OpenStack Labs

Lab 09: Customizing Instances

Contents

Introduction

In this lab, you will use the `cloud-init` utility to customize OpenStack instances.

Objectives

- Customize an instance with `cloud-init`.
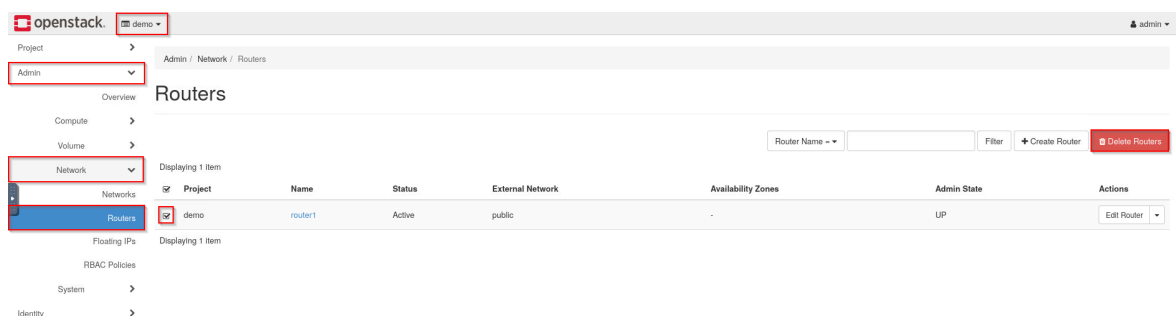- Verify instance customization.

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: 192.168.1.23 ens4: 172.25.250.23	ubuntu	ubuntu
devstack	ens3: 192.168.1.22 ens4: 172.25.250.22	ubuntu	ubuntu

1 Creating Customized Instances

In this task, you will customize two instances using `cloud-init` capabilities and features. You will log into the first instance to confirm `cloud-init` is up and running.

1. Open the web browser and navigate to **192.168.1.20**. Log into the dashboard as **admin** with the password **secret**.

2. Switch to the **demo** project. Navigate to **Admin→Network→Routers**. Check the box in the same row as **router1**, then click **Delete Routers**.

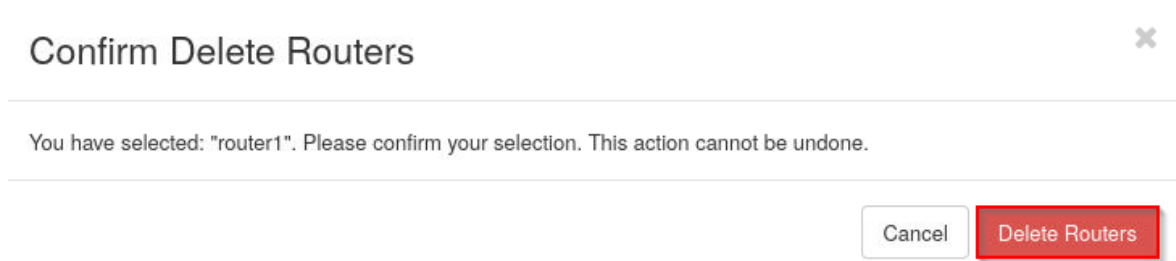3. In the *Confirm Delete Routers* dialog box that pops up, click **Delete Routers**.

4. Now, navigate to **Networks**. Check the box in the same row as **public**, then click **Delete Networks**.

5. In the *Confirm Delete Networks* dialog box that pops up, click **Delete Networks**.
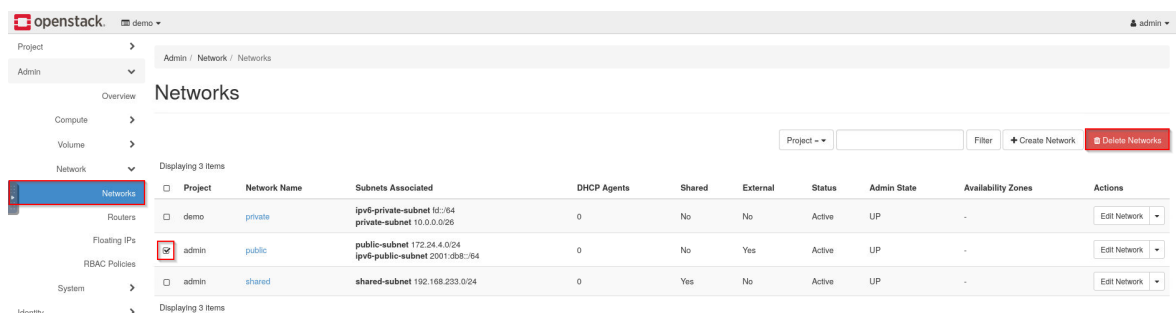
Confirm Delete Networks ✕

You have selected: "public". Please confirm your selection. This action cannot be undone.

Cancel   **Delete Networks**

6. Leave the web browser open and open a terminal window. Source the keystone credentials for the **admin** user.

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

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

7. A few resources need to be created to help with customizing the instances. First, create an external network named **external**. Set the network type to **flat** and the physical network to **public**. Set the network as shared and external.

```
ubuntu@workstation:~$ openstack network create external \
> --external --share \
> --provider-network-type flat \
> --provider-physical-network public
```

```
ubuntu@workstation:~$ openstack network create external \
> --external --share \
> --provider-network-type flat \
> --provider-physical-network public
+---------------------------+--------------------------------------+
| Field                     | Value                                |
+---------------------------+--------------------------------------+
| admin_state_up            | UP                                   |
| availability_zone_hints   |                                      |
| availability_zones        |                                      |
| created_at                | 2023-11-28T22:04:20Z                 |
| description               |                                      |
| dns_domain                | None                                 |
| id                        | 9413be91-6d77-4bd3-a206-d4b0d51e107a |
| ipv4_address_scope        | None                                 |
| ipv6_address_scope        | None                                 |
| is_default                | False                                |
| is_vlan_transparent       | None                                 |
| mtu                       | 1500                                 |
| name                      | external                             |
| port_security_enabled     | True                                 |
| project_id                | c524eaead1f74d4f9141f71b280e0237     |
| provider:network_type     | flat                                 |
| provider:physical_network | public                               |
| provider:segmentation_id  | None                                 |
| qos_policy_id             | None                                 |
| revision_number           | 1                                    |
| router:external           | External                             |
| segments                  | None                                 |
| shared                    | True                                 |
| status                    | ACTIVE                               |
| subnets                   |                                      |
| tags                      |                                      |
| updated_at                | 2023-11-28T22:04:20Z                 |
+---------------------------+--------------------------------------+
ubuntu@workstation:~$
```

> **Tip**
>
> WHen typing the command, make sure there is a space between `external` and the `\` character, and press **Enter** to get the > and continue typing the rest of the command.

8. Create a subnet named **subext** in the **external** network. Give the subnet a range of **172.25.250.60** to **172.25.250.80**. Disable DHCP services for the subnet and use the address **172.25.250.254** as the gateway as well as the DNS name server.

```
ubuntu@workstation:~$ openstack subnet create \
> --subnet-range 172.25.250.0/24 \
> --no-dhcp \
> --gateway 172.25.250.254 \
> --dns-nameserver 172.25.250.254 \
> --allocation-pool start=172.25.250.60,end=172.25.250.80 \
> --network external \
> subext
```

```
ubuntu@workstation:~$ openstack subnet create \
> --subnet-range 172.25.250.0/24 \
> --no-dhcp \
> --gateway 172.25.250.254 \
> --dns-nameserver 172.25.250.254 \
> --allocation-pool start=172.25.250.60,end=172.25.250.80 \
> --network external \
> subext
+--------------------+--------------------------------------+
| Field              | Value                                |
+--------------------+--------------------------------------+
| allocation_pools   | 172.25.250.60-172.25.250.80          |
| cidr               | 172.25.250.0/24                      |
| created_at         | 2023-11-28T22:06:04Z                 |
| description        |                                      |
| dns_nameservers    | 172.25.250.254                       |
| enable_dhcp        | False                                |
| gateway_ip         | 172.25.250.254                       |
| host_routes        |                                      |
| id                 | 1fc4acf4-704b-4a61-bbf3-cc8db40497ec |
| ip_version         | 4                                    |
| ipv6_address_mode  | None                                 |
| ipv6_ra_mode       | None                                 |
| name               | subext                               |
| network_id         | 9413be91-6d77-4bd3-a206-d4b0d51e107a |
| project_id         | c524eaead1f74d4f9141f71b280e0237     |
| revision_number    | 0                                    |
| segment_id         | None                                 |
| service_types      |                                      |
| subnetpool_id      | None                                 |
| tags               |                                      |
| updated_at         | 2023-11-28T22:06:04Z                 |
+--------------------+--------------------------------------+
ubuntu@workstation:~$
```

9. From the floating IP pool in the **external** network, create a floating IP.

```
ubuntu@workstation:~$ openstack floating ip create external
```

```
ubuntu@workstation:~$ openstack floating ip create external
+---------------------+--------------------------------------+
| Field               | Value                                |
+---------------------+--------------------------------------+
| created_at          | 2023-11-28T22:06:29Z                 |
| description         |                                      |
| fixed_ip_address    | None                                 |
| floating_ip_address | 172.25.250.78                        |
| floating_network_id | 9413be91-6d77-4bd3-a206-d4b0d51e107a |
| id                  | dea3c2c7-fd39-4d9a-9835-2444cf2dfa7e |
| name                | 172.25.250.78                        |
| port_id             | None                                 |
| project_id          | c524eaead1f74d4f9141f71b280e0237     |
| qos_policy_id       | None                                 |
| revision_number     | 0                                    |
| router_id           | None                                 |
| status              | DOWN                                 |
| subnet_id           | None                                 |
| updated_at          | 2023-11-28T22:06:29Z                 |
+---------------------+--------------------------------------+
ubuntu@workstation:~$
```

10. Create a router named **exercise-router**.

```
ubuntu@workstation:~$ openstack router create exercise-router
```

```
ubuntu@workstation:~$ openstack router create exercise-router
+-------------------------+--------------------------------------+
| Field                   | Value                                |
+-------------------------+--------------------------------------+
| admin_state_up          | UP                                   |
| availability_zone_hints |                                      |
| availability_zones      |                                      |
| created_at              | 2023-11-29T19:33:59Z                 |
| description             |                                      |
| distributed             | False                                |
| external_gateway_info   | None                                 |
| flavor_id               | None                                 |
| ha                      | False                                |
| id                      | c8ed3b3a-f70c-418e-a00f-1a8f8dca6161 |
| name                    | exercise-router                      |
| project_id              | c524eaead1f74d4f9141f71b280e0237     |
| revision_number         | 1                                    |
| routes                  |                                      |
| status                  | ACTIVE                               |
| tags                    |                                      |
| updated_at              | 2023-11-29T19:33:59Z                 |
+-------------------------+--------------------------------------+
ubuntu@workstation:~$
```

11. Connect the router to the **shared-subnet** subnet.

```
ubuntu@workstation:~$ openstack router add subnet \
> exercise-router shared-subnet
```

```
ubuntu@workstation:~$ openstack router add subnet \
> exercise-router shared-subnet
ubuntu@workstation:~$
```

12. Set the **external** network as the gateway for the router.

```
ubuntu@workstation:~$ openstack router set \
> --external-gateway external \
> exercise-router
```

```
ubuntu@workstation:~$ openstack router set \
> --external-gateway external \
> exercise-router
ubuntu@workstation:~$
```

13. Create the key pair **dev-keypair** and save the private key to the file ~**/Downloads/dev-keypair.pem**.

```
ubuntu@workstation:~$ openstack keypair create \
> dev-keypair > ~/Downloads/dev-keypair.pem
```

```
ubuntu@workstation:~$ openstack keypair create \
> dev-keypair > ~/Downloads/dev-keypair.pem
ubuntu@workstation:~$
```

14. the chmod command with a mode of **600** to make it so that the **ubuntu** user has read/write permissions on the file, and groups and other users have no permissions to the file.

```
ubuntu@workstation:~$ chmod 600 ~/Downloads/dev-keypair.pem
```

```
ubuntu@workstation:~$ chmod 600 ~/Downloads/dev-keypair.pem
ubuntu@workstation:~$
```

15. Create the **dev-secgroup** security group.

```
ubuntu@workstation:~$ openstack security group \
> create dev-secgroup
```

```
ubuntu@workstation:~$ openstack security group \
> create dev-secgroup
+-----------------+----------------------------------------------------------------------------------------------------------------------------------------------------------------+
| Field           | Value                                                                                                                                                          |
+-----------------+----------------------------------------------------------------------------------------------------------------------------------------------------------------+
| created_at      | 2023-11-28T22:07:57Z                                                                                                                                           |
| description     | dev-secgroup                                                                                                                                                   |
| id              | bf6127bb-edab-44c8-a470-20cc9c3c4f6c                                                                                                                           |
| name            | dev-secgroup                                                                                                                                                   |
| project_id      | c524eaead1f74d4f9141f71b280e0237                                                                                                                               |
| revision_number | 1                                                                                                                                                              |
| rules           | created_at='2023-11-28T22:07:57Z', direction='egress', ethertype='IPv6', id='93666585-0b16-4dee-9afc-797bd77935a9', standard_attr_id='61', updated_at='2023-11-28T22:07:57Z' |
|                 | created_at='2023-11-28T22:07:57Z', direction='egress', ethertype='IPv4', id='ccad6958-5c4d-476e-a90b-26d06e68de50', standard_attr_id='62', updated_at='2023-11-28T22:07:57Z' |
| updated_at      | 2023-11-28T22:07:57Z                                                                                                                                           |
+-----------------+----------------------------------------------------------------------------------------------------------------------------------------------------------------+
ubuntu@workstation:~$
```

16. Add a security rule in the **dev-secgroup** security group to allow remote ICMP traffic.

```
ubuntu@workstation: openstack security group \
> rule create \
> --protocol icmp \
> dev-secgroup
```

```
ubuntu@workstation:~$ openstack security group \
> rule create \
> --protocol icmp \
> dev-secgroup
+-------------------+--------------------------------------+
| Field             | Value                                |
+-------------------+--------------------------------------+
| created_at        | 2023-11-28T22:09:51Z                 |
| description       |                                      |
| direction         | ingress                              |
| ether_type        | IPv4                                 |
| id                | d38364cb-c1ba-4710-8561-3243de310569 |
| name              | None                                 |
| port_range_max    | None                                 |
| port_range_min    | None                                 |
| project_id        | c524eaead1f74d4f9141f71b280e0237     |
| protocol          | icmp                                 |
| remote_group_id   | None                                 |
| remote_ip_prefix  | 0.0.0.0/0                            |
| revision_number   | 0                                    |
| security_group_id | bf6127bb-edab-44c8-a470-20cc9c3c4f6c |
| updated_at        | 2023-11-28T22:09:51Z                 |
+-------------------+--------------------------------------+
ubuntu@workstation:~$
```

17. Add another security rule to allow remote connection using SSH on the default port 22.

```
ubuntu@workstation:~$ openstack security group \
> rule create \
> --protocol tcp \
> --dst-port 22 \
> dev-secgroup
```


18. Now that the necessary resources have been created, focus back to the web browser. Navigate to **Project→Compute→Instances**, then click **Launch Instance**.
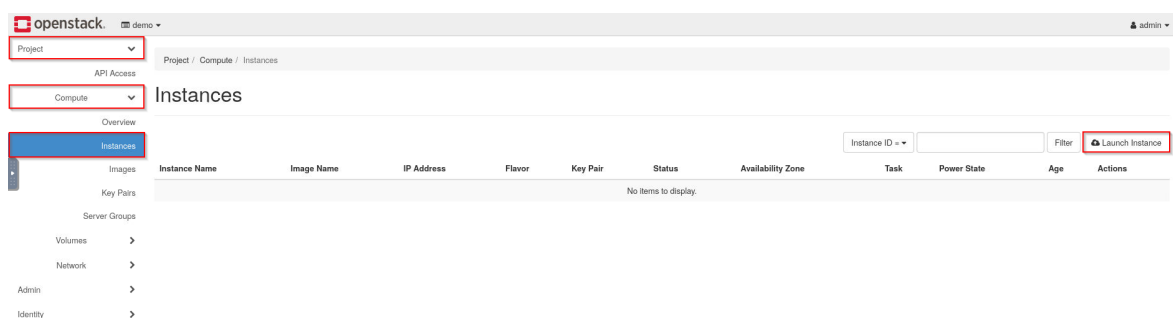
19. In the *Details* tab, enter **instance1** in the *Instance Name* field and click **Next**.

20. In the *Source* tab, make sure **Image** is selected in the *Select Boot Source* dropdown and click **No** under *Create New Volume*. Select the **ubuntu** image by clicking the ↑ symbol in the same row. Click **Next**.

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

21. In the *Flavor* tab, click the ↑ symbol in the same row as **m1.small**. Click **Next**.

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

22. In the *Networks* tab, click the ↑ symbol in the same row as **shared**. Click **Next**.

Stop

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

23. In the *Network Ports* tab, click **Next**.

24. In the *Security Groups* tab, click the ↓ symbol in the same row as **default**, and click the ↑ symbol in the same row as **dev-secgroup**. Click **Next**.

> **Stop**
>
> Before proceeding to the next step, confirm that only **dev-secgroup** appears underneath the *Allocated* section.

25. In the *Key Pair* tab, ensure that the key pair **dev-keypair** has been selected and is underneath the *Allocated* section. Click **Next**.

26. In the *Configuration* tab, populate the **Customization Script** field with the content below. Once finished, click **Launch Instance**.

```
#!/bin/bash
echo 'Hello, world!' > /root/hello.txt
```

> **Tip**
>
> A customization script can be used to perform many commands automatically upon instance creation, such as installing packages, configuring a host name, etc. The simple script above is just an example.

27. Once the status for **instance1** is **Active**, attach a floating IP address to it. Select **Associate Floating IP** from the dropdown menu next to **Create Snapshot** in the row for the instance.

28. Select any one of the IP addresses from the *IP Address* dropdown and select **instance1: 192.168.233.XYZ** as the *Port to be associated*. Click **Associate**.

29. To verify that the customization script worked, first click on **instance1** under the *Instance Name* column, then navigate to the *Console* tab if you are not directed there automatically. Log into the instance as **root** with the password **secret**.

30. Check **/var/log/cloud-init.log** to confirm that **cloud-init** ran. Use the `tail` command to print the last 10 lines of the log.

```
root@instance:~# tail /var/log/cloud-init.log
```

```
Connected to QEMU (instance-00000009)
root@instance1:~# sudo tail /var/log/cloud-init.log
sudo: unable to resolve host instance1: Temporary failure in name resolution
2023-11-30 17:32:30,843 - util.py[DEBUG]: Writing to /var/lib/cloud/instance/boot-finished - wb: [644] 70 bytes
2023-11-30 17:32:30,852 - handlers.py[DEBUG]: finish: modules-final/config-final_message: SUCCESS: config-final_message ran succ
essfully
2023-11-30 17:32:30,853 - main.py[DEBUG]: Ran 11 modules with 0 failures
2023-11-30 17:32:30,860 - atomic_helper.py[DEBUG]: Atomically writing to file /var/lib/cloud/data/status.json (via temporary fil
e /var/lib/cloud/data/tmppufil6z_) - w: [644] 590 bytes/chars
2023-11-30 17:32:30,867 - atomic_helper.py[DEBUG]: Atomically writing to file /var/lib/cloud/data/result.json (via temporary fil
e /var/lib/cloud/data/tmpwymsadmy) - w: [644] 87 bytes/chars
2023-11-30 17:32:30,870 - util.py[DEBUG]: Creating symbolic link from '/run/cloud-init/result.json' => '../../var/lib/cloud/data
/result.json'
2023-11-30 17:32:30,872 - util.py[DEBUG]: Reading from /proc/uptime (quiet=False)
2023-11-30 17:32:30,875 - util.py[DEBUG]: Read 12 bytes from /proc/uptime
2023-11-30 17:32:30,877 - util.py[DEBUG]: cloud-init mode 'modules' took 3.172 seconds (3.17)
2023-11-30 17:32:30,878 - handlers.py[DEBUG]: finish: modules-final: SUCCESS: running modules for final
root@instance1:~# _
```

31. Ensure that the **/root/hello.txt** file exists and has the correct content.

```
root@instance:~# cat /root/hello.txt
```

```
Connected to QEMU (instance-0000000b)
root@instance1:~# cat /root/hello.txt
Hello, world!
root@instance1:~# _
```

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

33. Focus back on the terminal and delete **instance1**.

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

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

34. Another instance will be created and customized using the *OpenStack Unified CLI*. First, create a **user-data** script that will be attached to the instance at creation. Create a script called ~**/set_hostname** that matches the content shown below. Press **CTRL+X**, then **Y** to accept the file changes. Press **Enter** to confirm and exit back to the terminal.

```
ubuntu@workstation: nano ~/set_hostname
```

```
  GNU nano 2.9.3                    /home/ubuntu/set_hostname                    Modified

#!/bin/bash
hostnamectl set-hostname nexus
```

35. Launch an instance using the **user-data** option with the previously created script to perform the customization. Use the **ubuntu** image, the **m1.small** flavor, the **shared** network, the **dev-secgroup** security group, and the **dev-keypair** key pair.

```
ubuntu@workstation: openstack server create \
> --image ubuntu \
> --flavor m1.small \
> --nic net-id=shared \
> --security-group dev-secgroup \
> --key-name dev-keypair \
> --user-data ~/set_hostname \
> --wait instance2
```

```
ubuntu@workstation:~$ openstack server create \
> --image ubuntu \
> --flavor m1.small \
> --nic net-id=shared \
> --security-group dev-secgroup \
> --key-name dev-keypair \
> --user-data ~/set_hostname \
> --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-0000000c                                      |
| OS-EXT-STS:power_state              | Running                                                |
| OS-EXT-STS:task_state               | None                                                   |
| OS-EXT-STS:vm_state                 | active                                                 |
| OS-SRV-USG:launched_at              | 2023-11-30T18:31:03.000000                             |
| OS-SRV-USG:terminated_at            | None                                                   |
| accessIPv4                          |                                                        |
| accessIPv6                          |                                                        |
| addresses                           | shared=192.168.233.47                                  |
| adminPass                           | 5G5xNceVrXus                                           |
| config_drive                        |                                                        |
| created                             | 2023-11-30T18:31:00Z                                   |
| flavor                              | m1.small (2)                                           |
| hostId                              | 151e314f6e3cfc8b4db0b1f6035cc4b68cb1e6c9aa97163a575f9f6c |
| id                                  | d178095d-49e4-4e05-9729-0e320cfe5309                   |
| image                               | ubuntu (10d986bd-8501-47be-b9d9-d72eab219920)          |
| key_name                            | dev-keypair                                            |
| name                                | instance2                                              |
| progress                            | 0                                                      |
| project_id                          | c524eaead1f74d4f9141f71b280e0237                       |
| properties                          |                                                        |
| security_groups                     | name='dev-secgroup'                                    |
| status                              | ACTIVE                                                 |
| updated                             | 2023-11-30T18:31:04Z                                   |
| user_id                             | b4bdeae0865449e1905fc5e639007753                       |
| volumes_attached                    |                                                        |
+-------------------------------------+--------------------------------------------------------+
ubuntu@workstation:~$
```

36. Verify that the status of the **instance2** instance is **ACTIVE**.

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

```
ubuntu@workstation:~$ openstack server list
+--------------------------------------+-----------+--------+-----------------------+--------+----------+
| ID                                   | Name      | Status | Networks              | Image  | Flavor   |
+--------------------------------------+-----------+--------+-----------------------+--------+----------+
| d178095d-49e4-4e05-9729-0e320cfe5309 | instance2 | ACTIVE | shared=192.168.233.47 | ubuntu | m1.small |
+--------------------------------------+-----------+--------+-----------------------+--------+----------+
ubuntu@workstation:~$
```

37. Generate another floating IP address to assign to this instance. Take note of the IP address generated, which is listed in the *name* row in the output from the below command.

```
ubuntu@workstation:~$ openstack floating ip create external
```

```
ubuntu@workstation:~$ openstack floating ip create external
+---------------------+--------------------------------------+
| Field               | Value                                |
+---------------------+--------------------------------------+
| created_at          | 2023-11-29T22:29:11Z                 |
| description         |                                      |
| fixed_ip_address    | None                                 |
| floating_ip_address | 172.25.250.63                        |
| floating_network_id | 9413be91-6d77-4bd3-a206-d4b0d51e107a |
| id                  | 61840770-30bb-4bed-83c2-9cb95c7a831f |
| name                | 172.25.250.63                        |
| port_id             | None                                 |
| project_id          | c524eaead1f74d4f9141f71b280e0237     |
| qos_policy_id       | None                                 |
| revision_number     | 0                                    |
| router_id           | None                                 |
| status              | DOWN                                 |
| subnet_id           | None                                 |
| updated_at          | 2023-11-29T22:29:11Z                 |
+---------------------+--------------------------------------+
ubuntu@workstation:~$
```

38. Assign the floating IP generated from the last step to **instance2**.

```
ubuntu@workstation:~$ openstack server add floating ip \
instance2 172.25.250.63
```

```
ubuntu@workstation:~$ openstack server add floating ip \
> instance2 172.25.250.63
ubuntu@workstation:~$
```

> **Note**
>
> The actual value of your floating IP address may be different.

2 Verify Customized Instances

In this task, you will verify that `cloud-init` has correctly customized the two instances created in the previous section.

1. If a terminal window is not already open, open one and source the admin credentials from the ~/**keystonerc-admin** file.

2. Determine the floating IP address associated with **instance1**. Remember that the floating IP address is in the **172.25.250.0/24** subnet.

```
ubuntu@workstation: openstack server show instance1 \
> | grep address
```

> **Note**
>
> The floating IP addresses in your output may differ from these examples.

3. Now, use this command again to determine the floating IP address associated with **instance2**.

```
ubuntu@workstation: openstack server show instance2 \
> | grep address
```