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Course/Section: CPE232/CPE31S4	**Date Submitted:** 12/08/2023
Instructor: Dr. Jonathan V. Taylar	**Semester and SY:** 1st Sem 2023-2024

Activity 14: OpenStack Installation (Keystone, Glance, Nova)

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)

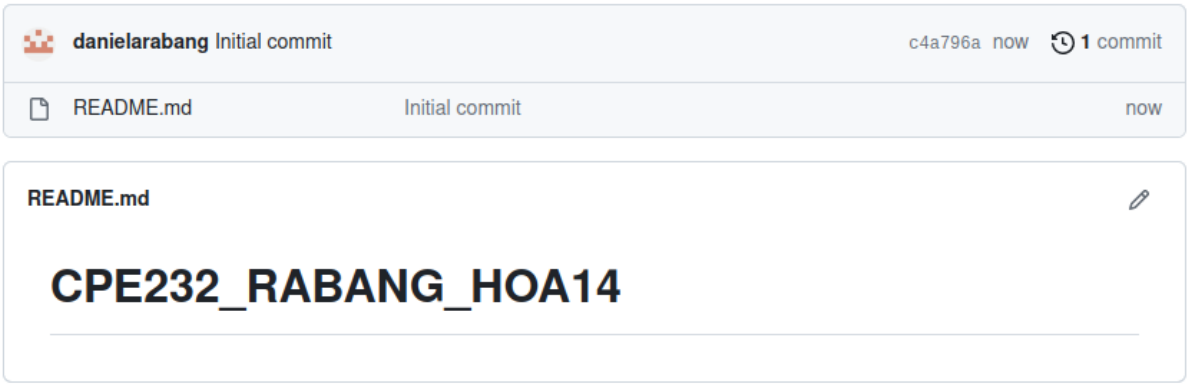
1x Ubuntu VM or Centos VM

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. Keystone (Identity Service)
    b. Glance (Imaging Service)
    c. Nova (Compute Service)
    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 (screenshots and explanations)

Create a new repository.



Clone the repository.

```
daniela@workstation:~$ git clone https://github.com/danielarabang/CPE232_RABANG_HOA14.git
Cloning into 'CPE232_RABANG_HOA14'...
remote: Enumerating objects: 3, done.
remote: Counting objects: 100% (3/3), done.
Receiving objects: 100% (3/3), done.
remote: Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
```

Create an inventory file.

```
 GNU nano 6.2                                          inventory *
[Ubuntu]
192.168.56.110  ansible_python_interpreter=/usr/bin/python3

[CentOS]
192.168.56.105  ansible_python_interpreter=/usr/bin/python
```

Create an ansible.cfg file

```
  GNU nano 6.2                                        ansible.cfg *
[defaults]

inventory = inventory
host_key checking = False

deprecation_warning = False

remote_user = daniela
private_key_file = ~/.ssh/
```

Create a directory roles and add the Ubuntu role that have a directory inside that have a playbook inside that is named main.yml

```
daniela@workstation:~/CPE232_RABANG_HOA14$ mkdir roles
daniela@workstation:~/CPE232_RABANG_HOA14$ cd roles
daniela@workstation:~/CPE232_RABANG_HOA14/roles$ mkdir Ubuntu
```

```
daniela@workstation:~/CPE232_RABANG_HOA14$ cd roles
daniela@workstation:~/CPE232_RABANG_HOA14/roles$ cd Ubuntu
daniela@workstation:~/CPE232_RABANG_HOA14/roles/Ubuntu$ mkdir tasks
daniela@workstation:~/CPE232_RABANG_HOA14/roles/Ubuntu$ cd tasks
daniela@workstation:~/CPE232_RABANG_HOA14/roles/Ubuntu/tasks$ sudo nano main.yml
```

Create an install.yml playbook that will be run.

```
 GNU nano 6.2                                                  install.yml *
- hosts: all
  become: true
  pre_tasks:

  - name: install updates Ubuntu
    apt:
      upgrade: dist
      update_cache: yes
    when: ansible_distribution == "Ubuntu"

- hosts: Ubuntu
  become: true
  roles:
    - Ubuntu
```

Input:

```
 GNU nano 6.2                                                    main.yml *
- name: Install Glance
  package:
    name: glance
    state: latest

- name: Configure Glance database
  replace:
    dest: /etc/glance/glance-api.conf
    regexp: 'connection = mysql+pymysql://glance:GLANCE_DBPASS@controller/glance'
    replace: 'connection = mysql+pymysql://glance:admin123@controller/glance'
    backup: yes

- name: Configure Glance Authentication Key
  lineinfile:
    dest: /etc/glance/glance-api.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 = glance
    - password = admin123

- name: Configure Glance paste_deploy
  lineinfile:
    dest: /etc/glance/glance-api.conf
    insertafter: '\[paste_deploy\]'
    line: 'flavor = keystone'
    backup: yes

- name: Configure Glance glance_store
  lineinfile:
    dest: /etc/glance/glance-api.conf
    insertafter: '\[glance_store\]'
    line: "{{ item }}"
    state: present
    backup: yes
  with_items:
    - stores = file,http
    - default_store = file
    - filesystem_store_datadir = /var/lib/glance/images/
```

```
  GNU nano 6.2                                                main.yml *
- name: Configure Glance oslo_limit
  lineinfile:
    dest: /etc/glance/glance-api.conf
    insertafter: '\[oslo_limit\]'
    line: "{{ item }}"
    state: present
    backup: yes
  with_items:
    - auth_url = http://controller:5000
    - auth_type = password
    - user_domain_id = default
    - username = MY_SERVICE
    - system_scope = all
    - password = MY_PASSWORD
    - endpoint_id = ENDPOINT_ID
    - region_name = RegionOne

- name: Configure Glance DEFAULT
  lineinfile:
    dest: /etc/glance/glance-api.conf
    insertafter: '\[DEFAULT\]'
    line: 'use_keystone_limits = True'
    backup: yes

- name: Populating Image Service Database
  shell: sudo glance-manage db_sync

- name: Installing Keystone (Ubuntu)
  apt:
    name: keystone
    state: latest

- name: Configuring Config File
  lineinfile:
    dest: /etc/keystone/keystone.conf
    insertafter: '\[database\]'
    regexp: 'connection = mysql+pymysql://keystone:KEYSTONE_DBPASS@controller/keystone'
    line: 'connection = mysql+pymysql://keystone:admin123@controller/keystone'
    backup: yes
    backrefs: yes

- name: Configuring Config File
  lineinfile:
    dest: /etc/keystone/keystone.conf
    insertafter: '\[token\]'
    line: 'provider = fernet'
    backup: yes
```

```
  GNU nano 6.2                                                main.yml *
- name: Populating the Database
  shell:
    sudo keystone-manage db_sync

- name: Initialize Fernet Key
  shell:
    keystone-manage fernet_setup --keystone-user keystone --keystone-group keystone

- name: Initialize Fernet Key
  shell:
     keystone-manage credential_setup --keystone-user keystone --keystone-group keystone

- name: Configuring the Apache (HTTP) Server
  lineinfile:
    dest: /etc/apache2/apache2.conf
    line: 'ServerName controller'
    state: present
    backup: yes

- name: Configure Administrative Account Environmental Variables
  shell:
    export OS_USERNAME=admin
    export OS_PASSWORD=ADMIN_PASS
    export OS_PROJECT_NAME=admin
    export OS_USER_DOMANI_NAME=Default
    export OS_PROJECT_DOMAIN_NAME=Default
    export OS_AUTH_URL=http://controller:5000/v3
    export OS_IDENTITY_API_VERSION=3

- name: Installing Nova (Ubuntu)
  apt:
    name:
      - nova-api
      - nova-conductor
      - nova-novncproxy
      - nova-scheduler
    state: latest

- name: Configuring Nova API
  lineinfile:
    dest: /etc/nova/nova.conf
    regexp: connection = mysql+pymysql://nova:NOVA_DBPASS@controller/nova_api
    line: connection = mysql+pymysql://nova:admin123@controller/nova_api
    backup: yes
    backrefs: yes
```

```
 GNU nano 6.2                                                  main.yml *
- name: Configure Nova API
  lineinfile:
    dest: /etc/nova/nova.conf
    insertafter: '\[api\]'
    line: 'auth_strategy = keystone'
    state: present
    backup: yes

- name: Configuring Nova Database
  lineinfile:
    dest: /etc/nova/nova.conf
    regexp: mysql+pymysql://nova:NOVA_DBPASS@controller/nova
    line: mysql+pymysql://nova:admin123@controller/nova
    backup: yes
    backrefs: yes

- name: Configure Nova Authentication Token (for Keystone)
  lineinfile:
    dest: /etc/glance/glance-api.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 = nova
    - password = admin123

- name: Configure Nova VNC
  lineinfile:
    dest: /etc/glance/glance-api.conf
    insertafter: '\[vnc\]'
    line: "{{ item }}"
    state: present
    backup: yes

  with_items:
    - enabled = true
    - server_listen = $my_ip
    - server_proxyclient_address = $my_ip
```

```
 GNU nano 6.2                                                  main.yml *
- name: Configure Nova placement
  lineinfile:
    dest: /etc/glance/glance-api.conf
    insertafter: '\[placement\]'
    line: "{{ item }}"
    state: present
    backup: yes

  with_items:
    - region_name = RegionOne
    - project_domain_name = Default
    - project_name = service
    - auth_type = password
    - user_domain_name = Default
    - auth_url = http://controller:5000/v3
    - username = placement
    - password = admin123

- name: Configure Nova Default
  lineinfile:
    dest: /etc/nova/nova.conf
    line: 'my_ip = 10.0.0.11'
    state: present
    backup: yes

- name: Configure Nova Glance
  lineinfile:
    dest: /etc/nova/nova.conf
    line: 'api_server = http://controller:9292'
    state: present
    backup: yes

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

- name: Additional Configuration of Nova
  shell:
    sudo nova-manage api_db sync

- name: Additional Configuration
  shell:
    sudo nova-manage cell_v2 map_cell0
```

```
- name: Additional Configuration
  shell:
    sudo nova-manage db sync

- name: Additional Configuration
  shell:
    sudo nova-manage cell_v2 list_cells
```

Process:

```
daniela@workstation:~/CPE232_RABANG_HOA14$ ansible-playbook --ask-become-pass install.yml
BECOME password:

PLAY [all] *********************************************************************************************************************************************************

TASK [Gathering Facts] *********************************************************************************************************************************************
ok: [192.168.56.105]
ok: [192.168.56.110]

TASK [install updates Ubuntu] **************************************************************************************************************************************
skipping: [192.168.56.105]
ok: [192.168.56.110]

PLAY [Ubuntu] ******************************************************************************************************************************************************

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

TASK [Ubuntu : Install Glance] *************************************************************************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Configure Glance database] **************************************************************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Configure Glance Authentication Key] ****************************************************************************************************************
ok: [192.168.56.110] => (item=www_authenticate_uri = http://controller:5000)
ok: [192.168.56.110] => (item=auth_url = http://controller:5000)
ok: [192.168.56.110] => (item=memcached_servers = controller:11211)
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=project_name = service)
ok: [192.168.56.110] => (item=username = glance)
ok: [192.168.56.110] => (item=password = admin123)

TASK [Ubuntu : Configure Glance paste_deploy] **********************************************************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Configure Glance glance_store] ***********************************************************************************************************************
ok: [192.168.56.110] => (item=stores = file,http)
ok: [192.168.56.110] => (item=default_store = file)
ok: [192.168.56.110] => (item=filesystem_store_datadir = /var/lib/glance/images/)
```

```
TASK [Ubuntu : Configure Glance oslo_limit] ************************************************************************************************
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=user_domain_id = default)
ok: [192.168.56.110] => (item=username = MY_SERVICE)
ok: [192.168.56.110] => (item=system_scope = all)
ok: [192.168.56.110] => (item=password = MY_PASSWORD)
ok: [192.168.56.110] => (item=endpoint_id = ENDPOINT_ID)
ok: [192.168.56.110] => (item=region_name = RegionOne)

TASK [Ubuntu : Configure Glance DEFAULT] ***************************************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Populating Image Service Database] ******************************************************************************************
[WARNING]: Consider using 'become', 'become_method', and 'become_user' rather than running sudo
changed: [192.168.56.110]

TASK [Ubuntu : Installing Keystone (Ubuntu)] ***********************************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Configuring Config File] ****************************************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Configuring Config File] ****************************************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Populating the Database] ****************************************************************************************************
changed: [192.168.56.110]

TASK [Ubuntu : Initialize Fernet Key] ******************************************************************************************************
changed: [192.168.56.110]

TASK [Ubuntu : Initialize Fernet Key] ******************************************************************************************************
changed: [192.168.56.110]

TASK [Ubuntu : Configuring the Apache (HTTP) Server] ***************************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Configure Administrative Account Environmental Variables] *******************************************************************
changed: [192.168.56.110]

TASK [Ubuntu : Installing Nova (Ubuntu)] ***************************************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Configuring Nova API] *******************************************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Configure Nova API] *********************************************************************************************************
ok: [192.168.56.110]
```

```
TASK [Ubuntu : Configuring Nova Database] ***********************************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Configure Nova Authentication Token (for Keystone)] **********************************************************************
ok: [192.168.56.110] => (item=www_authenticate_uri = http://controller:5000/)
ok: [192.168.56.110] => (item=auth_url = http://controller:5000/)
ok: [192.168.56.110] => (item=memcached_servers = controller:11211)
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=project_name = service)
ok: [192.168.56.110] => (item=username = nova)
ok: [192.168.56.110] => (item=password = admin123)

TASK [Ubuntu : Configure Nova VNC] ******************************************************************************************************
ok: [192.168.56.110] => (item=enabled = true)
ok: [192.168.56.110] => (item=server_listen = $my_ip)
ok: [192.168.56.110] => (item=server_proxyclient_address = $my_ip)

TASK [Ubuntu : Configure Nova placement] ************************************************************************************************
ok: [192.168.56.110] => (item=region_name = RegionOne)
ok: [192.168.56.110] => (item=project_domain_name = Default)
ok: [192.168.56.110] => (item=project_name = service)
ok: [192.168.56.110] => (item=auth_type = password)
ok: [192.168.56.110] => (item=user_domain_name = Default)
ok: [192.168.56.110] => (item=auth_url = http://controller:5000/v3)
ok: [192.168.56.110] => (item=username = placement)
ok: [192.168.56.110] => (item=password = admin123)

TASK [Ubuntu : Configure Nova Default] **************************************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Configure Nova Glance] ***************************************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Configure Nova olso_concurrency] *****************************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Additional Configuration of Nova] ****************************************************************************************
changed: [192.168.56.110]

TASK [Ubuntu : Additional Configuration] ************************************************************************************************
changed: [192.168.56.110]

TASK [Ubuntu : Additional Configuration] ************************************************************************************************
changed: [192.168.56.110]

TASK [Ubuntu : Additional Configuration] ************************************************************************************************
changed: [192.168.56.110]

PLAY RECAP ******************************************************************************************************************************
192.168.56.105             : ok=1    changed=0    unreachable=0    failed=0    skipped=1    rescued=0    ignored=0
192.168.56.110             : ok=33   changed=9    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
```

Output:

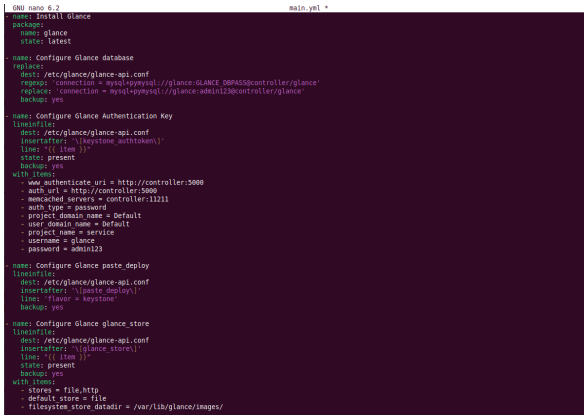
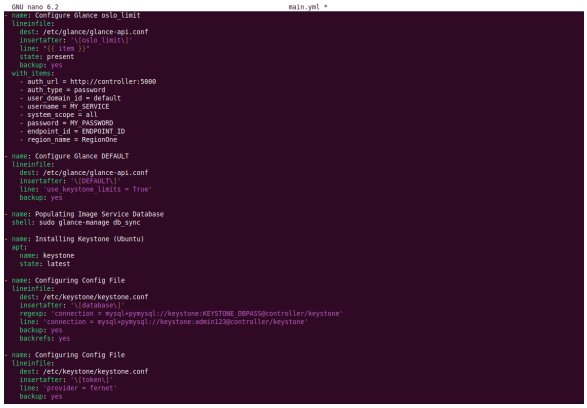
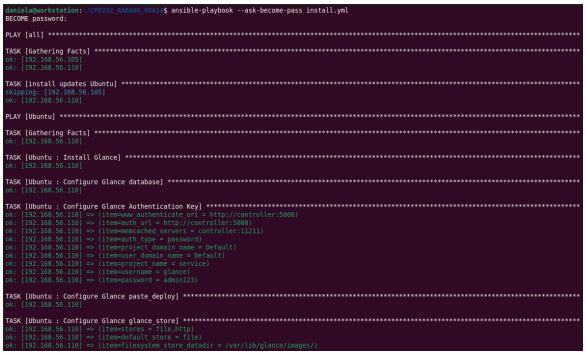
```
daniela@server1:~$ sudo nova --version
17.6.0
daniela@server1:~$ sudo glance --version
3.6.0
```

```
daniela@server1:~$ apt list --installed | grep glance

WARNING: apt does not have a stable CLI interface. Use with caution in scripts.

glance-api/jammy-updates,jammy-updates,now 2:24.2.1-0ubuntu1 all [installed,automatic]
glance-common/jammy-updates,jammy-updates,now 2:24.2.1-0ubuntu1 all [installed,automatic]
glance/jammy-updates,jammy-updates,now 2:24.2.1-0ubuntu1 all [installed]
python3-glance-store/jammy-updates,jammy-updates,jammy-security,jammy-security,now 3.0.0-0ubuntu1.3 all [installed,automatic]
python3-glance/jammy-updates,jammy-updates,now 2:24.2.1-0ubuntu1 all [installed,automatic]
python3-glanceclient/jammy,jammy,now 1:3.6.0-0ubuntu1 all [installed,automatic]
```

```
daniela@server1:~$ apt list --installed | grep nova

WARNING: apt does not have a stable CLI interface. Use with caution in scripts.

nova-api/jammy-updates,jammy-updates,now 3:25.2.1-0ubuntu1 all [installed]
nova-common/jammy-updates,jammy-updates,now 3:25.2.1-0ubuntu1 all [installed,automatic]
nova-conductor/jammy-updates,jammy-updates,now 3:25.2.1-0ubuntu1 all [installed]
nova-novncproxy/jammy-updates,jammy-updates,now 3:25.2.1-0ubuntu1 all [installed]
nova-scheduler/jammy-updates,jammy-updates,now 3:25.2.1-0ubuntu1 all [installed]
python3-nova/jammy-updates,jammy-updates,now 3:25.2.1-0ubuntu1 all [installed,automatic]
python3-novaclient/jammy,jammy,now 2:17.6.0-0ubuntu1 all [installed,automatic]
```

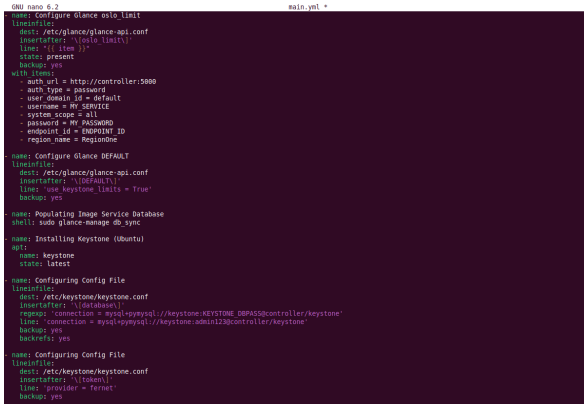
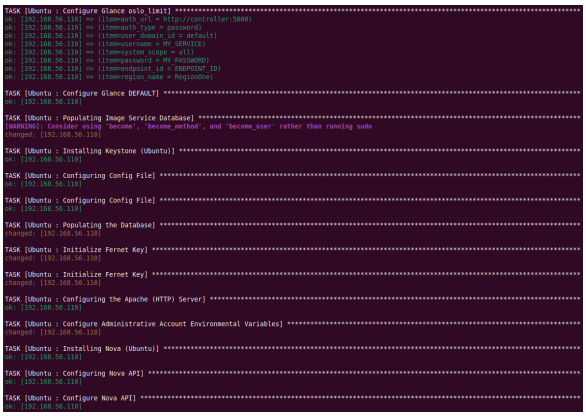
```
daniela@server1:~$ apt list --installed | grep keystone

WARNING: apt does not have a stable CLI interface. Use with caution in scripts.

keystone-common/jammy-updates,jammy-updates,now 2:21.0.1-0ubuntu1 all [installed,automatic]
keystone/jammy-updates,jammy-updates,now 2:21.0.1-0ubuntu1 all [installed]
python3-keystone/jammy-updates,jammy-updates,now 2:21.0.1-0ubuntu1 all [installed,automatic]
python3-keystoneauth1/jammy,jammy,now 4.4.0-0ubuntu1 all [installed,automatic]
python3-keystoneclient/jammy,jammy,now 1:4.4.0-0ubuntu1 all [installed,automatic]
python3-keystonemiddleware/jammy-updates,jammy-updates,now 9.4.0-0ubuntu1.1 all [installed,automatic]
```

IPO for glance:

Input	Process
 	

Output
daniela@server1:~$ sudo glance --version 3.6.0
daniela@server1:~$ apt list --installed | grep glance WARNING: apt does not have a stable CLI interface. Use with caution in scripts. glance-api/jammy-updates,jammy-updates,now 2:24.2.1-0ubuntu1 all [installed,automatic] glance-common/jammy-updates,jammy-updates,now 2:24.2.1-0ubuntu1 all [installed,automatic] glance/jammy-updates,jammy-updates,now 2:24.2.1-0ubuntu1 all [installed] python3-glance-store/jammy-updates,jammy-updates,jammy-security,jammy-security,now 3.0.0-0ubuntu1.3 all [installed,automatic] python3-glance/jammy-updates,jammy-updates,now 2:24.2.1-0ubuntu1 all [installed,automatic] python3-glanceclient/jammy,jammy,now 1:3.6.0-0ubuntu1 all [installed,automatic]

IPO for keystone:

Input	Process
	
Output	
daniela@server1:~$ apt list --installed | grep keystone WARNING: apt does not have a stable CLI interface. Use with caution in scripts. keystone-common/jammy-updates,jammy-updates,now 2:21.0.1-0ubuntu1 all [installed,automatic] keystone/jammy-updates,jammy-updates,now 2:21.0.1-0ubuntu1 all [installed] python3-keystone/jammy-updates,jammy-updates,now 2:21.0.1-0ubuntu1 all [installed,automatic] python3-keystoneauth1/jammy,jammy,now 4.4.0-0ubuntu1 all [installed,automatic] python3-keystoneclient/jammy,jammy,now 1:4.4.0-0ubuntu1 all [installed,automatic] python3-keystonemiddleware/jammy-updates,jammy-updates,now 9.4.0-0ubuntu1.1 all [installed,automatic]	

IPO for nova:

Input	Process

```
GNU nano 6.2                                                main.yml *
- name: Populating the Database
  shell:
    sudo keystone-manage db_sync

- name: Initialize Fernet Key
  shell:
    keystone-manage fernet_setup --keystone-user keystone --keystone-group keystone

- name: Initialize Fernet Key
  shell:
     keystone-manage credential_setup --keystone-user keystone --keystone-group keystone

- name: Configuring the Apache (HTTP) Server
  lineinfile:
    dest: /etc/apache2/apache2.conf
    line: 'ServerName controller'
    state: present
    backup: yes

- name: Configure Administrative Account Environmental Variables
  shell:
     export OS_USERNAME=admin
     export OS_PASSWORD=ADMIN_PASS
     export OS_PROJECT_NAME=admin
     export OS_USER_DOMAIN_NAME=Default
     export OS_PROJECT_DOMAIN_NAME=Default
     export OS_AUTH_URL=http://controller:5000/v3
     export OS_IDENTITY_API_VERSION=3

- name: Installing Nova (Ubuntu)
  apt:
     name:
       - nova-api
       - nova-conductor
       - nova-novncproxy
       - nova-scheduler
     state: latest

- name: Configuring Nova API
  lineinfile:
     dest: /etc/nova/nova.conf
     regexp: connection = mysql+pymysql://nova:NOVA_DBPASS@controller/nova_api
     line: connection = mysql+pymysql://nova:admin123@controller/nova_api
     backup: yes
     backrefs: yes
```

```
GNU nano 6.2                                                main.yml *
- name: Configure Nova API
  lineinfile:
     dest: /etc/nova/nova.conf
     insertafter: '\[api\]'
     line: 'auth_strategy = keystone'
     state: present
     backup: yes

- name: Configuring Nova Database
  lineinfile:
     dest: /etc/nova/nova.conf
     regexp: mysql+pymysql://nova:NOVA_DBPASS@controller/nova
     line: mysql+pymysql://nova:admin123@controller/nova
     backup: yes
     backrefs: yes

- name: Configure Nova Authentication Token (for Keystone)
  lineinfile:
     dest: /etc/glance/glance-api.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 = nova
     - password = admin123

- name: Configure Nova VNC
  lineinfile:
     dest: /etc/glance/glance-api.conf
     insertafter: '\[vnc\]'
     line: "{{ item }}"
     state: present
     backup: yes

  with_items:
     - enabled = true
     - server_listen = $my_ip
     - server_proxyclient_address = $my_ip
```

```
GNU nano 6.2                                                main.yml *
- name: Configure Nova placement
  lineinfile:
     dest: /etc/glance/glance-api.conf
     insertafter: '\[placement\]'
     line: "{{ item }}"
     state: present
     backup: yes

  with_items:
     - region_name = RegionOne
     - project_domain_name = Default
     - project_name = service
     - auth_type = password
     - user_domain_name = Default
     - auth_url = http://controller:5000/v3
     - username = placement
     - password = admin123

- name: Configure Nova Default
  lineinfile:
     dest: /etc/nova/nova.conf
     line: 'my_ip = 10.0.0.11'
     state: present
     backup: yes

- name: Configure Nova Glance
  lineinfile:
     dest: /etc/nova/nova.conf
     line: 'api_server = http://controller:9292'
     state: present
     backup: yes

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

- name: Additional Configuration of Nova
  shell:
    sudo nova-manage api_db sync

- name: Additional Configuration
  shell:
    sudo nova-manage cell_v2 map_cell0
```

```
- name: Additional Configuration
  shell:
    sudo nova-manage db sync

- name: Additional Configuration
  shell:
    sudo nova-manage cell_v2 list_cells
```

```
TASK [Ubuntu : Configure Glance oslo_limit] ************************************************************************************
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=user_domain_id = default)
ok: [192.168.56.110] => (item=username = MY_SERVICE)
ok: [192.168.56.110] => (item=system_scope = all)
ok: [192.168.56.110] => (item=password = MY_PASSWORD)
ok: [192.168.56.110] => (item=endpoint_id = ENDPOINT_ID)
ok: [192.168.56.110] => (item=region_name = RegionOne)

TASK [Ubuntu : Configure Glance DEFAULT] ***************************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Populating Image Service Database] ******************************************************************************
[WARNING]: Consider using 'become', 'become_method', and 'become_user' rather than running sudo
changed: [192.168.56.110]

TASK [Ubuntu : Installing Keystone (Ubuntu)] ***********************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Configuring Config File] ****************************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Configuring Config File] ****************************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Populating the Database] ****************************************************************************************
changed: [192.168.56.110]

TASK [Ubuntu : Initialize Fernet Key] ******************************************************************************************
changed: [192.168.56.110]

TASK [Ubuntu : Initialize Fernet Key] ******************************************************************************************
changed: [192.168.56.110]

TASK [Ubuntu : Configuring the Apache (HTTP) Server] ***************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Configure Administrative Account Environmental Variables] *******************************************************
changed: [192.168.56.110]

TASK [Ubuntu : Installing Nova (Ubuntu)] ***************************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Configuring Nova API] *******************************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Configure Nova API] *********************************************************************************************
ok: [192.168.56.110]
```

```
TASK [Ubuntu : Configuring Nova Database] **************************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Configure Nova Authentication Token (for Keystone)] *************************************************************
ok: [192.168.56.110] => (item=www_authenticate_uri = http://controller:5000/)
ok: [192.168.56.110] => (item=auth_url = http://controller:5000/)
ok: [192.168.56.110] => (item=memcached_servers = controller:11211)
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=project_name = service)
ok: [192.168.56.110] => (item=username = nova)
ok: [192.168.56.110] => (item=password = admin123)

TASK [Ubuntu : Configure Nova VNC] *********************************************************************************************
ok: [192.168.56.110] => (item=enabled = true)
ok: [192.168.56.110] => (item=server_listen = $my_ip)
ok: [192.168.56.110] => (item=server_proxyclient_address = $my_ip)

TASK [Ubuntu : Configure Nova placement] ***************************************************************************************
ok: [192.168.56.110] => (item=region_name = RegionOne)
ok: [192.168.56.110] => (item=project_domain_name = Default)
ok: [192.168.56.110] => (item=project_name = service)
ok: [192.168.56.110] => (item=auth_type = password)
ok: [192.168.56.110] => (item=user_domain_name = Default)
ok: [192.168.56.110] => (item=auth_url = http://controller:5000/v3)
ok: [192.168.56.110] => (item=username = placement)
ok: [192.168.56.110] => (item=password = admin123)

TASK [Ubuntu : Configure Nova Default] *****************************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Configure Nova Glance] ******************************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Configure Nova olso_concurrency] ********************************************************************************
ok: [192.168.56.110]

TASK [Ubuntu : Additional Configuration of Nova] *******************************************************************************
changed: [192.168.56.110]

TASK [Ubuntu : Additional Configuration] ***************************************************************************************
changed: [192.168.56.110]

TASK [Ubuntu : Additional Configuration] ***************************************************************************************
changed: [192.168.56.110]

TASK [Ubuntu : Additional Configuration] ***************************************************************************************
changed: [192.168.56.110]

PLAY RECAP *********************************************************************************************************************
192.168.56.105             : ok=1    changed=0    unreachable=0    failed=0    skipped=1    rescued=0    ignored=0
192.168.56.110             : ok=13   changed=9    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
```

Output

```
daniela@server1:~$ sudo nova --version
17.6.0
```

```
daniela@server1:~$ apt list --installed | grep nova

WARNING: apt does not have a stable CLI interface. Use with caution in scripts.

nova-api/jammy-updates,jammy-updates,now 3:25.2.1-0ubuntu1 all [installed]
nova-common/jammy-updates,jammy-updates,now 3:25.2.1-0ubuntu1 all [installed,automatic]
nova-conductor/jammy-updates,jammy-updates,now 3:25.2.1-0ubuntu1 all [installed]
nova-novncproxy/jammy-updates,jammy-updates,now 3:25.2.1-0ubuntu1 all [installed]
nova-scheduler/jammy-updates,jammy-updates,now 3:25.2.1-0ubuntu1 all [installed]
python3-nova/jammy-updates,jammy-updates,now 3:25.2.1-0ubuntu1 all [installed,automatic]
python3-novaclient/jammy,jammy,now 2:17.6.0-0ubuntu1 all [installed,automatic]
```

Git push all the work that you had done.

```
daniela@workstation:~/CPE232_RABANG_HOA14$ git add *
daniela@workstation:~/CPE232_RABANG_HOA14$ git status
On branch main
Your branch is up to date with 'origin/main'.

Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
        new file:   ansible.cfg
        new file:   install.yml
        new file:   inventory
        new file:   roles/Ubuntu/tasks/main.yml
```

```
daniela@workstation:~/CPE232_RABANG_HOA14$ git commit -m "final"
[main f657887] final
 4 files changed, 274 insertions(+)
 create mode 100644 ansible.cfg
 create mode 100644 install.yml
 create mode 100644 inventory
 create mode 100644 roles/Ubuntu/tasks/main.yml
daniela@workstation:~/CPE232_RABANG_HOA14$ git push
Username for 'https://github.com': daniela
Password for 'https://daniela@github.com':
Enumerating objects: 10, done.
Counting objects: 100% (10/10), done.
Delta compression using up to 2 threads
Compressing objects: 100% (6/6), done.
Writing objects: 100% (9/9), 2.18 KiB | 1.09 MiB/s, done.
Total 9 (delta 0), reused 0 (delta 0), pack-reused 0
To https://github.com/danielarabang/CPE232_RABANG_HOA14.git
   c4a796a..f657887  main -> main
```

Github repository link:

https://github.com/danielarabang/CPE232_RABANG_HOA14.git

Reflections:

Answer the following:

1. **Describe Keystone, Glance and Nova services**

- The first one is the keystone, it is the gatekeeper of an OpenStack cloud, managing authentication and authorization to ensure only authorized individuals can access resources. The next one is the glance and it is responsible sfor managing virtual machine images, like a library catalog for different operating system images. and for the lastl one is the nova service abd it is use as a compute service, responsible for managing compute resources within the cloud. It handles the creation, scheduling, and management of virtual machines, allowing users to launch and control instances according to their computing needs.

Conclusions:

The hands-on exercise demonstrated the value of setting up required services, facilitating well-informed cloud solution decision-making. I had encountered multiple issues in the playbook programs, due to the indention error, but after conducting thorough debugging, I had able to successfully accomplish the tasks. I also spent a lot of time thinking about how I could show the output that I had already installed the keystone packages since it does not want to appear. After doing this activity which includes the update, installation of the three services which is the keystone, glance, and nova, I gained the ability to balance the advantages and disadvantages of cloud solutions, which helped them make wise choices. The exercise brought to light the difficulties in implementing required packages for cloud solutions.