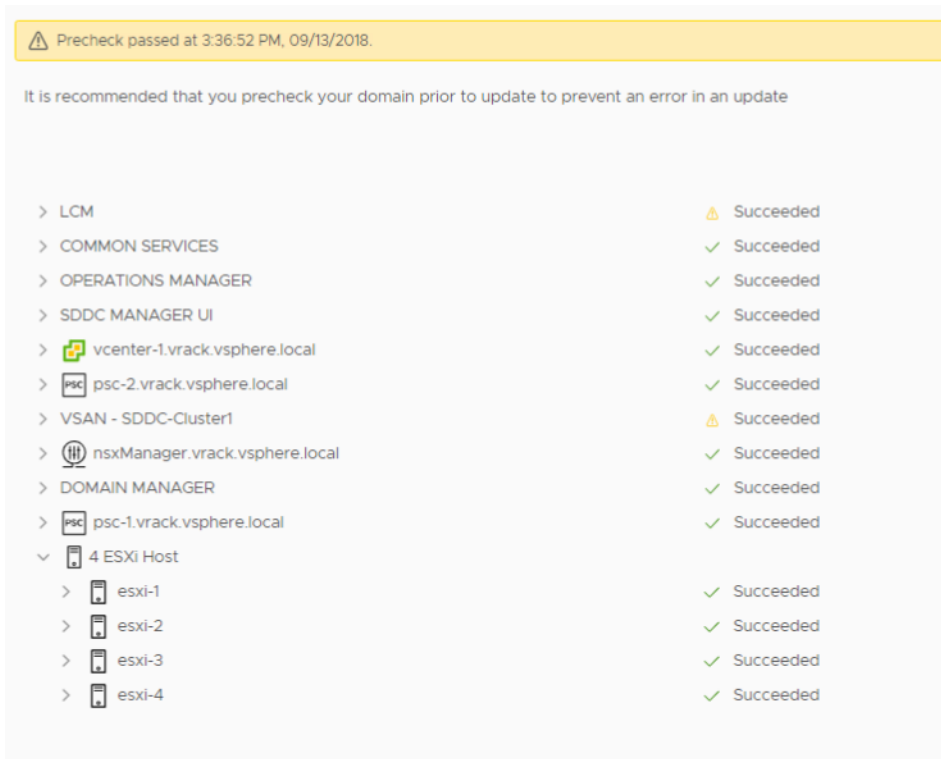
### Procedure

- 1 Ensure that the [Upgrade Prerequisites](#) are met.
- 2 On the SDDC Manager Dashboard, click **Inventory > Workload Domains**.

- 3 Click the management domain and then click the **Updates/Patches** tab.
- 4 Click **Precheck** to validate that SDDC Manager 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.

- 5 Click **Update Now** to start the first update or click **Schedule Update** to schedule the update for a specific date and time depending on your maintenance window.
- 6 Monitor the update. See [Monitor Upgrade](#).
- 7 When the upgrade completes, click **Finish**.

You are logged out of the old SDDC Manager Dashboard and logged back in to the new SDDC Manager Dashboard.

### What to do next

Delete the VM snapshots that you took before starting the upgrade.

## Upgrade vCenter Server and Platform Services Controllers for Cloud Foundation 3.7.2

After you upgrade SDDC Manager and Cloud Foundation services, the vCenter Server and Platform Services Controllers upgrade bundle becomes available.

### Prerequisites

Download the upgrade bundle. See [Download Bundles](#).

### Procedure

- 1 In the SDDC Manager Dashboard click **Inventory > Workload Domains**.
- 2 Click **View Details** in the **Virtual Infrastructure** section.
- 3 Click the management domain and then click **Update/Patches**.
- 4 Click **Precheck** to validate that vCenter Server is ready to be upgraded.

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.

- 5 Click **Schedule** to schedule the update for a specific date and time depending on your maintenance window.
- 6 Select a date and time and click **Next**.
- 7 Review the information displayed and click **Finish**.

The upgrade is scheduled at the specified date and time.

- 8 Monitor the update. See [Monitor Upgrade](#).

## Upgrade ESXi for Cloud Foundation 3.7.2

If you want to skip any hosts while applying an ESXi update to the management domain or a VI workload domain, you must add these hosts to the `application-prod.properties` file before you begin the update. See [Skip Hosts During ESXi Update](#).

### Prerequisites

Download the upgrade bundle. See [Download Bundles](#).

### Procedure

- 1 In the SDDC Manager Dashboard click **Inventory > Workload Domains**.
- 2 Click **View Details** in the **Virtual Infrastructure** section.
- 3 Click the management domain and then click **Update/Patches**.
- 4 Click **Precheck** to validate that ESXi 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.

- 5 Click **Upgrade Now** to start the update or click **Schedule** to schedule the update for a specific date and time depending on your maintenance window.
- 6 Monitor the update. See [Monitor Upgrade](#).
- 7 Repeat these steps for each VI workload domain.

## Upgrade Workload Domains to 3.7.2

Upgrade each workload domain in your environment using the procedure described here.

### Procedure

- 1 In the SDDC Manager Dashboard click **Inventory > Workload Domains**.
- 2 Click **View Details** in the **Virtual Infrastructure** section.
- 3 Click the workload domain to be upgraded and then click **Update/Patches**.
- 4 Upgrade vCenter Server and Platform Controller Services. See [Upgrade vCenter Server and Platform Services Controllers for Cloud Foundation 3.7.2](#).
- 5 Upgrade ESXi. See [Upgrade ESXi for Cloud Foundation 3.7.2](#).

## Upgrade ESXi with Custom ISO or Async Drivers

You can perform ESXi upgrades with custom images and async drivers.

### Upgrade ESXi with Custom ISO

You can upgrade ESXi with a custom ISO from your vendor. This feature is available for Cloud Foundation version 3.5.1 and later.

#### Prerequisites

Download the appropriate vendor-specific ISO on a computer with internet access.

#### Procedure

- 1 Download the ESXi upgrade bundle. See [Download Bundles from SDDC Manager](#).
- 2 Using SSH, log in to the SDDC Manager VM.
- 3 Create a directory for the vendor ISO under the `/nfs/vmware/vcf/nfs-mount` directory. For example, `/nfs/vmware/vcf/nfs-mount/esx-upgrade-partner-binaries`.

- 4 Copy the vendor-specific ISO to the directory you created on the SDDC Manager VM. For example, you can copy the ISO to the `/nfs/vmware/vcf/nfs-mount/esx-upgrade-partner-binaries` directory.
- 5 Change permissions on the directory where you copied the ISO. For example,
 

```
chmod -R 775 /nfs/vmware/vcf/nfs-mount/esx-upgrade-partner-binaries/
```
- 6 Change owner to vcf.
 

```
chown -R vcf_lcm:vcf /nfs/vmware/vcf/nfs-mount/esx-upgrade-partner-binaries/
```
- 7 Create an ESX custom image JSON using the following template.

```
{
  "esxCustomImageSpecList": [{
    "bundleId": "ID",
    "targetEsxVersion": "version",
    "useVcfBundle": false,
    "customIsoAbsolutePath": "Path_to_ISO"
  }]
}
```

where

Parameter	Description and Example Value
bundleId	<p>ID of the ESXi upgrade bundle you downloaded. You can retrieve the bundle ID by navigating to the <b>Repository &gt; Bundles</b> page and clicking <b>View Details</b> to view the bundle ID.</p> <p>For example, <code>8c0de63d-b522-4db8-be6c-f1e0ab7ef554</code>.</p> <p><b>Note</b> If an incorrect bundle ID is provided, the upgrade will proceed with the Cloud Foundation stock ISO and replace the custom VIBs in your environment with the stock VIBs.</p>
targetEsxVersion	ESXi version in the custom image to be applied.
useVcfBundle	<p>Specifies whether the Cloud Foundation ESXi bundle is to be used for the upgrade.</p> <p><b>Note</b> If you want to upgrade with a custom ISO image, ensure that this is set to <code>false</code>.</p>
customIsoAbsolutePath	Path to the custom ISO file on the SDDC Manager VM. For example, <code>/nfs/vmware/vcf/nfs-mount/esx-upgrade-partner-binaries/VMware-ESXi-6.7.0-Update1-10302608-HPE-Gen9plus-670.U1.10.3.5.12-Oct2018.iso</code>

Here is an example of a completed JSON template.

```
{
  "esxCustomImageSpecList": [{
    "bundleId": "8c0de63d-b522-4db8-be6c-f1e0ab7ef554",
    "targetEsxVersion": "6.7.0-10302608",
    "useVcfBundle": false,
    "customIsoAbsolutePath":
```



```
"/nfs/vmware/vcf/nfs-mount/esx-upgrade-partner-binaries/VMware-ESXi-6.7.0-Update1-10302608-HPE-
Gen9plus-670.U1.10.3.5.12-Oct2018.iso"
}]
}
```

- 8 Save the JSON file as `esx-custom-image-upgrade-spec.json` in the `/nfs/vmware/vcf/nfs-mount`.

---

**Note** If the JSON file is not saved in the correct directory, the stock Cloud Foundation ISO is used for the upgrade and the custom VIBs are overwritten.

---

- 9 Set the correct permissions on the `/nfs/vmware/vcf/nfs-mount/esx-custom-image-upgrade-spec.json` file:

```
chmod -R 775 /nfs/vmware/vcf/nfs-mount/esx-custom-image-upgrade-spec.json
```

```
chown -R vcf_lcm:vcf /nfs/vmware/vcf/nfs-mount/esx-custom-image-upgrade-spec.json
```

- 10 Open the `/opt/vmware/vcf/lcm/lcm-app/conf/application-prod.properties` file.

- 11 In the `lcm.esx.upgrade.custom.image.spec=` parameter, add the path to the JSON file.

For example, `lcm.esx.upgrade.custom.image.spec=/nfs/vmware/vcf/nfs-mount/esx-custom-image-upgrade-spec.json`

- 12 On the SDDC Manager Dashboard, click **Inventory > Workload Domains**.

- 13 Click the management domain and then click **Updates/Patches**.

- 14 Schedule the ESXi upgrade bundle.

- 15 Monitor the upgrade progress. See [Monitor Upgrade](#).

- 16 After the upgrade is complete, confirm the ESXi version by clicking **Current Versions**. The ESXi hosts table displays the current ESXi version.

## Upgrade ESXi with Cloud Foundation Stock ISO and Async Drivers

You can apply the stock ESXi upgrade bundle with specified async drivers. This feature is available for Cloud Foundation version 3.5.1 and later.

### Prerequisites

Download the appropriate async drivers for your hardware on a computer with internet access.

### Procedure

- 1 Download the Cloud Foundation ESXi upgrade bundle. See [Download Bundles from SDDC Manager](#).
- 2 Using SSH, log in to the SDDC Manager VM.
- 3 Create a directory for the vendor provided async drivers under the `/nfs/vmware/vcf/nfs-mount` directory. For example, `/nfs/vmware/vcf/nfs-mount/esx-upgrade-partner-drivers/drivers`.

- 4 Copy the async drivers to the directory you created on the SDDC Manager VM. For example, you can copy the drivers to the `/nfs/vmware/vcf/nfs-mount/esx-upgrade-partner-drivers/drivers` directory.
- 5 Change permissions on the directory where you copied the drivers. For example,
 

```
chmod -R 775 /nfs/vmware/vcf/nfs-mount/esx-upgrade-partner-drivers/drivers
```
- 6 Change owner to vcf.
 

```
chown -R vcf_lcm:vcf /nfs/vmware/vcf/nfs-mount/esx-upgrade-partner-drivers/drivers
```
- 7 Create an ESX custom image JSON using the following template.

```
{
  "esxCustomImageSpecList": [{
    "bundleId": "ID",
    "useVcfBundle": true,
    "esxPatchesAbsolutePaths": [
      "Path_to_Drivers"
    ]
  }]
}
```

where

Parameter	Description and Example Value
bundleId	ID of the ESXi upgrade bundle you downloaded. You can retrieve the bundle ID by navigating to the <b>Repository &gt; Bundles</b> page and clicking <b>View Details</b> to view the bundle ID. For example, 8c0de63d-b522-4db8-be6c-f1e0ab7ef554. Cloud Foundation
targetEsxVersion	ESXi version in the custom image to be applied.
useVcfBundle	Specifies whether the ESXi bundle is to be used for the upgrade. Set this to true.
esxPatchesAbsolutePaths	Path to the async drivers on the SDDC Manager VM. For example, <code>/nfs/vmware/vcf/nfs-mount/esx-upgrade-partner-drivers/drivers/VMW-ESX-6.7.0-smartpqi-1.0.2.1038-offline_bundle-8984687.zip</code>

Here is an example of a completed JSON template.

```
{
  "esxCustomImageSpecList": [{
    "bundleId": "8c0de63d-b522-4db8-be6c-f1e0ab7ef554",
    "useVcfBundle": true,
    "esxPatchesAbsolutePaths": [
      "/nfs/vmware/vcf/nfs-mount/esx-upgrade-partner-drivers/drivers/VMW-ESX-6.7.0-smartpqi-1.0.2.1038-offline_bundle-8984687.zip"
    ]
  }]
}
```

- 8 Save the JSON file as `esx-custom-image-upgrade-spec.json` in the `/nfs/vmware/vcf/nfs-mount`.

---

**Note** If the JSON file is not saved in the correct directory, the stock Cloud Foundation ISO is used for the upgrade and the custom VIBs are overwritten.

---

- 9 Set the correct permissions on the `/nfs/vmware/vcf/nfs-mount/esx-custom-image-upgrade-spec.json` file:

```
chmod -R 775 /nfs/vmware/vcf/nfs-mount/esx-custom-image-upgrade-spec.json
```

```
chown -R vcf_lcm:vcf /nfs/vmware/vcf/nfs-mount/esx-custom-image-upgrade-spec.json
```

- 10 Open the `/opt/vmware/vcf/lcm/lcm-app/conf/application-prod.properties` file.

- 11 In the `lcm.esx.upgrade.custom.image.spec=` parameter, add the path to the JSON file.

For example, `lcm.esx.upgrade.custom.image.spec=/nfs/vmware/vcf/nfs-mount/esx-custom-image-upgrade-spec.json`

- 12 On the SDDC Manager Dashboard, click **Inventory > Workload Domains**.

- 13 Click the management domain and then click **Updates/Patches**.

- 14 Schedule the ESXi upgrade bundle.

- 15 Monitor the upgrade progress. See [Monitor Upgrade](#).

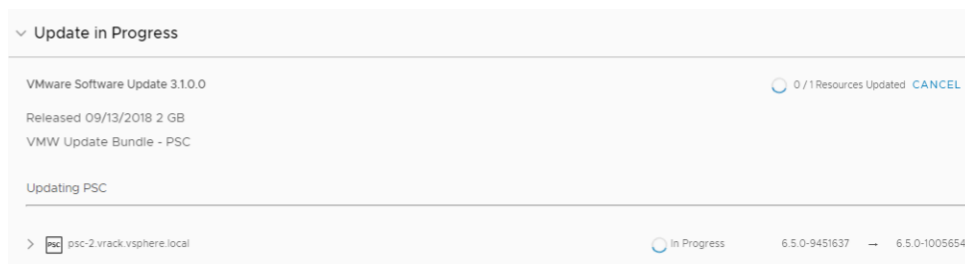
- 16 After the upgrade is complete, confirm the ESXi version by clicking **Current Versions**. The ESXi hosts table displays the current ESXi version.

## Monitor Upgrade

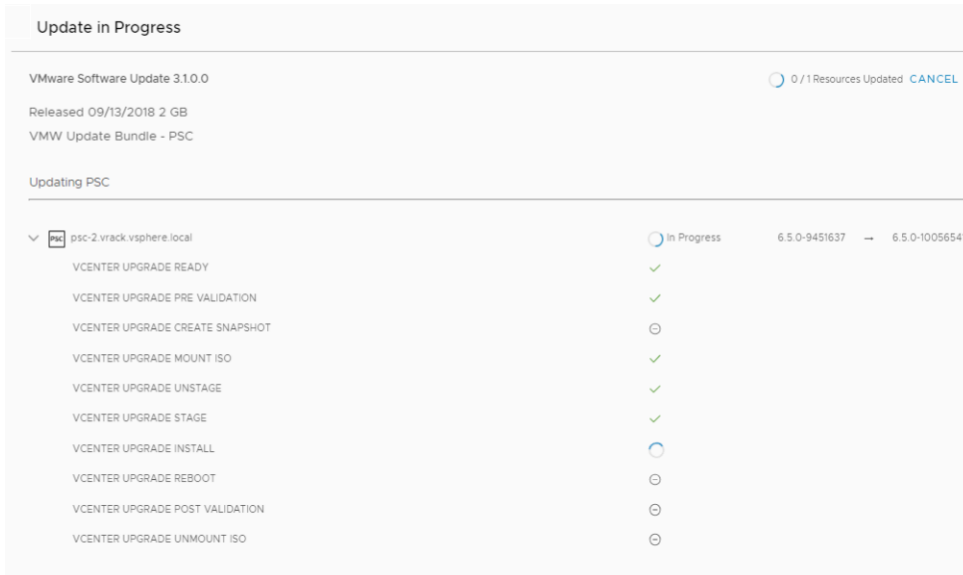
Monitor the upgrade progress on your workload domain

### Procedure

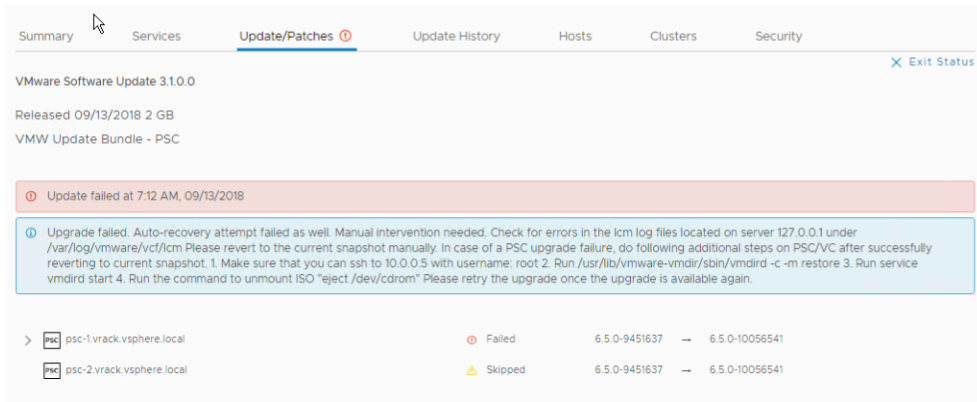
- 1 The Update in Progress section in the workload domain detail page displays the high level update progress and the number of components to be updated.
- 2 Details of the component being updated is shown below that.



- Click the arrow to see a list of tasks being performed to update the component. As the task is completed, it shows a green check mark.



- When all tasks to update a component have been completed, the update status for the component is displayed as Updated.
- If a component fails to be updated, the status is displayed as Failed. The reason for the failure as well as remediation steps are displayed.



- After you resolve the issues, the bundle becomes available. You can then apply the bundle or schedule it to be applied at a specific date and time.

### What to do next

- Remove the VM snapshots you had taken before starting the update.
- Take a backup of the newly installed components.

## Skip Hosts During ESXi Update

You can skip hosts while applying an ESXi update to the management domain or a VI workload domain. The skipped hosts are not updated.

### Procedure

1 Retrieve the host IDs for the hosts you want to skip.

- a Open a new tab in the browser where you are running SDDC Manager and type the following URL:

```
https://SDDC_Manager_IP/inventory/esxis
```

Log in as **admin** using the password you specified for the SDDC Manager REST API user.

Here is a sample output:

```
{
  "vcenterId": "d1a239e1-baef-11e8-a2de-d1b89736a031",
  "networkPoolId": "d3643003-c854-43e7-91ad-fd8d0711a02f",
  "bundleRepoDatastore": "lcm-bundle-repo",
  "domainId": "d0ef8bb0-baef-11e8-a2de-d1b89736a031",
  "clusterId": "d1b106f1-baef-11e8-a2de-d1b89736a031",
  "vsanIpAddress": "10.0.4.3",
  "vmotionIpAddress": "10.0.8.3",
  "hostAttributes": {},
  "dirty": false,
  "id": "d19d57e1-baef-11e8-a2de-d1b89736a031",
  "status": "ACTIVE",
  "version": "6.5.0-9298722",
  "hostName": "esxi-1.vrack.vsphere.local",
  "privateIpAddress": "10.0.0.100",
  "managementIpAddress": "10.0.0.100"
}
```

- b Copy the appropriate host IDs.

2 Using SSH, log in to the SDDC Manager VM with the user name vcf and password you specified in the deployment parameter sheet.

3 Type su to switch to the root account.

4 Open the /opt/vmware/vcf/lcm/lcm-app/conf/application-prod.properties file.

5 At the end of the file, add the following line:

```
esx.upgrade.skip.host.ids=host id1,host id2
```

6 Save and close the file.

7 Restart the LCM server by typing the following command in the console window:

```
systemctl restart lcm
```

The hosts added to the `application-prod.properties` are not updated when you update the workload domain.

## View Upgrade History

The Update History page displays all updates applied to a workload domain.

### Procedure

- 1 In the SDDC Manager Dashboard, click **Inventory > Workload Domains**..
- 2 Click the name of a workload domain and then click the **Update History** tab.

All updates applied to this workload domain are displayed. If an update bundle was applied more than once, click **View Past Attempts** to see more information.

## View Bundle Download History

The Bundle Download History page displays all bundles that have been downloaded.

### Procedure

- ◆ In the SDDC Manager Dashboard, click **Repository > Download History**.

All downloaded bundles are displayed. Click **View Details** to see bundle metadata details.

## Access LCM Log Files

- 1 Log in to the SDDC Manager VM with the `vcf` user name and the password you specified in the deployment parameter sheet.
- 2 To access LCM logs, navigate to the `/var/log/vmware/vcf/lcm` directory.
  - `lcm-debug` log file contains debug level logging information.
  - `lcm.log` contains information level logging.
- 3 To create an sos bundle for support, see [Chapter 16 Supportability and Serviceability \(SoS\) Utility](#) .

# Backing Up and Restoring SDDC Manager

# 21

Back up the SDDC Manager VM regularly to avoid downtime and data loss in case of a system failure. If the SDDC Manager VM does fail, you can restore VM to the last backup.

Follow the best practises below:

- Schedule backups when SDDC Manager is not running any workflows.
- Take periodic backups on a daily to weekly frequency.
- If a workflow does not complete successfully and the Cloud Foundation environment is in this state when the scheduled backup is taken, resolve the failure as soon possible and take an unscheduled backup. Restoring your environment from a backup that includes unresolved failures is more difficult than restoring from a clean backup.

A workflow is resolved when the environment is not in an intermediate state. For some SDDC Manager workflows, the workflow can only be resolved by fixing the failure conditions and retrying the operation. Other workflows can also be resolved by invoking the corresponding delete operation. For example, if adding a host to a workload domain fails, either fix the condition that caused the workflow to fail, or run the workflow that removes the host from the cluster. Contact VMware support if you are unable to resolve a workflow.

You can back up and restore SDDC Manager with an image-based or a file-based solution (starting from Cloud Foundation 3.7.2). It is recommended that you use the image-based solution. The file-based approach is more limited, has a higher network-ingress cost since patch and install bundles have to be re-downloaded, and requires scripting and working with APIs.

This chapter includes the following topics:

- [Image-Based Backup and Restore](#)
- [File-Based Backup and Restore](#)

## Image-Based Backup and Restore

For an image-based backup of the SDDC Manager, 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 the backup to a remote site. 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 a ESXi host allows restoring the vCenter servers.

For an SDDC Manager backup, connect your backup with the management domain vCenter Server. Configure the product to take non-quieted backups of SDDC Manager. To reduce the backup time and storage cost, use incremental backups in addition to full ones.

## File-Based Backup and Restore

With Cloud Foundation 3.7.2 and later, you can use APIs for a file-based backup and restore solution for SDDC Manager. The APIs are building blocks and do not implement a complete solution.

Before getting into the SDDC Manager details, it is useful to review the basic principles in a file-based solution. In such a solution, the state of a product is periodically exported to a file that is stored in a fault domain different than the one where the product is running. If the product needs to be restored, the OVA is redeployed and a selected backup-file is used to restore the state. Finally, post-restore fix-up steps are done.

In case you need to restore the SDDC Manager VM, you select the backup file to restore and download the appropriate OVA file. You can deploy this OVA either through vCenter Server or the OVF tool. You then load the state on the newly deployed SDDC Manager VM.

Note the following limitations for a file-based backup of the SDDC Manager VM:

- You must manually configure the NSX Managers in your Cloud Foundation environment to back up their state to an FTP site. You must repeat this step each time you create a workload domain.  
  
If you do not make these changes, the NSX Managers will continue to backup their state to SDDC Manager. These NSX backup files are not backed up if you use the file-based backup and restore.
- This solution cannot be used for composable servers.
- This solution cannot be used when you have stretched clusters in your environment.
- File-based solution cannot be used if you have a vRealize product or Horizon 7 domain in your environment.

## Backup SDDC Manager

This section describes the manual procedure for taking a backup using the SDDC Manager APIs. It is recommended that you write a script to automate this process.



## Prerequisites

Prepare the following:

- Computer that runs the backup automation script (or where you manually run the APIs). This computer may also be used to coordinate and support a restore operation. It can also host the FTP server required to protect the NSX Manager instances.
- Reliable and secure storage volume on which the backup files are stored.  
The computer and the storage need to be in a different fault domain.

## Procedure

- 1 Configure a passphrase. This passphrase is used for encrypting the backup.

```
curl -k -H"Content-Type: application/json" -u'admin:password' -X PUT https://SDDC_Manager_IP/backups/configuration -d '{"encryption": {"passphrase": "passphrase"}}'
```

In *password*, enter the password for the admin user. In *passphrase*, enter a passphrase that meets the criterion defined below.

The passphrase must contain the following:

- Twelve or more characters.
- At least two non-letters. A non-letter is a digit or special character.
- At least one upper-case letter.
- At least two digits.
- At least one special character.

You can change the passphrase by running the above command. After successfully changing the passphrase, all subsequently generated backup files are encrypted with this new passphrase.

---

**Note** SDDC Manager does not store previously-used passphrases. You must store the passphrase in a secure location separate from the backup files and from the Cloud Foundation environment you are protecting.

---

- 2 Take a backup of the SDDC Manager VM.

```
curl -k -H"Content-Type: application/json" -u'admin:password' -X POST https://SDDC_Manager_IP/backups/tasks -d'{'
```

The output includes a backup task ID and the name of the file in which the backup will be saved without the file extensions ".tar.gz".

```
{
  "id" : "cc159930-15cc-11e9-9cd7-9dd39a9b6b9e",
  "resources" : [
    {
```

```

      "name" : "vcf-backup-sddc-manager-vrack-vsphere-local-2019-05-26-01-01-18"
    }
  ]
}

```

In this example, the full filename of the backup file will be `vcf-backup-sddc-manager-vrack-vsphere-local-2019-05-26-01-01-18.tar.gz`. The backup files are saved in the `/nfs/vmware/vcf/nfs-mount/sddc-manager-backup` directory on the SDDC Manager VM. To inspect the contents of a backup tar file, use the `decrypt` command described in [Restore SDDC Manager](#).

- 3 Track the status of the backup operation by running the following API. The *ID* is the backup ID from the output of the backup command in step 3.

```
curl -k -u'admin:userName' https://SDDC_Manager_IP/workflows/ID | json_pp
```

This API returns the overall status of the backup operation and the status of each of the backup sub-operations. The overall status of the operation is reported by the `status` field, which appears towards the bottom.

The output is similar to the following:

```

{
  "tasks" : [
    {
      "updatedAt" : 1556740948248,
      "errors" : [],
      "status" : "Successful",
      "name" : "QuiesceSystem",
      "id" : "a37f41ad-068f-4451-9f41-a83fd946e503",
      "createdAt" : 1556740948215,
      "description" : "Quiescing the System for Backup Operation"
    },
    {
      "updatedAt" : 1556740949426,
      "errors" : [],
      "status" : "Successful",
      "name" : "BackupSDDCManagerDatabase",
      "id" : "b6cd9bff-0820-4229-806d-de0cc9bcb160",
      "createdAt" : 1556740948253,
      "description" : "Backup SDDC Manager Database"
    },
    {
      "updatedAt" : 1556740950214,
      "errors" : [],
      "status" : "Successful",
      "name" : "BackupSDDCManagerConfiguration",
      "id" : "3bad6fd9-d226-4021-a712-b632204a9687",
      "createdAt" : 1556740949430,
      "description" : "Backup SDDC Manager Configuration"
    },
    {
      "updatedAt" : 1556740952255,

```

```

    "errors" : [],
    "status" : "Successful",
    "name" : "BackupSDDCManagerSystemConfiguration",
    "id" : "1790403c-9c44-4ab6-bde1-4637b037664a",
    "createdTime" : 1556740950218,
    "description" : "Backup SDDC Manager System Configuration"
  },
  {
    "updatedAt" : 1556740953046,
    "errors" : [],
    "status" : "Successful",
    "name" : "PackageSDDCManagerBackup",
    "id" : "3058d4a0-ff99-48d3-a907-56570256e4b1",
    "createdTime" : 1556740952258,
    "description" : "Package and Encrypt SDDC Manager Backup"
  },
  {
    "updatedAt" : 1556740953102,
    "errors" : [],
    "status" : "Successful",
    "name" : "UnquiesceSystem",
    "id" : "6a1228ca-6899-4534-babc-0a7287a1f3b9",
    "createdTime" : 1556740953067,
    "description" : "Unquiesce the system after Backup operation"
  }
],
"outputs" : {},
"errors" : [],
"progress" : {
  "total" : 6,
  "completed" : 6
},
"status" : "Successful",
"name" : "SDDC Manager Backup Operation",
"tasksOrder" :
"QuiesceSystem,BackupSDDCManagerDatabase,BackupSDDCManagerConfiguration,BackupSDDCManagerSystemCon
figuration,PackageSDDCManagerBackup,UnquiesceSystem",
  "id" : "2b930ea1-9684-46fd-bcd6-5048d08e466a",
  "startTime" : 1556740948146
}

```

- 4 After the backup operation is completed, copy the backup from the SDDC Manager to the computer where you are running the API commands.

```

scp vcf@10.0.0.4:/nfs/vmware/vcf/nfs-mount/sddc-manager-backup/vcf-backup-sddc-manager-vrack-
vsphere-local-<timestamp>.tar.gz .

```

### What to do next

It is recommended that you retain at least 15 backups at any given time.

## Restore SDDC Manager

In case of a failure, you can restore SDDC Manager from a saved backup.

## Prerequisites

- Ensure that the original SDDC Manager VM is powered off. Then rename the VM to something like `sddc-manager-original` using the management domain vCenter Server.
- Identify the backup file to be used for the restore operation. In most cases, you should select the most recently taken backup.
- In order to restore SDDC Manager, you need to first determine the SDDC Manager OVA that you need to deploy, from where you can download it, and the parameters needed to deploy it. The information you need for these steps is contained in two files that are contained in the backup tar file you selected to use for the restore operation. In this step of the procedure, you decrypt the backup tar file to get access to these files.

The backup file contains sensitive data about your Cloud Foundation instance, including passwords in plain text. It is recommended you control access to the decrypted files and securely delete them when you are done with the restore operation.

Using a computer that has access to the secure secondary storage where which the backup files are stored, navigate to the backup file and extract the contents of the encrypted tar file using the following command.

```
openssl enc -d -aes256 -in filename-of-selected-file | tar -xz
```

At the prompt, enter the passphrase that you configured before backing up SDDC Manager.

Verify that the backup folder contains the files shown in the example below.

```
appliancemanager_dns_configuration.json
appliancemanager_ntp_configuration.json
appliancemanager_ssh_knownHosts.json
appliancemanager_trustedCertificates_configuration.json
configuration
database
metadata.json
security_password_vault.json
sos.log
```

## Procedure

- 1 Download the SDDC Manager OVA from [https://my.vmware.com/group/vmware/details?downloadGroup=VCF372\\_TOOLS&productId=865](https://my.vmware.com/group/vmware/details?downloadGroup=VCF372_TOOLS&productId=865).
- 2 Deploy SDDC Manager you downloaded in one of the following ways:
  - [Deploy SDDC Manager from vCenter Server](#)
  - [Deploy SDDC Manager with the OVF Tool](#)

The following information is required.

- Password of the backup user stored in the file `security_password_vault.json` file. Open the file and search for entityType "BACKUP". The "secret" field contains the password. The following is a sample extract from the file.

```
{
  "username": "backup",
  "entityType": "BACKUP",
  "creationTime": 1558811851033,
  "credentialType": "FTP",
  "modificationTime": 1558811851033,
  "secret": "VMware!",
  "entityId": "8b437548-98b5-4d57-9489-09573e9da4eb",
  "id": "8a298545-3a6f-4415-9307-27df16d18cdc"
}
```

- The remaining deployment parameters can be obtained from the `metadata.json` file. The following entries from this file are used.

```
{
  "resource_pool": "Mgmt-ResourcePool",
  "datacenter": "SDDC-Datacenter",
  "domain": "vrack.vsphere.local",
  "hostname": "sddc-manager.vrack.vsphere.local",
  "search_path": "vrack.vsphere.local,vsphere.local",
  "port_group": "SDDC-DPortGroup-Mgmt",
  "cluster": "SDDC-Cluster1",
  "netmask": "255.255.255.0",
  "vsan_datastore": "sfo01-m01-vsan",
  "ip": "10.0.0.4",
  "gateway": "10.0.0.250",
}
```

- 3 Take a snapshot of the SDDC Manager VM.
- 4 Copy the encrypted backup file to the `/tmp` directory on the SDDC Manager VM.
- 5 Start the restore operation by running the following API call.

```
curl -k -H "Content-Type: application/json" -u'admin:password' -X POST https://SDDC_Mmanager_IP/
restores/tasks -d '{"sddc-manager-restore": "/tmp/filename-of-copied-file ", "encryption":
{"passphrase": "passphrase"}}'
```

The output includes a task ID, such as the following example.

```
{
  "id": "1f392b8d-e415-4e55-a9c8-2e8070bea86d"
}
```

## 6 Check the restore status by running the following API. Use the ID from the output in step 3.

```
curl -k -u 'admin:password' https://SDDC_Mmanager_IP/restores/tasks/ID'
```

This API returns the overall status of the restore operation and the status of each sub-operation. The output is similar to the following. The overall status of the operation is reported by the status field, which appears towards the top in this example.

```
{
  "errors": [],
  "id": "1f392b8d-e415-4e55-a9c8-2e8070bea86d",
  "name": "SDDC Manager Restore Operation",
  "outputs": {},
  "progress": {
    "completed": 8,
    "total": 8
  },
  "startTime": 1556854314317,
  "status": "Successful",
  "tasks": [
    {
      "createdTime": 1556854314378,
      "description": "Decrypt and Extract Backup and Validate SDDC Manager for Restore operation",
      "errors": [],
      "id": "6366d0c4-b2bf-46dc-8db6-17999eda5bbb",
      "name": "ExtractSDDCManagerBackup",
      "status": "Successful",
      "updatedAt": 1556854316406
    },
    {
      "createdTime": 1556854316409,
      "description": "Stop all VCF SDDC Manager Services",
      "errors": [],
      "id": "b9b447d7-1de6-49c9-99c7-2de610a61450",
      "name": "StopSDDCManagerServices",
      "status": "Successful",
      "updatedAt": 1556854347350
    },
    {
      "createdTime": 1556854347353,
      "description": "Restore SDDC Manager Configuration files",
      "errors": [],
      "id": "4187f015-61c1-43c5-a4b3-71f16ce7e65d",
      "name": "RestoreSDDCManagerConfiguration",
      "status": "Successful",
      "updatedAt": 1556854347638
    },
    {
      "createdTime": 1556854347642,
      "description": "Restore SDDC Manager Database",
      "errors": [],
      "id": "18e6bea7-cd77-4d86-b568-5a6caadbc3e7",
      "name": "RestoreSDDCManagerDatabase",

```

```

    "status": "Successful",
    "updatedAt": 1556854391051
  },
  {
    "createdTime": 1556854391056,
    "description": "Start and Validate all VCF SDDC Manager Services",
    "errors": [],
    "id": "9fd2c0ab-f20a-4ea9-bdb1-a6e07129e785",
    "name": "StartSDDCManagerServices",
    "status": "Successful",
    "updatedAt": 1556854636756
  },
  {
    "createdTime": 1556854636763,
    "description": "Restore SDDC Manager System Configuration",
    "errors": [],
    "id": "8bcc509a-6c9b-4077-8a02-568846295536",
    "name": "RestoreSDDCSystemConfiguration",
    "status": "Successful",
    "updatedAt": 1556854637944
  },
  {
    "createdTime": 1556854638039,
    "description": "Post Restore Remediation",
    "errors": [],
    "id": "a5f6327f-b5d1-40c2-83df-1d7a1b3ef27a",
    "name": "PostRestoreRemediation",
    "status": "Successful",
    "updatedAt": 1556854641131
  },
  {
    "createdTime": 1556854641135,
    "description": "Unquiesce the system after Restore operation",
    "errors": [],
    "id": "19b286b0-aa31-4aca-a7aa-6e237f26ef49",
    "name": "UnquiesceSystem",
    "status": "Successful",
    "updatedAt": 1556854641191
  }
],
"tasksOrder":
"StopSDDCManagerServices,ExtractSDDCManagerBackup,RestoreSDDCManagerConfiguration,RestoreSDDCManagerDatabase,StartSDDCManagerServices,RestoreSDDCSystemConfiguration,PostRestoreRemediation,UnquiesceSystem"
}

```

7 If the API invoked in step 4 reports an error, perform the following steps to retry.

- a copy the contents of `/var/log/vmware/vcf/sddc-support/` to a filesystem that is external to SDDC Manager.

This preserves the restore log file.

- b Revert the SDDC Manager VM to the snapshot taken in step 3.

- c Take a new snapshot.
- d Perform steps 4 - 6.

If this attempt fails, contact VSDDC Manager VMware Support.

- 8 If the API invoked in step 4 reports the operation completed with success, perform the following steps.
  - a SSH in to the SDDC Manager as the vcf user.
  - b Type `su` to switch to the root user.
  - c Navigate to the `/opt/vmware/sddc-support` directory.
  - d Run the following command.

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

A green status indicates that the health is normal, yellow provides a warning that attention might be required, and red indicates that the component needs immediate attention. Possible reasons for yellow or red status are that you used an SDDC Manager backup with unresolved workflows, you used a backup taken before a workflow was completed successfully, you restored other products in addition to SDDC Manager, or some components are not operational. Call VMware Support if you need help with resolving the yellow or red status.

- 9 If the sos status was green, log in to the SDDC Manager and determine whether the Dashboard and other screens are reporting correct data and are functional. As an example, try opening the vCenter Server by clicking a vCenter link within a workload domain.
- 10 Download the applicable install and upgrade bundles.
  - Download the NSX-V bundle and NSX-T bundle if you plan to create NSX-T workload domains.
  - Download the upgrade bundles applicable to your environment.

For information on downloading bundles, see [Download Bundles](#).

## Deploy SDDC Manager from vCenter Server

You can deploy the SDDC Manager VM from the management domain vCenter Server.

### Procedure

- 1 Log in to the management domain vCenter Server using a web browser that is running on a system that has access to the downloaded SDDC Manager OVA.
- 2 In the vSphere Client, expand **SDDC-Datacenter > SDDC-Cluster1**.
- 3 Right-click on `Mgmt-ResourcePool` and select **Deploy OVF Template**.  
The Deploy OVF Template wizard appears.
- 4 Use the local file option and choose the downloaded SDDC Manager OVA
- 5 Specify the VM name as `sddc-manager`.



- 6 Select the location of the SDDC Manager VM as **SDDC-Datacenter > Management VMs** and click **Next**.
- 7 Specify the compute resource destination. See the `metadata.json` file for the name of the pool.
- 8 click **Next**.
- 9 Verify the template details and click **Next**.
- 10 Read the license terms and click the checkbox at the bottom of the page to accept the license agreements.
- 11 On the storage page, keep the vSAN datastore selection. The datastore name is in the `metadata.json` file.
- 12 Click **Next**.
- 13 On the networks page:
  - Do not change the default setting for Source Network.
  - In Destination Network, select the port group that is listed in the `metadata.json` file.
  - Do not change the default setting for IP allocation and IP protocol.
- 14 Click **Next**.
- 15 For the fields on the Customize template page, refer to the `metadata.json` file. Note the following:
  - Specify the backup user password from the `security_password_vault.jsonfile`.  
  
For the other `root`, `vcf`, and `admin` user accounts, you can re-use the passwords for the original SDDC Manager or assign new ones. For password considerations, refer to the *About the Deployment Parameter Sheet* section in the *VMware Cloud Foundation Architecture and Deployment Guide*.
  - Leave the DNS and NTP fields empty
  - Ignore the Brownfield Settings section.
- 16 Click **Next**.
- 17 Review the OVF details and click **Finish**.  
  
The OVF deployment begins. You can view the details in the Tasks pane.
- 18 Power on the newly deployed SDDC Manager VM and wait for the vCenter Server UI to report its IP address has been assigned.
- 19 SSH in to the SDDC Manager and log in as the `vcf` user.

## Deploy SDDC Manager with the OVF Tool

Install the OVF tool on a system that has access to the SDDC Manager OVA that you downloaded.

## Prerequisites

- Download the OVF tool from <https://code.vmware.com/web/tool/4.3.0/ovf> and install it on a system that has access to the SDDC Manager OVA that you downloaded
- Retrieve the DNS name or IP address of a host from the management domain.
  - a Log into the management domain vCenter Server
  - b navigate to the management domain cluster
  - c select an active host that is not reporting any vSAN errors
- Retrieve the rRoot password for the selected host. Search for the host's DNS name in the `security_password_vault.json`, which displays the root password.

## Procedure

- 1 Run the following command with information from the `metadata.json` file.

```
ovftool --noSSLVerify --skipManifestCheck --powerOn --diskMode=thin --acceptAllEulas --
allowExtraConfig --ipProtocol=IPv4 --ipAllocationPolicy=FixedPolicy --datastore=dataname --
name=sddc-manager --X:injectOvfEnv --X:waitForIp --prop:ROOT_PASSWORD=Password --
prop:VCF_PASSWORD=Password --prop:BASIC_AUTH_PASSWORD=Password --prop:BACKUP_PASSWORD=Password
--prop:vami.gateway.SDDC-Manager=gatewayIP --prop:vami.ip0.SDDC-Manager=SDDC_Manager_IP --
prop:vami.netmask0.SDDC-Manager=networkMask --prop:vami.hostname=hostName --
prop:vami.searchpath.SDDC-Manager=searchPath --prop:vami.domain.SDDC-Manager=domain --
network=portGroupName --X:logFile=./ovftool.log --X:logLevel=verbose OVA_filename vi://
root:password_for_selected_host@host_DNS_name_or_IP
```

### Sample output:

```
Opening OVA source: VCF-SDDC-Manager-Appliance-<version>_OVF10.ova
The manifest does not validate
Opening VI target: vi://root@10.0.0.100:443/
Deploying to VI: vi://root@10.0.0.100:443/
Transfer Completed
Powering on VM: sddc-manager
Task Completed
Received IP address: 10.0.0.4
Completed successfully
```

- 2 Navigate to the management domain vCenter Server.
- 3 Move the `sddc-manager` VM into the Management VM folder.
- 4 Move the `sddc-manager` VM into the Management Resource Pool. The name of this pool is available in the `metadata.json` file.
- 5 To confirm that SDDC Manager has been deployed correctly, ssh in to the VM as the `vcf` user.

# Cloud Foundation Glossary

# 22

Term	Description
availability zone	Collection of infrastructure components. Each availability zone is isolated from other availability zones to prevent the propagation of failure or outage across the data center.
bring-up	Initial configuration of a newly deployed Cloud Foundation system. During the bring-up process, the management domain is created and the Cloud Foundation software stack is deployed on the management domain.
commission host	Adding a host to Cloud Foundation inventory. The host remains in the free pool until it is assigned to a workload domain.
composability	Ability to dynamically configure servers to meet the needs of your workloads without physically moving any hardware components. You bind disaggregated hardware components (compute, network, storage, and offload components) together to create a logical system based on the needs of your applications.
dirty host	A host that has been removed from a cluster in a workload domain. A dirty host cannot be assigned to another workload domain until it is cleaned up.
decommission host	Remove an unassigned host from the Cloud Foundation inventory. SDDC Manager does not manage decommissioned hosts.
free pool	Hosts in the Cloud Foundation inventory that are not assigned to a workload domain
host	An imaged server.
inventory	Logical and physical entities managed by Cloud Foundation.
Lifecycle Manager (LCM)	Automates patching and upgrading of the software stack.
management domain	Cluster of physical hosts that contains the management component VMs
network pool	Automatically assigns static IP addresses to vSAN and vMotion vmkernel ports so that you don't need to enter IP addresses manually when creating a VI workload domain or adding a host or cluster to a workload domain.
patch update bundle	Contains bits to update the appropriate Cloud Foundation software components in your management or VI workload domain.
region	A Cloud Foundation instance.
SDDC Manager	Software component that provisions, manages, and monitors the logical and physical resources of a Cloud Foundation system.
SDDC Manager VM	Virtual machine (VM) that contains the SDDC Manager services and a shell from which command line tools can be run. This VM exposes the SDDC Manager UI.
server	Bare metal server in a physical rack. After imaging, it is referred to as a host.

Term	Description
unassigned host	Host in the free pool that does not belong to a workload domain.
workload domain	A policy based resource container with specific availability and performance attributes that combines vSphere, storage (vSAN or NFS) and networking (NSX for vSphere or NSX-T) into a single consumable entity. A workload domain can be created, expanded, and deleted as part of the SDDC lifecycle operations. It can contain cluster(s) of physical hosts with a corresponding vCenter to manage them. The vCenter for a workload domain physically lives in the management domain.