



**OpenStack Labs**

**Lab 12: Deploying an FTP Server**

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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: 192.168.1.20 ens4: 172.25.250.20	ubuntu	ubuntu

## 1 Launch an FTP Server Instance

In this task, you will deploy an FTP server in your environment. 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 FTP access to the instance. A floating IP will be associated with the instance to permit external connectivity.

1. Log into the **workstation** machine as **ubuntu** with the password **ubuntu**.
2. Open a terminal window and source the `~/keystonerc-admin` keystone credentials file.

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

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

3. Delete the **ubuntu** image.

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

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

4. Create the **prod** project.

```
ubuntu@workstation:~$ openstack project create prod \
> --domain default
```

```
ubuntu@workstation:~$ openstack project create prod \
> --domain default
+-----+-----+
| Field      | Value
+-----+-----+
| description |
| domain_id   | default
| enabled     | True
| id          | a72b27c5a34245bbb1c873a5fd420d4
| is_domain   | False
| name        | prod
| options     | {}
| parent_id   | default
| tags        | []
+-----+-----+
ubuntu@workstation:~$ █
```

**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.

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

```
ubuntu@workstation:~$ openstack user create \
> --project prod \
> --password secret \
> --email ubuntu@workstation.lab.example.com \
> superuser
```

```
ubuntu@workstation:~$ openstack user create \
> --project prod \
> --password secret \
> --email ubuntu@workstation.lab.example.com \
> superuser
+-----+-----+
| Field          | Value
+-----+-----+
| default_project_id | a72b27c5a34245bbbd1c873a5fd420d4
| domain_id      | default
| email          | ubuntu@workstation.lab.example.com
| enabled         | True
| id              | 18548b0493494ebeba479a1de1b3e264
| name            | superuser
| options         | {}
| password_expires_at | None
+-----+
ubuntu@workstation:~$
```

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

```
ubuntu@workstation:~$ openstack role add \
> --project prod \
> --user superuser \
> admin
```

```
ubuntu@workstation:~$ openstack role add \
> --project prod \
> --user superuser \
> admin
ubuntu@workstation:~$
```

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

```
ubuntu@workstation~$ cp ~/keystonerc-admin ~/keystonerc-superuser
```

```
ubuntu@workstation:~$ cp ~/keystonerc-admin ~/keystonerc-superuser
ubuntu@workstation:~$ █
```

8. Use nano to edit the `~/keystonerc-superuser` file. Change the `OS_USERNAME` to **superuser**, and change the `OS_PROJECT_NAME` to **prod**. 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:~$ nano ~/keystonerc-superuser
```

```
GNU nano 2.9.3          /home/ubuntu/keystonerc-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
█

^G Get Help  ^O Write Out  ^W Where Is  ^K Cut Text  ^J Justify  ^C Cur Pos
^X Exit      ^R Read File  ^\ Replace   ^U Uncut Text ^T To Spell  ^_ Go To Line
```

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

```
ubuntu@workstation:~$ openstack user create \
> --project prod \
> --password secret \
> --email ubuntu@workstation.lab.example.com \
> cloud-lab
```

```
ubuntu@workstation:~$ openstack user create \
> --project prod \
> --password secret \
> --email ubuntu@workstation.lab.example.com \
> cloud-lab
+-----+
| Field          | Value
+-----+
| default_project_id | a72b27c5a34245bbbd1c873a5fd420d4
| domain_id      | default
| email          | ubuntu@workstation.lab.example.com
| enabled         | True
| id              | 8588c114770741b6ae3cb0d3f6e85c00
| name            | cloud-lab
| options         | {}
| password_expires_at | None
+-----+
ubuntu@workstation:~$
```

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

```
ubuntu@workstation:~$ openstack role add \
> --project prod \
> --user cloud-lab \
> member
```

```
ubuntu@workstation:~$ openstack role add \
> --project prod \
> --user cloud-lab \
> member
ubuntu@workstation:~$
```

11. Copy the keystone credentials file `~/keystonerc-superuser` to `~/keystonerc-cloud-lab`.

```
ubuntu@workstation:~$ cp ~/keystonerc-superuser ~/keystonerc-cloud-lab
```

```
ubuntu@workstation:~$ cp ~/keystonerc-superuser ~/keystonerc-cloud-lab
ubuntu@workstation:~$
```

12. Use nano to edit the `~/keystonerc-cloud-lab` file. Change the `OS_USERNAME` to **cloud-lab**. 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:~$ nano ~/keystonerc-cloud-lab
```

```

GNU nano 2.9.3          keystonec-cloud-lab          Modified

unset OS_SERVICE_TOKEN
unset OS_TENANT_ID
unset OS_TENANT_NAME
export OS_USERNAME=cloud-lab
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
■

^G Get Help  ^O Write Out  ^W Where Is  ^K Cut Text  ^J Justify  ^C Cur Pos
^X Exit      ^R Read File  ^\ Replace   ^U Uncut Text^T To Spell  ^L Go To Line

```

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

```
ubuntu@workstation:~$ source ~/keystonec-superuser
```

```
ubuntu@workstation:~$ source ~/keystonec-superuser
ubuntu@workstation:~$ ■
```

- Before making an external network for the project, the existing one must be deleted. Before the existing external network can be deleted, the router needs to be deleted, which requires first deleting its interfaces. First, show the details of the router **router1** to find the interfaces to delete.

```
ubuntu@workstation:~$ openstack router show router1
```

```
ubuntu@workstation:~$ openstack router show router1
+-----+-----+
| Field | Value |
+-----+-----+
| admin_state_up | UP |
| availability_zone_hints | |
| availability_zones | |
| created_at | 2023-12-22T04:11:00Z |
| description | |
| distributed | False |
| external_gateway_info | None |
| flavor_id | None |
| ha | False |
| id | 95624933-06a9-4f6e-bcf8-1177e31c5542 |
| interfaces.info | [{"subnet_id": "4cba24fd-0428-4ca0-87ba-ad066722f0e7", "ip_address": "10.0.0.1", "port_id": "5290b8a9-4f26-415f-b134-459cb139a906"}, {"subnet_id": "467647b8-2d65-43bf-925b-18a692ba47f", "ip_address": "fd1:7620:ae07::1", "port_id": "5c97ebfb-d998-413e-998b-f375171b363f"}] |
| name | router1 |
| project_id | c50851c6559442df92e0e0799376a84f |
| revision_number | 9 |
| routes | |
| status | ACTIVE |
| tags | |
| updated_at | 2024-01-04T17:46:23Z |
+-----+-----+
ubuntu@workstation:~$
```

15. Next, delete the two interfaces on the router using the port\_id values from the output of the previous step.

```
ubuntu@workstation:~$ openstack router remove port \
> router1 \
> 5290b8a9-4f26-415f-b134-459cb139a906
ubuntu@workstation:~$ openstack router remove port \
> router1 \
> 5c97ebfb-d998-413e-998b-f375171b363f
```

```
ubuntu@workstation:~$ openstack router remove port \
> router1 \
> 5290b8a9-4f26-415f-b134-459cb139a906
ubuntu@workstation:~$ openstack router remove port \
> router1 \
> 5c97ebfb-d998-413e-998b-f375171b363f
ubuntu@workstation:~$
```

#### Note

The actual IDs may differ from this example.

#### Tip

You can copy a string from the terminal by selecting it with the mouse and pressing **Ctrl+Shift+C**, and you can paste to the terminal by pressing **Ctrl+Shift+V**.

16. Now, **router1** can be deleted.

```
ubuntu@workstation:~$ openstack router delete router1
```

```
ubuntu@workstation:~$ openstack router delete router1
ubuntu@workstation:~$ █
```

17. Finally, delete the existing external network named **public**.

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

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

18. Create an external, shared network called **external**.

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

```
ubuntu@workstation:~$ openstack network create external \
> --external --share \
> --provider-network-type flat \
> --provider-physical-network public
+-----+-----+
| Field | Value |
+-----+-----+
| admin_state_up | UP |
| availability_zone_hints | |
| availability_zones | |
| created_at | 2024-01-04T20:13:06Z |
| description | |
| dns_domain | None |
| id | 9d09170a-73c8-419c-b8b4-db0bcf418ac8 |
| ipv4_address_scope | None |
| ipv6_address_scope | None |
| is_default | False |
| is_vlan_transparent | None |
| mtu | 1500 |
| name | external |
| port_security_enabled | True |
| project_id | c50851c6559442df92e0e0799376a84f |
| 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 | 2024-01-04T20:13:06Z |
+-----+-----+
ubuntu@workstation:~$
```

19. Create the **external\_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:~$ openstack subnet create \
> --subnet-range 172.25.250.0/24 \
> --allocation-pool start=172.25.250.25,end=172.25.250.30 \
> --dhcp --network external \
> --gateway 172.25.250.254 \
> --dns-nameserver 172.25.250.254 external_subnet
```

```
ubuntu@workstation:~$ openstack subnet create \
> --subnet-range 172.25.250.0/24 \
> --allocation-pool start=172.25.250.25,end=172.25.250.30 \
> --dhcp --network external \
> --gateway 172.25.250.254 \
> --dns-nameserver 172.25.250.254 external_subnet
+-----+-----+
| Field      | Value
+-----+-----+
| allocation_pools | 172.25.250.25-172.25.250.30
| cidr        | 172.25.250.0/24
| created_at   | 2024-01-04T20:18:22Z
| description   |
| dns_nameservers | 172.25.250.254
| enable_dhcp    | True
| gateway_ip     | 172.25.250.254
| host_routes    |
| id            | a7caff1b-19a8-4eb1-bc81-35c878fa43f5
| ip_version     | 4
| ipv6_address_mode | None
| ipv6_ra_mode    | None
| name          | external_subnet
| network_id     | 9d09170a-73c8-419c-b8b4-db0bcf418ac8
| project_id      | a72b27c5a34245bbbd1c873a5fd420d4
| revision_number | 0
| segment_id      | None
| service_types    |
| subnetpool_id    |
| tags           |
| updated_at      | 2024-01-04T20:18:22Z
+-----+-----+
ubuntu@workstation:~$ 
```

20. Source the `/keystonerc-cloud-lab` keystone credentials file.

```
ubuntu@workstation:~$ source ~/keystonerc-cloud-lab
```

```
ubuntu@workstation:~$ source ~/keystonerc-cloud-lab
ubuntu@workstation:~$ 
```

21. Create an internal network called `net1`.

```
ubuntu@workstation:~$ openstack network create net1
```

```
ubuntu@workstation:~$ openstack network create net1
+-----+-----+
| Field | Value |
+-----+-----+
| admin_state_up | UP |
| availability_zone_hints | |
| availability_zones | |
| created_at | 2024-01-04T20:20:38Z |
| description | |
| dns_domain | None |
| id | 050946d2-1cc0-4403-9f26-8e8513dfd41d |
| ipv4_address_scope | None |
| ipv6_address_scope | None |
| is_default | False |
| is_vlan_transparent | None |
| mtu | 1442 |
| name | net1 |
| port_security_enabled | True |
| project_id | a72b27c5a34245bbb1c873a5fd420d4 |
| provider:network_type | geneve |
| provider:physical_network | None |
| provider:segmentation_id | 38038 |
| qos_policy_id | None |
| revision_number | 1 |
| router:external | Internal |
| segments | None |
| shared | False |
| status | ACTIVE |
| subnets | |
| tags | |
| updated_at | 2024-01-04T20:20:39Z |
+-----+-----+
ubuntu@workstation:~$ █
```

22. Create a subnet for **net1** called **subnet1** in the **192.168.0.0/24** range. Allow DHCP on the subnet.

```
ubuntu@workstation:~$ openstack subnet create \
> --subnet-range 192.168.0.0/24 \
> --network net1 subnet1
```

```
ubuntu@workstation:~$ openstack subnet create \
> --subnet-range 192.168.0.0/24 \
> --network net1 subnet1
+-----+-----+
| Field | Value |
+-----+-----+
| allocation_pools | 192.168.0.2-192.168.0.254 |
| cidr | 192.168.0.0/24 |
| created_at | 2024-01-04T20:21:21Z |
| description | |
| dns_nameservers | |
| enable_dhcp | True |
| gateway_ip | 192.168.0.1 |
| host_routes | |
| id | 6b44acd8-1ef7-4db6-9c3d-4bcd21179612 |
| ip_version | 4 |
| ipv6_address_mode | None |
| ipv6_ra_mode | None |
| name | subnet1 |
| network_id | 050946d2-1cc0-4403-9f26-8e8513dfd41d |
| project_id | a72b27c5a34245bbbd1c873a5fd420d4 |
| revision_number | 0 |
| segment_id | None |
| service_types | |
| subnetpool_id | None |
| tags | |
| updated_at | 2024-01-04T20:21:21Z |
+-----+-----+
ubuntu@workstation:~$
```

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

```
ubuntu@workstation:~$ openstack router create router1
```

```
ubuntu@workstation:~$ openstack router create router1
+-----+-----+
| Field | Value |
+-----+-----+
| admin_state_up | UP |
| availability_zone_hints | |
| availability_zones | |
| created_at | 2024-01-04T20:21:53Z |
| description | |
| distributed | False |
| external_gateway_info | None |
| flavor_id | None |
| ha | False |
| id | e6109151-8725-431f-90e5-a8a947679489 |
| name | router1 |
| project_id | a72b27c5a34245bbbd1c873a5fd420d4 |
| revision_number | 1 |
| routes | |
| status | ACTIVE |
| tags | |
| updated_at | 2024-01-04T20:21:53Z |
+-----+-----+
ubuntu@workstation:~$
```

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

```
ubuntu@workstation:~$ openstack router add subnet router1 subnet1
```

```
ubuntu@workstation:~$ openstack router add subnet router1 subnet1
ubuntu@workstation:~$
```

25. Set the external network as the gateway for the router.

```
ubuntu@workstation:~$ openstack router set \
> --external-gateway external \
> router1
```

```
ubuntu@workstation:~$ openstack router set \
> --external-gateway external \
> router1
ubuntu@workstation:~$
```

26. Allocate a floating IP address from the **external** network for the **prod** project.

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

```
ubuntu@workstation:~$ openstack floating ip create external
+-----+-----+
| Field | Value |
+-----+-----+
| created_at | 2024-01-04T20:48:35Z |
| description | None |
| fixed_ip_address | 172.25.250.30 |
| floating_ip_address | 9d09170a-73c8-419c-b8b4-db0bcf418ac8 |
| floating_network_id | f60c1e3a-cb0e-45ed-9e3f-8c64508594fd |
| id | 172.25.250.30 |
| name | None |
| port_id | a72b27c5a34245bbbd1c873a5fd420d4 |
| project_id | None |
| qos_policy_id | 0 |
| revision_number | None |
| router_id | DOWN |
| subnet_id | None |
| updated_at | 2024-01-04T20:48:35Z |
+-----+-----+
ubuntu@workstation:~$
```

27. Generate a key pair for the **cloud-lab** user named **key1**.

```
ubuntu@workstation:~$ openstack keypair create \
> key1 > ~/Downloads/key1.pem
```

```
ubuntu@workstation:~$ openstack keypair create \
> key1 > ~/Downloads/key1.pem
ubuntu@workstation:~$
```

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

```
ubuntu@workstation:~$ chmod 600 ~/Downloads/key1.pem
```

```
ubuntu@workstation:~$ chmod 600 ~/Downloads/key1.pem
ubuntu@workstation:~$
```

29. Create a security group named **sg1** for the **prod** project.

```
ubuntu@workstation:~$ openstack security group create \
> --description "SSH, ICMP, and FTP" sg1
```

```
ubuntu@workstation:~$ openstack security group create \
> --description "SSH, ICMP, and FTP" sg1
+-----+-----+
| Field | Value |
+-----+-----+
| created_at | 2024-01-04T21:33:42Z |
| description | SSH, ICMP, and FTP |
| id | c38c7982-bf57-4f91-b008-2da8310bce31 |
| name | sg1 |
| project_id | a72b27c5a34245bbbd1c873a5fd420d4 |
| revision_number | 1 |
| rules | created_at='2024-01-04T21:33:42Z', direction='egress', ether_type='IPv4', id='63fa510b-8aaa-464d-8aef-ab2af44275e3', standard_attr_id='71', updated_at='2024-01-04T21:33:42Z' |
|         | created_at='2024-01-04T21:33:42Z', direction='egress', ether_type='IPv6', id='ff246b29-d314-41c6-8a6c-d8c6eeccde4d', standard_attr_id='72', updated_at='2024-01-04T21:33:42Z' |
| updated_at | 2024-01-04T21:33:42Z |
+-----+-----+
ubuntu@workstation:~$
```

30. 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:~$ openstack security group \
> rule create \
> --proto tcp --remote-ip 0.0.0.0/0 --dst-port 22:22 sg1
```

```
ubuntu@workstation:~$ openstack security group \
> rule create \
> --proto tcp --remote-ip 0.0.0.0/0 --dst-port 22:22 sg1
+-----+-----+
| Field | Value |
+-----+-----+
| created_at | 2024-01-04T21:40:39Z |
| description |  |
| direction | ingress |
| ether_type | IPv4 |
| id | 42de396a-9317-42d9-be09-8a2476a69f85 |
| name | None |
| port_range_max | 22 |
| port_range_min | 22 |
| project_id | a72b27c5a34245bbbd1c873a5fd420d4 |
| protocol | tcp |
| remote_group_id | None |
| remote_ip_prefix | 0.0.0.0/0 |
| revision_number | 0 |
| security_group_id | 47533cb6-6c1f-4a0c-85a1-fb040708a79a |
| updated_at | 2024-01-04T21:40:39Z |
+-----+-----+
ubuntu@workstation:~$
```

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

```
ubuntu@workstation:~$ openstack security group \
> rule create \
> --proto icmp --remote-ip 0.0.0.0/0 sg1
```

```
ubuntu@workstation:~$ openstack security group \
> rule create \
> --proto icmp --remote-ip 0.0.0.0/0 sg1
+-----+-----+
| Field | Value |
+-----+-----+
| created_at | 2024-01-04T21:50:30Z |
| description | |
| direction | ingress |
| ether_type | IPv4 |
| id | 7508f181-399d-4ccc-aa4f-27ad4ffcd203 |
| name | None |
| port_range_max | None |
| port_range_min | None |
| project_id | a72b27c5a34245bbb1c873a5fd420d4 |
| protocol | icmp |
| remote_group_id | None |
| remote_ip_prefix | 0.0.0.0/0 |
| revision_number | 0 |
| security_group_id | 47533cb6-6c1f-4a0c-85a1-fb040708a79a |
| updated_at | 2024-01-04T21:50:30Z |
+-----+
ubuntu@workstation:~$ █
```

32. 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:~$ openstack security group \
> rule create \
> --proto tcp --remote-ip 0.0.0.0/0 --dst-port 20:21 sg1
```

```
ubuntu@workstation:~$ openstack security group \
> rule create \
> --proto tcp --remote-ip 0.0.0.0/0 --dst-port 20:21 sgl
+-----+-----+
| Field | Value |
+-----+-----+
| created_at | 2024-01-04T21:52:04Z
| description | 
| direction | ingress
| ether_type | IPv4
| id | b4125b68-e5a9-4778-bc4d-6de1e3b3bd6
| name | None
| port_range_max | 21
| port_range_min | 20
| project_id | a72b27c5a34245bbbd1c873a5fd420d4
| protocol | tcp
| remote_group_id | None
| remote_ip_prefix | 0.0.0.0/0
| revision_number | 0
| security_group_id | 47533cb6-6c1f-4a0c-85a1-fb040708a79a
| updated_at | 2024-01-04T21:52:04Z
+-----+
ubuntu@workstation:~$
```

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

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

```
ubuntu@workstation:~$ openstack image create \
> --disk-format qcow2 \
> --file ~/Downloads/ftp.img \
> ftp
+-----+-----+
| Field | Value |
+-----+-----+
| checksum | 923b92a0619d0783467aaddaf4107dd
| container_format | bare
| created_at | 2024-02-16T18:54:51Z
| disk_format | qcow2
| file | /v2/images/c7aeb66-1fdb-499b-99d8-86b49666d6af/file
| id | c7aeb66-1fdb-499b-99d8-86b49666d6af
| min_disk | 0
| min_ram | 0
| name | ftp
| owner | 872fde77943944dc9f00c932f4f2cd1
| properties | {"os_hash_alg": "sha512", "os_hash_value": "b3a52e18efb12dd965d3f674ce7465fa46bf354336b9b50b2769a150eee2af9e5787d8a0fcfe7f402f32434c090234c92fff66947c9beb42c2e46ad6c706e597", "os_hidden": "False"}
| protected | False
| schema | /v2/schemas/image
| size | 2155479040
| status | active
| tags | 
| updated_at | 2024-02-16T18:55:03Z
| virtual_size | 21474836480
| visibility | shared
+-----+
```

34. 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:~$ nano ~/script
```

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

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

#cloud-config
runcmd:
- echo "This instance has been customized by cloud-init" > /etc/motd

^G Get Help  ^O Write Out  ^W Where Is  ^K Cut Text  ^J Justify  ^C Cur Pos
^X Exit      ^R Read File  ^\ Replace   ^U Uncut Text^T To Spell  ^  Go To Line
```

#### Note

This cloud-init script writes to the “message of the day” file, and its contents will be displayed upon a successful login.

35. Create an instance named **ftp\_server** using **net1** for the internal network, **m1.small** as the flavor, and **ubuntu** as the image.

```
ubuntu@workstation:~$ openstack server create \
> --image ftp \
> --flavor m1.small \
> --security-group sg1 \
> --user-data ~/script \
> --key-name key1 \
> --nic net-id=net1 \
> --wait ftp_server
```

```
ubuntu@workstation:~$ openstack server create \
> --image ftp \
> --flavor m1.small \
> --security-group sgl \
> --user-data ~/script \
> --key-name key1 \
> --nic net-id=net1 \
> --wait ftp_server

+-----+-----+
| Field | Value |
+-----+-----+
| OS-DCF:diskConfig | MANUAL |
| OS-EXT-AZ:availability_zone | nova |
| OS-EXT-STS:power_state | Running |
| OS-EXT-STS:task_state | None |
| OS-EXT-STS:vm_state | active |
| OS-SRV-USG:launched_at | 2024-02-16T18:56:06.000000 |
| OS-SRV-USG:terminated_at | None |
| accessIPv4 |
| accessIPv6 |
| addresses | net1=192.168.0.131 |
| adminPass | v7yYjFwTDevC |
| config_drive |
| created | 2024-02-16T18:55:38Z |
| flavor | m1.small (2) |
| hostId | 875bc727e4b5bedf6041e50df232a9c5b868283f604946f6cf959757 |
| id | d78a2e83-5034-4948-bf71-f6bd63533814 |
| image |
| key_name | key1 |
| name | ftp_server |
| progress | 0 |
| project_id | 872fde77943944dc9f00c932f4f2cdd1 |
| properties |
| security_groups | name='sg1' |
| status | ACTIVE |
| updated | 2024-02-16T18:56:06Z |
| user_id | 964d56cfef4d4dd2a7b5fe62664a21bb |
| volumes_attached |
+-----+-----+
```

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

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

```
ubuntu@workstation:~$ openstack server list
+-----+-----+-----+-----+-----+
| ID | Name | Status | Networks | Image | Flavor |
+-----+-----+-----+-----+-----+
| 8652f17e-dc34-4672-bd79-5b8ca98764f1 | ftp_server | ACTIVE | net1=192.168.0.167 | ubuntu | m1.small |
+-----+-----+-----+-----+-----+
ubuntu@workstation:~$ █
```

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

```
ubuntu@workstation:~$ openstack floating ip list
```

```
ubuntu@workstation:~$ openstack floating ip list
+-----+-----+-----+-----+-----+
| ID | Floating IP Address | Fixed IP Address | Port | Floating Network | Project |
+-----+-----+-----+-----+-----+
| f60c1e3a-cb0e-45ed-9e3f-8c64508594fd | 172.25.250.30 | None | None | 9d09170a-73c8-419c-b8b4-db0bcf418ac8 | a72b27c5a34245bbbd1c873a5fd420d4 |
+-----+-----+-----+-----+-----+
ubuntu@workstation:~$ █
```

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

```
ubuntu@workstation:~$ openstack server add \
> floating ip ftp_server 172.25.250.30
```

```
ubuntu@workstation:~$ openstack server add \
> floating ip ftp_server 172.25.250.30
ubuntu@workstation:~$ █
```

**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.

39. 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:~$ scp ~/Downloads/key1.pem \
> ubuntu@192.168.1.20:~/key1.pem
```

```
ubuntu@workstation:~$ scp ~/Downloads/key1.pem \
> ubuntu@192.168.1.20:~/key1.pem
The authenticity of host '192.168.1.20 (192.168.1.20)' can't be established.
ECDSA key fingerprint is SHA256:m5VVLcfwdoCro/050c9o8b4JCiYr3RQt00hbLtFwEE.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '192.168.1.20' (ECDSA) to the list of known hosts.
ubuntu@192.168.1.20's password:
key1.pem                                         100% 1676      1.1MB/s   00:00
ubuntu@workstation:~$ █
```

40. SSH into the `devstack` machine. The password is the same as the last step.

```
ubuntu@workstation:~$ ssh 192.168.1.20
```

```
ubuntu@workstation:~$ ssh 192.168.1.20
ubuntu@192.168.1.20's password:
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/advantage

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: Thu Jan 11 06:10:01 2024
ubuntu@devstack:~$ █
```

41. SSH into the **ftp\_server** instance using 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 172.25.250.30
```

```
ubuntu@devstack:~$ ssh -i ~/key1.pem 172.25.250.30
The authenticity of host '172.25.250.30 (172.25.250.30)' can't be established.
ED25519 key fingerprint is SHA256:REtPt870jo+pAYWylf+3IaPBTU6LJFT9MLeaIDYcMS8.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '172.25.250.30' (ED25519) to the list of known hosts.
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 Thu Feb  1 18:30:40 UTC 2024

 System load:  0.75927734375      Processes:          85
 Usage of /:   8.1% of 19.20GB    Users logged in:    0
 Memory usage: 8%                  IPv4 address for ens3: 192.168.0.157
 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

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**

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

**Note**

It may take several minutes for the instance to fully boot and be available for an SSH connection.

42. 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/nod 3.0.5-0ubuntu1 amd64 [installed,local]
ubuntu@ftp-server:~$ █
```

43. Use nano to edit the **/etc/vsftpd.conf** configuration file and uncomment the following variables by deleting the "#" character that comes before them: anonymous\_enable, write\_enable, anon\_upload\_enable, and anon\_mkdir\_write\_enable. 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
```

## Lab 12: Deploying an FTP Server

```
GNU nano 6.2                               /etc/vsftpd.conf

#
# Allow anonymous FTP? (Disabled by default).
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 ftppd'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
# times returned by the MDTM FTP command are also affected by this
# option.
use_localtime=YES
#
^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   ^Y Replace     ^U Paste         ^J Justify      ^/ Go To Line   M-E Redo      M-G Copy
```

44. 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
sudo: unable to resolve host ftp-server: Temporary failure in name resolution
ubuntu@ftp-server:~$
```

45. Remove all ownership from the root FTP folder and remove 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
sudo: unable to resolve host ftp-server: Temporary failure in name resolution
ubuntu@ftp-server:~$ sudo chmod a-w /var/ftp
sudo: unable to resolve host ftp-server: Temporary failure in name resolution
ubuntu@ftp-server:~$
```

46. 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
sudo: unable to resolve host ftp-server: Temporary failure in name resolution
ubuntu@ftp-server:~$
```

47. Restart the vsftpd service so the changes will take effect.

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

```
ubuntu@ftp-server:~$ sudo systemctl restart vsftpd
sudo: unable to resolve host ftp-server: Temporary failure in name resolution
ubuntu@ftp-server:~$ █
```

48. Exit from the **ftp\_server** instance.

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

```
ubuntu@ftp-server:~$ exit
logout
Connection to 172.25.250.30 closed.
ubuntu@devstack:~$ █
```

49. 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:~$ █
```

50. 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 172.25.250.30
ftp> passive
ftp> dir
ftp> cd pub
ftp> put test_file.txt test_file.txt
ftp> bye
```

## Lab 12: Deploying an FTP Server

```
ubuntu@devstack:~$ ftp 172.25.250.30
Connected to 172.25.250.30.
220 (vsFTPd 3.0.5)
Name (172.25.250.30: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 Feb 01 18:52 pub
226 Directory send OK.
ftp> cd pub
250 Directory successfully changed.
ftp> put test_file.txt test_file.txt
local: test_file.txt remote: test_file.txt
200 EPRT command successful. Consider using EPSV.
150 Ok to send data.
100% |*****| 16 156.25 KiB/s 00:00 ETA
226 Transfer complete.
16 bytes sent in 00:00 (1.37 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.

## 51. SSH into the `ftp_server` instance.

```
ubuntu@devstack:~$ ssh -i ~/Downloads/key1.pem cloud-user@172.25.250.30
```

```
ubuntu@devstack:~$ ssh -i ~/key1.pem 172.25.250.30
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 Thu Feb 1 19:19:26 UTC 2024

 System load: 0.10595703125   Processes: 85
 Usage of /: 8.1% of 19.20GB   Users logged in: 0
 Memory usage: 8%           IPv4 address for ens3: 192.168.0.157
 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: Thu Feb 1 19:19:33 2024 from 172.25.250.20
ubuntu@ftp-server:~$
```

## 52. 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
sudo: unable to resolve host ftp-server: Temporary failure in name resolution
This is my file
ubuntu@ftp-server:~$ █
```

53. Exit from the **ftp\_server** instance.

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

```
ubuntu@ftp-server:~$ exit
logout
Connection to 172.25.250.30 closed.
ubuntu@devstack:~$ █
```

54. The lab is now complete.