



OpenStack Labs

Lab 03: Deploying an Internal Instance

Contents

Introduction	iii
Objectives	iv
Lab Settings.....	v
1 Uploading Images.....	1
2 Defining Flavors.....	9
3 Managing Private Networks.....	15
4 Launching an Internal Instance.....	25
5 Verifying the Functionality of an Internal Instance.....	32

About This Document

- This document was developed by a team at the University of Tennessee at Chattanooga led by Dr. Mengjun Xie (mengjun-xie@utc.edu).
- The development of this document was supported by a National Centers of Academic Excellence in Cybersecurity Grant (#H98230-20-1-0351), housed at the National Security Agency.
- This document is licensed with a Creative Commons Attribution 4.0 International License.

Introduction

In this lab, you will use the *Horizon Dashboard* and *OpenStack Unified CLI* to manage images, define flavors, manage private networks, launch an internal instance, and verify the instance's functionality. Images define the *software* configuration of an instance such as the operating system and installed packages, while flavors specify the *hardware* specifications such as the number of processors and the amount of memory and disk. Private networks are isolated networks within the OpenStack cloud and are not connected to external networks by default. Internal instances are connected only to private networks and are not directly accessible from external networks by default.

Objectives

- Create and manage software profiles (images).
- Create and manage hardware profiles (flavors).
- Create and manage private networks.
- Launch and verify an internal instance.

Lab Settings

The information in the table below will be needed in order to complete the lab. The task sections below provide details on the use of this information.

Virtual Machine	IP Address	Account	Password
workstation	ens3: 192.168.1.21 ens4: 172.25.250.21	ubuntu	ubuntu
devstack	ens3: 192.168.20 ens4: 172.25.250.20	ubuntu	ubuntu

1 Uploading Images

In this task, you will create, modify, and delete images with the *Horizon Dashboard* and *OpenStack Unified CLI*.

- 1.1. Log into the **workstation** machine as the **ubuntu** user with password **ubuntu**.

```
Ubuntu 18.04.6 LTS workstation tty1
workstation login: ubuntu
Password:
```

- 1.2. Launch the graphical user interface.

```
ubuntu@workstation:~$ startx

Welcome to Ubuntu 18.04.6 LTS (GNU/Linux 4.15.0-213-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

 System information as of Fri Jun  7 21:01:55 UTC 2024

 System load:  0.6                  Processes:           197
 Usage of /:   7.9% of 116.12GB    Users logged in:      0
 Memory usage: 13%                IP address for ens3: 192.168.1.21
 Swap usage:   0%                 IP address for ens4: 172.25.250.21

Expanded Security Maintenance for Infrastructure is not enabled.

2 updates can be applied immediately.
To see these additional updates run: apt list --upgradable

146 additional security updates can be applied with ESM Infra.
Learn more about enabling ESM Infra service for Ubuntu 18.04 at
https://ubuntu.com/18-04

ubuntu@workstation:~$ startx_
```

- 1.3. Open the web browser. Navigate to **192.168.1.20** and log into the dashboard as **admin** with the password **secret**.

- 1.4.** Select the **demo** project. In this lab, we will create our own Ubuntu images, so the default one is not needed and can be deleted. Navigate to **Project > Compute > Images**. Select the **ubuntu** image and click **Delete Image**.

The screenshot shows the OpenStack Compute Images interface. The 'demo' project is selected in the top navigation bar. The 'Compute' tab is active. Under the 'Images' section, there is a table displaying two items:

	Owner	Name	Type	Status	Visibility	Protected	Disk Format	Size
<input type="checkbox"/>	admin	cirros-0.6.2-x86_64-disk	Image	Active	Public	No	QCOW2	20.44 MB
<input checked="" type="checkbox"/>	demo	ubuntu	Image	Active	Image from Other Project - Non-Public	No	QCOW2	2.01 GB

A red box highlights the 'ubuntu' row, indicating it is selected for deletion. At the bottom right of the table, there is a red-bordered 'Delete Images' button.

- 1.5.** Click **Create Image** to create a new image through an image file upload. As you will see in the next steps, premade image files are provided in the lab environment.

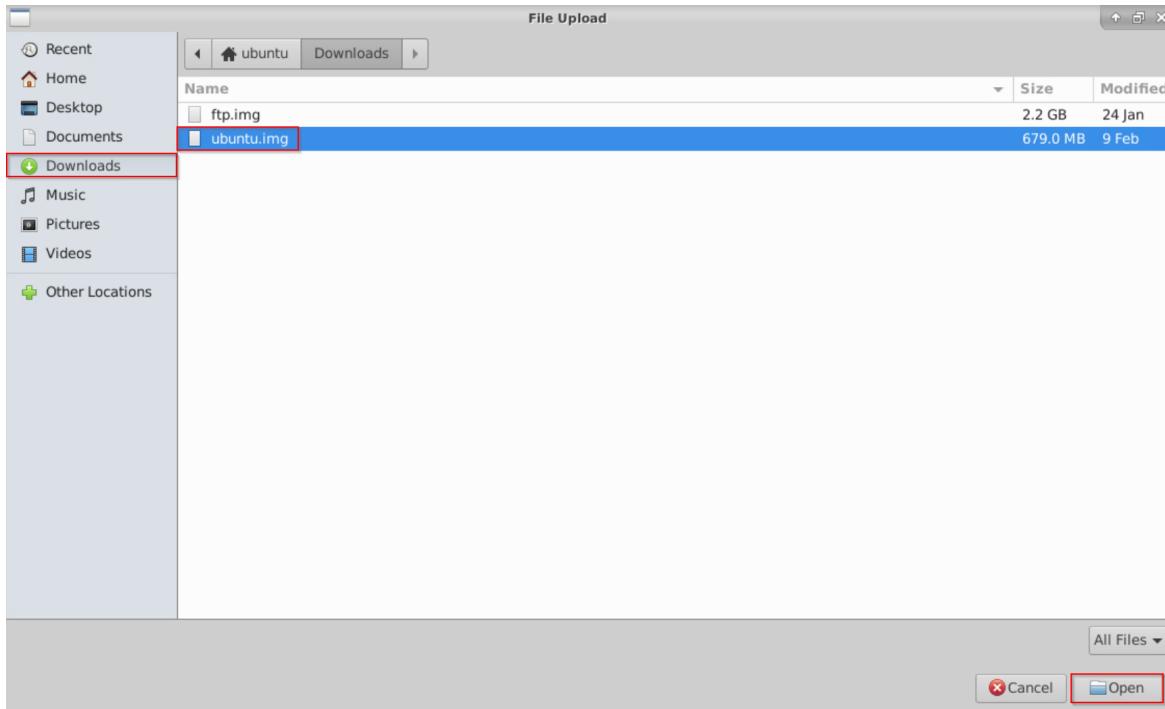
The screenshot shows the same OpenStack Compute Images interface as the previous one, but now the 'Create Image' button at the top right is highlighted with a red box. The table below shows a single item:

	Owner	Name	Type	Status	Visibility	Protected	Disk Format	Size
<input type="checkbox"/>	admin	cirros-0.6.2-x86_64-disk	Image	Active	Public	No	QCOW2	20.44 MB

- 1.6.** Enter **ubuntu1** into the *Image Name* field. Under **File**, click **Browse...**

The screenshot shows the 'Create Image' dialog. The 'Image Details' tab is active, indicated by a blue header. The 'Image Name' field contains the value 'ubuntu1', which is also highlighted with a red box. The 'Image Description' field is empty. Below the 'Image Details' section, there is an 'Image Source' section with a 'File' input field containing the placeholder 'Browse... No file selected.'.

- 1.7. In the file browser, navigate to **Downloads**, then select the **ubuntu.img** file. Click **Open**.



- 1.8. In the *Format* dropdown, select **QCOW2 - QEMU Emulator**, and under *Image Sharing*, set *Visibility* to **Private**. Click **Create Image**.

Format*

QCOW2 - QEMU Emulator

Image Requirements

Kernel: Choose an image

Ramdisk: Choose an image

Architecture: [empty input field]

Minimum Disk (GB): 0

Minimum RAM (MB): 0

Image Sharing

Visibility: **Private** (highlighted with a red border), Shared, Community, Public

Protected: Yes, No

< Back, Next >, **Create Image** (highlighted with a red border)

Stop

Wait for the **ubuntu1** status to be *Active*. You may need to refresh the browser until you see the status of *Active*.

- 1.9.** To edit the image after it has been created, open the dropdown menu next to the **Launch** button in the row of **ubuntu1**, and click **Edit Image**.

The screenshot shows the OpenStack Compute Images interface. In the 'Images' section, there are two items: 'cirros-0.6.2-x86_64-disk' (QCOW2, 20.44 MB) and 'ubuntu1' (QCOW2, 647.50 MB). The 'ubuntu1' row has a 'Launch' button with a dropdown menu. The 'Edit Image' option in this menu is highlighted with a red box.

	Owner	Name	Type	Status	Visibility	Protected	Disk Format	Size
admin	cirros-0.6.2-x86_64-disk	Image	Active	Public	No	QCOW2	20.44 MB	Launch
demo	ubuntu1	Image	Active	Private	No	QCOW2	647.50 MB	Launch

- 1.10.** Enter **10** in the *Minimum Disk (GB)* field, and select **Yes** for *Protected*. Click **Update Image**. Adding a minimum disk amount will require any new instance created with this image to allocate at least 10 GB of disk space. When an image or other OpenStack resource is protected, it cannot be deleted without first making it unprotected again.

The 'Edit Image' dialog box is open. The 'Image Details' tab is selected. The 'Image Name' field contains 'ubuntu1'. The 'Format' dropdown is set to 'QCOW2 - QEMU Emulator'. In the 'Image Requirements' section, the 'Minimum Disk (GB)' field is set to '10' (highlighted with a red box). Under 'Protected', the 'Yes' radio button is selected (highlighted with a red box). The 'Update Image' button at the bottom right is also highlighted with a red box.

- 1.11.** Reopen the dropdown next to the **Launch** button in the same row as **ubuntu1**. Notice that the option to delete the image no longer appears because the image is protected.

ID	Owner	Name	Type	Status	Visibility	Protected	Disk Format	Size
dfc5286d-bdb7-4338-8e4b-087422b21e68	admin	cirros-0.6.2-x86_64-disk	Image	Active	Public	No	QCOW2	20.44 MB
fd765042-c3e4-49a3-b1dc-9a81e02197c9	demo	ubuntu1	Image	Active	Private	Yes	QCOW2	647.50 MB

- 1.12.** Log out of the *Horizon Dashboard* and close the web browser.

- 1.13.** Open a terminal if one is not already open, and source the **keystonerc-admin** file to load the **admin** user credentials.

```
ubuntu@workstation:~$ source ~/keystonerc-admin
```

```
ubuntu@workstation:~$ source keystonerc-admin
[ubuntu@workstation (keystone-admin)]:~$ █
```

- 1.14.** List the current OpenStack images.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack image list
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack image list
+-----+-----+-----+
| ID   | Name  | Status |
+-----+-----+-----+
| dfc5286d-bdb7-4338-8e4b-087422b21e68 | cirros-0.6.2-x86_64-disk | active |
| fd765042-c3e4-49a3-b1dc-9a81e02197c9 | ubuntu1                  | active |
+-----+-----+-----+
[ubuntu@workstation (keystone-admin)]:~$ █
```

- 1.15.** Try to delete the **ubuntu1** image while it is protected. The command should return an HTTP 403 (Forbidden) error.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack image delete ubuntu1
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack image delete ubuntu1
Failed to delete image with name or ID 'ubuntu1': 403 Forbidden: Image fd765042-
c3e4-49a3-b1dc-9a81e02197c9 is protected and cannot be deleted. (HTTP 403)
Failed to delete 1 of 1 images.
[ubuntu@workstation (keystone-admin)]:~$ █
```

- 1.16.** Set the **ubuntu1** image to unprotected so that it can be deleted.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack image set \
> --unprotected ubuntu1
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack image set \
> --unprotected ubuntu1
[ubuntu@workstation (keystone-admin)]:~$ █
```

- 1.17.** Delete the **ubuntu1** image.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack image delete ubuntu1
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack image delete ubuntu1
[ubuntu@workstation (keystone-admin)]:~$ █
```

- 1.18.** List the images again to confirm that the image was deleted.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack image list
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack image list
+-----+-----+-----+
| ID      | Name          | Status |
+-----+-----+-----+
| dfc5286d-bdb7-4338-8e4b-087422b21e68 | cirros-0.6.2-x86_64-disk | active |
+-----+-----+-----+
[ubuntu@workstation (keystone-admin)]:~$ █
```

- 1.19.** Now, we will recreate and modify the image from the command line. Create the **ubuntu2** image with the **~/Downloads/ubuntu.img** file and the QCOW2 format.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack image create \
> --disk-format qcow2 \
> --file ~/Downloads/ubuntu.img \
> ubuntu2
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack image create \
> --disk-format qcow2 \
> --file ~/Downloads/ubuntu.img \
> ubuntu2
+-----+-----+
| Field    | Value           |
+-----+-----+
| checksum | 1f21ec2cbf86c5bb9fd19e0672f1594f
| container_format | bare
| created_at | 2024-06-12T16:59:25Z
| disk_format | qcow2
| file     | /v2/images/d55acaeef-8cfb-4bcf-a8dc-26ea0922ea5/file
| id       | d55acaeef-8cfb-4bcf-a8dc-26ea0922ea5
| min_disk | 0
| min_ram | 0
| name    | ubuntu2
| owner   | 39eb851b14f864573aad60582c35e40dc
| properties | os_hash_alg="sha512", os_hash_value="9e3d0f13d0ba1359956cb3dfa5743901caa2c22447f8aa4e9132601c71f6a348a20045a91e82b35fa3c3bb38096d18ca72fedf2155d572f957fdec528a86ff47", os_hidden='False'
| protected | False
| schema  | /v2/schemas/image
| size    | 670952960
| status  | active
| tags    |
| updated_at | 2024-06-12T16:59:29Z
| virtual_size | 2361393152
| visibility | shared
+-----+-----+
[ubuntu@workstation (keystone-admin)]:~$ █
```

- 1.20.** Confirm that the image was created by listing the images again.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack image list
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack image list
+-----+-----+-----+
| ID      | Name          | Status |
+-----+-----+-----+
| dfc5286d-bdb7-4338-8e4b-087422b21e68 | cirros-0.6.2-x86_64-disk | active |
| d55acaee-8cfb-4bcf-a8dc-26eea0922ea5 | ubuntu2        | active |
+-----+-----+-----+
[ubuntu@workstation (keystone-admin)]:~$ █
```

- 1.21.** Set the **ubuntu2** image status to **protected**, and set the minimum disk size to **10 GB**.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack image set \
> --protected \
> --min-disk 10 \
> ubuntu2
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack image set \
> --protected \
> --min-disk 10 \
> ubuntu2
[ubuntu@workstation (keystone-admin)]:~$ █
```

- 1.22.** If no visibility is set on creation, an image defaults to being private, which means the image is only visible to the user who created it. Set the **ubuntu2** image to be public so it is visible to other users. Note that this action requires administrative privileges.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack image set --public ubuntu2
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack image set \
> --public ubuntu2
[ubuntu@workstation (keystone-admin)]:~$ █
```

- 1.23.** Display the details of the **ubuntu2** image and verify that it was correctly updated. Confirm the value for the *min_disk* field is **10**, the value for the *protected* field is **True**, and the value for *visibility* is **public**.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack image show ubuntu2
```

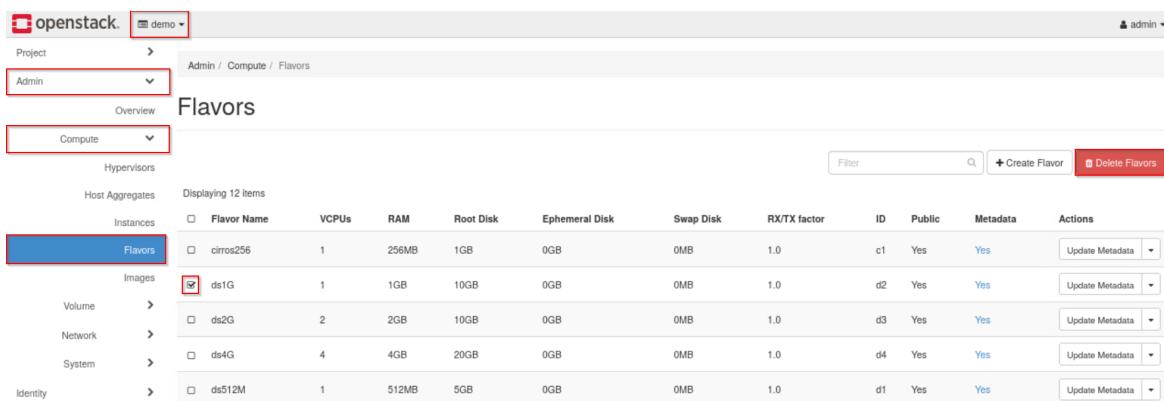
```
(ubuntu@workstation (keystone-admin)]:~$ openstack image show ubuntu2
+-----+-----+
| Field | Value |
+-----+-----+
| checksum | f121ec2cbf86c5bb9fd19e0672f15947 |
| container_format | bare |
| created_at | 2024-06-12T16:59:25Z |
| disk_format | qcow2 |
| file | /v2/images/d55acae8-8cfb-4bcf-a8dc-26eea0922ea5/file |
| id | d55acae8-8cfb-4bcf-a8dc-26eea0922ea5 |
| min_disk | 10 |
| min_ram | 0 |
| name | ubuntu2 |
| owner | 39e851b14f864573aad60582c35e40dc |
| properties | os_hash_alg="sha512", os_hash_value="9e3d0f13d0ba1359056cb3dfa5743901caa2c22447f8aa4e9132601c71f6a348a20045a91e82b35fa3c3bb38096d18ca72fedf2155d572f957fdec528a86ff47", os_hidden='False' |
| protected | True |
| schema | /v2/schemas/image |
| size | 678952960 |
| status | active |
| tags | |
| updated_at | 2024-06-12T17:04:13Z |
| virtual_size | 2361393152 |
| visibility | public |
+-----+-----+
(ubuntu@workstation (keystone-admin)]:~$
```

- 1.24.** Leave the terminal window open and continue to the next task.

2 Defining Flavors

In this task, you will create and delete flavors with the *Horizon Dashboard* and *OpenStack Unified CLI*.

- 2.1. Open the web browser and navigate to **192.168.1.20**. Log in to the dashboard as the **admin** user with the password **secret**.
- 2.2. Select **demo** project. We will not need any of the existing flavors in this lab, so any of them can be safely deleted. For demonstration, navigate to **Admin > Compute > Flavors**, select the **ds1G** flavor, and click **Delete Flavors**.

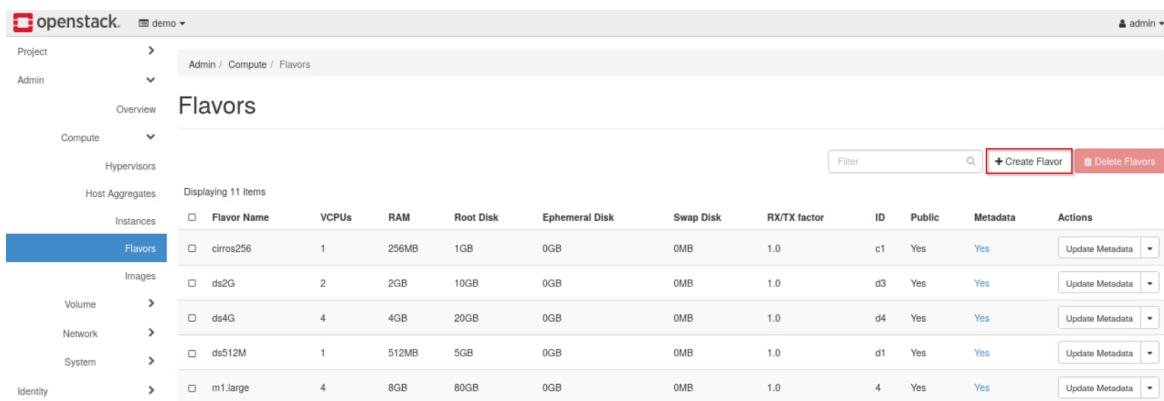


Flavor Name	VCPUs	RAM	Root Disk	Ephemeral Disk	Swap Disk	RX/TX factor	ID	Public	Metadata	Actions
cirros256	1	256MB	1GB	0GB	0MB	1.0	c1	Yes	Yes	<button>Update Metadata</button>
ds1G	1	1GB	10GB	0GB	0MB	1.0	d2	Yes	Yes	<button>Update Metadata</button>
ds2G	2	2GB	10GB	0GB	0MB	1.0	d3	Yes	Yes	<button>Update Metadata</button>
ds4G	4	4GB	20GB	0GB	0MB	1.0	d4	Yes	Yes	<button>Update Metadata</button>
ds512M	1	512MB	5GB	0GB	0MB	1.0	d1	Yes	Yes	<button>Update Metadata</button>

Tip

Alternatively, to delete a flavor, you can open the dropdown next to the **Update Metadata** button in the same row as the flavor, then click **Delete Flavor**.

- 2.3. Now, we will create our own flavor. On the same page, click **Create Flavor**.



Flavor Name	VCPUs	RAM	Root Disk	Ephemeral Disk	Swap Disk	RX/TX factor	ID	Public	Metadata	Actions
cirros256	1	256MB	1GB	0GB	0MB	1.0	c1	Yes	Yes	<button>Update Metadata</button>
ds2G	2	2GB	10GB	0GB	0MB	1.0	d3	Yes	Yes	<button>Update Metadata</button>
ds4G	4	4GB	20GB	0GB	0MB	1.0	d4	Yes	Yes	<button>Update Metadata</button>
ds512M	1	512MB	5GB	0GB	0MB	1.0	d1	Yes	Yes	<button>Update Metadata</button>
m1.large	4	8GB	80GB	0GB	0MB	1.0	4	Yes	Yes	<button>Update Metadata</button>

- 2.4. Enter **flavor1** in the *Name* field, **2** in the *VCPUs* field, **1024** in the *RAM (MB)* field, and **10** in the *Root Disk (GB)* field. Click **Create Flavor**.

Create Flavor

Flavor Information * **Flavor Access**

Name *
flavor1

ID ?
auto

VCPUs *
2

RAM (MB) *
1024

Root Disk (GB) *
10

Ephemeral Disk (GB)
0

Swap Disk (MB)
0

RX/TX Factor
1

Flavors define the sizes for RAM, disk, number of cores, and other resources and can be selected when users deploy instances.

Note

At the time of writing, there is no way to update flavors (apart from their metadata) from the Horizon Dashboard after a flavor has been created. Any changes will require deleting the flavor and remaking it.

Create Flavor

- 2.5. Log out of the *Horizon Dashboard* and close the web browser.

- 2.6.** Now, we will create a similar flavor from the command line. If a terminal is not already open, open one and source the `~/keystonerc-admin` file.

```
ubuntu@workstation:~$ source ~/keystonerc-admin
```

```
ubuntu@workstation:~$ source ~/keystonerc-admin
[ubuntu@workstation (keystone-admin)]:~$ █
```

- 2.7.** List the current OpenStack flavors.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack flavor list
```

ID	Name	RAM	Disk	Ephemeral	VCPUs	Is Public
1	m1.tiny	512	1	0	1	True
2	m1.small	2048	20	0	1	True
3	m1.medium	4096	40	0	2	True
36e8dc04-8957-48cd-8434-f6da50080173	flavor1	1024	10	0	2	True
4	m1.large	8192	80	0	4	True
42	m1.nano	128	1	0	1	True
5	m1.xlarge	16384	160	0	8	True
84	m1.micro	192	1	0	1	True
c1	cirros256	256	1	0	1	True
d1	ds512M	512	5	0	1	True
d3	ds2G	2048	10	0	2	True
d4	ds4G	4096	20	0	4	True

- 2.8.** Create a flavor named **flavor2** with **1 VCPU**, **1024 MB** of RAM, a **10 GB** root disk, a **2 GB** ephemeral disk, and a **1024 MB** swap disk.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack flavor create \
> --vcpus 1 \
> --ram 1024 \
> --disk 10 \
> --ephemeral 2 \
> --swap 1024 \
> flavor2
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack flavor create \
> --vcpus 1 \
> --ram 1024 \
> --disk 10 \
> --ephemeral 2 \
> --swap 1024 \
> flavor2
+-----+
| Field          | Value
+-----+
| OS-FLV-DISABLED:disabled | False
| OS-FLV-EXT-DATA:ephemeral | 2
| disk            | 10
| id              | 12c985b6-5506-4656-808b-cde996342518
| name            | flavor2
| os-flavor-access:is_public | True
| properties      |
| ram             | 1024
| rxtx_factor    | 1.0
| swap            | 1024
| vcpus           | 1
+-----+
[ubuntu@workstation (keystone-admin)]:~$ █
```

Note

Ephemeral storage is disk space that persists only until the instance is terminated. Swap space allows the operating system to use a portion of hard disk space as additional RAM if the physical memory becomes full.

- 2.9. Verify that the **flavor2** flavor has been created and has the correct values by listing the flavors.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack flavor list
```

ID	Name	RAM	Disk	Ephemeral	VCPUs	Is Public
1	m1.tiny	512	1	0	1	True
12c985b6-5506-4656-808b-cde996342518	flavor2	1024	10	2	1	True
2	m1.small	2048	20	0	1	True
3	m1.medium	4096	40	0	2	True
36e8dc04-8957-48cd-8434-f6da50080173	flavor1	1024	10	0	2	True
4	m1.large	8192	80	0	4	True
42	m1.nano	128	1	0	1	True
5	m1.xlarge	16384	160	0	8	True
84	m1.micro	192	1	0	1	True
c1	cirros256	256	1	0	1	True
d1	ds512M	512	5	0	1	True
d3	ds2G	2048	10	0	2	True
d4	ds4G	4096	20	0	4	True

- 2.10. Show more details about **flavor2**.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack flavor show flavor2
```

Field	Value
OS-FLV-DISABLED:disabled	False
OS-FLV-EXT-DATA:ephemeral	2
access_project_ids	None
disk	10
id	12c985b6-5506-4656-808b-cde996342518
name	flavor2
os-flavor-access:is_public	True
properties	
ram	1024
rxtx_factor	1.0
swap	1024
vcpus	1

- 2.11. The **flavor1** flavor is no longer needed. Delete the **flavor1** flavor to demonstrate deletion from the command line.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack flavor delete flavor1
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack flavor delete flavor1
[ubuntu@workstation (keystone-admin)]:~$
```

- 2.12.** Verify that **flavor1** has been deleted by listing all the available flavors and noting that **flavor1** does not appear on the list.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack flavor list
```

ID	Name	RAM	Disk	Ephemeral	VCPUs	Is Public
1	m1.tiny	512	1	0	1	True
12c985b6-5506-4656-808b-cde996342518	flavor2	1024	10	2	1	True
2	m1.small	2048	20	0	1	True
3	m1.medium	4096	40	0	2	True
4	m1.large	8192	80	0	4	True
42	m1.nano	128	1	0	1	True
5	m1.xlarge	16384	160	0	8	True
84	m1.micro	192	1	0	1	True
c1	cirros256	256	1	0	1	True
d1	ds512M	512	5	0	1	True
d3	ds2G	2048	10	0	2	True
d4	ds4G	4096	20	0	4	True

Tip

An alternative method is appending | **grep flavor1** to this command and noting that the output is empty.

Note

At the time of writing, there are no standard OpenStack commands to update a flavor after creation. Any changes will require deleting the flavor and remaking it.

- 2.13.** Leave the terminal window open and continue to the next task.

3 Managing Private Networks

In this task, you will manage networks and subnets with the *Horizon Dashboard* and *OpenStack Unified CLI*. You will create and delete networks and subnetworks, update their settings, and rename them.

- 3.1. Open the web browser and navigate to **192.168.1.20**. Log in to the dashboard as the **admin** user with the password **secret**.
- 3.2. In this lab, we will create and manage our own networks, so any existing network can be safely deleted. First, select **demo** project. Then, navigate to **Project > Network > Networks**, select the **shared** network, and click **Delete Networks**.

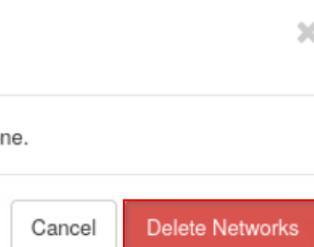
Name	Subnets Associated	Shared	External	Status	Admin State	Availability Zones	Actions
<input checked="" type="checkbox"/> shared	shared-subnet 192.168.233.0/24	Yes	No	Active	UP	-	<button>Edit Network</button>
<input type="checkbox"/> private	ipv6-private-subnet fd96:731b:22b0::/64 private-subnet 10.0.0.0/26	No	No	Active	UP	-	<button>Edit Network</button>
<input type="checkbox"/> public	ipv6-public-subnet 2001:db8::/64 public-subnet 172.24.4.0/24	No	Yes	Active	UP	-	<button>Edit Network</button>

Tip

A network can also be deleted by selecting the dropdown next to the **Edit Network** button in the same row as the network, then clicking **Delete Network**.

- 3.3. Click **Delete Networks** in the **Confirm Delete Networks** dialog box to confirm deletion.

Confirm Delete Networks



- 3.4.** Now, we will create our own network and subnet. Navigate back to **Project > Network > Networks** and click **Create Network**.

The screenshot shows the OpenStack interface under the 'demo' project. The left sidebar has 'Compute', 'Volumes', and 'Network' sections. Under 'Network', there are 'Network Topology' and 'Routers' sections. The main area displays two networks: 'private' (IPv6-private-subnet) and 'public' (IPv6-public-subnet). A red box highlights the '+ Create Network' button at the top right of the network list.

- 3.5.** Enter **net1** in the *Network Name* field. Click **Next**.

Create Network

Network **Subnet** **Subnet Details**

Network Name
net1

Create a new network. In addition, a subnet associated with the network can be created in the following steps of this wizard.

Enable Admin State ?

Shared

Create Subnet

Availability Zone Hints ?

MTU ?

Cancel **« Back** **Next »**

Stop

Verify that the *Create Subnet* checkbox is checked.

- 3.6. Enter **subnet1** in the *Subnet Name* field, and enter **10.0.0.0/24** in the *Network Address* field. Click **Next**.

Create Network

X

Network Subnet Subnet Details

Subnet Name
subnet1

Network Address Source
Enter Network Address manually ▾

Network Address ⓘ
10.0.0.0/24

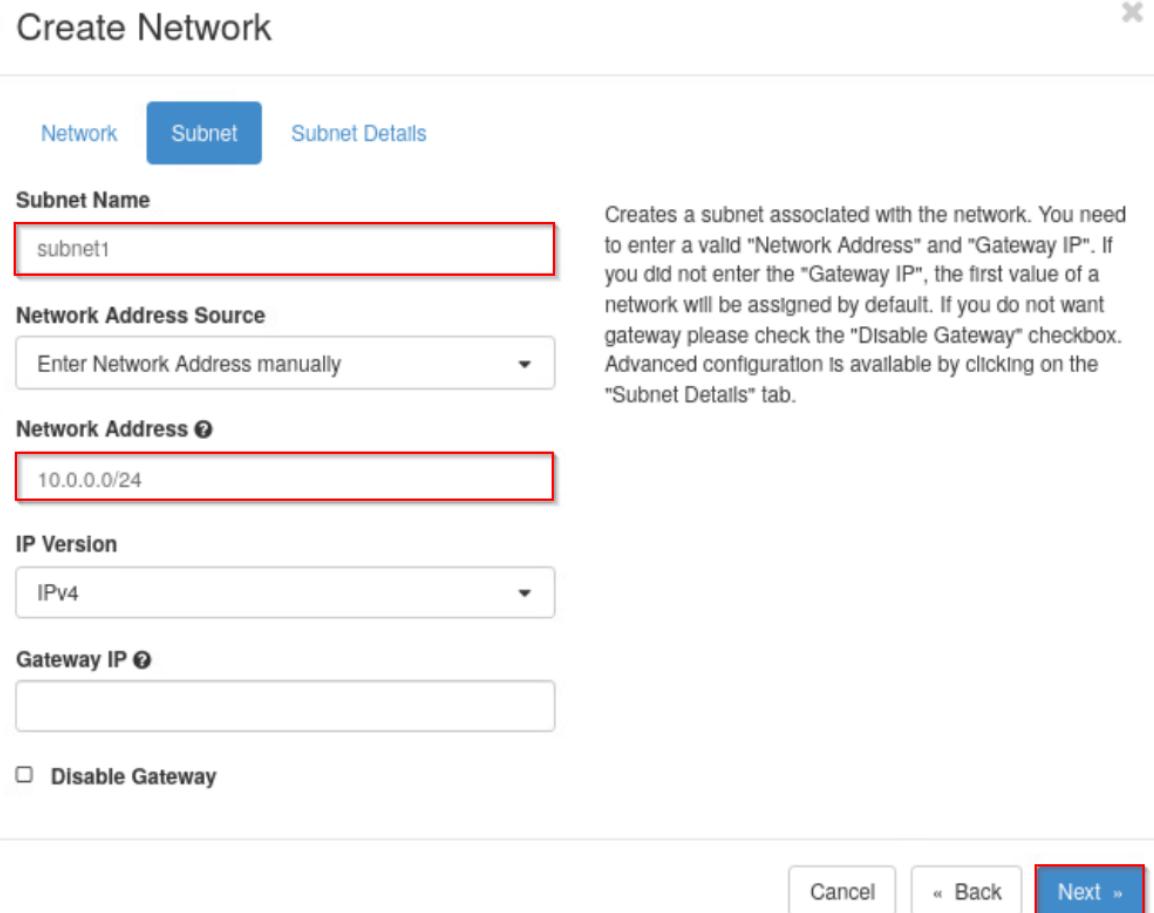
IP Version
IPv4 ▾

Gateway IP ⓘ

Disable Gateway

Creates a subnet associated with the network. You need to enter a valid "Network Address" and "Gateway IP". If you did not enter the "Gateway IP", the first value of a network will be assigned by default. If you do not want gateway please check the "Disable Gateway" checkbox. Advanced configuration is available by clicking on the "Subnet Details" tab.

Cancel « Back Next »



- 3.7. Leave the defaults in the *Subnet Details* tab and click **Create**.

Create Network

X

Network Subnet **Subnet Details**

Enable DHCP Specify additional attributes for the subnet.

Allocation Pools ?

DNS Name Servers ?

Host Routes ?

Cancel « Back **Create**

- 3.8. Log out of the *Horizon Dashboard* and close the web browser.

- 3.9. If a terminal window is not already open, open one and source the `~/keystonerc-admin` file to load the **admin** user credentials.

```
ubuntu@workstation:~$ source ~/keystonerc-admin
```

```
ubuntu@workstation:~$ source ~/keystonerc-admin
[ubuntu@workstation (keystone-admin)]:~$ █
```

3.10. List the current OpenStack networks.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack network list
```

ID	Name	Subnets
32da4c25-b517-40c5-97e3-cea031467d13	public	4fc6bf88-919c-49df-83c4-b09bd65776ad, c7916655-8954-4bf4-913d-416702f35d1b
966ecb4f-4ff8-44ea-a476-2d2f18955085	private	674205b6-1357-4727-a21a-94220492a57f, fa8a2545-5a8c-44a2-bacc-1b86c253b880
fb0015fd-0a5c-4be1-99f9-064c50ba36a8	net1	51bd8639-92af-414a-a437-011ef10215fe

3.11. Create a network named net2.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack network create net2
```

Field	Value
admin_state_up	UP
availability_zone_hints	
availability_zones	
created_at	2024-06-13T00:22:18Z
description	
dns_domain	None
id	77520fd5-cd86-4dfe-9340-497bf4eda481
ipv4_address_scope	None
ipv6_address_scope	None
is_default	False
is_vlan_transparent	None
mtu	1442
name	net2
port_security_enabled	True
project_id	39e851b14f864573aad60582c35e40dc
provider:network_type	geneve
provider:physical_network	None
provider:segmentation_id	786
qos_policy_id	None
revision_number	1
router:external	Internal
segments	None
shared	False
status	ACTIVE
subnets	
tags	
updated_at	2024-06-13T00:22:18Z

3.12. List the networks again to confirm that the network was successfully created.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack network list
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack network list
+-----+-----+
| ID      | Name   | Subnets
+-----+-----+
| 32da4c25-b517-40c5-97e3-cea031467d13 | public  | 4fc6bf88-919c-49df-83c4-b09bd65776ad, c7916655-8954-4bf4-913d-416702f35d1b |
| 77520fd5-cd86-4dfe-9340-497bf4eda481 | net2    |                                 |
| 966ecb4f-4ff8-44ea-a476-2d2f18955085 | private | 674205b6-1357-4727-a21a-94220492a57f, fa8a2545-5a8c-44a2-bacc-1b86c253b880 |
| be5d9b78-36ea-4058-90e6-012d280f7dd7 | net1    | 73ceba28-9ffd-49ab-98b3-b3d54981d41e
+-----+-----+
[ubuntu@workstation (keystone-admin)]:~$
```

- 3.13.** Create a subnet named **subnet2** for the **net2** network. Configure this subnet to use the **192.168.1.0/24** range and **172.25.250.254** as the DNS name server.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack subnet create \
> --subnet-range 192.168.1.0/24 \
> --dns-nameserver 172.25.250.254 \
> --network net2 \
> subnet2
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack subnet create \
> --subnet-range 192.168.1.0/24 \
> --dns-nameserver 172.25.250.254 \
> --network net2 \
> subnet2
+-----+
| Field          | Value
+-----+
| allocation_pools | 192.168.1.2-192.168.1.254
| cidr           | 192.168.1.0/24
| created_at     | 2024-06-13T00:28:33Z
| description    |
| dns_nameservers | 172.25.250.254
| enable_dhcp    | True
| gateway_ip     | 192.168.1.1
| host_routes    |
| id              | b5c61b0d-5951-421f-8df7-3fcbb6cc2e98
| ip_version      | 4
| ipv6_address_mode | None
| ipv6_ra_mode    | None
| name            | subnet2
| network_id      | 77520fd5-cd86-4dfe-9340-497bf4eda481
| project_id      | 39e851b14f864573aad60582c35e40dc
| revision_number | 0
| segment_id      | None
| service_types   |
| subnetpool_id   | None
| tags             |
| updated_at      | 2024-06-13T00:28:33Z
+-----+
[ubuntu@workstation (keystone-admin)]:~$
```

- 3.14.** The name of a network can also be changed. To demonstrate this, change the name of the **net1** network to **net3**.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack network set \
> --name net3 net1
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack network set \
> --name net3 net1
[ubuntu@workstation (keystone-admin)]:~$ █
```

Note

The format of this instruction is

```
openstack network set --name <new_name> <old_name>
```

This follows the convention that the object being operated on is always the final argument of the command.

- 3.15.** Verify that the **net1** network has been successfully changed to **net3**.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack network list
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack network list
+-----+-----+
| ID      | Name   | Subnets
+-----+-----+
| 32da4c25-b517-40c5-97e3-cea031467d13 | public  | 4fc6bf88-919c-49df-83c4-b09bd65776ad, c7916655-8954-4bf4-913d-416702f35d1b |
| 77520fd5-cd86-4dfe-9340-497bf4eda481 | net2    | b5c61b0d-5951-421f-8df7-3fc26cc2e98
| 966ecb4f-4ff8-44ea-a476-2d2f18955085 | private | 674205b6-1357-4727-a21a-94220492a57f, fa8a2545-5a8c-44a2-bacc-1b86c253b880
| be5d9b78-36ea-4058-90e6-012d280f7dd7 | net3    | 73ceba28-9ffd-49ab-98b3-b3d54981d41e
+-----+-----+
[ubuntu@workstation (keystone-admin)]:~$ █
```

- 3.16.** To avoid confusion, also rename **subnet1** to **subnet3**.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack subnet set \
> --name subnet3 subnet1
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack subnet set \
> --name subnet3 subnet1
[ubuntu@workstation (keystone-admin)]:~$ █
```

- 3.17.** Update the **subnet3** subnet to disable DHCP.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack subnet set \
> --no-dhcp subnet3
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack subnet set \
> --no-dhcp subnet3
[ubuntu@workstation (keystone-admin)]:~$ █
```

Note

DHCP (Dynamic Host Configuration Protocol) is a network protocol that automatically assigns IP addresses to devices on a network. If this protocol is disabled for a subnet, instances will not automatically receive an IP address or a default gateway. This option can be useful when you want to set a static IP address or set these values yourself.

- 3.18.** Verify that the **subnet3** subnetwork has been correctly updated. The **enable_dhcp** property should be listed as **False**.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack subnet show subnet3
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack subnet show subnet3
+-----+-----+
| Field          | Value
+-----+-----+
| allocation_pools | 10.0.0.2-10.0.0.254
| cidr           | 10.0.0.0/24
| created_at     | 2024-06-13T00:26:31Z
| description    |
| dns_nameservers |
| enable_dhcp    | False
| gateway_ip     | 10.0.0.1
| host_routes    |
| id              | 73ceba28-9ffd-49ab-98b3-b3d54981d41e
| ip_version      | 4
| ipv6_address_mode | None
| ipv6_ra_mode    | None
| name            | subnet3
| network_id      | be5d9b78-36ea-4058-90e6-012d280f7dd7
| project_id      | 39e851b14f864573aad60582c35e40dc
| revision_number | 2
| segment_id      | None
| service_types   |
| subnetpool_id   | None
| tags             |
| updated_at      | 2024-06-13T00:31:10Z
+-----+
[ubuntu@workstation (keystone-admin)]:~$ █
```

- 3.19.** The **net3** network is now ready to be deleted, which will also delete its subnets. To confirm this, first list the current subnets.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack subnet list
```

ID	Name	Network	Subnet
4fc6bf88-919c-49df-83c4-b09bd65776ad	ipv6-public-subnet	32da4c25-b517-40c5-97e3-cea031467d13	2001:db8::/64
674205b6-1357-4727-a21a-94220492a57f	ipv6-private-subnet	966ecb4f-4ff8-44ea-a476-2d2f18955085	fd96:731b:22b0::/64
b5c61b0d-5951-421f-8df7-3fc26cc2e98	subnet3	be5d9b78-36ea-4058-90e6-012d280f7dd7	10.0.0.0/24
c7916655-8954-4bf4-913d-416702f35d1b	subnet2	77520fd5-cd86-4dfe-9340-497bf4eda481	192.168.1.0/24
fa8a2545-5a8c-44a2-bacc-1b86c253b880	public-subnet	32da4c25-b517-40c5-97e3-cea031467d13	172.24.4.0/24
	private-subnet	966ecb4f-4ff8-44ea-a476-2d2f18955085	10.0.0.0/26

- 3.20.** Delete the **net3** network.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack network delete net3
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack network delete net3
[ubuntu@workstation (keystone-admin)]:~$
```

- 3.21.** Verify that the **net3** network has been deleted by listing all available networks and noting that **net3** is not present on the list.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack network list
```

ID	Name	Subnets
32da4c25-b517-40c5-97e3-cea031467d13	public	4fc6bf88-919c-49df-83c4-b09bd65776ad, c7916655-8954-4bf4-913d-416702f35d1b
77520fd5-cd86-4dfe-9340-497bf4eda481	net2	b5c61b0d-5951-421f-8df7-3fc26cc2e98
966ecb4f-4ff8-44ea-a476-2d2f18955085	private	674205b6-1357-4727-a21a-94220492a57f, fa8a2545-5a8c-44a2-bacc-1b86c253b880

- 3.22.** Verify that **subnet3**, the subnet that was attached to the **net3** network, was deleted along with the network.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack subnet list
```

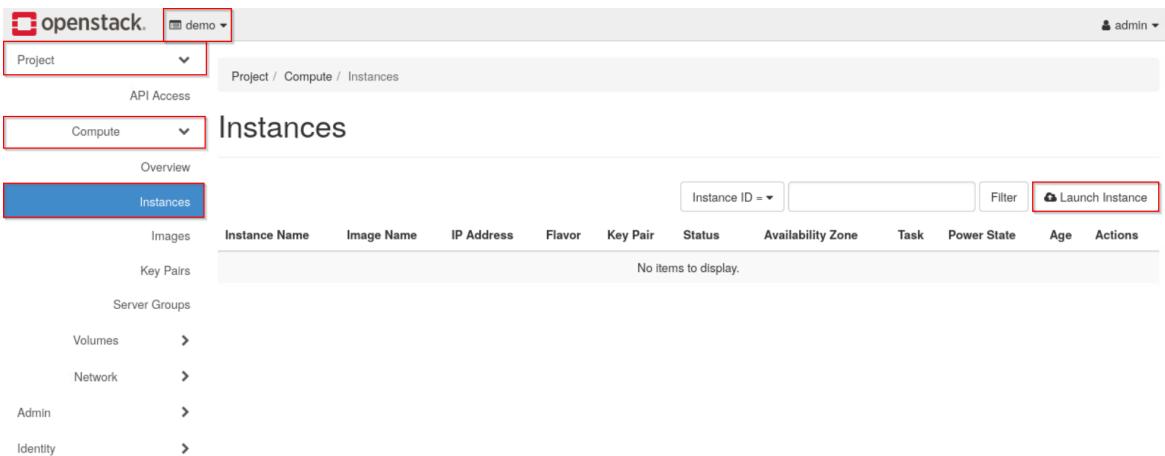
ID	Name	Network	Subnet
4fc6bf88-919c-49df-83c4-b09bd65776ad	ipv6-public-subnet	32da4c25-b517-40c5-97e3-cea031467d13	2001:db8::/64
674205b6-1357-4727-a21a-94220492a57f	ipv6-private-subnet	966ecb4f-4ff8-44ea-a476-2d2f18955085	fd96:731b:22b0::/64
b5c61b0d-5951-421f-8df7-3fc26cc2e98	subnet2	77520fd5-cd86-4dfe-9340-497bf4eda481	192.168.1.0/24
c7916655-8954-4bf4-913d-416702f35d1b	subnet1	32da4c25-b517-40c5-97e3-cea031467d13	172.24.4.0/24
fa8a2545-5a8c-44a2-bacc-1b86c253b880	private-subnet	966ecb4f-4ff8-44ea-a476-2d2f18955085	10.0.0.0/26

- 3.23.** Leave the terminal window open and continue to the next task.

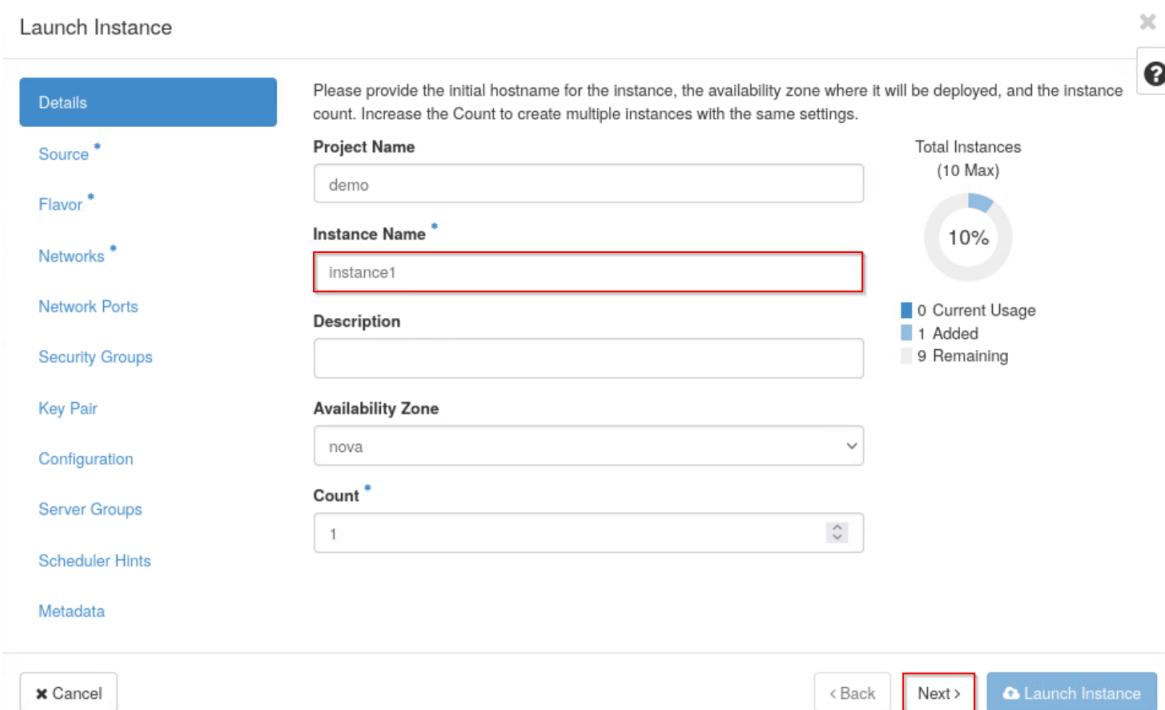
4 Launching an Internal Instance

In this task, you will launch an internal instance with the *Horizon Dashboard*. You will then delete that instance and launch a new instance with the *OpenStack Unified CLI*.

- 4.1. Open the web browser and navigate to **192.168.1.20**. Login as the **admin** user with the password **secret**.
- 4.2. Select **demo** project and navigate to **Projects > Compute > Instances**. Click **Launch Instance**.



- 4.3. Enter **instance1** in the *Instance Name* field. Click **Next**.



- 4.4.** Make sure **Image** is selected in the *Select Boot Source* dropdown, and click **No** under *Create New Volume*. Click the **↑** button on the same row as the **ubuntu2** image to allocate the image, and then click **Next**.

Launch Instance

Details	Instance source is the template used to create an Instance. You can use an Image, a snapshot of an Instance (Image snapshot), a volume or a volume snapshot (if enabled). You can also choose to use persistent storage by creating a new volume.																			
Source *	Select Boot Source <input type="text" value="Image"/> Create New Volume <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No																			
Flavor *																				
Networks *	Allocated Displaying 0 items																			
Network Ports	Name	Updated	Size	Format	Visibility															
Security Groups	Select an item from Available items below																			
Key Pair	Displaying 0 items																			
Configuration	Available <small>(2)</small> Select one																			
Server Groups	<input type="text"/> Click here for filters or full text search.																			
Scheduler Hints	Displaying 0 items																			
Metadata	Displaying 2 items <table border="1"> <thead> <tr> <th>Name</th> <th>Updated</th> <th>Size</th> <th>Format</th> <th>Visibility</th> </tr> </thead> <tbody> <tr> <td>clros-0.6.2-x86_64-disk</td> <td>2/9/24 7:59 PM</td> <td>20.44 MB</td> <td>QCOW2</td> <td>Public <input type="button" value="↑"/></td> </tr> <tr> <td>ubuntu2</td> <td>6/12/24 10:21 PM</td> <td>647.50 MB</td> <td>QCOW2</td> <td>Public <input checked="" type="button" value="↑"/></td> </tr> </tbody> </table>					Name	Updated	Size	Format	Visibility	clros-0.6.2-x86_64-disk	2/9/24 7:59 PM	20.44 MB	QCOW2	Public <input type="button" value="↑"/>	ubuntu2	6/12/24 10:21 PM	647.50 MB	QCOW2	Public <input checked="" type="button" value="↑"/>
Name	Updated	Size	Format	Visibility																
clros-0.6.2-x86_64-disk	2/9/24 7:59 PM	20.44 MB	QCOW2	Public <input type="button" value="↑"/>																
ubuntu2	6/12/24 10:21 PM	647.50 MB	QCOW2	Public <input checked="" type="button" value="↑"/>																
	Displaying 2 items																			
<input type="button" value="Cancel"/>		<input type="button" value="Back"/>		<input checked="" type="button" value="Next"/>	<input type="button" value="Launch Instance"/>															

Stop

Verify that **ubuntu2** appears in the *Allocated* section before moving on to the next step.

- 4.5. Click the ↑ button on the same row as the **flavor2** flavor to allocate that flavor, then click **Next**.

Launch Instance

Details Flavors manage the sizing for the compute, memory and storage capacity of the instance.

Allocated

Source Displaying 0 items

Flavor * Name VCPUS RAM Total Disk Root Disk Ephemeral Disk Public

Networks * Select a flavor from the available flavors below.

Network Ports Displaying 0 items

Security Groups Available 12 Select one

Key Pair Q Click here for filters or full text search. X

Configuration Displaying 12 items

Server Groups

Scheduler Hints

Metadata

Name	VCPUS	RAM	Total Disk	Root Disk	Ephemeral Disk	Public	Action
m1.nano	1	128 MB	1 GB	▲ 1 GB	0 GB	Yes	+
m1.micro	1	192 MB	1 GB	▲ 1 GB	0 GB	Yes	+
cirros256	1	256 MB	1 GB	▲ 1 GB	0 GB	Yes	+
m1.tiny	1	512 MB	1 GB	▲ 1 GB	0 GB	Yes	+
ds512M	1	512 MB	5 GB	▲ 5 GB	0 GB	Yes	+
flavor2	1	1 GB	12 GB	10 GB	2 GB	Yes	+
m1.small	1	2 GB	20 GB	20 GB	0 GB	Yes	+
ds2G	2	2 GB	10 GB	10 GB	0 GB	Yes	+
m1.medium	2	4 GB	40 GB	40 GB	0 GB	Yes	+
ds4G	4	4 GB	20 GB	20 GB	0 GB	Yes	+
m1.large	4	8 GB	80 GB	80 GB	0 GB	Yes	+
m1.xlarge	8	16 GB	160 GB	160 GB	0 GB	Yes	+

Displaying 12 items

< Back Next > Launch Instance

Stop

Verify that **flavor2** appears in the *Allocated* section before moving on to the next step.

Note

The warning signs in the *Root Disk* column indicate that the flavor in that row has a disk size less than the minimum size specified for the selected image.

- 4.6.** Click the ↑ button on the same row as the **net2** network, and click **Launch Instance**.

Launch Instance

Network	Subnets Associated	Shared	Admin State	Status	
net2	subnet2	No	Up	Active	↑
private	ipv6-private-subnet private-subnet	No	Up	Active	↑

Stop

Verify that **net2** appears under the *Allocated* section. Wait for the instance to have a power state of **Running** before proceeding further.

- 4.7.** Log out of the *Horizon Dashboard* and close the web browser.

- 4.8.** If a terminal window is not already open, open one and source the `~/keystonerc-admin` file to load the **admin** user credentials.

```
ubuntu@workstation:~$ source ~/keystonerc-admin
```

```
ubuntu@workstation:~$ source ~/keystonerc-admin
[ubuntu@workstation (keystone-admin)]:~$ █
```

- 4.9. List the available instances and see that the instance created from the *Horizon Dashboard* appears.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server list
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server list
+-----+-----+-----+-----+-----+
| ID      | Name    | Status | Networks      | Image   | Flavor  |
+-----+-----+-----+-----+-----+
| b0db1d25-dd6c-47b9-907f-1c683e7a4856 | instance1 | ACTIVE | net2=192.168.1.38 | ubuntu2 | flavor2 |
+-----+-----+-----+-----+-----+
[ubuntu@workstation (keystone-admin)]:~$ █
```

- 4.10. Now, we will recreate the instance from the CLI. First, delete the **instance1** instance.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server delete instance1
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server delete instance1
[ubuntu@workstation (keystone-admin)]:~$ █
```

- 4.11. List the instances again to verify that **instance1** was deleted successfully.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server list
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server list
[ubuntu@workstation (keystone-admin)]:~$ █
```

- 4.12. Create a new instance named **instance2**. Use the previously created **ubuntu2** image, **flavor2** flavor, and **net2** network.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server create \
> --image ubuntu2 \
> --flavor flavor2 \
> --nic net-id=net2 \
> instance2
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server create \
> --image ubuntu2 \
> --flavor flavor2 \
> --nic net-id=net2 \
> instance2
+-----+
| Field | Value |
+-----+
| OS-DCF:diskConfig | MANUAL |
| OS-EXT-AZ:availability_zone | None |
| OS-EXT-SRV-ATTR:host | None |
| OS-EXT-SRV-ATTR:hypervisor_hostname | None |
| OS-EXT-SRV-ATTR:instance_name | instance2 |
| OS-EXT-STS:power_state | NOSTATE |
| OS-EXT-STS:task_state | scheduling |
| OS-EXT-STS:vm_state | building |
| OS-SRV-USG:launched_at | None |
| OS-SRV-USG:terminated_at | None |
| accessIPv4 |  |
| accessIPv6 |  |
| addresses |  |
| adminPass | YFkPYMUwddc2 |
| config_drive |  |
| created | 2024-06-13T00:51:42Z |
| flavor | flavor2 (641a6748-3495-4ca3-adeb-8304ab64053b) |
| hostId |  |
| id | bb55ad62-155b-4e29-92c8-cf58a2cc36c3 |
| image | ubuntu2 (c5a2b30b-439b-4fc8-bf95-05d9d86fd94e) |
| key_name | None |
| name | instance2 |
| progress | 0 |
| project_id | 39e851b14f864573aad60582c35e40dc |
| properties |  |
| security_groups | name='default' |
| status | BUILD |
| updated | 2024-06-13T00:51:42Z |
| user_id | 14f5376f00c04e90b7103dd8d4263040 |
| volumes_attached |  |
+-----+
[ubuntu@workstation (keystone-admin)]:~$
```

- 4.13. List all the available instance to verify that the **instance2** instance is running.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server list
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server list
+-----+-----+-----+-----+-----+
| ID      | Name     | Status  | Networks   | Image    | Flavor  |
+-----+-----+-----+-----+-----+
| bb55ad62-155b-4e29-92c8-cf58a2cc36c3 | instance2 | ACTIVE  | net2=192.168.1.228 | ubuntu2  | flavor2 |
+-----+-----+-----+-----+-----+
[ubuntu@workstation (keystone-admin)]:~$ █
```

- 4.14. Leave the terminal window open and continue to the next task.

5 Verifying the Functionality of an Internal Instance

In this task, you will connect to the console of the instance you created previously and verify its flavor settings. You will also pause and stop the instance with the *OpenStack Unified CLI*.

- 5.1.** If a terminal window is not already open, open one and source the `~/keystonerc-admin` file to load the **admin** user credentials.

```
ubuntu@workstation:~$ source ~/keystonerc-admin
```

```
ubuntu@workstation:~$ source ~/keystonerc-admin
[ubuntu@workstation (keystone-admin)]:~$ █
```

- 5.2.** List all the available instances to find the name of the running instance.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server list
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server list
+-----+-----+-----+-----+-----+
| ID      | Name     | Status  | Networks    | Image   | Flavor  |
+-----+-----+-----+-----+-----+
| bb55ad62-155b-4e29-92c8-cf58a2cc36c3 | instance2 | ACTIVE  | net2=192.168.1.228 | ubuntu2 | flavor2 |
+-----+-----+-----+-----+-----+
[ubuntu@workstation (keystone-admin)]:~$ █
```

5.3. Show more details of the instance.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server show instance2
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server show instance2
+-----+-----+
| Field          | Value
+-----+-----+
| OS-DCF:diskConfig | MANUAL
| OS-EXT-AZ:availability_zone | nova
| OS-EXT-SRV-ATTR:host | devstack
| OS-EXT-SRV-ATTR:hypervisor_hostname | devstack
| OS-EXT-SRV-ATTR:instance_name | instance-00000002
| OS-EXT-STS:power_state | Running
| OS-EXT-STS:task_state | None
| OS-EXT-STS:vm_state | active
| OS-SRV-USG:launched_at | 2024-06-13T00:51:45.000000
| OS-SRV-USG:terminated_at | None
| accessIPv4 |
| accessIPv6 |
| addresses      | net2=192.168.1.228
| config_drive |
| created        | 2024-06-13T00:51:42Z
| flavor         | flavor2 (641a6748-3495-4ca3-adeb-8304ab64053b)
| hostId         | 1b8dbd84262b5472c62a2892fd623993d3a98d2faf2f7862e90ce419
| id             | bb55ad62-155b-4e29-92c8-cf58a2cc36c3
| image          | ubuntu2 (c5a2b30b-439b-4fc8-bf95-05d9d86fd94e)
| key_name       | None
| name           | instance2
| progress       | 0
| project_id    | 39e851b14f864573aad60582c35e40dc
| properties     |
| security_groups | name='default'
| status          | ACTIVE
| updated        | 2024-06-13T00:51:46Z
| user_id        | 14f5376f00c04e90b7103dd8d4263040
| volumes_attached |
+-----+-----+
[ubuntu@workstation (keystone-admin)]:~$ █
```

5.4. Review the specifications of the **flavor2** flavor.

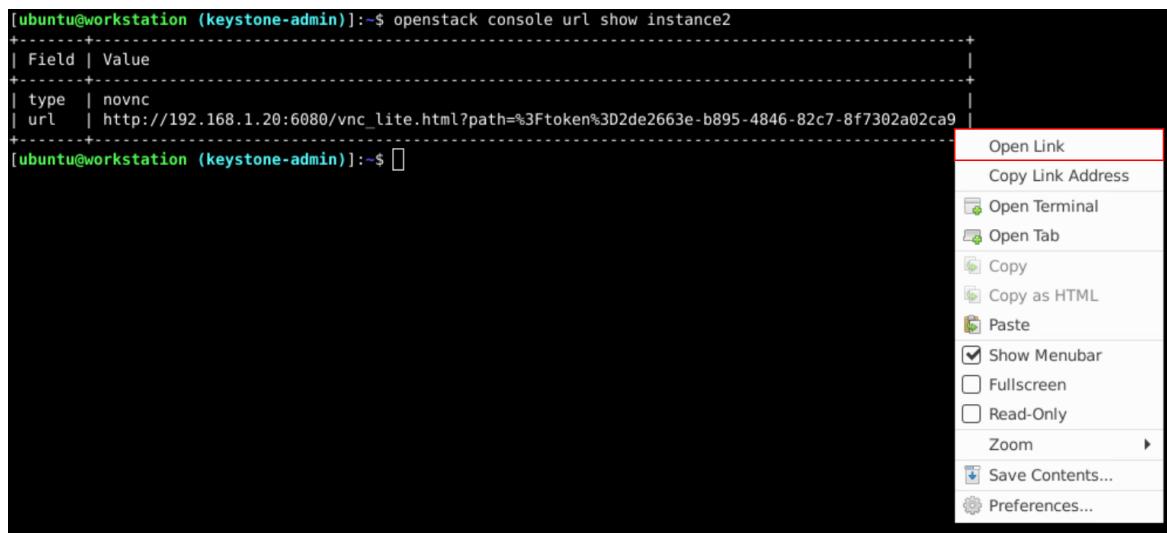
```
[ubuntu@workstation (keystone-admin)]:~$ openstack flavor show flavor2
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack flavor show flavor2
+-----+
| Field          | Value
+-----+
| OS-FLV-DISABLED:disabled | False
| OS-FLV-EXT-DATA:ephemeral | 2
| access_project_ids      | None
| disk                 | 10
| id                   | 641a6748-3495-4ca3-adeb-8304ab64053b
| name                 | flavor2
| os-flavor-access:is_public | True
| properties           |
| ram                  | 1024
| rxtx_factor           | 1.0
| swap                 | 1024
| vcpus                | 1
+-----+
[ubuntu@workstation (keystone-admin)]:~$
```

5.5. Retrieve the URL for the noVNC console connection. Right-click the link and select **Open Link**.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack console url show instance2
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack console url show instance2
+-----+
| Field | Value
+-----+
| type  | novnc
| url   | http://192.168.1.20:6080/vnc_lite.html?path=%3Ftoken%3D2de2663e-b895-4846-82c7-8f7302a02ca9
+-----+
[ubuntu@workstation (keystone-admin)]:~$
```



The context menu options include:

- Open Link (highlighted)
- Copy Link Address
- Open Terminal
- Open Tab
- Copy
- Copy as HTML
- Paste
- Show Menubar
- Fullscreen
- Read-Only
- Zoom
- Save Contents...
- Preferences...

- 5.6. Log in to **instance2** as **root** with the password **secret**.

```
Ubuntu 22.04.3 LTS instance2 tty1

instance2 login: root
Password: _
```

- 5.7. Use the **free** command to ensure that the RAM and swap amounts approximately match the one defined by **flavor2**, which is **1024 MB** for each.

```
root@instance2:~# free -m
```

```
root@instance2:~# free -m
      total        used        free      shared  buff/cache   available
Mem:       957         163         488          3         305         645
Swap:     1023           0        1023
root@instance2:~# _
```

Note

The amount of RAM on the system is given in the **Mem** row. The amounts shown in the output of this command will not exactly match the amounts specified by **flavor2** because a portion of the memory is reserved by the operating system.

- 5.8. Use the **df** command to ensure that the instance has disks of size **10 GB** and **2 GB**, as defined by **flavor2** for root and ephemeral disks, respectively. Notice that **/dev/vda1** is reported as nearly 10 GB, and **/dev/vdb** is exactly 2 GB.

```
root@instance2:~# df -h
```

```
root@instance2:~# df -h
Filesystem      Size  Used Avail Use% Mounted on
tmpfs            96M   976K    95M   1% /run
/dev/vda1        9.6G  1.5G   8.1G  15% /
tmpfs            479M     0    479M   0% /dev/shm
tmpfs            5.0M     0    5.0M   0% /run/lock
/dev/vda15       105M   6.1M    99M   6% /boot/efi
/dev/vdb          2.0G   24K   1.8G   1% /mnt
tmpfs            96M   4.0K    96M   1% /run/user/0
root@instance2:~#
```

Note

When the **-h** argument is passed, **df** reports sizes in a human-readable format by using units such as megabytes and gigabytes.

Note

The operating system also reserves a small portion of root disk space, which is why the root disk is reported as less than 10 GB. However, it does not reserve any space from ephemeral disk, so it is reported as exactly the right size.

- 5.9.** Determine the number of CPUs that the instance is using. Ensure the number matches the number of VCPUs defined by **flavor2**, which is **1**. Notice that under the **Architecture** heading at the top of the command output, there is a **CPU(s)** heading, whose value is **1**.

```
root@instance2:~# lscpu
```

```
root@instance2:~# lscpu
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Address sizes:         40 bits physical, 48 bits virtual
Byte Order:            Little Endian
CPU(s):                1
On-line CPU(s) list:  0
Vendor ID:             GenuineIntel
Model name:            Intel Core i7 9xx (Nehalem Class Core i7)
CPU family:            6
Model:                 26
Thread(s) per core:   1
Core(s) per socket:   1
Socket(s):            1
Stepping:              3
BogoMIPS:              4988.33
Flags:                 fpu de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush mmx fxsr sse sse2 syscall nx lm constant_tsc rep_good nopl xtopology cpuid dni ssse3 cx16 sse4_1 sse4_2 popcnt hypervisor lahf_lm pt
i
Caches (sum of all):
L1d:                  32 KiB (1 instance)
L1i:                  32 KiB (1 instance)
L2:                   4 MiB (1 instance)
L3:                   16 MiB (1 instance)
NUMA:
NUMA node(s):          1
NUMA node0 CPU(s):    0
Vulnerabilities:
Gather data sampling: Not affected
Itlb multihit:         KVM: Mitigation: VMX unsupported
L1if:                  Mitigation; PTE Inversion
Mds:                   Vulnerable; Clear CPU buffers attempted, no microcode; SMT Host state unknown
Meltdown:               Mitigation; PTI
Mmio stale data:       Unknown: No mitigations
Retbleed:               Not affected
Spec rstack overflow: Not affected
Spec store bypass:     Vulnerable
Spectre v1:              Mitigation; usercopy/swapgs barriers and __user pointer sanitization
Spectre v2:              Mitigation; Retpolines, STIBP disabled, RSB filling, PBRSB-eIBRS Not affected
Srbds:                  Not affected
Txn async abort:       Not affected
root@instance2:~#
```

- 5.10.** Use the **ping** command from the instance to reach the DHCP server defined for the network. Leave the **ping** command running, as it will be used in the following steps. Recall that the network for this instance (**net2**) is *not* the one on which you disabled DHCP (**net3**).

```
root@instance2:~# ping -c3 192.168.1.2
```

```
root@instance2:~# ping 192.168.1.2
PING 192.168.1.2 (192.168.1.2) 56(84) bytes of data.
64 bytes from 192.168.1.2: icmp_seq=1 ttl=64 time=4.83 ms
64 bytes from 192.168.1.2: icmp_seq=2 ttl=64 time=0.742 ms
64 bytes from 192.168.1.2: icmp_seq=3 ttl=64 time=0.456 ms
```

Note

You should receive 3 successful ping replies.

- 5.11.** Close the web browser and switch focus to the terminal on **workstation**.

- 5.12.** List the current OpenStack instances.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server list
```

ID	Name	Status	Networks	Image	Flavor
bb55ad62-155b-4e29-92c8-cf58a2cc36c3	instance2	ACTIVE	net2=192.168.1.228	ubuntu2	flavor2

- 5.13.** Delete **instance2**.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server delete instance2
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server delete instance2
[ubuntu@workstation (keystone-admin)]:~$
```

- 5.14.** List all available instances to verify the **instance2** instance has been deleted.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server list
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server list
[ubuntu@workstation (keystone-admin)]:~$
```

- 5.15.** Close the terminal window and the web browser.

- 5.16.** The lab is now complete.