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Course/Section: CPE 232 - CPE31S22	**Date Submitted:** 12/03/2022
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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 Inventory file.
   h. Add, commit and push it to your GitHub repo.

5. Output (screenshots and explanations)

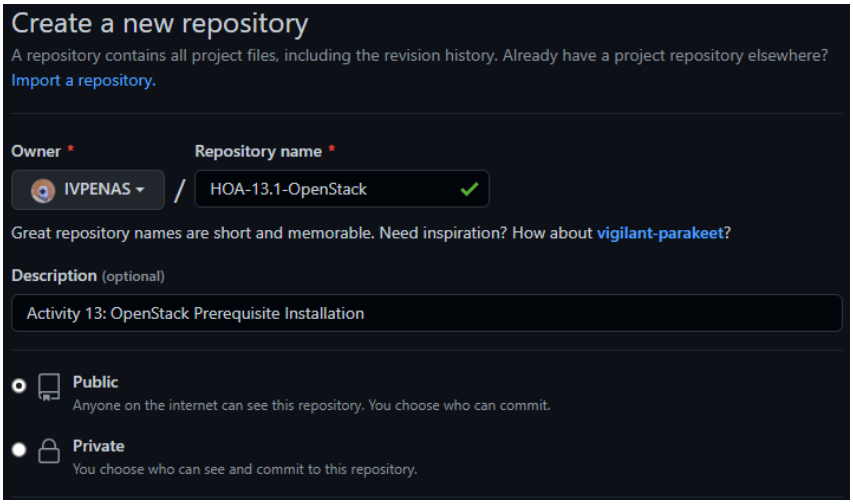


Figure 1.1. Creating new repository for this Activity

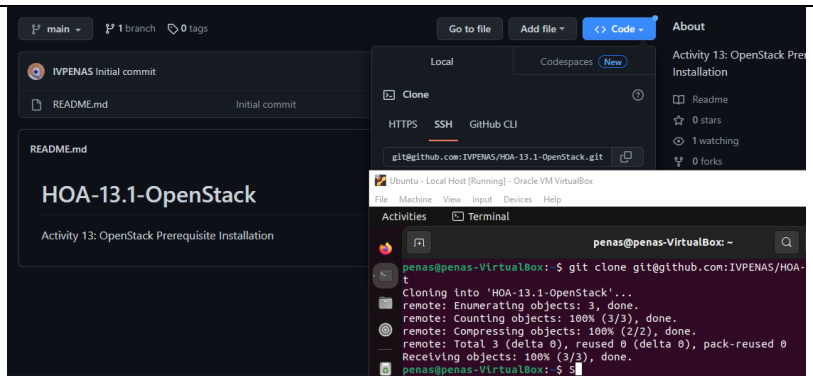


Figure 1.2. Cloning the created repository into the virtual box

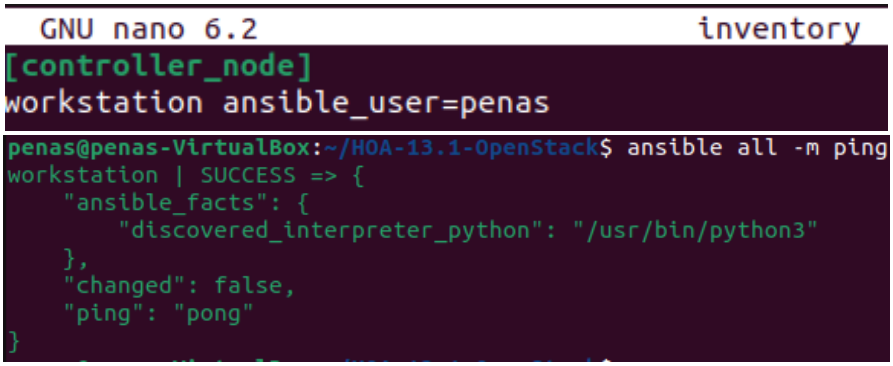


Figure 1.3. Copying and editing the ansible.cfg and inventory [IP: 192.168.56.116]

NTP:

```
penas@penas-VirtualBox:~/HOA-13.1-OpenStack/roles/ntp$ cat files/chrony.conf
#Please consider joining the pool.
server 0.centos.pool.ntp.org iburst
server 1.centos.pool.ntp.org iburst
server 2.centos.pool.ntp.org iburst
server 3.centos.pool.ntp.org iburst

# Record the rate at which the system clock gains/losses time.
driftfile /var/lib/chrony/drift

# Allow the system clock to be stepped in the first three updates
# if its offset is larger than 1 second.
makestep 1.0 3

# Enable kernel synchronization of the real-time clock (RTC).
rtcsync

# Specify directory for log files.
logdir /var/log/chrony

# Select which information is logged.
#log measurements statistics tracking

allow 10.0.0.0/24
penas@penas-VirtualBox:~/HOA-13.1-OpenStack/roles/ntp$ cat handlers/main.yml
#Restarting chrony
  - name: Restarting chrony
    service:
      name: chronyd.service
      state: restarted
      enabled: true
penas@penas-VirtualBox:~/HOA-13.1-OpenStack/roles/ntp$ cat tasks/main.yml
#Installation
  - name: Installing Chrony
    apt:
      name: chrony
      state: latest

  - name: Starting Chrony Service
    service:
      name: chronyd.service
      state: started
      enabled: true

  - name: Editing chrony.conf file
    copy:
      src: chrony.conf
      dest: /etc/chrony.conf
      owner: root
      group: root
      mode: 664
```

Openstack Packages:

```
#Obtaining the OpenStack Packets
 - name: Enabling OpenStack repository
      repo: 'obs://Cloud:OpenStack:Stein/Ubuntu_22.01.6'

 - name: Installing OpenStack
   pip:
     name: python-openstackclient
```

SQL Database:

```
penas@penas-VirtualBox:~/HOA-13.1-OpenStack/roles/SQL$ cat tasks/main.yml
#Installation of Mariadb - SQL
  - name: Installing Mariadb
    apt:
      name:
        - mariadb-server

  - name: Copying openstack.cnf file
    copy:
      src: openstack.cnf
      dest: /etc/my.cnf.d/openstack.cnf
      owner: root
      group: root
      mode: 644

  - name: Starting/Enabling Mariadb service
    service:
      name: mysql
      state: started
      enabled: true
penas@penas-VirtualBox:~/HOA-13.1-OpenStack/roles/SQL$ cat handlers/main.yml
#Restarting Mariadb for confirmation it was enabled
  - name: Restarting Mariadb service
    service:
      name: mysql
      state: restarted
      enabled: true
```

Message Queue:

```
penas@penas-VirtualBox:~/HOA-13.1-OpenStack/roles/MQ$ cat tasks/main.yml
#Installing rabbit message-queue
  - name: Installing rabbitmq-server
    apt:
      name: rabbitmq-server
      state: latest

  - name: Starting rabbitmq-server service
    service:
      name: rabbitmq-server.service
      state: started
      enabled: true
penas@penas-VirtualBox:~/HOA-13.1-OpenStack/roles/MQ$ cat handlers/main.yml

- name: Configuring rabbitmq-server
  shell: |
    rabbitmqctl add_user openstack server12345
    rabbitmqctl set_permissions openstack ".*" ".*" ".*"
penas@penas-VirtualBox:~/HOA-13.1-OpenStack/roles/MQ$
```

Memcached:

```
penas@penas-VirtualBox:~/HOA-13.1-OpenStack/roles/Memcached$ cat tasks/main.yml
#Installing Memcahed
  - name: Installing Memcached
    apt:
      name:
        - memcached
        - python-python-memcached
      state: latest

  - name: Editing memcached.conf file
    copy:
      src: memcached
      dest: /etc/sysconfig/memcached
      owner: root
      group: root
      mode: 644

  - name: Starting memcached service
    service:
      name: memcached
      state: started
      enabled: true
penas@penas-VirtualBox:~/HOA-13.1-OpenStack/roles/Memcached$ cat handlers/main.yml
#Restating Memcached to verify it was enabled
  - name: Restarting memcached
    service:
      name: memcached
      state: restarted
      enabled: true
penas@penas-VirtualBox:~/HOA-13.1-OpenStack/roles/Memcached$ cat files/Memcached
MEMCACHED_PARAMS="-l 192.168.56.116"

MEMCACHED_USER="memcached"

MEMCACHED_GROUP="memcached"
```

ETCD:

```
penas@penas-VirtualBox:~/HOA-13.1-OpenStack/roles/ETCD$ cat tasks/main.yml
#Installation of ETCD

  - name: Creating a ETCD User
    group:
      name: etcd
      system: true
      state: present

  - name: Creating a directory/folder for ETCD files
    user:
      name: etcd
      home: "/var/lib/etcd"
      shell: /bin/false
      group: etcd
      system: true

  - name: Creating Directory 1 for etcd
    file:
      path: /etc/etcd
      state: directory
      owner: etcd
      group: etcd

  - name: Creating Directory 2 for etcd
    file:
      path: /var/lib/etcd
      state: directory
      owner: etcd
      group: etcd

  - name: Installing ETCD tar.gz file from GitHub
    shell: |
      ETCD_VER=v3.2.7
      rm -rf /tmp/etcd && mkdir -p /tmp/etcd
      curl -L https://github.com/coreos/etcd/releases/download/${ETCD_VER}/etcd-${ETCD_VER}-linux-amd64.tar.gz -o /tmp/etcd-${ETCD_VER}-linux-amd64.tar.gz
      tar xzvf /tmp/etcd-${ETCD_VER}-linux-amd64.tar.gz -C /tmp/etcd --strip-components=1
      cp /tmp/etcd/etcd /usr/bin/etcd
      cp /tmp/etcd/etcdctl /usr/bin/etcdctl
```

```
penas@penas-VirtualBox:~/HOA-13.1-OpenStack/roles/ETCD$ cat handlers/main.yml
#Restarting ETCD service to verify it was enabled
  - name: Reloading systemd Service
    systemd:
      daemon_reload: yes
    ignore_errors: yes
penas@penas-VirtualBox:~/HOA-13.1-OpenStack/roles/ETCD$ cat files/etcd.service
[Unit]
After=network.target
Description=etcd - highly-available key value store

[Service]
# Uncomment this on ARM64.
# Environment="ETCD_UNSUPPORTED_ARCH=arm64"
LimitNOFILE=65536
Restart=on-failure
Type=notify
ExecStart=/usr/bin/etcd --config-file /etc/etcd/etcd.conf.yml
User=etcd

[Install]
WantedBy=multi-user.target

penas@penas-VirtualBox:~/HOA-13.1-OpenStack/roles/ETCD$ cat files/etcd.conf.yml
  name: controller
  data-dir: var/lib/etcd
  initial-cluster-state: 'new'
  initial-cluster-token: 'etcd-cluster-01'
  initial-cluster: controller=http://192.168.56.116:2380
  initial-advertise-peer-urls: http://192.168.56.116:2380
  advertise-client-urls: http://192.168.56.116:2379
  listen-peer-urls: http://0.0.0.0:2380
  listen-client-urls: http://192.168.56.116:2379
```

```
- name: Creating a config file for ETCD
  copy:
    src: etcd.conf.yml
    dest: /etc/etcd/etcd.conf.yml
    owner: root
    group: root
    mode: 644

- name: Copying the ETCD service file
  copy:
    src: etcd.service
    dest: /usr/lib/systemd/system/etcd.service
    owner: root
    group: root
    mode: 644
```

Tree:

```
penas@penas-VirtualBox:~/HOA-13.1-OpenStack$ tree
.
├── ansible.cfg
├── install_os.yml
├── inventory
├── README.md
└── roles
    ├── ETCD
    │   ├── files
    │   │   ├── etcd.conf.yml
    │   │   └── etcd.service
    │   ├── handlers
    │   │   └── main.yml
    │   └── tasks
    │       └── main.yml
    ├── Memcached
    │   ├── files
    │   │   └── Memcached
    │   ├── handlers
    │   │   └── main.yml
    │   └── tasks
    │       └── main.yml
    ├── MQ
    │   ├── handlers
    │   │   └── main.yml
    │   └── tasks
    │       └── main.yml
    ├── ntp
    │   ├── files
    │   │   └── chrony.conf
    │   ├── handlers
    │   │   └── main.yml
    │   └── tasks
    │       └── main.yml
    ├── OS_Packages
    │   └── tasks
    │       └── main.yml
    └── SQL
        ├── files
        ├── handlers
        │   └── main.yml
        └── tasks
            └── main.yml

22 directories, 19 files
```

Install_os.yml:

```yaml
---

- hosts: all
  become: true
  pre_tasks:

  - name: Updating and Upgrading the OS
    apt:
      name: "*"
      state: latest
      update_cache: true

- hosts: controller_node
  become: true
  roles:
    - ntp
    - OS_Packages
    - SQL
    - MQ
    - Memcached
    - ETCD
```

```
penas@penas-VirtualBox:~/HOA-13.1-OpenStack$ git add *
penas@penas-VirtualBox:~/HOA-13.1-OpenStack$ git commit -m "Commiting"
[main 8a4d855] Commiting
 18 files changed, 250 insertions(+)
 create mode 100644 ansible.cfg
 create mode 100644 install_os.yml
 create mode 100644 inventory
 create mode 100644 roles/ETCD/files/etcd.conf.yml
 create mode 100644 roles/ETCD/files/etcd.service
 create mode 100644 roles/ETCD/handlers/main.yml
 create mode 100644 roles/ETCD/tasks/main.yml
 create mode 100644 roles/MQ/handlers/main.yml
 create mode 100644 roles/MQ/tasks/main.yml
 create mode 100644 roles/Memcached/files/Memcached
 create mode 100644 roles/Memcached/handlers/main.yml
 create mode 100644 roles/Memcached/tasks/main.yml
 create mode 100644 roles/OS_Packages/tasks/main.yml
 create mode 100644 roles/SQL/handlers/main.yml
 create mode 100644 roles/SQL/tasks/main.yml
 create mode 100644 roles/ntp/files/chrony.conf
 create mode 100644 roles/ntp/handlers/main.yml
 create mode 100644 roles/ntp/tasks/main.yml
penas@penas-VirtualBox:~/HOA-13.1-OpenStack$ git push
Enumerating objects: 42, done.
Counting objects: 100% (42/42), done.
Compressing objects: 100% (26/26), done.
Writing objects: 100% (41/41), 4.78 KiB | 1.59 MiB/s, done.
Total 41 (delta 0), reused 0 (delta 0), pack-reused 0
To github.com:IVPENAS/HOA-13.1-OpenStack.git
   45c25ee..8a4d855  main -> main
```

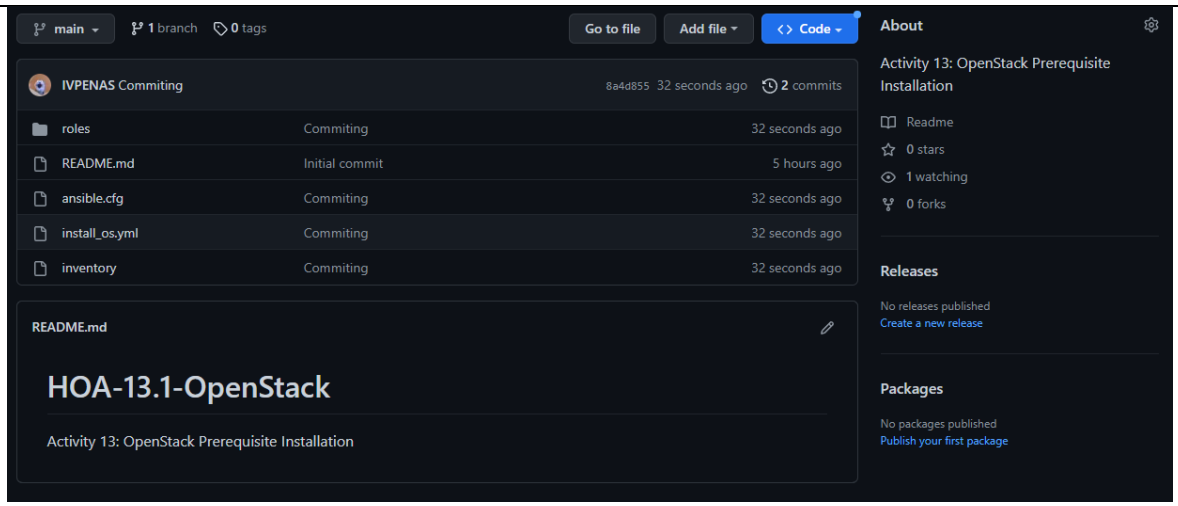
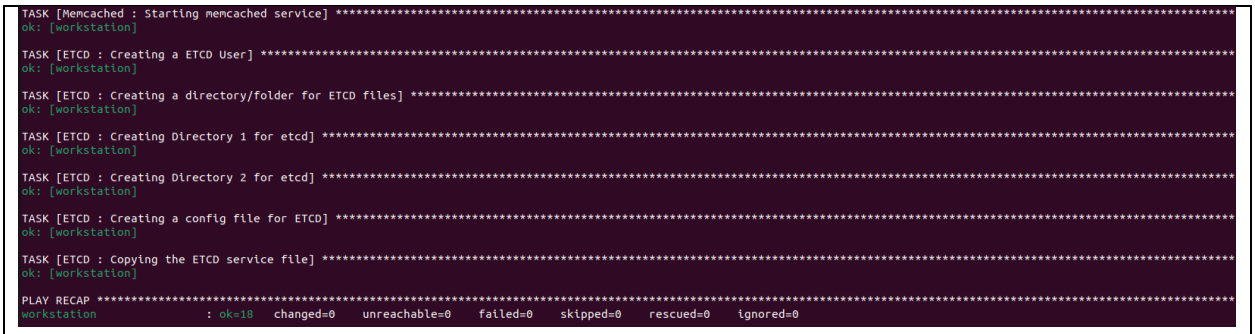


Figure 8.1. Pushing all the modified folder to sync to the repository

Playbook Output:

```
penas@penas-VirtualBox:~/HOA-13.1-OpenStack$ ansible-playbook --ask-become-pass install_os.yml
BECOME password:

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

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

TASK [Updating and Upgrading the OS] *******************************************************
ok: [workstation]

PLAY [controller_node] *********************************************************************

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

TASK [ntp : Installing Chrony] *************************************************************
ok: [workstation]

TASK [ntp : Starting Chrony Service] *******************************************************
ok: [workstation]

TASK [ntp : Editing chrony.conf file] ******************************************************
ok: [workstation]

TASK [OS_Packages : Installing OpenStack] **************************************************
changed: [workstation]

TASK [SQL : Installing Mariadb] ************************************************************
changed: [workstation]

TASK [SQL : Starting/Enabling Mariadb service] *********************************************
ok: [workstation]

TASK [MQ : Installing rabbitmq-server] *****************************************************
changed: [workstation]

TASK [MQ : Starting rabbitmq-server service] ***********************************************
ok: [workstation]

TASK [Memcached : Installing Memcached] ****************************************************
changed: [workstation]

TASK [Memcached : Starting memcached service] **********************************************
ok: [workstation]
```



Link: https://github.com/IVPENAS/HOA-13.1-OpenStack.git

Reflections:

Answer the following:

1. What are the benefits of implementing OpenStack?

   Implementing OpenStack can benefit companies that uses Cloud upon storing data from their clients whereas it can handle faster and numerous deployments of IT resources resulting for the businesses to start their own network services and application as soon it was implemented that benefits the workforce to adjust, plan, and complete projects earlier. In cloud hosting scalability is a key component where as clients can increase their resources due to the rise of demand whereas the OpenStack can accommodate demands as it was flexible enough to adjust whether requests from clients are high or low without creating errors to the network and cloud. Because of this companies continue to use Cloud Hosting applications such as Open Stack as it was ready to use for the recipient without spilling money, and it was easy to use as applications has in-built tools

Conclusions:

In this activity the student was able to accomplish it with the given due date, there are some major setbacks on the student's personal family life which resulted for the output's to be incomplete in a way it lacks of description per figures and steps. Without further ado, the OpenStack is an open-source cloud computing operating system which was used by Administrators and IT when managing cloud where as it allows users to build their own cloud infrastructure. Unlike other Cloud Services such as Amazon Web Services, IBM Cloud and more, the OpenStack is free to be installed by student to practice and hone their skills to control their respective data inputted to the cloud. Yet in when being a professional in a workforce, most probably the company uses and shouldered by a Cloud Service which most likely has in-built tools, in which it allows Administrator to handle, store, complete projects efficiently, it also benefits the company itself due to its flexibility to keep up to the latest demand and supply from high to low without wasting and failing the resources of the cloud and the money coming in to the company.