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Course/Section: CPE232-CPE31S24	**Date Submitted:** 12 / 09 / 2022
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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)

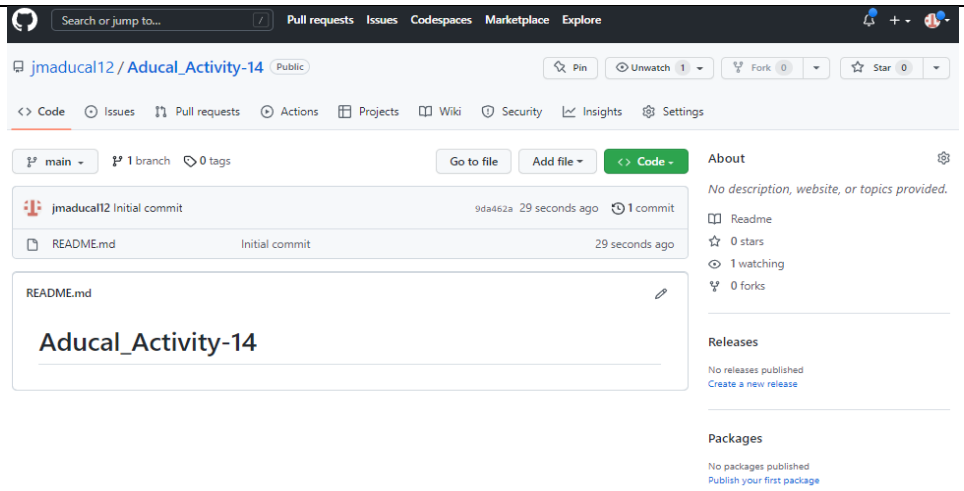
1x Ubuntu VM or Centos VM

4. Tasks

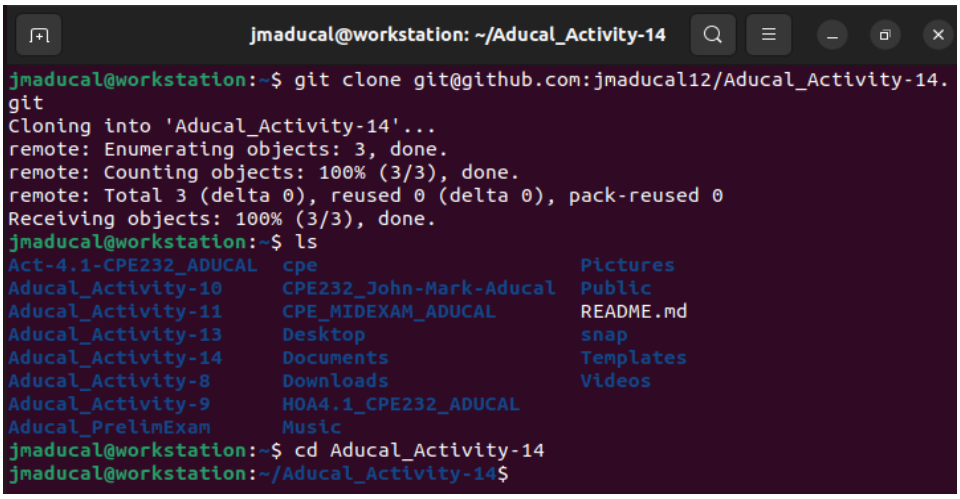
1. Create a new repository for this activity.
2. Create a playbook that converts the steps in the following items in https://docs.openstack.org/install-guide/
    a. Keystone (Identity Service)
    b. Glance (Imaging Service)
    c. Nova (Compute Service)
    d. Create different plays in installing per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

5. Output (screenshots and explanations)

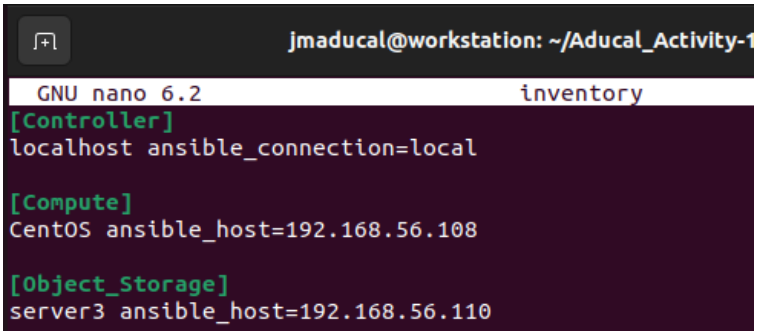
Task 1: Create a new repository



I create a new repository named Aducal_Activity-14.



I used the git clone command to link my new repository to my workstation and use the cd command to change directory to Aducal_Activity-14.



This are the contents of inventory file including the three groups such as controller, compute, object_storage.

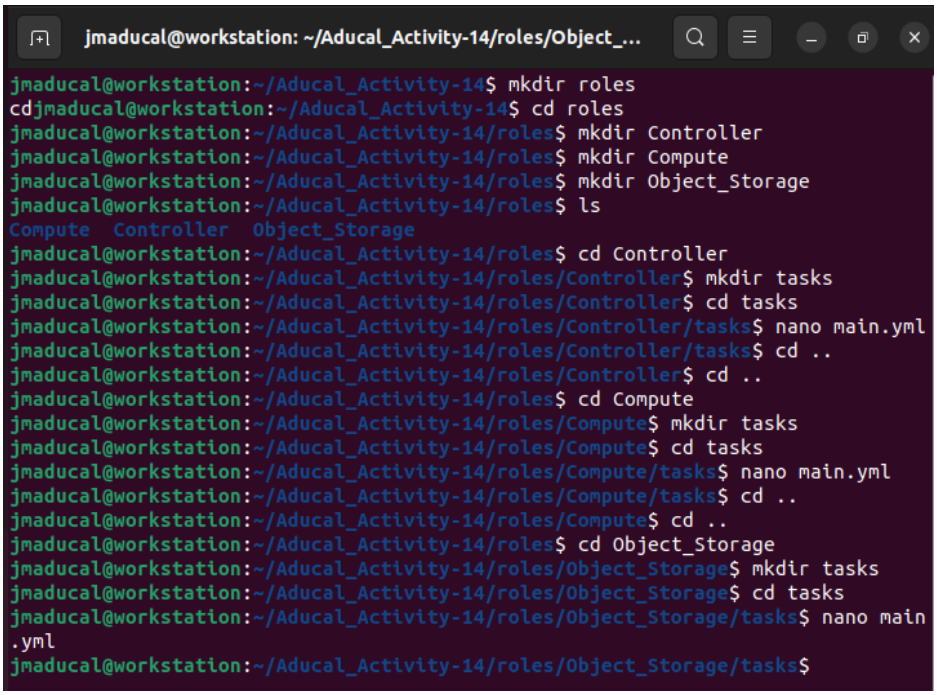
```
jmaducal@workstation: ~/Aducal_Activity-14
  GNU nano 6.2                                ansible.cfg
[defaults]
inventory = inventory
host_key_checking = False

deprecation_warnings = False

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

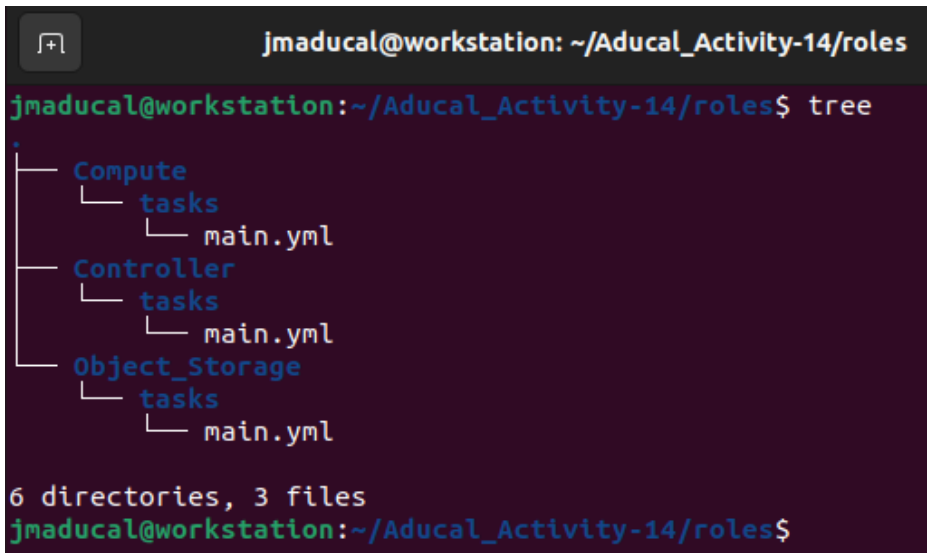
This are the configurations inside of ansible.cfg file.

```
jmaducal@workstation: ~/Aducal_Activity-14
  GNU nano 6.2                              openstack.yml
---

- hosts: all
  become: true
  pre_tasks:

  - name: install updates (CentOS)
    tags: always
    dnf:
      update_only: yes
      update_cache: yes
    when: ansible_distribution == "CentOS"

  - name: install updates (Ubuntu)
    tags: always
    apt:
      upgrade: dist
      update_cache: yes
    when: ansible_distribution == "Ubuntu"
```

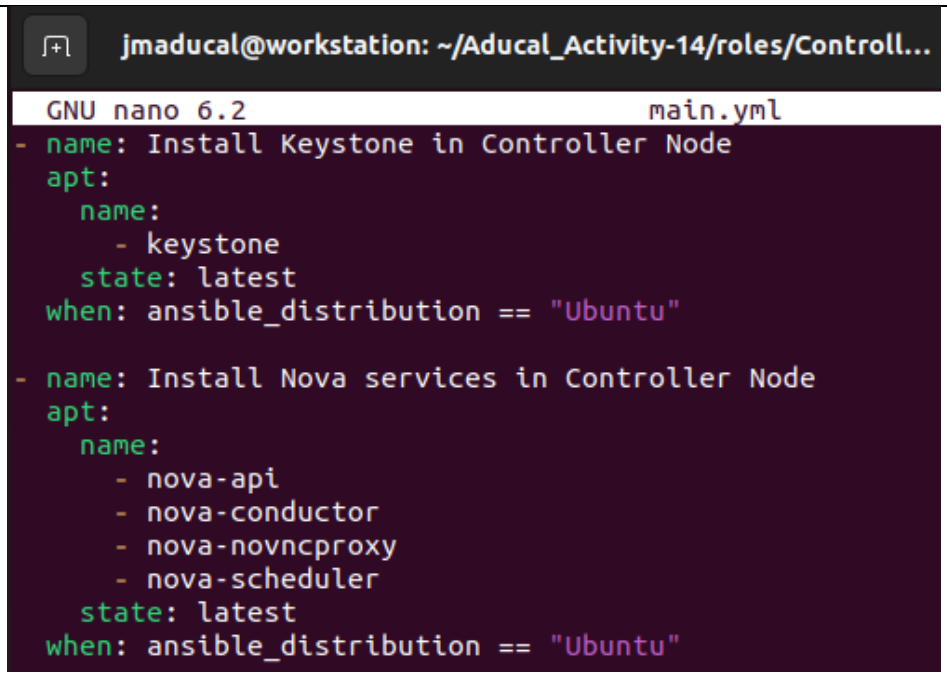
```
- hosts: Controller
  become: true
  roles:
    - Controller

- hosts: Compute
  become: true
  roles:
    - Compute

- hosts: Object_Storage
  become: true
  roles:
    - Object_Storage
```

Inside of openstack file, there are pre_tasks for installing updates for CentOS and Ubuntu servers and particular roles for Controller, Compute and Object Storage.

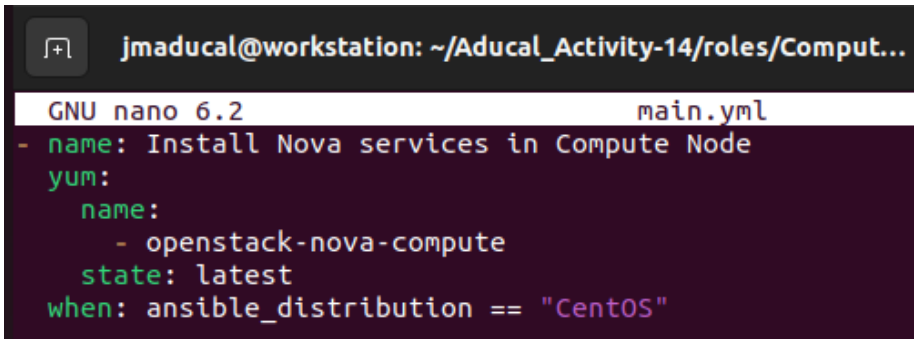




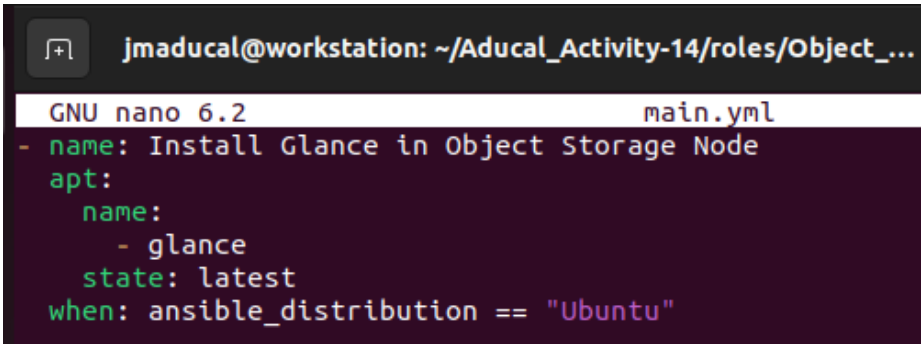
I named the directories Compute, Controller, and Object Storage. Then, inside those directories, there were specific tasks for installing keystone, glance, and nova.



The contents of main.yml file inside of Controller Directory.



The contents of main.yml file inside of Compute Directory.



The contents of main.yml file inside of Object Storage Directory.

a) Keystone (Identity service)

Prerequisites before install and configure Identity service: (Controller Node)

```
jmaducal@workstation: ~/Aducal_Activity-14
jmaducal@workstation:~/Aducal_Activity-14$ sudo mysql
[sudo] password for jmaducal:
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 31
Server version: 10.6.11-MariaDB-0ubuntu0.22.04.1 Ubuntu 22.04

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]> CREATE DATABASE keystone;
Query OK, 1 row affected (0.083 sec)

MariaDB [(none)]> GRANT ALL PRIVILEGES ON keystone.* TO 'keystone'@'localhost'
IDENTIFIED BY 'KEYSTONE_DBPASS';
Query OK, 0 rows affected (0.196 sec)

MariaDB [(none)]> GRANT ALL PRIVILEGES ON keystone.* TO 'keystone'@'%' IDENTIFI
ED BY 'KEYSTONE_DBPASS';
Query OK, 0 rows affected (0.026 sec)
```

Creating a database and grant access to the keystone.

```
jmaducal@workstation: ~/Aducal_Activity-14
  GNU nano 6.2                  /etc/keystone/keystone.conf
[database]
connection = mysql+pymysql://keystone:KEYSTONE_DBPASS@Controller/keystone
```

Configuring database access in /etc/keystone/keystone.conf

```
jmaducal@workstation: ~/Aducal_Activity-14
  GNU nano 6.2                  /etc/keystone/keystone.conf

[token]

#
# From keystone
#

# The amount of time that a token should remain valid (in seconds). Drastically
# reducing this value may break "long-running" operations that involve multiple
# services to coordinate together, and will force users to authenticate with
# keystone more frequently. Drastically increasing this value will increase the
# number of tokens that will be simultaneously valid. Keystone tokens are also
# bearer tokens, so a shorter duration will also reduce the potential security
# impact of a compromised token. (integer value)
# Minimum value: 0
# Maximum value: 9223372036854775807
#expiration = 3600
```

```
# Entry point for the token provider in the `keystone.token.provider`
# namespace. The token provider controls the token construction, validation,
# and revocation operations. Supported upstream providers are `fernet` and
# `jws`. Neither `fernet` or `jws` tokens require persistence and both require
# additional setup. If using `fernet`, you're required to run `keystone-manage
# fernet_setup`, which creates symmetric keys used to encrypt tokens. If using
# `jws`, you're required to generate an ECDSA keypair using a SHA-256 hash
# algorithm for signing and validating token, which can be done with `keystone-
# manage create_jws_keypair`. Note that `fernet` tokens are encrypted and `jws`
# tokens are only signed. Please be sure to consider this if your deployment
# has security requirements regarding payload contents used to generate token
# IDs. (string value)
provider = fernet
```

Configure the Fernet token provider.

```
jmaducal@workstation: ~/Aducal_Activity-14
jmaducal@workstation:~/Aducal_Activity-14$ sudo -s /bin/sh -c "keystone-manage
db_sync" keystone
keystone-manage fernet_setup --keystone-user keystone --keystone-group keystone
keystone-manage credential_setup --keystone-user keystone --keystone-group keys
tone
jmaducal@workstation:~/Aducal_Activity-14$
```

Populate the Identity service database

```
jmaducal@workstation: ~/Aducal_Activity-14
jmaducal@workstation:~/Aducal_Activity-14$ sudo -s /bin/sh -c "keystone-manage
db_sync" keystone
keystone-manage bootstrap --bootstrap-password ADMIN_PASS \
--bootstrap-admin-url http://Controller:5000/v3/ \
--bootstrap-internal-url http://Controller:5000/v3/ \
--bootstrap-public-url http://Controller:5000/v3/ \
--bootstrap-region-id RegionOnejmaducal@workstation:~/Aducal_Activity-14$
```

Bootstrap the Identity service

```
jmaducal@workstation: ~/Aducal_Activity-14
  GNU nano 6.2                  /etc/apache2/apache2.conf
# (the actual bytes sent including headers) instead of %b (the size of the
# requested file), because the latter makes it impossible to detect partial
# requests.
#
# Note that the use of %{X-Forwarded-For}i instead of %h is not recommended.
# Use mod_remoteip instead.
#
LogFormat "%v:%p %h %l %u %t \"%r\" %>s %O \"%{Referer}i\" \"%{User-Agent}i\""
LogFormat "%h %l %u %t \"%r\" %>s %O \"%{Referer}i\" \"%{User-Agent}i\"" combi
LogFormat "%h %l %u %t \"%r\" %>s %O" common
LogFormat "%{Referer}i -> %U" referer
LogFormat "%{User-agent}i" agent

# Include of directories ignores editors' and dpkg's backup files,
# see README.Debian for details.

# Include generic snippets of statements
IncludeOptional conf-enabled/*.conf

# Include the virtual host configurations:
IncludeOptional sites-enabled/*.conf

# vim: syntax=apache ts=4 sw=4 sts=4 sr noet
ServerName Controller
```

```
jmaducal@workstation: ~/Aducal_Activity-14
jmaducal@workstation:~/Aducal_Activity-14$ service apache2 restart
```

Restart the Apache service

```
jmaducal@workstation: ~/Aducal_Activity-14
jmaducal@workstation:~/Aducal_Activity-14$ export OS_USERNAME=admin
jmaducal@workstation:~/Aducal_Activity-14$ export OS_PASSWORD=ADMIN_PASS
jmaducal@workstation:~/Aducal_Activity-14$ export OS_PROJECT_NAME=admin
jmaducal@workstation:~/Aducal_Activity-14$ export OS_USER_DOMAIN_NAME=Default
jmaducal@workstation:~/Aducal_Activity-14$ export OS_PROJECT_DOMAIN_NAME=Defaul
t
jmaducal@workstation:~/Aducal_Activity-14$ export OS_AUTH_URL=http://Controller
:5000/v3
jmaducal@workstation:~/Aducal_Activity-14$ export OS_IDENTITY_API_VERSION=3
```

Configure the administrative account

Prerequisites before install and configure Compute service: (Controller Node)

```
jmaducal@workstation: ~/Aducal_Activity-14
jmaducal@workstation:~/Aducal_Activity-14$ sudo mysql
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 32
Server version: 10.6.11-MariaDB-0ubuntu0.22.04.1 Ubuntu 22.04

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]> CREATE DATABASE nova_api;
Query OK, 1 row affected (0.000 sec)

MariaDB [(none)]> CREATE DATABASE nova;
Query OK, 1 row affected (0.000 sec)

MariaDB [(none)]> CREATE DATABASE nova_cell0;
Query OK, 1 row affected (0.000 sec)

MariaDB [(none)]> GRANT ALL PRIVILEGES ON nova_api.* TO 'nova'@'localhost' IDEN
TIFIED BY 'NOVA_DBPASS';
Query OK, 0 rows affected (0.005 sec)

MariaDB [(none)]> GRANT ALL PRIVILEGES ON nova_api.* TO 'nova'@'%' IDENTIFIED B
Y 'NOVA_DBPASS';
Query OK, 0 rows affected (0.036 sec)

MariaDB [(none)]> GRANT ALL PRIVILEGES ON nova.* TO 'nova'@'localhost' IDENTIFI
ED BY 'NOVA_DBPASS';
Query OK, 0 rows affected (0.014 sec)
```

```
MariaDB [(none)]> GRANT ALL PRIVILEGES ON nova.* TO 'nova'@'%' IDENTIFIED BY 'N
OVA_DBPASS';
Query OK, 0 rows affected (0.007 sec)

MariaDB [(none)]> GRANT ALL PRIVILEGES ON nova_cell0.* TO 'nova'@'localhost' ID
ENTIFIED BY 'NOVA_DBPASS';
Query OK, 0 rows affected (0.045 sec)

MariaDB [(none)]> GRANT ALL PRIVILEGES ON nova_cell0.* TO 'nova'@'%' IDENTIFIED
 BY 'NOVA_DBPASS';
Query OK, 0 rows affected (0.025 sec)
```

Creating the nova_api, nova and nova_cell0 databases and grant proper access.

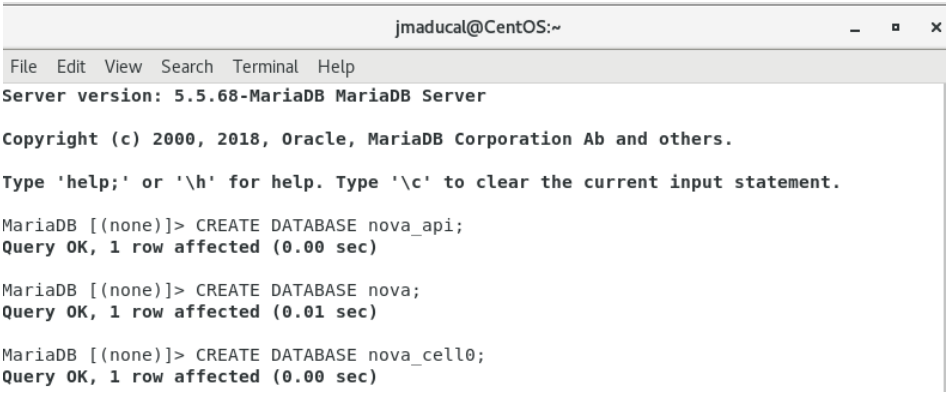
b) Glance (Imaging service)

Prerequisites before install and configure Imaging service: (Object Storage Node)

Creating glance database and grant proper access.

c) Nova (Compute service)

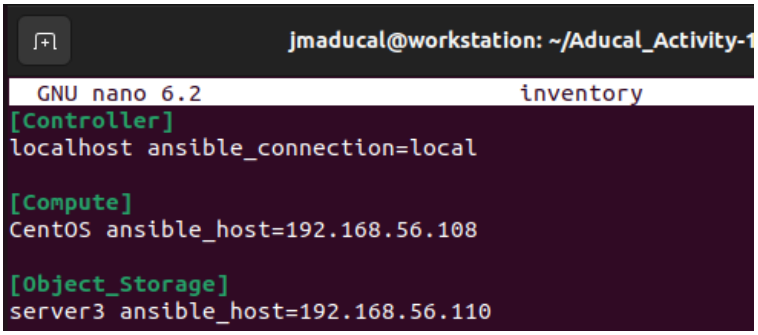
Prerequisites before install and configure Compute service: (Compute Node)



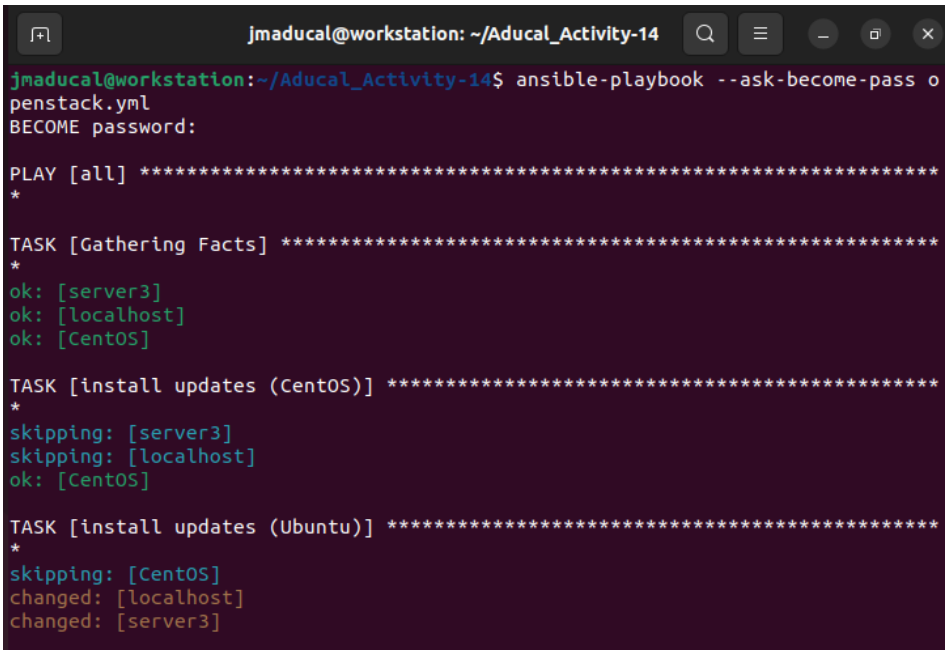
```
MariaDB [(none)]> GRANT ALL PRIVILEGES ON nova_api.* TO 'nova'@'localhost' \
    -> IDENTIFIED BY 'NOVA_DBPASS';
Query OK, 0 rows affected (0.10 sec)

MariaDB [(none)]> GRANT ALL PRIVILEGES ON nova_api.* TO 'nova'@'%'  IDENTIFIED BY 'NOVA
_DBPASS';
Query OK, 0 rows affected (0.00 sec)

MariaDB [(none)]> GRANT ALL PRIVILEGES ON nova.* TO 'nova'@'localhost'  IDENTIFIED BY '
NOVA_DBPASS';
Query OK, 0 rows affected (0.00 sec)

MariaDB [(none)]> GRANT ALL PRIVILEGES ON nova.* TO 'nova'@'%'  IDENTIFIED BY 'NOVA_DBP
ASS';
Query OK, 0 rows affected (0.00 sec)

MariaDB [(none)]> GRANT ALL PRIVILEGES ON nova_cell0.* TO 'nova'@'localhost'  IDENTIFIE
D BY 'NOVA_DBPASS';
Query OK, 0 rows affected (0.00 sec)

MariaDB [(none)]> GRANT ALL PRIVILEGES ON nova_cell0.* TO 'nova'@'%'  IDENTIFIED BY 'NO
VA_DBPASS';
Query OK, 0 rows affected (0.01 sec)
```

Creating the nova_api, nova and nova_cell0 databases and grant proper access.

Create different plays in installing per server type (controller, compute etc.) and identify it as a group in the Inventory file.



This are the contents of inventory file including the three groups such as controller, compute, object_storage.



```
PLAY [Controller] ***********************************************************
*

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

TASK [Controller : Install Keystone in Controller Node] *********************
*
changed: [localhost]

TASK [Controller : Install Nova services in Controller Node] ****************
*
changed: [localhost]
```

```
PLAY [Compute] **************************************************************
*

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

TASK [Compute : Install Nova services in Compute Node] **********************
*
changed: [CentOS]
```

```
TASK [Object_Storage : Install Glance in Object Storage Node] ***************
*
changed: [server3]

PLAY RECAP ******************************************************************
*
CentOS                     : ok=4    changed=1    unreachable=0    failed=0
skipped=1    rescued=0    ignored=0
localhost                  : ok=5    changed=0    unreachable=0    failed=0
skipped=1    rescued=0    ignored=0
server3                    : ok=4    changed=1    unreachable=0    failed=0
skipped=1    rescued=0    ignored=0
```

Add, commit and push it to your github repository.

```
jmaducal@workstation: ~/Aducal_Activity-14
jmaducal@workstation:~/Aducal_Activity-14$ git status
On branch main
Your branch is up to date with 'origin/main'.

Untracked files:
  (use "git add <file>..." to include in what will be committed)
        ansible.cfg
        inventory
        openstack.yml
        roles/

nothing added to commit but untracked files present (use "git add" to track)
```

```
jmaducal@workstation:~/Aducal_Activity-14$ git add ansible.cfg
jmaducal@workstation:~/Aducal_Activity-14$ git add inventory
jmaducal@workstation:~/Aducal_Activity-14$ git add openstack.yml
jmaducal@workstation:~/Aducal_Activity-14$ git add roles/
jmaducal@workstation:~/Aducal_Activity-14$ git commit -m "Aducal_Activity-14"
[main a9b2e1f] Aducal_Activity-14
 6 files changed, 78 insertions(+)
 create mode 100644 ansible.cfg
 create mode 100644 inventory
 create mode 100644 openstack.yml
 create mode 100644 roles/Compute/tasks/main.yml
 create mode 100644 roles/Controller/tasks/main.yml
 create mode 100644 roles/Object_Storage/tasks/main.yml
jmaducal@workstation:~/Aducal_Activity-14$ git push origin main
Enumerating objects: 16, done.
Counting objects: 100% (16/16), done.
Compressing objects: 100% (9/9), done.
Writing objects: 100% (15/15), 1.60 KiB | 1.60 MiB/s, done.
Total 15 (delta 0), reused 0 (delta 0), pack-reused 0
To github.com:jmaducal12/Aducal_Activity-14.git
   9da462a..a9b2e1f  main -> main
```

GitHub Repository Link:

https://github.com/jmaducal12/Aducal_Activity-14.git

Reflections:

Answer the following:

1. Describe Keystone, Glance and Nova services

   Keystone is Identity service that verifies the user's identity and provides information about which resources the user has access to. Keystone provides authentication, authorization and other services such as delivering the system catalog etc. The Glance (Imaging service) enables user to discover, register and retrieve virtual machine images. Nova (Compute service) provides a way to provision compute instances in virtual servers.it manages a pool of compute resources and the virtual machines that is running.

Conclusions:

In this activity, I learned the different openstack services such as Keystone (Identity service), Glance (Image service) and Nova (Compute Service). As we know the Openstack is built as a set of distributed services. These services communicate with each other and are responsible for the various functions expected from virtualization/cloud management.