



**OpenStack Labs**

**Lab 07: Deploying an FTP Server**

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## About This Document

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- The development of this document was supported by a National Centers of Academic Excellence in Cybersecurity Grant (#H98230-20-1-0351), housed at the National Security Agency.
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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 composed 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**.

```
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 a terminal window and source the `~/keystonerc-admin` keystone credentials file.

```
ubuntu@workstation:~$ source ~/keystonerc-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)]:~$ █
```

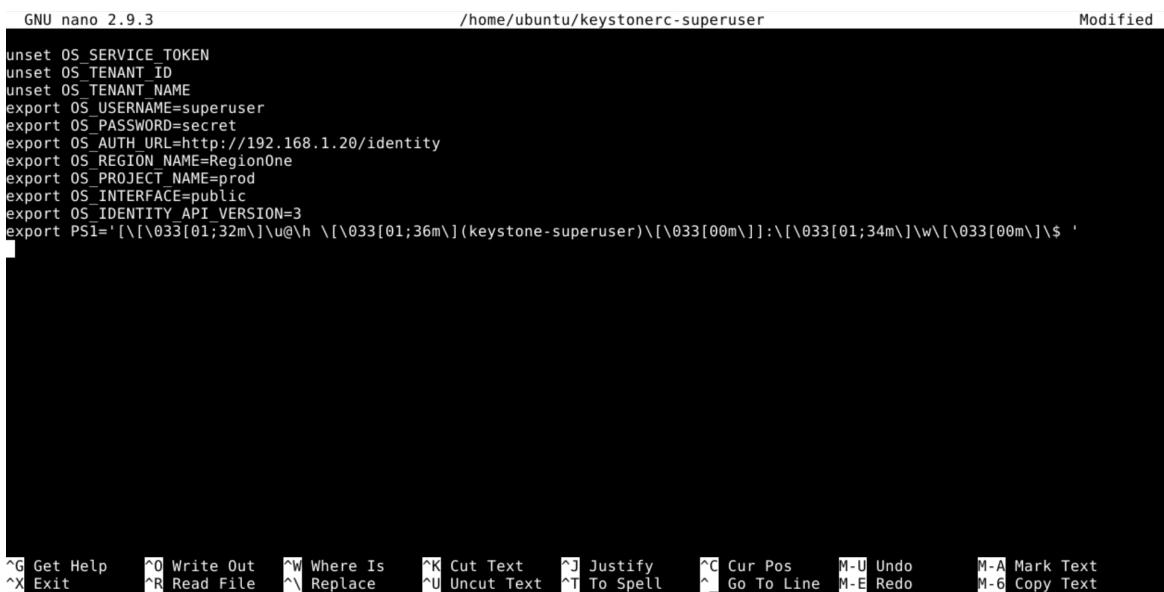
- 1.7.** Copy the keystone credentials file `~/keystonerc-admin` to `~/keystonerc-superuser`.

```
[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 `~/kestonerc-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 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 ~/kestonerc-superuser
```

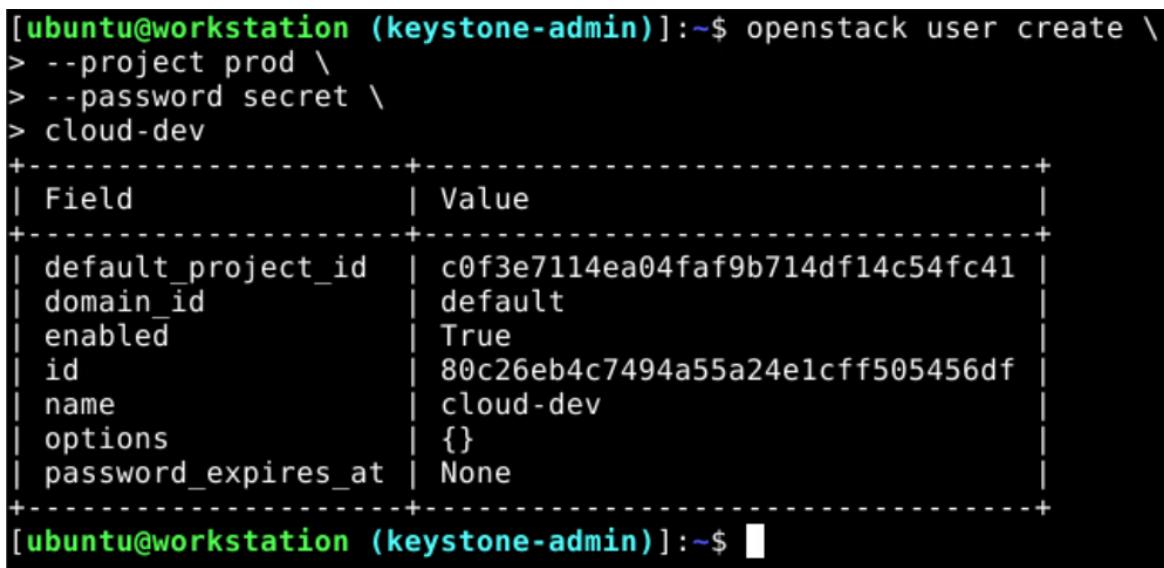


```
GNU nano 2.9.3                               /home/ubuntu/kestonerc-superuser                         Modified
unset OS_SERVICE_TOKEN
unset OS_TENANT_ID
unset OS_TENANT_NAME
export OS_USERNAME=superuser
export OS_PASSWORD=secret
export OS_AUTH_URL=http://192.168.1.20/identity
export OS_REGION_NAME=RegionOne
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-superuser)\[\033[00m\]]:\[\033[01;34m\]\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 ^M Replace ^U Uncut Text ^T To Spell ^A Go To Line M-E Redo M-G Copy Text

- 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
```



Field	Value
default_project_id	c0f3e7114ea04faf9b714df14c54fc41
domain_id	default
enabled	True
id	80c26eb4c7494a55a24e1cff505456df
name	cloud-dev
options	{}
password_expires_at	None

- 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='[\[\033[01;32m\]\u0@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 ^N Replace ^U Uncut Text ^T To Spell ^I 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
```

ID	Name	Network	Subnet
4fc6bf88-919c-49df-83c4-b09bd65776ad	ipv6-public-subnet	32da4c25-b517-40c5-97e3-c ea031467d13	2001:db8::/64
674205b6-1357-4727-a21a-94220492a57f	ipv6-private-subnet	966ecb4f-4ff8-44ea-a476-2 d2f18955085	fd96:731b:22b0::/64
7e456257-76e5-4fcf-bf3f-b2a3876dba40	shared-subnet	9f23266f-d833-4337-9a27-4 818a6d28e9e	192.168.233.0/24
c7916655-8954-4bf4-913d-416702f35d1b	public-subnet	32da4c25-b517-40c5-97e3-c ea031467d13	172.24.4.0/24
f8a82545-5a8c-44a2-bacc-1b86c253b880	private-subnet	966ecb4f-4ff8-44ea-a476-2 d2f18955085	10.0.0.0/26

- 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
```

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

**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 **172.25.250.30**, 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
```

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

- 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
```

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

- 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 the **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 | ingress
| direction   | IPv4
| ether_type  | None
| 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    | ingress
| 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
```

```
GNU nano 2.9.3                                     script
#cloud-config
runcmd:
- echo "This instance has been customized by cloud-init" > /etc/motd
- echo "127.0.1.1 ftp-server" >> /etc/hosts

[ Read 4 lines ]
^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   ^V Replace    ^U Uncut Text  ^T To Spell   ^Y Go To Line  M-E Redo   M-B Copy Text
```

#### 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 with the **key1** private key. Notice that the message 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/n 3.0.5-0ubuntul 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
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   ^V Replace    ^U Paste      ^J Justify    ^Y Go To Line  M-E Redo    M-C 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. 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 that 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: enabled)
    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, status=0)
        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; then, log out. 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
```

```
ubuntu@devstack:~$ ssh -i ~/key1.pem ubuntu@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 Fri Jun 21 00:19:24 UTC 2024

 System load: 0.1806640625   Processes:          86
 Usage of /:   8.1% of 19.20GB  Users logged in:    0
 Memory usage: 9%            IPv4 address for ens3: 192.168.0.188
 Swap usage:   0%

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
Failed to connect to https://changelogs.ubuntu.com/meta-release-lts. Check your Internet connection or proxy settings

This instance has been customized by cloud-init
Last login: Fri Jun 21 00:16:19 2024 from 172.25.250.20
ubuntu@ftp-server:~$
```

**2.21.** Verify the file uploaded successfully.

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

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

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

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

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

**2.23.** The lab is now complete.