OpenStack Labs

Lab 07: Deploying an FTP Server

Contents

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**).
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Introduction

In this lab, you will practice and demonstrate the knowledge and skills you acquired throughout the course by deploying an FTP server through OpenStack.

Objectives

- Launch an instance in your OpenStack environment and customize the instance to run an FTP server.
- Access the FTP server from the workstation to confirm the configuration.

Lab Settings

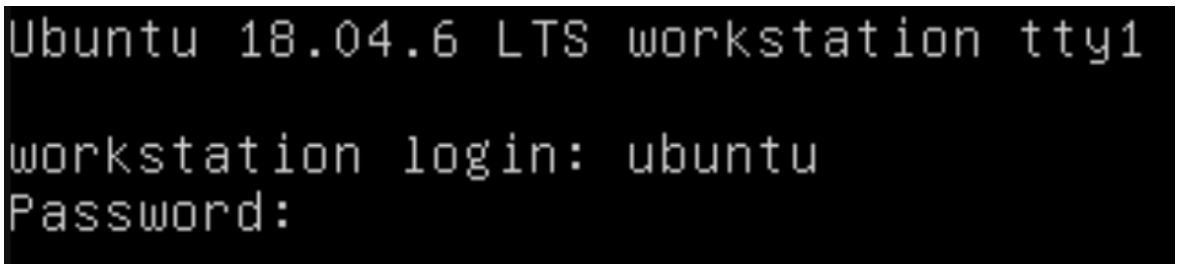
The information in the table below will be needed in order to complete the lab. The task sections below provide details on the use of this information.

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 Creating an Environment

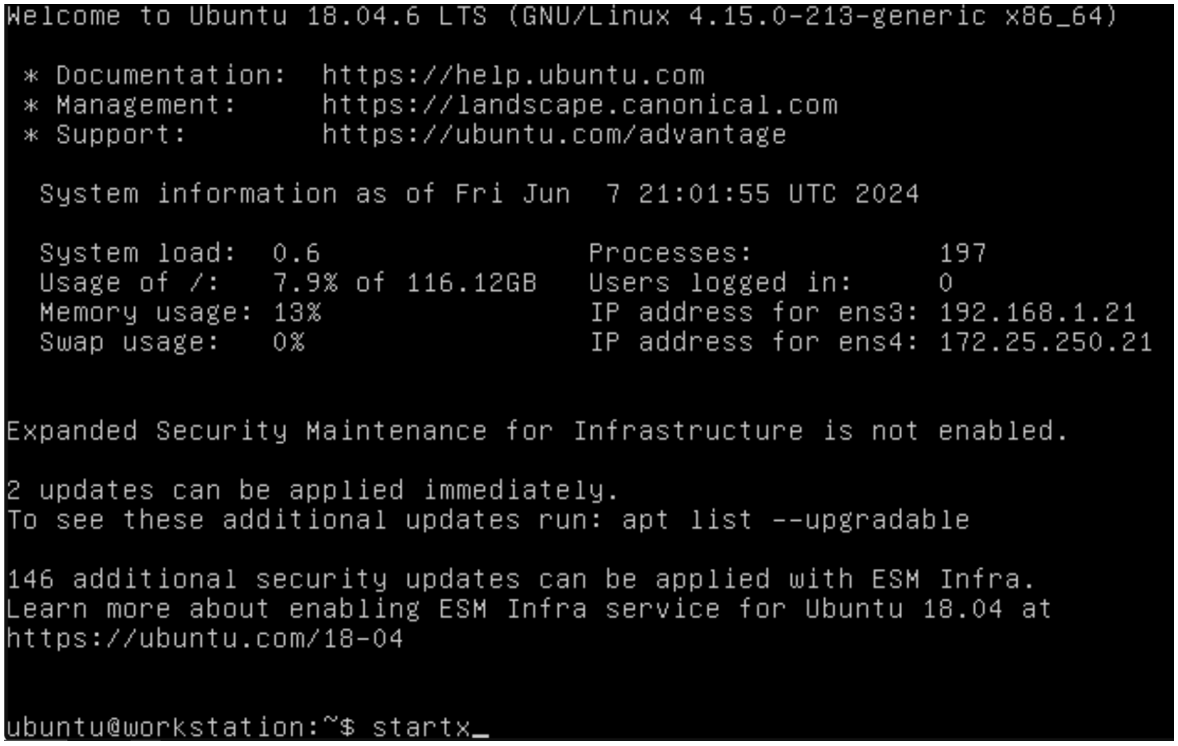
In this task, you will create all the resources necessary to create an external instance running an FTP server. The architecture will be comprised of an external network and an internal network, a new privileged user and a non-privileged user, and a set of new security rules to allow SSH and FTP access to the instance. A floating IP will be associated with the instance to permit external connectivity.

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



1.2. Launch the graphical user interface.

```
ubuntu@workstation:~$ startx
```



1.3. Open a terminal window and source the **~/keystonerc-admin** keystone credentials file.

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

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

1.4. In this lab, we will create our own project and set of users to simulate a more realistic working environment. First, create the **prod** project.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack project create prod \
> --domain default
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack project create prod \
> --domain default
+-------------+----------------------------------+
| Field       | Value                            |
+-------------+----------------------------------+
| description |                                  |
| domain_id   | default                          |
| enabled     | True                             |
| id          | c0f3e7114ea04faf9b714df14c54fc41 |
| is_domain   | False                            |
| name        | prod                             |
| options     | {}                               |
| parent_id   | default                          |
| tags        | []                               |
+-------------+----------------------------------+
[ubuntu@workstation (keystone-admin)]:~$
```

Tip

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

1.5. Create a user named **superuser** with the password **secret** to the **prod** project.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack user create \
> --project prod \
> --password secret \
> superuser
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack user create \
> --project prod \
> --password secret \
> superuser
+---------------------+----------------------------------+
| Field               | Value                            |
+---------------------+----------------------------------+
| default_project_id  | c0f3e7114ea04faf9b714df14c54fc41 |
| domain_id           | default                          |
| enabled             | True                             |
| id                  | d64283cd29e44603b01b68579e41336d |
| name                | superuser                        |
| options             | {}                               |
| password_expires_at | None                             |
+---------------------+----------------------------------+
[ubuntu@workstation (keystone-admin)]:~$
```

1.6. Assign the **admin** role to the user **superuser**.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack role add \
> --project prod \
> --user superuser \
> admin
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack role add \
> --project prod \
> --user superuser \
> admin
[ubuntu@workstation (keystone-admin)]:~$
```

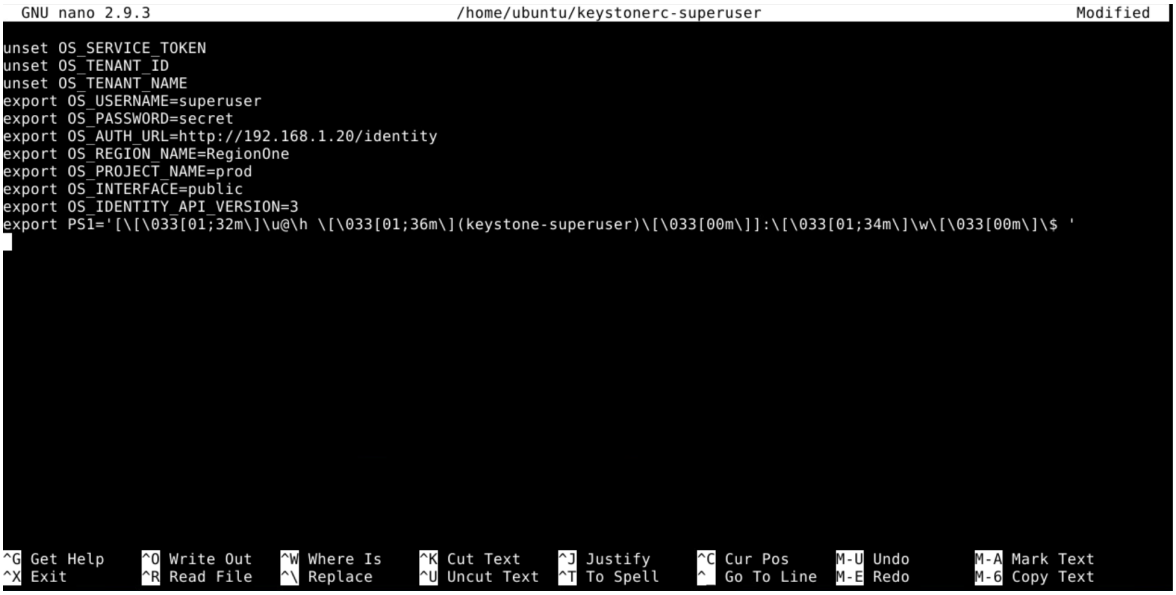
1.7. Copy the keystone credentials file **~/keystonerc-admin** to **~/keystonerc-superuser**.

```
[ubuntu@workstation (keystone-admin)]:~$ cp ~/keystonerc-admin \
> ~/keystonerc-superuser
```

```
[ubuntu@workstation (keystone-admin)]:~$ cp ~/keystonerc-admin \
> ~/keystonerc-superuser
[ubuntu@workstation (keystone-admin)]:~$
```

1.8. Use **nano** to edit the **~/keystonerc-superuser** file. Change the **OS_USERNAME** to **superuser**, and change the **OS_PROJECT_NAME** to **prod**. Finally, in the line beginning **export PS1=...**, replace **(keystone-admin)** with **(keystone-superuser)**. The file should match the the contents shown below. Press **Ctrl+X** to exit the file, then press **Y** and then **Enter** to save the changes to the file.

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



1.9. Now, create a non-privileged user called **cloud-dev** with the password **secret**.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack user create \
> --project prod \
> --password secret \
> cloud-dev
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack user create \
> --project prod \
> --password secret \
> cloud-dev
+---------------------+----------------------------------+
| Field               | Value                            |
+---------------------+----------------------------------+
| default_project_id  | c0f3e7114ea04faf9b714df14c54fc41 |
| domain_id           | default                          |
| enabled             | True                             |
| id                  | 80c26eb4c7494a55a24e1cff505456df |
| name                | cloud-dev                        |
| options             | {}                               |
| password_expires_at | None                             |
+---------------------+----------------------------------+
[ubuntu@workstation (keystone-admin)]:~$
```

1.10. Assign **cloud-dev** the **member** role in the **prod** project so that it can perform actions in that project.

```
[ubuntu@workstation (keystone-admin)]:~$ openstack role add \
> --project prod \
> --user cloud-dev \
> member
```

```
[ubuntu@workstation (keystone-admin)]:~$ openstack role add \
> --project prod \
> --user cloud-dev \
> member
[ubuntu@workstation (keystone-admin)]:~$
```

1.11. Copy the keystone credentials file ~/**keystonerc-superuser** to ~/**keystonerc-cloud-dev**.

```
[ubuntu@workstation (keystone-admin)]:~$ cp ~/keystonerc-superuser \
> ~/keystonerc-cloud-dev
```

```
[ubuntu@workstation (keystone-admin)]:~$ cp ~/keystonerc-superuser \
> ~/keystonerc-cloud-dev
[ubuntu@workstation (keystone-admin)]:~$
```

1.12. Use **nano** to edit the ~/**keystonerc-cloud-dev** file. Change the **OS_USERNAME** to **cloud-dev**. In the line beginning **export PS1=...**, replace **(keystone-superuser)** with **(keystone-cloud-dev)** The file should match the contents shown below. Press **Ctrl+X** to exit the file, then press **Y** and then **Enter** to save the changes to the file.

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

```
 GNU nano 2.9.3                    keystonerc-cloud-dev                    Modified

unset OS_SERVICE_TOKEN
unset OS_TENANT_ID
unset OS_TENANT_NAME
export OS_USERNAME=cloud-dev
export OS_PASSWORD=secret
export OS_AUTH_URL=http://192.168.1.20/identity
export OS_REGION_NAME=RegionOne
export OS_PROJECT_NAME=prod
export OS_INTERFACE=public
export OS_IDENTITY_API_VERSION=3
export PS1='[\[\033[01;32m\]\u@\h \[\033[01;36m\](keystone-cloud-dev)\[\033[00m\]]:\[\033[01;34m\]\w\[\033[00m\]\$ '

^G Get Help  ^O Write Out  ^W Where Is  ^K Cut Text  ^J Justify  ^C Cur Pos  M-U Undo  M-A Mark Text
^X Exit      ^R Read File  ^\ Replace   ^U Uncut Text ^T To Spell ^_ Go To Line M-E Redo  M-6 Copy Text
```

1.13. Now, source the **keystonerc-superuser** keystone file to begin working with admin privileges in the **prod** project.

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

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

1.14. Before making an external network for the project, the default router and external network need to be deleted. List the routers to find the default router's name.

```
[ubuntu@workstation (keystone-superuser)]:~$ openstack router list \
--max-width 80
```

```
[ubuntu@workstation (keystone-superuser)]:~$ openstack router list \
> --max-width 80
+--------------+---------+--------+-------+-------------+-------+---------------+
| ID           | Name    | Status | State | Distributed | HA    | Project       |
+--------------+---------+--------+-------+-------------+-------+---------------+
| 07df5a07-87  | router1 | ACTIVE | UP    | False       | False | 39e851b14f864 |
| 95-4d8e-     |         |        |       |             |       | 573aad60582c3 |
| accf-f9d7e4  |         |        |       |             |       | 5e40dc        |
| cbb4ee       |         |        |       |             |       |               |
+--------------+---------+--------+-------+-------------+-------+---------------+
[ubuntu@workstation (keystone-superuser)]:~$
```

1.15. Before the router can be deleted, it must be disconnected from all subnets. Show the details of **router1** to find the subnets to remove from it.

```
[ubuntu@workstation (keystone-superuser)]:~$ openstack router show router1 \
> --max-width 100
```

```
[ubuntu@workstation (keystone-superuser)]:~$ openstack router show router1 \
> --max-width 100
+-------------------------+------------------------------------------------------------------------------+
| Field                   | Value                                                                        |
+-------------------------+------------------------------------------------------------------------------+
| admin_state_up          | UP                                                                           |
| availability_zone_hints |                                                                              |
| availability_zones      |                                                                              |
| created_at              | 2024-02-09T19:58:10Z                                                         |
| description             |                                                                              |
| distributed             | False                                                                        |
| external_gateway_info   | {"network_id": "32da4c25-b517-40c5-97e3-cea031467d13", "enable_snat":         |
|                         | true, "external_fixed_ips": [{"subnet_id": "c7916655-8954-4bf4-913d-         |
|                         | 416702f35d1b", "ip_address": "172.24.4.73"}, {"subnet_id": "4fc6bf88         |
|                         | -919c-49df-83c4-b09bd65776ad", "ip_address": "2001:db8::1"}]}                |
| flavor_id               | None                                                                         |
| ha                      | False                                                                        |
| id                      | 07df5a07-8795-4d8e-accf-f9d7e4cbb4ee                                         |
| interfaces_info         | [{"subnet_id": "fa8a2545-5a8c-44a2-bacc-1b86c253b880", "ip_address":         |
|                         | "10.0.0.1", "port_id": "a05f4e1c-4014-4d25-9538-64e8114197e1"},              |
|                         | {"subnet_id": "674205b6-1357-4727-a21a-94220492a57f", "ip_address":          |
|                         | "fd96:731b:22b0::1", "port_id":                                              |
|                         | "d369b706-db4a-4239-b715-721708931870"}]                                     |
| name                    | router1                                                                      |
| project_id              | 39e851b14f864573aad60582c35e40dc                                             |
| revision_number         | 6                                                                            |
| routes                  |                                                                              |
| status                  | ACTIVE                                                                       |
| tags                    |                                                                              |
| updated_at              | 2024-02-09T19:58:27Z                                                         |
+-------------------------+------------------------------------------------------------------------------+
[ubuntu@workstation (keystone-superuser)]:~$
```

1.16. The previous command only outputs IDs, which can be used to remove the subnets from the router. To use the subnet names, list the subnets to see which names are mapped to the IDs from the previous step.

```
[ubuntu@workstation (keystone-superuser)]:~$ openstack subnet list \
> --max-width 100
```

```
[ubuntu@workstation (keystone-superuser)]:~$ openstack subnet list \
> --max-width 100
+--------------------------+--------------------+--------------------------+--------------------+
| ID                       | Name               | Network                  | Subnet             |
+--------------------------+--------------------+--------------------------+--------------------+
| 4fc6bf88-919c-49df-      | ipv6-public-subnet | 32da4c25-b517-40c5-97e3-c | 2001:db8::/64      |
| 83c4-b09bd65776ad        |                    | ea031467d13              |                    |
| 674205b6-1357-4727-a21a- | ipv6-private-subnet | 966ecb4f-4ff8-44ea-a476-2 | fd96:731b:22b0::/64 |
| 94220492a57f             |                    | d2f18955085              |                    |
| 7e456257-76e5-4cfc-bf3f- | shared-subnet      | 9f23266f-d833-4337-9a27-4 | 192.168.233.0/24   |
| b2a3876dba40             |                    | 818a6d28e9e              |                    |
| c7916655-8954-4bf4-913d- | public-subnet      | 32da4c25-b517-40c5-97e3-c | 172.24.4.0/24      |
| 416702f35d1b             |                    | ea031467d13              |                    |
| fa8a2545-5a8c-44a2-bacc- | private-subnet     | 966ecb4f-4ff8-44ea-a476-2 | 10.0.0.0/26        |
| 1b86c253b880             |                    | d2f18955085              |                    |
+--------------------------+--------------------+--------------------------+--------------------+
[ubuntu@workstation (keystone-superuser)]:~$
```

1.17. By matching the names and IDs, you can see that the router is connected to the **private-subnet** and **ipv6-private-subnet** subnets. Remove both subnets from **router1**

```
[ubuntu@workstation (keystone-superuser)]:~$ openstack router remove subnet \
> router1 \
> private-subnet
[ubuntu@workstation (keystone-superuser)]:~$ openstack router remove subnet \
> router1 \
> ipv6-private-subnet
```

```
[ubuntu@workstation (keystone-superuser)]:~$ openstack router remove subnet \
> router1 \
> private-subnet
[ubuntu@workstation (keystone-superuser)]:~$ openstack router remove subnet \
> router1 \
> ipv6-private-subnet
[ubuntu@workstation (keystone-superuser)]:~$
```

1.18. Now, **router1** can be deleted. Delete **router1**.

```
[ubuntu@workstation (keystone-superuser)]:~$ openstack router delete router1
```

```
[ubuntu@workstation (keystone-superuser)]:~$ openstack router delete router1
[ubuntu@workstation (keystone-superuser)]:~$
```

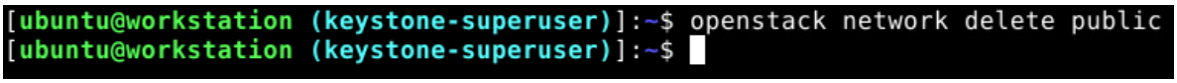
1.19. List the available networks to find the name of the default external network

```
[ubuntu@workstation (keystone-superuser)]:~$ openstack network list \
> --max-width 100
```

```
[ubuntu@workstation (keystone-superuser)]:~$ openstack network list \
> --max-width 100
+--------------------------------------+---------+--------------------------------------+
| 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-superuser)]:~$
```

1.20. From the output of the previous step, you can see that the **public** network should be the default external network. Delete the **public** network.

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



Tip

You can confirm that **public** is an external network by viewing its details with the command **openstack network show public**.

1.21. Create an external, shared network called **extern-net**.

```
[ubuntu@workstation (keystone-superuser)]:~$ openstack network create \
> --external --share \
> --provider-network-type flat \
> --provider-physical-network public \
> extern-net
```

```
[ubuntu@workstation (keystone-superuser)]:~$ openstack network create \
> --external --share \
> --provider-network-type flat \
> --provider-physical-network public \
> extern-net
+---------------------------+--------------------------------------+
| Field                     | Value                                |
+---------------------------+--------------------------------------+
| admin_state_up            | UP                                   |
| availability_zone_hints   |                                      |
| availability_zones        |                                      |
| created_at                | 2024-06-20T20:08:21Z                 |
| description               |                                      |
| dns_domain                | None                                 |
| id                        | a740581a-3dda-4bd3-9feb-c94af92ec0a3 |
| ipv4_address_scope        | None                                 |
| ipv6_address_scope        | None                                 |
| is_default                | False                                |
| is_vlan_transparent       | None                                 |
| mtu                       | 1500                                 |
| name                      | extern-net                           |
| port_security_enabled     | True                                 |
| project_id                | c0f3e7114ea04faf9b714df14c54fc41     |
| 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                | 2024-06-20T20:08:21Z                 |
+---------------------------+--------------------------------------+
[ubuntu@workstation (keystone-superuser)]:~$
```

1.22. Create the **extern-subnet** subnet in the **172.25.250.0/24** range. Make the floating IP allocation pool range from **172.25.250.25** to **172.250.250.30**, and allow DHCP. Set both the gateway and DNS nameserver addresses to **172.25.250.254**.

```
[ubuntu@workstation (keystone-superuser)]:~$ openstack subnet create \
> --subnet-range 172.25.250.0/24 \
> --allocation-pool start=172.25.250.25,end=172.25.250.30 \
> --dhcp --network extern-net \
> --gateway 172.25.250.254 \
> --dns-nameserver 172.25.250.254 \
> extern-subnet
```

```
[ubuntu@workstation (keystone-superuser)]:~$ openstack subnet create \
> --subnet-range 172.25.250.0/24 \
> --allocation-pool start=172.25.250.25,end=172.25.250.30 \
> --dhcp --network extern-net \
> --gateway 172.25.250.254 \
> --dns-nameserver 172.25.250.254 \
> extern-subnet
+-------------------+--------------------------------------+
| Field             | Value                                |
+-------------------+--------------------------------------+
| allocation_pools  | 172.25.250.25-172.25.250.30          |
| cidr              | 172.25.250.0/24                      |
| created_at        | 2024-06-20T20:10:04Z                 |
| description       |                                      |
| dns_nameservers   | 172.25.250.254                       |
| enable_dhcp       | True                                 |
| gateway_ip        | 172.25.250.254                       |
| host_routes       |                                      |
| id                | 86847c13-2252-456a-b6e5-98df40297b5a |
| ip_version        | 4                                    |
| ipv6_address_mode | None                                 |
| ipv6_ra_mode      | None                                 |
| name              | extern-subnet                        |
| network_id        | a740581a-3dda-4bd3-9feb-c94af92ec0a3 |
| project_id        | c0f3e7114ea04faf9b714df14c54fc41     |
| revision_number   | 0                                    |
| segment_id        | None                                 |
| service_types     |                                      |
| subnetpool_id     | None                                 |
| tags              |                                      |
| updated_at        | 2024-06-20T20:10:04Z                 |
+-------------------+--------------------------------------+
[ubuntu@workstation (keystone-superuser)]:~$
```

1.23. Source the **/keystonerc-cloud-dev** keystone credentials file.

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

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

1.24. Create an internal network called **intern-net**.

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack network create intern-net
```

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack network create intern-net
+---------------------------+--------------------------------------+
| Field                     | Value                                |
+---------------------------+--------------------------------------+
| admin_state_up            | UP                                   |
| availability_zone_hints   |                                      |
| availability_zones        |                                      |
| created_at                | 2024-06-20T20:14:46Z                 |
| description               |                                      |
| dns_domain                | None                                 |
| id                        | db6c02b6-eb96-4eac-92d6-bde450b9f5f3 |
| ipv4_address_scope        | None                                 |
| ipv6_address_scope        | None                                 |
| is_default                | False                                |
| is_vlan_transparent       | None                                 |
| mtu                       | 1442                                 |
| name                      | intern-net                           |
| port_security_enabled     | True                                 |
| project_id                | c0f3e7114ea04faf9b714df14c54fc41     |
| provider:network_type     | None                                 |
| provider:physical_network | None                                 |
| provider:segmentation_id  | None                                 |
| qos_policy_id             | None                                 |
| revision_number           | 1                                    |
| router:external           | Internal                             |
| segments                  | None                                 |
| shared                    | False                                |
| status                    | ACTIVE                               |
| subnets                   |                                      |
| tags                      |                                      |
| updated_at                | 2024-06-20T20:14:46Z                 |
+---------------------------+--------------------------------------+
[ubuntu@workstation (keystone-cloud-dev)]:~$
```

1.25. Create a subnet for **intern-net** called **intern-subnet** in the **192.168.0.0/24** range. Allow DHCP on the subnet.

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack subnet create \
> --dhcp \
> --subnet-range 192.168.0.0/24 \
> --network intern-net \
> intern-subnet
```

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack subnet create \
> --dhcp \
> --subnet-range 192.168.0.0/24 \
> --network intern-net \
> intern-subnet
+-------------------+--------------------------------------+
| Field             | Value                                |
+-------------------+--------------------------------------+
| allocation_pools  | 192.168.0.2-192.168.0.254            |
| cidr              | 192.168.0.0/24                       |
| created_at        | 2024-06-20T20:29:38Z                 |
| description       |                                      |
| dns_nameservers   |                                      |
| enable_dhcp       | True                                 |
| gateway_ip        | 192.168.0.1                          |
| host_routes       |                                      |
| id                | 1cb34b67-2a4a-4dc6-bc4d-c4524066e94e |
| ip_version        | 4                                    |
| ipv6_address_mode | None                                 |
| ipv6_ra_mode      | None                                 |
| name              | intern-subnet                        |
| network_id        | db6c02b6-eb96-4eac-92d6-bde450b9f5f3 |
| project_id        | c0f3e7114ea04faf9b714df14c54fc41     |
| revision_number   | 0                                    |
| segment_id        | None                                 |
| service_types     |                                      |
| subnetpool_id     | None                                 |
| tags              |                                      |
| updated_at        | 2024-06-20T20:29:38Z                 |
+-------------------+--------------------------------------+
[ubuntu@workstation (keystone-cloud-dev)]:~$
```

1.26. Create a router named **router1** so that the internal and external networks can be connected.

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack router create router1
```

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack router create router1
+-------------------------+--------------------------------------+
| Field                   | Value                                |
+-------------------------+--------------------------------------+
| admin_state_up          | UP                                   |
| availability_zone_hints |                                      |
| availability_zones      |                                      |
| created_at              | 2024-06-20T20:31:25Z                 |
| description             |                                      |
| distributed             | False                                |
| external_gateway_info   | None                                 |
| flavor_id               | None                                 |
| ha                      | False                                |
| id                      | 4d4613dc-d99e-4333-95fa-40022290df29 |
| name                    | router1                              |
| project_id              | c0f3e7114ea04faf9b714df14c54fc41     |
| revision_number         | 1                                    |
| routes                  |                                      |
| status                  | ACTIVE                               |
| tags                    |                                      |
| updated_at              | 2024-06-20T20:31:25Z                 |
+-------------------------+--------------------------------------+
[ubuntu@workstation (keystone-cloud-dev)]:~$
```

1.27. Add a port to the router for the internal network.

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack router add subnet \
> router1 \
> intern-subnet
```

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack router add subnet \
> router1 \
> intern-subnet
[ubuntu@workstation (keystone-cloud-dev)]:~$
```

1.28. Set the **extern-net** network as the gateway for the router.

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack router set \
> --external-gateway extern-net \
> router1
```

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack router set \
> --external-gateway extern-net \
> router1
[ubuntu@workstation (keystone-cloud-dev)]:~$
```

1.29. Allocate a floating IP address from the **extern-net** network for hte **prod** project.

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack floating ip create \
> extern-net
```

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack floating ip create \
> extern-net
+---------------------+--------------------------------------+
| Field               | Value                                |
+---------------------+--------------------------------------+
| created_at          | 2024-06-20T20:46:39Z                 |
| description         |                                      |
| fixed_ip_address    | None                                 |
| floating_ip_address | 172.25.250.27                        |
| floating_network_id | a740581a-3dda-4bd3-9feb-c94af92ec0a3 |
| id                  | 180bd796-ad5c-4391-9db6-1cf9e4a47137 |
| name                | 172.25.250.27                        |
| port_id             | None                                 |
| project_id          | c0f3e7114ea04faf9b714df14c54fc41     |
| qos_policy_id       | None                                 |
| revision_number     | 0                                    |
| router_id           | None                                 |
| status              | DOWN                                 |
| subnet_id           | None                                 |
| updated_at          | 2024-06-20T20:46:39Z                 |
+---------------------+--------------------------------------+
[ubuntu@workstation (keystone-cloud-dev)]:~$
```

1.30. Generate a key pair for the **cloud-dev** user named **key1**.

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack keypair create \
> key1 > ~/Downloads/key1.pem
```

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack keypair create \
> key1 > ~/Downloads/key1.pem
[ubuntu@workstation (keystone-cloud-dev)]:~$
```

1.31. Change the permissions of the key pair file so that only the **ubuntu** user has read and write permissions.

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ chmod 600 ~/Downloads/key1.pem
```

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ chmod 600 ~/Downloads/key1.pem
[ubuntu@workstation (keystone-cloud-dev)]:~$
```

1.32. Create a security group named **ftp-secgroup** for the **prod** project.

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack security group create \
> --description "SSH, ICMP, and FTP" \
> ftp-secgroup
```

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack security group create \
> --description "SSH, ICMP, and FTP" \
> --max-width 80 \
> ftp-secgroup
+-----------------+-------------------------------------------------------+
| Field           | Value                                                 |
+-----------------+-------------------------------------------------------+
| created_at      | 2024-06-20T20:50:20Z                                  |
| description     | SSH, ICMP, and FTP                                    |
| id              | d8f799be-7cc0-4d48-a845-7fdbd6839314                  |
| name            | ftp-secgroup                                          |
| project_id      | c0f3e7114ea04faf9b714df14c54fc41                      |
| revision_number | 1                                                     |
| rules           | created_at='2024-06-20T20:50:20Z', direction='egress',|
|                 | ethertype='IPv6',                                     |
|                 | id='12d20cfc-9528-4646-ae21-a835afe7bb48',            |
|                 | standard_attr_id='69', updated_at='2024-06-20T20:50:20Z'|
|                 | created_at='2024-06-20T20:50:20Z', direction='egress',|
|                 | ethertype='IPv4', id='20048e64-b31d-40d5-9cdf-        |
|                 | 35fb69bef9bb', standard_attr_id='70',                 |
|                 | updated_at='2024-06-20T20:50:20Z'                     |
| updated_at      | 2024-06-20T20:50:20Z                                  |
+-----------------+-------------------------------------------------------+
[ubuntu@workstation (keystone-cloud-dev)]:~$
```

1.33. Create a security group rule to allow **ICMP** traffic from any IP address.

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack security group \
> rule create \
> --proto icmp \
> ftp-secgroup
```

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack security group \
> rule create \
> --proto icmp \
> ftp-secgroup
+-------------------+--------------------------------------+
| Field             | Value                                |
+-------------------+--------------------------------------+
| created_at        | 2024-06-20T20:53:43Z                 |
| description       |                                      |
| direction         | ingress                              |
| ether_type        | IPv4                                 |
| id                | da090aea-462e-4ad6-bdca-40b894514af5 |
| name              | None                                 |
| port_range_max    | None                                 |
| port_range_min    | None                                 |
| project_id        | c0f3e7114ea04faf9b714df14c54fc41     |
| protocol          | icmp                                 |
| remote_group_id   | None                                 |
| remote_ip_prefix  | 0.0.0.0/0                            |
| revision_number   | 0                                    |
| security_group_id | d8f799be-7cc0-4d48-a845-7fdbd6839314 |
| updated_at        | 2024-06-20T20:53:43Z                 |
+-------------------+--------------------------------------+
[ubuntu@workstation (keystone-cloud-dev)]:~$
```

1.34. Create a security group rule to allow **SSH** traffic from any IP address. SSH uses the TCP protocol on port 22 by default.

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack security group \
> rule create \
> --proto tcp \
> --dst-port 22:22 \
> ftp-secgroup
```

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack security group \
> rule create \
> --proto tcp \
> --dst-port 22:22 \
> ftp-secgroup
+-------------------+--------------------------------------+
| Field             | Value                                |
+-------------------+--------------------------------------+
| created_at        | 2024-06-20T20:52:50Z                 |
| description       |                                      |
| direction         | ingress                              |
| ether_type        | IPv4                                 |
| id                | 4bf9cb94-48ff-45c8-9360-559697bbb498 |
| name              | None                                 |
| port_range_max    | 22                                   |
| port_range_min    | 22                                   |
| project_id        | c0f3e7114ea04faf9b714df14c54fc41     |
| protocol          | tcp                                  |
| remote_group_id   | None                                 |
| remote_ip_prefix  | 0.0.0.0/0                            |
| revision_number   | 0                                    |
| security_group_id | d8f799be-7cc0-4d48-a845-7fdbd6839314 |
| updated_at        | 2024-06-20T20:52:50Z                 |
+-------------------+--------------------------------------+
[ubuntu@workstation (keystone-cloud-dev)]:~$
```

1.35. Create a security group rule to allow **FTP** traffic from any IP address. FTP uses the TCP protocol on port 20 (data channel) and port 21 (control channel).

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack security group \
> rule create \
> --proto tcp \
> --dst-port 20:21 \
> ftp-secgroup
```

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack security group \
> rule create \
> --proto tcp \
> --dst-port 20:21 \
> ftp-secgroup
+-------------------+--------------------------------------+
| Field             | Value                                |
+-------------------+--------------------------------------+
| created_at        | 2024-06-20T20:54:34Z                 |
| description       |                                      |
| direction         | ingress                              |
| ether_type        | IPv4                                 |
| id                | 8a9701d6-b3dc-4743-a521-973b1ffeca32 |
| name              | None                                 |
| port_range_max    | 21                                   |
| port_range_min    | 20                                   |
| project_id        | c0f3e7114ea04faf9b714df14c54fc41     |
| protocol          | tcp                                  |
| remote_group_id   | None                                 |
| remote_ip_prefix  | 0.0.0.0/0                            |
| revision_number   | 0                                    |
| security_group_id | d8f799be-7cc0-4d48-a845-7fdbd6839314 |
| updated_at        | 2024-06-20T20:54:34Z                 |
+-------------------+--------------------------------------+
[ubuntu@workstation (keystone-cloud-dev)]:~$
```

1.36. Create an image named **ftp** with the file **~/Downloads/ftp.img**.

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack image create \
> --disk-format qcow2 \
> --file ~/Downloads/ftp.img \
> --max-width 100 \
> ftp
```

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack image create \
> --disk-format qcow2 \
> --file ~/Downloads/ftp.img \
> --max-width 100 \
> ftp
+------------------+------------------------------------------------------------------------------+
| Field            | Value                                                                        |
+------------------+------------------------------------------------------------------------------+
| checksum         | 92a592a8619d0d7834d7aaddaf4187dd                                             |
| container_format | bare                                                                         |
| created_at       | 2024-06-20T20:56:34Z                                                         |
| disk_format      | qcow2                                                                        |
| file             | /v2/images/b5b7fef2-7e6b-46a8-bf4f-5861e90f6d97/file                         |
| id               | b5b7fef2-7e6b-46a8-bf4f-5861e90f6d97                                         |
| min_disk         | 0                                                                            |
| min_ram          | 0                                                                            |
| name             | ftp                                                                          |
| owner            | c0f3e7114ea04faf9b714df14c54fc41                                             |
| properties       | os_hash_algo='sha512', os_hash_value='b3a52e18efb12dd965d3f674ce7465fa46bf354 |
|                  | 336b9b58b2769a150eee2af9e5787d8a0fcfe7f402f32434c090234c92fff66947c9beb42c2e4 |
|                  | 6ad6c706e597', os_hidden='False'                                             |
| protected        | False                                                                        |
| schema           | /v2/schemas/image                                                            |
| size             | 2155479040                                                                   |
| status           | active                                                                       |
| tags             |                                                                              |
| updated_at       | 2024-06-20T20:56:45Z                                                         |
| virtual_size     | 21474836480                                                                  |
| visibility       | shared                                                                       |
+------------------+------------------------------------------------------------------------------+
[ubuntu@workstation (keystone-cloud-dev)]:~$
```

1.37. The FTP server instance is almost ready to be launched. First, use **nano** to create a file named **script** in the home directory. Be sure it has the correct indentation and matches the contents shown below. Press **Ctrl+X** to exit the file, then press **Y** and then **Enter** to save the changes to the file.

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ nano ~/script
```

```
#cloud-config
runcmd:
 - echo "This instance has been customized by cloud-init" > /etc/motd
 - echo "127.0.1.1" ftp-server >> /etc/hosts
```

Note

This **cloud-init** script writes to the "message of the day" file, whose contents will be displayed upon a successful login. It also appends **127.0.1.1 ftp-server** to the **/etc/hosts** file to suppress an "unable to resolve host" warning that would otherwise occur when running commands with `sudo`.

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

2 Launching an FTP Server Instance

In this task, you will deploy an FTP server in your environment and verify its external connectivity and functionality.

2.1. Create an instance named **ftp-server** using **intern-net** for the internal network, **m1.small** as the flavor, and **ubuntu** as the image.

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack server create \
> --image ftp \
> --flavor m1.small \
> --security-group ftp-secgroup \
> --user-data ~/script \
> --key-name key1 \
> --nic net-id=intern-net \
> ftp-server
```

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack server create \
> --image ftp \
> --flavor m1.small \
> --security-group ftp-secgroup \
> --user-data ~/script \
> --key-name key1 \
> --nic net-id=intern-net \
> ftp-server
+-----------------------------+-----------------------------------------------+
| Field                       | Value                                         |
+-----------------------------+-----------------------------------------------+
| OS-DCF:diskConfig           | MANUAL                                        |
| OS-EXT-AZ:availability_zone |                                               |
| OS-EXT-STS:power_state      | NOSTATE                                       |
| OS-EXT-STS:task_state       | scheduling                                    |
| OS-EXT-STS:vm_state         | building                                      |
| OS-SRV-USG:launched_at      | None                                          |
| OS-SRV-USG:terminated_at    | None                                          |
| accessIPv4                  |                                               |
| accessIPv6                  |                                               |
| addresses                   |                                               |
| adminPass                   | GXNK87WBYpxo                                  |
| config_drive                |                                               |
| created                     | 2024-06-20T21:16:57Z                          |
| flavor                      | m1.small (2)                                  |
| hostId                      |                                               |
| id                          | c10de78f-01e5-40b7-b43e-77f4a9647505          |
| image                       | ftp (b5b7fef2-7e6b-46a8-bf4f-5861e90f6d97)    |
| key_name                    | key1                                          |
| name                        | ftp-server                                    |
| progress                    | 0                                             |
| project_id                  | c0f3e7114ea04faf9b714df14c54fc41              |
| properties                  |                                               |
| security_groups             | name='d8f799be-7cc0-4d48-a845-7fdbd6839314'   |
| status                      | BUILD                                         |
| updated                     | 2024-06-20T21:16:56Z                          |
| user_id                     | 80c26eb4c7494a55a24e1cff505456df              |
| volumes_attached            |                                               |
+-----------------------------+-----------------------------------------------+
[ubuntu@workstation (keystone-cloud-dev)]:~$
```

2.2. Ensure that the instance state is **ACTIVE**.

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

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack server list
+--------------------------------------+------------+--------+-------------------------+-------+----------+
| ID                                   | Name       | Status | Networks                | Image | Flavor   |
+--------------------------------------+------------+--------+-------------------------+-------+----------+
| c10de78f-01e5-40b7-b43e-77f4a9647505 | ftp-server | ACTIVE | intern-net=192.168.0.122 | ftp   | m1.small |
+--------------------------------------+------------+--------+-------------------------+-------+----------+
[ubuntu@workstation (keystone-cloud-dev)]:~$
```

2.3. When the instance state is **ACTIVE**, list the floating IP addresses available.

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack floating ip list \
> --max-width 80
```

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack floating ip list \
> --max-width 80
+-------------+---------------------+-----------------+------+-----------------+--------------+
| ID          | Floating IP Address | Fixed IP Address | Port | Floating Network | Project      |
+-------------+---------------------+-----------------+------+-----------------+--------------+
| 180bd796-ad | 172.25.250.27       | None            | None | a740581a-3dda-  | c0f3e7114ea04 |
| 5c-4391-9db |                     |                 |      | 4bd3-9feb-      | faf9b714df14c |
| 6-1cf9e4a47 |                     |                 |      | c94af92ec0a3    | 54fc41       |
| 137         |                     |                 |      |                 |              |
+-------------+---------------------+-----------------+------+-----------------+--------------+
[ubuntu@workstation (keystone-cloud-dev)]:~$
```

2.4. Associate an open floating IP address to the instance.

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack server add floating ip \
> ftp-server 172.25.250.27
```

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ openstack server add floating ip \
> ftp-server 172.25.250.27
[ubuntu@workstation (keystone-cloud-dev)]:~$
```

Note

When associating the floating IP, make sure to use the IP address that appears for you in the previous step as it may differ from this example.

2.5. Use the **scp** command to copy the **~/Downloads/key1.pem** file to the **devstack** machine. When prompted to enter the password for **ubuntu@192.168.1.20**, enter **ubuntu**.

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ scp ~/Downloads/key1.pem \
> ubuntu@192.168.1.20:~/key1.pem
```

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ scp ~/Downloads/key1.pem \
> ubuntu@192.168.1.20:~/key1.pem
ubuntu@192.168.1.20's password:
key1.pem                                      100% 1676     2.1MB/s   00:00
[ubuntu@workstation (keystone-cloud-dev)]:~$
```

2.6. SSH into the **devstack** machine. Enter **ubuntu** when prompted for a password.

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ ssh 192.168.1.20
```

```
[ubuntu@workstation (keystone-cloud-dev)]:~$ ssh 192.168.1.20
ubuntu@192.168.1.20's password:
Welcome to Ubuntu 22.04.3 LTS (GNU/Linux 5.15.0-94-generic x86_64)

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

This system has been minimized by removing packages and content that are
not required on a system that users do not log into.

To restore this content, you can run the 'unminimize' command.
Failed to connect to https://changelogs.ubuntu.com/meta-release-lts. Check your
Internet connection or proxy settings

Last login: Fri Feb  9 22:37:16 2024
ubuntu@devstack:~$
```

2.7. SSH into the **ftp-server** instance using the **key1** private key. Notice that the message of the of the day uploaded with the **cloud-init** script appears near the bottom of the output.

```
ubuntu@devstack:~$ ssh -i ~/key1.pem 172.25.250.27
```

```
ubuntu@devstack:~$ ssh -i ~/key1.pem 172.25.250.27
Welcome to Ubuntu 22.04.3 LTS (GNU/Linux 5.15.0-91-generic x86_64)

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

  System information as of Tue Jan 23 16:41:33 UTC 2024

  System load:  0.7685546875      Processes:             90
  Usage of /:   7.3% of 19.20GB   Users logged in:       0
  Memory usage: 9%                IPv4 address for ens3: 192.168.1.57
  Swap usage:   0%                IPv4 address for ens4: 172.25.250.153


Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status


The list of available updates is more than a week old.
To check for new updates run: sudo apt update


The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

This instance has been customized by cloud-init
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

ubuntu@ftp-server:~$
```

Note

It may take several minutes for the instance to fully boot and be available for an SSH connection. Until then, the connection will be refused.

2.8. Verify that the **/etc/hosts** file was updated properly.

```
ubuntu@ftp-server:~$ cat /etc/hosts
```

```
ubuntu@ftp-server:~$ cat /etc/hosts
127.0.0.1 localhost

# The following lines are desirable for IPv6 capable hosts
::1 ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
ff02::3 ip6-allhosts
127.0.1.1 ftp-server
ubuntu@ftp-server:~$
```

2.9. Verify that the **vsftpd** package is installed.

```
ubuntu@ftp-server:~$ apt list --installed | grep vsftpd
```

```
ubuntu@ftp-server:~$ apt list --installed | grep vsftpd

WARNING: apt does not have a stable CLI interface. Use with caution in scripts.

vsftpd/now 3.0.5-0ubuntu1 amd64 [installed,local]
ubuntu@ftp-server:~$
```

2.10. Use **nano** to edit the **/etc/vsftpd.conf** configuration file and uncomment the variables **anonymous_enable**, **write_enable**, **anon_upload_enable**, and **anon_mkdir_write_enable** by deleting the "**#**" character that comes before them. For the variable **anonymous_enable**, change the **NO** to **YES**. Then, append the following lines: **allow_writeable_chroot=YES** and **anon_root=/var/ftp**. The content of the file should resemble the output given below.

```
ubuntu@ftp-server:~$ sudo nano /etc/vsftpd.conf
```

```
anonymous_enable=YES
write_enable=YES
anon_upload_enable=YES
anon_mkdir_write_enable=YES
allow_writeable_chroot=YES
anon_root=/var/ftp
```

```
 GNU nano 6.2                                  /etc/vsftpd.conf *
anonymous_enable=YES
#
# Uncomment this to allow local users to log in.
local_enable=YES
#
# Uncomment this to enable any form of FTP write command.
write_enable=YES
#
# Default umask for local users is 077. You may wish to change this to 022,
# if your users expect that (022 is used by most other ftpd's)
#local_umask=022
#
# Uncomment this to allow the anonymous FTP user to upload files. This only
# has an effect if the above global write enable is activated. Also, you will
# obviously need to create a directory writable by the FTP user.
anon_upload_enable=YES
#
# Uncomment this if you want the anonymous FTP user to be able to create
# new directories.
anon_mkdir_write_enable=YES
allow_writeable_chroot=YES
anon_root=/var/ftp
#
# Activate directory messages - messages given to remote users when they
# go into a certain directory.
dirmessage_enable=YES
#
# If enabled, vsftpd will display directory listings with the time
# in  your  local  time  zone.  The default is to display GMT. The
^G Help      ^O Write Out  ^W Where Is   ^K Cut        ^T Execute    ^C Location  M-U Undo      M-A Set Mark
^X Exit      ^R Read File  ^\ Replace    ^U Paste      ^J Justify    ^/ Go To Line M-E Redo      M-6 Copy
```

2.11. Create a folder for anonymous FTP users.

```
ubuntu@ftp-server:~$ sudo mkdir -p /var/ftp/pub
```

```
ubuntu@ftp-server:~$ sudo mkdir -p /var/ftp/pub
ubuntu@ftp-server:~$
```

2.12. Remove all ownership from the root FTP folder and remove all write permissions from this folder.

```
ubuntu@ftp-server:~$ sudo chown nobody:nogroup /var/ftp
ubuntu@ftp-server:~$ sudo chmod a-w /var/ftp
```

```
ubuntu@ftp-server:~$ sudo chown nobody:nogroup /var/ftp
ubuntu@ftp-server:~$ sudo chmod a-w /var/ftp
ubuntu@ftp-server:~$
```

2.13. Change the ownership of the **/var/ftp/pub** directory so that the **ftp** user and group owns everything within this directory.

```
ubuntu@ftp-server:~$ sudo chown -R ftp. /var/ftp/pub
```

```
ubuntu@ftp-server:~$ sudo chown -R ftp. /var/ftp/pub
ubuntu@ftp-server:~$
```

2.14. View the permissions of the **/var/ftp** folder to ensure that no users or groups have ownership or write privileges for the **/var/ftp** folder and that the **ftp** user and group owns the **/var/ftp/pub** directory and its contents.

```
ubuntu@ftp-server:~$ ls -al /var/ftp
```

```
ubuntu@ftp-server:~$ ls -al /var/ftp
total 12
dr-xr-xr-x  3 nobody nogroup 4096 Jun 20 23:26 .
drwxr-xr-x 14 root   root    4096 Jun 20 23:26 ..
drwxr-xr-x  2 ftp    ftp     4096 Jun 20 23:26 pub
ubuntu@ftp-server:~$
```

2.15. Restart the **vsftpd** service so the changes will take effect.

```
ubuntu@ftp-server:~$ sudo systemctl restart vsftpd
```

```
ubuntu@ftp-server:~$ sudo systemctl restart vsftpd
ubuntu@ftp-server:~$
```

2.16. View the status of the **vsftpd** service. If all changes were made correctly, it should report that the service is active. If it reports that the service has failed, there is mostly likely a mistake in the **/var/vsftpd.conf** file. Press **Q** to regain the command prompt.

```
ubuntu@ftp-server:~$ sudo systemctl status vsftpd
```

```
ubuntu@ftp-server:~$ sudo systemctl status vsftpd
● vsftpd.service - vsftpd FTP server
     Loaded: loaded (/lib/systemd/system/vsftpd.service; enabled; vendor preset>
     Active: active (running) since Fri 2024-06-21 00:07:04 UTC; 25s ago
    Process: 1214 ExecStartPre=/bin/mkdir -p /var/run/vsftpd/empty (code=exited>
   Main PID: 1215 (vsftpd)
      Tasks: 1 (limit: 2309)
     Memory: 856.0K
        CPU: 163ms
     CGroup: /system.slice/vsftpd.service
             └─1215 /usr/sbin/vsftpd /etc/vsftpd.conf

Jun 21 00:07:04 ftp-server systemd[1]: Starting vsftpd FTP server...
Jun 21 00:07:04 ftp-server systemd[1]: Started vsftpd FTP server.
ubuntu@ftp-server:~$
```

2.17. Exit from the **ftp-server** instance.

```
ubuntu@ftp-server:~$ exit
```

```
ubuntu@ftp-server:~$ exit
logout
Connection to 172.25.250.27 closed.
ubuntu@devstack:~$
```

2.18. From **workstation**, create a text file named **test_file.txt** containing the string "This is my file".

```
ubuntu@devstack:~$ echo "This is my file" > ~/test_file.txt
```

```
ubuntu@devstack:~$ echo "This is my file" > ~/test_file.txt
ubuntu@devstack:~$
```

2.19. Open an FTP session to the FTP server and upload the **test_file.txt** file. Log out when done. Use **anonymous** as the user and when prompted for the password, press the **Enter** key for no password input. Follow the instructions from the example and summary below.

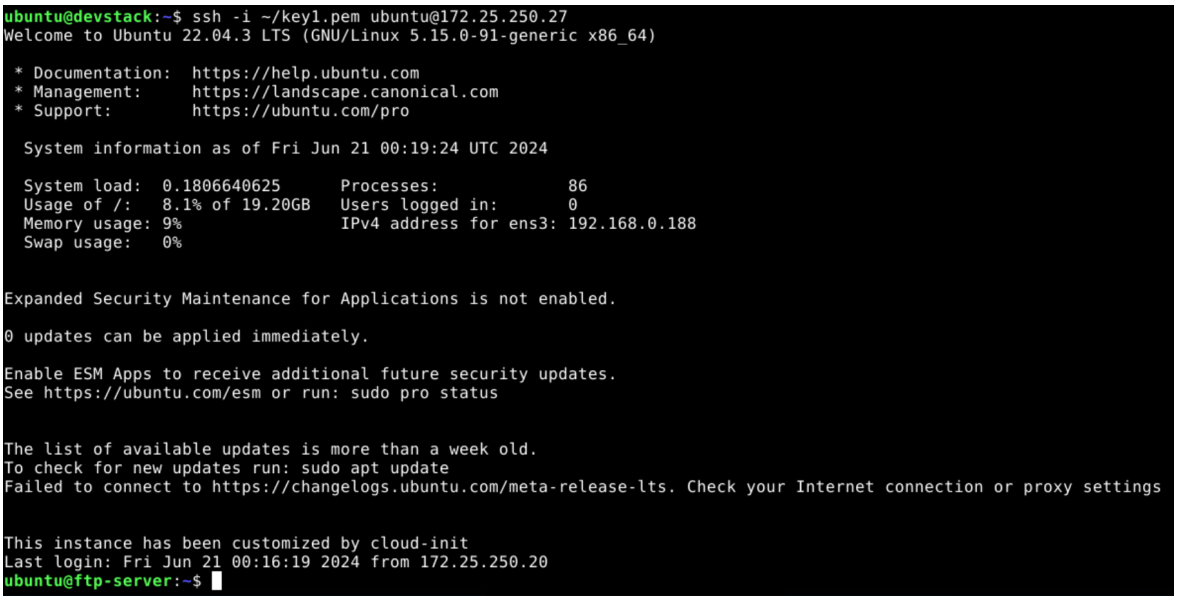
```
ubuntu@devstack:~$ ftp 172.25.250.27
ftp> passive
ftp> dir
ftp> cd pub
ftp> put ~/test_file.txt test_file.txt
ftp> bye
```

```
ubuntu@devstack:~$ ftp 172.25.250.27
Connected to 172.25.250.27.
220 (vsFTPd 3.0.5)
Name (172.25.250.27:ubuntu): anonymous
331 Please specify the password.
Password:
230 Login successful.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp> passive
Passive mode: off; fallback to active mode: off.
ftp> dir
200 EPRT command successful. Consider using EPSV.
150 Here comes the directory listing.
drwxr-xr-x    2 113      122          4096 Jun 20 23:26 pub
226 Directory send OK.
ftp> cd pub
250 Directory successfully changed.
ftp> put ~/test_file.txt test_file.txt
local: /home/ubuntu/test_file.txt remote: test_file.txt
200 EPRT command successful. Consider using EPSV.
150 Ok to send data.
100% |*****************************************************************************|    16        2.98 KiB/s    00:00 ETA
226 Transfer complete.
16 bytes sent in 00:00 (1.51 KiB/s)
ftp> bye
221 Goodbye.
ubuntu@devstack:~$
```

> **Note**
>
> The IP address may differ slightly from this example. Make sure to use the floating IP address that you created.

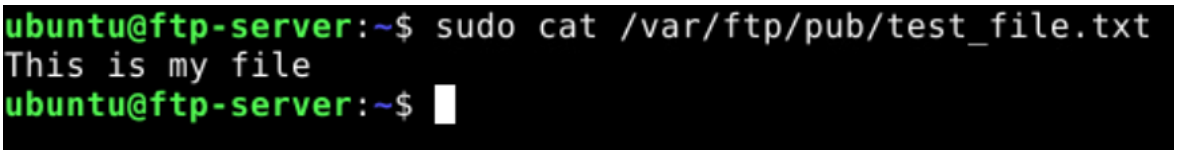
2.20. SSH into the **ftp-server** instance.

```
ubuntu@devstack:~$ ssh -i ~/key1.pem ubuntu@172.25.250.27
```



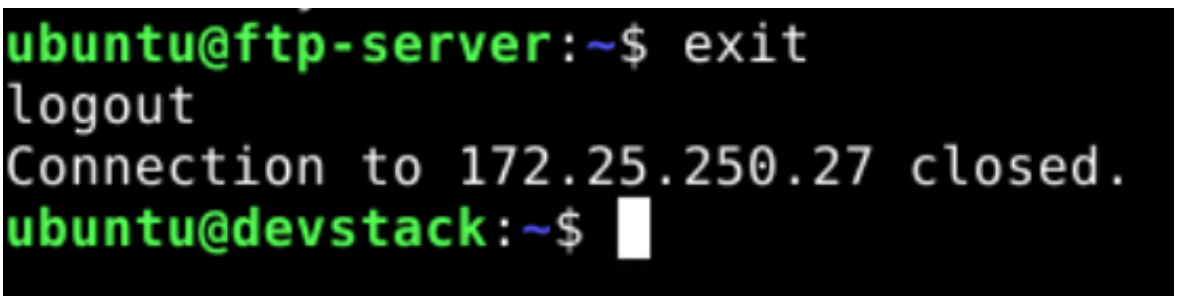
2.21. Verify the file uploaded successfully.

```
ubuntu@ftp-server:~$ sudo cat /var/ftp/pub/test_file.txt
```



2.22. Exit from the **ftp-server** instance.

```
ubuntu@ftp-server:~$ exit
```



2.23. The lab is now complete.