# VMware Integrated OpenStack Installation and Configuration Guide

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vmware®

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https://docs.vmware.com/

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# VMware Integrated OpenStack Installation and Configuration Guide

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The *VMware Integrated OpenStack Installation and Configuration Guide* explains the process of deploying OpenStack in your VMware vSphere® environment.

Before installing VMware Integrated OpenStack, review the deployment and networking modes described in this guide and ensure that your environment meets the stated requirements. Once you are ready, prepare your vCenter Server® instance and deploy the VMware Integrated OpenStack virtual appliance. The virtual appliance installs the Integrated OpenStack Manager, which streamlines the process of deploying OpenStack. After deployment, you can use the Integrated OpenStack Manager to add components or otherwise modify the configuration of your OpenStack cloud infrastructure.

## Intended Audience

This guide is for system administrators and developers who want to integrate their vSphere deployment with OpenStack services. To do so successfully, you should be familiar with vSphere and the OpenStack components and functions. If you are deploying VMware Integrated OpenStack with VMware NSX® Data Center for vSphere® or NSX-T™ Data Center, you should also be familiar with the administration of those products.

# Introducing VMware Integrated OpenStack

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VMware Integrated OpenStack is a distribution of OpenStack designed to run on a vSphere infrastructure.

VMware Integrated OpenStack makes use of your existing infrastructure for the hypervisor, networking, and storage components for OpenStack, simplifying installation and operations and offering better performance and stability.

VMware Integrated OpenStack offers a variety of unique features:

- vCenter Server cluster as the compute node for reduced management complexity
- Distributed Resource Scheduler (DRS) and Storage DRS for workload rebalancing and datastore load balancing
- vSphere high availability (HA) to protect and automatically restart workloads
- Support for importing vSphere virtual machines and templates into OpenStack
- Advanced networking functionality through NSX
- Integration with products such as vRealize Operations Manager and vRealize Log Insight

This chapter includes the following topics:



## VMware Integrated OpenStack Architecture

VMware Integrated OpenStack connects vSphere resources to OpenStack components.

VMware Integrated OpenStack is implemented as compute and management clusters in your vSphere environment. The compute clusters handle tenant workloads, while the management cluster contains OpenStack components and other services such as load balancing, database, and DHCP.

The core OpenStack projects included in VMware Integrated OpenStack are as follows:

**Nova (compute)**

Compute clusters in vSphere are used as Nova compute nodes. Nova creates instances as virtual machines in these clusters, and vSphere uses DRS to place the virtual machines.

**Neutron (networking)**

Neutron implements networking functions by communicating with the NSX Manager (for NSX-T Data Center or NSX Data Center for vSphere deployments) or with vCenter Server (for VDS-only deployments).

**Cinder (block storage)**

Cinder executes block volume operations through the VMDK driver, causing the desired volumes to be created in vSphere.

**Glance (image service)**

Glance images are stored and cached in a dedicated image service datastore when the virtual machines that use them are booted.

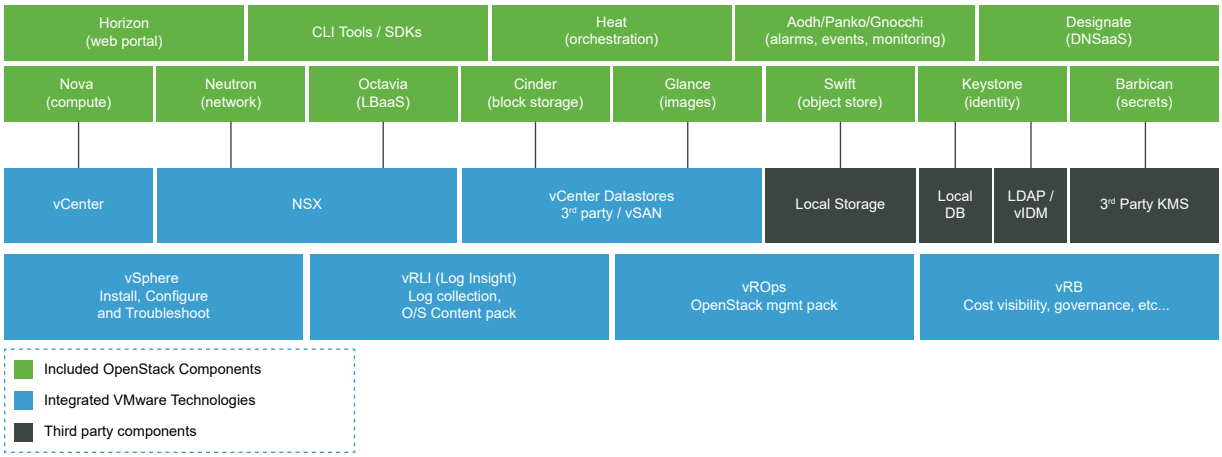
**Keystone (identity management)**

Authentication and authorization in OpenStack are managed by Keystone.

VMware Integrated OpenStack also provides the following OpenStack components:

- Octavia (load balance)
- Barbican (secret management)
- Ceilometer (telemetry), including Aodh (alarming), Panko (event storage), and Gnocchi (time series database)
- Designate (DNS)
- Heat (orchestration)
- Horizon (user interface)
- Swift (object storage) - technical preview only

Figure 2-1. Overview of VMware Integrated OpenStack Components




# Internationalization and Unicode Support

VMware Integrated OpenStack supports UTF-8 character encoding, and its interface and documentation are available in English, French, German, Spanish, Japanese, Korean, Simplified Chinese, and Traditional Chinese.

If you are using Linux to access VMware Integrated OpenStack, configure the system to use the UTF-8 encoding specific to your locale. For example, to use U.S. English, specify the `en_US.UTF-8` locale. For more information, see the documentation for your operating system.

**Important** Although VMware Integrated OpenStack supports Unicode, the following items must only contain ASCII characters:

- Names of OpenStack resources (such as project, users, and images)
- Names of infrastructure components (such as ESXi hosts, port groups, data centers, and datastores)
- LDAP and Active Directory attributes

# OpenStack Foundation Compliance

Every new version of VMware Integrated OpenStack complies with the most recent interoperability guidelines available at the time of release.

Interoperability guidelines are created in the OpenStack community by the Interop Working Group and are approved by the OpenStack Foundation Board of Directors.

As an OpenStack Powered Platform product, VMware Integrated OpenStack provides proven interoperability with all other OpenStack Powered products. For more information, see the VMware Integrated OpenStack page on OpenStack Marketplace at https://www.openstack.org/marketplace/distros/distribution/vmware/vmware-integrated-openstack.

# VMware Integrated OpenStack Licensing

VMware Integrated OpenStack requires a license key to provide functionality. Licenses are available for VMware Integrated OpenStack Data Center Edition and Carrier Edition

Carrier Edition is part of the VMware vCloud NFV bundle. It is designed for telecommunications companies and communication service providers that want to build a network functions virtualization (NFV) cloud. In addition to all features of Data Center Edition, it supports the following:

- SR-IOV
- Tenant data centers
- Enhanced Platform Awareness (EPA), including virtual CPU pinning and NUMA awareness
- NSX-managed virtual distributed switch (N-VDS) in enhanced data path mode

To obtain licenses or additional information, see the VMware Integrated OpenStack product page at https://www.vmware.com/products/openstack.html or contact your VMware sales representative.

You can use VMware Integrated OpenStack in evaluation mode for 60 days by assigning an evaluation license. When the evaluation license expires, all Carrier Edition features are disabled. Obtain and assign your VMware Integrated OpenStack license key as soon as possible after installing VMware Integrated OpenStack.

In addition to the VMware Integrated OpenStack license, you will also need sufficient licenses for vSphere and for any other VMware components that you deploy, such as NSX-T Data Center.

# Datastore Clusters in VMware Integrated OpenStack

You can use datastore clusters in the ESXi clusters that host VMware Integrated OpenStack compute workloads.

A datastore cluster is a collection of datastores with shared resources and a shared management interface. You can use vSphere Storage DRS to manage the resources in a datastore cluster. For information about creating and configuring datastore clusters, see "Creating a Datastore Cluster" in *vSphere Resource Management*.

If you want to use datastore clusters with VMware Integrated OpenStack, be aware of the following:

- Datastore clusters cannot be configured by using the Integrated OpenStack Manager web interface. To add a datastore cluster to your deployment, perform the following steps using the command-line interface.
  a Specify the name of the Nova Compute server to update.

    ```
    viocli update novacompute <novacompute_XXX>
    ```

  b Ensure that your datastore cluster is accessible to the Nova Compute server.

c Assign the name of your datastore cluster to the `datastore_cluster` key.

```
conf:
  nova_compute:
    DEFAULT:
      default_schedule_zone: nova
      disk_allocation_ratio: 2
      host: compute01
    vmware:
      cluster_name: compute_cluster
      datastore_cluster: <your_datastore_cluster>
```

d Wait for the Nova Compute server to restart.

When you use Nova to start a new compute instance, it is allocated to your datastore cluster.

- Only one datastore cluster can be used for each vCenter Server instance.
- If your environment has multiple vCenter Server instances, the name of the datastore cluster used by VMware Integrated OpenStack in each instance must be the same.
- Swift nodes do not support datastore clusters.
- You can only boot images backed by virtual machines. Sparse and preallocated images cannot be booted on datastore clusters.
- You must enable Storage DRS on your datastore clusters and set the **Cluster automation level** to **No Automation (Manual Mode)**. Automatic migrations are not supported.
- Only the following provisioning operations use Storage DRS:
  - Booting from a Glance template image
  - Creating raw Cinder volumes
  - Creating a volume from another volume (full clones and linked clones)
  - Cloning snapshots in COW format (full clones and linked clones)

# First Class Disks in VMware Integrated OpenStack

In VMware Integrated OpenStack 7.1, you can create Cinder volumes as First Class Disks (FCDs) instead of VMDKs.

An FCD, also known as an Improved Virtual Disk (IVD) or Managed Virtual Disk, is a named virtual disk independent of a virtual machine. Using FCDs for Cinder volumes eliminates the need for shadow virtual machines.

The FCD back end is offered in addition to the default VMDK back end. If you add FCD as driver for a new back-end of Cinder, you can use both FCD and VMDK volumes in the same deployment. You can also attach FCD and VMDK volumes to the same OpenStack instance.

To specify the back-end driver used for volume creation, create volume types with the `volume_backend_name` extra spec set to the name of the desired driver as in the following examples:

- For the VMDK driver, use **`VMwareVcVmdkDriver`**.
- For the FCD driver, use **`VMwareVStorageObjectDriver`**.

Then select the volume type when you create volumes.

Existing VMDK volumes cannot be automatically converted to FCD volumes. To convert a VMDK volume manually, detach the volume from all instances, unmanage it, and manage it again. For information, see "Manage a Volume" in the *VMware Integrated OpenStack Administration Guide*.

If you want to use FCD volumes with VMware Integrated OpenStack, be aware of the following:

- vSphere 6.7 Update 2 or later is required to use FCD volumes.
- vSphere 6.7 Update 3 or later is required to perform the following operations on volumes that are attached to powered-on instances:
  - Creating a volume from a snapshot
  - Backing up a volume snapshot using a temporary volume created from a snapshot
- Storage DRS is not supported for FCD volumes.
- Volume multi-attach is not supported for FCD volumes.
- FCD volumes must be backed by a shared datastore.
- FCD volumes that are in use cannot be cloned, retyped, or extended.
- After you set a storage policy on an FCD volume, you cannot remove the storage policy from the volume. However, you can change the storage policy used by an unattached volume.
- Instances that have an FCD volume attached cannot be migrated. You must detach the volume before migrating the instance.
- FCD volumes with snapshots cannot be extended.
- FCD volumes do not support the import of a VM disk from vSphere.

# Preparing Your Environment

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Before deploying VMware Integrated OpenStack, ensure that your environment meets the system requirements and perform pre-installation tasks to prepare your networks and vSphere infrastructure.

This chapter includes the following topics:



## Hardware Requirements for VMware Integrated OpenStack

The specific hardware required to run VMware Integrated OpenStack depends on the scale of your deployment and size of controller that you select.

The Integrated OpenStack Manager requires the following hardware resources:

- 4 vCPUs
- 16 GB of memory
- One 60 GB hard disk and one 30 GB hard disk

A non-HA deployment requires between one and ten controllers. An HA deployment requires between three and ten controllers. The supported controller sizes are as follows:

- Small: 4 vCPUs, 16 GB of memory, and one 25 GB hard disk
- Medium: 8 vCPUs and 32 GB of memory, and one 50 GB hard disk
- Large: 12 vCPUs and 32 GB of memory, and one 75 GB hard disk

**Note** The small size can be used in HA deployments only. Non-HA deployments must use medium or large controllers.

The following persistent volumes are also required:

- MariaDB: one 60 GB hard disk for non-HA deployments or three 60 GB hard disks for HA deployments
- RabbitMQ: one 20 GB for non-HA deployments or three 20 GB hard disks for HA deployments
- Virtual Serial Port Concentrator (VSPC): one 2 GB hard disk per Nova compute instance

The following table lists minimum and maximum resource requirements for typical configurations.

| Deployment Type | vCPUs | Memory | Disk Space (Non-Persistent) | Disk Space (Persistent) |
|---|---|---|---|---|
| Single-node non-HA deployment (minimum) | 12 (4 + 8) | 48 GB (16 + 32) | 85 GB (30×2 + 25) | 82 GB (60 + 20 + 2) |
| Single-node non-HA deployment (maximum) | 16 (4 + 12) | 48 GB (16 + 32) | 135 GB (30×2 + 75) | 82 GB (60 + 20 + 2) |
| Three-node HA deployment (minimum) | 16 (4 + 4×3) | 64 GB (16 + 16×3) | 135 GB (30×2 + 25×3) | 246 GB (60×3 + 20×3 + 2×3) |
| Three-node HA deployment (maximum) | 40 (4 + 12×3) | 112 GB (16 + 32×3) | 285 GB (30×2 + 75×3) | 246 GB (60×3 + 20×3 + 2×3) |
| Five-node HA deployment (minimum) | 24 (4 + 4×5) | 96 GB (16 + 16×5) | 185 GB (30×2 + 25×5) | 246 GB (60×3 + 20×3 + 2×3) |
| Five-node HA deployment (maximum) | 64 (4 + 12×5) | 176 GB (16 + 32×5) | 435 GB (30×2 + 75×5) | 246 GB (60×3 + 20×3 + 2×3) |

**Note** If you want to enable Ceilometer, the CPUs on the ESXi host running the Integrated OpenStack Manager must support Advanced Vector Extensions (AVX).

If you want to deploy VMware Integrated OpenStack with NSX-T Data Center or NSX Data Center for vSphere networking, additional resources may be required.

- For NSX-T Data Center, see "System Requirements" in the *NSX-T Data Center Installation Guide*.
- For NSX Data Center for vSphere, see "System Requirements for NSX Data Center for vSphere" in the *NSX Installation Guide*.

# Software Requirements for VMware Integrated OpenStack

VMware Integrated OpenStack works together with various software products to provide functionality.

VMware Integrated OpenStack 7.1 requires the following products:

- vSphere Enterprise Plus Edition.
- (NSX-T Data Center deployments only) NSX-T Data Center Advanced Edition
- (NSX Data Center for vSphere deployments only) NSX Data Center for vSphere

**Note** If you want to deploy VMware Integrated OpenStack with VDS networking only, NSX is not required.

You can optimize performance by using a separate vCenter Server instance dedicated to VMware Integrated OpenStack.

VMware Integrated OpenStack 7.1 is also compatible with the following products:

- vSAN
- VMware Identity Manager
- vRealize Log Insight
- vRealize Operations Manager with vRealize Operations Management Pack for VMware Integrated OpenStack

The Integrated OpenStack Manager web interface supports the following web browsers:

- Google Chrome version 50 and later
- Mozilla Firefox version 45 and later
- (Windows only) Microsoft Edge version 38 and later

For the most current information about supported versions, see the VMware Product Interoperability Matrices at https://www.vmware.com/resources/compatibility/sim/interop_matrix.php.

# Required Network Ports

You open required ports on your firewall to ensure that VMware Integrated OpenStack can operate properly.

All ports listed are TCP unless otherwise specified.

| Object | Port Number | Protocol | Network | Service or Product | Description |
|---|---|---|---|---|---|
| Manager and Controllers | 22 | | Internal | SSH | SSH |
| Manager | 53 | TCP or UDP | Internal | DNS | FQDN resolution |
| Controllers | 53 | TCP or UDP | Public and Internal | DNS | FQDN resolution |
| Manager | 443 | | Internal | VIO Web UI | VIO Web UI service |

| Object | Port Number | Protocol | Network | Service or Product | Description |
|---|---|---|---|---|---|
| Controllers | 443 | | Public and Internal | OpenStack dashboard service | VMware Integrated OpenStack dashboard |
| ESXi hosts | 443 | | Internal | ESXi hosts | ESXi API endpoint |
| NSX Manager | 443 | | Internal | NSX Manager | NSX Manager endpoint |
| vCenter Server Appliance | 443 | | Internal | vCenter Server | vCenter Server API endpoint |
| Manager | 2379 | | Internal | Etcd Server | Etcd API endpoint |
| Manager | 2380 | | Internal | Etcd Server | Etcd API endpoint |
| Controllers | 3306 | | Internal | OpenStack database | Database cluster |
| Controllers | 4567 | | Internal | OpenStack database | MariaDB Galera replication traffic |
| Manager | 5000 | | Internal | Docker Registry | Docker Registry service endpoint |
| Controllers | 5000 | | Public and Internal | OpenStack API services | Keystone API endpoint |
| Controllers | 5672 | | Internal | OpenStack RPC bus | RabbitMQ message bus |
| Controllers | 6090 | | Public and Internal | OpenStack console services | MKS proxy |
| Manager | 6443 | | Internal | Kubernetes apiserver | Kubernetes apiserver endpoint |
| Controllers | 8000 | | Public and Internal | OpenStack API services | Heat CloudFormation API endpoint |
| Controllers | 8004 | | Public and Internal | OpenStack API services | Heat API endpoint |
| Manager | 8443 | | Internal | VIO API | VIO API endpoint |
| Controllers | 8774 | | Public and Internal | OpenStack API services | Nova API endpoint |
| Controllers | 8775 | | Internal | OpenStack metadata | Metadata service (required unless config drive is used) |

| Object | Port Number | Protocol | Network | Service or Product | Description |
|---|---|---|---|---|---|
| Controllers | 8776 | | Public and Internal | OpenStack API services | Cinder API endpoint |
| Controllers | 8778 | | Public and Internal | OpenStack API services | Nova Placement API endpoint |
| Manager | 8879 | | Internal | Helm Repo Server | Helm Repo service endpoint |
| Manager | 9000 | | Internal | VIO Web UI Authentication Proxy | VIO Web UI Authentiation Proxy |
| Manager | 9090 | | Internal | VIO API swagger | VIO API swagger endpoint |
| Manager and Controllers | 9099 | | Internal | Calico CNI | Calico CNI |
| Controllers | 9292 | | Public and Internal | OpenStack API services | Glance API endpoint |
| Controllers | 9311 | | Public and Internal | OpenStack API services | Barbican API endpoint |
| vCenter Server Appliance | 9443 | | Internal | vCenter Server | vCenter Server |
| Manager | 9449 | | Internal | vAPI | vAPI |
| Controllers | 9696 | | Public and Internal | OpenStack API services | Neutron API endpoint |
| Controllers | 9876 | | Public and Internal | OpenStack API services | Octavia API endpoint |
| Manager and Controllers | 10250 | | Internal | Kubernetes kubelet | Kubernetes kubelet |
| Manager | 10251 | | Internal | Kubernetes scheduler | Kubernetes scheduler |
| Manager | 10252 | | Internal | Kubrernetes controller manager | Kubernetes controller manager |
| Controllers | 11211 | | Internal | OpenStack control plane cache | Memory cache services for controller nodes |
| Controllers | 35357 | | Public and Internal | OpenStack API services | Keystone administrator API endpoint |
| Manager and Controllers | 44134 | | Internal | Tiller Server | Tiller service endpoint |

If you want to use LDAP or Active Directory, the following ports must also be open.

| Object | Port Number | Network | Service or Product | Description |
|---|---|---|---|---|
| Active Directory or LDAP hosts | 389 | Internal | Domain controller or LDAP server | Serving LDAP requests (non-secured) |
| Active Directory or LDAP hosts | 636 | Internal | Domain controller or LDAP server (LDAPS) | Serving LDAP requests (secured) |
| Active Directory or LDAP hosts | 3268 | Internal | Domain controller | Serving LDAP requests with global catalog (non-secured) |
| Active Directory or LDAP hosts | 3269 | Internal | Domain controller (LDAPS) | Serving LDAP requests with global catalog (secured) |

If you want to forward logs to vRealize Log Insight, the following port must also be open.

| Object | Port Number | Network | Service or Product | Description |
|---|---|---|---|---|
| vRealize Log Insight syslog server | 9000 (TCP or UDP) | Internal | Syslog server | Syslog service |

If you deploy Ceilometer, the following ports must also be open.

| Object | Port Number | Network | Service or Product | Description |
|---|---|---|---|---|
| Controllers | 8041 | Public and Internal | OpenStack API services | Gnocchi API endpoint |
| Controllers | 8042 | Public and Internal | OpenStack API services | Aodh API endpoint |
| Controllers | 8779 | Public and Internal | OpenStack API services | Panko API endpoint |

If you deploy Designate, the following ports must also be open.

| Object | Port Number | Network | Service or Product | Description |
|---|---|---|---|---|
| Controllers | 53 (UDP) | Public and Internal | DNS | Designate MiniDNS service |
| Controllers | 9001 | Public and Internal | OpenStack API services | Designate endpoint |

If you deploy Swift, the following port must also be open.

| Object | Port Number | Network | Service or Product | Description |
|---|---|---|---|---|
| Controllers | 8080 | Public and Internal | OpenStack API services | Swift endpoint |

# Configure vCenter Server for OpenStack

Before installing the VMware Integrated OpenStack OVA, configure your environment as described in the following procedure.

### Prerequisites

- Deploy vCenter Server and all ESXi hosts.
- Enable NTP on vCenter Server and on all ESXi hosts. Configure vCenter Server and ESXi hosts to use the same NTP time source, and ensure that the time source is highly available. For information about configuring NTP in vSphere, see "Synchronizing Clocks on the vSphere Network" in the *vSphere Security* guide.
- Create a PTR record associating the IP address planned for the Integrated OpenStack Manager with its FQDN, and ensure that the Integrated OpenStack Manager can connect to a DNS server.

### Procedure

1. In vCenter Server, create a data center for VMware Integrated OpenStack.
2. In the data center, create the management cluster and compute cluster.
3. If you want to use NSX networking, create the edge cluster.
4. Enable DRS and vSphere HA on the management cluster.

   **Note** After deploying OpenStack, disable vSphere HA on all controller nodes.
5. Create a resource pool in the management cluster.
6. For NSX Data Center for vSphere deployments, create a resource pool in the edge cluster.
7. If you want to use datastore clusters for compute nodes, enable Storage DRS on the datastore clusters and set the **Cluster automation level** to **No Automation (Manual Mode)**.
8. In your data center, create one or more distributed switches for your management, compute, and edge clusters.
9. On each distributed switch, set the maximum transmission unit (MTU) to 1600 or higher.
10. Plan the management network and assign a dedicated VLAN to it.
    - If you do not want to use DHCP, ensure that the management network has at least five contiguous IP addresses available.
    - Ensure that the management network can be expanded to twice the original number of IP addresses during upgrades. When upgrading VMware Integrated OpenStack, you will temporarily require sufficient IP addresses to support two deployments.
    - For NSX-T Data Center deployments, ensure that the vCenter Server, NSX Manager, and NSX Controller instances can access the management network on Layer 2 or Layer 3.

- For NSX Data Center for vSphere deployments, if you want to use the management network for metadata service, ensure that the management network has an additional two contiguous IP addresses available. This is not required for deployments with an independent metadata service network.

11 Plan the API access network and assign a dedicated VLAN to it.

- Create the port group for the API access network on the distributed switches for your management, compute, and edge clusters. The network must be externally accessible.
- If you do not want to use DHCP, ensure that the API access network has at least four contiguous IP addresses available.
- Ensure that the API access network can be expanded to twice the original number of IP addresses during upgrades. When upgrading VMware Integrated OpenStack, you will temporarily require sufficient IP addresses to support two deployments.

12 For NSX Data Center for vSphere deployments, create the port group for the external network on the distributed switch for the edge cluster.

13 (Optional) For NSX Data Center for vSphere deployments, plan the metadata service network.

- Ensure that the metadata service network has at least two contiguous IP addresses available. If you do not create an independent metadata service network, ensure that your management network has two additional IP addresses available for the metadata service.
- Ensure that the metadata service network can communicate with the management network.

### What to do next

If you want to use NSX networking, deploy and configure your networking back end.

- Configure NSX Data Center for vSphere for OpenStack
- Configure NSX-T Data Center for OpenStack

## Configure NSX Data Center for vSphere for OpenStack

If you want to use NSX Data Center for vSphere as the networking solution for VMware Integrated OpenStack, deploy and configure NSX Data Center for vSphere as described in the following procedure.

### Procedure

◆ Install NSX Data Center for vSphere as described in the NSX Installation Guide.

Note the following:

- The NSX Manager must be installed on the compute vCenter Server instance used by VMware Integrated OpenStack. Cross-vCenter Server installation is not supported.
- Ensure that the maximum transmission unit (MTU) on the transport network is set to 1600 or higher.

### What to do next

Install VMware Integrated OpenStack. See Chapter 4 Installing VMware Integrated OpenStack.

## Configure NSX-T Data Center for OpenStack

If you want to use NSX-T Data Center as the networking solution for VMware Integrated OpenStack, deploy and configure NSX-T Data Center as described in the following procedure.

**Note** For NSX-T Data Center to work with vSphere Distributed Switch (VDS) version 7.0, you must install vSphere 7.0 and NSX-T 3.0 or later. Before deploying and configuring NSX-T Data Center, see "Prepare a vSphere Distributed Switch for NSX-T" in the *NSX-T Data Center Installation Guide*.

### Prerequisites

- Deploy vSphere, including vCenter Server and all ESXi hosts.
- Install NSX-T Data Center.
  a. Deploy NSX Manager. See "NSX Manager Installation" in the *NSX-T Data Center Installation Guide*.
  b. Add your vCenter Server instance as a compute manager. See "Add a Compute Manager" in the *NSX-T Data Center Installation Guide*.
  c. For using NSX Manager cluster, you must deploy NSX Manager nodes. See "Deploy NSX Manager Nodes to Form a Cluster from UI" in the *NSX-T Data Center Installation Guide*.

     **Note** An NSX Manager cluster provides high availability for a single NSX-T Data Center instance. Multiple instances of NSX-T Data Center cannot be used with the same VMware Integrated OpenStack deployment.

  d. Deploy NSX Edge nodes. See "Installing NSX Edge" in the *NSX-T Data Center Installation Guide*.
  e. If you are running vSphere 7.0 or later, add a new compute manager. See "Add Compute Manager" in the *NSX-T Data Center Installation Guide*.
- Generate the NSX-T root CA certificate using the cluster virtual IP. See "Generating and Registering the NSX Manager Certificate for Enterprise PKS" in the *VMware Enterprise PKS Product Documentation*.

### Procedure

1. Log in to the NSX Manager as an administrator.
2. Create an overlay transport zone.
   a. On the **System** tab, select **Fabric > Transport Zones**.
   b. On the **Transport Zones** tab, click **Add Zone**.

c Enter the name, description, and N-VDS name for the overlay transport zone.

The N-VDS name is used for the N-VDS installed on the transport nodes added to this transport zone.

d If provided with the option, select **Standard** or **Enhanced Datapath** for the N-VDS.

e Select **Overlay** for the traffic type.

f Click **Add**.

3 Create a VLAN transport zone.

a On the **System** tab, select **Fabric > Transport Zones**.

b On the **Transport Zones** tab, click **Add Zone**.

c Enter the name, description, and N-VDS name for the VLAN transport zone.

The N-VDS name is for the N-VDS installed on the transport nodes added to this transport zone.

d Select **Standard** or **Enhanced Datapath** for the N-VDS mode.

e Select **VLAN** for the traffic type.

f Click **Add**.

4 Add the compute managers.

a On the **System** tab, select **Fabric > Compute Managers**.

b On the **Compute Managers** tab, click **Add Compute Manager**.

c Enter the name, description, type, IP address, HTTPS port of reverse proxy, user name, and password for the new compute manager.

d Click **Add**.

5 Create an uplink profile.

a On the **System** tab, select **Fabric > Profiles**.

b On the **Uplink Profiles** tab, click **Add Profile**.

**Note** If you are using a physical link on an ESXi host, you can modify the default policy instead of creating a new one.

c Enter a name and description for the profile.

d (Optional) Under **LAGs**, add and configure one or more link aggregation groups (LAGs).

e Under **Teamings**, add a new teaming policy or configure the default policy.

f In the **Active Uplinks** column, define a custom uplink name.

If you are using a physical link on an ESXi host, you can also define a standby uplink name.

g Click **Add**.

6 For using the N-VDS in standard mode, create a Network I/O Control (NIOC) profile.
   a On the **System** tab, select **Fabric > Profiles**.
   b On the **NIOC Profiles** tab, click **Add Profile**.
   c Enter the name and description for the profile.
   d Set **Status** to **Enabled**.
   e Under **Host Infra Traffic Resource**, specify the desired traffic types and bandwidth allocations.
   f Click **Add**.
7 Under **Policy** view, create an IP address pool for tunnel endpoints.
   a On the **Networking** tab, select **IP Address Pools**.
   b On the **IP Address Pools** tab, click **Add IP Address Pool**.
   c Enter the name and description for the pool.
   d Under **Subnets**, click **Set**.
   e Click the first entry under each column and specify the IP address ranges and CIDR.

      You can also specify DNS servers (separated by commas) and a DNS suffix.
   f Click **Add**.
8 Add the NSX Edge nodes in your edge cluster to the NSX-T Data Center fabric.
   a On the **System** tab, select **Fabric > Nodes**.
   b On the **Edge Transport Nodes** tab, click **Add Edge Node**.
   c Enter the name, FQDN, and description for the transport node.
   d Select a form factor and click **Next**.
   e Enter the credentials for the NSX Edge virtual machine and click **Next**.
   f From the **Compute Manager** drop-down menu, select the compute manager that you configured in this procedure.
   g Select the cluster, resource pool or host, and datastore for the NSX Edge virtual machine and click **Next**.
   h Select whether to use DHCP or a static IP address for the NSX Edge virtual machine.

      If you select **Static**, enter the management IP address and default gateway.
   i From the **Management Interface** drop-down menu, select the management network and click **Next**.
   j Select the DNS servers and NTP servers and click **Next**.
   k In the **Edge Switch Name** text box, enter the NSX Edge switch name.
   l From the **Transport Zone** drop-down menu, select the overlay transport zone.

m From the **Uplink Profile** drop-down menu, select the uplink profile that you created in this procedure.

n From the **IP Assignment** drop-down menu, select **Use IP Pool**.

o From the **IP Pool** drop-down menu, select the tunnel endpoint IP address pool that you created in this procedure.

p From the **DPDK Fastpath Interfaces** drop-down menu, select the uplink name that you defined in the uplink profile.

q Click **Finish**.

r To add another switch, click **Add Switch**.

s From the **New Node Switch** drop-down menu, in the **Edge Switch Name** text box, enter the NSX Edge switch name.

t From the **Transport Zone** drop-down menu, select the VLAN transport zone.

u From the **Uplink Profile** drop-down menu, select the uplink profile that you created in this procedure.

v From the **DPDK Fastpath Interfaces** drop-down menu, select the uplink name that you defined in the uplink profile.

w Click **Finish**.

9 Create an edge cluster and add NSX Edge nodes to it.

a On the **System** tab, select **Fabric > Nodes**.

b On the **Edge Clusters** tab, click **Add Edge Cluster**.

c Enter the name and description for the edge cluster.

d From the **Edge Cluster** drop-down menu, select the edge cluster.

e From the **Member Type** drop-down menu, select the **Edge Node**.

f Select the NSX Edge nodes in the **Available** column and click the left arrow for moving them to the **Selected** column.

g Click **Add**.

10 Under **Policy** view, create a logical switch.

a On the **Networking** tab, select **Segments**.

b On the **Segments** tab, click **Add Segment**.

c Enter the name and description for the switch.

d From the **Connected Gateway** drop-down menu, select the gateway as **None**.

e From the **Transport Zone** drop-down menu, select the VLAN transport zone.

f Select an uplink teaming policy.

g Specify the VLAN ID of the network.

h Click **Add**.

11 Under **Policy** view, create a tier-0 gateway.

a On the **Networking** tab, select **Tier-0 Gateways** and click **Add Gateway**.

b Enter the name and description for the gateway.

c From the **Edge Cluster** drop-down menu, select the default cluster that you created in this procedure.

d Select **Active-Active** or **Active-Standby** as the high availability mode.

e For using **Active-Standby** mode, select **Preemptive** or **Non-Preemptive** as the failover mode and select a preferred member from the edge cluster.

f Click **Add**.

12 Under **Policy** view, create a port on the tier-0 gateway for associating with the upstream physical router.

a On the **Networking** tab, select **Tier-0 Gateways**.

b For editing the tier-0 gateway settings, click the three dots before the name of the tier-0 gateway.

c Under **Interface**, click **Set**.

d Enter the name and description for the interface.

e Specify the type of interface.

f Enter the name of the switch connected to the segment.

g Specify the edge node of the interface.

h Enter the IP address of the interface and its prefix length in bits.

**Note** This IP address cannot be within the subnet of any OpenStack external network.

i Click **Add**.

13 Under **Policy** view, create a DHCP server profile.

a On the **Networking** tab, select **DHCP**.

b Under **DHCP**, click **Add DHCP Profile**.

c Enter the name and description for the profile.

d From the **Edge Cluster** drop-down menu, select the default cluster that you created in this procedure.

e Select the server IP address.

f Enter the lease time in seconds.

g Click **Add**.

14 Under **Policy** view, create a metadata proxy server.

a On the **Networking** tab, select **Segments**.

b On the **Metadata Proxies** tab, click **Add Metadata Proxy**.

c Enter the name and description for the metadata proxy server.

d In the **Server Address** field, enter the planned private OpenStack endpoint of your VMware Integrated OpenStack deployment.

VMware Integrated OpenStack uses the first IP address in the management network as the private OpenStack endpoint. If you are not certain which IP address can be used, you can enter a placeholder IP address and update this setting after you have deployed VMware Integrated OpenStack.

e In the **Shared Signature Secret** text box, enter a password for pairing with your VMware Integrated OpenStack deployment.

f From the **Edge Cluster** drop-down menu, select the default cluster that you created in this procedure.

g Click **Add**.

15 Under **Policy** view, create a transport node profile.

a On the **System** tab, select **Fabric > Profiles**.

b On the **Transport Node Profiles** tab, click **Add Profile**.

c Enter the name and description for the transport node profile.

d From the **NSX Host Switch** drop-down menu, select the type as **N-VDS**.

e Select the standard mode.

f Enter the NSX switch name.

g From the **Transport Zone** drop-down menu, select the overlay and the VLAN transport zone.

h From the **NIOC Profile** drop-down menu, select the NIOC profile that you created in this procedure.

i From the **Uplink Profile** drop-down menu, select the uplink profile that you created in this procedure.

j From the **LLDP Profile** drop-down menu, select the desired LLDP profile.

k From the **IP Assignment** drop-down menu, select **Use IP Pool**.

l From the **IP Pool** drop-down menu, select the tunnel endpoint IP address pool that you created in this procedure.

m In the **Physical NICs** text box, enter the name of an unused NIC on your host.

n From the drop-down, select the uplink name that you defined in the uplink profile.

o Click **Add**.

16 Configure compute cluster with transport profile as transport node.

a On the **System** tab, select **Fabric > Nodes**.

b Under the **Host Transport Nodes** tab, from the **Managed by** drop-down menu, select the IP address.

c Select compute cluster for applying the transport node profile.

d From the **Transport Node Profile** drop-down menu, select the transport node.

e Click **Apply**.

### What to do next

Install VMware Integrated OpenStack. See Chapter 4 Installing VMware Integrated OpenStack.

# Installing VMware Integrated OpenStack

4

You obtain the VMware Integrated OpenStack OVA package, install it in vSphere, and then create an OpenStack deployment.

Procedure

1 Install the VMware Integrated OpenStack Virtual Appliance

You deploy the VMware Integrated OpenStack virtual appliance on your vCenter Server instance. This appliance includes the OpenStack Management Server, through which you deploy and maintain your OpenStack cloud infrastructure.

2 Create an OpenStack Deployment

You deploy OpenStack by using the Integrated OpenStack Manager web interface.

3 Assign the VMware Integrated OpenStack License Key

You assign a license key for VMware Integrated OpenStack to enable its features.

## Install the VMware Integrated OpenStack Virtual Appliance

You deploy the VMware Integrated OpenStack virtual appliance on your vCenter Server instance. This appliance includes the OpenStack Management Server, through which you deploy and maintain your OpenStack cloud infrastructure.

This procedure describes how to install the VMware Integrated OpenStack using the vSphere Client. If you want to use the OVF Tool to install the virtual appliance, you must include the `--allowExtraConfig` parameter.

Prerequisites

- Deploy or upgrade vSphere and any other VMware products that you want to use with VMware Integrated OpenStack.
- Verify that your hardware, networks, and vCenter Server instance are correctly prepared. See Chapter 3 Preparing Your Environment.
- Verify that DRS has been enabled on the management cluster for VMware Integrated OpenStack.

- Obtain the VMware Integrated OpenStack 7.1 OVA file from the product download page at https://customerconnect.vmware.com/en/downloads/info/slug/infrastructure_operations_management/vmware_integrated_openstack/7_1. The file requires approximately 6 GB of storage space.

Procedure

1 Log in to the vSphere Client and select the **Hosts and Clusters** view.

2 Edit the settings of the management cluster previously configured for VMware Integrated OpenStack and set **DRS Automation** to **Manual**.

**Important** Do not use Storage vMotion for migrating VMware Integrated OpenStack vApp and controller virtual machines as it can rename the vmdk files for Kubernetes Persistent Volume and break the function.

3 Right-click the management cluster previously configured for VMware Integrated OpenStack and select **Deploy OVF Template...** from the pop-up menu.

4 Provide the path to the VMware Integrated OpenStack OVA and click **Next**.

5 Select the name and folder for the VMware Integrated OpenStack vApp, select the data center that you defined during preparation, and click **Next**.

**Note** In the **Virtual machine name** field, you must enter the vApp name and not the virtual machine name.

6 Select the cluster on which to run the vApp and click **Next**.

7 Review the details of the template to be installed and click **Next**.

8 Read the license agreements and select **I accept all license agreements**. Then click **Next**.

9 Specify a provisioning format and storage policy, select the datastore for vApp files storage, and click **Next**.

For more information about provisioning formats, see "About Virtual Disk Provisioning Policies" in *vSphere Virtual Machine Administration*.

10 In the **Destination Network** column, select the management network defined during preparation and click **Next**.

11 On the **Customize template** page, enter additional settings for VMware Integrated OpenStack.

a Under **Network properties**, you can enter static IP addresses for the Integrated OpenStack Manager virtual machine and DNS server.

- If you want to use DHCP, leave all fields blank. If you enter a static IP address for the Integrated OpenStack Manager, you must also enter the subnet mask, default gateway, and DNS server. For the default gateway, use the eth1 interface.
- If you enter the Integrated OpenStack Manager FQDN, alphanumeric letters must be lowercase and match the DNS record on the DNS server. For example, "viomgr01".

b Under **System**, enter an initial password for the administrator accounts on the Integrated OpenStack Manager.

This password is used for the `admin` account on the web interface and the `root` user on the Integrated OpenStack Manager virtual machine. The following rules apply to the password:

- The password must contain between 8 and 128 characters.
- The password must contain at least one uppercase letter, one lowercase letter, one digit, and one special character.
- The password cannot contain simplistic patterns, common words, or words derived from the name of the account.

c For **Permit Root Logon**, select **true**.

d Under **Internal Network**, enter the network address of the Kubernetes service network, the network address of the Kubernetes pod network, and the domain name suffix of the service network.

**Important**

- The network settings cannot be changed after deployment. Ensure that each network is large enough to support your deployment, including future expansion.

  The pod network must contain enough IP addresses so that each manager and controller node in the deployment can be assigned a /24 CIDR block. For example, the network 192.168.0.0/22 can support a maximum of four nodes, and the network 192.168.0.0/21 can support a maximum of eight nodes.
- The service and pod networks must be valid private networks as defined by RFC 1918.
- The service and pod networks must not overlap each other or any existing networks.
- The service network domain suffix must not overlap any existing domains. For example, if your current domain is named `corp.local`, you cannot use `cluster.local` as your service network domain. Use a different domain suffix, such as `cluster.example`.

e (Optional) Under **Log Management**, enter the IP address and port number of your log analytics server.

You can add or update the log analytics server information after the deployment is finished.

f Under **Time Management**, enter one or more NTP servers to use for time synchronization.

All VMware Integrated OpenStack virtual machines must use a single, highly available time source. You must enter an NTP server in this field.

12 Once `All properties have valid values` is displayed in the upper left of the page, click **Next**.

13 On the **Ready to complete** page, review your settings. When you are satisfied that the settings are correct, click **Finish** to install the virtual appliance.

14 Right-click the name of the VMware Integrated OpenStack virtual appliance and select **Power > Power On**.

15 Select the Integrated OpenStack Manager virtual machine in the virtual appliance and record its IP address.

You can access this IP address to log in to the Integrated OpenStack Manager through the web interface or SSH.

### What to do next

Apply the VMware Integrated OpenStack 7.1 Patch then use the Integrated OpenStack Manager web interface to create an OpenStack deployment and assign a license key.

## Create an OpenStack Deployment

You deploy OpenStack by using the Integrated OpenStack Manager web interface.

### Prerequisites

- Prepare your networks and vCenter Server environment. See Chapter 3 Preparing Your Environment.
- Install VMware Integrated OpenStack on your vCenter Server instance. See Install the VMware Integrated OpenStack Virtual Appliance.
- In vSphere, take a snapshot of the Integrated OpenStack Manager virtual machine. This snapshot is needed if you want to delete and recreate your deployment.
- Verify that all required clusters and datastores are available. If you add any resources to your vSphere environment after starting the deployment wizard, you must close and reopen the wizard before your changes can be displayed.
- Verify that the DNS server is set correctly and that the network gateway or firewall forwards DNS requests on private networks.

- For NSX-T Data Center deployments, obtain the values of the following parameters:
  - FQDN or IP address of the NSX Manager
  - Username and password to access the NSX Manager
  - Overlay transport zone
  - VLAN transport zone
  - Tier-0 router
  - DHCP profile
  - Metadata proxy server and secret
- For NSX Data Center for vSphere deployments, obtain the values of the following parameters:
  - FQDN or IP address of the NSX Manager
  - Username and password to access the NSX Manager
  - Transport zone
  - Edge cluster
  - Resource pool and datastore for the edge cluster
  - Distributed switch for NSX Data Center for vSphere
  - Port group for the external network
  - Port group for the metadata service network (if independent from the management network)

**Procedure**

1. Log in to the Integrated OpenStack Manager web interface as the `admin` user.

   You can access the web interface by opening the IP address of the Integrated OpenStack Manager in a web browser. To find the IP address, select the Integrated OpenStack Manager virtual machine in the vSphere Client and view the **Summary** tab.
2. Select **OpenStack Deployment** and click **Add**.
3. Select whether you want to create a deployment or use an exported template to populate settings.

   **Note**
   - Passwords are not saved in exported templates. You must enter each password and validate it before additional settings can be populated.
   - Additional vCenter Server instances are not saved in exported templates. You must add vCenter Server instances manually before their settings can be populated.

4 Specify the deployment name, deployment mode, number of controllers, and controller size.

   For non-HA mode, you can deploy with one medium or large controller. For HA mode, you can deploy with three or five controllers of any size.

   After deployment, you can scale out your control plane and convert non-HA deployments to HA mode. However, you cannot scale in your control plane or convert HA deployments to non-HA mode.

5 Click **Next**.

6 Enter the FQDN or IP address of your management vCenter Server instance and specify its administrator credentials.

   **Note** If you want to deploy VMware Integrated OpenStack with NSX Data Center for vSphere networking, you must enter the location of the vCenter Server instance in the format in which it was registered with NSX Manager. To find the correct format, log in to NSX Manager, click **Manage vCenter Registration**, and view the **vCenter Server** section. Ensure that the value entered in VMware Integrated OpenStack is the same as the value displayed in the **vCenter Server** section in NSX Manager.

7 If the Integrated OpenStack Manager connects to the vCenter Server instance over a private, secure network and you need to disable certificate validation, select the **Ignore vCenter Server certificate validation** check box.

8 Click **Next**.

9 Under **Management network**, select the management network from the drop-down menu, choose whether to enable DHCP, and specify an IP address for the private OpenStack endpoint.

   **Note** The following conditions apply:

   - If you disable DHCP, you must enter:
     - One or more IP address ranges for the network
     - The subnet mask for those ranges
     - The gateway address
     - One or more DNS servers
   - The IP address of the private OpenStack endpoint cannot be included in any IP address range specified for the management network.

10 Under **API network**, select the API access network from the drop-down menu, choose whether to enable DHCP, specify an IP address for the public OpenStack endpoint and optionally specify a public hostname.

**Note** The following conditions apply:

- If you disable DHCP, you must enter:
  - One or more IP address ranges for the network
  - The subnet mask for those ranges
  - The gateway address
  - One or more DNS servers
- The IP address of the public OpenStack endpoint cannot be included in any IP address range specified for the API access network.
- After the initial deployment, the public hostname for the public OpenStack endpoint cannot be changed.

11 Under **Control plane resources**, select the vSphere data center, resource pool, and datastore that you want to use for the OpenStack control plane.

**Note** The datastore cannot be changed after the control plane has been deployed.

12 Under **Persistent storage**, select a datastore and click **Next**.

13 Select a networking mode from the drop-down menu.

**Important** You cannot change the networking mode after deploying OpenStack. To switch to a different networking mode, you must redeploy.

14 Enter the parameters for your networking back end.

- If you selected **NSX Policy**, perform the following steps:
  a Enter the FQDN or IP address of the NSX Manager and its administrator credentials, and click **Validate**.

  **Note** If you have deployed an NSX Manager cluster, specify only the parent NSX Manager node. After OpenStack is deployed, specify the additional nodes as described in Configure VMware Integrated OpenStack with an NSX Manager Cluster" in the *VMware Integrated OpenStack Administration Guide*.

  b Select the default transport zones, tier-0 router, DHCP server profile, and metadata proxy server from the drop-down menus.

  c Enter the secret for the metadata proxy server and click **Next**.
- If you selected **DVS**, specify the distributed switch and trunk network to use for OpenStack and click **Next**.

15 Under **Nova configuration**, click **Add** and select the vCenter Server instance containing your compute cluster.

16 Enter a Nova availability zone for the instances in the target cluster.

17 Select the desired cluster and datastore and click **Submit**.

You can click **Add** again to include multiple compute clusters in your deployment.

18 Confirm your compute settings and click **Next**.

19 Under **Glance configuration**, click **Add** and select the vCenter Server instance containing the datastore that you want to use to store images.

20 Select one or more datastores and click **OK**.

21 Confirm your image datastore settings and click **Next**.

22 Under **Cinder configuration**, click **Add** and select the vCenter Server instance containing the cluster that you want to use for the block storage.

23 Select **VMDK** or **FCD** as the backend driver.

24 Enter an availability zone for the target cluster.

25 Select one or more clusters and click **OK**.

26 Confirm your block storage settings and click **Next**.

27 Under **Local admin user**, enter the password of the OpenStack administrator account and click **Next**.

This password is used to authenticate with OpenStack and the VMware Integrated OpenStack dashboard as the cloud administrator.

---

**Important** Do not select **Configure identity source** and configure LDAP. For new deployments of VMware Integrated OpenStack 7.1, you can configure LDAP only after the deployment has finished. For instructions, see "Configure LDAP Authentication" in the *VMware Integrated OpenStack Administration Guide*.

---

28 Select whether you want to enable VMware Integrated OpenStack Carrier Edition and click **Next**.

29 Under **Barbican configuration**, select **Simple Crypto** or **KMIP** as the plugin for secret management.

If you select **KMIP**, you must enter the hostname and credentials for your KMIP server.

30 Review your settings. When you are satisfied that the settings are correct, click **Finish**.

### Results

The Integrated OpenStack Manager begins to deploy your OpenStack cloud, and the status of the deployment is displayed as `Provisioning`. When the status changes to `Running`, the deployment is finished.

**Note** Do not scale out the deployment or add components (such as Designate) while the deployment is in the `Provisioning` state.

## Assign the VMware Integrated OpenStack License Key

You assign a license key for VMware Integrated OpenStack to enable its features.

For more information about licensing, see VMware Integrated OpenStack Licensing.

### Prerequisites

- Install VMware Integrated OpenStack.
- Obtain your VMware Integrated OpenStack license key by logging in to My VMware https://my.vmware.com/group/vmware/home.

### Procedure

1. Log in to the OpenStack Management Server web interface as the `admin` user.
2. Select **Licenses** and click **Add**.
3. Enter a name for your license key.

   The name cannot exceed 253 characters. It can only contain letters, digits, spaces, hyphens (-), and periods (.) and must start and end with a letter or digit.
4. Enter your license key and click **OK**.
5. Select your license key, click **Assign**, and click **OK**.

### Results

Your license key is displayed in the table with related information. You can repeat this procedure to add more licenses as needed for your deployment.

# Configuring Additional Components and Features

5

After installing VMware Integrated OpenStack, you can configure additional OpenStack components and integrate your deployment with vRealize Operations Manager.

This chapter includes the following topics:



## Integrate VMware Integrated OpenStack with vRealize Operations Manager

You can monitor OpenStack resources in vRealize Operations Manager by installing the vRealize Operations Management Pack for VMware Integrated OpenStack and the vRealize Operations Management Pack for Container Monitoring.

### Prerequisites

If you have already installed the vRealize Operations Management Pack for NSX-T version 2.0, uninstall the management pack before proceeding. You can reinstall version 2.0 after the vRealize Operations Management Pack for VMware Integrated OpenStack has been installed.

### Procedure

1. Deploy and configure vRealize Operations Manager.

   See *VMware vRealize Operations Manager Help*.

2. Install and configure the vRealize Operations Management Pack for VMware Integrated OpenStack.

   See "Installing and Configuring the Management Pack for VMware Integrated OpenStack" in the *VMware vRealize Operations Management Pack for VMware Integrated OpenStack* document.

3 Configure the OpenStack instance.

See "Configure the OpenStack Instance" in the *VMware vRealize Operations Management Pack for VMware Integrated OpenStack* document.

### Results

You can view VMware Integrated OpenStack objects on the dashboards displayed in vRealize Operations Manager.

### What to do next

Configure the vCenter Adapter. For information, see "VMware vSphere Solution in vRealize Operations Manager" in the *vRealize Operations Manager Help* document.

For NSX deployments, you can also configure the vRealize Operations Management Pack for NSX-T or vRealize Operations Management Pack for NSX for vSphere.

- For information about the vRealize Operations Management Pack for NSX-T, see the *VMware vRealize Operations Management Pack for NSX-T* document.
- For information about the vRealize Operations Management Pack for NSX for vSphere, see documentation under the **Resources** tab on the vRealize Operations Management Pack for NSX for vSphere page on VMware Solution Exchange at https://marketplace.vmware.com/vsx/solutions/management-pack-for-nsx-for-vsphere.

## Integrate VMware Integrated OpenStack with vRealize Log Insight

You can monitor OpenStack data in vRealize Log Insight using dashboards provided by the VMware OpenStack Content Pack.

For more information about the VMware OpenStack Content Pack, see the VMware OpenStack Content Pack page at https://marketplace.cloud.vmware.com/services/details/vmware-integrated-openstack-content-pack-7-0?slug=true.

**Note** By default, vRealize Log Insight 8.1.1 or later, port 9543, is used for the HTTPS connection. If you use port 9000 for the HTTP connection, disable **Require SSL Connection** in **SSL Configuration** of vRealize Log Insight.

### Prerequisites

Deploy vRealize Log Insight. See the *Getting Started* document for your version of vRealize Log Insight.

Procedure

1 Install the VMware OpenStack Content Pack in vRealize Log Insight.

   a Log in to the vRealize Log Insight web user interface as a user with the **Edit Admin** permission.

   b From the drop-down menu on the upper right, select **Content Packs**.

   c Click **Marketplace** under **Content Pack Marketplace** on the left.

   d Click **OpenStack**.

   e Select the check box to agree to the terms of the license agreement.

   f Click **Install**.

   For more information about vRealize Log Insight content packs, see "Working with Content Packs" in the *Using vRealize Log Insight* document for your version.

2 If you did not configure a syslog server when deploying OpenStack, modify your deployment configuration to send logs to vRealize Log Insight.

   a Log in to the Integrated OpenStack Manager web interface as the `admin` user.

   b In **OpenStack Deployment**, click the name of your deployment and open the **Manage** tab.

   c On the **Settings** tab, select **Log Management** and click **Edit**.

   d Enter the IP address and port of your vRealize Log Insight syslog server and click **OK**.

Results

You can monitor the OpenStack data in vRealize Log Insight on the dashboards under **Content Pack Dashboards > OpenStack**. You can select the status of your log analytics integration by running the `viocli get deployment` command.

# Forward Logs to an External Server

If you did not configure a syslog server when deploying VMware Integrated OpenStack, you can modify your deployment to send logs to a remote syslog server. You can also modify your deployment if you no longer want to send logs to vRealize Log Insight.

The procedure to forward logs to a remote server depends upon your deployment configuration.

- If you have never configured a syslog server, you enable the Fluentd Cluster Logging Custom Resource (CR) by creating a custom-fluentd-cr.yml file and using the Kubernetes command-line utility to apply the file.
- If you specified a vRealize Log Insight server and want to change the syslog server, you disable fluentd CR using the Kubernetes command-line utility or by removing the vRealize Log Insight IP from the VMware Integrated OpenStack UI. Then you edit the custom-fluentd-cr.yml file and run the file to reenable fluentd CR.

### Prerequisites

Verify that a remote syslog server such as Rsyslog is installed and configured.

### Procedure

1 (Optional) If you configured your deployment to send logs to vRealize Log Insight, disable fluentd CR.

- To disable fluentd CR using the VMware Integrated OpenStack UI, remove the IP address that you specified for the vRealize Log Insight syslog server. See Integrate VMware Integrated OpenStack with vRealize Log Insight.
- To disable fluentd CR using the Kubernetes command-line utility, type the command:

```
osctl delete fluentd fluentd1
```

2 Create the custom-fluentd-cr.yml file with a valid remote syslog server IP and port.

If fluentd CR was previously enabled, you update your existing custom-fluentd-cr.yml file.

```
apiVersion: vio.vmware.com/v1alpha1
kind: Fluentd
metadata:
  name: fluentd1
  labels:
    app: lcm
    StatusController: ""
spec:
  loginsight:
    type: remote_syslog
    ip: <remote_server_ip>
    port: <remote_server_port>
```

3 Enable fluentd CR.

```
osctl apply -f custom-fluentd-cr.yml
```

# Enable the Designate Component

Designate is a component of OpenStack that provides DNS as a service, including domain name registration and zone and record set management for OpenStack clouds.

After deploying VMware Integrated OpenStack, you can enable Designate to provide DNS functions. Enabling or disabling Designate may temporarily affect other OpenStack services.

For more information about Designate, see the OpenStack Designate documentation at https://docs.openstack.org/designate/train.

### Prerequisites

VMware Integrated OpenStack supports Infoblox, Bind9, PowerDNS, and Microsoft DNS back-end servers for Designate. The prerequisites for each type of DNS server are listed as follows.

Infoblox:

1 Ensure that the DNS server can communicate with the VMware Integrated OpenStack API access network.

2 On the Infoblox server, create a user for Designate to use.

3 Create one name server group to serve Designate zones.

   a Set the Designate mDNS servers as external primaries.

   b Set all IP addresses on the eth1 interface of the load balancer node as external primaries.

   c Add a grid member as a grid secondary and select the `Lead Secondary` option for this member.

   d Add additional grid secondaries as needed.

Bind9:

1 Ensure that the DNS server can communicate with the VMware Integrated OpenStack API access network.

2 Enable `rndc addzone` and `rndc delzone` functionality to allow receipt of a NOTIFY message from a secondary node. Open `named.conf.options` or `named.conf` in a text editor and add the following lines in the `options` section:

```
allow-new-zones yes;
allow-notify{any;};
```

3 Restart the Bind9 server.

PowerDNS:

1 Ensure that the DNS server can communicate with the VMware Integrated OpenStack API access network.

2 Enable the API in the `pdns.conf` file.

3 In the `pdns.conf` file, add the `trusted-notification-proxy` parameter and set its value to the IP address of the `eth1` interface of each controller node, separated by commas:

```
trusted-notification-proxy=controller1-eth1-ip,...
```

Microsoft DNS:

1 Ensure that the DNS server can communicate with the VMware Integrated OpenStack API access network.

2 On the Microsoft DNS server, add inbound rules allowing communication on port 5358 over TCP and UDP.

3 Install Python 2.7, the Microsoft Visual C++ Compiler for Python 2.7, and the pip package installer.

4 Install Designate version 8.0.0.

```
pip install designate==8.0.0
```

5 Write the following information to a file named `designate.conf`:

```
[service:agent]
backend_driver = msdns
masters = mgmt-server-ip:53
```

6 Open Command Prompt as an administrator and start the Designate agent using the `designate.conf` file:

```
designate-agent --config-file path/designate.conf
```

The Designate agent must remain open while Designate is in use.

Procedure

1 Log in to the Integrated OpenStack Manager web interface as the `admin` user.

2 In **OpenStack Deployment**, click the name of your deployment and open the **Manage** tab.

3 On the **Settings** tab, select **Configure Designate** and click **Enable**.

4 Select your back end and enter the required parameters.

- Infoblox back end

| Option | Description |
|---|---|
| **DNS server** | Enter the IP address of the Infoblox server. |
| **DNS port** | Enter the port on the Infoblox server for the DNS service. The default value is `53`. |
| **WAPI URL** | Enter the Infoblox WAPI URL. The default is `https://<infoblox-server>/wapi/v<wapi-version-major.minor>/`.<br>For example: `https://infoblox-server-example/wapi/v3.4/`<br>**Note** The URL must end with a slash (/). |
| **Username** | Enter the username for Designate to access the Infoblox API. |
| **Password** | Enter the password for the Infoblox username. |
| **Confirm password** | Confirm the password for the Infoblox username. |
| **NS group** | Specify the name server group to serve Designate zones. |

- Bind9 back end

| Option | Description |
|---|---|
| **DNS server** | Enter the IP address of the Bind9 server. |
| **DNS port** | Enter the port on the Bind9 server for the DNS service. The default value is `53`. |
| **RNDC host** | Enter the IP address of the Remote Name Daemon Control (RNDC) server. The default value is the IP address of the Bind9 server. |
| **RNDC port** | Enter the port for the RNDC service. The default value is 953. |
| **RNDC key** | Enter the contents of the `/etc/bind/rndc.key` file. |

- PowerDNS back end

| Option | Description |
|---|---|
| **DNS server** | Enter the IP address of the PowerDNS server. |
| **DNS port** | Enter the port on the PowerDNS server for the DNS service. The default value is `53`. |
| **API endpoint** | Enter the PowerDNS API endpoint URL. The default value is `http://{powerdns-server}:8081`. |
| **API key** | Enter the value of `api-key` in the `/etc/powerdns/pdns.conf` file. |

- Microsoft DNS back end

| Option | Description |
|---|---|
| **DNS server** | Enter the IP address of the Microsoft DNS server. |
| **DNS port** | Enter the port on the Microsoft DNS server for the DNS service. The default value is `53`. |
| **Agent server** | Enter the IP address of the host where the Designate agent is running. |
| **Agent port** | Enter the port to use for the Designate agent service. The default value is `5358`. |

5 Click **Validate**. Once validation has finished, click **OK**.

### Results

Tenants can now create DNS zones using the VMware Integrated OpenStack dashboard. For instructions, see "Create a DNS Zone" in the *VMware Integrated OpenStack Administration Guide*.

# Enable Carrier Edition Features

You can enable VMware Integrated OpenStack Carrier Edition features through the Integrated OpenStack Manager web interface.

### Prerequisites

Assign a Carrier Edition license to your VMware Integrated OpenStack deployment. See Assign the VMware Integrated OpenStack License Key.

For information about licensing, see VMware Integrated OpenStack Licensing.

### Procedure

1. Log in to the Integrated OpenStack Manager web interface as the `admin` user.
2. In **OpenStack Deployment**, click the name of your deployment and open the **Manage** tab.
3. On the **Settings** tab, select **Configure Carrier Edition** and click **Enable**.

### Results

You can now configure your deployment to use Carrier Edition features.

# Enable the Ceilometer Component

Ceilometer is a component of OpenStack that polls, collects, and publishes OpenStack service data. The VMware Integrated OpenStack implementation of Ceilometer includes the Aodh, Panko, and Gnocchi projects.

After deploying VMware Integrated OpenStack, you can enable Ceilometer to perform telemetry functions. Enabling or disabling Ceilometer may temporarily affect other OpenStack services.

For more information about Ceilometer, see the OpenStack Ceilometer documentation at https://docs.openstack.org/ceilometer/train.

### Prerequisites

Verify that the CPUs on the ESXi host running the Integrated OpenStack Manager support Advanced Vector Extensions (AVX).

### Procedure

1. Log in to the Integrated OpenStack Manager web interface as the `admin` user.
2. In **OpenStack Deployment**, click the name of your deployment and open the **Manage** tab.
3. On the **Settings** tab, select **Configure Ceilometer** and click **Enable**.

### Results

The Kubernetes pods required by Ceilometer are created and the services are enabled.

### What to do next

If you no longer want to use Ceilometer, you can disable it on this page. This will stop the Ceilometer service and remove all Ceilometer nodes.

# Upgrading VMware Integrated OpenStack

6

Your upgrade path to VMware Integrated OpenStack 7.1 depends upon the version that you are migrating from.

To upgrade from VMware Integrated OpenStack 6.0 to VMware Integrated OpenStack 7.1, you follow instructions to Upgrade VMware Integrated OpenStack 6.x to 7.1.

To upgrade from VMware Integrated OpenStack 7.0 or 7.0.1 to 7.1, you follow instructions to Apply the VMware Integrated OpenStack 7.1 Patch to your VMware Integrated OpenStack 7.1 OVA.

Before starting any upgrade, verify that your environment meets the requirements for VMware Integrated OpenStack 7.1. See Hardware Requirements for VMware Integrated OpenStack and Software Requirements for VMware Integrated OpenStack.

If you have enabled Ceilometer, verify that the CPUs on the ESXi host support Advanced Vector Extensions (AVX). If AVX is not supported, disable Ceilometer before upgrading.

Note the following differences between a new VMware Integrated OpenStack 7.1 deployment and a deployment that has been upgraded from a previous version:

- The OpenStack region name of a new VMware Integrated OpenStack 7.1 deployment is `RegionOne`. The OpenStack region name of an upgraded deployment is `nova`.
- The names of Nova compute nodes in a new VMware Integrated OpenStack 7.1 deployment are in the following format: `compute-`*`vcenter-id-cluster-moid`*. The names of Nova compute nodes in an upgraded deployment are in the following format: `nova-compute-`*`number`*. After the deployment is upgraded, new Nova compute nodes use the new naming format, including nodes that are deleted and recreated.
- A new VMware Integrated OpenStack 7.1 deployment includes the `service` and `default` domains only. The `service` domain contains accounts used by OpenStack services, and the `Default` domain contains accounts used by OpenStack users, including the `admin` account. An upgraded deployment also contains the `local` domain for backward compatibility.

This chapter includes the following topics:

# Apply the VMware Integrated OpenStack 7.1 Patch

To upgrade to VMware Integrated OpenStack 7.1 from 7.0 or 7.0.1 versions, you apply a patch.

### Prerequisites

- Download both the VMware Integrated OpenStack 7.1 patch packages from the product download page at https://my.vmware.com/en/group/vmware/info?slug=infrastructure_operations_management/vmware_integrated_openstack/7_1.
- Verify that the VMware Integrated OpenStack manager has 20 GB of free disk space. To free some disk space, you can remove the downloaded tar ball patch.
- If you have an existing VMware Integrated OpenStack 7.0 or 7.0.1 with an OpenStack deployment, create a backup of your existing deployment. See Back Up Your Deployment.
- Applying patch cannot update the previously customized images in CR. For using the images delivered in the patch, you must remove the image related configuration by using `viocli update <CR name>`.

### Procedure

1. Log in to the Integrated OpenStack Manager in the VMware Integrated OpenStack environment.

   ```
   ssh root@mgmt-server-ip
   ```

   Navigate to the VMware Integrated OpenStack 7.1 patch folder.

   ```
   cd <vio-patch-folder>
   ```

   Unpack the tarball.

   ```
   tar -zxvf vio-patch-7.1.0.0-build-number.tar.gz
   ```

2. Run the `patch -prepare.sh` script. This script reminds you the next steps for installing the patch.

   ```
   ./patch-prepare.sh
   ```

3. Add the patch to your VMware Integrated OpenStack manager.

   ```
   viocli patch add -l /<vio-patch-folder>/patch-<vio-patch-version>.tar.gz
   ```

   Verify that the patch has been added.

   ```
   viocli patch list
   ```

   If properly added, the state of the patch appears as: `ADDED`.

4 Install the patch.

```
viocli patch install -p patch-<vio-patch-version>
```

Verify that the patch has been installed.

```
viocli patch list
```

If properly installed on an existing VMware Integrated OpenStack 7.x deployment, the state of the patch appears as: `APPLIED`.

If the patch has been applied, check the patch deployment status.

```
viocli get deployment
```

During the patch process, there can be some deployment state transitions between `OUTAGE`, `RECONFIGURING`, `DEGRADED`, and `RUNNING`.

If the deployment is stable, the state of the patch appears as: `RUNNING`, indicating that all OpenStack services have been patched.

**Note**

- If an error occurs or the deployment is not stable, retain the support bundle for tracking.
- If VMware Integrated OpenStack is integrated with vRealize Operations Manager, you must accept the new certificate of VMware Integrated OpenStack manager by clicking the **VALIDATE CONNECTION** from vRealize Operations Manager after applying the VMware Integrated OpenStack 7.1 patch.

# Remove the VMware Integrated OpenStack 7.1 Patch

If you do not want to use VMware Integrated OpenStack 7.1, you can remove the patch and revert to the previous version.

**Procedure**

1 Remove the VMware Integrated OpenStack 7.1 patch.

```
viocli patch delete -p <VIO_7.1.0.0_patch_name>
```

2 (Optional) If you are removing the patch from an existing VMware Integrated OpenStack deployment, check the OpenStack deployment status.

```
viocli get deployment
```

If the deployment is stable, the state of the patch appears as: `RUNNING`. The state of the patch must remain `RUNNING`, indicating that all OpenStack services have been rolled back to previous version of VMware Integrated OpenStack.

3 If you are reverting from VMware Integrated OpenStack 7.1 to version 7.0.1, you must manually rollback the core service `vio-lcm` as follows:

```
helm repo update
```

```
helm upgrade --install vio-lcm vio/vio-lcm-controllers --wait --force --timeout=1800
--namespace=openstack --version=7.0.1+17200834 --values=/vio/config/input/vio-lcm-cntl-
values.yml
```

4 If you are reverting from VMware Integrated OpenStack 7.1 to version 7.0, you must manually rollback four core services: `vio-operator`, `vio-api`, `nginx-ingress`, and `vio-lcm` as follows:

```
helm repo update
```

```
helm upgrade --install vio-operator vio/vio-operator --version=1.0.0 --values /vio/config/
input/vio-api-cntl-values.yml
```

```
helm upgrade --install vio-api vio/vio-api --version=1.0.0 --values /vio/config/input/vio-
api-cntl-values.yml
```

```
helm upgrade --install vio-ingress-cntl vio/nginx-ingress --version=1.6.0 --values /vio/
config/input/mgmt-ingress-cntl-values.yml
```

```
helm upgrade --install vio-lcm vio/vio-lcm-controllers --wait --force --timeout=1800
--namespace=openstack --version=7.0.0+16220932 --values=/vio/config/input/vio-lcm-cntl-
values.yml
```

**Note** If an error occurs, retain the support bundle for tracking.

# Upgrade VMware Integrated OpenStack 6.x to 7.1

You follow this procedure to upgrade from VMware Integrated OpenStack 6.x to 7.1.

### Prerequisites

- Download the VMware Integrated OpenStack 7.1 OVA from the product download page at https://my.vmware.com/en/group/vmware/info?slug=infrastructure_operations_management/vmware_integrated_openstack/7_1.
- Ensure that your current deployment is running VMware Integrated OpenStack 6.0 or later.

### Procedure

1 Log in to the Integrated OpenStack Manager in the existing VMware Integrated OpenStack environment.

```
ssh root@old-mgmt-server-ip
```

2 Run the `ovfenv` command to determine the OVF configuration for your existing VMware Integrated OpenStack environment.

```
ovfenv
```

Record the output of this command for later use.

3 Create a backup of your existing VMware Integrated OpenStack environment.

For instructions, see Back Up Your Deployment.

4 Export the configuration for your existing VMware Integrated OpenStack deployment.

a Log in to the Integrated OpenStack Manager web interface of your existing VMware Integrated OpenStack deployment.

b Click **OpenStack Deployment**.

c Select your deployment and click **Export Template**.

Save the exported template for later use.

5 Install the OVA on your vCenter Server instance.

**Important**

- Ensure that all aspects of the OVF configuration are consistent with your existing VMware Integrated OpenStack environment. To determine the correct configuration, refer to the output of the `ovfenv` command in Step 2.
- Do not power on the newly installed VMware Integrated OpenStack virtual appliance at this time.

For more information, see Install the VMware Integrated OpenStack Virtual Appliance.

6 Stop the existing VMware Integrated OpenStack deployment.

a In the vSphere Client, power off the Integrated OpenStack Manager virtual machine.

b Take a snapshot of the Integrated OpenStack Manager virtual machine.

c Power off all OpenStack controller virtual machines.

7 Power on the new VMware Integrated OpenStack virtual appliance.

8 Restore the backup that you created in Step 3 on the new VMware Integrated OpenStack installation.

When restoring the backup, you must use the configuration file template for restoring VMware Integrated OpenStack on a new control plane. For instructions, see Restore Your Deployment from a Backup.

To determine the correct values for the required parameters, refer to the exported template in Step 4.

### Results

Your existing environment is migrated to VMware Integrated OpenStack 7.1. When the status of your OpenStack deployment is displayed as `Running`, the upgrade process is finished. You can check the status of your deployment by running the `viocli get deployment` command.

After the new deployment is in the `Running` status, you can safely delete the manager and controller virtual machines for the old deployment.