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Course/Section: CPE31S4	**Date Submitted:** November 28, 2023
Instructor: Dr. Taylar	**Semester and SY:** 2023-2024

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

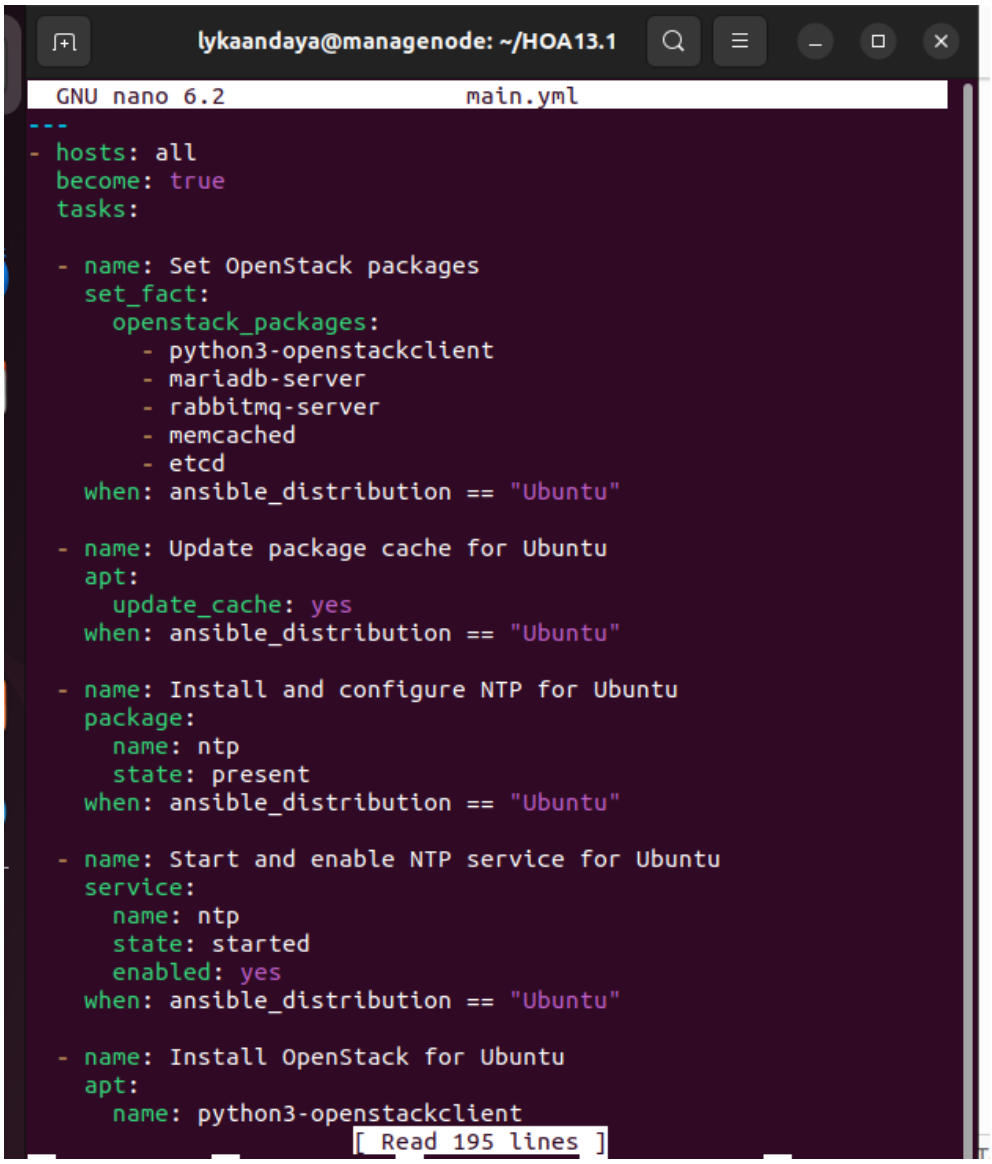
Oracle VirtualBox (Hypervisor)

1x Ubuntu VM or Centos VM

4. Tasks

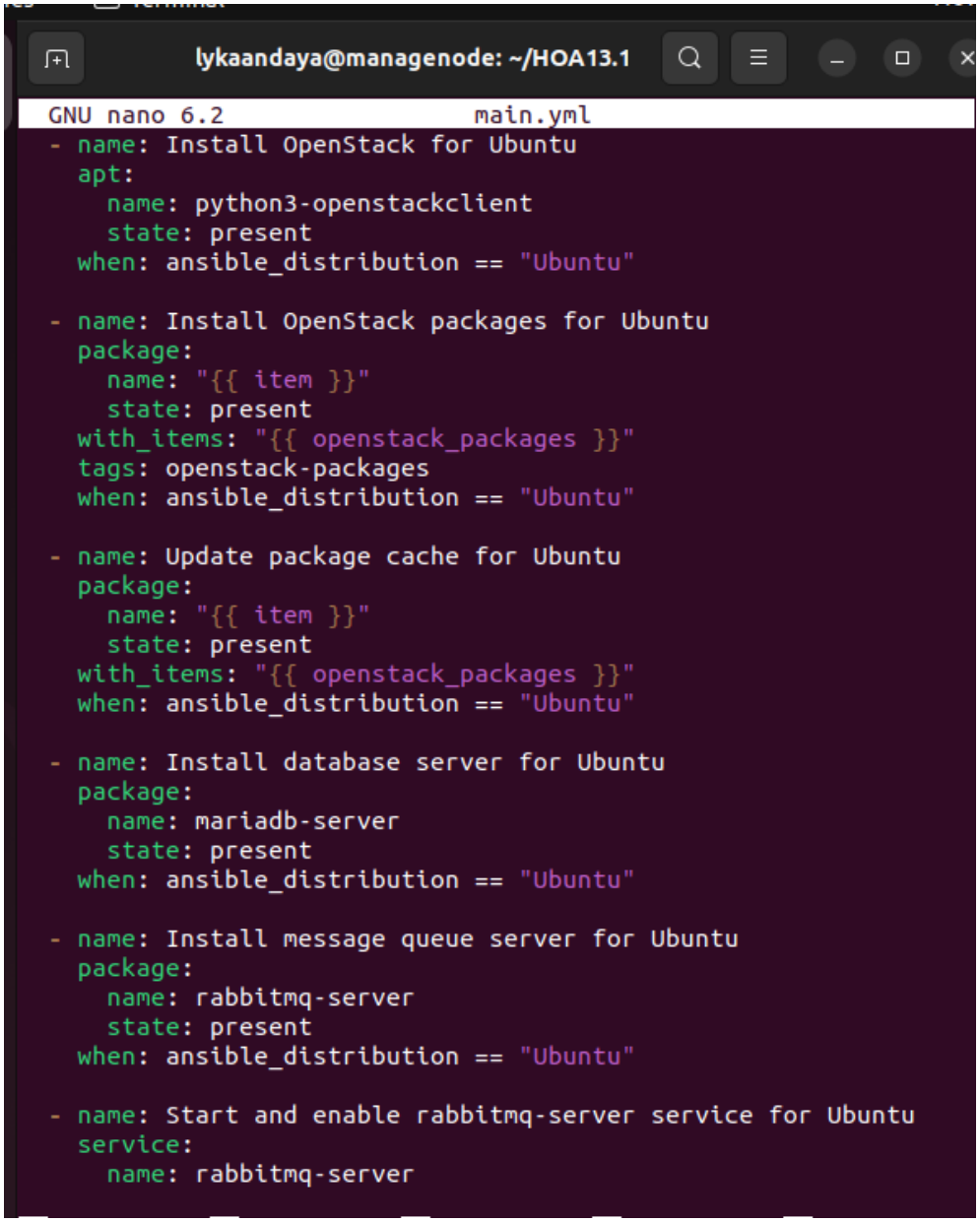
1. Create a new repository for this activity.
2. Create a playbook that converts the steps in the following items in https://docs.openstack.org/install-guide/
    a. NTP
    b. OpenStack packages
    c. SQL Database
    d. Message Queue
    e. Memcached
    f. Etcd
    g. Create different plays in installing 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.

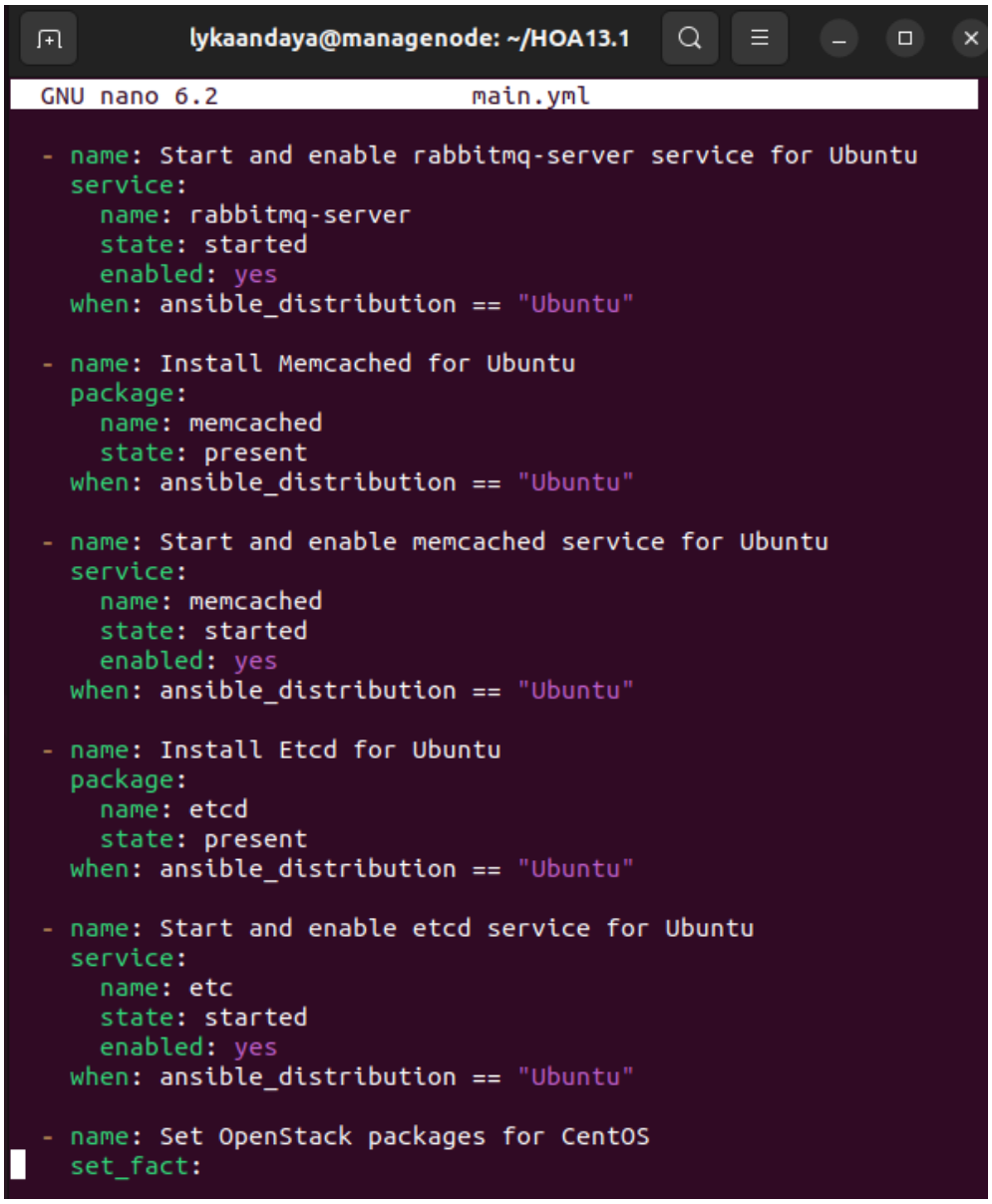
5. Output (screenshots and explanations)

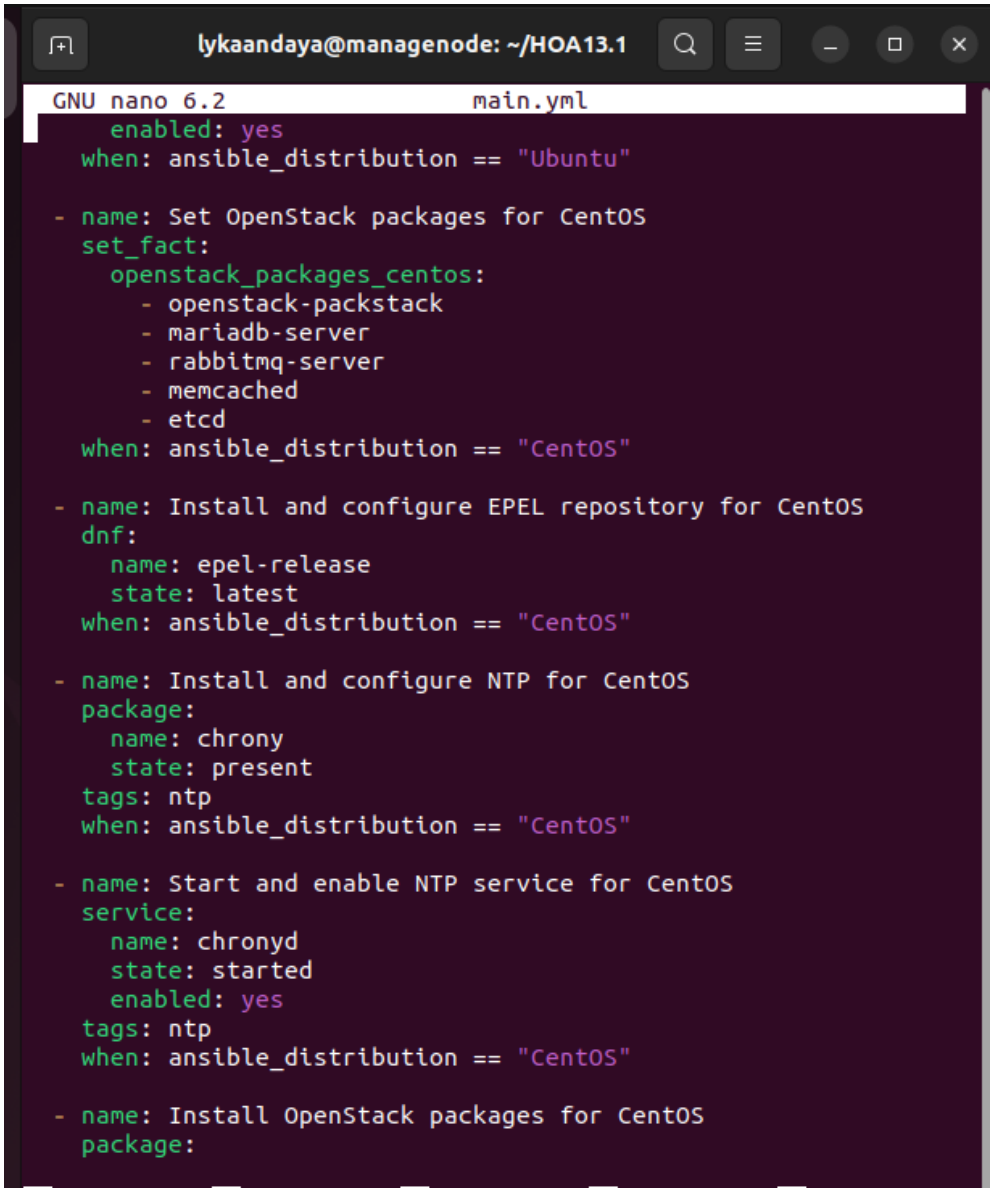
INPUT	

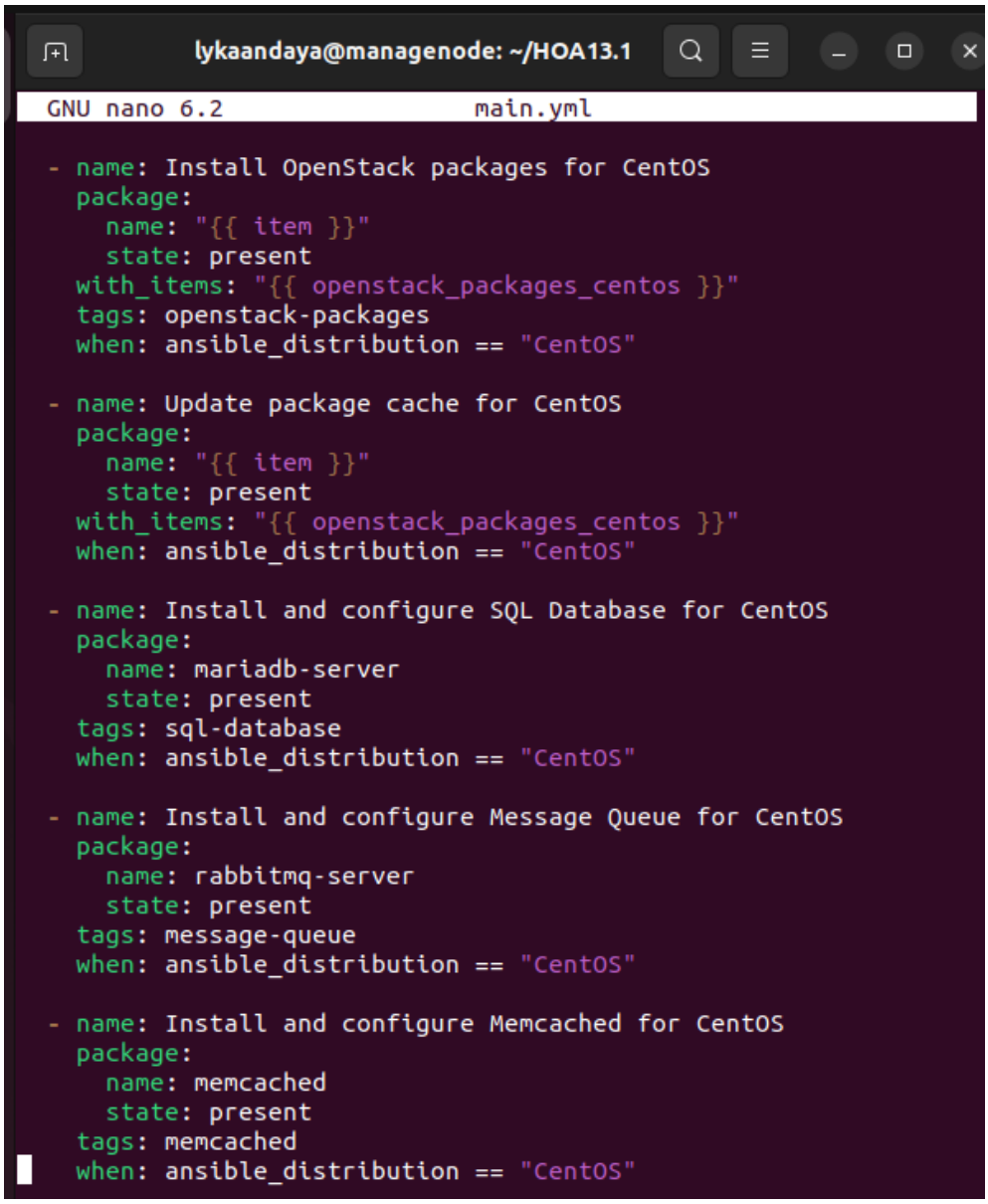
lykaandaya@managenode: ~/HOA13.1
GNU nano 6.2 main.yml

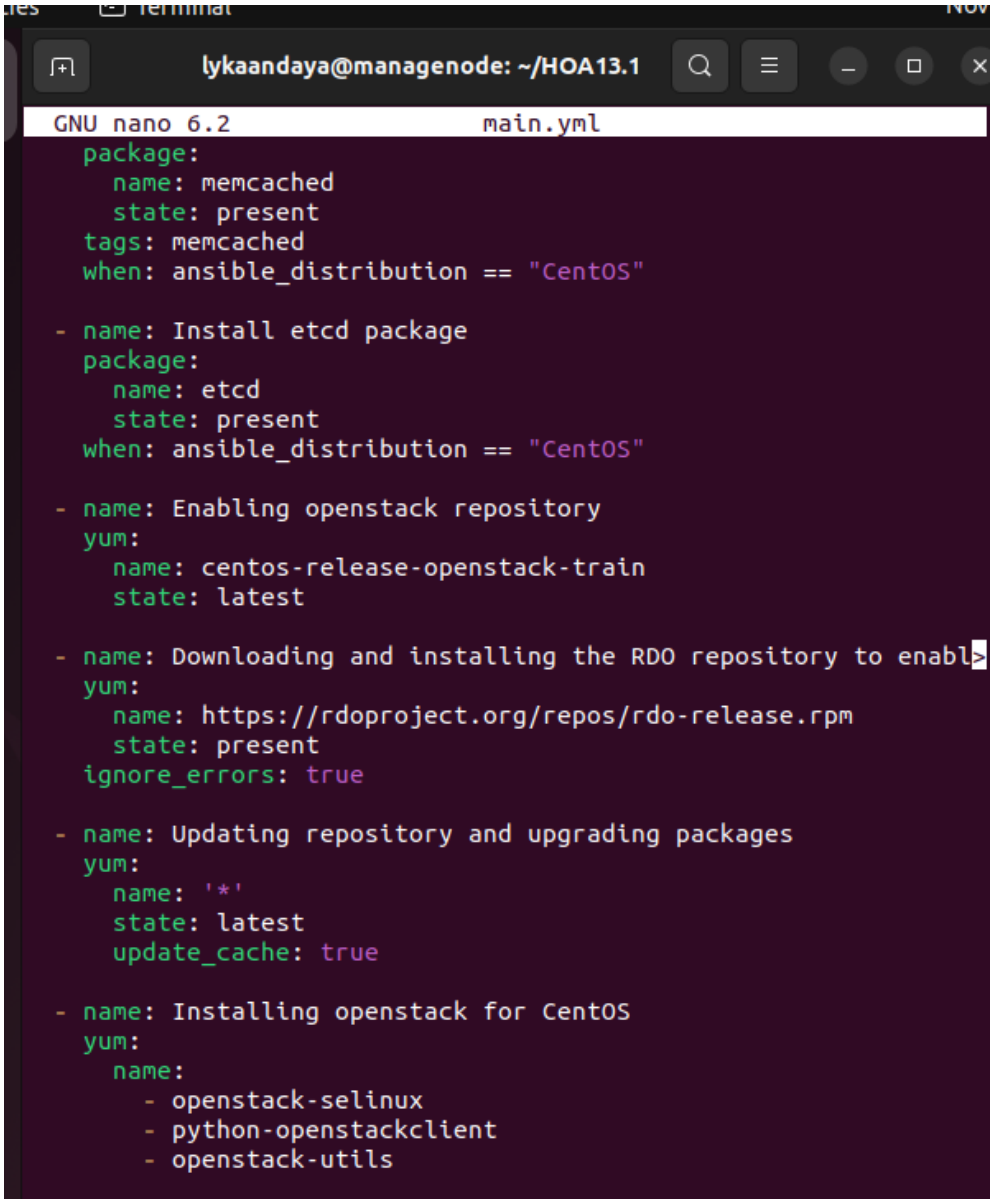
- hosts: all
become: true
tasks:
- name: Set OpenStack packages
set_fact:
openstack_packages:
- python3-openstackclient
- mariadb-server
- rabbitmq-server
- memcached
- etcd
when: ansible_distribution == "Ubuntu"
- name: Update package cache for Ubuntu
apt:
update_cache: yes
when: ansible_distribution == "Ubuntu"
- name: Install and configure NTP for Ubuntu
package:
name: ntp
state: present
when: ansible_distribution == "Ubuntu"
- name: Start and enable NTP service for Ubuntu
service:
name: ntp
state: started
enabled: yes
when: ansible_distribution == "Ubuntu"
- name: Install OpenStack for Ubuntu
apt:
name: python3-openstackclient
[Read 195 lines]


lykaandaya@managenode: ~/HOA13.1
GNU nano 6.2 main.yml
- name: Install OpenStack for Ubuntu
apt:
name: python3-openstackclient
state: present
when: ansible_distribution == "Ubuntu"
- name: Install OpenStack packages for Ubuntu
package:
name: "{{ item }}"
state: present
with_items: "{{ openstack_packages }}"
tags: openstack-packages
when: ansible_distribution == "Ubuntu"
- name: Update package cache for Ubuntu
package:
name: "{{ item }}"
state: present
with_items: "{{ openstack_packages }}"
when: ansible_distribution == "Ubuntu"
- name: Install database server for Ubuntu
package:
name: mariadb-server
state: present
when: ansible_distribution == "Ubuntu"
- name: Install message queue server for Ubuntu
package:
name: rabbitmq-server
state: present
when: ansible_distribution == "Ubuntu"
- name: Start and enable rabbitmq-server service for Ubuntu
service:
name: rabbitmq-server

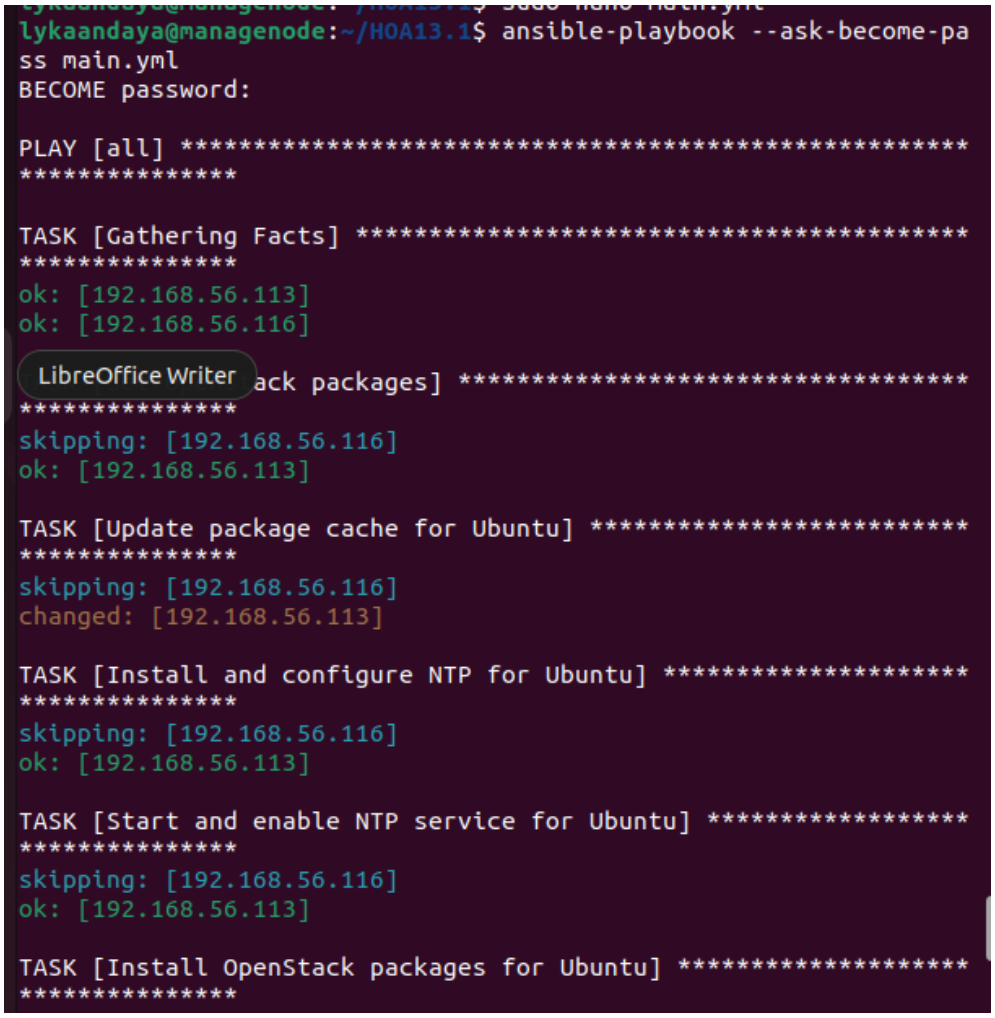

lykaandaya@managenode: ~/HOA13.1
GNU nano 6.2 main.yml
- name: Start and enable rabbitmq-server service for Ubuntu
service:
name: rabbitmq-server
state: started
enabled: yes
when: ansible_distribution == "Ubuntu"
- name: Install Memcached for Ubuntu
package:
name: memcached
state: present
when: ansible_distribution == "Ubuntu"
- name: Start and enable memcached service for Ubuntu
service:
name: memcached
state: started
enabled: yes
when: ansible_distribution == "Ubuntu"
- name: Install Etcd for Ubuntu
package:
name: etcd
state: present
when: ansible_distribution == "Ubuntu"
- name: Start and enable etcd service for Ubuntu
service:
name: etc
state: started
enabled: yes
when: ansible_distribution == "Ubuntu"
- name: Set OpenStack packages for CentOS
set_fact:


lykaandaya@managenode: ~/HOA13.1
GNU nano 6.2 main.yml
enabled: yes
when: ansible_distribution == "Ubuntu"
- name: Set OpenStack packages for CentOS
set_fact:
openstack_packages_centos:
- openstack-packstack
- mariadb-server
- rabbitmq-server
- memcached
- etcd
when: ansible_distribution == "CentOS"
- name: Install and configure EPEL repository for CentOS
dnf:
name: epel-release
state: latest
when: ansible_distribution == "CentOS"
- name: Install and configure NTP for CentOS
package:
name: chrony
state: present
tags: ntp
when: ansible_distribution == "CentOS"
- name: Start and enable NTP service for CentOS
service:
name: chronyd
state: started
enabled: yes
tags: ntp
when: ansible_distribution == "CentOS"
- name: Install OpenStack packages for CentOS
package:


lykaandaya@managenode: ~/HOA13.1
GNU nano 6.2 main.yml
- name: Install OpenStack packages for CentOS
package:
name: "{{ item }}"
state: present
with_items: "{{ openstack_packages_centos }}"
tags: openstack-packages
when: ansible_distribution == "CentOS"
- name: Update package cache for CentOS
package:
name: "{{ item }}"
state: present
with_items: "{{ openstack_packages_centos }}"
when: ansible_distribution == "CentOS"
- name: Install and configure SQL Database for CentOS
package:
name: mariadb-server
state: present
tags: sql-database
when: ansible_distribution == "CentOS"
- name: Install and configure Message Queue for CentOS
package:
name: rabbitmq-server
state: present
tags: message-queue
when: ansible_distribution == "CentOS"
- name: Install and configure Memcached for CentOS
package:
name: memcached
state: present
tags: memcached
when: ansible_distribution == "CentOS"

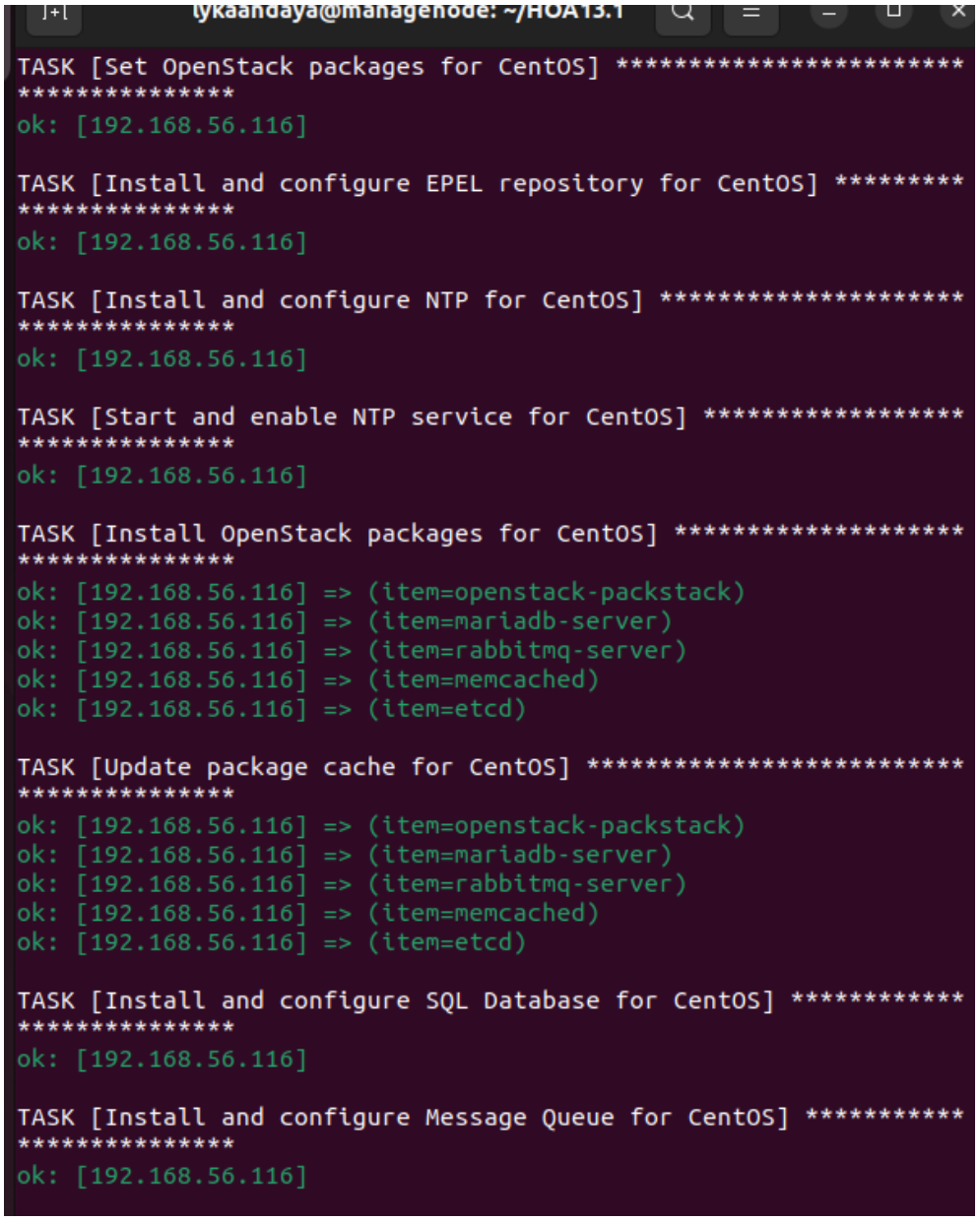


Explanation: The server 1 in linux and the server in CentOS will install NTP, OpenStack packages, SQL Database, Message Queue, Memcached, and Etcd

PROCESS	

```
lykaandaya@managenode:~/HOA13.1$ ansible-playbook --ask-become-pass main.yml
BECOME password:

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

TASK [Gathering Facts] *********************************************************
ok: [192.168.56.113]
ok: [192.168.56.116]

TASK [ack packages] ************************************************************
skipping: [192.168.56.116]
ok: [192.168.56.113]

TASK [Update package cache for Ubuntu] *****************************************
skipping: [192.168.56.116]
changed: [192.168.56.113]

TASK [Install and configure NTP for Ubuntu] ************************************
skipping: [192.168.56.116]
ok: [192.168.56.113]

TASK [Start and enable NTP service for Ubuntu] *********************************
skipping: [192.168.56.116]
ok: [192.168.56.113]

TASK [Install OpenStack packages for Ubuntu] ***********************************
```

```
TASK [Install OpenStack packages for Ubuntu] ********************
***************
skipping: [192.168.56.116]
ok: [192.168.56.113] => (item=python3-openstackclient)
ok: [192.168.56.113] => (item=mariadb-server)
ok: [192.168.56.113] => (item=rabbitmq-server)
ok: [192.168.56.113] => (item=memcached)
ok: [192.168.56.113] => (item=etcd)

TASK [Update package cache for Ubuntu] **************************
***************
skipping: [192.168.56.116]
ok: [192.168.56.113] => (item=python3-openstackclient)
ok: [192.168.56.113] => (item=mariadb-server)
ok: [192.168.56.113] => (item=rabbitmq-server)
ok: [192.168.56.113] => (item=memcached)
ok: [192.168.56.113] => (item=etcd)

TASK [Install database server for Ubuntu] ***********************
***************
skipping: [192.168.56.116]
ok: [192.168.56.113]

TASK [Install message queue server for Ubuntu] ******************
***************
skipping: [192.168.56.116]
ok: [192.168.56.113]

TASK [Install Memcached for Ubuntu] *****************************
***************
skipping: [192.168.56.116]
ok: [192.168.56.113]

TASK [Install Etcd for Ubuntu] **********************************
***************
skipping: [192.168.56.116]
ok: [192.168.56.113]
```


lykaandaya@manageNode: ~/HOA13.1
TASK [Set OpenStack packages for CentOS] ***********************
****
ok: [192.168.56.116]
TASK [Install and configure EPEL repository for CentOS] *********
****
ok: [192.168.56.116]
TASK [Install and configure NTP for CentOS] *********************
****
ok: [192.168.56.116]
TASK [Start and enable NTP service for CentOS] ******************
****
ok: [192.168.56.116]
TASK [Install OpenStack packages for CentOS] ********************
****
ok: [192.168.56.116] => (item=openstack-packstack)
ok: [192.168.56.116] => (item=mariadb-server)
ok: [192.168.56.116] => (item=rabbitmq-server)
ok: [192.168.56.116] => (item=memcached)
ok: [192.168.56.116] => (item=etcd)
TASK [Update package cache for CentOS] *************************
****
ok: [192.168.56.116] => (item=openstack-packstack)
ok: [192.168.56.116] => (item=mariadb-server)
ok: [192.168.56.116] => (item=rabbitmq-server)
ok: [192.168.56.116] => (item=memcached)
ok: [192.168.56.116] => (item=etcd)
TASK [Install and configure SQL Database for CentOS] ************
****
ok: [192.168.56.116]
TASK [Install and configure Message Queue for CentOS] ***********
****
ok: [192.168.56.116]

```
TASK [Install and configure Memcached for CentOS] ***************
***************
ok: [192.168.56.116]

TASK [Install etcd package] ***************************************
***************
ok: [192.168.56.116]

TASK [Enabling openstack repository] ****************************
***************
ok: [192.168.56.116]

TASK [Downloading and installing the RDO repository to enable ope
nstack repository] ***
ok: [192.168.56.116]

TASK [Updating repository and upgrading packages] ***************
***************
ok: [192.168.56.116]

TASK [Installing openstack for CentOS] **************************
***************
ok: [192.168.56.116]

PLAY RECAP ******************************************************
***************
192.168.56.113             : ok=11   changed=1    unreachable=0
  failed=0    skipped=9    rescued=0    ignored=0
192.168.56.116             : ok=15   changed=0    unreachable=0
  failed=0    skipped=10   rescued=0    ignored=0
```

Explanation: It shows that It executed the tasks that I created in the playbook

OUTPUT

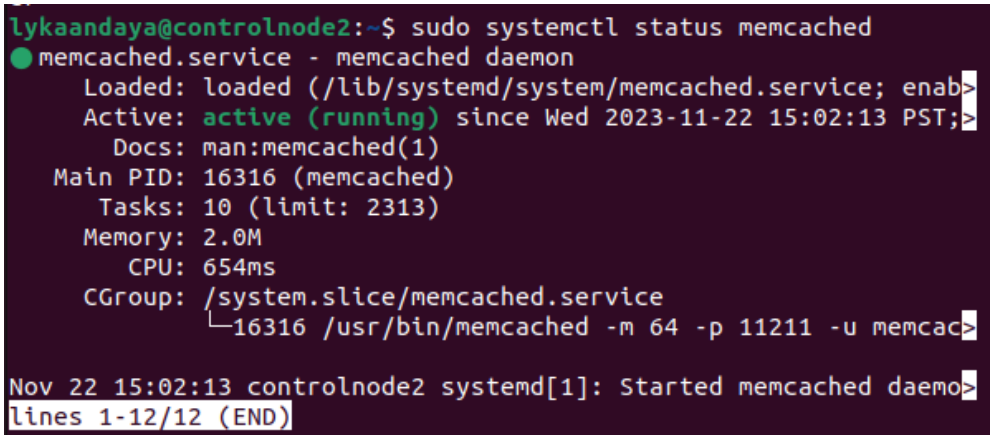
UBUNTU

```
lykaandaya@controlnode2:~$ sudo systemctl status ntp
● ntp.service - Network Time Service
     Loaded: loaded (/lib/systemd/system/ntp.service; enabled; v>
     Active: active (running) since Wed 2023-11-22 17:37:36 PST;>
       Docs: man:ntpd(8)
    Process: 31211 ExecStart=/usr/lib/ntp/ntp-systemd-wrapper (c>
   Main PID: 31217 (ntpd)
      Tasks: 2 (limit: 2313)
     Memory: 2.4M
        CPU: 30ms
     CGroup: /system.slice/ntp.service
             └─31217 /usr/sbin/ntpd -p /var/run/ntpd.pid -g -u 1>

Nov 22 17:37:41 controlnode2 ntpd[31217]: Soliciting pool server>
Nov 22 17:37:41 controlnode2 ntpd[31217]: Soliciting pool server>
Nov 22 17:37:42 controlnode2 ntpd[31217]: Soliciting pool server>
Nov 22 17:37:42 controlnode2 ntpd[31217]: Soliciting pool server>
Nov 22 17:37:43 controlnode2 ntpd[31217]: Soliciting pool server>
Nov 22 17:37:44 controlnode2 ntpd[31217]: Soliciting pool server>
Nov 22 17:37:45 controlnode2 ntpd[31217]: Soliciting pool server>
Nov 22 17:37:58 controlnode2 ntpd[31217]: receive: Unexpected or>
Nov 22 17:37:58 controlnode2 ntpd[31217]: receive: Unexpected or>
Nov 22 17:37:58 controlnode2 ntpd[31217]: receive: Unexpected or>
lines 1-22/22 (END)
```

```
lykaandaya@controlnode2:~$ openstack --version
openstack 5.8.0
```

```
lykaandaya@controlnode2:~$ sudo systemctl status mariadb
● mariadb.service - MariaDB 10.6.12 database server
     Loaded: loaded (/lib/systemd/system/mariadb.service; enable>
     Active: active (running) since Wed 2023-11-22 15:00:34 PST;>
       Docs: man:mariadbd(8)
             https://mariadb.com/kb/en/library/systemd/
   Main PID: 14900 (mariadbd)
     Status: "Taking your SQL requests now..."
      Tasks: 8 (limit: 2313)
     Memory: 61.8M
        CPU: 993ms
     CGroup: /system.slice/mariadb.service
             └─14900 /usr/sbin/mariadbd

Nov 22 15:00:34 controlnode2 mariadbd[14900]: Version: '10.6.12->
Nov 22 15:00:34 controlnode2 systemd[1]: Started MariaDB 10.6.12>
Nov 22 15:00:34 controlnode2 /etc/mysql/debian-start[14916]: Upg>
Nov 22 15:00:34 controlnode2 /etc/mysql/debian-start[14921]: Loo>
Nov 22 15:00:34 controlnode2 /etc/mysql/debian-start[14921]: Loo>
Nov 22 15:00:34 controlnode2 /etc/mysql/debian-start[14921]: Thi>
Nov 22 15:00:34 controlnode2 /etc/mysql/debian-start[14921]: The>
Nov 22 15:00:34 controlnode2 /etc/mysql/debian-start[14921]: You>
Nov 22 15:00:34 controlnode2 /etc/mysql/debian-start[14929]: Che>
Nov 22 15:00:34 controlnode2 /etc/mysql/debian-start[14933]: Tri>
lines 1-23/23 (END)
```

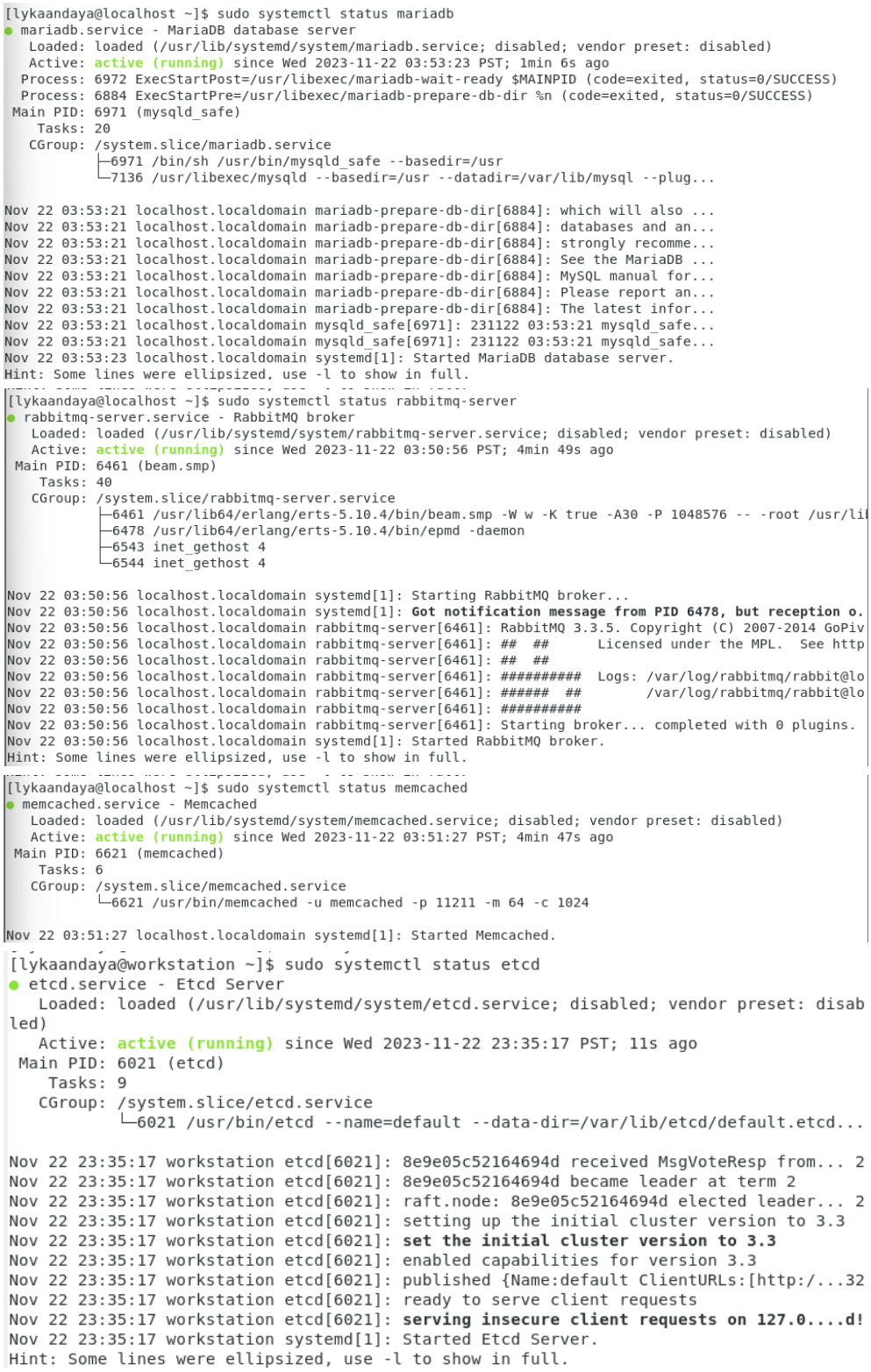

lykaandaya@controlnode2:~$ sudo systemctl status rabbitmq-server
rabbitmq-server.service - RabbitMQ Messaging Server
Loaded: loaded (/lib/systemd/system/rabbitmq-server.service>
Active: active (running) since Wed 2023-11-22 15:00:52 PST;>
Main PID: 15371 (beam.smp)
Tasks: 21 (limit: 2313)
Memory: 77.9M
CPU: 20.780s
CGroup: /system.slice/rabbitmq-server.service
├─15371 /usr/lib/erlang/erts-12.2.1/bin/beam.smp -W>
├─15382 erl_child_setup 65536
├─15429 inet_gethost 4
└─15430 inet_gethost 4
Nov 22 15:00:50 controlnode2 systemd[1]: Starting RabbitMQ Messa>
Nov 22 15:00:52 controlnode2 systemd[1]: Started RabbitMQ Messag>
lines 1-15/15 (END)


lykaandaya@controlnode2:~$ sudo systemctl status memcached
memcached.service - memcached daemon
Loaded: loaded (/lib/systemd/system/memcached.service; enab>
Active: active (running) since Wed 2023-11-22 15:02:13 PST;>
Docs: man:memcached(1)
Main PID: 16316 (memcached)
Tasks: 10 (limit: 2313)
Memory: 2.0M
CPU: 654ms
CGroup: /system.slice/memcached.service
└─16316 /usr/bin/memcached -m 64 -p 11211 -u memcac>
Nov 22 15:02:13 controlnode2 systemd[1]: Started memcached daemo>
lines 1-12/12 (END)

```
lykaandaya@controlnode2:~$ sudo systemctl status etcd
● etcd.service - etcd - highly-available key value store
     Loaded: loaded (/lib/systemd/system/etcd.service; enabled; >
     Active: active (running) since Wed 2023-11-22 15:02:20 PST;>
       Docs: https://etcd.io/docs
             man:etcd
   Main PID: 16582 (etcd)
      Tasks: 7 (limit: 2313)
     Memory: 5.7M
        CPU: 10.997s
     CGroup: /system.slice/etcd.service
             └─16582 /usr/bin/etcd

Nov 22 15:02:20 controlnode2 etcd[16582]: 8e9e05c52164694d recei>
Nov 22 15:02:20 controlnode2 etcd[16582]: 8e9e05c52164694d becam>
Nov 22 15:02:20 controlnode2 etcd[16582]: raft.node: 8e9e05c5216>
Nov 22 15:02:20 controlnode2 etcd[16582]: setting up the initial>
Nov 22 15:02:20 controlnode2 etcd[16582]: published {Name:contro>
Nov 22 15:02:20 controlnode2 etcd[16582]: ready to serve client >
Nov 22 15:02:20 controlnode2 etcd[16582]: serving insecure clien>
Nov 22 15:02:20 controlnode2 systemd[1]: Started etcd - highly-a>
Nov 22 15:02:20 controlnode2 etcd[16582]: set the initial cluste>
Nov 22 15:02:20 controlnode2 etcd[16582]: enabled capabilities f>
lines 1-22/22 (END)
```

CENTOS

```
[lykaandaya@localhost ~]$ sudo systemctl status chronyd
● chronyd.service - NTP client/server
   Loaded: loaded (/usr/lib/systemd/system/chronyd.service; enabled; vendor preset: ena
bled)
   Active: active (running) since Wed 2023-11-22 00:22:02 PST; 3h 30min ago
     Docs: man:chronyd(8)
           man:chrony.conf(5)
 Main PID: 737 (chronyd)
    Tasks: 1
   CGroup: /system.slice/chronyd.service
           └─737 /usr/sbin/chronyd

Nov 22 02:59:38 localhost.localdomain chronyd[737]: Source 47.243.51.23 online
Nov 22 02:59:38 localhost.localdomain chronyd[737]: Source 58.176.194.67 online
Nov 22 02:59:38 localhost.localdomain chronyd[737]: Source 162.159.200.1 online
Nov 22 02:59:38 localhost.localdomain chronyd[737]: Source 157.119.101.135 online
Nov 22 03:02:58 localhost.localdomain chronyd[737]: Source 58.176.194.67 replaced w...7
Nov 22 03:06:12 localhost.localdomain chronyd[737]: Selected source 194.36.178.157
Nov 22 03:06:12 localhost.localdomain chronyd[737]: System clock wrong by 6451.8437...d
Nov 22 03:15:18 localhost.localdomain chronyd[737]: Selected source 157.119.101.135
Nov 22 03:15:18 localhost.localdomain chronyd[737]: System clock wrong by 2404.9639...d
Nov 22 03:16:23 localhost.localdomain chronyd[737]: Selected source 47.243.51.23
Hint: Some lines were ellipsized, use -l to show in full.
[4]+  Stopped                 grep --color=auto openstack-selinux
[lykaandaya@workstation ~]$ sudo yum list installed | grep openstack-selinux
[sudo] password for lykaandaya:
Repository rdo-trunk-train-tested is listed more than once in the configuration
openstack-selinux.noarch     _    0.8.26-1.el7            @centos-openstack-train
```



Explanation: In the linux server 1 it shows that the NTP, SQL Database, Message Queue, Memcached, Etcd are installed and the service is currently active and

running. and the installed OpenStack packages are version 5.8.0. In the CentOS server it shows that NTP, SQL Database, Message Queue, Memcached, Etcd are installed and the service is currently active and running and the installed Openstack packages (openstack-selinux.noarch) are version 0.8.26-1.el7

```
create mode 100644 roles/ubuntu/tasks/install.yml
lykaandaya@managenode:~/HOA13.1$ git add *
lykaandaya@managenode:~/HOA13.1$ git commit -m "HOA13"
On branch main
Your branch is ahead of 'origin/main' by 1 commit.
  (use "git push" to publish your local commits)

nothing to commit, working tree clean
lykaandaya@managenode:~/HOA13.1$ git push
Enumerating objects: 13, done.
Counting objects: 100% (13/13), done.
Compressing objects: 100% (8/8), done.
Writing objects: 100% (12/12), 1.91 KiB | 1.92 MiB/s, done.
Total 12 (delta 2), reused 0 (delta 0), pack-reused 0
remote: Resolving deltas: 100% (2/2), done.
To github.com:andayalyka/HOA13.1.git
   e426e61..ee133f4  main -> main
```

Explanation: All of the created files has been push in the github and has a commit message “HOA13”

Reflections:

Answer the following:

1. **What are the benefits of implementing OpenStack?**
   - Integrating OpenStack provides organizations with a versatile and scalable cloud computing solution, allowing for the seamless administration of virtualized resources to boost agility and efficiency. OpenStack promotes interoperability among different infrastructure components, emphasizing vendor neutrality. Its modular architecture enables users to tailor deployments to specific requirements, facilitating automation to minimize manual intervention and expedite provisioning processes. OpenStack's open-source nature fosters community collaboration and ongoing innovation. This framework supports a range of hypervisors and storage options, accommodating diverse workloads. In essence, OpenStack empowers businesses to construct and oversee robust, cost-efficient private and public cloud environments, promoting resource optimization and technological resilience.

Conclusions:

In conclusion, implementing a workflow for OpenStack installation using Ansible as the Infrastructure as Code (IaC) solution presents a strategic method

for cloud deployment. This approach leverages the robust cloud computing capabilities of OpenStack alongside Ansible's automation proficiency. With IaC, the deployment process becomes more efficient, uniform, and easily replicable. Ansible's role in orchestrating OpenStack installation not only boosts efficiency through task automation but also ensures a standardized and dependable infrastructure. This strategy facilitates smooth management, adaptability, and scalability for future needs. In essence, the adoption of Ansible for OpenStack deployment reflects a dedication to agility, efficiency, and the sustained manageability of cloud infrastructure.