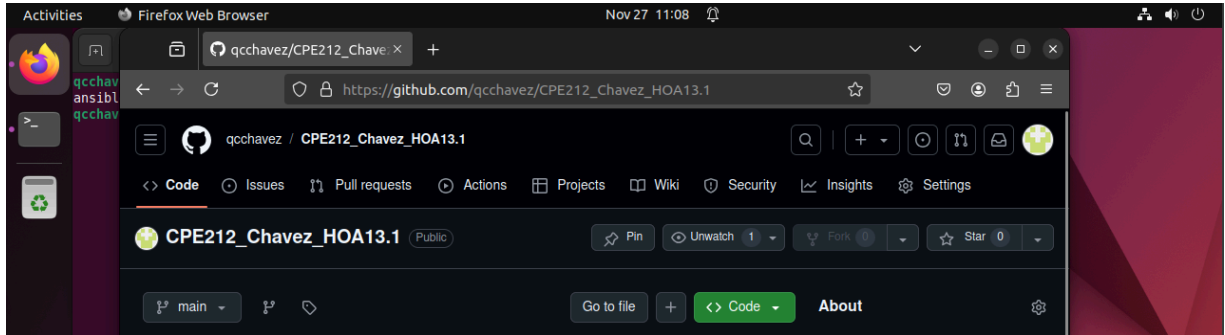


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<b>Course/Section: CPE31S2</b>	<b>Date Submitted: November 30, 2024</b>
<b>Instructor: Engr. Robin Valenzuela</b>	<b>Semester and SY: 1st Sem, 2024-2025</b>
<b>Activity 13: OpenStack Prerequisite Installation</b>	
<b>1. Objectives</b>	
Create a workflow to install OpenStack using Ansible as your Infrastructure as Code (IaC).	
<b>2. Intended Learning Outcomes</b>	
<ol style="list-style-type: none"> <li>1. Analyze the advantages and disadvantages of cloud services</li> <li>2. Evaluate different Cloud deployment and service models</li> <li>3. Create a workflow to install and configure OpenStack base services using Ansible as documentation and execution.</li> </ol>	
<b>3. Resources</b>	
<p>Oracle VirtualBox (Hypervisor)</p> <p>1x Ubuntu VM or Centos VM</p>	
<b>4. Tasks</b>	
<ol style="list-style-type: none"> <li>1. Create a new repository for this activity.</li> <li>2. Create a playbook that converts the steps in the following items in <a href="https://docs.openstack.org/install-guide/">https://docs.openstack.org/install-guide/</a> <ol style="list-style-type: none"> <li>a. NTP</li> <li>b. OpenStack packages</li> <li>c. SQL Database</li> <li>d. Message Queue</li> <li>e. Memcached</li> <li>f. Etcd</li> <li>g. Create different plays in installing per server type (controller, compute etc.) and identify it as a group in the Inventory file.</li> <li>h. Add, commit and push it to your GitHub repo.</li> </ol> </li> </ol>	

## 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.

```

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

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

- name: Enable Nova API service
  service:
    name: nova-api
    state: restarted

- name: Enable Neutron server service
  service:
    name: neutron-server
    state: restarted

- name: Create Cinder API service file
  copy:
    dest: /etc/systemd/system/cinder-api.service
    content: |
      [Unit]
      Description=OpenStack Cinder API Service
      After=network.target

      [Service]
      User=cinder
      ExecStart=/usr/bin/cinder-api
      ExecStop=/bin/kill -TERM $MAINPID
      Restart=always
      LimitNOFILE=8192

      [Install]
      WantedBy=multi-user.target

- name: Enable Cinder API service
  service:
    name: cinder-api
    state: restarted

- name: Enable Heat API service
  service:
    name: heat-api
    state: restarted

```

qcchavez@workstation:~/CPE212\_Chavez\_H0A13.1/roles/Controller/tasks\$

- 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_H0A13.1/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_H0A13.1/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_H0A13.1/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_H0A13.1/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

```
qcchavez@workstation: ~/CPE212_Chavez_HOA13.1
tree
.
├── ansible.cfg
├── install_openstack.yml
├── inventory
├── README.md
└── roles
    ├── Compute
    │   ├── tasks
    │   └── main.yml
    ├── Controller
    │   ├── tasks
    │   └── main.yml
    ├── Database
    │   ├── tasks
    │   └── main.yml
    ├── Etcd
    │   ├── tasks
    │   └── main.yml
    ├── Memcached
    │   ├── tasks
    │   └── main.yml
    └── MessageQueue
        ├── tasks
        └── main.yml

13 directories, 10 files
qcchavez@workstation:~/CPE212_Chavez_HOA13.1$ cat inventory
[Controller]
#Server 1
192.168.56.102

[Compute]
#Server 1
192.168.56.102

[Database]
#Server 1
192.168.56.102

[MessageQueue]
#Server 1
192.168.56.102

[Memcached]
#Server 1
192.168.56.102

[Etcd]
#Server 1
192.168.56.102
```

- 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_H0A13.1$ 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

```
es  Terminal  Nov 27 14:59  [bell icon]

qcchavez@workstation: ~/CPE212_Chavez_HOA13.1

qcchavez@workstation:~/CPE212_Chavez_HOA13.1$ ansible-playbook --ask-become-pass install_openstack.yml
BECOME password:

PLAY [Update repository indexes] *****
TASK [Gathering Facts] *****
ok: [192.168.56.102]
TASK [Update repository index (Ubuntu)] *****
changed: [192.168.56.102]
PLAY [Install and configure Controller role] *****
TASK [Gathering Facts] *****
ok: [192.168.56.102]
TASK [Controller : Install NTP package] *****
ok: [192.168.56.102]
TASK [Controller : Ensure NTP service is started and enabled] *****
ok: [192.168.56.102]
TASK [Controller : Install OpenStack packages on Controller node] *****
ok: [192.168.56.102]
TASK [Controller : Create Keystone service file] *****
ok: [192.168.56.102]
TASK [Controller : Enable Keystone service] *****
changed: [192.168.56.102]
TASK [Controller : Enable Glance service] *****
changed: [192.168.56.102]
TASK [Controller : Enable Nova API service] *****
changed: [192.168.56.102]
TASK [Controller : Enable Neutron server service] *****
changed: [192.168.56.102]
TASK [Controller : Create Cinder API service file] *****
ok: [192.168.56.102]
TASK [Controller : Enable Cinder API service] *****
changed: [192.168.56.102]
TASK [Controller : Enable Heat API service] *****
changed: [192.168.56.102]
PLAY [Install and configure Compute role] *****
TASK [Gathering Facts] *****
ok: [192.168.56.102]
TASK [Compute : Install Compute service] *****
```

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

```
es  Terminal  Nov 27 15:00  [bell icon]

qcchavez@workstation: ~/CPE212_Chavez_HOA13.1

PLAY [Install and configure Compute role] *****
TASK [Gathering Facts] *****
ok: [192.168.56.102]
TASK [Compute : Install Compute service] *****
ok: [192.168.56.102]
TASK [Compute : Ensure Compute service is running] *****
ok: [192.168.56.102]
PLAY [Install and configure Database role] *****
TASK [Gathering Facts] *****
ok: [192.168.56.102]
TASK [Database : Install MariaDB and dependencies] *****
ok: [192.168.56.102]
TASK [Database : Configure MariaDB for OpenStack] *****
ok: [192.168.56.102]
TASK [Database : Enable MariaDB service] *****
changed: [192.168.56.102]
PLAY [Install and configure Message Queue role] *****
TASK [Gathering Facts] *****
ok: [192.168.56.102]
TASK [MessageQueue : Install RabbitMQ] *****
ok: [192.168.56.102]
TASK [MessageQueue : Enable RabbitMQ service] *****
ok: [192.168.56.102]
TASK [MessageQueue : Add RabbitMQ user for OpenStack] *****
ok: [192.168.56.102]
TASK [MessageQueue : Set permissions for RabbitMQ user] *****
changed: [192.168.56.102]
PLAY [Install and configure Memcached role] *****
TASK [Gathering Facts] *****
ok: [192.168.56.102]
TASK [Memcached : Install Memcached] *****
ok: [192.168.56.102]
TASK [Memcached : Configure Memcached to listen on all interfaces] *****
ok: [192.168.56.102]
TASK [Memcached : Enable Memcached service] *****
changed: [192.168.56.102]
```

- 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_H0A13.1$

```

- 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

```

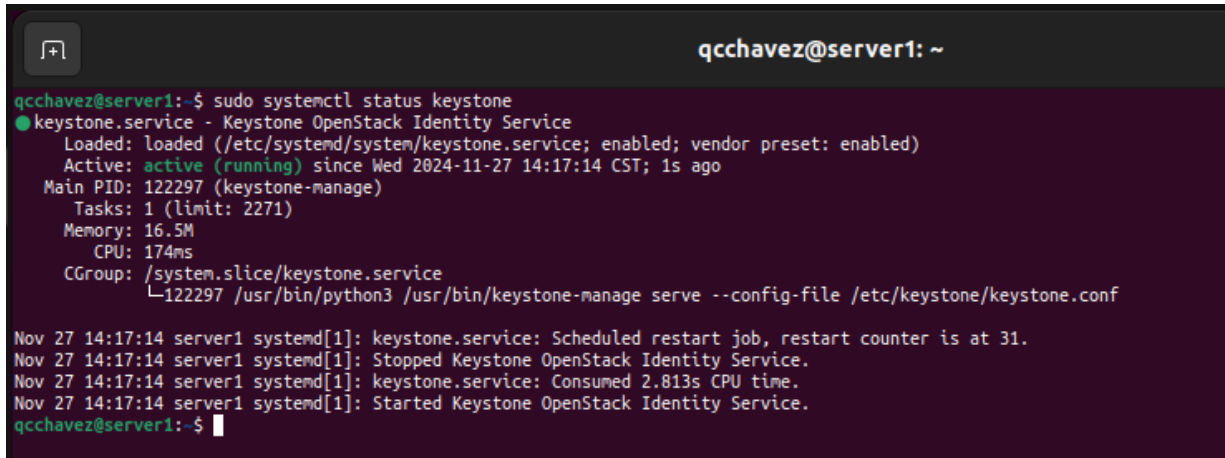
qcchavez@server1:~$ systemctl status ntp
● ntp.service - Network Time Service
   Loaded: loaded (/lib/systemd/system/ntp.service; enabled; vendor preset: enabled)
   Active: active (running) since Wed 2024-11-27 11:57:15 CST; 1h 0min ago
     Docs: man:ntpd(8)
    Main PID: 25024 (ntpd)
      Tasks: 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.

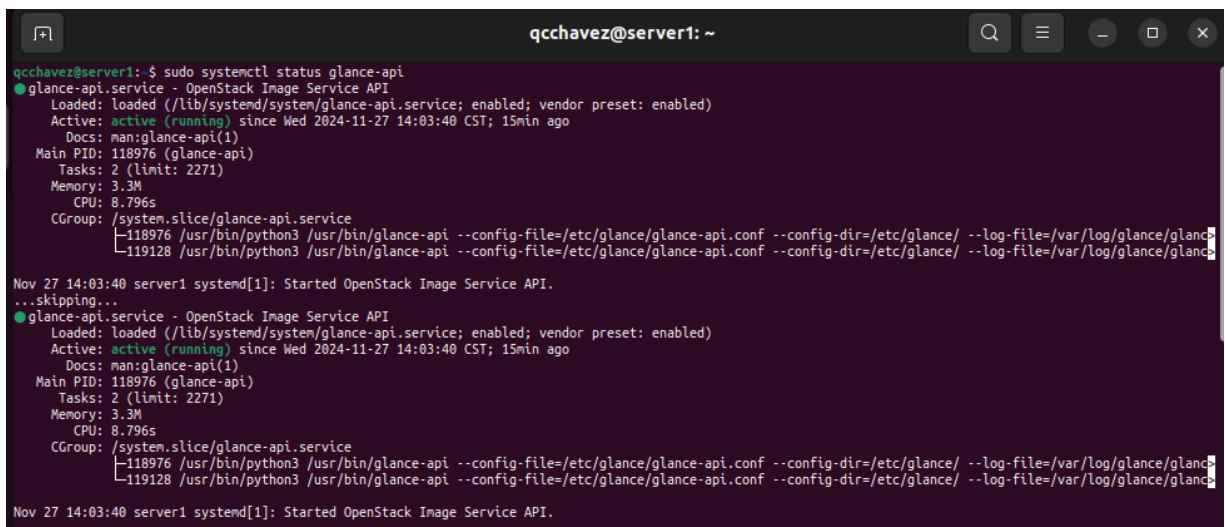
## keystone



```
qcchavez@server1: ~  
qcchavez@server1:~$ sudo systemctl status keystone  
● keystone.service - Keystone OpenStack Identity Service  
   Loaded: loaded (/etc/systemd/system/keystone.service; enabled; vendor preset: enabled)  
   Active: active (running) since Wed 2024-11-27 14:17:14 CST; 1s ago  
     Main PID: 122297 (keystone-manage)  
       Tasks: 1 (limit: 2271)  
      Memory: 16.5M  
         CPU: 174ms  
    CGroup: /system.slice/keystone.service  
            └─122297 /usr/bin/python3 /usr/bin/keystone-manage serve --config-file /etc/keystone/keystone.conf  
  
Nov 27 14:17:14 server1 systemd[1]: keystone.service: Scheduled restart job, restart counter is at 31.  
Nov 27 14:17:14 server1 systemd[1]: Stopped Keystone OpenStack Identity Service.  
Nov 27 14:17:14 server1 systemd[1]: keystone.service: Consumed 2.813s CPU time.  
Nov 27 14:17:14 server1 systemd[1]: Started Keystone OpenStack Identity Service.  
qcchavez@server1:~$
```

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

## glance



```
qcchavez@server1: ~  
qcchavez@server1:~$ sudo systemctl status glance-api  
● glance-api.service - OpenStack Image Service API  
   Loaded: loaded (/lib/systemd/system/glance-api.service; enabled; vendor preset: enabled)  
   Active: active (running) since Wed 2024-11-27 14:03:40 CST; 15min ago  
     Docs: man:glance-api(1)  
    Main PID: 118976 (glance-api)  
       Tasks: 2 (limit: 2271)  
      Memory: 3.3M  
         CPU: 8.796s  
    CGroup: /system.slice/glance-api.service  
            └─118976 /usr/bin/python3 /usr/bin/glance-api --config-file=/etc/glance/glance-api.conf --config-dir=/etc/glance/ --log-file=/var/log/glance/glance-  
              └─119128 /usr/bin/python3 /usr/bin/glance-api --config-file=/etc/glance/glance-api.conf --config-dir=/etc/glance/ --log-file=/var/log/glance/glance-  
  
Nov 27 14:03:40 server1 systemd[1]: Started OpenStack Image Service API.  
...skipping...  
● glance-api.service - OpenStack Image Service API  
   Loaded: loaded (/lib/systemd/system/glance-api.service; enabled; vendor preset: enabled)  
   Active: active (running) since Wed 2024-11-27 14:03:40 CST; 15min ago  
     Docs: man:glance-api(1)  
    Main PID: 118976 (glance-api)  
       Tasks: 2 (limit: 2271)  
      Memory: 3.3M  
         CPU: 8.796s  
    CGroup: /system.slice/glance-api.service  
            └─118976 /usr/bin/python3 /usr/bin/glance-api --config-file=/etc/glance/glance-api.conf --config-dir=/etc/glance/ --log-file=/var/log/glance/glance-  
              └─119128 /usr/bin/python3 /usr/bin/glance-api --config-file=/etc/glance/glance-api.conf --config-dir=/etc/glance/ --log-file=/var/log/glance/glance-  
  
Nov 27 14:03:40 server1 systemd[1]: Started OpenStack Image Service API.
```

- 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

```
qchavez@server1: ~  
qchavez@server1:~$ sudo systemctl status neutron-server  
● neutron-server.service - OpenStack Neutron Server  
   Loaded: loaded (/lib/systemd/system/neutron-server.service; enabled; vendor preset: enabled)  
   Active: active (running) since Wed 2024-11-27 14:26:03 CST; 22s ago  
     Docs: man:neutron-server(1)  
   Main PID: 124317 (neutron-server)  
     Tasks: 1 (limit: 2271)  
    Memory: 104.8M  
       CPU: 2.201s  
   CGroup: /system.slice/neutron-server.service  
           └─124317 /usr/bin/python3 /usr/bin/neutron-server --config-file=/etc/neutron/neutron.conf --config-file=/etc/neutron/plugins/ml2/ml2_conf.ini --log-file=/var/log/neutron.log  
  
Nov 27 14:26:03 server1 systemd[1]: neutron-server.service: Scheduled restart job, restart counter is at 39.  
Nov 27 14:26:03 server1 systemd[1]: Stopped OpenStack Neutron Server.  
Nov 27 14:26:03 server1 systemd[1]: neutron-server.service: Consumed 3.439s CPU time.  
Nov 27 14:26:03 server1 systemd[1]: Started OpenStack Neutron Server.  
  
qchavez@server1:~$ sudo systemctl status neutron-dhcp-agent  
● neutron-dhcp-agent.service - OpenStack Neutron DHCP agent  
   Loaded: loaded (/lib/systemd/system/neutron-dhcp-agent.service; enabled; vendor preset: enabled)  
   Active: active (running) since Wed 2024-11-27 13:07:34 CST; 1h 18min ago  
     Docs: man:neutron-dhcp-agent(1)  
   Main PID: 69501 (neutron-dhcp-ag)  
     Tasks: 1 (limit: 2271)  
    Memory: 10.9M  
       CPU: 3.360s  
   CGroup: /system.slice/neutron-dhcp-agent.service  
           └─69501 "neutron-dhcp-agent (/usr/bin/python3 /usr/bin/neutron-dhcp-agent --config-file=/etc/neutron/neutron.conf --config-file=/etc/neutron/dhcp.conf --log-file=/var/log/neutron.log)  
  
Nov 27 13:07:34 server1 systemd[1]: Started OpenStack Neutron DHCP agent.  
  
qchavez@server1:~$ sudo systemctl status neutron-l3-agent  
● neutron-l3-agent.service - OpenStack Neutron L3 agent  
   Loaded: loaded (/lib/systemd/system/neutron-l3-agent.service; enabled; vendor preset: enabled)  
   Active: active (running) since Wed 2024-11-27 14:26:17 CST; 16s ago  
     Docs: man:neutron-l3-agent(1)  
   Main PID: 124377 (neutron-l3-agent)  
     Tasks: 1 (limit: 2271)  
    Memory: 84.3M  
       CPU: 1.639s  
   CGroup: /system.slice/neutron-l3-agent.service  
           └─124377 /usr/bin/python3 /usr/bin/neutron-l3-agent --config-file=/etc/neutron/neutron.conf --config-file=/etc/neutron/l3_agent.ini --log-file=/var/log/neutron.log
```

- 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

```
qcchavez@server1: /
qcchavez@server1:~$ sudo systemctl status cinder-api
● cinder-api.service - OpenStack Cinder API Service
   Loaded: loaded (/etc/systemd/system/cinder-api.service; disabled; vendor preset: enabled)
   Active: active (running) since Wed 2024-11-27 14:40:26 CST; 40s ago
     Main PID: 130543 (cinder-api)
       Tasks: 1 (limit: 2271)
      Memory: 119.5M
         CPU: 2.231s
        CGroup: /system.slice/cinder-api.service
                └─130543 /usr/bin/python3 /usr/bin/cinder-api

Nov 27 14:40:26 server1 systemd[1]: cinder-api.service: Scheduled restart job, restart counter is at 2.
Nov 27 14:40:26 server1 systemd[1]: Stopped OpenStack Cinder API Service.
Nov 27 14:40:26 server1 systemd[1]: cinder-api.service: Consumed 2.773s CPU time.
Nov 27 14:40:26 server1 systemd[1]: Started OpenStack Cinder API Service.
Nov 27 14:40:54 server1 cinder-api[130543]: /usr/lib/python3/dist-packages/cinder/db/sqlalchemy/models.py:152: SAWarning: implicitly coercing SELECT object to
Nov 27 14:40:54 server1 cinder-api[130543]: last_heartbeat = column_property(
Nov 27 14:40:54 server1 cinder-api[130543]: /usr/lib/python3/dist-packages/cinder/db/sqlalchemy/models.py:160: SAWarning: implicitly coercing SELECT object to
Nov 27 14:40:54 server1 cinder-api[130543]: num_hosts = column_property(
Nov 27 14:40:54 server1 cinder-api[130543]: /usr/lib/python3/dist-packages/cinder/db/sqlalchemy/models.py:169: SAWarning: implicitly coercing SELECT object to
Nov 27 14:40:54 server1 cinder-api[130543]: num_down_hosts = column_property(

qcchavez@server1:~$ sudo systemctl status cinder-scheduler
● cinder-scheduler.service - OpenStack Cinder Scheduler
   Loaded: loaded (/lib/systemd/system/cinder-scheduler.service; enabled; vendor preset: enabled)
   Active: active (running) since Wed 2024-11-27 14:41:12 CST; 339ms ago
     Docs: man:cinder-scheduler(1)
     Main PID: 130711 (cinder-scheduler)
       Tasks: 1 (limit: 2271)
      Memory: 3.1M
         CPU: 23ms
        CGroup: /system.slice/cinder-scheduler.service
                └─130711 /usr/bin/python3 /usr/bin/cinder-scheduler --config-file=/etc/cinder/cinder.conf --log-file=/var/log/cinder/cinder-scheduler.log

Nov 27 14:41:12 server1 systemd[1]: Stopped OpenStack Cinder Scheduler.
Nov 27 14:41:12 server1 systemd[1]: cinder-scheduler.service: Consumed 2.683s CPU time.
Nov 27 14:41:12 server1 systemd[1]: Started OpenStack Cinder Scheduler.
qcchavez@server1:~$ sudo systemctl status cinder-volume
● cinder-volume.service - OpenStack Cinder Volume
   Loaded: loaded (/lib/systemd/system/cinder-volume.service; enabled; vendor preset: enabled)
   Drop-In: /usr/lib/systemd/system/cinder-volume.service.d
           └─cinder-volume.service.conf
   Active: active (running) since Wed 2024-11-27 14:40:51 CST; 27s ago
```

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

## heat-api, heat-engine

```
qcchavez@server1: /  
qcchavez@server1:~$ sudo systemctl status heat-api  
● heat-api.service - Heat API  
   Loaded: loaded (/lib/systemd/system/heat-api.service; enabled; vendor preset: enabled)  
   Active: active (running) since Wed 2024-11-27 14:37:50 CST; 4min 38s ago  
     Docs: man:heat-api(1)  
  Main PID: 128918 (heat-api)  
    Tasks: 2 (limit: 2271)  
   Memory: 10.7M  
      CPU: 2.005s  
   CGroup: /system.slice/heat-api.service  
           └─128918 /usr/bin/python3 /usr/bin/heat-api --config-file=/etc/heat/heat.conf --log-file=/var/log/heat/heat-api.log  
           └─130055 /usr/bin/python3 /usr/bin/heat-api --config-file=/etc/heat/heat.conf --log-file=/var/log/heat/heat-api.log  
  
Nov 27 14:37:50 server1 systemd[1]: heat-api.service: Consumed 2.522s CPU time.  
Nov 27 14:37:50 server1 systemd[1]: Started Heat API.  
qcchavez@server1:~$ sudo systemctl status heat-engine  
● heat-engine.service - Heat Engine  
   Loaded: loaded (/lib/systemd/system/heat-engine.service; enabled; vendor preset: enabled)  
   Active: active (running) since Wed 2024-11-27 13:26:11 CST; 1h 16min ago  
     Docs: man:heat-engine(1)  
  Main PID: 87525 (heat-engine)  
    Tasks: 5 (limit: 2271)  
   Memory: 83.0M  
      CPU: 5min 59.308s  
   CGroup: /system.slice/heat-engine.service  
           └─87525 /usr/bin/python3 /usr/bin/heat-engine --config-file=/etc/heat/heat.conf --log-file=/var/log/heat/heat-engine.log  
           └─130946 /usr/bin/python3 /usr/bin/heat-engine --config-file=/etc/heat/heat.conf --log-file=/var/log/heat/heat-engine.log  
           └─130954 /usr/bin/python3 /usr/bin/heat-engine --config-file=/etc/heat/heat.conf --log-file=/var/log/heat/heat-engine.log  
           └─130978 /usr/bin/python3 /usr/bin/heat-engine --config-file=/etc/heat/heat.conf --log-file=/var/log/heat/heat-engine.log  
           └─130979 /usr/bin/python3 /usr/bin/heat-engine --config-file=/etc/heat/heat.conf --log-file=/var/log/heat/heat-engine.log  
  
Nov 27 13:26:11 server1 systemd[1]: Started Heat Engine.  
qcchavez@server1:~$
```

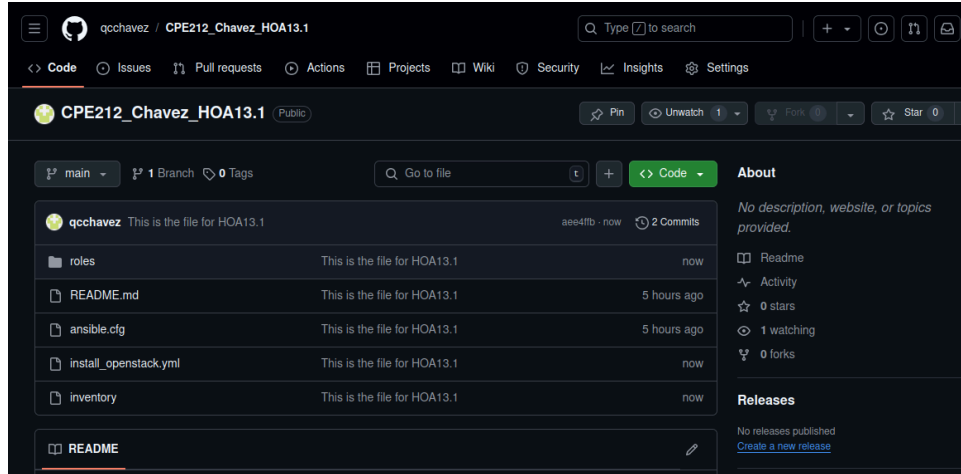
- In this screenshot, it shows that the **heat-api**, and **heat-engine** package is active or currently running.

## TASK 4.2H

```
qcchavez@workstation:~/CPE212_Chavez_H0A13.1$ git add .  
qcchavez@workstation:~/CPE212_Chavez_H0A13.1$ git commit -m "This is the file for H0A13.1"  
[main aee4ffb] This is the file for H0A13.1  
 8 files changed, 219 insertions(+), 138 deletions(-)  
rewrite roles/Controller/tasks/main.yml (88%)  
rewrite roles/Database/tasks/main.yml (91%)  
rewrite roles/Etcd/tasks/main.yml (91%)  
rewrite roles/MessageQueue/tasks/main.yml (96%)  
qcchavez@workstation:~/CPE212_Chavez_H0A13.1$ git push origin main  
Enumerating objects: 40, done.  
Counting objects: 100% (30/30), done.  
Compressing objects: 100% (11/11), done.  
Writing objects: 100% (23/23), 3.18 KiB | 1.59 MiB/s, done.  
Total 23 (delta 1), reused 0 (delta 0), pack-reused 0  
remote: Resolving deltas: 100% (1/1), completed with 1 local object.  
To github.com:qcchavez/CPE212_Chavez_H0A13.1.git  
 2878209..aee4ffb  main -> main  
qcchavez@workstation:~/CPE212_Chavez_H0A13.1$
```

- 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.