



**OpenStack Labs**

**Lab 03: Deploying an Internal Instance**

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## Introduction

In this lab, you will manage images using the *Horizon Dashboard* and *OpenStack Unified CLI*, develop flavors, manage private networks, launch an internal instance, and verify the functionality of an internal instance.

## Objectives

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

## Lab Settings

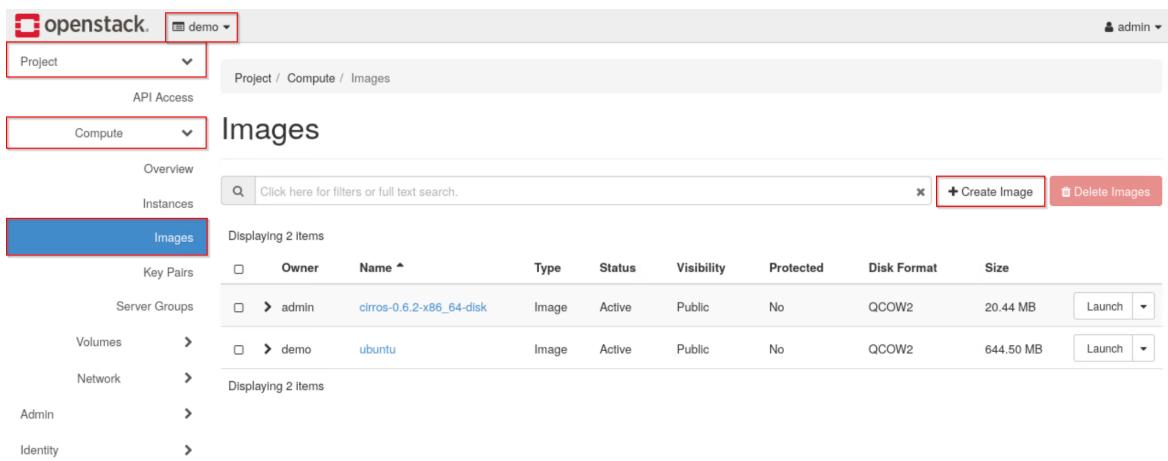
The information in the table below will be needed in order to complete the lab. The task sections below provide details on the use of this information.

Virtual Machine	IP Address	Account	Password
workstation	ens3: 192.168.1.21 ens4: 172.25.250.21	ubuntu	ubuntu
devstack	ens3: 192.168.1.20 ens4: 172.25.250.20	ubuntu	ubuntu

# 1 Uploading Images

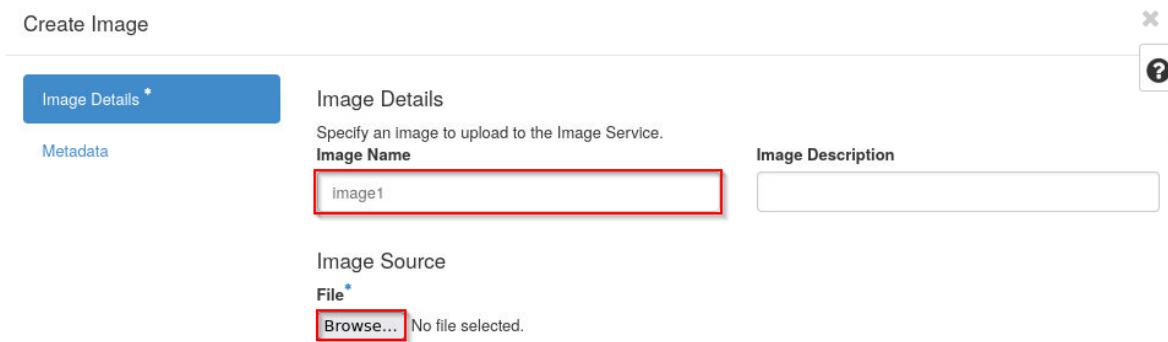
In this task, you will create, modify, and delete images using the *Horizon Dashboard* and *OpenStack Unified CLI*.

1. Open the web browser. Navigate to **192.168.1.20** and log into the dashboard as **admin** with the password **secret**.
2. Switch to the **demo** project. To create a new OpenStack image, first navigate to **Project > Compute > Images** and click **Create Image**.



	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 type="checkbox"/>	demo	ubuntu	Image	Active	Public	No	QCOW2	644.50 MB

3. Enter **image1** into the *Image Name* field. Under **File**, click **Browse....**



**Create Image**

**Image Details \***

**Image Name**

Specify an image to upload to the Image Service.

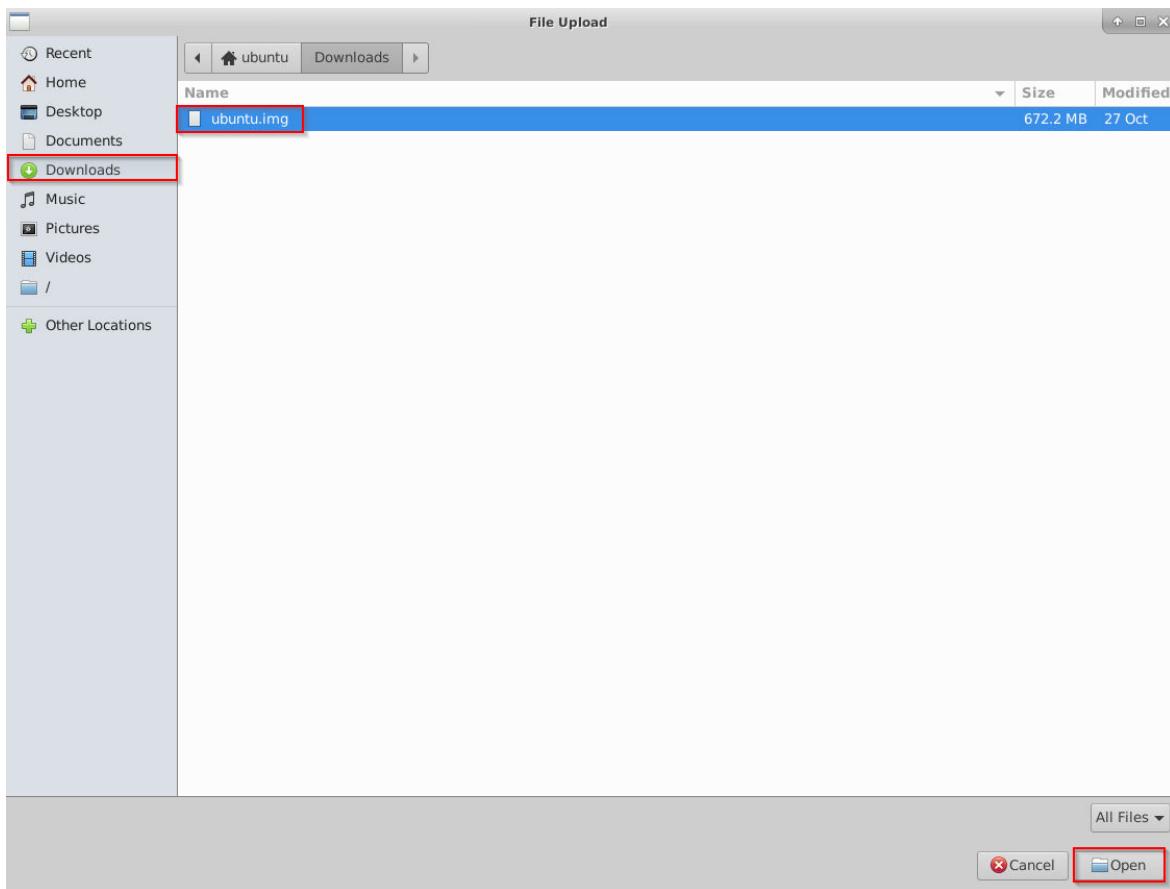
**Image Description**

**Image Source**

**File \***

**Browse...** No file selected.

4. In the file browser, click **Downloads**, then select the **ubuntu.img** file. Click the **Open** button.



5. In the format dropdown, select **QCOW2 - QEMU Emulator**, and under *Image Sharing*, set *Visibility* to **Private**. Make sure **No** is selected for *Protected*, and click on **Create Image**.

**Format\***  
QCOW2 - QEMU Emulator

**Image Requirements**

**Kernel**: Choose an Image

**Architecture**: [empty input field]

**Ramdisk**: Choose an Image

**Minimum Disk (GB)**: 0

**Minimum RAM (MB)**: 0

**Image Sharing**

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

**Protected**: Yes, No (highlighted with a red box)

**Create Image** (highlighted with a red box)

### Stop

Wait for the **image1** status to be *Active*. You may need to refresh the browser until you see the status of *Active*.

6. Open the dropdown menu next to the **Launch** button in the row of **image1**, and click on **Edit Image**.

The screenshot shows the OpenStack Horizon Dashboard under the 'Compute' tab. The 'Images' section is selected. A table lists three images: 'cirros-0.6.2-x86\_64-disk' (Owner: admin, Status: Active, Size: 20.44 MB), 'image1' (Owner: demo, Status: Active, Size: 644.50 MB), and 'ubuntu' (Owner: demo, Status: Active, Size: 644.50 MB). The 'image1' row has a context menu open, with the 'Edit Image' option highlighted by a red box.

7. Enter **10** in the *Minimum Disk (GB)* field, and select **Yes** for *Protected*. Click the **Update Image** button.

The screenshot shows the 'Edit Image' dialog. The 'Image Details' tab is selected. Under 'Format\*', 'QCOW2 - QEMU Emulator' is chosen. In the 'Image Requirements' section, the 'Minimum Disk (GB)' dropdown is set to '10' and is highlighted with a red box. In the 'Protected' section, the 'Yes' radio button is selected and highlighted with a red box. At the bottom right, the 'Update Image' button is highlighted with a red box.

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

9. 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:~$ █
```

10. Try to delete the **image1** image while it is protected. It should return an error.

```
ubuntu@workstation:~$ openstack image delete image1
```

```
ubuntu@workstation:~$ openstack image delete image1
Failed to delete image with name or ID 'image1': 403 Forbidden: Image 6e4f7f11-7
846-4542-9846-ccc50872c9c3 is protected and cannot be deleted. (HTTP 403)
Failed to delete 1 of 1 images.
ubuntu@workstation:~$ █
```

11. Set the **image1** image to unprotected.

```
ubuntu@workstation:~$ openstack image set --unprotected image1
```

```
ubuntu@workstation:~$ openstack image set --unprotected image1
ubuntu@workstation:~$ █
```

12. Delete the **image1** image.

```
ubuntu@workstation:~$ openstack image delete image1
```

```
ubuntu@workstation:~$ openstack image delete image1
ubuntu@workstation:~$ █
```

13. Create the **image1** image using the **~/Downloads/ubuntu.img** file and the QCOW2 format.

```
ubuntu@workstation:~$ openstack image create \
> --disk-format qcow2 \
> --file ~/Downloads/ubuntu.img \
> image2
```

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```
ubuntu@workstation:~$ openstack image create \
> --container-format qcow2 \
> --file ~/Downloads/ubuntu.img \
> image2
+-----+-----+
| Field | Value |
+-----+-----+
| checksum | 7967fb6a381a085f764c8194e28ecead |
| container_format | bare |
| created_at | 2023-11-10T17:47:16Z |
| disk_format | qcow2 |
| file | /v2/images/fa481031-8d4c-480a-8a98-e4096dbbf07/file |
| id | fa481031-8d4c-480a-8a98-e4096dbbf07 |
| min_disk | 0 |
| min_ram | 0 |
| name | image2 |
| owner | c524eaeadd1f74d4f9141f71b280e0237 |
| properties | os_hash_algo=sha512, os_hash_value='fdf9dc12589a47f91def7fe653a0806d09051ce17e04f5ce1f73385d27a963a0cb16f72d3ca9c069ae74457fed2d7310c46015ada5793eb487d86731d2234f6db', os_hidden=False |
| protected | False |
| schema | /v2/schemas/image |
| size | 672202752 |
| status | active |
| tags | |
| updated_at | 2023-11-10T17:47:20Z |
| virtual_size | 2361399312 |
| visibility | shared |
+-----+-----+
ubuntu@workstation:~$
```

14. Set the **image2** image status to **protected**, and set the minimum disk size to **10 GB**.

```
ubuntu@workstation:~$ openstack image set \
> --protected \
> --min-disk 10 \
> image2
```

```
ubuntu@workstation:~$ openstack image set \
> --protected \
> --min-disk 10 \
> image2
ubuntu@workstation:~$
```

15. Set the **image2** image to be public. Note that this action requires administrative privileges.

```
ubuntu@workstation:~$ openstack image set --public image2
```

```
ubuntu@workstation:~$ openstack image set --public image2
ubuntu@workstation:~$
```

16. Verify that the **image2** image was correctly created by listing the available images.

```
ubuntu@workstation:~$ openstack image list
```

```
ubuntu@workstation:~$ openstack image list
+-----+-----+-----+
| ID | Name | Status |
+-----+-----+-----+
| 370be92a-f4e2-44cd-b59c-8c0c5feab441 | cirros-0.6.2-x86_64-disk | active |
| 192700d5-735e-420c-b638-ca5f176d58bb | image2 | active |
| b98a6f63-3af5-49fa-8811-e12816862cbd | ubuntu | active |
+-----+-----+-----+
ubuntu@workstation:~$
```

17. Display the details of the **image2** 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:~$ openstack image show image2
```

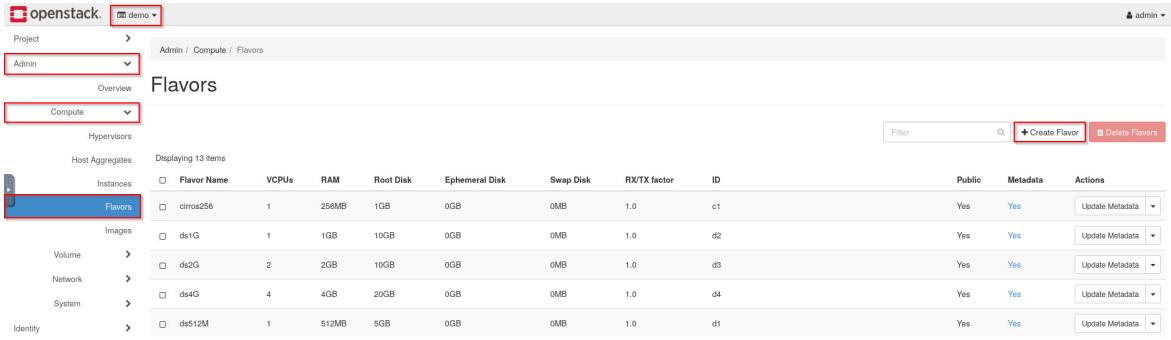
```
ubuntu@workstation:~$ openstack image show image2
+-----+-----+
| Field | Value |
+-----+-----+
| checksum | 7067fb6a831a085f764c8194e28ecca0 |
| container_format | bare |
| created_at | 2023-11-10T18:07:55Z |
| disk_format | qcow2 |
| file | /var/lib/images/c47aa055-79b8-4841-89be-ad0605414f6b/file |
| id | c47aa055-79b8-4841-89be-ad0605414f6b |
| min_disk | 10 |
| min_ram | 0 |
| name | image2 |
| owner | c524e6ead1f74d4f9141f71b2880e0237 |
| properties | os_hash_algo='sha512', os_hash_value='fdf9dc12589a47f9def7fe653a806d09051ce17e04f5cef73385d27a963a0cb16f72d3dca9c069ae74457fed2d7318c46015ada5793eb487d86731d2234f6db', os_hidden='False' |
| protected | True |
| schema | /v2/schemas/image |
| size | 672202752 |
| status | active |
| tags | |
| updated_at | 2023-11-10T18:10:45Z |
| virtual_size | 2361393152 |
| visibility | public |
+-----+-----+
ubuntu@workstation:~$
```

18. Leave the terminal window open and continue to the next task.

## 2 Developing Flavors

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

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. Switch to the **demo** project. Navigate to **Admin > Compute > Flavors** and 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	<input type="button" value="Update Metadata"/>
ds1G	1	1GB	10GB	0GB	0MB	1.0	d2	Yes	Yes	<input type="button" value="Update Metadata"/>
ds2G	2	2GB	10GB	0GB	0MB	1.0	d3	Yes	Yes	<input type="button" value="Update Metadata"/>
ds4G	4	4GB	20GB	0GB	0MB	1.0	d4	Yes	Yes	<input type="button" value="Update Metadata"/>
ds512M	1	512MB	5GB	0GB	0MB	1.0	d1	Yes	Yes	<input type="button" value="Update Metadata"/>

3. 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 on **Create Flavor**.

## Create Flavor

**Flavor Information \***

<input style="border: 2px solid red; width: 100%; height: 20px; margin-bottom: 5px;" type="text" value="flavor1"/> <input style="width: 100%; height: 20px; margin-bottom: 5px;" type="text" value="auto"/> <input style="width: 100%; height: 20px; margin-bottom: 5px;" type="text" value="2"/> <input style="width: 100%; height: 20px; margin-bottom: 5px;" type="text" value="1024"/> <input style="width: 100%; height: 20px; margin-bottom: 5px;" type="text" value="10"/> <input style="width: 100%; height: 20px; margin-bottom: 5px;" type="text" value="0"/> <input style="width: 100%; height: 20px; margin-bottom: 5px;" type="text" value="0"/> <input style="width: 100%; height: 20px; margin-bottom: 5px;" type="text" value="1"/>	<b>Flavor Access</b> <small>Flavors define the sizes for RAM, disk, number of cores, and other resources and can be selected when users deploy instances.</small>
---	--

**Name \***

**ID ?**

**VCPUs \***

**RAM (MB) \***

**Root Disk (GB) \***

**Ephemeral Disk (GB)**

**Swap Disk (MB)**

**RX/TX Factor**

**Cancel** **Create Flavor**

4. Log out of the *Horizon Dashboard* and close the web browser.
5. If a terminal is not already open, open one and source the `~/keystonerc-admin` file.
6. Create a flavor named **m1.exercise**. Configure the flavor 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:~$ openstack flavor create \
> --vcpus 1 \
> --ram 1024 \
> --disk 10 \
> --ephemeral 2 \
> --swap 1024 \
> m1.exercise
```

```
ubuntu@workstation:~$ openstack flavor create \
> --vcpus 1 \
> --ram 1024 \
> --disk 10 \
> --ephemeral 2 \
> --swap 1024 \
> m1.exercise
+-----+-----+
| Field | Value |
+-----+-----+
| OS-FLV-DISABLED:disabled | False |
| OS-FLV-EXT-DATA:ephemeral | 2 |
| disk | 10 |
| id | 6b91ea54-5721-4177-9e44-81d9c3b98a41 |
| name | m1.exercise |
| os-flavor-access:is_public | True |
| properties | |
| ram | 1024 |
| rxtx_factor | 1.0 |
| swap | 1024 |
| vcpus | 1 |
+-----+-----+
ubuntu@workstation:~$ █
```

7. Verify that the **m1.exercise** flavor has been created with the correct settings.

```
ubuntu@workstation:~$ openstack flavor show m1.exercise
```

```
ubuntu@workstation:~$ openstack flavor show m1.exercise
+-----+-----+
| Field | Value |
+-----+-----+
| OS-FLV-DISABLED:disabled | False |
| OS-FLV-EXT-DATA:ephemeral | 2 |
| access_project_ids | None |
| disk | 10 |
| id | 6b91ea54-5721-4177-9e44-81d9c3b98a41 |
| name | m1.exercise |
| os-flavor-access:is_public | True |
| properties | |
| ram | 1024 |
| rxtx_factor | 1.0 |
| swap | 1024 |
| vcpus | 1 |
+-----+-----+
ubuntu@workstation:~$ █
```

8. Delete the **flavor1** flavor.

```
ubuntu@workstation:~$ openstack flavor delete flavor1
```

```
ubuntu@workstation:~$ openstack flavor delete flavor1
ubuntu@workstation:~$ █
```

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

```
ubuntu@workstation:~$ 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
4	m1.large	8192	80	0	4	True
42	m1.nano	128	1	0	1	True
5	m1.xlarge	16384	160	0	8	True
6b91ea54-5721-4177-9e44-81d9c3b98a41	m1.exercise	1024	10	2	1	True
84	m1.micro	192	1	0	1	True
c1	cirros256	256	1	0	1	True
d1	ds512M	512	5	0	1	True
d2	ds1G	1024	10	0	1	True
d3	ds2G	2048	10	0	2	True
d4	ds4G	4096	20	0	4	True

### Tip

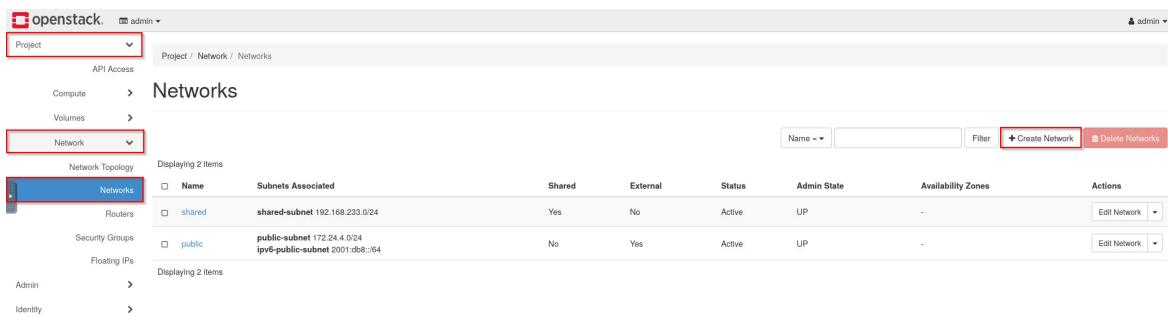
An alternative method is appending | grep flavor1 to this command and noting that there is no output.

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

## 3 Managing Private Networks

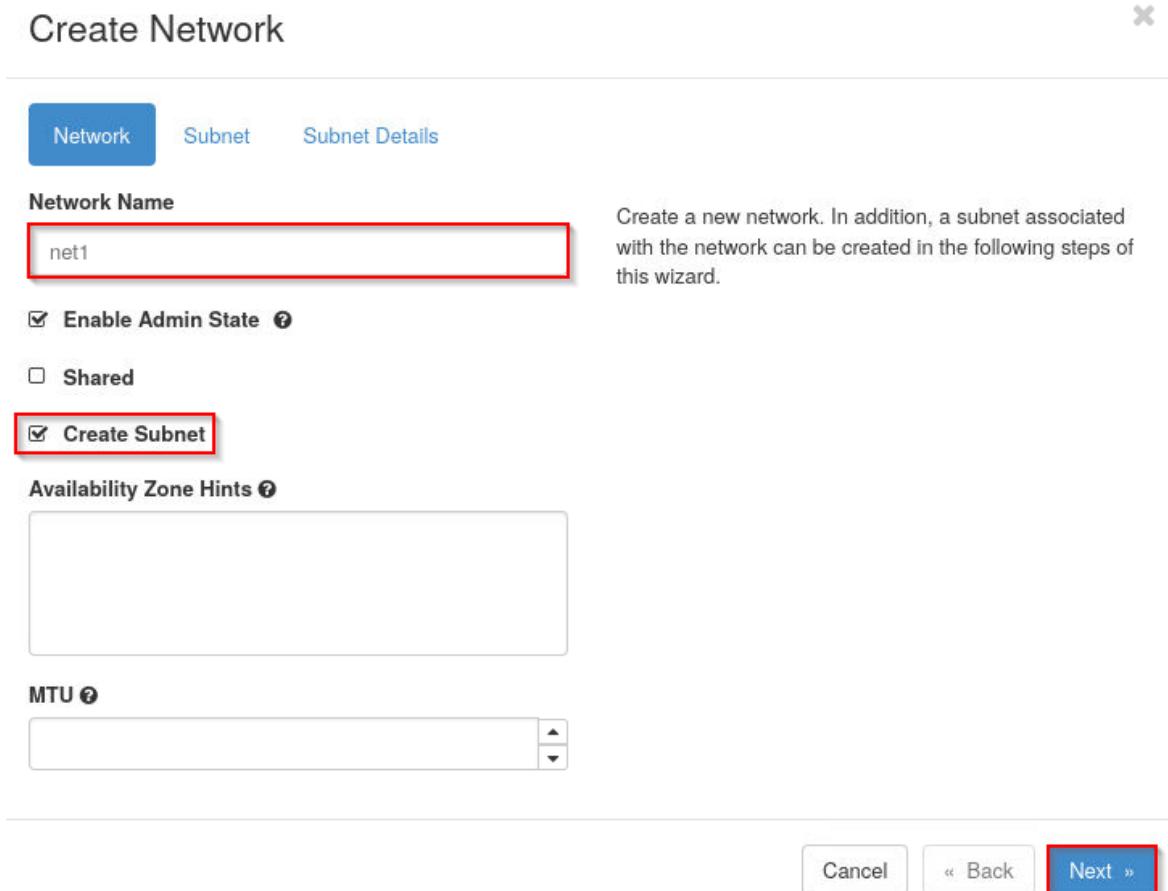
In this task, you will manage networks and subnets using the *Horizon Dashboard* and *OpenStack Unified CLI*. You will create and delete networks and subnetworks, update their settings, and rename them.

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. Navigate to **Project > Network > Networks** and click **Create Network**.



Name	Subnets Associated	Shared	External	Status	Admin State	Availability Zones	Actions
shared	shared-subnet 192.168.233.0/24	Yes	No	Active	UP	-	<a href="#">Edit Network</a>
public	public-subnet 172.24.4.0/24 ipv6-public-subnet 2001:db8::/64	No	Yes	Active	UP	-	<a href="#">Edit Network</a>

3. Enter **net1** in the *Network Name* field. Verify that the **Create Subnet** check box is selected. Click **Next**.



**Network Name**  
net1

**Enable Admin State** ?

**Shared**

**Create Subnet**

**Availability Zone Hints** ?

**MTU** ?

[Cancel](#) [« Back](#) **Next**

4. 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**  
  

**Network Address Source**  
 ▼

**Network Address** ?  
  

**IP Version**  
 ▼

**Gateway IP** ?  
 ▼

**Disable Gateway**

---

Cancel
« Back
Next  

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

## Create Network



Network

Subnet

Subnet Details

 **Enable DHCP**

Specify additional attributes for the subnet.

**Allocation Pools** **DNS Name Servers** **Host Routes** [Cancel](#)[« Back](#)[Create](#)

6. Log out of the *Horizon Dashboard* and close the web browser.
7. If a terminal window is not already open, open one and source the `~/keystonerc-admin` file to load the **admin** user credentials.
8. Create a network named **exercise** using the command below.

```
ubuntu@workstation:~$ openstack network create exercise
```

```
ubuntu@workstation:~$ openstack network create exercise
+-----+-----+
| Field | Value |
+-----+-----+
| admin_state_up | UP |
| availability_zone_hints | |
| availability_zones | |
| created_at | 2023-11-10T21:34:11Z |
| description | |
| dns_domain | None |
| id | d354ca06-0769-461f-83a7-cfbafb811768 |
| ipv4_address_scope | None |
| ipv6_address_scope | None |
| is_default | False |
| is_vlan_transparent | None |
| mtu | 1442 |
| name | exercise |
| port_security_enabled | True |
| project_id | c524eaead1f74d4f9141f71b280e0237 |
| provider:network_type | geneve |
| provider:physical_network | None |
| provider:segmentation_id | 42760 |
| qos_policy_id | None |
| revision_number | 1 |
| router:external | Internal |
| segments | None |
| shared | False |
| status | ACTIVE |
| subnets | |
| tags | |
| updated_at | 2023-11-10T21:34:11Z |
+-----+-----+
ubuntu@workstation:~$
```

9. Create a subnet named **subexer** for the **exercise** 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:~$ openstack subnet create \
> --subnet-range 192.168.1.0/24 \
> --dns-nameserver 172.25.250.254 \
> --network exercise \
> subexer
```

```
ubuntu@workstation:~$ openstack subnet create \
> --subnet-range 192.168.1.0/24 \
> --dns-nameserver 172.25.250.254 \
> --network exercise \
> subexer
+-----+-----+
| Field | Value |
+-----+-----+
| allocation_pools | 192.168.1.2-192.168.1.254 |
| cidr | 192.168.1.0/24 |
| created_at | 2023-11-10T21:37:34Z |
| description | |
| dns_nameservers | 172.25.250.254 |
| enable_dhcp | True |
| gateway_ip | 192.168.1.1 |
| host_routes | |
| id | b8b3fa50-4503-458d-b177-8dfca8529bca |
| ip_version | 4 |
| ipv6_address_mode | None |
| ipv6_ra_mode | None |
| name | subexer |
| network_id | d354ca06-0769-461f-83a7-cfbafb811768 |
| project_id | c524eaead1f74d4f9141f71b280e0237 |
| revision_number | 0 |
| segment_id | None |
| service_types | |
| subnetpool_id | None |
| tags | |
| updated_at | 2023-11-10T21:37:34Z |
+-----+-----+
ubuntu@workstation:~$ █
```

10. Change the name of the **net1** network to **net2**.

```
ubuntu@workstation:~$ openstack network set --name net2 net1
```

```
ubuntu@workstation:~$ openstack network set --name net2 net1
ubuntu@workstation:~$ █
```

#### Note

The desired name for the network follows the `--name` option, while the current network name is the final argument of the command.

11. Verify that the **net1** network has been successfully changed to **net2**.

```
ubuntu@workstation:~$ openstack network list
```

```
ubuntu@workstation:~$ openstack network list
+-----+-----+-----+
| ID      | Name   | Subnets |
+-----+-----+-----+
| 2515f9a8-4177-453f-a526-b5824c1ad972 | private | 17e1a621-29e0-4fac-b113-aa7ea67e2d38, 65888d75-acd0-4101-8ec3-c07e18da41d |
| 6d95f08e-1a08-44bf-8d3f-b8d060d3992e | net2    | 09340c74-56ca-4a0a-9bc3-a00821d524d2 |
| b7819369-ed2c-4e0e-9954-6e5417343a99 | public   | 117b53d6-e53c-4f8c-a4d5-134304bdb604, cba55603-b443-4d7c-8be6-995b2f3cb515 |
| c4a5605c-3c3e-4abd-a144-be8de8d5b405 | shared   | 5c9345df-47ac-446a-a7e3-8e6821ff6f08 |
| d354ca06-0769-461f-83a7-cfbaf811768 | exercise | b8b3fa50-4503-458d-b177-8dfca8529bca |
+-----+-----+-----+
ubuntu@workstation:~$
```

12. Update the **subnet1** subnetwork to disable DHCP.

```
ubuntu@workstation:~$ openstack subnet set --no-dhcp subnet1
```

```
ubuntu@workstation:~$ openstack subnet set --no-dhcp subnet1
ubuntu@workstation:~$
```

13. Verify that the **subnet1** subnetwork has been correctly updated.

```
ubuntu@workstation:~$ openstack subnet show subnet1
```

```
ubuntu@workstation:~$ openstack subnet show subnet1
+-----+-----+
| Field        | Value      |
+-----+-----+
| allocation_pools | 10.0.0.2-10.0.0.254 |
| cidr          | 10.0.0.0/24 |
| created_at    | 2023-11-10T21:31:51Z |
| description    |              |
| dns_nameservers |              |
| enable_dhcp    | False      |
| gateway_ip     | 10.0.0.1  |
| host_routes    |              |
| id             | 09340c74-56ca-4a0a-9bc3-a00821d524d2 |
| ip_version      | 4          |
| ipv6_address_mode | None      |
| ipv6_ra_mode    | None      |
| name           | subnet1    |
| network_id      | 6d95f08e-1a08-44bf-8d3f-b8d060d3992e |
| project_id      | b66cb1cff9be44eda8643d16f77d67c3 |
| revision_number | 1          |
| segment_id      | None      |
| service_types    |              |
| subnetpool_id    | None      |
| tags            |              |
| updated_at      | 2023-11-10T21:45:46Z |
+-----+-----+
ubuntu@workstation:~$
```

14. Delete the **net2** network.

```
ubuntu@workstation:~$ openstack network delete net2
```

```
ubuntu@workstation:~$ openstack network delete net2
ubuntu@workstation:~$ █
```

15. Verify that the **net2** network has been deleted by listing all available networks and noting that **net2** is not present in the list.

```
ubuntu@workstation:~$ openstack network list
```

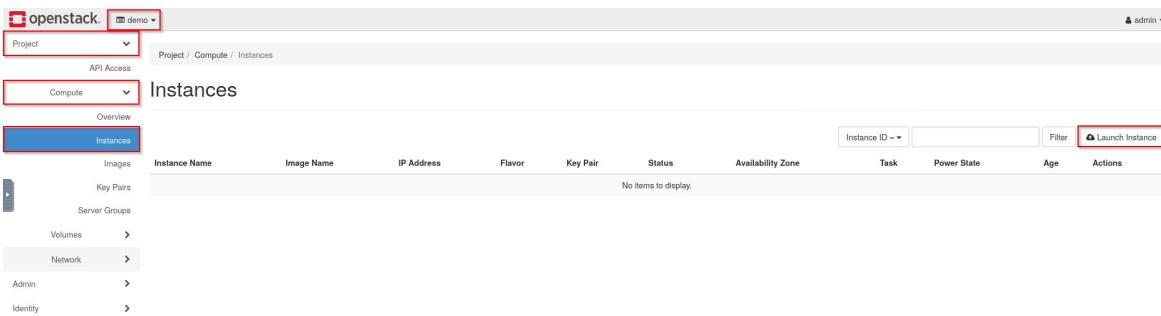
```
ubuntu@workstation:~$ openstack network list
+-----+-----+-----+
| ID      | Name    | Subnets
+-----+-----+-----+
| 2515f9a8-4177-453f-a526-b5824c1ad972 | private | 17e1a621-29e0-4fac-b113-aa7ea67e2d38, 65888d75-acd0-4101-8ec3-c07e18dda41d |
| b7819369-ed2c-4e0e-9954-6e5417343a99 | public   | 117b53d6-e53c-4f8c-a4d5-134304bdb604, cba55603-b443-4d7c-8be6-995b2f3cb515 |
| c4a5605c-3c3e-4abd-a144-be8de8d5b405 | shared   | 5c9345df-47ac-446a-a7e3-8e6821ff6f08
| d354ca06-0769-461f-83a7-cfbafb811768 | exercise | b8b3fa50-4503-458d-b177-8dfca8529bca
+-----+-----+-----+
ubuntu@workstation:~$ █
```

16. Leave the terminal window open and continue to the next task.

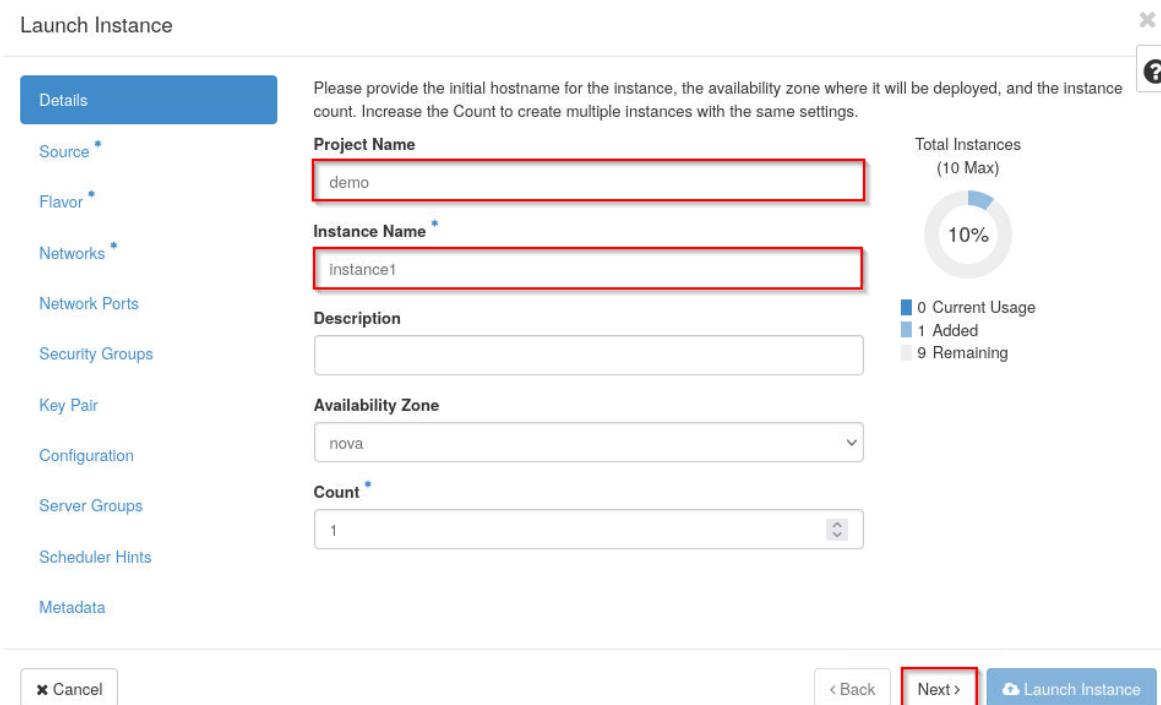
## 4 Launching an Internal Instance

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

1. Open the web browser and navigate to **192.168.1.20**. Login as the **admin** user with the password **secret**.
2. Switch to the **demo** project and navigate to **Projects > Compute > Instances**. Click **Launch Instance**.



3. Ensure that **demo** is entered in the *Project Name* field, and enter **instance1** in the *Instance Name* field. Click **Next**.



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 **image2** 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 *	<div style="display: flex; align-items: center;"> <span>Select Boot Source</span> <input style="width: 200px; border: 1px solid red; margin-right: 10px;" type="text" value="Image"/> <span>Create New Volume</span> <input checked="" type="checkbox" value="Yes"/> Yes <input type="checkbox" value="No"/> No         </div>																											
Flavor *																												
Networks *	<p><b>Allocated</b></p> <p>Displaying 0 items</p>																											
Network Ports																												
Security Groups																												
Key Pair	<p>Select an item from Available items below</p> <p>Displaying 0 items</p>																											
Configuration																												
Server Groups	<p>▼ Available (3) <span>Select one</span></p> <p>Click here for filters or full text search.</p> <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>clirros-0.6.2-x86_64-disk</td> <td>1/11/24 2:54 AM</td> <td>20.44 MB</td> <td>QCOW2</td> <td>Public</td> <td></td> </tr> <tr> <td>Image2</td> <td>1/18/24 5:40 PM</td> <td>642.75 MB</td> <td>QCOW2</td> <td>Public</td> <td></td> </tr> <tr> <td>ubuntu</td> <td>1/11/24 5:26 AM</td> <td>644.50 MB</td> <td>QCOW2</td> <td>Public</td> <td></td> </tr> </tbody> </table> <p>Displaying 3 items</p>					Name	Updated	Size	Format	Visibility	clirros-0.6.2-x86_64-disk	1/11/24 2:54 AM	20.44 MB	QCOW2	Public		Image2	1/18/24 5:40 PM	642.75 MB	QCOW2	Public		ubuntu	1/11/24 5:26 AM	644.50 MB	QCOW2	Public	
Name	Updated	Size	Format	Visibility																								
clirros-0.6.2-x86_64-disk	1/11/24 2:54 AM	20.44 MB	QCOW2	Public																								
Image2	1/18/24 5:40 PM	642.75 MB	QCOW2	Public																								
ubuntu	1/11/24 5:26 AM	644.50 MB	QCOW2	Public																								
Scheduler Hints																												
Metadata																												

### Stop

Verify that **image2** appears in the *Allocated* section before moving on to the next step.

5. Click the ↑ button on the same row as the **m1.exercise** flavor to allocate that flavor, then click **Next**.

## Lab 03: Deploying an Internal Instance

Launch Instance

Allocated						
Name	VCPUS	RAM	Total Disk	Root Disk	Ephemeral Disk	Public
Select a flavor from the available flavors below.						

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

Details

Source

**Flavor \***

Networks \*

Network Ports

Security Groups

Key Pair

Configuration

Server Groups

Scheduler Hints

Metadata

Available 13

Select one

Displaying 13 items

Name	VCPUS	RAM	Total Disk	Root Disk	Ephemeral Disk	Public	
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	↑
<b>m1.exercise</b>	<b>1</b>	<b>1 GB</b>	<b>12 GB</b>	<b>10 GB</b>	<b>2 GB</b>	<b>Yes</b>	<b>↑</b>
ds1G	1	1 GB	10 GB	10 GB	0 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 13 items

< Back

Next >

Launch Instance

### 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.

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

Launch Instance

Details	Networks provide the communication channels for instances in the cloud. You can select ports instead of networks or a mix of both.				
Source	Allocated				
Flavor	Displaying 0 items				
Networks *	Select one or more networks from the available networks below.				
Network Ports	Displaying 0 items				
Security Groups	Available 3 Select one or more				
Key Pair	Click here for filters or full text search.				
Configuration	Displaying 3 items				
Server Groups	Network	Subnets Associated	Shared	Admin State	Status
Scheduler Hints	shared	shared-subnet	Yes	Up	Active
Metadata	private	ipv6-private-subnet private-subnet	No	Up	Active
	exercise	subexer	No	Up	Active
					↑

Displaying 3 items

**x Cancel** **< Back** **Next >** **Launch Instance**

### Stop

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

- Log out of the *Horizon Dashboard* and close the web browser.
- If a terminal window is not already open, open one and source the `~/keystonerc-admin` file to load the **admin** user credentials.
- List the available instances and see that the instance created from the *Horizon Dashboard* appears.

```
ubuntu@workstation:~$ openstack server list
```

```
ubuntu@workstation:~$ openstack server list
+-----+-----+-----+-----+
| ID   | Name  | Status | Networks          | Image  | Flavor |
+-----+-----+-----+-----+
| 7292a398-8be7-43a4-84d8-df5a2c11bb2c | instance1 | ACTIVE | exercise=192.168.1.38 | image1 | m1.exercise |
+-----+-----+-----+-----+
```

- Delete the **instance1** instance.

```
ubuntu@workstation:~$ openstack server delete instance1
```

```
ubuntu@workstation:~$ openstack server delete instance1
ubuntu@workstation:~$ █
```

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

```
ubuntu@workstation:~$ openstack server list
```

```
ubuntu@workstation:~$ openstack server list
ubuntu@workstation:~$ █
```

12. Create a new instance named **instance2**. Use the previously created **image2** image, **m1.exercise** flavor, and **exercise** network.

```
ubuntu@workstation:~$ openstack server create \
> --image image2 \
> --flavor m1.exercise \
> --nic net-id=exercise \
> --wait instance2
```

```
ubuntu@workstation:~$ openstack server create \
> --image image2 \
> --flavor m1.exercise \
> --nic net-id=exercise \
> --wait 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-00000001 |
| OS-EXT-STS:power_state | Running |
| OS-EXT-STS:task_state | None |
| OS-EXT-STS:vm_state | active |
| OS-SRV-USG:launched_at | 2024-01-11T20:41:41.000000 |
| OS-SRV-USG:terminated_at | None |
| accessIPv4 |
| accessIPv6 |
| addresses | exercise=192.168.1.129 |
| adminPass | F9YNsmj4PUf |
| config_drive |
| created | 2024-01-11T20:41:17Z |
| flavor | m1.exercise (ab920cfa-a1ac-4ac6-a883-29a6039e55f5) |
| hostId |
| id | bc6f228f7747fc0d2d35bd9a38bc7c3c031264c7b383a1ba7ddbf81d |
| 577b3d23-bfc1-4437-b0c9-c9a59da3102a |
| image | image2 (192700d5-735e-420c-b638-ca5f176d58bb) |
| key_name | None |
| name | instance2 |
| progress | 0 |
| project_id | a96f441f305f48d4a2be02606b29faa8 |
| properties |
| security_groups | name='default' |
| status | ACTIVE |
| updated | 2024-01-11T20:41:42Z |
| user_id | 2c41850bd89b421eb3aabb59b1b4aec8 |
| volumes_attached |
+-----+-----+
ubuntu@workstation:~$
```

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

```
ubuntu@workstation:~$ openstack server list
```

```
ubuntu@workstation:~$ openstack server list
+-----+-----+-----+-----+-----+
| ID | Name | Status | Networks | Image | Flavor |
+-----+-----+-----+-----+-----+
| d174f36b-95c4-4336-87c5-6685b3feb1e5 | instance2 | ACTIVE | exercise=192.168.1.83 | image1 | m1.exercise |
+-----+-----+-----+-----+-----+
ubuntu@workstation:~$
```

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 instance and verify the flavor settings. You will also pause and stop an instance using the *OpenStack Unified CLI*.

1. If a terminal window is not already open, open one and source the `~/keystonerc-admin` file to load the **admin** user credentials.
2. List all the available instances to find the name of the running instance.

```
ubuntu@workstation:~$ openstack server list
```

```
ubuntu@workstation:~$ openstack server list
+-----+-----+-----+-----+
| ID      | Name     | Status  | Networks          | Image   | Flavor  |
+-----+-----+-----+-----+
| a7ce6615-dd3c-4816-9d16-8b9d83908418 | instance2 | ACTIVE  | exercise=192.168.1.150 | image1 | m1.exercise |
+-----+-----+-----+-----+
ubuntu@workstation:~$
```

3. Access the instance's details to retrieve its flavor.

```
ubuntu@workstation:~$ openstack server show instance2
```

```
ubuntu@workstation:~$ 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-00000008 |
| OS-EXT-STS:power_state | Running     |
| OS-EXT-STS:task_state | None        |
| OS-EXT-STS:vm_state | active      |
| OS-SRV-USG:launched_at | 2023-11-11T16:42:56.000000 |
| OS-SRV-USG:terminated_at | None        |
| accessIPv4 |             |
| accessIPv6 |             |
| addresses |             |
| config_drive |             |
| created | 2023-11-11T16:42:53Z |
| flavor | m1.exercise (6b91ea54-5721-4177-9e44-81d9c3b98a41) |
| hostId | 151e314f6e3cf8b4db0b1f6035cc4b68cb1e6c9aa97163a575f9f6c |
| id | a7ce6615-dd3c-4816-9d16-8b9d83908418 |
| image | image1 (2d219343-2468-45d0-8946-72364b7acca9) |
| key_name | None        |
| name | instance2   |
| progress | 0            |
| project_id | c524eaead1f74d4f9141f71b280e0237 |
| properties |             |
| security_groups | name='default' |
| status | ACTIVE      |
| updated | 2023-11-11T16:42:57Z |
| user_id | b4bdeae0865449e1905fc5e639007753 |
| volumes_attached |             |
+-----+-----+
ubuntu@workstation:~$
```

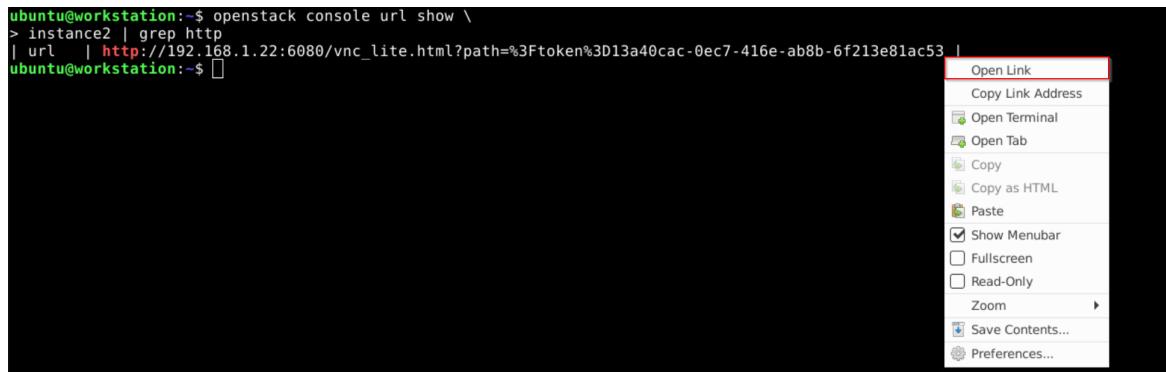
4. Review the specifications of the **m1.exercise** flavor.

```
ubuntu@workstation:~$ openstack flavor show m1.exercise
```

```
ubuntu@workstation:~$ openstack flavor show m1.exercise
+-----+-----+
| Field | Value |
+-----+-----+
| OS-FLV-DISABLED:disabled | False |
| OS-FLV-EXT-DATA:ephemeral | 2 |
| access_project_ids | None |
| disk | 10 |
| id | 6b91ea54-5721-4177-9e44-81d9c3b98a41 |
| name | m1.exercise |
| os-flavor-access:is_public | True |
| properties | |
| ram | 1024 |
| rxtx_factor | 1.0 |
| swap | 1024 |
| vcpus | 1 |
+-----+-----+
ubuntu@workstation:~$
```

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

```
ubuntu@workstation:~$ openstack console url show \
> instance2 | grep http
```



6. Log in to the **instance2** instance as **root** with the password **secret**.
7. Use the **free** command to ensure that the RAM and swap amount matches the one defined by the flavor, which is **1024 MB**.

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

```
root@instance2:~# free
              total        used        free      shared  buff/cache   available
Mem:       980500       155252       475256          4052     349992       670980
Swap:      1048572           0      1048572
root@instance2:~#
```

8. Use the `df` command to ensure that the instance has a disk size of **10 GB**, as defined by the flavor.

```
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:~#
```

9. Determine the number of CPUs that the instance is using. Ensure the number matches the number of VCPUs defined by the flavor, which 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 xtTopology cpuid pn1 ssse3 cx16 sse4_1 sse4_2 popcnt hypervisor lahf_lm pt
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
  L1tf:                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
  Tsx async abort:    Not affected
root@instance2:~#
```

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.

```
root@instance2:~$ ping 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
```

11. While the ping command is active, switch back to the terminal on **workstation**. Use the command below to pause **instance2**.

```
ubuntu@workstation:~$ openstack server pause instance2
```

```
ubuntu@workstation:~$ openstack server pause instance2
ubuntu@workstation:~$ █
```

12. Switch back to the console of **instance2** and observe the behavior of the instance.

**Note**

Notice that the instance is paused and that the ping command are no longer going through.

13. Switch back to the terminal on **workstation**. Use the command below to unpause **instance2**.

```
ubuntu@workstation:~$ openstack server unpause instance2
```

```
ubuntu@workstation:~$ openstack server unpause instance2
ubuntu@workstation:~$ █
```

14. Switch back to the console of **instance2** and observe the behavior of the instance.

**Note**

Notice that the instance is unpause and that the ping commands are continuing.

15. Switch back to the terminal on **workstation**. Use the command below to stop **instance2**.

```
ubuntu@workstation:~$ openstack server stop instance2
```

```
ubuntu@workstation:~$ openstack server stop instance2
ubuntu@workstation:~$ █
```

16. Switch back to the console of **instance2** and observe the behavior of the instance.

Note

Notice that the console to the instance is no longer available.

17. Switch back to the terminal on **workstation**. Start **instance2**.

```
ubuntu@workstation:~$ openstack server start instance2
```

```
ubuntu@workstation:~$ openstack server start instance2
ubuntu@workstation:~$ █
```

18. List all instances and check the status of **instance2**.

```
ubuntu@workstation:~$ openstack server list
```

```
ubuntu@workstation:~$ openstack server list
+-----+-----+-----+-----+
| ID      | Name    | Status | Networks
+-----+-----+-----+-----+
| 9982ab81-496d-4b81-abba-751074f1c9ef | instance2 | ACTIVE | exercise=192.168.1.56 | image1 | m1.exercise |
+-----+-----+-----+-----+
ubuntu@workstation:~$ █
```

19. Delete **instance2**.

```
ubuntu@workstation:~$ openstack server delete instance2
```

```
ubuntu@workstation:~$ openstack server delete instance2
ubuntu@workstation:~$ █
```

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

```
ubuntu@workstation:~$ openstack server list
```

```
ubuntu@workstation:~$ openstack server list
ubuntu@workstation:~$ █
```

21. Close the terminal window and the web browser.  
22. The lab is now complete.