Name: Clarence B. Chavez	Date Performed: November 27, 2024
Course/Section: CPE31S2	Date Submitted: November 30, 2024
Instructor: Engr. Robin Valenzuela	Semester and SY: 1st Sem, 2024-2025

Activity 13: OpenStack Prerequisite Installation

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)

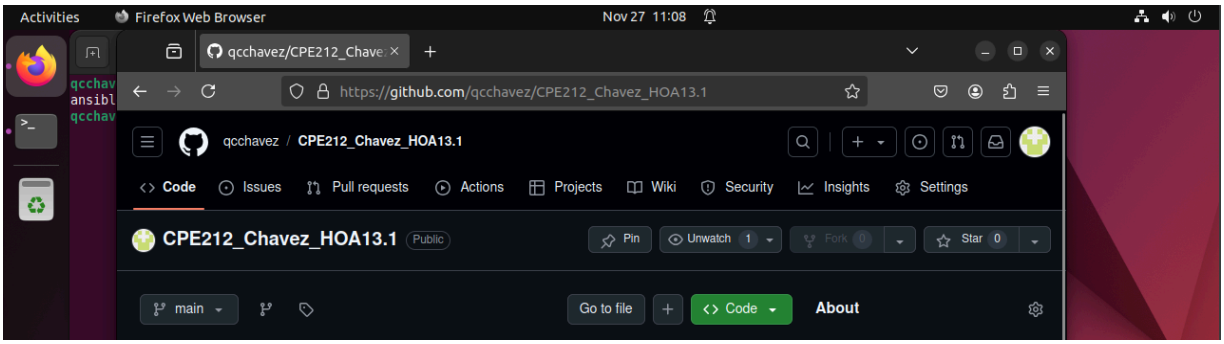
1x Ubuntu VM or Centos VM

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. NTP
    b. OpenStack packages
    c. SQL Database
    d. Message Queue
    e. Memcached
    f. Etcd
    g. Create different plays in installing per server type (controller, compute etc.) and identify it as a group in the Inventory file.
    h. Add, commit and push it to your GitHub repo.

5. **Output** (screenshots and explanations)

TASK 4.1



- In this screenshot, I've created a GitHub repository for this activity.

TASK 4.2A (NTP)

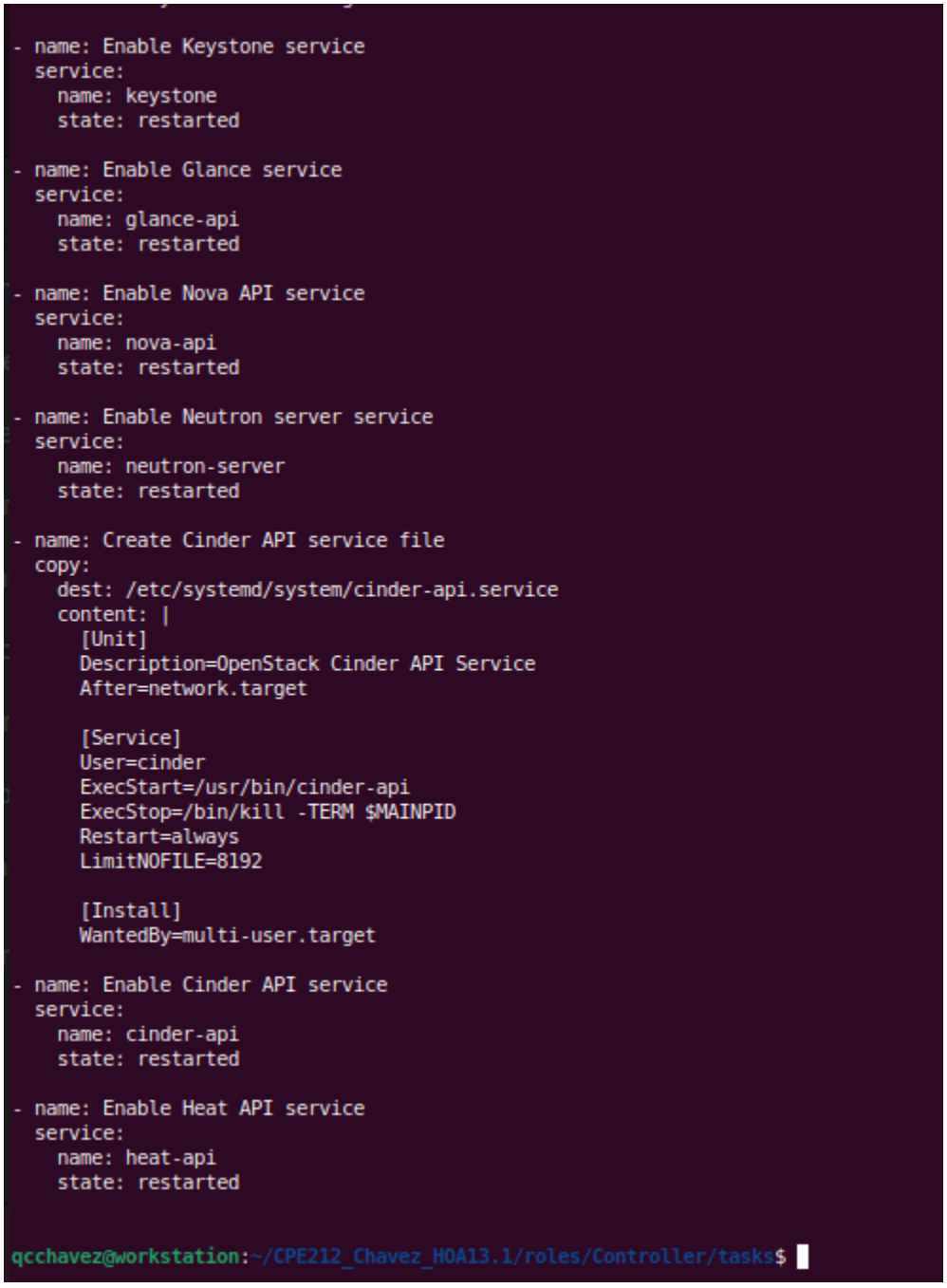
```
qcchavez@workstation:~/CPE212_Chavez_HOA13.1/roles/Controller/tasks$ cat main.yml
---
- name: Install NTP package
  apt:
    name: ntp
    state: present
    update_cache: yes

- name: Ensure NTP service is started and enabled
  service:
    name: ntp
    state: started
    enabled: yes
```

- In this screenshot, these are the lines of codes or the task that is required in order to install and start the NTP package.

TASK 4.2B (OpenStack Packages)

```
- name: Install OpenStack packages on Controller node
  apt:
    name:
      - python3-openstackclient
      - keystone
      - glance
      - nova-api
      - nova-scheduler
      - nova-conductor
      - nova-novncproxy
      - neutron-server
      - neutron-dhcp-agent
      - neutron-l3-agent
      - neutron-metadata-agent
      - cinder-api
      - cinder-scheduler
      - cinder-volume
      - heat-api
      - heat-engine
    state: present
    update_cache: yes

- name: Create Keystone service file
  copy:
    dest: /etc/systemd/system/keystone.service
    content: |
      [Unit]
      Description=Keystone OpenStack Identity Service
      After=network.target

      [Service]
      User=keystone
      ExecStart=/usr/bin/keystone-manage serve --config-file /etc/keystone/keystone.conf
      ExecStop=/bin/kill -TERM $MAINPID
      Restart=always

      [Install]
      WantedBy=multi-user.target

- name: Enable Keystone service
  service:
    name: keystone
    state: restarted

- name: Enable Glance service
  service:
    name: glance-api
    state: restarted
```

- In this screenshot, these are the lines of codes or the task that is required in order to install the required packages for OpenStack, configuration files, and also to start the packages' services.



- In this screenshot, these are the lines of codes or the task that is required in order to install the required packages for OpenStack, configuration files, and also to start the packages' services.

TASK 4.2C (SQL Database - MariaDB)

```
qcchavez@workstation:~/CPE212_Chavez_HOA13.1/roles/Database/tasks$ cat main.yml
---
- name: Install MariaDB and dependencies
  apt:
    name:
      - mariadb-server
      - python3-pymysql
    state: present

- name: Configure MariaDB for OpenStack
  ansible.builtin.copy:
    dest: /etc/mysql/mariadb.conf.d/99-openstack.cnf
    content: |
      [mysqld]
      bind-address = 0.0.0.0
      default-storage-engine = innodb
      innodb_file_per_table = on
      max_connections = 4096
      collation-server = utf8_general_ci
      character-set-server = utf8

- name: Enable MariaDB service
  ansible.builtin.systemd:
    name: mariadb
    state: restarted
    enabled: yes
```

- In this screenshot, these are the lines of codes or the task that is required in order to install MariaDB and its dependencies, and also, to configure MariaDB for OpenStack, and enable its service.

TASK 4.2D (Message Queue)

```
qcchavez@workstation:~/CPE212_Chavez_HOA13.1/roles/MessageQueue/tasks$ cat main.yml
---
- name: Install RabbitMQ
  apt:
    name: rabbitmq-server
    state: present

- name: Enable RabbitMQ service
  systemd:
    name: rabbitmq-server
    state: started
    enabled: yes

- name: Add RabbitMQ user for OpenStack
  ansible.builtin.command: rabbitmqctl list_users
  register: rabbitmq_users
  changed_when: false

- name: Set permissions for RabbitMQ user
  ansible.builtin.command:
    cmd: rabbitmqctl set_permissions openstack ".*" ".*" ".*"
  when: "'openstack' in rabbitmq_users.stdout"
```

- In this screenshot, these are the lines of codes or the task that is required to install RabbitMQ, and also, to enable its service, add a MessageQueue user for OpenStack, and set its permissions.

TASK 4.2E (Memcached)

```
qcchavez@workstation:~/CPE212_Chavez_HOA13.1/roles/Memcached/tasks$ cat main.yml
---
- name: Install Memcached
  apt:
    name: memcached
    state: present

- name: Configure Memcached to listen on all interfaces
  lineinfile:
    path: /etc/memcached.conf
    regexp: '-l'
    line: '-l 0.0.0.0'

- name: Enable Memcached service
  systemd:
    name: memcached
    state: restarted
    enabled: yes
```

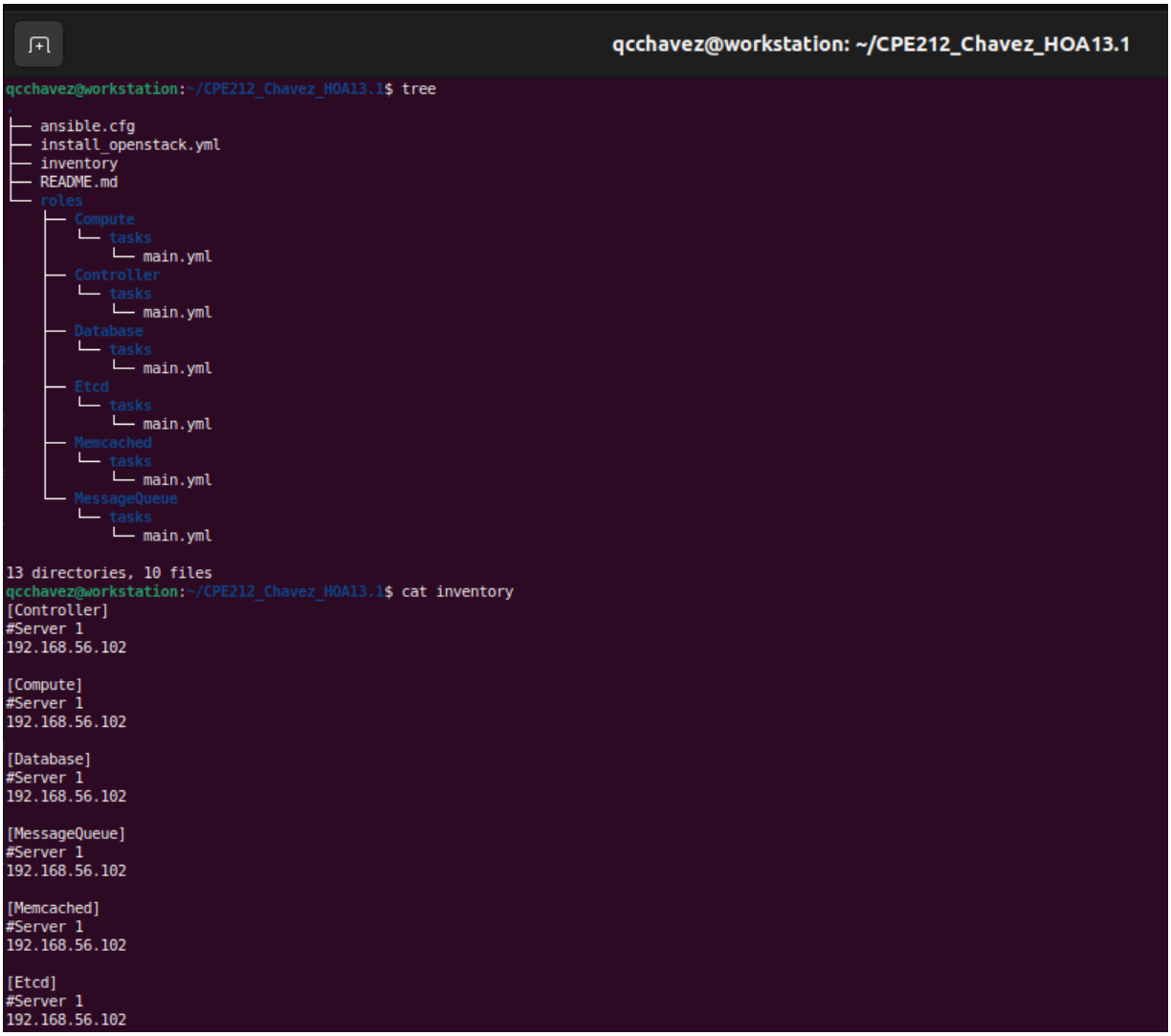
- In this screenshot, these are the lines of codes or the task that is required to install Memcached, configuration file of Memcached to listen on all interfaces, and also, enable its service.

TASK 4.2F (Etcd)

```
qcchavez@workstation:~/CPE212_Chavez_HOA13.1/roles/Etcd/tasks$ cat main.yml
---
- name: Install Etcd
  apt:
    name: etcd
    state: present

- name: Configure Etcd for OpenStack
  copy:
    dest: /etc/default/etcd
    content: |
      ETCD_LISTEN_PEER_URLS="http://0.0.0.0:2380"
      ETCD_LISTEN_CLIENT_URLS="http://0.0.0.0:2379"
      ETCD_INITIAL_ADVERTISE_PEER_URLS="http://127.0.0.1:2380"
      ETCD_ADVERTISE_CLIENT_URLS="http://127.0.0.1:2379"
      ETCD_INITIAL_CLUSTER="default=http://127.0.0.1:2380"
      ETCD_INITIAL_CLUSTER_TOKEN="etcd-cluster-01"
      ETCD_INITIAL_CLUSTER_STATE="new"

- name: Enable Etcd service
  systemd:
    name: etcd
    state: restarted
    enabled: yes
```

- In this screenshot, these are the lines of codes or the task that is required to install Etcd, creating Etcd configuration file for OpenStack, and also, enabling its service.

TASK 4.2G

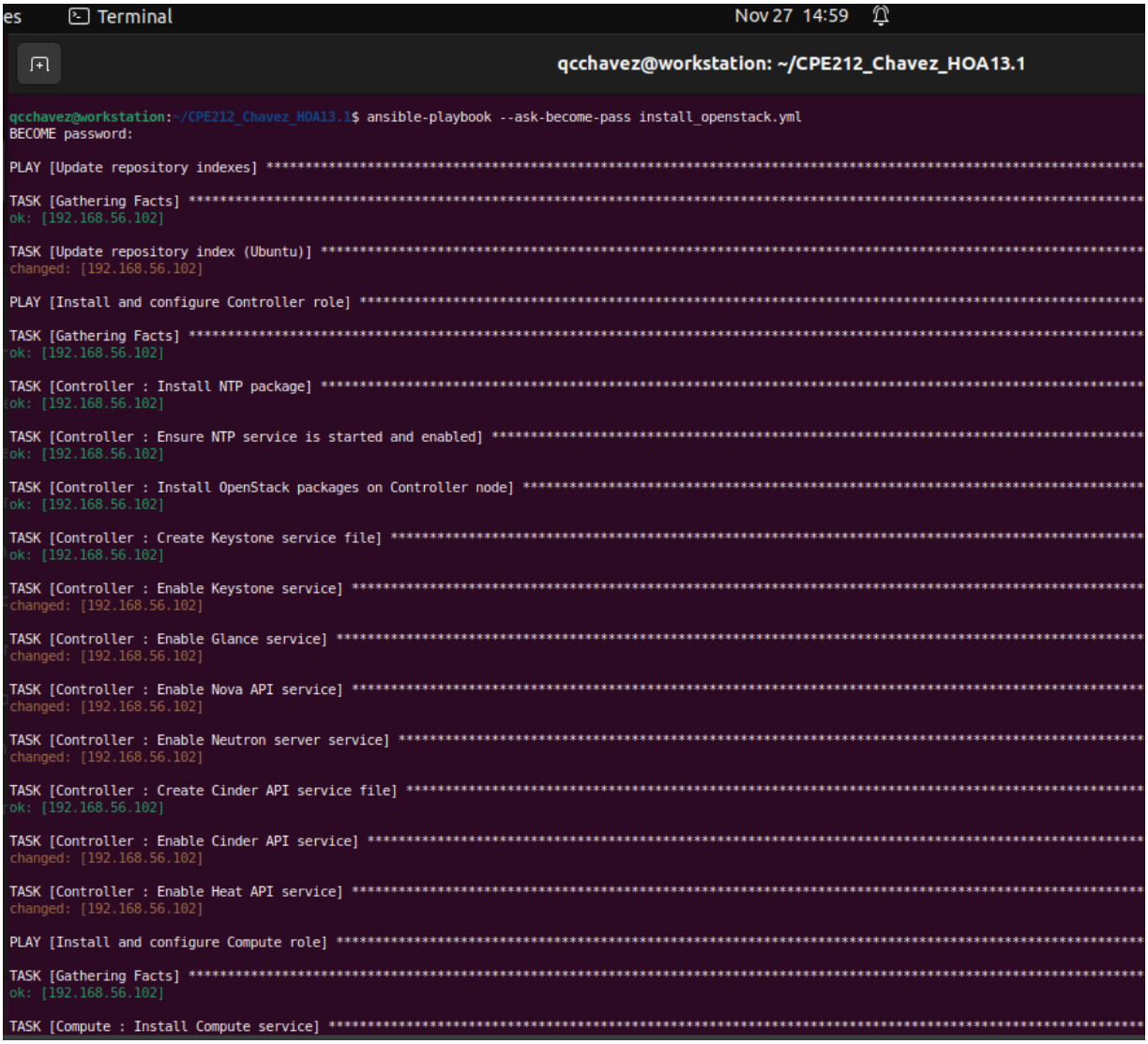


- This is the file tree or the file content of the repository after making changes, it also shows the content of inventory file, which shows the different groups (Controller, Compute, Database, MessageQueue, Memcached, and Etcd).

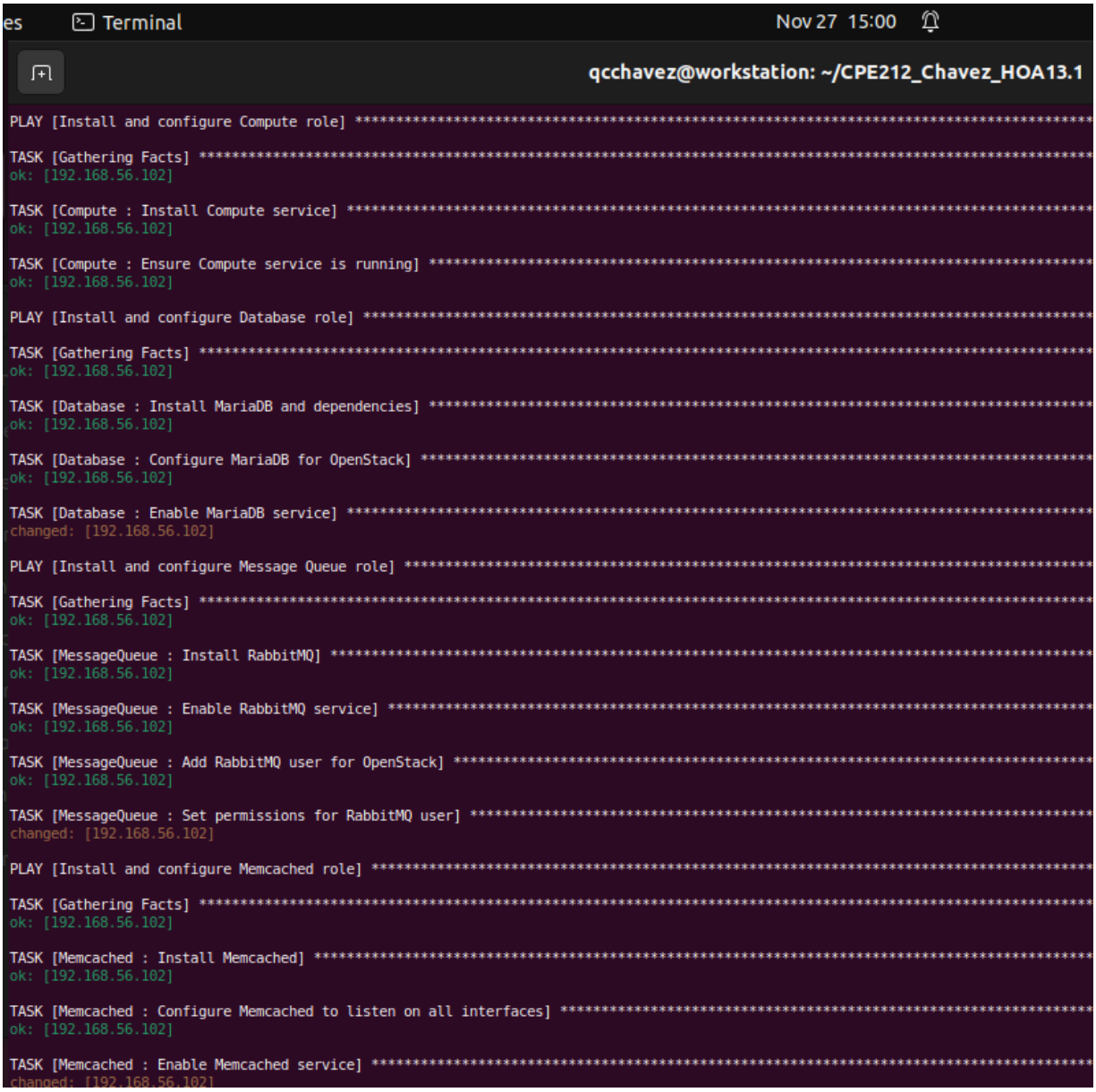
```
qcchavez@workstation:~/CPE212_Chavez_HOA13.1$ cat install_openstack.yml
---
- name: Update repository indexes
  hosts: all
  become: true
  tasks:

    - name: Update repository index (Ubuntu)
      apt:
        update_cache: yes
      when: ansible_distribution == "Ubuntu"

- name: Install and configure Controller role
  hosts: Controller
  become: true
  roles:
    - Controller

- name: Install and configure Compute role
  hosts: Compute
  become: true
  roles:
    - Compute

- name: Install and configure Database role
  hosts: Database
  become: true
  roles:
    - Database

- name: Install and configure Message Queue role
  hosts: MessageQueue
  become: true
  roles:
    - MessageQueue

- name: Install and configure Memcached role
  hosts: Memcached
  become: true
  roles:
    - Memcached

- name: Install and configure Etcd role
  hosts: Etcd
  become: true
  roles:
    - Etcd
```

- This is the main playbook, named **install_openstack.yml**, it is the one that is prompted in order to make the tasks in every role work.

PROOF OF SUCCESSFUL INSTALLATION AND CONFIGURATION



- This is the screenshot where all of the tasks are working properly and successfully done without errors.



- This is the screenshot where all of the tasks are working properly and successfully done without errors.

```
TASK [Memcached : Enable Memcached service] ************************************************************************************
changed: [192.168.56.102]

PLAY [Install and configure Etcd role] *****************************************************************************************

TASK [Gathering Facts] *********************************************************************************************************
ok: [192.168.56.102]

TASK [Etcd : Install Etcd] *****************************************************************************************************
ok: [192.168.56.102]

TASK [Etcd : Configure Etcd for OpenStack] *************************************************************************************
ok: [192.168.56.102]

TASK [Etcd : Enable Etcd service] **********************************************************************************************
changed: [192.168.56.102]

PLAY RECAP *********************************************************************************************************************
192.168.56.102             : ok=34   changed=11   unreachable=0    failed=0    skipped=0    rescued=0    ignored=0

qcchavez@workstation:~/CPE212_Chavez_HOA13.1$
```

- This is the screenshot where all of the tasks are working properly and successfully done without errors.

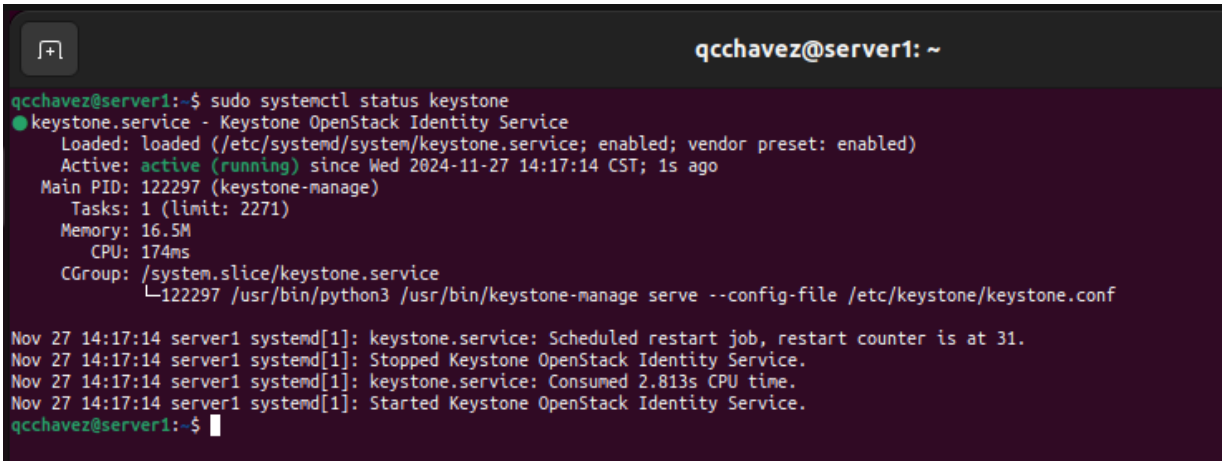
VERIFYING THAT THE REQUIRED ITEMS ARE WORKING

ntp

```
qcchavez@server1:~$ systemctl status ntp
● ntp.service - Network Time Service
     Loaded: loaded (/lib/systemd/system/ntp.service; enabled; vendor preset: enabled)
     Active: active (running) since Wed 2024-11-27 11:57:15 CST; 1h 0min ago
       Docs: man:ntpd(8)
   Main PID: 25024 (ntpd)
      Tasks: 2 (limit: 2271)
     Memory: 840.0K
        CPU: 303ms
     CGroup: /system.slice/ntp.service
             └─25024 /usr/sbin/ntpd -p /var/run/ntpd.pid -g -u 131:139
qcchavez@server1:~$ ntpq -p
     remote           refid      st t when poll reach   delay   offset  jitter
==============================================================================
 0.ubuntu.pool.n .POOL.          16 p    -   64    0    0.000   +0.000   0.000
 1.ubuntu.pool.n .POOL.          16 p    -   64    0    0.000   +0.000   0.000
 2.ubuntu.pool.n .POOL.          16 p    -   64    0    0.000   +0.000   0.000
 3.ubuntu.pool.n .POOL.          16 p    -   64    0    0.000   +0.000   0.000
 ntp.ubuntu.com  .POOL.          16 p    -   64    0    0.000   +0.000   0.000
*185.125.190.56  17.253.28.253    2 u   98  128  377  258.170   +1.063   1.610
+alphyn.canonica 132.163.96.1     2 u   45  128  377  229.514   +5.719   0.866
+185.125.190.58  17.253.28.123    2 u   85  128  377  257.311   +1.006   2.437
-185.125.190.57  17.253.28.251    2 u  107  128  377  246.574   -7.672   1.888
qcchavez@server1:~$
```

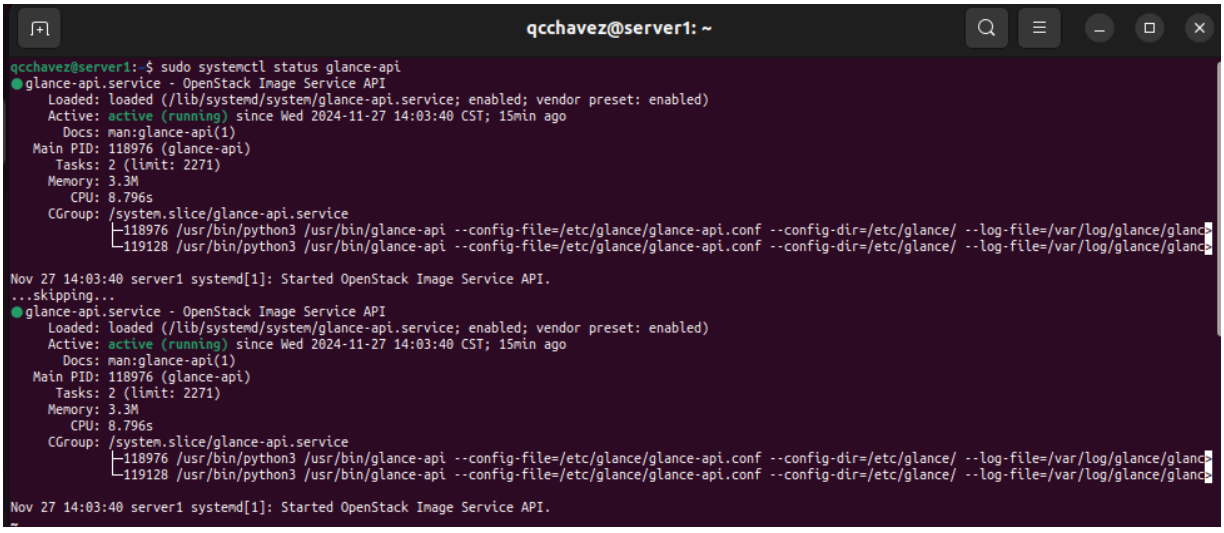
- In this screenshot, it shows that the **ntp** package is active or currently running.

keystone



- In this screenshot, it shows that the **keystone** package is active or currently running.

glance



- In this screenshot, it shows that the **glance** package is active or currently running.

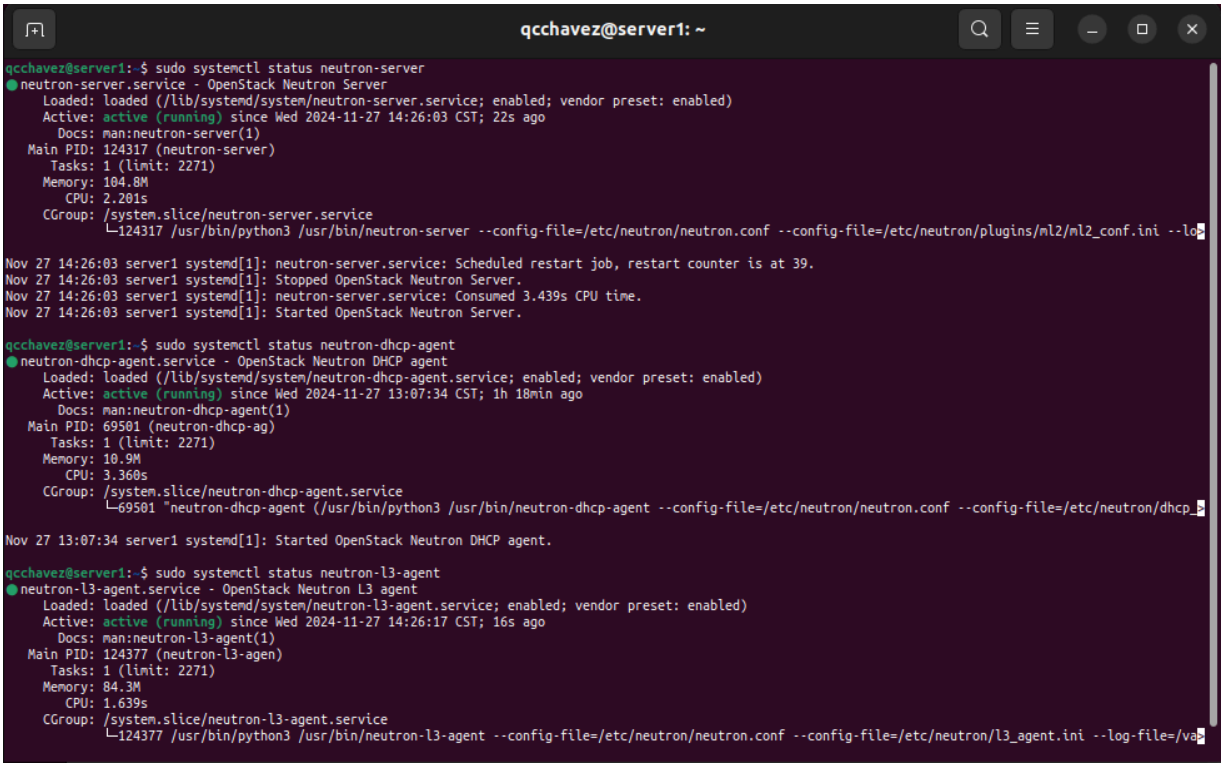
nova-api, nova-scheduler, nova-conductor

```
qcchavez@server1:~$ sudo systemctl status nova-api
● nova-api.service - OpenStack Compute API
     Loaded: loaded (/lib/systemd/system/nova-api.service; enabled; vendor preset: enabled)
     Active: active (running) since Wed 2024-11-27 14:03:56 CST; 15min ago
       Docs: man:nova-api(1)
   Main PID: 119031 (nova-api)
      Tasks: 3 (limit: 2271)
     Memory: 80.9M
        CPU: 1min 40.897s
     CGroup: /system.slice/nova-api.service
             ├─119031 /usr/bin/python3 /usr/bin/nova-api --config-file=/etc/nova/nova.conf --log-file=/var/log/nova/nova-api.log
             ├─122804 /usr/bin/python3 /usr/bin/nova-api --config-file=/etc/nova/nova.conf --log-file=/var/log/nova/nova-api.log
             └─122806 /usr/bin/python3 /usr/bin/nova-api --config-file=/etc/nova/nova.conf --log-file=/var/log/nova/nova-api.log

Nov 27 14:03:56 server1 systemd[1]: Started OpenStack Compute API.
Nov 27 14:04:04 server1 nova-api[119031]: Modules with known eventlet monkey patching issues were imported prior to eventlet monkey patching: urllib3. This war
lines 1-15/15 (END)
qcchavez@server1:~$
```

```
qcchavez@server1:~$ sudo systemctl status nova-scheduler
● nova-scheduler.service - OpenStack Compute Scheduler
     Loaded: loaded (/lib/systemd/system/nova-scheduler.service; enabled; vendor preset: enabled)
     Active: active (running) since Wed 2024-11-27 14:20:40 CST; 6s ago
       Docs: man:nova-scheduler(1)
   Main PID: 123045 (nova-scheduler)
      Tasks: 1 (limit: 2271)
     Memory: 35.0M
        CPU: 607ms
     CGroup: /system.slice/nova-scheduler.service
             └─123045 /usr/bin/python3 /usr/bin/nova-scheduler --config-file=/etc/nova/nova.conf --log-file=/var/log/nova/nova-scheduler.log

Nov 27 14:20:40 server1 systemd[1]: nova-scheduler.service: Scheduled restart job, restart counter is at 225.
Nov 27 14:20:40 server1 systemd[1]: Stopped OpenStack Compute Scheduler.
Nov 27 14:20:40 server1 systemd[1]: nova-scheduler.service: Consumed 2.318s CPU time.
Nov 27 14:20:40 server1 systemd[1]: Started OpenStack Compute Scheduler.
Nov 27 14:20:46 server1 nova-scheduler[123045]: Modules with known eventlet monkey patching issues were imported prior to eventlet monkey patching: urllib3. Th

qcchavez@server1:~$ sudo systemctl status nova-conductor
● nova-conductor.service - OpenStack Compute Conductor
     Loaded: loaded (/lib/systemd/system/nova-conductor.service; enabled; vendor preset: enabled)
     Active: active (running) since Wed 2024-11-27 14:20:40 CST; 16s ago
       Docs: man:nova-conductor(1)
   Main PID: 123039 (nova-conductor)
      Tasks: 1 (limit: 2271)
     Memory: 84.4M
        CPU: 1.548s
     CGroup: /system.slice/nova-conductor.service
             └─123039 /usr/bin/python3 /usr/bin/nova-conductor --config-file=/etc/nova/nova.conf --log-file=/var/log/nova/nova-conductor.log

Nov 27 14:20:40 server1 systemd[1]: nova-conductor.service: Scheduled restart job, restart counter is at 230.
Nov 27 14:20:40 server1 systemd[1]: Stopped OpenStack Compute Conductor.
Nov 27 14:20:40 server1 systemd[1]: nova-conductor.service: Consumed 2.283s CPU time.
Nov 27 14:20:40 server1 systemd[1]: Started OpenStack Compute Conductor.
Nov 27 14:20:45 server1 nova-conductor[123039]: Modules with known eventlet monkey patching issues were imported prior to eventlet monkey patching: urllib3. Th
```

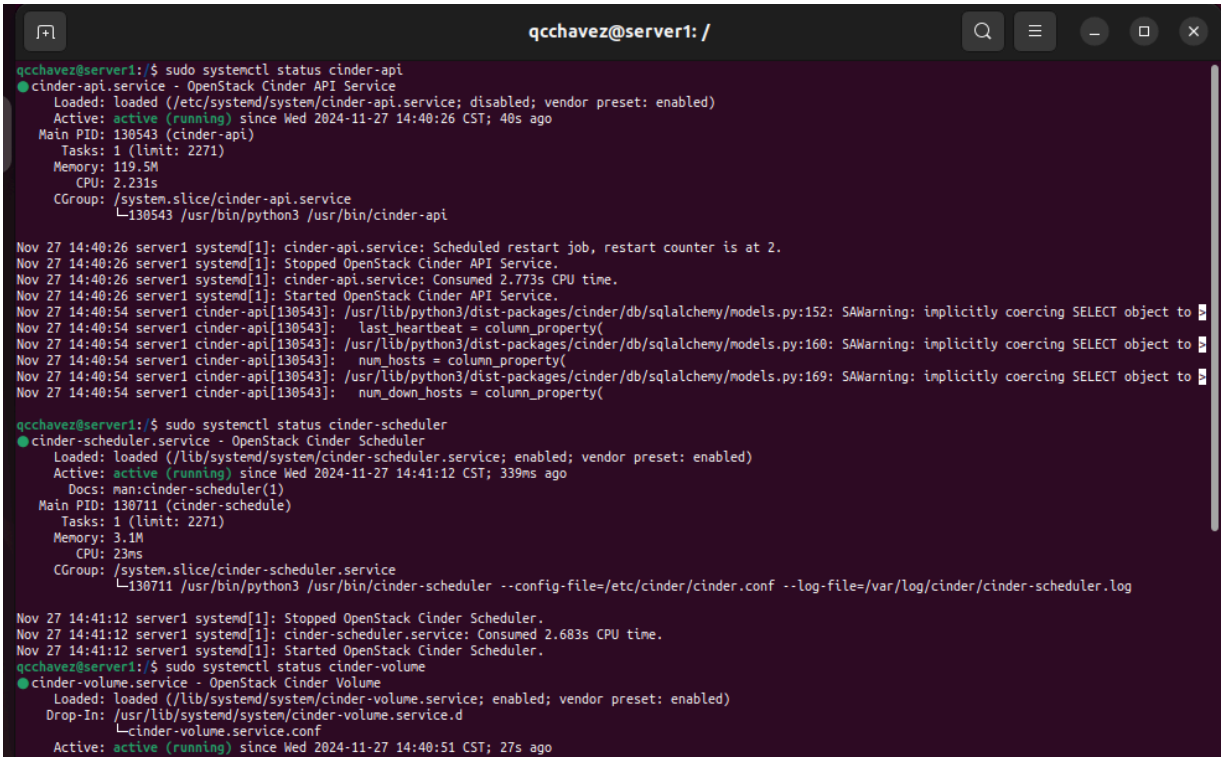
- In this screenshot, it shows that the **nova-api, nova-scheduler, nova-conductor** package is active or currently running.

neutron-server, neutron-dhcp-agent, neutron-l3-agent



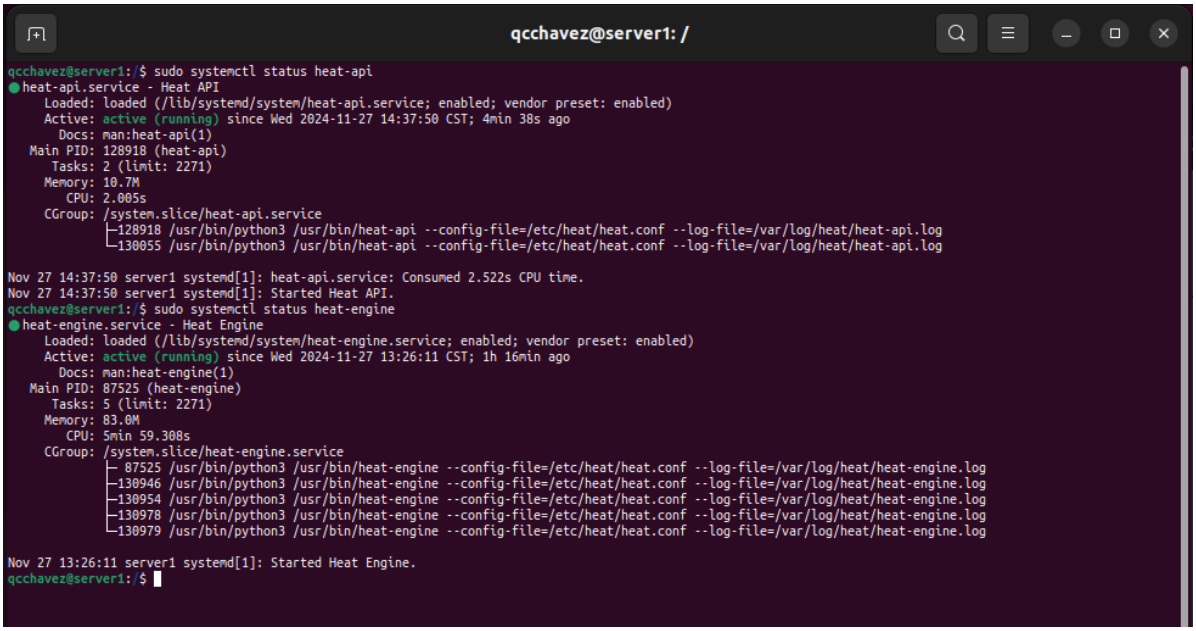
- In this screenshot, it shows that the **neutron-server, neutron-dhcp-agent, neutron-l3-agent** package is active or currently running.

cinder-api, cinder-scheduler, cinder-volume



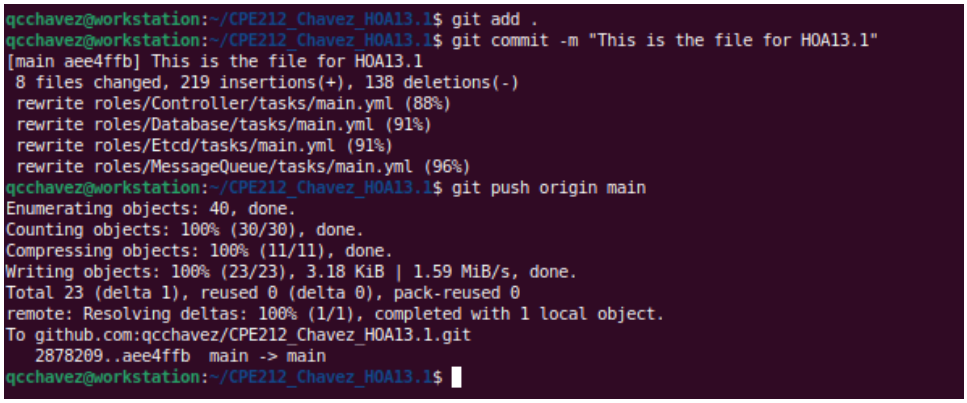
- In this screenshot, it shows that the **cinder-api, cinder-scheduler, cinder-volume** package is active or currently running.

heat-api, heat-engine

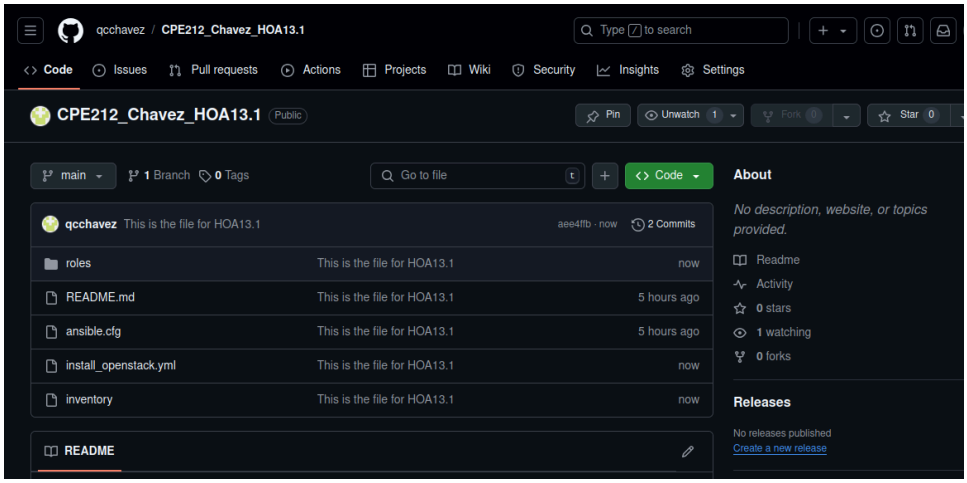


- In this screenshot, it shows that the **heat-api, and heat-engine** package is active or currently running.

TASK 4.2H



- In this screenshot, it shows that I've added, committed, and pushed my repository to Github.



- In this screenshot, it shows that it is now updated in Github.

Reflections:

Answer the following:

1. What are the benefits of implementing OpenStack?
   - The benefits of implementing OpenStack is that it enhances the security with robust access control, and allows full data and infrastructure management which ensures compliance and control.

Conclusions:

- In this activity, it involved installing and configuring several packages, such as MariaDB, OpenStack, and its packages, and etc. The process included setting up several configuration files, the settings of MariaDB, in order for it to be compatible with OpenStack. I've encountered some issues where several packages does not have a configuration file, and also, when MariaDB failed to start due to potential configuration errors, file permission issues, and port conflicts.