

**OpenStack Labs**

**Lab 01: Launching an Instance**

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## 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](mailto:mengjun-xie@utc.edu)).
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## Introduction

OpenStack is a cloud operating system that manages large pools of compute, storage, and networking resources throughout a datacenter. These resources can be managed through a web-based dashboard called the *Horizon Dashboard*, or through a command-line interface called the *OpenStack Unified CLI*. This lab series provides a hands-on tour of key OpenStack features and components. Each lab focuses on a different aspect of OpenStack, and the final lab is a capstone project that integrates the skills and knowledge you have gained.

In this lab, you will launch an instance with the *Horizon Dashboard* and the *OpenStack Unified CLI*.

## Objectives

- Use the *Horizon Dashboard*.
- Launch an instance with the *Horizon Dashboard*.
- Use the *OpenStack Unified CLI*.
- Launch an instance with the *OpenStack Unified CLI*.

## 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 Launching an Instance with the Horizon Dashboard

In this task, you will launch an instance with the *Horizon Dashboard*.

- 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.

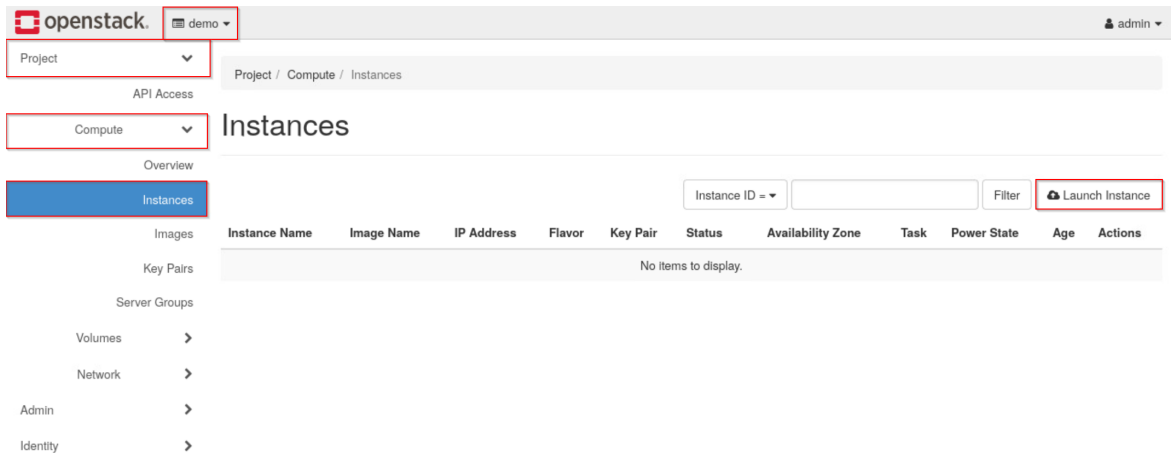


### 1.4. Enter the IP address of the **devstack** machine (**192.168.1.20**) into the address bar, and log into the OpenStack Horizon Dashboard with username **admin** and password **secret**.

The image shows the OpenStack Horizon login page. At the top is the OpenStack logo, a red square with a white 'O' inside. Below the logo is the text 'openstack.' in a large, bold, black font. Underneath is the text 'Log in' in a smaller, bold, black font. There are two input fields: 'User Name' with the text 'admin' and 'Password' with a series of dots. Both fields are outlined with a red border. At the bottom right is a blue button with the text 'Sign In' in white.

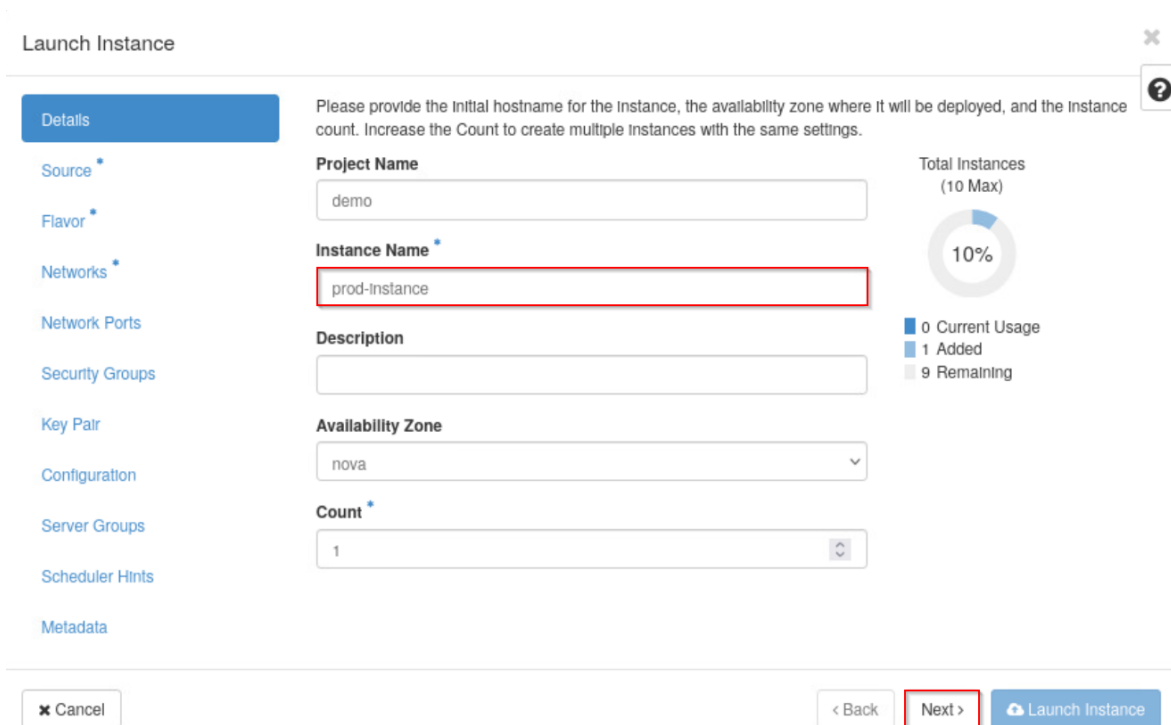


- 1.5. Click on the dropdown menu in the top left corner of the webpage, then select **demo** as the project. Navigate to **Project > Compute > Instances**, then click **Launch Instance** in the top right corner.



The screenshot shows the OpenStack dashboard interface. In the top left, the 'demo' project is selected. The breadcrumb navigation shows 'Project / Compute / Instances'. The left sidebar has 'Instances' selected under the 'Compute' section. In the top right, the 'Launch Instance' button is highlighted with a red box. Below the navigation, a table header for instances is visible, but it currently shows 'No items to display'.

- 1.6. In the *Instance Name* field, type **prod-instance**, and leave the other fields with their default values. Click **Next**.



The screenshot shows the 'Launch Instance' form. The 'Project Name' is 'demo'. The 'Instance Name' field, highlighted with a red box, contains 'prod-instance'. The 'Description' field is empty. The 'Availability Zone' is set to 'nova'. The 'Count' is set to '1'. On the right, a progress indicator shows 'Total Instances (10 Max)' with a 10% completion bar. A legend indicates: 0 Current Usage, 1 Added, and 9 Remaining. At the bottom, the 'Next >' button is highlighted with a red box, along with 'Cancel' and 'Launch Instance' buttons.

- 1.7. In the *Select Boot Source* dropdown, **Image** should already be selected. Set *Create New Volume* to **No**, and scroll down (if needed) to click the ↑ icon beside of **ubuntu** to use **ubuntu** as the image. Click **Next**.

Launch Instance

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.

**Select Boot Source**

Image

**Create New Volume**

Yes No

**Allocated**

Displaying 0 items

Name	Updated	Size	Format	Visibility
Select an item from Available items below				

Displaying 0 items

**Available** 2

Select one

Click here for filters or full text search.

Displaying 2 items

Name	Updated	Size	Format	Visibility
cirros-0.6.2-x86_64-disk	2/9/24 7:59 PM	20.44 MB	QCOW2	Public
ubuntu	2/9/24 9:32 PM	647.50 MB	QCOW2	Shared

Displaying 2 items

Cancel

< Back Next > Launch Instance

## Stop

Before proceeding to the next step, confirm that **ubuntu** appears underneath the *Allocated* section.

1.8. Scroll down (if needed) and click the ↑ icon beside the **m1.small** flavor. Click **Next**.

Launch Instance

Details

Source

**Flavor**

Networks

Network Ports

Security Groups

Key Pair

Configuration

Server Groups

Scheduler Hints

Metadata

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

**Allocated**

Displaying 0 Items

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

Displaying 0 Items

▼ **Available** 12 Select one

Click here for filters or full text search.

Displaying 12 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	↑
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 12 Items

Cancel

< Back **Next >** Launch Instance

### Stop

Before proceeding to the next step, confirm that **m1.small** appears underneath the *Allocated* section.

**1.9.** Click the ↑ icon beside the **shared** network.

Launch Instance

Details

Source

Flavor

**Networks**

Network Ports

Security Groups

Key Pair

Configuration

Server Groups

Scheduler Hints

Metadata

Networks provide the communication channels for instances in the cloud. You can select ports instead of networks or a mix of both.

▼ Allocated

Displaying 0 items

Network	Subnets Associated	Shared	Admin State	Status
Select one or more networks from the available networks below.				

Displaying 0 items

▼ Available 2

Select one or more

Q

Click here for filters or full text search.

×

Displaying 2 items

Network	Subnets Associated	Shared	Admin State	Status	
shared	shared-subnet	Yes	Up	Active	↑
private	ipv6-private-subnet private-subnet	No	Up	Active	↑

Displaying 2 items

✕ Cancel

< Back

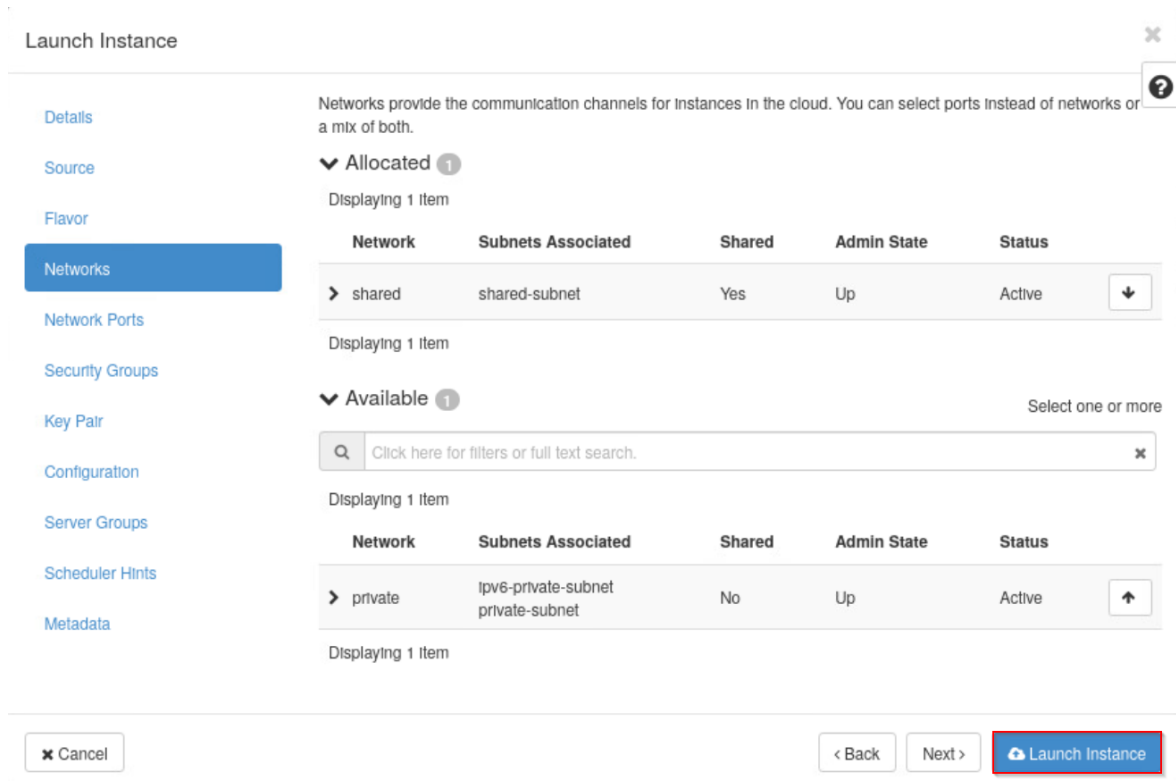
Next >

Launch Instance

**Stop**

Before proceeding to the next step, confirm that **shared** appears underneath the *Allocated* section.

- 1.10. If all required fields have been set, the **Launch Instance** button in the bottom right corner should now be available. Click **Launch Instance**.



Launch Instance

Details

Source

Flavor

**Networks**

Network Ports

Security Groups

Key Pair

Configuration

Server Groups

Scheduler Hints

Metadata

Networks provide the communication channels for Instances in the cloud. You can select ports instead of networks or a mix of both.

▼ Allocated 1

Displaying 1 Item

Network	Subnets Associated	Shared	Admin State	Status
> shared	shared-subnet	Yes	Up	Active

Displaying 1 Item

▼ Available 1

Select one or more

Click here for filters or full text search.

Displaying 1 Item

Network	Subnets Associated	Shared	Admin State	Status
> private	ipv6-private-subnet private-subnet	No	Up	Active

Displaying 1 Item

Cancel

< Back

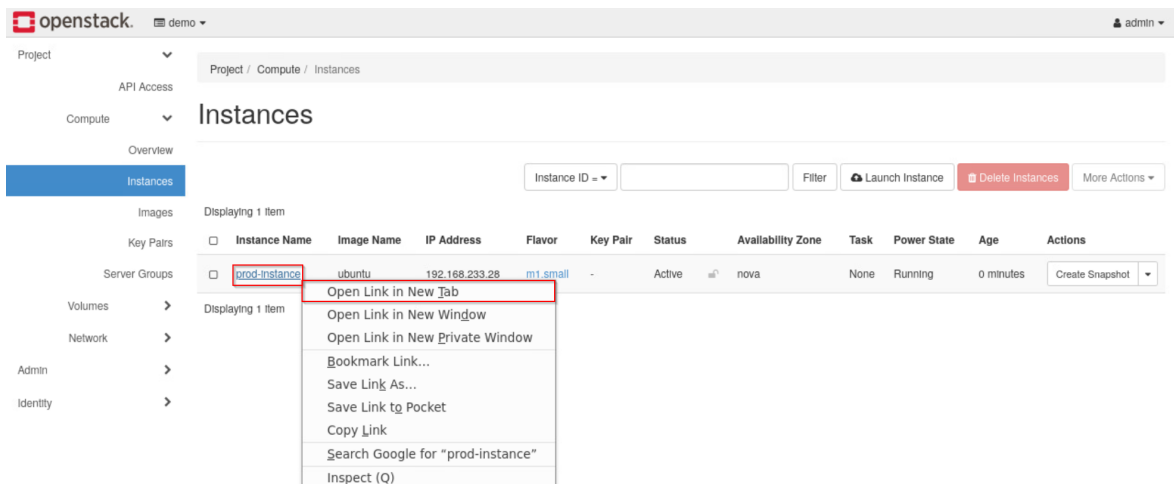
Next >

**Launch Instance**

## Stop

Wait for the *Power State* of **prod-instance** to display the status of *Running* before continuing to the next step.

- 1.11. To open the console of **prod-instance** in a new tab, right-click the name **prod-instance** and select **Open Link in New Tab**, or middle-click (press in the mouse wheel) the name **prod-instance**.



openstack. demo

Project / Compute / Instances

Instances

Instance ID

Filter

Launch Instance

Delete Instances

More Actions

Displaying 1 Item

Instance Name	Image Name	IP Address	Flavor	Key Pair	Status	Availability Zone	Task	Power State	Age	Actions
prod-instance	ubuntu	192.168.233.28	m1.small	-	Active	nova	None	Running	0 minutes	Create Snapshot

Open Link in New Tab

Open Link in New Window

Open Link in New Private Window

Bookmark Link...

Save Link As...

Save Link to Pocket

Copy Link

Search Google for "prod-instance"

Inspect (Q)

- 1.12. In the new tab, click the *Console* tab. Optionally, to make the console take up the whole tab, click the **Click here to show only console** link.



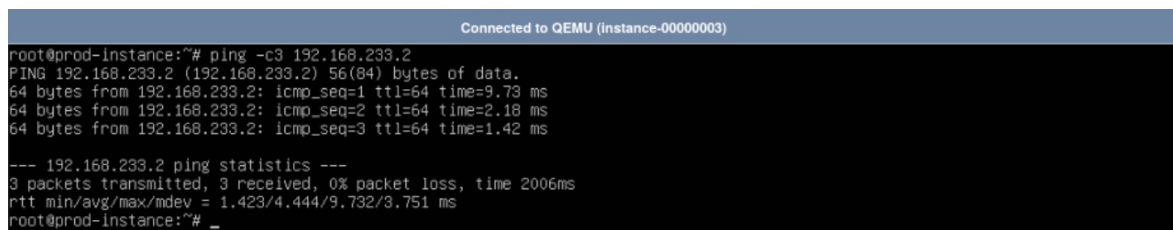
- 1.13. Log into the console as **root** with the password **secret**.

#### Note

It may take several minutes for the instance to fully boot up and present a login prompt.

- 1.14. In the console, ping **192.168.233.2** (DHCP server) to verify connectivity.

```
$ ping -c3 192.168.233.2
```

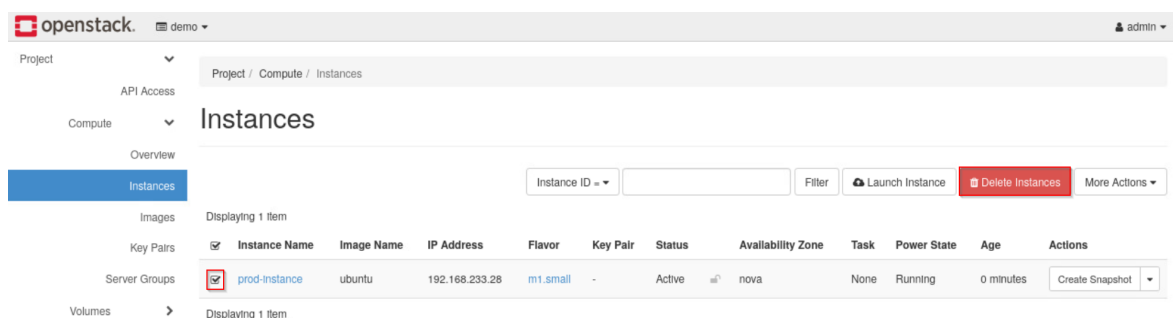


#### Note

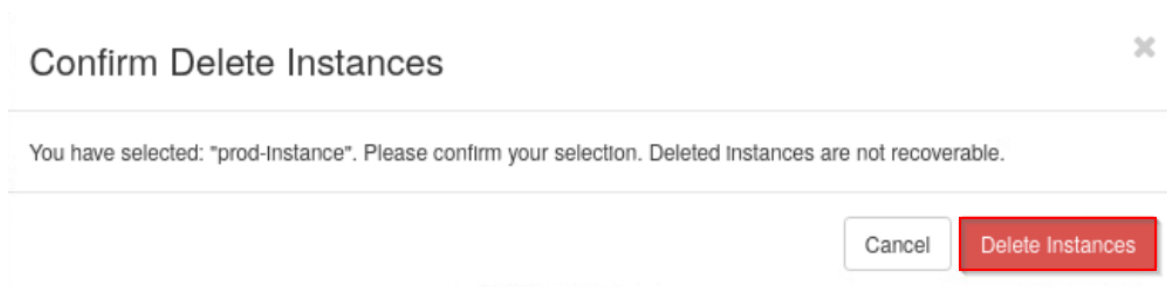
You should receive three successful ping replies.

- 1.15. Close the console tab for **prod-instance**.

- 1.16. Focus back on the tab showing instances and delete **prod-instance**. Select the checkbox for **prod-instance** and click the **Delete Instances** button.



**1.17.** Confirm the deletion by clicking the **Delete Instances** button.



**1.18.** Close the web browser. Continue to the next task.

## 2 Running the OpenStack Unified CLI

In this task, you will launch an instance with the *OpenStack Unified command-line interface (CLI)*.

- 2.1. Open a terminal by clicking the terminal icon in the icon bar at the bottom of the screen. A terminal can also be opened by right-clicking the desktop and selecting **Open Terminal Here**, or by selecting **Applications** at the top left of the screen, then selecting **Terminal Emulator**.



- 2.2. Source the **keystonerc-admin** file. This will provide a connection with the local OpenStack service with the credentials of the **admin** user, and the command prompt will change to indicate the current OpenStack user whose credentials are keyed in.

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

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

### Note

**keystonerc** files will be discussed in more depth in a future lab.



- 2.3. The OpenStack CLI is now ready to use, allowing us to create an instance. Just like in the Horizon Dashboard, an image, a flavor, and a network are required. Before launching an instance, we will list the available options for these resources. First, list all available 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 |
| 329d361e-f6dc-4b72-b200-3de0ec230e65 | ubuntu | active |
+-----+-----+-----+
[ubuntu@workstation (keystone-admin)]:~$
```

- 2.4. List all available flavors.

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

```
[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 |
| 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 |
| d2 | ds1G | 1024 | 10 | 0 | 1 | True |
| d3 | ds2G | 2048 | 10 | 0 | 2 | True |
| d4 | ds4G | 4096 | 20 | 0 | 4 | True |
+-----+-----+-----+-----+-----+-----+-----+
[ubuntu@workstation (keystone-admin)]:~$
```

## 2.5. Display the details specifically for the **m1.small** flavor.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack flavor show m1.small
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack flavor show m1.small
+-----+-----+
| Field                                | Value                                |
+-----+-----+
| OS-FLV-DISABLED:disabled             | False                               |
| OS-FLV-EXT-DATA:ephemeral            | 0                                   |
| access_project_ids                   | None                               |
| disk                                 | 20                                  |
| id                                    | 2                                   |
| name                                  | m1.small                           |
| os-flavor-access:is_public           | True                               |
| properties                           | hw_rng:allowed='True'              |
| ram                                   | 2048                                |
| rxtx_factor                          | 1.0                                 |
| swap                                  |                                     |
| vcpus                                | 1                                   |
+-----+-----+
[ubuntu@workstation (keystone-admin)]:~$
```

## 2.6. List all available networks.

```
[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 |
| 966ecb4f-4ff8-44ea-a476-2d2f18955085 | private | 674205b6-1357-4727-a21a-94220492a57f, fa8a2545-5a8c-44a2-bacc-1b86c253b880 |
| 9f23266f-d833-4337-9a27-4818a6d28e9e | shared | 7e456257-76e5-4cfc-bf3f-b2a3876dba40 |
+-----+-----+-----+
[ubuntu@workstation (keystone-admin)]:~$
```

- 2.7. Create a new instance with the name **prod-instance**, using **ubuntu** as the image, **m1.small** as the flavor, and **shared** as the network.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server create \
> --image ubuntu \
> --flavor m1.small \
> --network shared \
> prod-instance
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server create \
> --image ubuntu \
> --flavor m1.small \
> --network shared \
> --wait prod-instance
```

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	2024-06-10T16:42:42.000000
OS-SRV-USG:terminated_at	None
accessIPv4	
accessIPv6	
addresses	shared=192.168.233.166
adminPass	uPsyV9r8Rdxv
config_drive	
created	2024-06-10T16:42:39Z
flavor	m1.small (2)
hostId	1b8dbd84262b5472c62a2892fd623993d3a98d2faf2f7862e90ce419
id	c67ff809-ff02-443f-9015-c30dbb33e45d
image	ubuntu (329d361e-f6dc-4b72-b200-3de0ec230e65)
key_name	None
name	prod-instance
progress	0
project_id	39e851b14f864573aad60582c35e40dc
properties	
security_groups	name='default'
status	ACTIVE
updated	2024-06-10T16:42:43Z
user_id	14f5376f00c04e90b7103dd8d4263040
volumes_attached	

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

### Tip

When typing the command, make sure there is a space between the last word of the line and `\`, and press **Enter** to get the `>` and continue typing the rest of the command.

## 2.8. Use the **openstack server list** command to list all the available instances.

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

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server list
+-----+-----+-----+-----+-----+-----+
| ID | Name | Status | Networks | Image | Flavor |
+-----+-----+-----+-----+-----+-----+
| c67ff809-ff02-443f-9015-c30dbb33e45d | prod-instance | ACTIVE | shared=192.168.233.166 | ubuntu | m1.small |
+-----+-----+-----+-----+-----+-----+
```

### Note

The UUID in the *ID* field and the IP address in the *Networks* field may differ from the screenshot provided.

## 2.9. Display more details about the instance **prod-instance**.

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

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server show prod-instance
+-----+-----+
| 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 | 2024-06-10T16:42:42.000000 |
| OS-SRV-USG:terminated_at | None |
| accessIPv4 | |
| accessIPv6 | |
| addresses | shared=192.168.233.166 |
| config_drive | |
| created | 2024-06-10T16:42:39Z |
| flavor | m1.small (2) |
| hostId | 1b8dbd84262b5472c62a2892fd623993d3a98d2faf2f7862e90ce419 |
| id | c67ff809-ff02-443f-9015-c30dbb33e45d |
| image | ubuntu (329d361e-f6dc-4b72-b200-3de0ec230e65) |
| key_name | None |
| name | prod-instance |
| progress | 0 |
| project_id | 39e851b14f864573aad60582c35e40dc |
| properties | |
| security_groups | name='default' |
| status | ACTIVE |
| updated | 2024-06-10T16:42:43Z |
| user_id | 14f5376f00c04e90b7103dd8d4263040 |
| volumes_attached | |
+-----+-----+
```

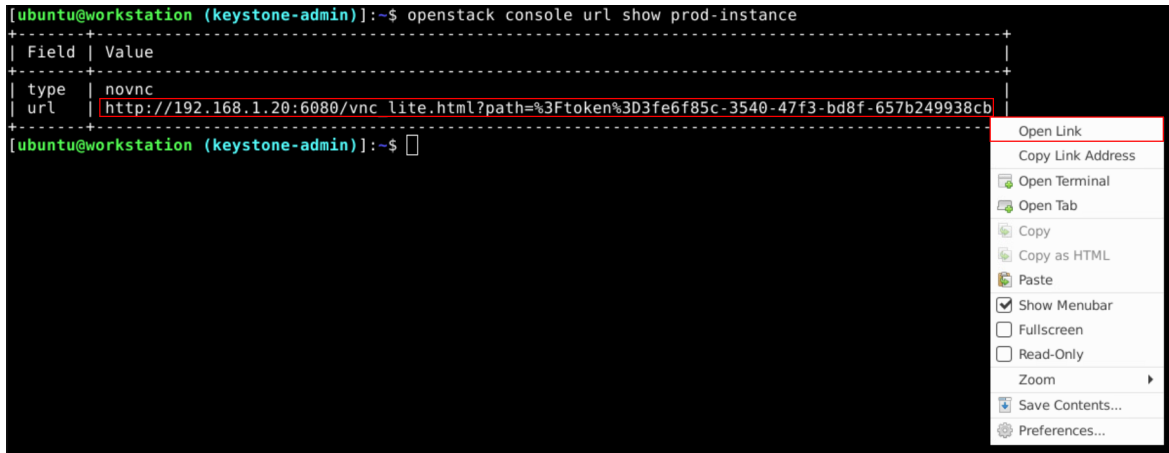
### Tip

The UUID for the instance **prod-instance** can be used in place of **prod-instance** in the above command to identify the instance.

- 2.10. Display the instance's console URL. Then right-click on the URL and select **Open Link**.

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

```
[ubuntu@workstation (keystone-admin)]:~$ openstack console url show prod-instance
+-----+-----+
| Field | Value |
+-----+-----+
| type  | novnc |
| url   | http://192.168.1.20:6080/vnc_lite.html?path=%3Ftoken%3D3fe6f85c-3540-47f3-bd8f-657b249938cb |
+-----+-----+
[ubuntu@workstation (keystone-admin)]:~$
```



- 2.11. The web browser will open directly to the instance's console through noVNC. Log into **prod-instance** using **root** as the username and **secret** as the password. Then use the **ping** command to verify connectivity with the DHCP server (**192.168.233.2**).

```
$ ping -c3 192.168.233.2
```

```
Connected to QEMU (Instance-00000002)
root@prod-instance:~# ping -c3 192.168.233.2
PING 192.168.233.2 (192.168.233.2) 56(84) bytes of data:
64 bytes from 192.168.233.2: icmp_seq=1 ttl=64 time=5.85 ms
64 bytes from 192.168.233.2: icmp_seq=2 ttl=64 time=3.25 ms
64 bytes from 192.168.233.2: icmp_seq=3 ttl=64 time=1.59 ms

--- 192.168.233.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2005ms
rtt min/avg/max/mdev = 1.585/3.559/5.849/1.754 ms
root@prod-instance:~#
```

#### Note

You should receive three successful ping replies.

- 2.12. Close the web browser and change focus back to the previous terminal window.
- 2.13. The instance is now ready to be deleted, but first list the servers so that the effect of the next step can be observed.

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

```
[ubuntu@workstation (keystone-admin)]:~$ openstack server list
+-----+-----+-----+-----+-----+-----+
| ID | Name | Status | Networks | Image | Flavor |
+-----+-----+-----+-----+-----+-----+
| c67ff809-ff02-443f-9015-c30dbb33e45d | prod-instance | ACTIVE | shared=192.168.233.166 | ubuntu | m1.small |
+-----+-----+-----+-----+-----+-----+
[ubuntu@workstation (keystone-admin)]:~$
```

#### 2.14. Delete the instance.

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

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

#### 2.15. Ensure that the instance was deleted by seeing that the server list is empty.

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

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

#### 2.16. The lab is now complete.

## A OpenStack Unified CLI Help

The OpenStack Unified CLI has many commands. Thankfully, they follow a predictable form:

```
openstack [<global-options>] <object-1> <action> [<object-2>] [<command-arguments>]
```

Items in square brackets indicate that they are not present in every command. For instance,

```
openstack image list
```

contains only one object and an action. We will encounter more complex commands in the future, but it is good to keep this common structure in mind. For more information on the structure of OpenStack CLI commands, visit the [Command Structure Documentation](#).

To see what actions can be performed on a given object, it is always possible to run a command structured like this:

```
openstack <object> --help
```

For instance, to see what actions you can perform on instances, you can run the command

```
openstack instance --help
```

Other objects include **image**, **flavor**, **network**, and many more that will appear throughout the labs.

Additionally, to see what parameters you can pass to an action, you can run a command structured like this:

```
openstack <object> <action> --help
```

for instance, to see what parameters you can set on an instance, you can run the command

```
openstack server set --help
```

Other object actions include **server list**, **flavor show**, **network create**, and many more that will appear throughout the labs.