



Red Hat OpenStack Platform 16.2

Deploying the Shared File Systems service with CephFS through NFS

Understanding, using, and managing the Shared File Systems service with CephFS
through NFS in Red Hat OpenStack Platform

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Abstract

Install, configure, and verify the Shared File Systems service (manila) with the Red Hat Ceph File System (CephFS) through NFS for the Red Hat OpenStack Platform (RHOSP) environment.

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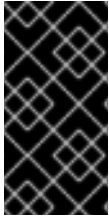
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CHAPTER 1. THE SHARED FILE SYSTEMS SERVICE WITH CEPHFS THROUGH NFS

With the Shared File Systems service (manila) with Ceph File System (CephFS) through NFS, you can use the same Ceph cluster that you use for block and object storage to provide file shares through the NFS protocol. For more information, see [Configuring the Shared File Systems service \(manila\)](#) in the *Storage Guide*.



IMPORTANT

The RHOSP Shared File Systems service with CephFS through NFS for RHOSP 16.0 and later is supported for use with Red Hat Ceph Storage version 4.1 or later. For more information about how to determine the version of Ceph Storage installed on your system, see [Red Hat Ceph Storage releases and corresponding Ceph package versions](#) .

CephFS is the highly scalable, open-source distributed file system component of Red Hat Ceph Storage, a unified distributed storage platform. Ceph Storage implements object, block, and file storage using Reliable Autonomic Distributed Object Store (RADOS). CephFS, which is POSIX compatible, provides file access to a Ceph storage cluster.

The Shared File Systems service (manila) enables users to create shares in CephFS and access them with NFS 4.1 through NFS-Ganesha. NFS-Ganesha controls access to the shares and exports them to clients through the NFS 4.1 protocol.

The Shared File Systems service manages the life cycle of these shares from within RHOSP. When cloud administrators configure the service to use CephFS through NFS, these file shares come from the CephFS cluster, but are created and accessed as familiar NFS shares.

For more information about the Shared File Systems service, see [Configuring the Shared File Systems service \(manila\)](#) in the *Storage Guide*.

1.1. CEPHFS WITH NATIVE DRIVER

The CephFS native driver combines the OpenStack Shared File Systems service (manila) and Red Hat Ceph Storage. When you use Red Hat OpenStack (RHOSP) director, the Controller nodes host the Ceph daemons, such as the manager, metadata servers (MDS), and monitors (MON) and the Shared File Systems services.

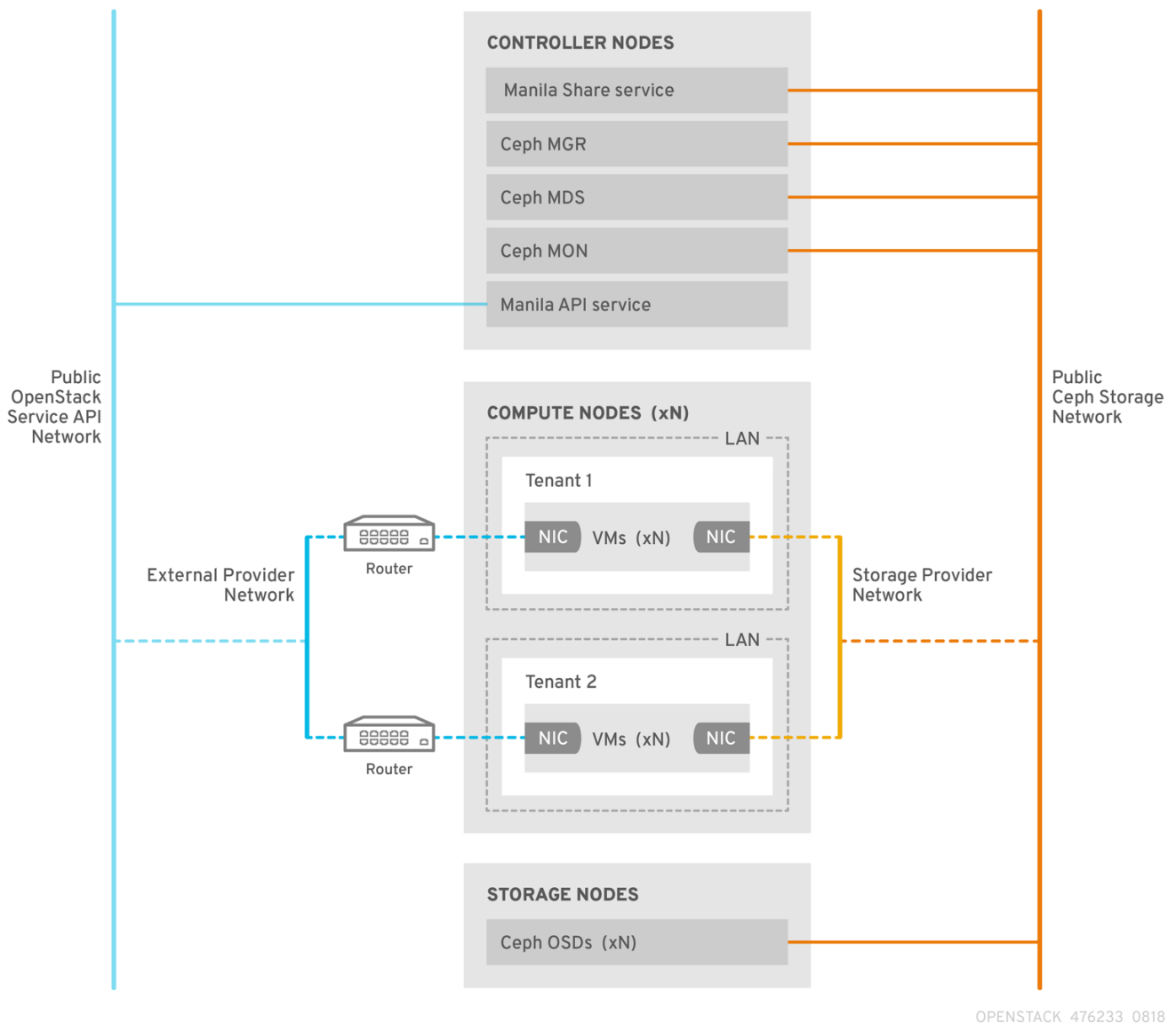
Compute nodes can host one or more projects. Projects, which were formerly referred to as tenants, are represented in the following graphic by the white boxes. Projects contain user-managed VMs, which are represented by gray boxes with two NICs. To access the ceph and manila daemons projects, connect to the daemons over the public Ceph storage network.

On this network, you can access data on the storage nodes provided by the Ceph Object Storage Daemons (OSDs). Instances, or virtual machines (VMs), that are hosted on the project boot with two NICs: one dedicated to the storage provider network and the second to project-owned routers to the external provider network.

The storage provider network connects the VMs that run on the projects to the public Ceph storage network. The Ceph public network provides back end access to the Ceph object storage nodes, metadata servers (MDS), and Controller nodes.

Using the native driver, CephFS relies on cooperation with the clients and servers to enforce quotas, guarantee project isolation, and for security. CephFS with the native driver works well in an environment

with trusted end users on a private cloud. This configuration requires software that is running under user control to cooperate and work correctly.

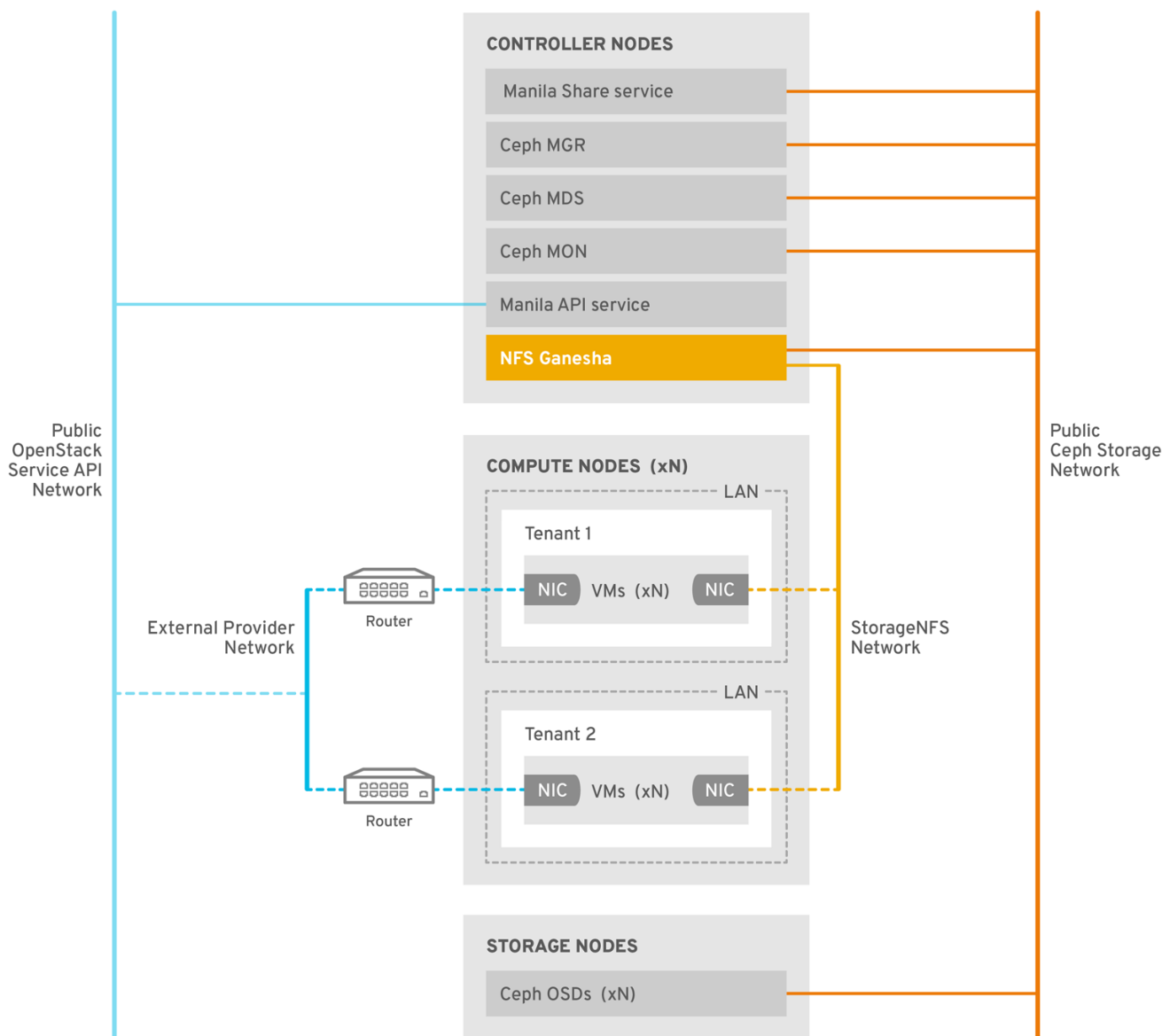


1.2. CEPHFS THROUGH NFS

The CephFS through NFS back end in the Shared File Systems service (manila) is composed of Ceph metadata servers (MDS), the CephFS through NFS gateway (NFS-Ganesha), and the Ceph cluster service components. The Shared File Systems service CephFS NFS driver uses NFS-Ganesha gateway to provide NFSv4 protocol access to CephFS shares. The Ceph MDS service maps the directories and file names of the file system to objects that are stored in RADOS clusters. NFS gateways can serve NFS file shares with different storage back ends, such as Ceph. The NFS-Ganesha service runs on the Controller nodes with the Ceph services.

Instances are booted with at least two NICs: one NIC connects to the project router and the second NIC connects to the StorageNFS network, which connects directly to the NFS-Ganesha gateway. The instance mounts shares by using the NFS protocol. CephFS shares that are hosted on Ceph OSD nodes are provided through the NFS gateway.

NFS-Ganesha improves security by preventing user instances from directly accessing the MDS and other Ceph services. Instances do not have direct access to the Ceph daemons.



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1.3. CEPH SERVICES AND CLIENT ACCESS

In addition to the monitor, OSD, Rados Gateway (RGW), and manager services deployed when Ceph provides object and block storage, a Ceph metadata service (MDS) is required for CephFS and an NFS-Ganesha service is required as a gateway to native CephFS using the NFS protocol. For user-facing object storage, an RGW service is also deployed. The gateway runs the CephFS client to access the Ceph public network and is under administrative rather than end-user control.

NFS-Ganesha runs in its own container that interfaces both to the Ceph public network and to a new isolated network, StorageNFS. The composable network feature of Red Hat OpenStack Platform (RHOSP) director deploys this network and connects it to the Controller nodes. As the cloud administrator, you can configure the network as a Networking (neutron) provider network.

NFS-Ganesha accesses CephFS over the Ceph public network and binds its NFS service using an address on the StorageNFS network.

To access NFS shares, provision user VMs, Compute (nova) instances, with an additional NIC that connects to the Storage NFS network. Export locations for CephFS shares appear as standard NFS **IP: <path>** tuples that use the NFS-Ganesha server VIP on the StorageNFS network. The network uses the

IP address of the user VM to perform access control on the NFS shares.

Networking (neutron) security groups prevent the user VM that belongs to project 1 from accessing a user VM that belongs to project 2 over the StorageNFS network. Projects share the same CephFS file system but project data path separation is enforced because user VMs can access files only under export trees: **/path/to/share1/...**, **/path/to/share2/....**

1.4. SHARED FILE SYSTEMS SERVICE WITH CEPHFS THROUGH NFS FAULT TOLERANCE

When Red Hat OpenStack Platform (RHOSP) director starts the Ceph service daemons, they manage their own high availability (HA) state and, in general, there are multiple instances of these daemons running. By contrast, in this release, only one instance of NFS-Ganesha can serve file shares at a time.

To avoid a single point of failure in the data path for CephFS through NFS shares, NFS-Ganesha runs on a RHOSP Controller node in an active-passive configuration managed by a Pacemaker-Corosync cluster. NFS-Ganesha acts across the Controller nodes as a virtual service with a virtual service IP address.

If a Controller node fails or the service on a particular Controller node fails and cannot be recovered on that node, Pacemaker-Corosync starts a new NFS-Ganesha instance on a different Controller node using the same virtual IP address. Existing client mounts are preserved because they use the virtual IP address for the export location of shares.

Using default NFS mount-option settings and NFS 4.1 or later, after a failure, TCP connections are reset and clients reconnect. I/O operations temporarily stop responding during failover, but they do not fail. Application I/O also stops responding but resumes after failover completes.

New connections, new lock-state, and so on are refused until after a grace period of up to 90 seconds during which time the server waits for clients to reclaim their locks. NFS-Ganesha keeps a list of the clients and exits the grace period earlier if all clients reclaim their locks.



NOTE

The default value of the grace period is 90 seconds. To change this value, edit the NFSv4 **Grace_Period** configuration option.

CHAPTER 2. CEPHFS THROUGH NFS-GANESHA INSTALLATION

A typical Ceph file system (CephFS) through NFS installation in a Red Hat OpenStack Platform (RHOSP) environment includes the following configurations:

- OpenStack Controller nodes running containerized Ceph metadata server (MDS), Ceph monitor (MON), manila, and NFS-Ganesha services. Some of these services can coexist on the same node or can have one or more dedicated nodes.
- Ceph storage cluster with containerized object storage daemons (OSDs) running on Ceph storage nodes.
- An isolated StorageNFS network that provides access from projects to the NFS-Ganesha services for NFS share provisioning.



IMPORTANT

Red Hat requires a Support Exception to use the Shared File Systems service (manila) with CephFS through NFS to serve shares to OpenShift Container Platform through Manila CSI. For more information, contact Red Hat Support.

The Shared File Systems service (manila) provides APIs that allow the projects to request file system shares, which are fulfilled by driver modules. The driver for Red Hat CephFS, **manila.share.drivers.cephfs.driver.CephFSDriver**, means that you can use the Shared File Systems service as a CephFS back end. RHOSP director configures the driver to deploy the NFS-Ganesha gateway so that the CephFS shares are presented through the NFS 4.1 protocol.

Using RHOSP director to deploy the Shared File Systems service with a CephFS back end on the overcloud automatically creates the required storage network defined in the heat template. For more information about network planning, see [Overcloud networks](#) in the *Director Installation and Usage* guide.

Although you can manually configure the Shared File Systems service by editing its node `/etc/manila/manila.conf` file, RHOSP director can override any settings in future overcloud updates. The recommended method for configuring a Shared File Systems back end is through director.



NOTE

Adding CephFS through NFS to an externally deployed Ceph cluster, which was not configured by Red Hat OpenStack Platform (RHOSP) director, is supported. Currently, only one CephFS back end can be defined in director. For more information, see [Integrating with the existing Ceph Storage cluster](#) in the *Integrating an Overcloud with an Existing Red Hat Ceph Cluster* guide.

2.1. REQUIREMENTS

CephFS through NFS has been fully supported since Red Hat OpenStack Platform version (RHOSP) 13. The RHOSP Shared File Systems service with CephFS through NFS for RHOSP 16.0 and later is supported for use with Red Hat Ceph Storage version 4.1 or later. For more information about how to determine the version of Ceph Storage installed on your system, see [Red Hat Ceph Storage releases and corresponding Ceph package versions](#).

Prerequisites

- You install the Shared File Systems service on Controller nodes, as is the default behavior.
- You install the NFS-Ganesha gateway service on Pacemaker cluster of the Controller node.
- You configure only a single instance of a CephFS back end to use the Shared File Systems service. You can use other non-CephFS back ends with the single CephFS back end.
- You use RHOSP director to create an extra network (StorageNFS) for the storage traffic.

2.2. FILE SHARES

File shares are handled slightly different between the OpenStack Shared File Systems service (manila), Ceph File System (CephFS), and Ceph through NFS.

The Shared File Systems service provides shares, where a share is an individual file system namespace and a unit of storage with a defined size. Shared file system storage inherently allows multiple clients to connect, read, and write data to any given share, but you must give each client access to the share through the Shared File Systems service access control APIs before they can connect.

With CephFS, a share is considered a directory with a defined quota and a layout that points to a particular storage pool or namespace. CephFS quotas limit the size of a directory to the size share that the Shared File Systems service creates. Access to CephFS through NFS shares is provided by specifying the IP address of the client.

With CephFS through NFS, file shares are provisioned and accessed through the NFS protocol. The NFS protocol also handles security.

2.3. INSTALLING THE CEPH-ANSIBLE PACKAGE

Install the **ceph-ansible** package to be installed on an undercloud node to deploy containerized Ceph.

Procedure

1. Log in to an undercloud node as the **stack** user.
2. Install the **ceph-ansible** package:

```
[stack@undercloud-0 ~]$ sudo dnf install -y ceph-ansible
[stack@undercloud-0 ~]$ sudo dnf list ceph-ansible
...
Installed Packages
ceph-ansible.noarch 4.0.23-1.el8cp @rhelosp-ceph-4-tools
```

2.4. GENERATING THE CUSTOM ROLES FILE

The **ControllerStorageNFS** custom role configures the isolated **StorageNFS** network. This role is similar to the default **Controller.yaml** role file with the addition of the **StorageNFS** network and the **CephNfs** service, indicated by the **OS::TripleO::Services:CephNfs** command.

```
[stack@undercloud ~]$ cd /usr/share/openstack-tripleo-heat-templates/roles
[stack@undercloud roles]$ diff Controller.yaml ControllerStorageNfs.yaml
16a17
```

```
> - StorageNFS
50a45
> - OS::TripleO::Services::CephNfs
```

For more information about the **openstack overcloud roles generate** command, see [Roles](#) in the *Advanced Overcloud Customization* guide.

The **openstack overcloud roles generate** command creates a custom **roles_data.yaml** file including the services specified after **-o**. In the following example, the **roles_data.yaml** file created has the services for **ControllerStorageNfs**, **Compute**, and **CephStorage**.



NOTE

If you have an existing **roles_data.yaml** file, modify it to add **ControllerStorageNfs**, **Compute**, and **CephStorage** services to the configuration file. For more information, see [Roles](#) in the *Advanced Overcloud Customization* guide.

Procedure

1. Log in to an undercloud node as the **stack** user,
2. Use the **openstack overcloud roles generate** command to create the **roles_data.yaml** file:

```
[stack@undercloud ~]$ openstack overcloud roles generate --roles-path
/usr/share/openstack-tripleo-heat-templates/roles -o /home/stack/roles_data.yaml
ControllerStorageNfs Compute CephStorage
```

2.5. DEPLOYING THE UPDATED ENVIRONMENT

When you are ready to deploy your environment, use the **openstack overcloud deploy** command with the custom environments and roles required to run CephFS with NFS-Ganesha.

The overcloud deploy command has the following options in addition to other required options.

Action	Option	Additional information
Add the extra StorageNFS network with network_data_ganesha.yaml	-n /usr/share/openstack-tripleo-heat-templates/network_data_ganesha.yaml	The StorageNFS and network_data_ganesha.yaml file
Add the custom roles defined in roles_data.yaml file from the previous section	-r /home/stack/roles_data.yaml	Generating the custom roles file
Deploy the Ceph daemons with ceph-ansible.yaml	-e /usr/share/openstack-tripleo-heat-templates/environments/ceph-ansible/ceph-ansible.yaml	Initiating Overcloud Deployment in the <i>Deploying an Overcloud with Containerized Red Hat Ceph</i> guide.

Action	Option	Additional information
Deploy the Ceph metadata server with ceph-mds.yaml	-e /usr/share/openstack-tripleo-heat-templates/environments/ceph-ansible/ceph-mds.yaml	Initiating Overcloud Deployment in the <i>Deploying an Overcloud with Containerized Red Hat Ceph</i> guide
Deploy the Shared File Systems (manila) service with the CephFS through NFS back end. Configure NFS-Ganesha with director.	-e /usr/share/openstack-tripleo-heat-templates/environments/manila-cephfsganesha-config.yaml	The manila-cephfsganesha-config.yaml environment file

The following example shows an **openstack overcloud deploy** command with options to deploy CephFS through NFS-Ganesha, Ceph cluster, Ceph MDS, and the isolated StorageNFS network:

```
[stack@undercloud ~]$ openstack overcloud deploy \
--templates /usr/share/openstack-tripleo-heat-templates \
-n /usr/share/openstack-tripleo-heat-templates/network_data_ganesha.yaml \
-r /home/stack/roles_data.yaml \
-e /home/stack/containers-default-parameters.yaml \
-e /usr/share/openstack-tripleo-heat-templates/environments/network-isolation.yaml \
-e /home/stack/network-environment.yaml \
-e /usr/share/openstack-tripleo-heat-templates/environments/ceph-ansible/ceph-ansible.yaml \
-e /usr/share/openstack-tripleo-heat-templates/environments/ceph-ansible/ceph-mds.yaml \
-e /usr/share/openstack-tripleo-heat-templates/environments/manila-cephfsganesha-config.yaml
```

For more information about the **openstack overcloud deploy** command, see [Deployment command](#) in the *Director Installation and Usage* guide.

2.5.1. The StorageNFS and network_data_ganesha.yaml file

Use composable networks to define custom networks and assign them to any role. Instead of using the standard **network_data.yaml** file, you can configure the StorageNFS composable network with the **network_data_ganesha.yaml** file. Both of these roles are available in the **/usr/share/openstack-tripleo-heat-templates** directory.

The **network_data_ganesha.yaml** file contains an additional section that defines the isolated StorageNFS network. Although the default settings work for most installations, you must edit the YAML file to add your network settings, including the VLAN ID, subnet, and other settings.

```
name: StorageNFS
enabled: true
vip: true
name_lower: storage_nfs
vlan: 70
ip_subnet: '172.16.4.0/24'
allocation_pools: [{'start': '172.16.4.4', 'end': '172.16.4.149'}]
ipv6_subnet: 'fd00:fd00:fd00:7000::/64'
ipv6_allocation_pools: [{'start': 'fd00:fd00:fd00:7000::10', 'end': 'fd00:fd00:fd00:7000:ffff:ffff:ffff:ffff'}]
```


For more information about composable networks, see [Using Composable Networks](#) in the *Advanced Overcloud Customization* guide.

2.5.2. The manila-cephfs-ganesha-config.yaml environment file

The integrated environment file for defining a CephFS back end is located in the following path of an undercloud node:

```
/usr/share/openstack-tripleo-heat-templates/environments/
```

The **manila-cephfs-ganesha-config.yaml** environment file contains settings relevant to the deployment of the Shared File Systems service. The back end default settings work for most environments. The following example shows the default values that director uses during deployment of the Shared File Systems service:

```
[stack@undercloud ~]$ cat /usr/share/openstack-tripleo-heat-templates/environments/manila-
cephfs-ganesha-config.yaml
# A Heat environment file which can be used to enable a
# a Manila CephFS-NFS driver backend.
resource_registry:
  OS::TripleO::Services::ManilaApi: ../deployment/manila/manila-api-container-puppet.yaml
  OS::TripleO::Services::ManilaScheduler: ../deployment/manila/manila-scheduler-container-
puppet.yaml
# Only manila-share is pacemaker managed:
OS::TripleO::Services::ManilaShare: ../deployment/manila/manila-share-pacemaker-puppet.yaml
OS::TripleO::Services::ManilaBackendCephFs: ../deployment/manila/manila-backend-cephfs.yaml
# ceph-nfs (ganesha) service is installed and configured by ceph-ansible
# but it's still managed by pacemaker
OS::TripleO::Services::CephNfs: ../deployment/ceph-ansible/ceph-nfs.yaml

parameter_defaults:
  ManilaCephFSBackendName: cephfs 1
  ManilaCephFSDriverHandlesShareServers: false 2
  ManilaCephFSCephFSAuthId: 'manila' 3
  ManilaCephFSCephFSEnableSnapshots: false 4
# manila cephfs driver supports either native cephfs backend - 'CEPHFS'
# (users mount shares directly from ceph cluster), or nfs-ganesha backend -
# 'NFS' (users mount shares through nfs-ganesha server)
ManilaCephFSCephFSProtocolHelperType: 'NFS'
```

The **parameter_defaults** header signifies the start of the configuration. In this section, you can edit settings to override default values set in **resource_registry**. This includes values set by **OS::TripleO::Services::ManilaBackendCephFs**, which sets defaults for a CephFS back end.

- 1 **ManilaCephFSBackendName** sets the name of the manila configuration of your CephFS backend. In this case, the default back end name is **cephfs**.
- 2 **ManilaCephFSDriverHandlesShareServers** controls the lifecycle of the share server. When set to **false**, the driver does not handle the lifecycle. This is the only supported option.
- 3 **ManilaCephFSCephFSAuthId** defines the Ceph auth ID that the director creates for the **manila** service to access the Ceph cluster.
- 4 **ManilaCephFSCephFSEnableSnapshots** controls snapshot activation. The **false** value indicates that snapshots are not enabled. This feature is currently not supported.

For more information about environment files, see [Environment Files](#) in the *Director Installation and Usage* guide.

CHAPTER 3. POST-DEPLOYMENT CONFIGURATION

You must complete two post-deployment configuration tasks before you create NFS shares, grant user access, and mount NFS shares.

- Map the Networking service (neutron) StorageNFS network to the isolated data center Storage NFS network.
- Create the default share type.

After you complete these steps, the tenant compute instances can create, allow access to, and mount NFS shares.

3.1. CREATING THE STORAGE PROVIDER NETWORK

You must map the new isolated StorageNFS network to a Networking (neutron) provider network. The Compute VMs attach to the network to access share export locations that are provided by the NFS-Ganesha gateway.

For information about network security with the Shared File Systems service, see [Hardening the Shared File Systems Service](#) in the *Security and Hardening Guide*.

Procedure

The **openstack network create** command defines the configuration for the StorageNFS neutron network.

1. From an undercloud node, enter the following command:

```
[stack@undercloud ~]$ source ~/overcloudrc
```

2. On an undercloud node, create the StorageNFS network:

```
(overcloud) [stack@undercloud-0 ~]$ openstack network create StorageNFS --share --
provider-network-type vlan --provider-physical-network datacentre --provider-segment 70
```

You can enter this command with the following options:

- For the **--provider-physical-network** option, use the default value **datacentre**, unless you set another tag for the br-isolated bridge through NeutronBridgeMappings in your tripleo-heat-templates.
- For the **--provider-segment** option, use the VLAN value set for the StorageNFS isolated network in the heat template, **/usr/share/openstack-tripleo-heat-templates/network_data_ganesha.yaml**. This value is 70, unless the deployer modified the isolated network definitions.
- For the **--provider-network-type** option, use the value **vlan**.

3.2. CONFIGURE THE SHARED PROVIDER STORAGE NFS NETWORK

Create a corresponding **StorageNFSSubnet** on the neutron-shared provider network. Ensure that the subnet is the same as the **storage_nfs** network definition in the **network_data.yml** file and ensure that the allocation range for the **StorageNFS** subnet and the corresponding undercloud subnet do not overlap. No gateway is required because the **StorageNFS** subnet is dedicated to serving NFS shares.

Prerequisites

- The start and ending IP range for the allocation pool.
- The subnet IP range.

3.2.1. Configuring the shared provider StorageNFS IPv4 network

Create a corresponding **StorageNFSSubnet** on the neutron-shared IPv4 provider network.

Procedure

1. Log in to an overcloud node.
2. Source your overcloud credentials.
3. Use the example command to provision the network and make the following updates:
 - a. Replace the **start=172.16.4.150,end=172.16.4.250** IP values with the IP values for your network.
 - b. Replace the **172.16.4.0/24** subnet range with the subnet range for your network.

```
[stack@undercloud-0 ~]$ openstack subnet create --allocation-pool
start=172.16.4.150,end=172.16.4.250 --dhcp --network StorageNFS --subnet-range 172.16.4.0/24 --
gateway none StorageNFSSubnet
```

3.2.2. Configuring the shared provider StorageNFS IPv6 network

Create a corresponding **StorageNFSSubnet** on the neutron-shared IPv6 provider network.

Procedure

1. Log in to an overcloud node.
2. Use the sample command to provision the network, updating values as needed.
 - Replace the **fd00:fd00:fd00:7000::/64** subnet range with the subnet range for your network.

```
[stack@undercloud-0 ~]$ openstack subnet create --ip-version 6 --dhcp --network StorageNFS --
subnet-range fd00:fd00:fd00:7000::/64 --gateway none --ipv6-ra-mode dhcpv6-stateful --ipv6-
address-mode dhcpv6-stateful StorageNFSSubnet -f yaml
```

3.3. CONFIGURING A DEFAULT SHARE TYPE

You can use the Shared File Systems service to define share types that you can use to create shares with specific settings. Share types work like Block Storage volume types. Each type has associated settings, for example, extra specifications. When you invoke the type during share creation the settings apply to the shared file system.

With Red Hat OpenStack Platform (RHOSP) director, you must create a default share type before you open the cloud for users to access. For CephFS with NFS, use the **manila type-create** command:

manila type-create default false

For more information about share types, see [Creating a share type](#) in the *Storage Guide*.

CHAPTER 4. VERIFYING SUCCESSFUL CEPHFS THROUGH NFS DEPLOYMENT

When you deploy CephFS through NFS as a back end of the Shared File Systems service (manila), you add the following new elements to the overcloud environment:

- StorageNFS network
- Ceph MDS service on the controllers
- NFS-Ganesha service on the controllers

As the cloud administrator, you must verify the stability of the CephFS through NFS environment before you make it available to service users.

4.1. VERIFYING CREATION OF ISOLATED STORAGE NFS NETWORK

The **network_data_ganesha.yaml** file used to deploy CephFS through NFS as a Shared File Systems service back end creates the StorageNFS VLAN. Complete the following steps to verify the existence of the isolated StorageNFS network.

Prerequisites

- Complete the steps in [CephFS through NFS-Ganesha installation](#).

Procedure

1. Log in to one of the controllers in the overcloud.
2. Enter the following command to check the connected networks and verify the existence of the VLAN as set in **network_data_ganesha.yaml**:

```
$ ip a
15: vlan310: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state
UNKNOWN group default qlen 1000
    link/ether 32:80:cf:0e:11:ca brd ff:ff:ff:ff:ff:ff
    inet 172.16.4.4/24 brd 172.16.4.255 scope global vlan310
        valid_lft forever preferred_lft forever
    inet 172.16.4.7/32 brd 172.16.4.255 scope global vlan310
        valid_lft forever preferred_lft forever
    inet6 fe80::3080:cfff:fe0e:11ca/64 scope link
        valid_lft forever preferred_lft forever
```

4.2. VERIFYING CEPH MDS SERVICE

Use the **systemctl status** command to verify the Ceph MDS service status.

Procedure

- Enter the following command on all Controller nodes to check the status of the MDS container:

```
$ systemctl status ceph-mds<@CONTROLLER-HOST>
```

Example:

```
$ systemctl status ceph-mds@controller-0.service

ceph-mds@controller-0.service - Ceph MDS
  Loaded: loaded (/etc/systemd/system/ceph-mds@.service; enabled; vendor preset: disabled)
  Active: active (running) since Tue 2018-09-18 20:11:53 UTC; 6 days ago
  Main PID: 65066 (common)
  Tasks: 16 (limit: 204320)
  Memory: 38.2M
  CGroup: /system.slice/system-ceph\x2dmads.slice/ceph-mds@controller-0.service
          └─60921 /usr/bin/podman run --rm --net=host --memory=32000m --cpus=4 -v
            /var/lib/ceph:/var/lib/ceph:z -v /etc/ceph:/etc/ceph:z -v
            /var/run/ceph:/var/run/ceph:z -v /etc/localtime:/etc/localtime:ro>
```

4.3. VERIFYING CEPH CLUSTER STATUS

Complete the following steps to verify Ceph cluster status.

Procedure

1. Log in to the active Controller node.
2. Enter the following command:

```
$ sudo ceph -s

cluster:
  id: 3369e280-7578-11e8-8ef3-801844ecec7c
  health: HEALTH_OK

services:
  mon: 3 daemons, quorum overcloud-controller-1,overcloud-controller-2,overcloud-
controller-0
  mgr: overcloud-controller-1(active), standbys: overcloud-controller-2, overcloud-controller-0
  mds: cephfs-1/1/1 up {0=overcloud-controller-0=up:active}, 2 up:standby
  osd: 6 osds: 6 up, 6 in
```

There is one active MDS and two MDSs on standby.

3. To check the status of the Ceph file system in more detail, enter the following command and replace **<cephfs>** with the name of the Ceph file system:

```
$ sudo ceph fs ls

name: cephfs, metadata pool: manila_metadata, data pools: [manila_data]
```

4.4. VERIFYING NFS-GANESHA AND MANILA-SHARE SERVICE STATUS

Complete the following step to verify the status of NFS-Ganesha and manila-share service.

Procedure

1. Enter the following command from one of the Controller nodes to confirm that **ceph-nfs** and **openstack-manila-share** started:

```
$ pcs status

ceph-nfs      (systemd:ceph-nfs@pacemaker):  Started overcloud-controller-1

podman container: openstack-manila-share [192.168.24.1:8787/rhosp-rhel8/openstack-
manila-share:pcmklatest]
  openstack-manila-share-podman-0    (ocf::heartbeat:podman):    Started overcloud-
controller-1
```

4.5. VERIFYING MANILA-API SERVICES ACKNOWLEDGES SCHEDULER AND SHARE SERVICES

Complete the following steps to confirm that the **manila-api** service acknowledges the scheduler and share services.

Procedure

1. Log in to the undercloud.
2. Enter the following command:

```
$ source /home/stack/overcloudrc
```

3. Enter the following command to confirm **manila-scheduler** and **manila-share** are enabled:

```
$ manila service-list

| Id | Binary          | Host              | Zone | Status | State | Updated_at |
| 2 | manila-scheduler | hostgroup        | nova | enabled | up   | 2018-08-08T04:15:03.000000 |
| 5 | manila-share    | hostgroup@cephfs | nova | enabled | up   | 2018-08-08T04:15:03.000000 |
```