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Activity 15: OpenStack Installation (Neutron, Horizon, Cinder)

1. Objectives

Create a workflow to install OpenStack using Ansible as your Infrastructure as Code (IaC).

2. Intended Learning Outcomes

1. Analyze the advantages and disadvantages of cloud services
2. Evaluate different Cloud deployment and service models
3. Create a workflow to install and configure OpenStack base services using Ansible as documentation and execution.

3. Resources

Oracle VirtualBox (Hypervisor)

1x Ubuntu VM or Centos VM

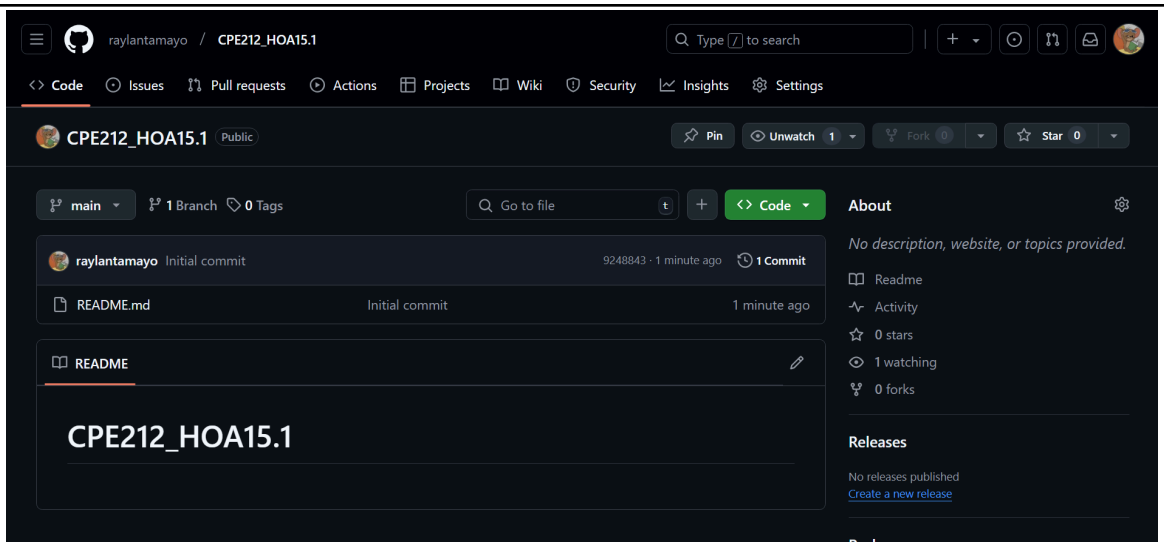
4. Tasks

1. Create a new repository for this activity.
2. Create a playbook that converts the steps in the following items in https://docs.openstack.org/install-guide/
   a. Neutron
   b. Horizon
   c. Cinder
   d. Create different plays in installing per server type (controller, compute etc.) and identify it as a group in the Inventory file.
   e. Add, commit and push it to your GitHub repo.

5. Output

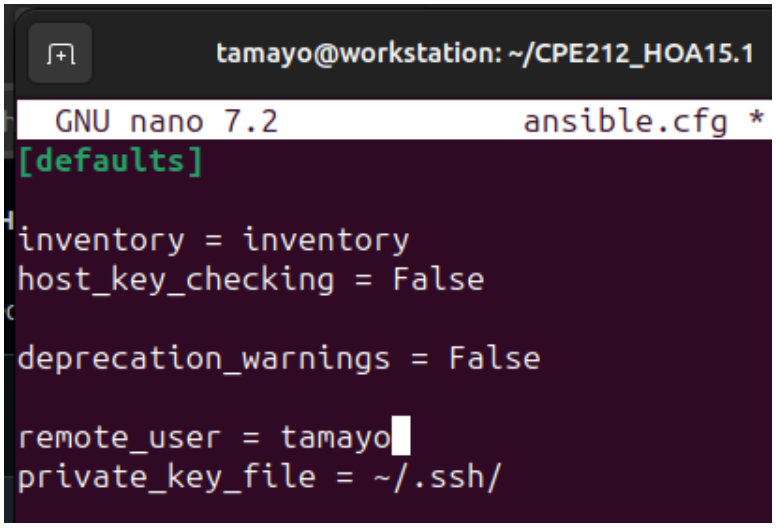
Task 1: Create a File

1. Create a new repository for this Hands-On Activity




```
tamayo@workstation:~$ git clone git@github.com:raylantamayo/CPE212_HOA15.1.git
Cloning into 'CPE212_HOA15.1'...
remote: Enumerating objects: 3, done.
remote: Counting objects: 100% (3/3), done.
remote: Total 3 (delta 0), reused 0 (delta 0), pack-reused 0 (from 0)
Receiving objects: 100% (3/3), done.
tamayo@workstation:~$ cd CPE212_HOA15.1
tamayo@workstation:~/CPE212_HOA15.1$
```

2. Create the ansible.cfg and inventory file (must include one Ubuntu)



```
tamayo@
  GNU nano 7.2
[Neutron]
192.168.56.110

[Horizon]
192.168.56.110

[Cinder]
192.168.56.110
```

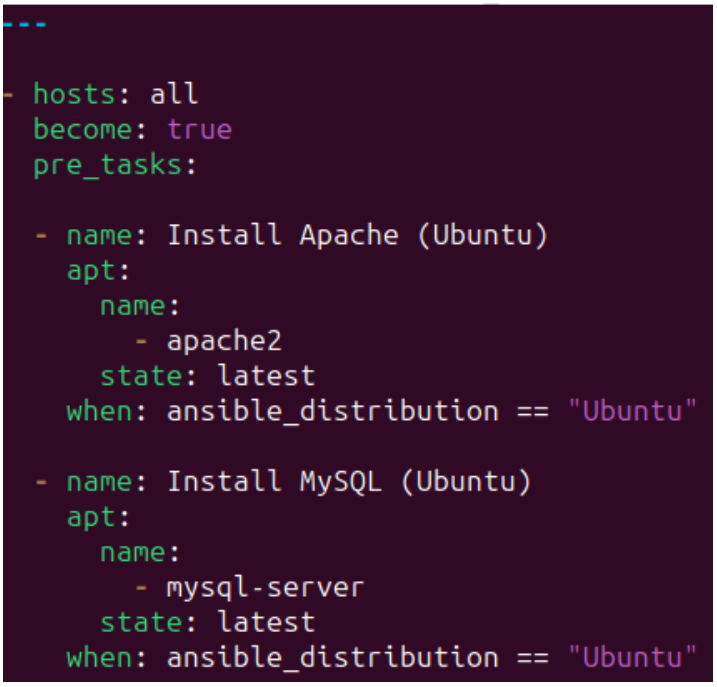
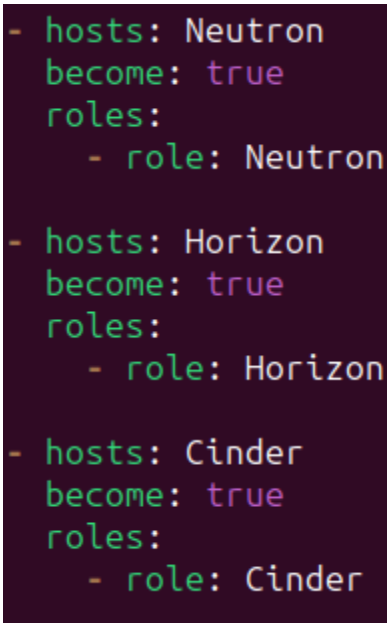
Task 2: Create Playbook for Installing OpenStack

1. Create a playbook and name it install_openstack.yml.

```
tamayo@workstation: ~/CPE212_HOA15.1
  GNU nano 7.2        install_openstack.yml *
---

- hosts: all
  become: true
  pre_tasks:

  - name: Install Apache (Ubuntu)
    apt:
      name:
        - apache2
      state: latest
    when: ansible_distribution == "Ubuntu"

  - name: Install MySQL (Ubuntu)
    apt:
      name:
        - mysql-server
      state: latest
    when: ansible_distribution == "Ubuntu"

- hosts: Neutron
  become: true
  roles:
    - role: Neutron

- hosts: Horizon
  become: true
  roles:
    - role: Horizon
```

```
- hosts: Cinder
  become: true
  roles:
    - role: Cinder
```

CODE EXPLANATION

This Ansible playbook automates the installation of Apache and MySQL on all hosts. It first checks if the distribution is Ubuntu, then installs the latest version of Apache and MySQL using the apt package manager. The 'become: true' allows privilege escalation for installation.	
This Ansible playbook orchestrates tasks on different hosts. It installs and configures roles on hosts named Neutron, Horizon, and Cinder. The 'become: true' enables privileged actions, and each 'roles' section specifies a role to apply, ensuring specific configurations are set up on the respective hosts.	

Task 3: Create Roles

1. Create a new directory and name it “roles”. Enter the roles directory and create new directories: Neutron, Horizon, and Cinder. For each directory, create a directory and name it tasks.

For Neutron

```
tamayo@workstation:~/CPE212_HOA15.1/roles$ mkdir Neutron
tamayo@workstation:~/CPE212_HOA15.1/roles$ cd Neutron
tamayo@workstation:~/CPE212_HOA15.1/roles/Neutron$ mkdir tasks
tamayo@workstation:~/CPE212_HOA15.1/roles/Neutron$ cd tasks
tamayo@workstation:~/CPE212_HOA15.1/roles/Neutron/tasks$
```

For Horizon

```
tamayo@workstation:~/CPE212_HOA15.1/roles$ mkdir Horizon
tamayo@workstation:~/CPE212_HOA15.1/roles$ cd Horizon
tamayo@workstation:~/CPE212_HOA15.1/roles/Horizon$ mkdir tasks
tamayo@workstation:~/CPE212_HOA15.1/roles/Horizon$ cd tasks
tamayo@workstation:~/CPE212_HOA15.1/roles/Horizon/tasks$
```

For Cinder

```
tamayo@workstation:~/CPE212_HOA15.1/roles$ mkdir Cinder
tamayo@workstation:~/CPE212_HOA15.1/roles$ cd Cinder
tamayo@workstation:~/CPE212_HOA15.1/roles/Cinder$ mkdir tasks
tamayo@workstation:~/CPE212_HOA15.1/roles/Cinder$ cd tasks
tamayo@workstation:~/CPE212_HOA15.1/roles/Cinder/tasks$
```

2. In each of the tasks for the three directory (Neutron, Horizon, Cinder), create another file and name it main.yml

For Neutron

```
tamayo@workstation:~/CPE212_HOA15.1/roles$ cd Neutron/tasks
tamayo@workstation:~/CPE212_HOA15.1/roles/Neutron/tasks$ sudo nano main.yml
```

For Horizon

```
tamayo@workstation:~/CPE212_HOA15.1/roles$ cd Horizon/tasks
tamayo@workstation:~/CPE212_HOA15.1/roles/Horizon/tasks$ sudo nano main.yml
```

For Cinder

```
tamayo@workstation:~/CPE212_HOA15.1/roles$ cd Cinder/tasks
tamayo@workstation:~/CPE212_HOA15.1/roles/Cinder/tasks$ sudo nano main.yml
```

Tree for roles

```
tamayo@workstation:~/CPE212_HOA15.1/roles$ tree
.
├── Cinder
│   └── tasks
│       └── main.yml
├── Horizon
│   └── tasks
│       └── main.yml
└── Neutron
    └── tasks
        └── main.yml

7 directories, 3 files
```

3. Copy the code to the main.yml of the each subdirectory.

For Neutron

tamayo@workstation: ~/CPE212_HOA15.1/roles/Neutron/tasks

GNU nano 7.2 main.yml *

```
- name: Installing Neutron (Ubuntu)
  apt:
    name:
      - neutron-server
      - neutron-plugin-ml2
      - neutron-openvswitch-agent
      - neutron-dhcp-agent
      - neutron-metadata-agent
    state: latest

- name: Configure Neutron
  replace:
    dest: /etc/neutron/neutron.conf
    regexp: connection = mysql+pymysql://neutron:NEUTRON_DBPASS@controller/neutron
    replace: connection = mysql+pymysql://neutron:admin123@controller/neutron
    backup: yes

- name: Configure Neutron
  lineinfile:
    dest: /etc/neutron/neutron.conf
    line: core_plugin = ml2
    state: present
    backup: yes

- name: Configure Neutron
  lineinfile:
    dest: /etc/neutron/neutron.conf
    regexp: 'service_plugins = '
    state: absent
    backup: yes
```

```
- name: Conf Neutron
  replace:
    dest: /etc/neutron/neutron.conf
    regexp: transport_url = rabbit://openstack:RABBIT_PASS@controller
    replace: transport_url = rabbit://openstack:admin123@controller
    backup: yes

- name: Configure Neutron
  lineinfile:
    dest: /etc/neutron/neutron.conf
    line: 'auth_strategy = keystone'
    state: present
    backup: yes

- name: Configure Neutron
  lineinfile:
    dest: /etc/neutron/neutron.conf
    insertafter: '\[keystone_authtoken\]'
    line: "{{ item }}"
    state: present
    backup: yes

  with_items:
    - www_authenticate_uri = http://controller:5000
    - auth_url = http://controller:5000
    - memcached_servers = controller:11211
    - auth_type = password
    - project_domain_name = Default
    - user_domain_name = Default
    - project_name = service
```

```
    - username = neutron
    - password = admin123

- name: Configure Neutron
  lineinfile:
    dest: /etc/neutron/neutron.conf
    insertafter: '\[DEFAULT\]'
    line: "{{ item }}"
    state: present
    backup: yes

  with_items:
    - notify_nova_on_port_status_changes = true
    - notify_nova_on_port_data_changes = true

- name: Configure Neutron
  lineinfile:
    dest: /etc/neutron/neutron.conf
    insertafter: '\[nova\]'
    line: "{{ item }}"
    state: present
    backup: yes

  with_items:
    - auth_url = http://controller:5000
    - auth_type = password
    - project_domain_name = Default
    - user_domain_name = Default
    - region_name = RegionOne
```

```
    - project_name = service
    - username = nova
    - password = admin123

- name: Configure Neutron
  lineinfile:
    dest: /etc/neutron/neutron.conf
    line: 'lock_path = /var/lib/neutron/tmp'
    state: present
    backup: yes

- name: Configure Neutron
  lineinfile:
    dest: /etc/neutron/plugins/ml2/ml2_conf.ini
    line: 'type_drivers = flat,vlan'
    state: present
    backup: yes

- name: Configure Neutron
  lineinfile:
    dest: /etc/neutron/plugins/ml2/ml2_conf.ini
    regexp: 'tenant_network_types ='
    state: absent
    backup: yes

- name: Configure Neutron
  lineinfile:
    dest: /etc/neutron/plugins/ml2/ml2_conf.ini
```

```
    insertafter: '\[ml2\]'
    line: " {{ item }}"
    state: present
    backup: yes

  with_items:
    - mechanism_drivers = openvswitch
    - extension_drivers = portsecurity

- name: Configure Neutron
  lineinfile:
    dest: /etc/neutron/plugins/ml2/ml2_conf.ini
    line: 'flat_networks = provider'
    state: present
    backup: yes

- name: Configure Neutron
  lineinfile:
    dest: /etc/neutron/plugins/ml2/openvswitch_agent.ini
    regexp: 'bridge_mappings = provider: PROVIDER_INTERFACE_NAME'
    line: 'bridge_mappings = provider:LocalMachine'
    backup: yes

- name: Configure Neutron
  lineinfile:
    dest: /etc/neutron/plugins/ml2/openvswitch_agent.ini
    insertafter: '\[securitygroup\]'
    line: "{{ item }}"
```

```
    state: present
    backup: yes

  with_items:
    - enable_security_group = true
    - firewall_driver = openvswitch

- name: Configure Neutron
  lineinfile:
    dest: /etc/neutron/dhcp_agent.ini
    insertafter: '\[DEFAULT\]'
    line: "{{ item }}"
    state: present
    backup: yes

  with_items:
    - interface_driver = openvswitch
    - dhcp_driver = neutron.agent.linux.dhcp.Dnsmasq
    - enable_isolated_metadata = true

- name: Configure Neutron
  lineinfile:
    dest: /etc/neutron/metadata_agent.ini
    line: 'nova_metadata_host = controller'
    state: present
    backup: yes

- name: Configure Neutron
```

```
  lineinfile:
    dest: /etc/neutron/metadata_agent.ini
    regexp: 'metadata_proxy_shared_secret = METADATA_SECRET'
    line: 'metadata_proxy_shared_secret = admin123'
    state: present
    backup: yes

- name: Confgiure Neutron
  lineinfile:
    dest: /etc/nova/nova.conf
    insertafter: '\[neutron\]'
    line: "{{ item }}"
    state: present
    backup: yes

  with_items:
    - auth_url = http://controller:5000
    - auth_type = password
    - project_domain_name = Default
    - user_domain_name = Default
    - region_name = RegionOne
    - project_name = service
    - username = neutron
    - password = admin123
    - service_metadata_proxy = true
    - metadata_proxy_shared_secret = admin123
```

For Horizon

tamayo@workstation: ~/CPE212_HOA15.1/roles/Horizon/tasks

GNU nano 7.2 main.yml *

```
- name: Installing Horizon
  apt:
    name:
      - openstack-dashboard
    state: latest

- name: Configure Openstack file
  lineinfile:
        dest: /etc/openstack-dashboard/local_settings.py
        regexp: 'OPENSTACK_HOST ='
        line: 'OPENSTACK_HOST = "controller"'
        state: present
        backup: yes

- name: Configure Openstack file
  lineinfile:
        dest: /etc/openstack-dashboard/local_settings.py
        regexp: '^ALLOWED_HOST ='
        line: "ALLOWED_HOST = ['localhost', '*']"
        state: present
        backup: yes
        backrefs: yes

- name: Configure Openstack file
  lineinfile:
        dest: /etc/openstack-dashboard/local_settings.py
        regexp: 'SESSION_ENGINE ='
        line: "{{ item }}"
        state: present
        backup: yes
```

```
  with_items:
        - "SESSION_ENGINE = 'django.contrib.sessions.backends.cache'"
        - ' '
        - "CACHES = {"
        -   "'default': {"
        -       "'BACKEND': 'django.core.cache.backends.memcached.MemcachedCache',"
        -       "'LOCATION': 'controller:11211',"
        -   "}"
        - "}"

- name: Configure Openstack file
  lineinfile:
        dest: /etc/openstack-dashboard/local_settings.py
        regexp: 'OPENSTACK_KEYSTONE_URL ='
        line: 'OPENSTACK_KEYSTONE_URL = "http://%s5000/identity/v3" % OPENSTACK_HOST'
        state: present
        backup: yes

- name: Configure Openstack file
  lineinfile:
        dest: /etc/openstack-dashboard/local_settings.py
        regexp: 'OPENSTACK_KEYSTONE_MULTIDOMAIN_SUPPORT ='
        line: 'OPENSTACK_KEYSTONE_MULTIDOMAIN_SUPPORT = True'
        state: present
        backup: yes
```

```
- name: Configure Openstack file
  lineinfile:
        dest: /etc/openstack-dashboard/local_settings.py
        regexp: '^OPENSTACK_API_VERSIONS ='
        line: "{{ item }}"
        state: present
        backup: yes

  with_items:
        - "OPENSTACK_API_VERSIONS = {"
        -     '"identity": 3,'
        -     '"image": 2,'
        -     '"volume": 3,'
        - "}"

- name: Configure Openstack file
  lineinfile:
        dest: /etc/openstack-dashboard/local_settings.py
        regexp: 'OPENSTACK_KEYSTONE_DEFAULT_DOMAIN ='
        line: 'OPENSTACK_KEYSTONE_DEFAULT_DOMAIN = "Default"'
        state: present
        backup: yes

- name: Configure Openstack file
  lineinfile:
        dest: /etc/openstack-dashboard/local_settings.py
        regexp: 'OPENSTACK_KEYSTONE_DEFAULT_ROLE ='
        line: 'OPENSTACK_KEYSTONE_DEFAULT_ROLE = "user"'
```

```
        state: present
        backup: yes

- name: Configure Openstack file
  lineinfile:
        dest: /etc/openstack-dashboard/local_settings.py
        regexp: 'OPENSTACK_NEUTRON_NETWORK ='
        line: '{{ item }}'
        state: present
        backup: yes

  with_items:
        - "OPENSTACK_NEUTRON_NETWORK = {"
        -     "..."
        -     "'enable_router': False,"
        -     "'enable_quotas': False,"
        -     "'enable_ipv6': False,"
        -     "'enable_distributed_router': False,"
        -     "'enable_ha_router': False,"
        -     "'enable_fip_topology_check': False,"
        - "}"

- name: Configure Openstack file
  lineinfile:
        dest: /etc/apache2/conf-available/openstack-dashboard.conf
        line: 'WSGIApplicationGroup %{GLOBAL}'
```

For Cinder

tamayo@workstation: ~/CPE212_HOA15.1/roles/Cinder/tasks

GNU nano 7.2 main.yml *

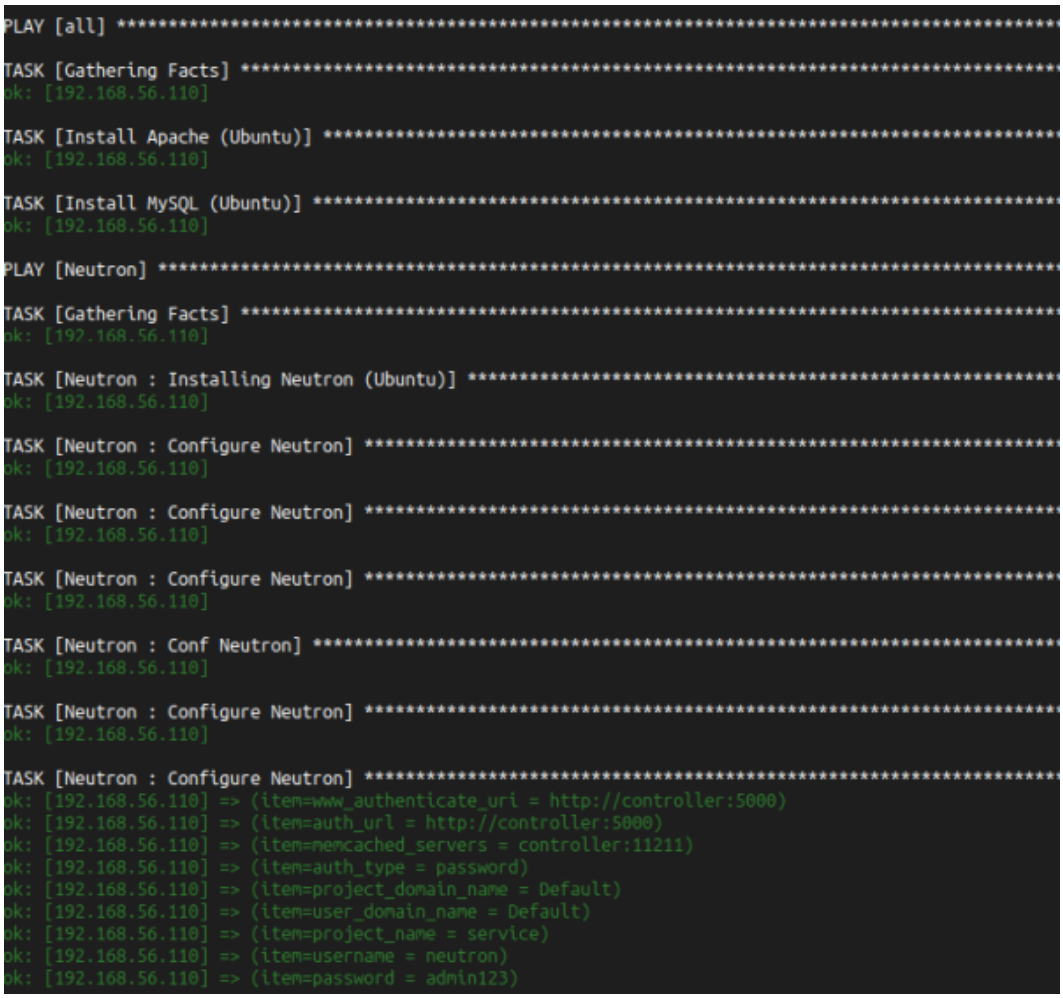
```
- name: Installing Cinder (Ubuntu)
  apt:
    name:
      - cinder-api
      - cinder-scheduler
    state: latest

- name: Configure Cinder
  replace:
        dest: /etc/cinder/cinder.conf
        regexp: connection = mysql+pymysql://cinder:CINDER_DBPASS@controller/cinder
        replace: connection = mysql+pymysql://cinder:admin123@controller/cinder
        backup: yes

- name: Configure Cinder
  replace:
        dest: /etc/cinder/cinder.conf
        regexp: transport_url = rabbit://openstack:RABBIT_PASS@controller
        replace: transport_url = rabbit://openstack:admin123@controller
        backup: yes

- name: Configure Cinder
  lineinfile:
        dest: /etc/cinder/cinder.conf
        line: 'auth_strategy = keystone'
        state: present
        backup: yes

- name: Configure Cinder
  lineinfile:
```

```
        dest: /etc/cinder/cinder.conf
        insertafter: '\[keystone_authtoken\]'
        line: '{{ item }}'
        state: present
        backup: yes

  with_items:
        - www_authenticate_uri = http://controller:5000
        - auth_url = http://controller:5000
        - memcached_servers = controller:11211
        - auth_type = password
        - project_domain_name = default
        - user_domain_name = default
        - project_name = service
        - username = cinder
        - password = pass123

- name: Configure Cinder
  lineinfile:
        dest: /etc/cinder/cinder.conf
        line: 'my_ip = 192.168.52.103'
        state: present
        backup: yes

- name: Configure Cinder
  lineinfile:
        dest: /etc/cinder/cinder.conf
```

```
        line: 'lock_path = /var/lib/cinder/tmp'
        state: present
        backup: yes

- name: Populate the Database
  shell: |
    sudo cinder-manage db sync

- name: Configure Cinder
  lineinfile:
        dest: /etc/nova/nova.conf
        line: 'os_region_name = RegionOne'
        state: present
        backup: yes
```

Task 4: Run and Verify

1. Run the command ansible-playbook - - ask-become-pass install_openstack.yml to completely install the OpenStack base services.



```
TASK [Neutron : Configure Neutron] *********************************************************
ok: [192.168.56.110] => (item=notify_nova_on_port_status_changes = true)
ok: [192.168.56.110] => (item=notify_nova_on_port_data_changes = true)

TASK [Neutron : Configure Neutron] *********************************************************
ok: [192.168.56.110] => (item=auth_url = http://controller:5000)
ok: [192.168.56.110] => (item=auth_type = password)
ok: [192.168.56.110] => (item=project_domain_name = Default)
ok: [192.168.56.110] => (item=user_domain_name = Default)
ok: [192.168.56.110] => (item=region_name = RegionOne)
ok: [192.168.56.110] => (item=project_name = service)
ok: [192.168.56.110] => (item=username = nova)
ok: [192.168.56.110] => (item=password = admin123)

TASK [Neutron : Configure Neutron] *********************************************************
ok: [192.168.56.110]

TASK [Neutron : Configure Neutron] *********************************************************
ok: [192.168.56.110]

TASK [Neutron : Configure Neutron] *********************************************************
ok: [192.168.56.110]

TASK [Neutron : Configure Neutron] *********************************************************
ok: [192.168.56.110] => (item=mechanism_drivers = openvswitch)
ok: [192.168.56.110] => (item=extension_drivers = portsecurity)

TASK [Neutron : Configure Neutron] *********************************************************
ok: [192.168.56.110]

TASK [Neutron : Configure Neutron] *********************************************************
ok: [192.168.56.110]

TASK [Neutron : Configure Neutron] *********************************************************
ok: [192.168.56.110] => (item=enable_security_group = true)
ok: [192.168.56.110] => (item=firewall_driver = openvswitch)

TASK [Neutron : Configure Neutron] *********************************************************
ok: [192.168.56.110] => (item=interface_driver = openvswitch)
ok: [192.168.56.110] => (item=dhcp_driver = neutron.agent.linux.dhcp.Dnsmasq)
ok: [192.168.56.110] => (item=enable_isolated_metadata = true)

TASK [Neutron : Configure Neutron] *********************************************************
ok: [192.168.56.110]

TASK [Neutron : Configure Neutron] *********************************************************
ok: [192.168.56.110]
```

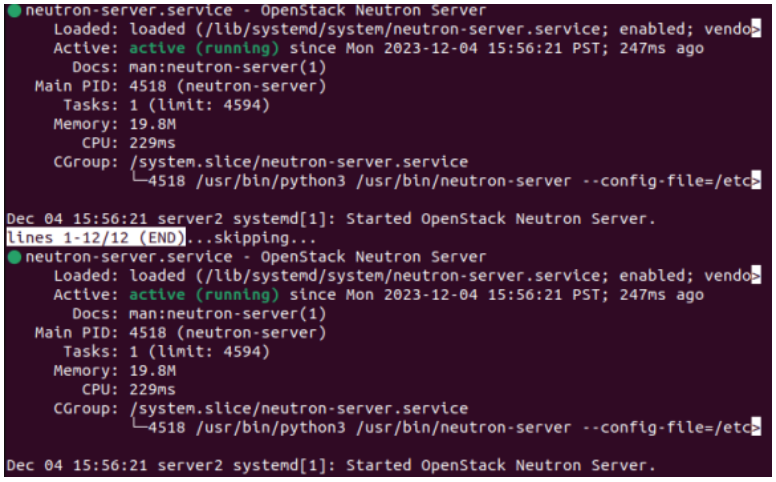
```
TASK [Neutron : Configure Neutron] *********************************************************
ok: [192.168.56.110]

TASK [Neutron : Confgiure Neutron] *********************************************************
ok: [192.168.56.110] => (item=auth_url = http://controller:5000)
ok: [192.168.56.110] => (item=auth_type = password)
ok: [192.168.56.110] => (item=project_domain_name = Default)
ok: [192.168.56.110] => (item=user_domain_name = Default)
ok: [192.168.56.110] => (item=region_name = RegionOne)
ok: [192.168.56.110] => (item=project_name = service)
ok: [192.168.56.110] => (item=username = neutron)
ok: [192.168.56.110] => (item=password = admin123)
ok: [192.168.56.110] => (item=service_metadata_proxy = true)
ok: [192.168.56.110] => (item=metadata_proxy_shared_secret = admin123)

PLAY [Horizon] *****************************************************************************

TASK [Gathering Facts] *********************************************************************
ok: [192.168.56.110]

TASK [Horizon : Installing Horizon] ********************************************************
changed: [192.168.56.110]

TASK [Horizon : Configure Openstack file] **************************************************
changed: [192.168.56.110]

TASK [Horizon : Configure Openstack file] **************************************************
ok: [192.168.56.110]

TASK [Horizon : Configure Openstack file] **************************************************
changed: [192.168.56.110] => (item=SESSION_ENGINE = 'django.contrib.sessions.backends.cache')
changed: [192.168.56.110] => (item= )
ok: [192.168.56.110] => (item=CACHES = {)
changed: [192.168.56.110] => (item='default': {)
changed: [192.168.56.110] => (item='BACKEND': 'django.core.cache.backends.memcached.MemcachedCache',)
changed: [192.168.56.110] => (item='LOCATION': 'controller:11211',)
ok: [192.168.56.110] => (item=})
ok: [192.168.56.110] => (item=})

TASK [Horizon : Configure Openstack file] **************************************************
changed: [192.168.56.110]

TASK [Horizon : Configure Openstack file] **************************************************
changed: [192.168.56.110]

TASK [Horizon : Configure Openstack file] **************************************************
changed: [192.168.56.110] => (item=OPENSTACK_API_VERSIONS = {)
changed: [192.168.56.110] => (item="identity": 3,)
```

```
TASK [Horizon : Configure Openstack file] ************************************************************
changed: [192.168.56.110] => (item=OPENSTACK_API_VERSIONS = {)
changed: [192.168.56.110] => (item="identity": 3,)
changed: [192.168.56.110] => (item="image": 2,)
changed: [192.168.56.110] => (item="volume": 3,)
ok: [192.168.56.110] => (item=})

TASK [Horizon : Configure Openstack file] ************************************************************
changed: [192.168.56.110]

TASK [Horizon : Configure Openstack file] ************************************************************
changed: [192.168.56.110]

TASK [Horizon : Configure Openstack file] ************************************************************
changed: [192.168.56.110] => (item=OPENSTACK_NEUTRON_NETWORK = {)
changed: [192.168.56.110] => (item=...)
changed: [192.168.56.110] => (item='enable_router': False,)
changed: [192.168.56.110] => (item='enable_quotas': False,)
changed: [192.168.56.110] => (item='enable_ipv6': False,)
changed: [192.168.56.110] => (item='enable_distributed_router': False,)
changed: [192.168.56.110] => (item='enable_ha_router': False,)
changed: [192.168.56.110] => (item='enable_fip_topology_check': False,)
ok: [192.168.56.110] => (item=})

TASK [Horizon : Configure Openstack file] ************************************************************
ok: [192.168.56.110]

PLAY [Cinder] ****************************************************************************************

TASK [Gathering Facts] *******************************************************************************
ok: [192.168.56.110]

TASK [Cinder : Installing Cinder (Ubuntu)] ***********************************************************
changed: [192.168.56.110]

TASK [Cinder : Configure Cinder] *********************************************************************
ok: [192.168.56.110]

TASK [Cinder : Configure Cinder] *********************************************************************
ok: [192.168.56.110]

TASK [Cinder : Configure Cinder] *********************************************************************
ok: [192.168.56.110]

TASK [Cinder : Configure Cinder] *********************************************************************
changed: [192.168.56.110] => (item=www_authenticate_uri = http://controller:5000)
changed: [192.168.56.110] => (item=auth_url = http://controller:5000)
changed: [192.168.56.110] => (item=memcached_servers = controller:11211)
```

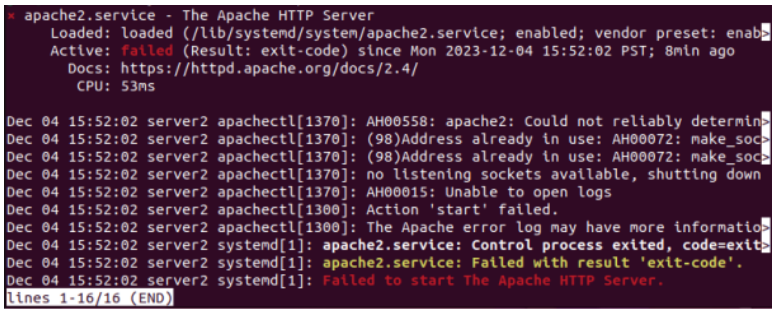
```
TASK [Cinder : Configure Cinder] *********************************************************************
changed: [192.168.56.110] => (item=www_authenticate_uri = http://controller:5000)
changed: [192.168.56.110] => (item=auth_url = http://controller:5000)
changed: [192.168.56.110] => (item=memcached_servers = controller:11211)
changed: [192.168.56.110] => (item=auth_type = password)
changed: [192.168.56.110] => (item=project_domain_name = default)
changed: [192.168.56.110] => (item=user_domain_name = default)
changed: [192.168.56.110] => (item=project_name = service)
changed: [192.168.56.110] => (item=username = cinder)
changed: [192.168.56.110] => (item=password = pass123)

TASK [Cinder : Configure Cinder] *********************************************************************
changed: [192.168.56.110]

TASK [Cinder : Configure Cinder] *********************************************************************
changed: [192.168.56.110]

TASK [Cinder : Populate the Database] ****************************************************************
changed: [192.168.56.110]

TASK [Cinder : Configure Cinder] *********************************************************************
changed: [192.168.56.110]

PLAY RECAP *******************************************************************************************
192.168.56.110             : ok=46   changed=15   unreachable=0    failed=0    skipped=0    rescued=0    ignored=
0
```

2. Show the screenshot of the Neutron, Horizon, and Cinder that are working.

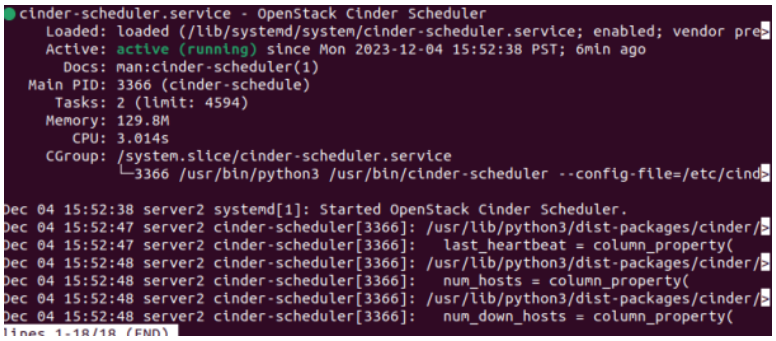
Neutron



Horizon



Cinder



3. Upload it in the github.

```
tamayo@server1:~/CPE212_HOA15.1$ git add .
tamayo@server1:~/CPE212_HOA15.1$ git commit -m "Openstack Installation (Neutron,
 Horizon, Cinder)"
[main c45d94f] Openstack Installation (Neutron, Horizon, Cinder)
 6 files changed, 433 insertions(+)
 create mode 100644 ansible.cfg
 create mode 100644 install_openstack.yml
 create mode 100644 inventory
 create mode 100644 roles/Cinder/tasks/main.yml
 create mode 100644 roles/Horizon/tasks/main.yml
 create mode 100644 roles/Neutron/tasks/main.yml
```

```
tamayo@server1:~/CPE212_HOA15.1$ git push origin
Enumerating objects: 16, done.
Counting objects: 100% (16/16), done.
Delta compression using up to 2 threads
Compressing objects: 100% (9/9), done.
Writing objects: 100% (15/15), 3.21 KiB | 1.07 MiB/s, done.
Total 15 (delta 1), reused 0 (delta 0), pack-reused 0 (from 0)
remote: Resolving deltas: 100% (1/1), done.
To github.com:raylantamayo/CPE212_HOA15.1.git
   9248843..c45d94f  main -> main
```

GitHub Link: https://github.com/raylantamayo/CPE212_HOA15.1.git

Reflections:

Answer the following:

1. Describe Neutron, Horizon and Cinder services.
   Neutron orchestrates networking in OpenStack, managing virtual networks and IP addresses. It's like the backstage crew ensuring seamless communication between virtual machines. Horizon is the user interface, OpenStack's friendly face that lets you control and monitor your cloud resources through a web dashboard. Think of it as the control center. Cinder handles block storage, functioning like a digital storage manager that ensures your data has a reliable and flexible home within the OpenStack cloud.

Conclusions:

In this activity, I worked with three core OpenStack services: Neutron, Horizon, and Cinder. The installation process for these services went smoothly, and I didn't encounter any issues. One of the key tasks was setting up a repository and creating an Ubuntu playbook to replicate the steps for installing OpenStack. Breaking down the complexities of Neutron, Horizon, and Cinder into actionable tasks helped me gain a better understanding of how these services function.

This hands-on activity not only enhanced my technical skills but also highlighted the importance of clear and methodical documentation. Writing a playbook goes beyond automation—it simplifies complex processes into a structured, repeatable guide for efficient deployment. The act of transforming intricate configurations into an executable format deepened my appreciation for structured problem-solving.

By using Ansible to orchestrate the installation and configuration of OpenStack base services on Ubuntu, I embraced a modern, innovative approach to cloud technology. This experience wasn't just technical—it prepared me for the future by equipping me with practical knowledge to manage and leverage cloud solutions while understanding the complexities involved.