HP Helion OpenStack Carrier Grade (Beta) Software Installation Guide

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1

Overview

The HP Helion OpenStack Carrier Grade is a high-performance, high-availability, cloud operating system that enables telecommunications operators to use off-the-shelf (COTS) hardware to manage Virtualized Network Functions (VNF) within a carrier grade Network Function Virtualization (NFV) architecture.

Installing the HP Helion OpenStack Carrier Grade involves loading and configuring the software on the controller nodes, and then using the controller nodes to initialize compute and storage nodes. For details, see *HP Helion OpenStack Carrier Grade Software Installation* on page 16.

Before installation, ensure that you are familiar with the HP Helion OpenStack Carrier Grade architecture, and that your hardware meets the minimum requirements. For architecture details, refer to the *HP Helion OpenStack Carrier Grade Administration Guide*. For minimum hardware requirements, see *Hardware Requirements* on page 5.

Review the *HP Helion OpenStack Carrier Grade Release Notes* for any additional information pertaining to installation.

During installation, have ready the following items:

*   the HP Helion OpenStack Carrier Grade ISO image on bootable media.
*   a configuration plan for use during the installation process
*   a license file

For help creating a bootable USB drive, see *Preparing a Bootable USB Flash Drive* on page 18.

You should be familiar with the following terms used in this guide:

host

> A unit of computing hardware in the rack. Hosts can be assigned or *commissioned* as controller, compute, or storage nodes.

personality

> The role assigned to a host when it is commissioned. Available personalities include *controller*, *compute*, and *storage*.

HP Helion OpenStack Carrier Grade Cluster

> An ensemble of HP Helion OpenStack Carrier Grade hosts. A HP Helion OpenStack Carrier Grade cluster consists of compute nodes and optionally two storage nodes managed by a pair of controller nodes.

HP Helion OpenStack Carrier Grade Hardware Reference Platform

The HP Helion OpenStack Carrier Grade can be deployed on a variety of hardware scenarios. The examples in this guide use a particular scenario, called the *reference platform*.

Different hardware platforms can be used to meet the requirements of different telecommunication services, including:

- edge and security gateways
- edge and core GPRS support nodes
- IMS control function servers
- operational support systems (OSS)
- business support systems (BSS)
- network operation centers (NOC)
- call servers

For this guide, the reference platform has the following components (see *Figure 1: HP Helion OpenStack Carrier Grade Sample Hardware Deployment Scenario* on page 4):

- two hosts to be initialized as HP Helion OpenStack Carrier Grade *controller nodes*. This guide refers to these hosts as *controller-0* and *controller-1*.
- two hosts to be initialized as HP Helion OpenStack Carrier Grade *storage nodes*. This guide refers to these hosts as *storage-0* and *storage-1*.
- two hosts to be initialized as HP Helion OpenStack Carrier Grade *compute nodes*. This guide refers to these hosts as *compute-0* and *compute-1*.
- a terminal server, used to access the serial or console ports of the hosts in the rack.
- a Layer 2 Ethernet switch, used to interconnect the hosts over the internal management network. The same switch can be used to provide connectivity to the infrastructure, OAM, and provider networks.
- power supplies.
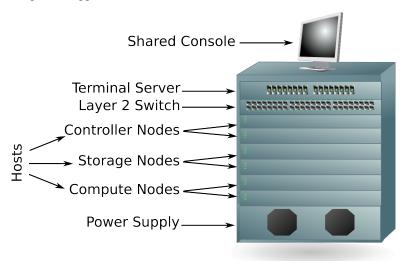
Figure 1: HP Helion OpenStack Carrier Grade Sample Hardware Deployment Scenario

Licensing Requirements

To install and use HP Helion OpenStack Carrier Grade, you require a license from HP.

Evaluation License

You can use an evaluation license to try out HP Helion OpenStack Carrier Grade. This is a fully functional, time-limited license, provided for evaluation purposes only.

Product License

You can use a product license to operate HP Helion OpenStack Carrier Grade for your business requirements.

For complete information about licenses and licensing terms, contact your sales representative.

Obtaining a License

To obtain a license, contact your sales representative. The license is sent to the contact e-mail address you provide when you make a request or place an order.

Installing a License

To install a license initially, follow the procedure for installing and configuring the HP Helion OpenStack Carrier Grade system. During this procedure, you must copy the license file to a designated license directory on the controller host. The default designated directory is /home/wrsroot; you can specify a different one during installation.

Updating a License

After you have installed a license, you can update it by copying the new license file to the designated license directory on the active controller host, and then running the license-install utility as shown in the following example.

```
$ sudo /usr/sbin/license-install license_file
```

Hardware Requirements

For successful software installation and operation, the HP Helion OpenStack Carrier Grade hardware platform must meet specific requirements.

For detailed configuration information, refer to the *HP Helion OpenStack Carrier Grade System Engineering Guidelines*.

System Architecture

The HP Helion OpenStack Carrier Grade consists of a set of hosts connected to internal and external networks, as illustrated in the following figure.
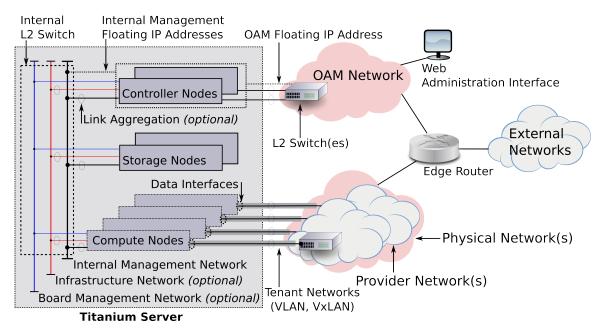
Figure 2: HP Helion OpenStack Carrier Grade Reference Logical Architecture

📝 **Note:**

This figure is simplified to show internal network connections to just one host of each type.

- Two controller nodes are required.
- For systems using storage nodes, two storage nodes are required.

The HP Helion OpenStack Carrier Grade runs on all x86-64 processors that support Intel Virtualization Technology (VT) VT-x/VT-d extensions. However, the HP Helion OpenStack Carrier Grade kernel has been optimized specifically for the Intel Xeon-core family of processors.

System / BIOS Requirements

The BIOS on each host must support PXE booting for initial installation of the HP Helion OpenStack Carrier Grade software.

Memory Requirements

The following are the minimum RAM resources suggested for the hosts.

Table 1: HP Helion OpenStack Carrier Grade Minimum RAM Requirements

Host Type	RAM Size
Controller	32 GB
Compute	32 GB
Storage	32 GB

The actual memory requirement for production environments depends on the expected load. In particular, for compute nodes, the memory requirement depends on the expected number of virtual machines and the types of application running on them.

Storage Requirements

The storage requirements for the HP Helion OpenStack Carrier Grade depend on the system scale.

• For small-scale solutions, the use of LVM/iSCSI shares on the controller node is recommended. Storage nodes are not required.
• For large-scale solutions, the use of Ceph storage on dedicated storage nodes is recommended. This type of system can be scaled upwards using additional disks on the storage nodes.
• For very large-scale deployments using external distributed file systems, contact Professional Services.

All hosts require one system disk where the HP Helion OpenStack Carrier Grade system software is installed. System disks are automatically partitioned by the HP Helion OpenStack Carrier Grade installer program.

Controller nodes require an additional physical disk for volume storage. Storage nodes require an additional physical disk for OSD storage.

The following minimum hard drive capacities are suggested for the hosts.

Table 2: HP Helion OpenStack Carrier Grade Minimum Hard Drive Capacities

Host Type	Drive	Capacity
Controller	Primary disk	500 GB. A two-disk RAID is suggested.
	Secondary disk	500 GB. Solid-state drive recommended. A two-disk RAID is suggested.
	Note:	
	The storage configurations for **controller-0** and **controller-1** must be identical.	
Compute	Primary disk	120 GB
Storage	Primary disk	120 GB
	Secondary disk (one or more)	10 GB per OSD (suggested minimum)

On the controller nodes, the disk space is used to accommodate a variety of content, including HP Helion OpenStack Carrier Grade and guest images, the OpenStack configuration database, Cinder volumes, and Ceilometer CSV files.

For controller nodes, the suggested storage hardware includes the following:

• solid state drives (SSD) to improve overall performance
• hardware RAID array for transparent failover and fallback operations

The HP Helion OpenStack Carrier Grade uses distributed replicated block device (DRDB) technology to automatically synchronize the hard drives across the two controller nodes.

Ethernet Interfaces

All hosts in the HP Helion OpenStack Carrier Grade connect to at least the internal management network using an Ethernet interface. The ports used for this connection must support network booting and must be configured to be used as the primary booting device for installation. Typically this means that they must be on-board ports, since in most BIOS/UEFI implementations only on-board ports can be configured for network booting.

HP Helion OpenStack Carrier Grade supports provisioning multiple ports on supported NICs.

⚠ **Caution:**

For a Mellanox CX3, all ports must be used either for data interfaces, or for non-data interfaces. It is not possible to use some ports for data interfaces and others for non-data interfaces on the same Mellanox CX3 NIC.

The following table illustrates the number and type of Ethernet ports required in two different installation scenarios.

📝 **Note:**

The following table assumes that each interface is connected to a single network. An Ethernet interface can be shared by more than one network; for more information, see the *HP Helion OpenStack Carrier Grade Administration Guide: Shared (VLAN) Ethernet Interfaces*.

Table 3: Ethernet Port Density Scenarios

Personality	Basic Scenario	LAG Scenario
Controller Node	One 1G or 10G on-board interface (Internal management network)	Two 1G or 10G on-board interfaces (Internal management network)
	One 1G or 10G interface (OAM)	Two 1G or 10G interfaces (OAM)
	One optional 1G or 10G interface (Infrastructure network)	Two optional 1G or 10G interfaces (Infrastructure network)
	📝 **Note:** The controller-0 and controller-1 port configurations must be identical.	
Compute Node	One 1G or 10G on-board interface (Internal management network)	Two 1G or 10G on-board interfaces (Internal management network)
	One 1G (Intel i350), 10G (Intel 82599 or Mellanox CX3), or 40G (Mellanox CX3) interface per additional Provider Network	Two 1G (Intel i350), 10G (Intel 82599 or Mellanox CX3), or 40G (Mellanox CX3) interfaces per additional Provider Network
	One optional 1G or 10 G interface (Infrastructure network)	Two optional 1G or 10 G interfaces (Infrastructure network)
Storage Node	One 1Gor 10G on-board interface (Internal management network)	Two 1G or 10G on-board interfaces (Internal management network)
	One optional 1G or 10 G interface (Infrastructure network)	Two optional 1G or 10 G interfaces (Infrastructure network)

In the basic scenario, a single Ethernet port is used to attach the host to each of the networks. In the LAG scenario, two Ethernet ports are used for each connection.

Board Management Modules

For out-of-band reset and power-on/power-off capabilities, HP360 or HP380 servers equipped with HP iLO (Integrated Lights Out) board management modules are required. Each module must be connected using port-based VLAN to a switch that has access to the internal management network.

USB Interface

For the controller, a USB interface is required for backup and restore operations, and for software installation if a DVD is not available.

The Controller Configuration Script

The config_controller script presents a series of prompts for initial configuration of the HP Helion OpenStack Carrier Grade system.

The script is used to configure the first controller in the HP Helion OpenStack Carrier Grade cluster as **controller-0** (see *Configuring Controller-0* on page 21). The prompts are grouped by configuration area. Details for each area are described in the following tables. Review them carefully before committing configuration changes to the controller. For configuration planning information, see the *HP Helion OpenStack Carrier Grade System Engineering Guidelines*.

📝 **Note:**

> In many cases, you can accept the default values. Prompts requiring special attention are marked with an asterisk (*).

The configuration is applied only after all options have been specified. You can safely abort the configuration process at any time by pressing the **Q** key.

Prompt	Comment
Is the current date and time correct? [y/n]	The current date and time, using the UTC time zone. Provide the correct UTC time if required.
	The controller periodically synchronizes the local system date and time with reference time servers configured later in the script. However, if the current local time is not within about 15 minutes of the reference UTC time, the controller does not make the synchronization.
Storage:	
Cinder storage backend [lvm]*	The storage resource type for VMs and VM data.
	⚠ **Caution:**
	The Cinder storage type cannot be changed after the system is installed.
	lvm
	Provides a small-scale storage solution using LVM/ iSCSI shares on the controller node. Note that this option does not use or support storage nodes in the HP Helion OpenStack Carrier Grade cluster.
	ceph
	Provides a large-scale storage solution using a Ceph storage system. This option uses storage nodes in the HP Helion OpenStack Carrier Grade cluster.
	📝 **Note:**
	For Ceph storage, an infrastructure network is required.
	After the system is installed, you can selectively implement local compute node storage for VM data. For more information, see the *HP Helion OpenStack*

Prompt	Comment
	Carrier Grade Administration Guide: Storage Planning.
Database storage in GiB [20]*	The storage allotment for the OpenStack database. As a reference point, a system with six hosts, 40 VMs and 120 tenant networks requires about 9 GiB. For more details, see the *HP Helion OpenStack Carrier Grade Administration Guide: Storage Planning.*
Image storage in GiB [19]:*	The size of the partition to use for image storage. Consider the expected number of images and their storage requirements. A minimum of 10 GiB is recommended. The prompt shows the current available disk space.
Backup storage in GiB [20]*	The storage allotment for backup operations. To ensure enough space for at least one backup, this must be at least 20 GiB larger than the **Image storage** allotment. For details, see the *HP Helion OpenStack Carrier Grade Administration Guide: Storage Planning.*
Volume storage location [0]:	(For LVM storage only) The disk to use for a storage volume. A numbered list of available disks is displayed. Type the number for the disk you want to assign. Note that the primary disk is not included in this list.
Volume storage in GiB [500]:	(For LVM storage only) The storage allotment for all volumes used by the guest instances. The prompt shows the current available disk space.
Management Network:	
Management interface link aggregation [y/N]*	An option to use LAG for the management network.
	If using LAG, you are asked for the name of the bonding interface to be created, and the name of the two physical interfaces to use for bonding. Additional questions about the LAG options are also asked. For details, refer to *Link Aggregation Settings* on page 14.
Management Interface [eth1]	The name of the physical interface to use to connect to the internal management network in non-LAG mode.
Management Interface MTU [1500]	The maximum transmission unit for the internal management network. The default value is 1500.
Management subnet [192.168.204.0/24]	The IPv4 subnet to use for the internal management network. You can safely accept the default value assigned to this internal network. The suggested value belongs to the 16-bit block of private networks specified in RFC 1918. Use the suggested value, or any other 16-bit private address block.

Prompt	Comment
Board Management Control Network:	
Configure board management control network [y/N] *	Select whether to configure a baseboard management network. This option is for use with hosts equipped with HP iLO (Integrated Lights-Out) modules.
Board management control VLAN Identifier []*	The VLAN number designated for board management control traffic on the management network. For more information, see the *HP Helion OpenStack Carrier Grade Administration Guide: Network Planning*.
Board management control interface MTU [1496]	The maximum transmission unit for the board management control network. This must be at least 4 bytes less than the management network MTU. If the management network MTU is greater than 1504, then the board management control MTU default value is 1500. Otherwise, the default value is 1496.
Board management control subnet [192.168.203.0/24]	The IPv4 subnet to use for the board management control network. You can safely accept the default value assigned to this internal network. The suggested value belongs to the 16-bit block of private networks specified in RFC 1918. Use the suggested value, or any other 16-bit private address block.
Infrastructure Network:	
Configure an infrastructure interface [y/N]*	Select whether to configure an Ethernet interface for access to an infrastructure network. For a system using Ceph storage, an infrastructure network is required.
Infrastructure interface link aggregation [y/N]*	An option to use LAG for the infrastructure network. If using LAG, you are asked for the name of the bonding interface to be created, and the name of the two physical interfaces to use for bonding. Additional questions about the LAG options are also asked. For details, refer to *Link Aggregation Settings* on page 14.
Infrastructure interface []*	The name of the physical interface to use to connect to the infrastructure network in non-LAG mode. You can use a dedicated interface, or share the interface used for the management or OAM network. For a shared interface, a VLAN ID is required.
Configure an infrastructure VLAN [y/N]	A VLAN ID for use on a shared network. For a shared interface, the VLAN ID is required. For a dedicated interface, a VLAN ID can optionally be used to tag traffic for routing purposes.
Infrastructure VLAN identifier []	The VLAN ID, if VLAN tagging is used.

Prompt	Comment
Infrastructure Interface MTU [1500]	The maximum transmission unit for the infrastructure network. The default value is 1500.
Infrastructure subnet [192.168.205.0/24]	The IPv4 subnet to use for the infrastructure network. You can safely accept the default value assigned to this internal network. The suggested value belongs to the 16-bit block of private networks specified in RFC 1918. Use the suggested value, or any other 16-bit private address block.
External OAM Network:	
External OAM interface Link aggregation [y/N]*	An option to use LAG for the external OAM network.
	If using LAG, you are asked for the name of the bonding interface to be created, and the name of the two physical interfaces to use for bonding. Additional questions about the LAG options are also asked. For details, refer to *Link Aggregation Settings* on page 14.
External OAM interface [eth0]*	The name of the physical interface to use to connect to the OAM network in non-LAG mode. You can use a dedicated interface, or share the interface used for the management or infrastructure network. For a shared interface, a VLAN ID is required.
Configure an External OAM VLAN [y/N]	A VLAN ID for use on a shared network. For a shared interface, the VLAN ID is required. For a dedicated interface, a VLAN ID can optionally be used to tag traffic for routing purposes.
External OAM VLAN identifier []	The VLAN ID, if VLAN tagging is used.
External OAM interface MTU [1500]	The maximum transmission unit for the OAM network. The default value is 1500.
External OAM subnet [10.10.10.0/24]*	The IPv4 subnet to use for the OAM network. Note that the default value provided by the script is probably not appropriate. Provide a valid subnet value as per your OAM Network's IPv4 address plan.
External OAM gateway address [10.10.10.1]*	The IPv4 address for the OAM subnet's default gateway. You must provide a value in accordance with your OAM network address plan.
External OAM floating address [10.10.10.2]*	The floating IP address for the OAM network. This is the address used to access the web administration interface or the controller console. You must provide a value in accordance with your OAM network address plan.

Prompt	Comment
External OAM address for first controller node [10.10.10.3]*	The physical IPv4 address to be assigned to the first controller on the OAM network. You must provide a value in accordance with your OAM network address plan.
External OAM address for second controller node [10.10.10.4]*	The physical IPv4 address to be assigned to the second controller on the OAM network. You must provide a value in accordance with your OAM network address plan.
Domain Name System (DNS):	
Nameserver 1 [8.8.8.8] Nameserver 2 [8.8.4.4] Nameserver 3 []	The IPv4 addresses of up to three DNS servers. The default values are addresses of public DNS servers available from Google. To continue without configuring DNS servers, press the **C** key.
Network Time Protocol (NTP):	
NTP server 1 [0.pool.ntp.org] NTP server 2 [1.pool.ntp.org] NTP server 3 [2.pool.ntp.org]	The IPv4 addresses of up to three NTP servers used to synchronize the HP Helion OpenStack Carreir Grade cluster. The default values are addresses of public NTP servers available from the *NTP Pool Project*.
	The use of an NTP server is recommended. If no NTP server is available, the controller clock is used to synchronize the cluster. If necessary, you can continue without configuring NTP servers by pressing the **C** key.
Licensing:	
License File [/home/wrsroot/license.lic]	The path to a valid license file. The file name may differ from the default.
Security:	
Use secure (https) external REST APIs [N/y]	An option to enable secure access for external REST APIs.
	📝 **Note:** This feature is not currently implemented. Press **Enter** to continue.
Authentication:	
Create admin user password	The password for the cloud **admin** user. This account is used to log into the web administration interface.
Repeat admin user password	Password confirmation.

Link Aggregation Settings

The HP Helion OpenStack Carrier Grade supports several link aggregation (LAG) operational modes.

If you select link aggregation (also known as Aggregate Ethernet) when configuring the management, infrastructure, or OAM networks, you can choose from the following operational modes. For more information, refer to the Linux kernel *Ethernet Bonding Driver* documentation.

Table 4: Supported Link Aggregation Operational Modes

Mode	Description	Supported Interface Types
Active-backup (default value)	Provides fault tolerance. Only one slave interface at a time is available. The backup slave interface becomes active only when the active slave interface fails.	OAM, infrastructure, and data interfaces (compute nodes)
Balanced XOR	Provides aggregated bandwidth and fault tolerance. The same slave interface is used for each destination MAC address. This mode uses the default transmit policy, where the target slave interface is determined by calculating the source MAC address XOR'd with the destination MAC address, modulo 2. You can modify the transmit policy using the xmit-hash-policy option. For details, see *Table 5: xmit-hash-policy Options* on page 14.	OAM, infrastructure, and data interfaces (compute nodes)
802.3ad	Provides aggregated bandwidth and fault tolerance. Implements dynamic link aggregation as per the IEEE 802.3ad specification. You can modify the transmit policy using the xmit-hash-policy option. For details, see *Table 5: xmit-hash-policy Options* on page 14. In order to support booting over an aggregated management interface, the far-end switch ports must be configured in passive LACP mode.	Internal management network

Table 5: xmit-hash-policy Options

Option	Description	Supported Interface Types
Layer 2 (default value)	Hashes on source and destination MAC addresses.	OAM, internal management, infrastructure, and data interfaces (compute nodes)
Layer 2 + 3	Hashes on source and destination MAC addresses, and on source and destination IP addresses.	OAM, internal management, and infrastructure
Layer 3 + 4	Hashes on source and destination IP addresses, and on source and destination ports.	OAM, internal management, and infrastructure

About Login Accounts

During HP Helion OpenStack Carrier Grade installation and administration, you must log in with different accounts at different times.

Two accounts are provided with HP Helion OpenStack Carrier Grade:

wrsroot

> A Linux account, used for initial access and for administration of Linux resources. The default password is **wrsroot**. The first time you log in, you are required to change the password.
>
> You can use this account to perform actions as a regular Linux user, or as the **root** user if elevated privileges are required. To run a command as the **root** user, preface it with the sudo command; for example:
>
> ```
> $ sudo config-controller
> ```
>
> If a password is requested for the **sudo** command, provide the password for the **wrsroot** account.

admin

> An OpenStack Keystone account, used for administration of OpenStack resources. The password for this account is set up at the end of the controller configuration script during initial system configuration.
>
> You can use this account to manage OpenStack resources from the web administration interface or the command-line interface.
>
> - To use the web administration interface, log in from a browser using the **admin** account and password.
> - To use the CLI, log in to the active controller as **wrsroot** and then use the source command, as follows:
>
> ```
> $ source /etc/nova/openrc
> ~(keystone_admin)$
> ```
>
> This sets up the environment for the Keystone **admin** user, including the username and password required for authentication to OpenStack services.

For more information about Linux user accounts, see the *HP Helion OpenStack Carrier Grade Administration Guide: Linux User Accounts*. For more about OpenStack accounts managed through the Keystone service, refer to the documentation for the OpenStack project.

Chapter

2

HP Helion OpenStack Carrier Grade Software Installation

Topics:

Installing the HP Helion OpenStack Carrier Grade involves initializing and configuring a controller node, and then using the controller node to initialize and configure other hosts.

To start, you must *initialize* a single host using an ISO image from an external source, such as a USB flash drive or a DVD. Initialization installs an operating system on the host's disk drive, and automatically boots the host from the drive.

Then you must *configure* the host as a controller using a command-line script. The configured host becomes **controller-0**.

📝 **Note:**

> For the configuration to run successfully, the management interface on **controller-0** must be connected and operational.

You use **controller-0** to initialize and configure the remaining hosts (compute and storage nodes, as well as the second controller node). Both a web administration interface and a command-line interface (CLI) are available for this purpose. The instructions in this section assume you are using the web administration interface. For CLI instructions, see *Command-line Installation* on page 32.

Each host after the initial **controller-0** installation must be booted over the management network to install an operating system, and then booted from the disk drive for further configuration. the recommended order of installation is as follows:

1. second controller node
2. storage nodes (if the system is configured to use Ceph storage)
3. compute nodes

📝 **Note:**

> To ensure you can correctly identify hosts as you install them, power on and configure each new host one at a time.

To prevent a host from repeatedly booting over the network, some means of redirecting the boot device to the hard disk is needed. Normally you can arrange this by setting the boot order for the host (see *Boot sequence considerations* on page 19). Terminal-server access to the hosts may be required to adjust the BIOS or UEFI boot settings

After the hosts are configured, you can unlock them to make them operational.

To unlock a compute node, you must do the following, in order:

1. Define at least one provider network. You must do this before you can configure the compute node data interfaces. For details, see *Configuring Provider Networks* on page 45.
2. Configure the data interfaces. For details, see *Network Interface Provisioning* on page 45.
3. Optionally, configure the infrastructure interface. This is required only if an infrastructure network is defined. For details, see *Network Interface Provisioning* on page 45.

To unlock a storage node, you must do the following:

1. Configure the storage volumes. For details, see *Creating Storage Volumes* on page 60.
2. Optionally, configure the infrastructure interface. This is required only if an infrastructure network is defined. For details, see *Network Interface Provisioning* on page 45.

Preparing a Bootable USB Flash Drive

You can prepare a bootable USB flash drive from the boot image file included on the product DVD.

The product DVD includes an image file (`.iso` extension), which is used to create bootable media (for example, a bootable DVD or USB flash drive).

For convenience, instructions are provided for creating a bootable USB flash drive. If you prefer, you can prepare and use a bootable DVD or other bootable media, using any suitable open-source or commercially available software.

Preparing a Bootable USB Flash Drive on a Linux System

On a Linux system, you can use built-in utilities to prepare a bootable USB flash drive.

1. Copy the ISO image from the DVD to a Linux workstation.

    This example assumes that the copied image file is `/tmp/TS-host-installer-1.0.iso`

2. Identify the USB Linux device on which to write the image.

    You can do this by monitoring the system log and then attaching the USB flash drive.

    ```
    $ tail -f /var/log/syslog
    ```

    Attach the USB flash drive, and then use the displayed log to identify the assigned device.

3. Unmount all partitions on the USB flash drive.

    a) Identify the mount points for the partitions.

        In the following command, *usb_device* represents the actual device identifier (for example, `/dev/scd`).

        ```
        $ sudo mount | grep usb_device
        /dev/scd1 on /media/sdc type vfat (rw,relatime,...)
        ```

        In this example, only one partition, `/dev/sdc1`, is identified. Its mount point is `/media/sdc`.

    b) Unmount the partitions by referencing the mount points.

        In the following command, *mount_point* represents the actual mount point (for example, */media/sdc*).

        ```
        $ sudo umount mount_point
        ```

        Repeat this command to unmount any additional partitions that may have been identified above.

4. Write the ISO image to the USB flash drive.

    ⚠ **Caution:**

    The following command overwrites any existing content on the USB flash drive.

    ```
    $ sudo dd if=/tmp/TS-host-installer-1.0.iso of=/dev/sdc bs=1M; sync
    1825+0 records in
    1825+0 records out
    1913651200 bytes (1.9 GB) copied, 499.681 s, 3.8 MB/s
    ```

    You can use other block sizes with the bs option, or omit it entirely and let the Linux kernel determine an optimal size.

The USB flash drive is ready now. It can be safely removed from the workstation.

Preparing a Bootable USB Flash Drive on a Windows System

On a Windows system, you can prepare a bootable USB flash drive using a variety of downloadable tools.

The selection of tools varies depending on your Windows version.

1. Download and install a tool designed for your version of Windows.

   Use a tool that can burn media from an ISO 9660 image.

2. Follow the instructions provided with the tool.

Boot sequence considerations

During HP Helion OpenStack Carrier Grade software installation, the hosts must boot from different devices at different times. In some cases, you may need to adjust the boot order.

The first controller node must be booted initially from a removable storage device to install an operating system. The host then reboots from the hard drive.

Each remaining host must be booted initially from the network using PXE to install an operating system. The host then reboots from the hard drive.

To facilitate this process, ensure that the hard drive does not already contain a bootable operating system, and set the following boot order in the BIOS.

1. removable storage device (USB flash drive or DVD drive)
2. hard drive
3. network (PXE), over an interface connected to the internal management network

For BIOS configuration details, refer to the OEM documentation supplied with the computing node.

> **Note:**
>
> If a host contains a bootable hard drive, either erase the drive beforehand, or ensure that the host is set to boot from the correct source for initial configuration. If necessary, you can change the boot device at boot time by pressing a dedicated key. For more information, refer to the OEM documentation for the computing node.

Initializing Controller-0

You can initialize **controller-0** using the HP Helion OpenStack Carrier Grade bootable ISO image.

Before installing the ISO image, ensure the following:

- The host meets the hardware requirements for a controller. For more information, see *Hardware Requirements* on page 5.
- You have terminal-server access to the host, so that you can monitor messages during initialization.
- The management, OAM, and optional infrastructure networks are planned, set up, and connected.
- All other hosts on the system are powered off.
- You have reviewed the *HP Helion OpenStack Carrier Grade Release Notes* for any additional information pertaining to installation.

1. Power on the host to be configured as **controller-0**.

   > **Note:**
   >
   > To ensure you can correctly identify hosts as you install them, power on and configure each new host one at a time.

2. Configure the host BIOS to boot from the USB flash drive. For details, see *Boot sequence considerations* on page 19.

3. Insert the USB flash drive and boot the host.

   The installer welcome screen appears.

Figure 3: HP Helion OpenStack Carrier Grade Installer Welcome Screen

4. Optional: Select the display device to be used during initialization, and press `Enter`.

1) Serial <personality> Node Install (default)

Use the serial port to display messages. You can monitor the port using the terminal server.

2) Graphics <personality> Node Install

Use the console port in graphics mode to display messages. This selection works with most console displays.

3) Graphics Text <personality> Node Install

Use the console port in text mode to display messages. This is a safe option for nodes that do not support graphics mode.

5. Monitor the initialization until it is complete.

The installer initializes the target hard drive with the HP Helion OpenStack Carrier Grade image. When initialization is complete, a reboot is initiated on the host.

6. Immediately remove the USB flash drive from the host to ensure that the host reboots from the hard drive.

> ⚠ **Caution:**
>
> If the USB flash drive is still attached when the host reboots, then unless the boot sequence has been configured to prevent it, the host will boot from the USB flash drive again instead of the hard drive. For more information, see *Boot sequence considerations* on page 19.

After a few minutes, the host reboots from the hard drive and displays the **GNU GRUB** welcome screen.

After a brief delay, the system boots automatically into the HP Helion OpenStack Carrier Grade image.

7. Log into the host as `wrsroot`, with password `wrsroot`.

> 📝 **Note:**
>
> Typed responses to password prompts are suppressed and do not appear on the display.

The first time you log in as `wrsroot`, you are required to change your password.

```
Changing password for wrsroot.
(current) UNIX Password:
```

Enter the current password (**wrsroot**).

```
New password:
```

Enter a new password for the **wrsroot** account.

```
Retype new password:
```

Enter the new password again to confirm it.

The host is now ready for configuration as **controller-0**.

Configuring Controller-0

You can configure **controller-0** by running a script from the Linux command line.

Before running the configuration script:

- Ensure that **controller-0** has been initialized, as described in *Initializing Controller-0* on page 19.
- Ensure that the management interface on **controller-0** is connected and operational.
- Install system software patches if there are any available.
- Prepare a configuration plan to use as a reference. For details, see the *HP Helion OpenStack Carrier Grade Administration Guide: Storage Planning*.

1. Copy the license file to the controller node.

    a) Connect the controller to the OAM network.

    On the controller, assign the correct OAM network address to the appropriate port.

    ```
    $ sudo ip addr add OAM_IP_address/mask dev port
    $ sudo ip link set port up
    ```

    📝 **Note:**

    To identify the controller-0 port and IP address, refer to your OAM network plan.

    For example:

    ```
    $ sudo ip addr add 10.10.10.3/24 dev eth0
    $ sudo ip link set eth0 up
    ```

    b) Connect a server containing the license file to the OAM network.

    c) Copy the HP Helion OpenStack Carrier Grade license file to `/home/wrsroot/license.lic` on the controller.

    This is the default path offered during controller configuration. If you prefer, you can copy the file to a different path, and specify the path during configuration.

    ```
    $ scp username@sourcehost:sourcepath/license.lic /home/wrsroot/
    license.lic
    ```

2. Install any applicable system software patches.

    For efficient installation, apply patches before starting the configuration process. For details, see the *HP Helion OpenStack Carrier Grade Administration Guide: Managing Software Patches: Installing Patches Locally*.

3. Start the controller configuration script.

```
$ sudo config_controller
HP Helion OpenStack Carrier Grade Configuration
===============================================
Enter Q at any prompt to abort...
```

4. Configure the controller options as requested by the configuration script.

> 📝 **Note:**
>
> The configuration is applied only after all options have been specified. You can safely abort the configuration process at any time by pressing the **Q** key.

The following configuration groups are presented. For detailed information, refer to *The Controller Configuration Script* on page 9.

Table 6: Controller Configuration Groups

Configuration Group	Comments
System date and time	The date and time as read from the local system clock.
Storage	The disk space allocations for database, image, and volume storage. For details, see the *HP Helion OpenStack Carrier Grade Administration Guide*.
Management network	The configuration associated with the internal management network.
Board Management Control Network	The configuration associated with the board management control network.
Infrastructure network	The configuration associated with the infrastructure network.
External OAM network	The configuration associated with the OAM Network.
Domain Name System (DNS)	The IP addresses to use for DNS servers. The servers must be accessible from the OAM Network.
Network Time Protocol (NTP)	The IP addresses to use for NTP servers. The servers must be accessible from the OAM Network.
Licensing	The path to the HP Helion OpenStack Carrier Grade license file.
Authentication	A temporary password for the cloud **admin** account. 📝 **Note:** This is the password for the cloud **admin** account, not the Linux **wrsroot** account.
Apply the configuration settings	This is the final question before the configuration selections are applied. Once you enter `y` to accept the selected options, the installation script commits the configuration settings.

After a few minutes, the message **Configuration was applied** appears.

5. Change to the Keystone **admin** account.

   Use the `source` command to become the Keystone **admin** user.

   ```
   $ source /etc/nova/openrc
   ~(keystone_admin)$
   ```

6. Verify that the HP Helion OpenStack Carrier Grade controller services are running.

   ```
   ~(keystone_admin)$ nova service-list
   +-----------------+-------------+--------+---------+-----------+------
   + ...
   | Binary          | Host        | Zone   | Status  | Maint Mode | State
    | ...
   +-----------------+-------------+--------+---------+-----------+------
   + ...
   | nova-conductor   | controller-0 | int... | enabled | disabled   | up
    | ...
   | nova-cert        | controller-0 | int... | enabled | disabled   | up
    | ...
   | nova-consoleauth | controller-0 | int... | enabled | disabled   | up
    | ...
   | nova-scheduler   | controller-0 | int... | enabled | disabled   | up
    | ...
   +-----------------+-------------+--------+---------+-----------+------
   + ...
   ```

7. Verify that **controller-0** is in the state **unlocked-enabled-available**.

   ```
   ~(keystone_admin)$ system host-list
   +----+-------------+-------------+---------------+-------------
   +--------------+
   | id | hostname    | personality | administrative | operational |
    availability |
   +----+-------------+-------------+---------------+-------------
   +--------------+
   | 1  | controller-0 | controller  | unlocked       | enabled     |
    available    |
   +----+-------------+-------------+---------------+-------------
   +--------------+
   ```

8. Optional: Synchronize the RAID array.

   Normally, the RAID array is already synchronized. If you need to synchronize the RAID array manually, do so now. You may be able to do this by pressing a button on the unit, or using a special key combination on the console keyboard. For details, consult the OEM documentation for the RAID.

9. Using a Web browser, navigate to the OAM floating IP address to verify that the HP Helion OpenStack Carrier Grade web administration interface is available.

   To identify the OAM floating IP address, consult the configuration plan.

   The **HP Helion OpenStack Carrier Grade** login screen appears.

Figure 4: HP Helion OpenStack Carrier Grade login screen

10. Log in using the cloud **admin** account.

The **HP Helion OpenStack Carrier Grade** web administration interface appears.
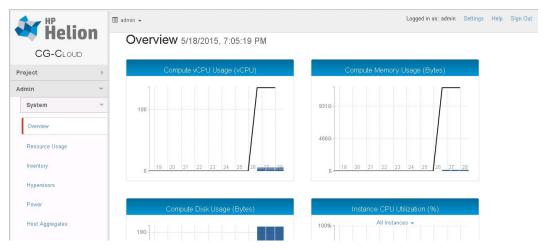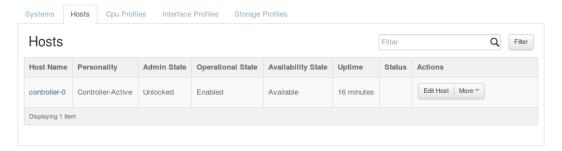
Figure 5: HP Helion OpenStack Carrier Grade web administration interface

11. In the left-hand pane, on the **Admin** tab, click **Inventory**, and then select the **Hosts** tab.

Controller-0 is reported in the hosts inventory list.

The host **controller-0** is now fully operational. It can be used to initialize all other hosts in the HP Helion OpenStack Carrier Grade cluster.

Initializing and Configuring Controller-1

You must assign a host as a second controller to provide redundancy for **controller-0**.

Before initializing a node, ensure that the following conditions are satisfied:

• The node must meet the hardware requirements for the personality to be assigned. For more information, see *Hardware Requirements* on page 5.

• Controller-0 must be installed and operational, as described in *Configuring Controller-0* on page 21.

- The node must be connected to the internal management network using an Ethernet interface configured for PXE boot.
- The node must be configured in the BIOS to boot from the internal management network.

1. Power on the node to be configured as **controller-1**.

   > **Note:**
   >
   > To ensure you can correctly identify hosts as you install them, power on and configure each new node one at a time.

2. Using the web administration interface, assign the node as a controller host.

   a) Select the **Hosts** list.

   On the **Admin** tab, in the **System Panel** section, click **Inventory**, and then select the **Hosts** tab.

   The new node is listed with an empty **Host Name** and **Personality**.

Host Name	Personality	Admin State	Operational State	Availability State	Uptime	Status	Actions
controller-0	Controller-Active	Unlocked	Enabled	Available	17 minutes		Edit Host More ▼
-	-	Locked	Disabled	Offline	0 minutes	-	Edit Host More ▼

   Displaying 2 items

   b) Assign the node's personality.
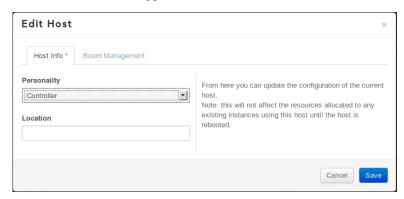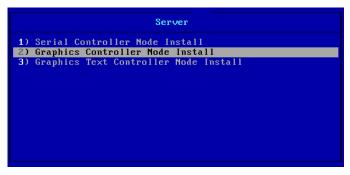
   Click **Edit Host** for the new host.

   The **Edit Host** window appears.

   Edit Host

   Host Info *   Board Management

   Personality

   Controller

   From here you can update the configuration of the current host.
   Note: this will not affect the resources allocated to any existing instances using this host until the host is rebooted.

   Location

   Cancel   Save

   c) Select **Personality** > **Controller**.
   d) Optional: Type a physical **Location** for the node to help identify it.
   e) Click **Save** to initialize and configure the new node.

   The node is restarted automatically, and a display-device menu appears on the node console.

f) Optional: Select the display device to use during initialization.

The personality (**Controller**, **Compute**, or **Storage**) is confirmed in the menu.

1) Serial <personality> Node Install (default)

Use the serial port to display messages. You can monitor the port using the terminal server.

2) Graphics <personality> Node Install

Use the console port in graphics mode to display messages. This selection works with most console displays.

3) Graphics Text <personality> Node Install

Use the console port in text mode to display messages. This is a safe option for nodes that do not support graphics mode.

If you do not change the selection, the default is applied automatically after a few seconds.

g) Wait while the node is configured and rebooted.

After a few minutes, the node is reported as **Locked**, **Disabled**, and **Online** in the **Hosts** list.

⚠ **Caution:**

To ensure a successful installation, wait for the node to be reported as **Locked**, **Disabled**, and **Online**, and ensure that the login prompt appears on the host console. If the process is interrupted prematurely, the host installation can fail.

The time required to configure and reboot **controller-1** depends on the secondary disk partition size. Larger partitions require more time for synchronization with **controller-0**.

The host is now configured with a personality.

3. Unlock the node to make it available for use.

In the **Hosts** list, on the row associated with the node, click **More** > **Unlock Host**.

The node is rebooted, and its **Availability State** is reported as **In-Test**. After a few minutes, it is reported as **Unlocked**, **Enabled**, and **Available**.

Initializing and Configuring Storage Nodes

You can assign a new host as a storage node to provide object storage.

📄 **Note:**

Storage nodes are required only if the system is configured to use Ceph storage. For more information, see *Storage Requirements*.

Before initializing a node, ensure that the following conditions are satisfied:
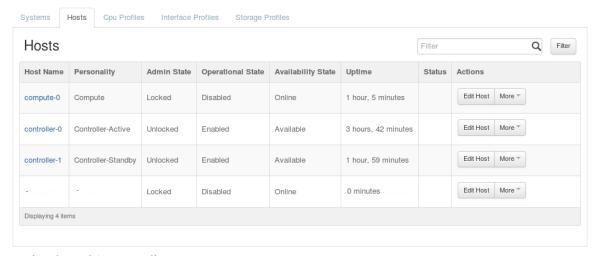
• The node must meet the hardware requirements for the personality to be assigned. For more information, see *Hardware Requirements* on page 5.

- Controller-0 must be installed and operational, as described in *Configuring Controller-0* on page 21.
- The node must be connected to the internal management network using an Ethernet interface configured for PXE boot.
- The node must be configured in the BIOS to boot from the internal management network.

1. Power on the node to be configured as a storage host.

   📄 **Note:**

      To ensure you can correctly identify hosts as you install them, power on and configure each new node one at a time.
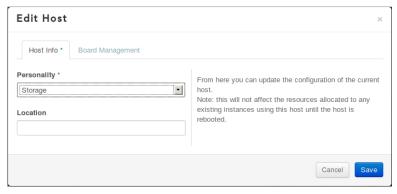
2. Using the web administration interface, assign the node as a storage host.

   a) Select the **Hosts** list.

      The new node is listed with an empty **Host Name** and **Personality**.

   b) Assign the node's personality.

      Click **Edit Host** for the new host.

   c) Select **Personality** > **Storage**.
   d) Optional: Type a physical **Location** for the node to help identify it.
   e) Click **Save** to initialize and configure the new node.

      The node is restarted automatically, and a display-device menu appears on the node console.

f) Optional: Select the display device to use during initialization.

The personality (**Controller**, **Compute**, or **Storage**) is confirmed in the menu.

1) Serial <personality> Node Install (default)

Use the serial port to display messages. You can monitor the port using the terminal server.

2) Graphics <personality> Node Install

Use the console port in graphics mode to display messages. This selection works with most console displays.

3) Graphics Text <personality> Node Install

Use the console port in text mode to display messages. This is a safe option for nodes that do not support graphics mode.

If you do not change the selection, the default is applied automatically after a few seconds.

g) Wait while the node is configured and rebooted.

After a few minutes, the node is reported as **Locked**, **Disabled**, and **Online** in the **Hosts** list.

⚠ **Caution:**

To ensure a successful installation, wait for the node to be reported as **Locked**, **Disabled**, and **Online**, and ensure that the login prompt appears on the host console. If the process is interrupted prematurely, the host installation can fail.

The new host is initialized with an operating system, rebooted, and configured as a storage node. It is automatically assigned the next available consecutive name (**storage-0** or **storage-1**).

After a few minutes, the host is shown as **Locked**, **Disabled**, and **Online** in the **Hosts** list.

3. Configure the host so that it can be unlocked.

Before you can unlock a storage node, you must do the following:

    a) Create storage volumes. For details, see *Creating Storage Volumes* on page 60.

    b) If using LAG to attach to the management network, change the **Interface Type** for the management network interface to **aggregated ethernet** For more information, see *Editing Interface Settings* on page 55.

    c) Configure the interface to the infrastructure network. For details, see *Network Interface Provisioning* on page 45.

4. Unlock the node to make it available for use.

In the **Hosts** list, on the row associated with the node, click **More** > **Unlock Host**.

The node is rebooted, and its **Availability State** is reported as **In-Test**. After a few minutes, it is reported as **Unlocked**, **Enabled**, and **Available**.

> 📝 **Note:**
>
> Ensure that you install two storage nodes, as required by the HP Helion OpenStack Carrier Grade architecture.

Initializing and Configuring Compute Nodes

You can assign a new host as a compute node to support virtual machines.

Before initializing a node, ensure that the following conditions are satisfied:

- The node must meet the hardware requirements for the personality to be assigned. For more information, see *Hardware Requirements* on page 5.
- Controller-0 must be installed and operational, as described in *Configuring Controller-0* on page 21.
- The node must be connected to the internal management network using an Ethernet interface configured for PXE boot.
- The node must be configured in the BIOS to boot from the internal management network.

1. Power on the node to be configured as a compute host.

> 📝 **Note:**
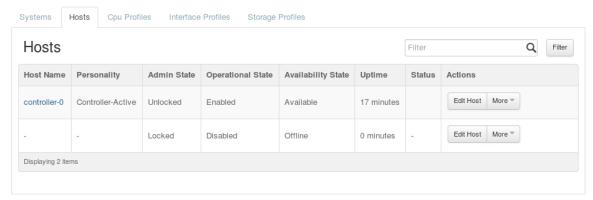>
> To ensure you can correctly identify hosts as you install them, power on and configure each new node one at a time.
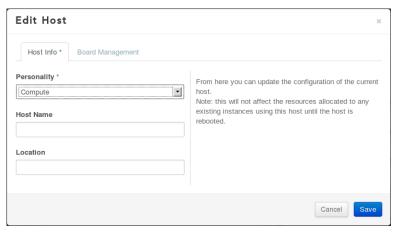
2. Using the web administration interface, assign the node as a compute host.

    a) Select the **Hosts** list.

The new node is listed with an empty **Host Name** and **Personality**.

Systems	Hosts	Cpu Profiles	Interface Profiles	Storage Profiles			

Hosts

Host Name	Personality	Admin State	Operational State	Availability State	Uptime	Status	Actions
controller-0	Controller-Active	Unlocked	Enabled	Available	17 hours, 53 minutes		Edit Host More ▾
controller-1	Controller-Standby	Unlocked	Enabled	Available	16 hours, 35 minutes		Edit Host More ▾
-	-	Locked	Disabled	Offline	0 minutes	-	Edit Host More ▾

Displaying 3 items

    b) Assign the node's personality.

Click **Edit Host** for the new host.
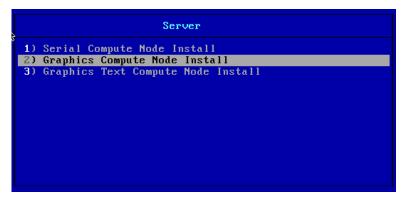
c) Select **Personality** > **Compute**.

d) Provide a **Host Name** (for example, **compute-0**).

e) Optional: Type a physical **Location** for the node to help identify it.

f) Click **Save** to initialize and configure the new node.

The node is restarted automatically, and a display-device menu appears on the node console.

g) Optional: Select the display device to use during initialization.

The personality (**Controller**, **Compute**, or **Storage**) is confirmed in the menu.

1) Serial <personality> Node Install (default)

Use the serial port to display messages. You can monitor the port using the terminal server.

2) Graphics <personality> Node Install

Use the console port in graphics mode to display messages. This selection works with most console displays.

3) Graphics Text <personality> Node Install

Use the console port in text mode to display messages. This is a safe option for nodes that do not support graphics mode.

If you do not change the selection, the default is applied automatically after a few seconds.

h) Wait while the node is configured and rebooted.

After a few minutes, the node is reported as **Locked**, **Disabled**, and **Online** in the **Hosts** list.

⚠ **Caution:**

To ensure a successful installation, wait for the node to be reported as **Locked**, **Disabled**, and **Online**, and ensure that the login prompt appears on the host console. If the process is interrupted prematurely, the host installation can fail.
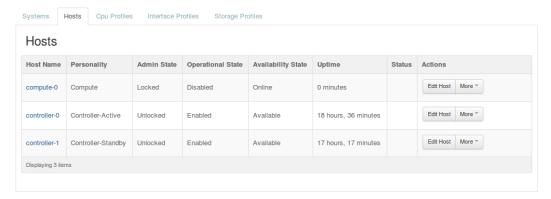
The new host is initialized with an operating system, rebooted, and configured as a compute node.

After a few minutes, the host is shown as **Locked**, **Disabled**, and **Online** in the **Hosts** list.

| Systems | Hosts | Cpu Profiles | Interface Profiles | Storage Profiles |

Hosts

Host Name	Personality	Admin State	Operational State	Availability State	Uptime	Status	Actions
compute-0	Compute	Locked	Disabled	Online	0 minutes		Edit Host More ▾
controller-0	Controller-Active	Unlocked	Enabled	Available	18 hours, 36 minutes		Edit Host More ▾
controller-1	Controller-Standby	Unlocked	Enabled	Available	17 hours, 17 minutes		Edit Host More ▾

Displaying 3 items

3. Configure the host so that it can be unlocked.

   Before you can unlock a compute node, you must do the following:

   a) Configure provider networks. This is required before you can define data interfaces on the compute node. For details, see *Configuring Provider Networks* on page 45.

   b) Create data interfaces on the host. For details, see *Network Interface Provisioning* on page 45.

   c) If using LAG to attach to the management network, change the **Interface Type** for the management network interface to **aggregated ethernet** For more information, see *Editing Interface Settings* on page 55.

   d) If an infrastructure network is in use, create an interface to the infrastructure network. For details, see *Network Interface Provisioning* on page 45.

4. Unlock the node to make it available for use.

   In the **Hosts** list, on the row associated with the node, click **More** > **Unlock Host**.

   The node is rebooted, and its **Availability State** is reported as **In-Test**. After a few minutes, it is reported as **Unlocked**, **Enabled**, and **Available**.

Chapter

3

Command-line Installation

Topics:

- *Initializing and Configuring Controller-1 Using the CLI*
- *Initializing and Configuring Storage Nodes Using the CLI*
- *Initializing and Configuring Compute Nodes Using the CLI*
- *Configuring a Host for Board Management Using the CLI*

After initializing and configuring **controller-0**, you can add and configure the remaining hosts using the command-line interface (CLI).

Controller-0 provides both a web administration interface and a command-line interface for completing the HP Helion OpenStack Carrier Grade installation. To use the web administration interface, see *HP Helion OpenStack Carrier Grade Software Installation* on page 16.

For information on initializing and configuring **controller-0**, see *HP Helion OpenStack Carrier Grade Software Installation* on page 16.

Initializing and Configuring Controller-1 Using the CLI

You can initialize and configure a redundant controller (**controller-1**) using the **controller-0** command-line interface.

Initialize and configuring **controller-1** involves:

- booting a new host over the internal management network using PXE
- configuring the host as a controller using **controller-0**, which prepares the host's hard drive and then reboots it automatically from the drive
- moving **controller-1** into an enabled operational state

Before initializing a node, ensure that the following conditions are satisfied:

- The node must meet the hardware requirements for the personality to be assigned. For more information, see *Hardware Requirements* on page 5.
- Controller-0 must be installed and operational, as described in *Configuring Controller-0* on page 21.
- The node must be connected to the internal management network using an Ethernet interface configured for PXE boot.
- The node must be configured in the BIOS to boot from the internal management network.

1. Boot the new node using PXE.

With **controller-0** running, start the node.

The node boots from the network.

```
                    Communication Server

  Waiting for this node to be configured.

  Please configure the personality for this node from the
  controller node in order to proceed.
```

2. Log in to the active controller as the Keystone **admin** user.

```
$ source /etc/nova/openrc
```

3. On the **controller-0** console, verify the status of the host.

```
~(keystone_admin)$ system host-list
+----+-------------+-------------+----------------+-------------
+--------------+
| id | hostname    | personality | administrative | operational |
 availability |
+----+-------------+-------------+----------------+-------------
+--------------+
| 1  | controller-0 | controller  | unlocked       | enabled     |
 available    |
| 2  | None        | None        | locked         | disabled    | offline
     |
+----+-------------+-------------+----------------+-------------
+--------------+
```

The host is reported as id 2, availability offline, with no hostname or personality.

4. On the **controller-0** console, set the personality of the host to be a controller.

```
~(keystone_admin)$ system host-update 2 personality=controller
+----------------+------------------------------------+
| Property       | Value                              |
+----------------+------------------------------------+
| administrative | locked                             |
| availability   | offline                            |
| created_at     | 2014-01-06T15:54:40.313688+00:00   |
| hostname       | controller-1                       |
| id             | 2                                  |
| invProvision   | None                               |
| location       | {}                                 |
| mgmt_ip        | 192.168.204.4                      |
| mgmt_mac       | 08:00:27:1f:5e:e4                  |
| operational    | disabled                           |
| personality    | controller                         |
| serialId       | None                               |
| updated_at     | None                               |
| uuid           | 4e83bc2f-57d4-4508-9550-564d74dc32d4 |
+----------------+------------------------------------+
```

Controller-0 configures the required parameters for **controller-1** and displays them as illustrated above. **Controller-1** is still reported as offline, since the HP Helion OpenStack Carrier Grade software has yet to be installed in its hard drive.

Controller-0 automatically pushes the HP Helion OpenStack Carrier Grade installer image over the internal management network for the host to boot. The console of the host displays the HP Helion OpenStack Carrier Grade welcome screen.

5. Optional: On the **controller-1** console, select the installation mode.

1) Serial <personality> Node Install (default)

Use the serial port to display messages. You can monitor the port using the terminal server.

2) Graphics <personality> Node Install

Use the console port in graphics mode to display messages. This selection works with most console displays.

3) Graphics Text <personality> Node Install

Use the console port in text mode to display messages. This is a safe option for nodes that do not support graphics mode.

📝 **Note:**

If you do not change the selection, the default is applied automatically after a few seconds.

The installer initializes the target hard drive with the HP Helion OpenStack Carrier Grade image. The time required to configure and reboot **controller-1** depends on the secondary disk partition size. Larger partitions require more time for synchronization with **controller-0**.

6. Wait for **controller-1** to reboot.

> 📝 **Note:**
>
> It may be necessary to reconfigure the system's BIOS or UEFI manually to force the host to boot from the hard drive.

The host boots from the hard drive into the HP Helion OpenStack Carrier Grade image and displays the GNU GRUB welcome screen.

After a brief delay, the system boots automatically into the HP Helion OpenStack Carrier Grade image, providing you with a login prompt.

7. On the **controller-0** console, verify the status of the host.

```
~(keystone_admin)$ system host-list
+----+-------------+-------------+---------------+-------------
+--------------+
| id | hostname    | personality | administrative | operational |
 availability |
+----+-------------+-------------+---------------+-------------
+--------------+
| 1  | controller-0 | controller  | unlocked       | enabled     |
 available    |
| 2  | controller-1 | controller  | locked         | disabled    | offline
      |
+----+-------------+-------------+---------------+-------------
+--------------+
```

The host is still offline, but it is now reported as a controller node with name **controller-1**, in the **locked** administrative state.

8. On the **controller-0** console, unlock **controller-1**.

```
~(keystone_admin)$ system host-unlock controller-1
+----------------+------------------------------------+
| Property       | Value                              |
+----------------+------------------------------------+
| administrative | unlocked                           |
| availability   | offline                            |
| created_at     | 2014-01-06T15:54:40.313688+00:00   |
| hostname       | controller-1                       |
| id             | 2                                  |
| invProvision   | provisioned                        |
| location       | {}                                 |
| mgmt_ip        | 192.168.204.4                      |
| mgmt_mac       | 08:00:27:1f:5e:e4                  |
| operational    | disabled                           |
| personality    | controller                         |
| serialId       | None                               |
| updated_at     | 2014-01-06T17:07:10.987257+00:00   |
```

```
| uuid           | 4e83bc2f-57d4-4508-9550-564d74dc32d4 |
+---------------+--------------------------------------+
```

controller-1 moves into the **intest** availability state, and then into the **available** state. This may take several minutes.

a) On the **controller-0** console, verify that **controller-1** is in the **intest** availability state.

```
~(keystone_admin)$ system host-list
+----+-------------+-------------+---------------+-------------
+--------------+
| id | hostname    | personality | administrative | operational |
 availability |
+----+-------------+-------------+---------------+-------------
+--------------+
| 1  | controller-0 | controller  | unlocked       | enabled     |
 available    |
| 2  | controller-1 | controller  | unlocked       | disabled    |
 intest       |
+----+-------------+-------------+---------------+-------------
+--------------+
```

Controller-1 moves into the **intest** availability state within 30 seconds following the unlocking command.

b) On the **controller-0** console, verify that **controller-1** moves to the **available** state.

```
~(keystone_admin)$ system host-list
+----+-------------+-------------+---------------+-------------
+--------------+
| id | hostname    | personality | administrative | operational |
 availability |
+----+-------------+-------------+---------------+-------------
+--------------+
| 1  | controller-0 | controller  | unlocked       | enabled     |
 available    |
| 2  | controller-1 | controller  | unlocked       | enabled     |
 available    |
+----+-------------+-------------+---------------+-------------
+--------------+
```

Controller-1 moves into the **available** state within the 2 to 3 minutes following the unlock command.

Controller-1 is enabled. It works with **controller-0** to form a single high-availability cluster.

Initializing and Configuring Storage Nodes Using the CLI

You can use the **controller-0** command-line interface to set up storage nodes to provide object storage.

Installing the HP Helion OpenStack Carrier Grade software on the storage nodes is similar to installing the software on the **controller-1** host, described in detail in *Initializing and Configuring Controller-1 Using the CLI* on page 33. The differences are as follows:

- assigning the personality and name of the host
- configuring the infrastructure interface

This section uses the **storage-0** host as the installation target. Except where noted, all commands must be executed from the console of **controller-0**.

This procedure requires **controller-0** and **controller-1** to be already operational, as described in *HP Helion OpenStack Carrier Grade Software Installation* on page 16 and *Initializing and Configuring Controller-1 Using the CLI* on page 33.

1. Boot the new node using PXE.

With **controller-0** running, start the node.

The node boots from the network.

```
                   Communication Server

 Waiting for this node to be configured.

 Please configure the personality for this node from the
 controller node in order to proceed.
```

2. Log in to the active controller as the Keystone **admin** user.

```
$ source /etc/nova/openrc
```

3. Verify the status of the host.

```
~(keystone_admin)$ system host-list
+----+-------------+------------+---------------+-------------
+--------------+
| id | hostname    | personality | administrative | operational |
 availability |
+----+-------------+------------+---------------+-------------
+--------------+
| 1  | controller-0 | controller  | unlocked       | enabled     |
 available    |
| 2  | controller-1 | controller  | unlocked       | enabled     |
 available    |
| 3  | compute-0    | compute     | unlocked       | enabled     |
 available    |
| 4  | None         | None        | locked         | disabled    | offline
      |
+----+-------------+------------+---------------+-------------
+--------------+
```

The host is reported as host number 4, operating offline, with no host name or personality.

4. Set up the host to have the host name **storage-0**, and the personality of a storage node.

```
~(keystone_admin)$ system host-update 4 hostname=storage-0
 personality=storage
+---------------+------------------------------------+
| Property      | Value                              |
+---------------+------------------------------------+
| administrative | locked                            |
| availability  | offline                            |
| created_at    | 2014-06-19T18:22:09.561079+00:00   |
| hostname      | storage-0                          |
| id            | 4                                  |
| invProvision  | None                               |
| location      | {}                                 |
| mgmt_ip       | 192.168.204.5                      |
| mgmt_mac      | 08:00:27:dc:b8:4b                  |
| operational   | disabled                           |
| personality   | storage                            |
| serialId      | None                               |
| updated_at    | None                               |
```

```
| uuid            | eb9fffd7-c859-419e-951b-30950dd8505c |
+----------------+--------------------------------------+
```

Controller-0 configures the required parameters for **storage-0** and displays them as illustrated above. Note that **storage-0** is still offline since the HP Helion OpenStack Carrier Grade software has yet to be installed in its hard drive.

Additionally, **controller-0** automatically pushes the HP Helion OpenStack Carrier Grade installer image over the internal management network for the host to boot.

5. On the **storage-0** console, select the installation mode.

   1) Serial <personality> Node Install (default)

   Use the serial port to display messages. You can monitor the port using the terminal server.

   2) Graphics <personality> Node Install

   Use the console port in graphics mode to display messages. This selection works with most console displays.

   3) Graphics Text <personality> Node Install

   Use the console port in text mode to display messages. This is a safe option for nodes that do not support graphics mode.

   The installer initializes the target hard drive with the HP Helion OpenStack Carrier Grade image. This step may take several minutes.

6. Wait for **storage-0** to reboot.

   📝 **Note:**

   It may be necessary to reconfigure the system's BIOS or UEFI manually to force the host to boot from the hard drive.

   The host boots from the hard drive into the HP Helion OpenStack Carrier Grade image and displays the GNU GRUB welcome screen.

   After a brief delay, the system boots automatically into the HP Helion OpenStack Carrier Grade image, providing you with a login prompt.

7. Verify the status of the host.

```
~(keystone_admin)$ system host-list
+----+-------------+------------+---------------+-------------
+-------------+
| id | hostname    | personality | administrative | operational |
 availability |
+----+-------------+------------+---------------+-------------
+-------------+
| 1  | controller-0 | controller  | unlocked       | enabled     |
 available    |
| 2  | controller-1 | controller  | unlocked       | enabled     |
 available    |
| 3  | compute-0    | compute     | unlocked       | enabled     |
 available    |
| 3  | storage-0    | storage     | locked         | disabled    | offline
    |
+----+-------------+------------+---------------+-------------
+-------------+
```

The host is still offline, but it is now reported as a storage node with name **storage-0**, in the **locked** administrative state.

8. Attach the infrastructure interface.

   For more information, see *Network Interface Provisioning Using the CLI* on page 56.

9. Unlock the **storage-0** host.

```
~(keystone_admin)$ system host-unlock storage-0
+---------------+------------------------------------+
| Property      | Value                              |
+---------------+------------------------------------+
| administrative | unlocked                          |
| availability  | offline                            |
| created_at    | 2014-06-19T18:22:09.561079+00:00   |
| hostname      | storage-0                          |
| id            | 4                                  |
| invProvision  | provisioned                        |
| location      | {}                                 |
| mgmt_ip       | 192.168.204.5                      |
| mgmt_mac      | 08:00:27:dc:b8:4b                  |
| operational   | disabled                           |
| personality   | storage                            |
| serialId      | None                               |
| updated_at    | 2014-06-19T19:10:21.622719+00:00   |
| uuid          | eb9fffd7-c859-419e-951b-30950dd8505c |
+---------------+------------------------------------+
```

The unlocking operation moves **storage-0** into the intermediate **in-test** availability state first, and then into the final **available** state.

> 📝 **Note:**
>
> The unlock operation will fail if the storage volumes (and the infrastructure interface, if an infrastructure network is present) have not been configured beforehand.

10. Verify that the **storage-0** host is operational.

```
~(keystone_admin)$ system host-list
+----+-------------+------------+---------------+-------------
+--------------+
| id | hostname    | personality | administrative | operational |
 availability |
+----+-------------+------------+---------------+-------------
+--------------+
| 1  | controller-0 | controller | unlocked       | enabled     |
 available    |
| 2  | controller-1 | controller | unlocked       | enabled     |
 available    |
| 3  | compute-0   | compute     | unlocked       | enabled     |
 available    |
| 4  | storage-0   | compute     | unlocked       | enabled     |
 available    |
+----+-------------+------------+---------------+-------------
+--------------+
```

Storage-0 moves into the **available** state within a few minutes following the unlock command.

Storage-0 is now operational.

Initializing and Configuring Compute Nodes Using the CLI

You can use the **controller-0** command-line interface to set up compute nodes in order to support virtual machines.

Installing the HP Helion OpenStack Carrier Grade software on the compute nodes is similar to installing the software on the **controller-1** host, described in detail in *Initializing and Configuring Controller-1 Using the CLI* on page 33. The differences are as follows:

• assigning the personality and name of the host

- configuring the data interfaces

This section uses the **compute-0** host as the installation target. Except where noted, all the commands must be executed from the console of **controller-0**.

This procedure requires the **controller-0** to be already operational, as described in *Configuring Controller-0* on page 21.

1. Boot the new node using PXE.

   With **controller-0** running, start the node.

   The node boots from the network.

   ```
                     Communication Server


    Waiting for this node to be configured.

    Please configure the personality for this node from the
    controller node in order to proceed.
   ```

2. Log in to the active controller as the Keystone **admin** user.

   ```
   $ source /etc/nova/openrc
   ```

3. Verify the status of the host.

   ```
   ~(keystone_admin)$ system host-list
   +----+-------------+------------+---------------+-------------
   +-------------+
   | id | hostname    | personality | administrative | operational |
    availability |
   +----+-------------+------------+---------------+-------------
   +-------------+
   | 1  | controller-0 | controller  | unlocked       | enabled     |
    available    |
   | 2  | controller-1 | controller  | unlocked       | enabled     |
    available    |
   | 3  | None        | None        | locked         | disabled     | offline
        |
   +----+-------------+------------+---------------+-------------
   +-------------+
   ```

   The host is reported as host number 3, operating offline, with no host name or personality.

4. Set up the host to have the host name **compute-0**, and the personality of a compute node.

   ```
   ~(keystone_admin)$ system host-update 3 hostname=compute-0
    personality=compute
   +---------------+------------------------------------+
   | Property      | Value                              |
   +---------------+------------------------------------+
   | administrative | locked                             |
   | availability   | offline                            |
   | created_at     | 2014-01-06T17:20:09.561079+00:00   |
   | hostname       | compute-0                          |
   | id             | 3                                  |
   | invProvision   | None                               |
   ```

```
| location        | {}                                   |
| mgmt_ip         | 192.168.204.156                      |
| mgmt_mac        | 08:00:27:47:33:e9                    |
| operational     | disabled                             |
| personality     | compute                              |
| serialId        | None                                 |
| updated_at      | None                                 |
| uuid            | 2f5d3522-209c-4bea-9a67-7200bcbaddbc |
+-----------------+--------------------------------------+
```

Controller-0 configures the required parameters for **compute-0** and displays them as illustrated above. Note that **compute-0** is still offline since the HP Helion OpenStack Carrier Grade software has yet to be installed in its hard drive.

Additionally, **controller-0** automatically pushes the HP Helion OpenStack Carrier Grade installer image over the internal management network for the host to boot.

5. On the **compute-0** console, select the installation mode.

   1) Serial <personality> Node Install (default)

   Use the serial port to display messages. You can monitor the port using the terminal server.

   2) Graphics <personality> Node Install

   Use the console port in graphics mode to display messages. This selection works with most console displays.

   3) Graphics Text <personality> Node Install

   Use the console port in text mode to display messages. This is a safe option for nodes that do not support graphics mode.

   The installer initializes the target hard drive with the HP Helion OpenStack Carrier Grade image. This step may take several minutes.

6. Wait for **compute-0** to reboot.

   📝 **Note:**

   It may be necessary to reconfigure the system's BIOS or UEFI manually to force the host to boot from the hard drive.

   The host boots from the hard drive into the HP Helion OpenStack Carrier Grade image and displays the GNU GRUB welcome screen.

   After a brief delay, the system boots automatically into the HP Helion OpenStack Carrier Grade image, providing you with a login prompt.

7. Verify the status of the host.

```
~(keystone_admin)$ system host-list
+----+--------------+-------------+----------------+-------------
+--------------+
| id | hostname     | personality | administrative | operational |
 availability |
+----+--------------+-------------+----------------+-------------
+--------------+
| 1  | controller-0 | controller  | unlocked       | enabled     |
 available    |
| 2  | controller-1 | controller  | unlocked       | enabled     |
 available    |
| 3  | compute-0    | compute     | locked         | disabled    | offline
     |
+----+--------------+-------------+----------------+-------------
+--------------+
```

The host is still offline, but it is now reported as a compute node with name **compute-0**, in the **locked** administrative state.

8. Add data interfaces.

   For more information, see *Network Interface Provisioning Using the CLI* on page 56

9. If the cluster uses an infrastructure network, add an infrastructure interface.

   For more information, see *Network Interface Provisioning Using the CLI* on page 56

10. Unlock the **compute-0** host.

```
~(keystone_admin)$ system host-unlock compute-0
+---------------+------------------------------------+
| Property      | Value                              |
+---------------+------------------------------------+
| administrative | unlocked                          |
| availability  | offline                            |
| created_at    | 2014-01-06T17:20:09.561079+00:00   |
| hostname      | compute-0                          |
| id            | 3                                  |
| invProvision  | provisioned                        |
| location      | {}                                 |
| mgmt_ip       | 192.168.204.156                    |
| mgmt_mac      | 08:00:27:47:33:e9                  |
| operational   | disabled                           |
| personality   | compute                            |
| serialId      | None                               |
| updated_at    | 2014-01-06T17:31:45.829503+00:00   |
| uuid          | 2f5d3522-209c-4bea-9a67-7200bcbaddbc |
+---------------+------------------------------------+
```

The unlocking operation moves **compute-0** into the intermediate **in-test** availability state first, and then into the final **available** state.

📋 **Note:**

   The unlock operation will fail if the data interfaces have not been configured beforehand.

11. Verify that the **compute-0** host is operational.

```
~(keystone_admin)$ system host-list
+----+-------------+-------------+---------------+-------------
+--------------+
| id | hostname    | personality | administrative | operational |
 availability |
+----+-------------+-------------+---------------+-------------
+--------------+
| 1  | controller-0 | controller  | unlocked       | enabled     |
 available    |
| 2  | controller-1 | controller  | unlocked       | enabled     |
 available    |
| 3  | compute-0    | compute     | unlocked       | enabled     |
 available    |
+----+-------------+-------------+---------------+-------------
+--------------+
```

Compute-0 moves into the **available** state within a few minutes following the unlock command.

Compute-0 is now operational and ready to host new virtual machines.

Configuring a Host for Board Management Using the CLI

To use board management on a host, you must provision the host with information about the attached board management module. If you prefer, you can do this from the command-line interface.

For more information about using board management on HP Helion OpenStack Carrier Grade, see the *HP Helion OpenStack Carrier Grade Administration Guide*.

To complete this task, you need the board type (ilo3 or ilo4), MAC address, username, and password of the board management module. For help obtaining this information, consult the user documentation for the module.

1. Provision the host with the MAC address and module type of the attached iLO module.

   ```
   ~(keystone_admin)$ system host-update hostname bm_mac=MAC_address
    bm_type=module_type
   ```

   For example:

   ```
   ~(keystone_admin)$ system host-update compute-0 bm_mac=b4:b5:2f:ee:ae:90
    bm_type=ilo4
   ```

2. Provision the host with the username and password of the iLO module.

   ```
   ~(keystone_admin)$ system host-update hostname bm_username=user_name \
   bm_password=password
   ```

Chapter

4

HP Helion OpenStack Carrier Grade System Provisioning

Topics:

- *Network Interface Provisioning*
- *Storage Provisioning*
- *Configuring Hosts with Board Management*

Before you can unlock the nodes and use HP Helion OpenStack Carrier Grade, you must perform basic system provisioning.

- You must provision data interfaces for the compute nodes. Before you can do this, you must create provider networks to which the interfaces can be attached.
- If an infrastructure network is installed, you must provision the compute nodes and storage nodes to attach to the infrastructure network.
- If using storage nodes, you must provision storage volumes for the storage nodes.
- If a board management network is installed, you must provision the hosts to use it.

Network Interface Provisioning

Interfaces on compute and storage nodes require initial provisioning to attach them to networks.

On compute and storage nodes, some interfaces require manual provisioning before the nodes can be unlocked.

- For a storage node, you must attach an interface to the infrastructure network before you can unlock the node.
- For a compute node, you must attach interfaces to provider networks before you can unlock the node. The provider networks must be set up beforehand; for more information, see *Configuring Provider Networks* on page 45.

  If the cluster uses an infrastructure network, you must also attach an interface to the infrastructure network before you can unlock the node.

The procedure for attaching an interface depends on whether the interface is an Ethernet, aggregated Ethernet, or shared (VLAN) interface.

- To attach an Ethernet interface, see *Attaching to Networks Using an Ethernet Interface* on page 47.
- To attach an aggregated Ethernet interface, see *Attaching to Networks Using an Aggregated Ethernet Interface* on page 48.
- To attach a VLAN interface, see *Attaching to Networks Using a VLAN Interface* on page 50.

  Note:

  To attach a data network to an existing management or infrastructure network interface, see *Editing Interface Settings* on page 55.

As an alternative, you can use the CLI to attach interfaces. See *Network Interface Provisioning Using the CLI* on page 56.

For more information about interfaces, see the *HP Helion OpenStack Carrier Grade Administration Guide: Ethernet Interfaces*.

Note:

On compute and storage nodes, the Ethernet interface for the management network is attached automatically, to support installation using PXE booting.

On controller nodes, interfaces are attached to the management, OAM, and optional infrastructure networks automatically according to the settings specified during the controller configuration script. They do not require further provisioning before system deployment. For more information, see *The Controller Configuration Script* on page 9.

Configuring Provider Networks

You can use the HP Helion OpenStack Carrier Grade CLI or web administration interface to set up provider networks over physical networks.

A *provider network* is a layer-2 virtual network associated with a physical network. Provider networks are used to provide connectivity for tenant networks.

You can choose from three types of provider network:

- A flat network mapped directly to the physical network.
- A VLAN network, which can support multiple tenant networks using designated ranges of VLAN IDs for communication between hosts on the same Layer 2 network.
- A VXLAN network, which can support multiple tenant networks using designated ranges of VNIs for communication between hosts on different Layer 2 segments separated by one or more L3 routers.

For more about provider networks and tenant networks, see the *HP Helion OpenStack Carrier Grade Administration Guide: Network Requirements*.

To create an association with a physical network, the provider network must be mapped to an Ethernet interface on a compute node. At least one such interface must be set up before the compute node can be unlocked. For more information, see *Network Interface Provisioning* on page 45.

> 📝 **Note:**
>
> If you plan to follow the exercises in the *HP Helion OpenStack Carrier Grade Reference Deployment Scenarios*, you can set up the required provider networks now. The scenarios use two provider networks of the **vlan** type, named **provider-net-a** and **provider-net-b**.

1. Open the HP Helion OpenStack Carrier Grade web administration interface.

    Using a browser, navigate to the OAM floating IP address, and log in as **admin**.

2. In the left-hand pane, on the **Admin** tab, click **Networks**, and then select the **Provider Networks** tab.

    The Provider Networks list is displayed.

Networks	Provider Networks	Qos Policies				

    Provider Networks   ➕ Create Provider Network

☐	Network Name	Status	Type	MTU	Segmentation Ranges	Actions
			No items to display.			

    Displaying 0 items

3. Create a provider network.

    Click **Create Provider Network**.

    In the **Create Provider Network** window, complete the fields as required.

    Name

    The name of the provider network.

    Description

    A free-text field for reference.

    Type

    The type of provider network to be created.

    flat

    mapped directly to the physical network

    vlan

    supports multiple tenant networks using VLAN IDs.

    vxlan

    supports multiple tenant networks using VXLAN VNIs.

    MTU

    The maximum transmission unit for the Ethernet segment used to access the network.

Create Provider Network

Name *

Description:

You can create a provider network and later segment this network for access by one or more tenant networks.

Description

Type *

Select a network type

MTU *

1500

Cancel   **Create Provider Network**

4. Commit the changes.

Click **Create Provider Network**.

The new provider network is added to the **Provider Networks** list.

After creating a provider network of the VLAN or VXLAN type, you can assign one or more *segmentation ranges* consisting of a set of consecutive VLAN IDs (for VLANs) or VNIs (for VXLANs). Segmentation ranges are required in order to set up tenant networks.

Segmentation ranges are not required in order to attach interfaces and unlock compute nodes.

For general information about segmentation ranges, see the *HP Helion OpenStack Carrier Grade Administration Guide: Provider Networks*. For more information about creating segmentation ranges or setting up tenant networks, see the *HP Helion OpenStack Carrier Grade Reference Deployment Scenarios*.

Attaching to Networks Using an Ethernet Interface
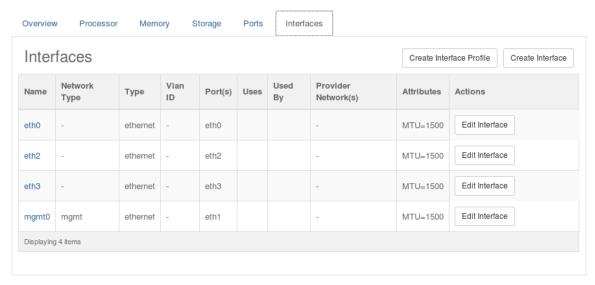
You can attach an Ethernet interface to a network by editing the interface.

When a compute or storage node is added to HP Helion OpenStack Carrier Grade and initialized, Ethernet interfaces are created automatically for each physical port detected. To support installation using PXE booting, one interface is attached automatically to the management network. You must attach additional interfaces manually before you can unlock the node. For more about this requirement, see *Network Interface Provisioning* on page 45.
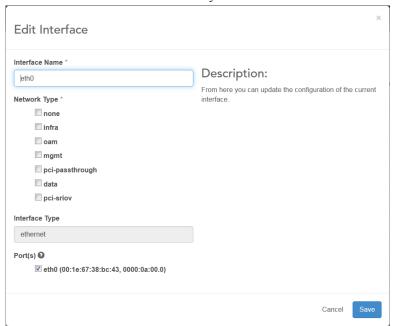
For a network that uses Ethernet interfaces, you can edit an existing Ethernet interface on the node to attach it, as described in this topic. You can also do this from the CLI; for more information, see *Network Interface Provisioning Using the CLI* on page 56.

For a network that uses aggregated Ethernet or VLAN interfaces, you must create an interface in order to attach it; see *Attaching to Networks Using an Aggregated Ethernet Interface* on page 48 or *Attaching to Networks Using a VLAN Interface* on page 50.

1. Open the **Inventory Detail** page for the host.

a) On the **Admin** pane of the web administration interface, in the **System Panel** section, select **Inventory**.

b) Select the **Hosts** tab, and then in the **Host Name** column, click the name of the host.

2. Select the **Interfaces** tab.

3. Click **Edit Interface** for the interface you want to attach to a network.

4. Select the type of network for the interface.

For details, see *Interface Settings* on page 53.

5. Complete the required information for the type of interface.

For more information, see *Interface Settings* on page 53.

6. Click **Save** to save your changes and close the dialog box.

The interface is attached to the network.
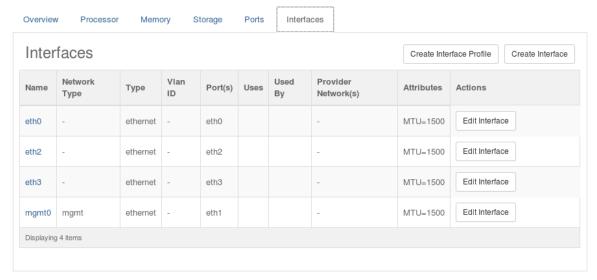
Attaching to Networks Using an Aggregated Ethernet Interface

You can add and remove interfaces from a LAG group on a host using the web administration interface or the CLI.
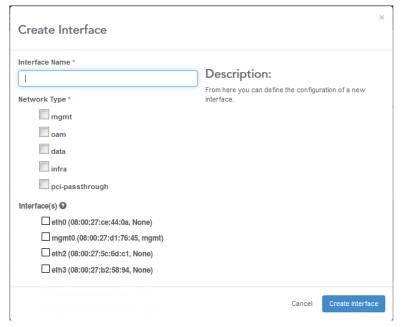
For CLI instructions, see *Network Interface Provisioning Using the CLI* on page 56.

1. Open the **Inventory Detail** page for the host.

a) On the **Admin** pane of the web administration interface, in the **System Panel** section, select **Inventory**.

b) Select the **Hosts** tab, and then in the **Host Name** column, click the name of the host.

2. Select the **Interfaces** tab.

Name	Network Type	Type	Vlan ID	Port(s)	Uses	Used By	Provider Network(s)	Attributes	Actions
eth0	-	ethernet	-	eth0			-	MTU=1500	Edit Interface
eth2	-	ethernet	-	eth2			-	MTU=1500	Edit Interface
eth3	-	ethernet	-	eth3			-	MTU=1500	Edit Interface
mgmt0	mgmt	ethernet	-	eth1			-	MTU=1500	Edit Interface

Displaying 4 items

3. Click **Create Interface**.

Create Interface

Interface Name *

Description:
From here you can define the configuration of a new interface.

Network Type *
- mgmt
- oam
- data
- infra
- pci-passthrough

Interface(s)
- eth0 (08:00:27:ce:44:0a, None)
- mgmt0 (08:00:27:d1:76:45, mgmt)
- eth2 (08:00:27:5c:6d:c1, None)
- eth3 (08:00:27:b2:58:94, None)

Cancel   Create Interface

4. Select the type of network for the interface.

For details, see *Interface Settings* on page 53.

5. If required, open the **Interface Type** drop-down menu, and select **aggregated ethernet**.

The **Interface Type** control appears when the **Network Type** is set to **mgmt**, **oam**, **data**, or **infra**.

6. Set the **Aggregated Ethernet - Mode**. For more information, see *Link Aggregation Settings* on page 14.

7. From the **Interfaces** list, select the Ethernet interfaces used to attach this interface to the network.

8. Complete any other settings required for the Network Type. For more information, see *Interface Settings* on page 53.

9. Click **Create Interface** to save your changes and close the dialog box.

The interface is created and attached to the network.

Attaching to Networks Using a VLAN Interface

You can attach an interface to multiple networks using VLAN tagging.

If the cluster is configured with VLAN-tagged networks, you can share an Ethernet interface by attaching it to one or more VLAN-tagged networks. You can do this using the web administration interface or the CLI. For CLI instructions, see *Network Interface Provisioning Using the CLI* on page 56.
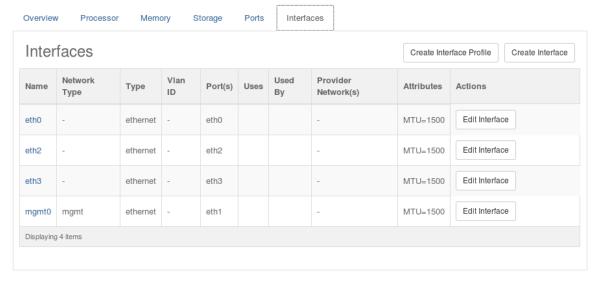
> 📝 **Note:**
>
> You cannot use a VLAN interface to attach to a data network. However, you can edit a management or infrastructure interface to attach to a data network. For more information, see *Editing Interface Settings* on page 55.

For more information about shared interfaces, see the *HP Helion OpenStack Carrier Grade Administration Guide: Shared (VLAN) Ethernet Interfaces*.

1. Open the **Inventory Detail** page for the host.
   a) On the **Admin** pane of the web administration interface, in the **System Panel** section, select **Inventory**.
   b) Select the **Hosts** tab, and then in the **Host Name** column, click the name of the host.
2. Select the **Interfaces** tab.

| Overview | Processor | Memory | Storage | Ports | Interfaces |

Interfaces

Create Interface Profile   Create Interface

Name	Network Type	Type	Vlan ID	Port(s)	Uses	Used By	Provider Network(s)	Attributes	Actions
eth0	-	ethernet	-	eth0			-	MTU=1500	Edit Interface
eth2	-	ethernet	-	eth2			-	MTU=1500	Edit Interface
eth3	-	ethernet	-	eth3			-	MTU=1500	Edit Interface
mgmt0	mgmt	ethernet	-	eth1			-	MTU=1500	Edit Interface

Displaying 4 items

3. Click **Create Interface**.

4. Select the type of network for the interface.

    For details, see *Interface Settings* on page 53.

5. Open the **Interface Type** drop-down menu, and select **vlan**.

    The **Interface Type** control appears when the **Network Type** is set to **mgmt**, **oam**, **data**, or **infra**.

6. In the **Vlan ID** field, type a unique VLAN identifier for the network.

7. From the **Interfaces** list, select the Ethernet interfaces used to attach this interface to the network.

    The Ethernet interfaces correspond to ports on the node. For more information, see *Network Interface Provisioning* on page 45.

8. Complete any other settings required for the Network Type. For more information, see *Interface Settings* on page 53.

9. Click **Create Interface** to save your changes and close the dialog box.

The interface is created and attached to the network.

Creating an Interface Profile

You can optionally save the interface configuration for a host as a *profile*, and apply the profile to other hosts.
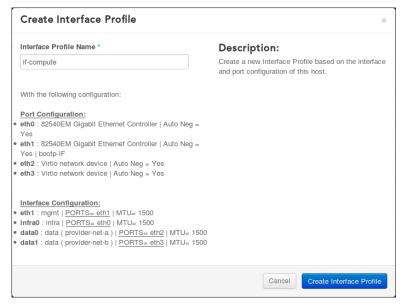
You can also use the CLI to create and apply interface profiles. The following command creates a new interface configuration profile named **hp360-server**.

```
~(keystone_admin)$ system ifprofile-add hp360-server compute-0
```

You can use this profile when configuring additional compute nodes to simplify the interface configuration process. Available interface profiles can be listed with the following command:

```
~(keystone_admin)$ system ifprofile-list

+--------------+--------------+--------------------
+-----------------------------+
| uuid         | name         | port config         | interface config
        |
+--------------+--------------+--------------------
+-----------------------------+
| b8444eb0-... | hp360-server | eth1: 82540EM  ...  | eth1: mgmt | ethernet
   | ... |
```

```
|                |                      | eth2: 82540OEM ...   | data-0:
 data( provider-net-a )|
|                |                      | eth3: 82540OEM ...   | data-1:
 data( provider-net-b )|
|                |                      | infra0: 82540EM ... | eth0: infra | ethernet
 |  ... |
+-------------+-------------+-------------------
 +---------------------------+
```

1. Open the **Inventory Detail** page for the host.
   a) On the **Admin** pane of the web administration interface, in the **System Panel** section, select **Inventory**.
   b) Select the **Hosts** tab, and then in the **Host Name** column, click the name of the host.
2. On the **Interfaces** tab, click **Create Interface Profile**.

   The **Create Interface Profile** window appears.
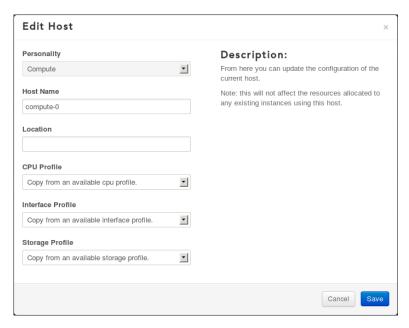
3. Enter an interface profile name, and then click **Create Interface Profile**.

   The interface profile is created. To view it, select **System Panel** > **Inventory** on the **Admin** page, and then select the **Interface Profiles** tab.

   You can use this interface profile when installing additional compute nodes. For example, when assigning the host **compute-1**, you can eliminate the steps to attach interfaces by clicking **Edit Host**, and then selecting a profile from the **Interface Profile** drop-down list.

Note:

To list existing interface profiles, select the **Interface Profiles** tab on the **Inventory** page.

Interface Settings

The settings for creating or editing an interface on a node depend on the type of network to which the interface is connected (for example, **infra** or **data**), as well as the type of interface (for example, **aggregated ethernet** or **vlan**).

For more about creating and editing interfaces, see *Network Interface Provisioning* on page 45.

Interface Name

A name used to identify the interface.

Network Type

The type of network to which the interface is attached. You can select multiple check boxes, but the only valid multiple selection is **data** in addition to either **mgmt** or **infra** on the interface connected to the management or infrastructure network.

Depending on the interface, the check box options may include:

none

Clears the Network Type setting.

infra

Attaches the interface to an infrastructure network.

When a compute or storage node is added to HP Helion OpenStack Carrier Grade, an interface must be attached to the infrastructure network before the node can be unlocked.

You can edit the infrastructure interface to add a **data** network and provider network. This allows both management and data traffic to be carried on the interface.

oam

Attaches the interface to the OAM network.

The OAM network is used by controller nodes for administrator remote access. It is not applicable to compute or storage nodes.

mgmt

Attaches the interface to the management network.

When a compute or storage node is added to HP Helion OpenStack Carrier Grade, the interface used for PXE boot is assigned automatically to the management network. In the settings for this interface, **mgmt** is already selected. For other interfaces, this selection is not used.

You can edit the management interface to add a **data** network and provider network. This allows both management and data traffic to be carried on the interface.

pci-passthrough

Provides for a direct connection to a provider network from a virtual machine. For more information, see the *HP Helion OpenStack Carrier Grade Administration Guide: PCI Passthrough Ethernet Devices.*

For information about adding provider networks, see *Configuring Provider Networks* on page 45.

data

Attaches the interface to a provider network. For information about adding provider networks, see *Configuring Provider Networks* on page 45.

You can add a data interface to a management or infrastructure interface by editing the interface and selecting **data** in addition to **mgmt** or **infra**.

pci-sriov

Provides VM access to multiple virtual interfaces implemented on a single physical interface. For more information, see the *HP Helion OpenStack Carrier Grade Administration Guide: SR-IOV Ethernet Interfaces*.

Interface Type

(Shown only when the **Network Type** is set to **mgmt**, **oam**, **data**, or **infra**) The type of interface (Ethernet, Aggregated Ethernet, or VLAN).

Aggregated Ethernet - Mode

(Shown only when the **Interface Type** is set to **aggregated ethernet**) The operational mode for link aggregation. For more information, see *Link Aggregation Settings* on page 14.

Vlan ID

(Shown only when the **Interface Type** is set to **vlan**) A unique VLAN identifier for the network.

Port(s)

The physical port or ports used for the interface.

Provider Networks

(Shown only when the Network Type is set to **data** or **pci-passthrough**) The available provider networks. To add provider networks, see *Configuring Provider Networks* on page 45. To attach the interface to a provider network, select the provider network.

> **Note:**
>
> You cannot attach to a VLAN provider network using a VLAN data interface.

MTU

The maximum transmission unit for the interface. For more information, see the *HP Helion OpenStack Carrier Grade Administration Guide: The Ethernet MTU.*

IPv4 Addressing Mode

(Shown only when the Network Type is set to **data**) The method for assigning an IP address to the interface for use with VXLAN networks. For more information about VXLAN networks, see the *HP Helion OpenStack Carrier Grade Administration Guide: Using VXLANs*. The available options are **static** or **disabled**.

Disabled

Do not assign an IPv4 address.

Static

Use a static IPv4 address.

IPv6 Addressing Mode

(Shown only when the Network Type is set to **data**) The method for assigning an IP address to the interface for use with VXLAN networks. For more information about VXLAN networks, see the *HP Helion OpenStack Carrier Grade Administration Guide: Using VXLANs*.

Disabled

Do not assign an IPv6 address.

Static

Use a static IPv6 address.

Automatic Assignment

Use an automatically assigned IPv6 address.

Link Local

Use a link local IPv6 address.

Virtual Functions

(Shown only when the Network Type is set to **pci-sriov**) The number of virtual interfaces to use. For more information, see the *HP Helion OpenStack Carrier Grade Administration Guide: SR-IOV Ethernet Interfaces*.

Maximum Virtual Functions

(Shown only when the Network Type is set to **pci-sriov**)

the maximum number of virtual interfaces available.

Editing Interface Settings

You can change the settings for a host interface.

The ability to change the interface settings is especially useful for updating the management interface. When a compute node is first created, its management interface is automatically set up using the default **Interface Type** (**ethernet**). If you are using LAG on the management network, you must update this manually to **aggregated ethernet**.
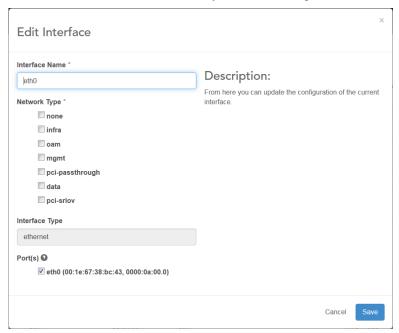
You can also edit a management or infrastructure interface to attach to a data network by selecting **data** as an additional Network Type for the interface, or using the CLI. For CLI instructions, see *Network Interface Provisioning Using the CLI* on page 56.

1. Lock the host to make changes.
   a) On the **Admin** pane of the web administration interface, in the **System Panel** section, select **Inventory**.
   b) Select the **Hosts** tab.
   c) Open the **More** drop-down list for the host, and then select **Lock Host**.
   d) Wait for the host to be reported as **Locked**.
2. Open the **Inventory Detail** page for the locked host.

   In the **Host Name** column, click the name of the host.
3. Select the **Interfaces** tab to display the existing interfaces.

4. Click **Edit Interface** for the interface you want to change.

5. Make the required changes, and then click **Save**.

   For information about the available settings, see *Interface Settings* on page 53.

6. Unlock the host.

Network Interface Provisioning Using the CLI

You can use CLI commands to create and attach network interfaces.

For more information about interface provisioning, or help using the web administration interface, see *Network Interface Provisioning* on page 45.

To list attached interfaces, use the **system host-if-list** command.

```
~(keystone_admin)$ system host-if-list controller-0
...+--------+------...+----------+---------+----------+------------
+------------+...
...| name   | netwo...| type     | vlan id | ports    | uses i/f   | used
 by i/f |...
...+--------+------...+----------+---------+----------+------------
+------------+...
...| infra0 | infra...| vlan     | 22      | []       | [u'mgmt0'] | []
      |...
```

```
...| oam0   | oam  ...| ethernet | None    | [u'eth0'] | []          | []
     |...
...| mgmt0  | mgmt ...| ethernet | None    | [u'eth1'] | []          |
 [u'infra0'] |...
...+-------+------...+---------+--------+----------+-----------
+------------+...
```

To see all available interfaces, add the -a flag.

```
~(keystone_admin)$ system host-if-list -a controller-0
...+-------+------...+---------+--------+----------+-----------
+------------+...
...| name   | netwo...| type     | vlan id | ports     | uses i/f   | used
 by i/f |...
...+-------+------...+---------+--------+----------+-----------
+------------+...
...| eth3   | None ...| ethernet | None    | [u'eth3'] | []          | []
     |...
...| infra0 | infra...| vlan     | 22      | []        | [u'mgmt0'] | []
     |...
...| eth2   | None ...| ethernet | None    | [u'eth2'] | []          | []
     |...
...| oam0   | oam  ...| ethernet | None    | [u'eth0'] | []          | []
     |...
...| mgmt0  | mgmt ...| ethernet | None    | [u'eth1'] | []          |
 [u'infra0'] |...
...+-------+------...+---------+--------+----------+-----------
+------------+...
```

Ethernet Interfaces

Ethernet interfaces are created automatically. To attach one to a network, use a command for the following form:

```
~(keystone_admin)$ system host-if-modify -n ifname -m mtu \
-nt networktype hostname ethname
```

where

ifname

   is a name for the interface

mtu

   is the MTU for the interface

networktype

   is the type of network to attach to

hostname

   is the name or UUID of the host

ethname

   is the name or UUID of the Ethernet interface to use

For example, to attach an interface named **infra0** to the infrastructure network, using Ethernet interface **eth0** on **compute-0**:

```
~(keystone_admin)$ system host-if-modify -n infra0 \
-nt infra compute0 eth0
```

Aggregated Ethernet Interfaces

To create an aggregated Ethernet interface and attach it to a network, use a command of the following form:

```
~(keystone_admin)$ system host-if-add ifname -m mtu \
-a aemode -x policy hostname \
 ae "providernetworklist" ethname1 ethname2
```

where

ifname

is a name for the interface

mtu

is the MTU for the interface

aemode

is the link aggregation mode

policy

is the balanced tx distribution hash policy

hostname

is the name or UUID of the host

providernetworklist

is a list of provider networks to attach to

ethname1, ethname2

are the names or UUIDs of the member interfaces

For example, to attach an aggregated Ethernet interface named **ae0** to provider networks **provider-net-a** and **provider-net-b**, using member interfaces **eth2** and **eth3** on **compute-0**:

```
~(keystone_admin)$ system host-if-add -n ae0 -a balanced \
-x layer2 compute-0 ae "provider-net-a, provider-net-b" eth2 eth3
```

For more about link aggregation modes and policies, see *Link Aggregation Settings* on page 14.

VLAN Interfaces

To create a VLAN interface and attach it to a network, use a command of the following form:

```
~(keystone_admin)$ system host-if-add ifname -V vlan_id -
n ifname hostname networktype ethname
```

where

ifname

is a name for the interface

vlan_id

is the VLAN identifier for the network

hostname

is the name or UUID of the host

networktype

is the type of network to attach to

ethname

is the name or UUID of the Ethernet interface to use

For example, to attach a VLAN interface named **infra0** with VLAN ID **22** to the infrastructure network, using Ethernet interface **eth1** on **storage-0**:

```
~(keystone_admin)$ system host-if-add -V 22 -n infra storage-0 infra0 vlan
 eth1
+-----------------+------------------------------------+
| Property        | Value                              |
+-----------------+------------------------------------+
| ifname          | infra0                             |
| networktype     | infra                              |
| iftype          | vlan                               |
| ports           | []                                 |
| providernetworks | None                              |
| imac            | 08:00:27:f2:0d:68                  |
| imtu            | 1500                               |
| aemode          | None                               |
| schedpolicy     | None                               |
| txhashpolicy    | None                               |
| uuid            | 8ca9854e-a18e-4a3c-8afe-f050da702fdf |
| ihost_uuid      | 3d207384-7d30-4bc0-affe-d68ab6a00a5b |
| vlan_id         | 22                                 |
| uses            | [u'eth1']                          |
| used_by         | []                                 |
| created_at      | 2015-02-04T16:23:28.917084+00:00   |
| updated_at      | None                               |
+-----------------+------------------------------------+
```

where

ifname

is a name for the interface

mtu

is the MTU for the interface

aemode

is the link aggregation mode

policy

is the balanced tx distribution hash policy

hostname

is the name or UUID of the host

ethname1, ethname2

are the names or UUIDs of the member interfaces

For more about VLAN interfaces, see the *HP Helion OpenStack Carrier Grade Administration Guide: Shared Ethernet Interfaces*.

Combined Data and Management or Infrastructure Interfaces

You can add a data interface to a management or infrastructure interface using a command of the following form:

```
~(keystone_admin)$ system host-if-modify -nt "mgmt,data" -p group0-data0
 compute-0 mgmt0
```

This example adds a data network to the **mgmt0** interface on **compute-0**, for the provider network **group0-data0**.

Configuring Provider Networks Using the CLI

You can set up provider networks over physical networks using the **controller-0** command-line interface. The provider networks provide connectivity for tenant networks.

You must configure at least one provider network in order to assign data interfaces to compute nodes and unlock the hosts.

📝 **Note:**

> If you plan to follow the exercises in the *HP Helion OpenStack Carrier Grade Reference Deployment Scenarios*, you can set up the required provider networks now. The scenarios use two provider networks of the **vlan** type, named **provider-net-a** and **provider-net-b**.

Controller-0 must be installed and operational, as described in

To create a provider network using the CLI, use the following command:

```
~(keystone_admin)$ neutron providernet-create name \
--type=type --description=description mtu=mtu_size
```

where

name

> is a name for the provider network

type

> is the type of provider network (**flat**, **vlan**, or **vxlan**)

description

> is a brief description for reference purposes

mtu_size

> is the maximum transmission unit size

You can obtain information about provider networks and segmentation ranges using the following commands.

```
~(keystone_admin)$ neutron net-list-on-providernet providernet
```

```
~(keystone_admin)$ neutron providernet-range-show providernet-range
```

Storage Provisioning

Storage nodes require initial provisioning to assign storage volumes.

Creating Storage Volumes

You can define storage volumes (Object Storage Devices or OSDs) on storage nodes.

To create storage volumes, you must have at least two unlocked hosts with Ceph monitors (that is, at least two unlocked controller or storage nodes).

1. Open the **Inventory Detail** page for the host.
   a) On the **Admin** pane of the web administration interface, in the **System Panel** section, select **Inventory**.
   b) Select the **Hosts** tab, and then in the **Host Name** column, click the name of the host.
2. Select the **Storage** tab to view the **Disks** and **Storage Volumes** for the node.

Overview	Processor	Memory	Storage	Ports	Interfaces

Disks

UUID	Node	Type	Size (MiB)	Serial ID	Model
a86c4d22-fc7a-4a80-91e0-295f06d035c2	/dev/sda	disk	40960	VBd5b35d21-3636c000	VBOX_HARDDISK
a9185ad3-8be7-4103-84eb-93892d7182da	/dev/sdb	disk	12288	VB47e70774-cc501b98	VBOX_HARDDISK

Displaying 2 items

Storage Volumes ＋ Create Storage Volume   ＋ Create Storage Profile

UUID	Name	Function
	No items to display.	

Displaying 0 items

3. Create a new storage volume for the node.
   a) Click **Create Storage Volume** to open the **Create Storage Volume** dialog box.

Create Storage Volume ✕

Hostname *

storage-0

Description:
From here you can define the configuration of a new storage volume.

Function

osd ▾

Disks *

/dev/sda (a86c4d22-fc7a-4a80-91e0-295f06d035 ▾

Cancel   Create Storage Volume

   b) Using the **Disks** drop-down list, select the disk to use for the volume.

   📝 **Note:**

   You cannot use the rootfs disk (**dev/sda**) for storage volumes.

   c) Click **Create Storage Volume** to commit your selection.

   The storage volume is added to the system, and displayed in the list.

Storage Volumes ＋ Create Storage Volume   ＋ Create Storage Profile

UUID	Name	Function
a52201fc-c2ee-4814-80ad-304ef6983707		osd

Displaying 1 item

You can re-use the same settings with other storage nodes by creating and applying a storage profile. See *Creating a Storage Profile* on page 63.

Creating Storage Volumes Using the CLI

(steps moved from initializing and configuring storage nodes using the CLI)

1. Create a storage volume (an Object Storage Device or OSD).

   First list the available disks.

   ```
   ~(keystone_admin)$ system host-disk-list storage-0

   +--------------+------------+-----------+------------+----------
   +----------+
   | uuid         | device_node | device_num | device_type | size_mib |
    seria... |
   +--------------+------------+-----------+------------+----------
   +----------+
   | a86c4d22-... | /dev/sda    | 2048      | disk        | 40960    |
    VBd5b... |
   | a9185ad3-... | /dev/sdb    | 2064      | disk        | 12288    |
    VB471... |
   +--------------+------------+-----------+------------+----------
   +----------+
   ```

   Add a storage volume to the desired physical disk.

   > 📝 **Note:**
   >
   > You cannot add a storage volume to the root disk (/dev/sda in this example).

   ```
   ~(keystone_admin)$ system host-stor-add storage-0
    a9185ad3-8be7-4103-84eb-93892d7182da

   +------------+-------------------------------------+
   | Property   | Value                               |
   +------------+-------------------------------------+
   | osdid      | 2                                   |
   | name       | stor0-0                             |
   | state      | None                                |
   | function   | osd                                 |
   | uuid       | a52201fc-c2ee-4814-80ad-304ef6983707 |
   | ihost_uuid | eb9fffd7-c859-419e-951b-30950dd8505c |
   | created_at | 2014-06-19T18:53:35.256716+00:00    |
   | updated_at | none                                |
   +------------+-------------------------------------+
   ```

2. Optional: Create a named profile for the storage volume configuration.

   ```
   ~(keystone_admin)$ system ifprofile-add hp360-storage storage-0
   ```

   This command creates a new storage volume configuration profile named **hp360-storage**. You can use this profile when configuring additional storage nodes to simplify the volume configuration process. Available storage profiles can be listed with the following command:

   ```
   ~(keystone_admin)$ system storprofile-list

   +--------------+------------------+----------------+------------+
   | uuid         | profilename      | disk config    | stor config |
   +--------------+------------------+----------------+------------+
   | 47c24b87-... | hp360-storage    | /dev/sdb: 12288 | : osd      |
   +--------------+------------------+----------------+------------+
   ```

For example, when configuring **storage-1**, use the following command to apply the profile just created.

```
~(keystone_admin)$ system host-apply-storprofile storage-1 hp360-storage
```
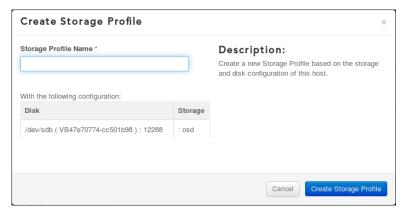
Creating a Storage Profile

You can save the storage configuration for a storage node as a *profile*, and apply the profile to other storage nodes.

1. Open the **Create Storage Profile** dialog box.

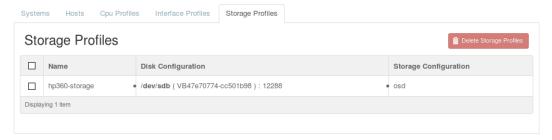   On the **Storage** tab of the **Inventory** page, click **Create Storage Profile**.

   The **Create Storage Profile** dialog box appears.

2. Create the storage profile.

   Enter a storage profile name, and then click **Create Storage Profile**.

   The storage profile is created. To view it, select **System Panel** > **Inventory** on the **Admin** pane, and then select the **Storage Profiles** tab.

You can use this storage profile when installing additional storage nodes. For example, when assigning the node **storage-1**, you can select a profile from the **Storage Profile** drop-down list.

> 📝 **Note:**
>
> To list existing storage profiles, select the **Storage Profiles** tab on the **Inventory** page.

Configuring Hosts with Board Management

If the HP Helion OpenStack Carrier Grade is configured to support board management, you can activate this feature on a host by provisioning the host with information about the attached board management module.

The option to use board management on the HP Helion OpenStack Carrier Grade is available during controller configuration (see *The Controller Configuration Script* on page 9).
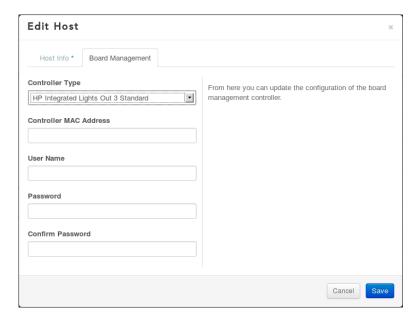
To use board management on a host, the host must be equipped with a supported HP integrated Lights Out (iLO) module (iLO3 or iLO4).

To provision a host with board management, you need the MAC address, username, and password for the board management module. For help obtaining this information, consult the user documentation for the module.

You can use the web administration interface or the CLI to provision the host. For CLI instructions, see *Configuring a Host for Board Management Using the CLI* on page 43.

For more information about using board management on the HP Helion OpenStack Carrier Grade, see the *HP Helion OpenStack Carrier Grade Administration Guide*.

1. Open the **Hosts** list.

    On the **Admin** tab, in the **System Panel** section, click **Inventory**, and then select the **Hosts** tab.
2. Click **Edit Host** for the host.
3. Select the **Board Management** tab.

4. Complete the form as follows.

Field	Comments
Controller Type	Select the type of iLO module attached to the host.
Controller MAC Address	Provide the MAC address of the iLO module.
User Name	Provide the user name and password configured for the iLO module.
Password	
Confirm Password	

5. Click **Save**.