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Course/Section: CPE232-CPE31S1	**Instructor:** Dr. Jonathan Taylar

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)

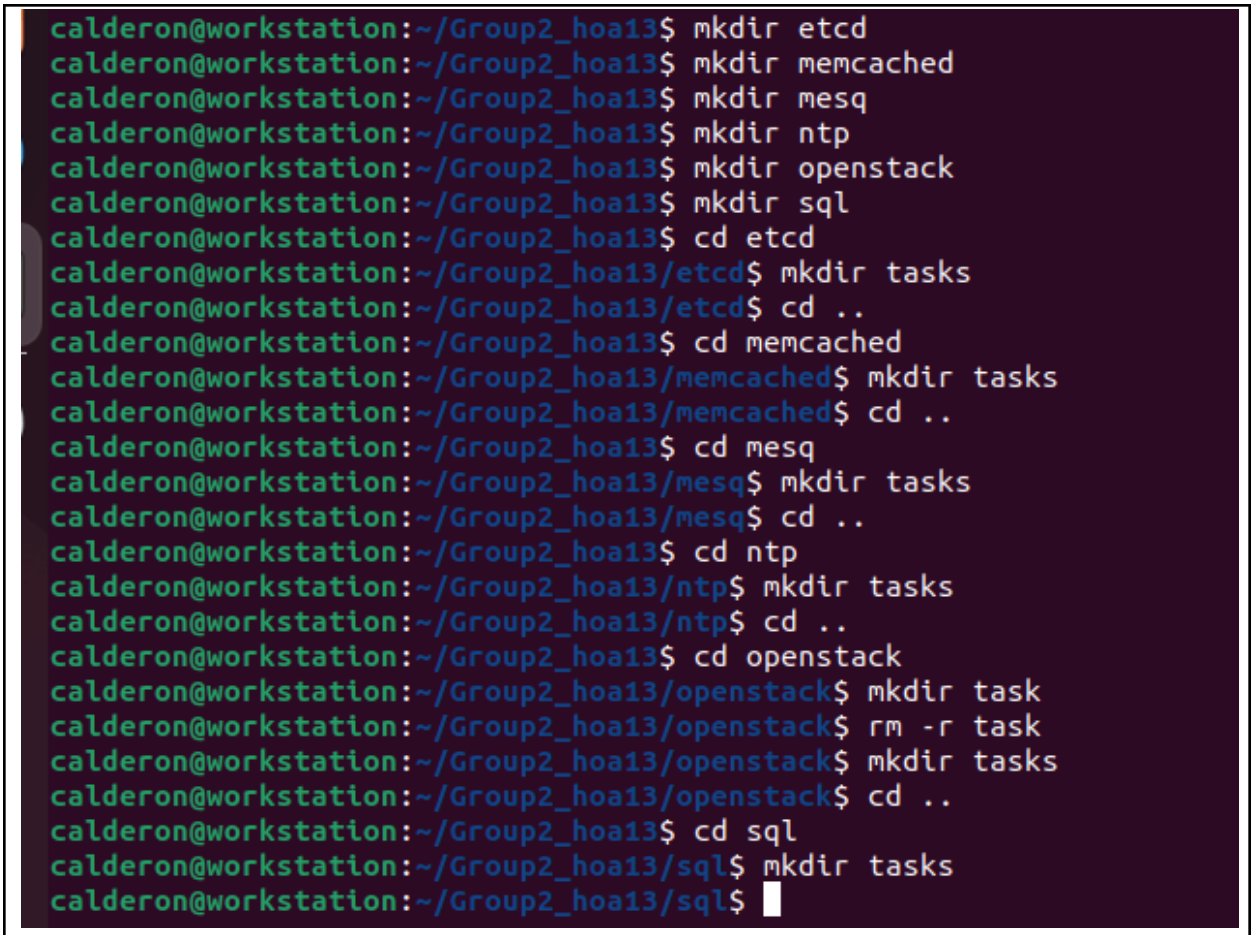
```
calderon@workstation:~$ git config --global user.name "Riccalder"
calderon@workstation:~$ git config --global user.email "qrbcalder
on@tip.edu.ph"
calderon@workstation:~$ git config --list
user.name=Riccalder
user.email=qrbcalderon@tip.edu.ph
calderon@workstation:~$ git clone git@github.com:Riccalder/Group2
_hoa13.git
Cloning into 'Group2_hoa13'...
remote: Enumerating objects: 3, done.
remote: Counting objects: 100% (3/3), done.
remote: Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
Receiving objects: 100% (3/3), done.
calderon@workstation:~$ cd Group2_hoa13
calderon@workstation:~/Group2_hoa13$ ls
README.md
calderon@workstation:~/Group2_hoa13$
```

We've utilized Ubuntu to clone the 'Group2_hoa13' GitHub repository onto my local machine, indicating that we're operating within the Ubuntu environment for our Git operations.

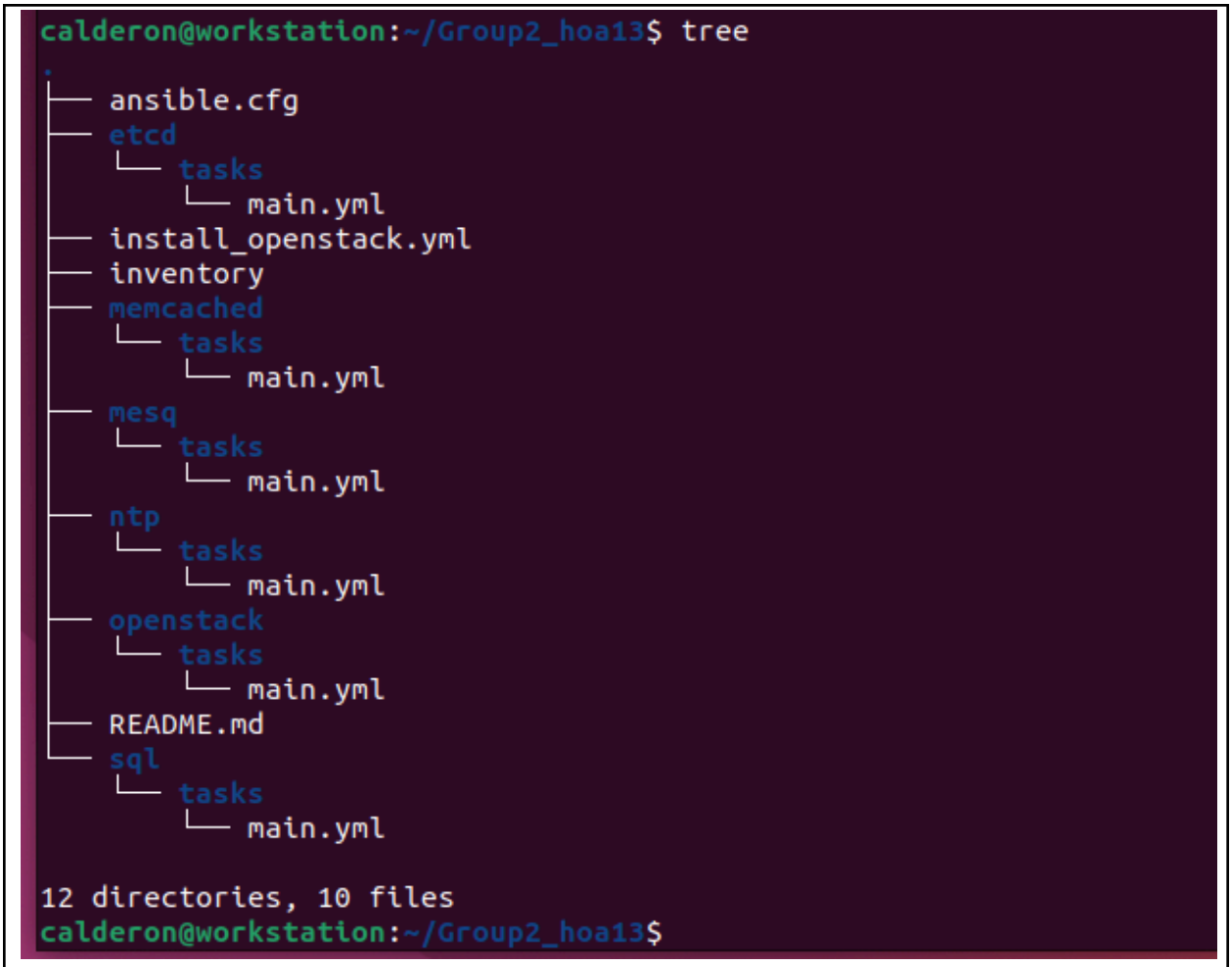
```
calderon@workstation:~/Group2_hoa13$ sudo nano ansible.cfg
[sudo] password for calderon:
calderon@workstation:~/Group2_hoa13$ ls
ansible.cfg  README.md
calderon@workstation:~/Group2_hoa13$ sudo nano install_openstack.yml
calderon@workstation:~/Group2_hoa13$ sudo nano inventory
calderon@workstation:~/Group2_hoa13$
```

```
calderon@workstation:~/Group2_hoa13$ cat ansible.cfg
[defaults]

inventory = inventory
host_key_checking = False

deprecation_warnings = False

remote_user = Riccalder
private_key_file = ~/.ssh/
calderon@workstation:~/Group2_hoa13$ cat install_openstack.yml
#This is the main playbook for openstack installation

---


- hosts: all
  become: true
  roles:
    - role: ntp
    - role: openstack
    - role: sql
    - role: mesq
    - role: memcache
    - role: etcd
calderon@workstation:~/Group2_hoa13$ cat inventory
[ubuntu]
192.168.56.103
calderon@workstation:~/Group2_hoa13$
```

We, as Group2, are working within the Group2_hoa13 directory on my Ubuntu machine. We used the sudo nano command to edit the ansible.cfg, install_openstack.yml, and inventory files.



We created directories for different components of the project, etcd, memcached, mesq,ntp,openstack and sql, each containing a "tasks" directory.



This directory structure shows various tasks organized into separate folders for different components of the OpenStack installation.

In each component, there is code provided for their installation through Ansible.

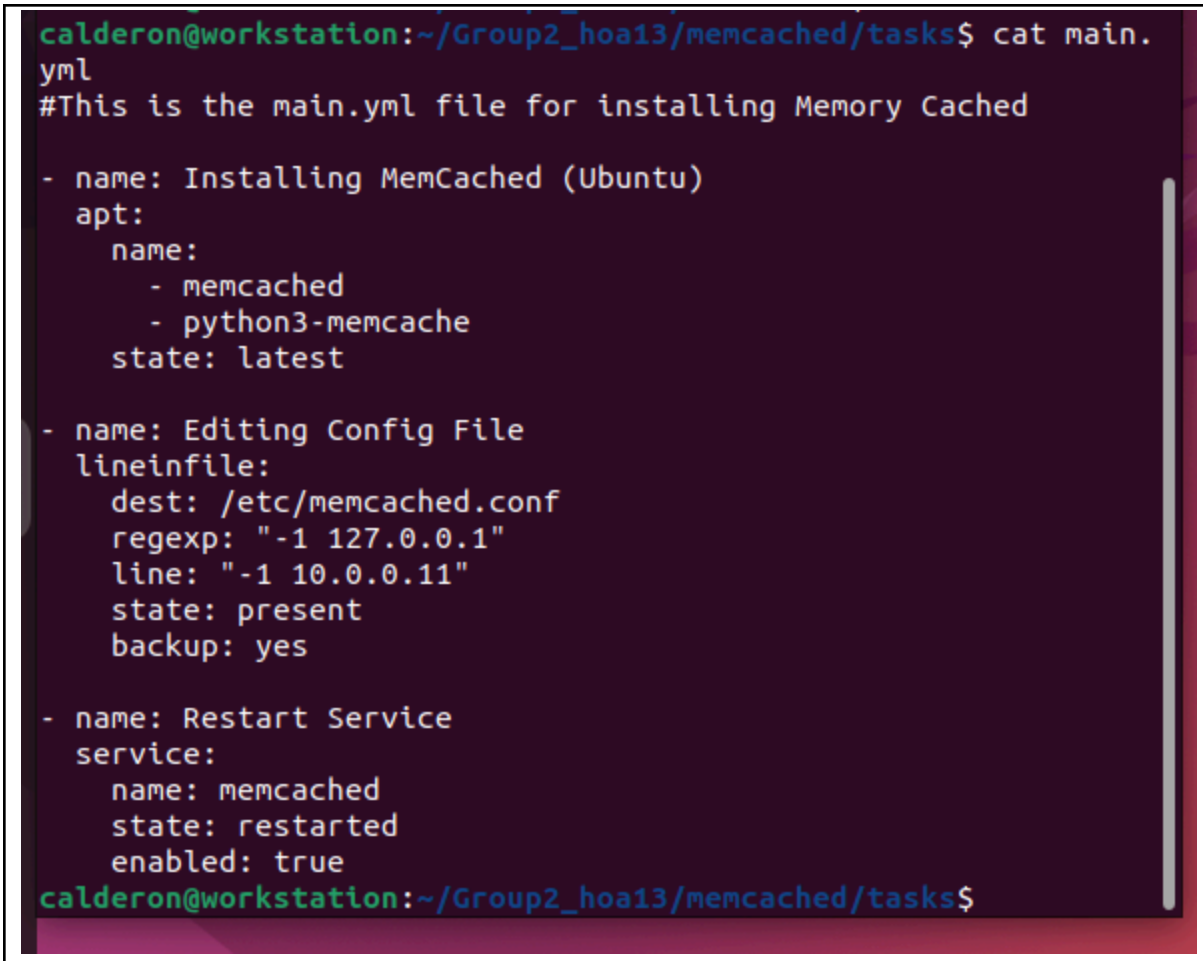
```
calderon@workstation:~/Group2_hoa13/mesq/tasks$ cat  main.yml
- name: Install Message Queue
  apt:
    name: rabbitmq-server
    state: present
    update_cache: yes

- name: Starting service
  service:
    name: rabbitmq-server.service
    state: started
    enabled: true
```

this

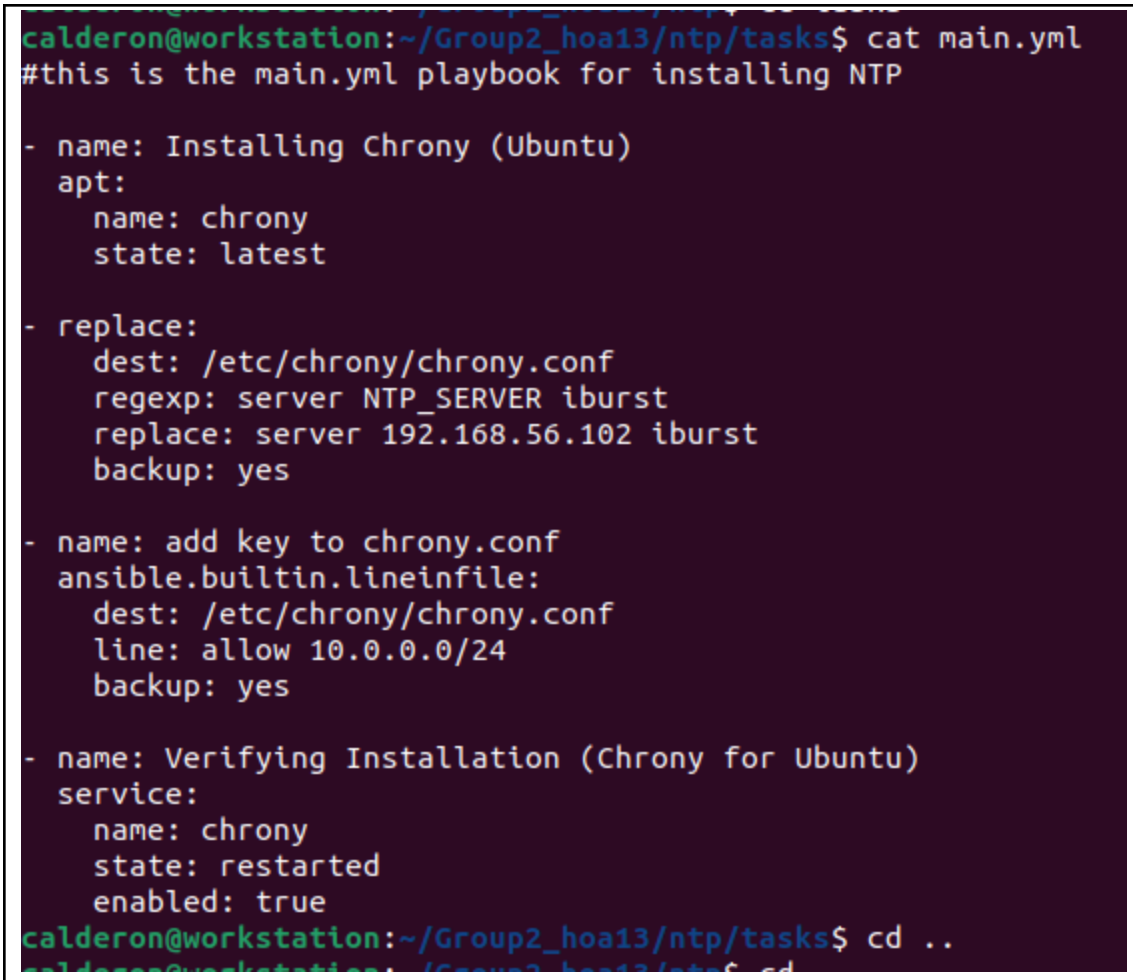
This playbook automates the installation and initialization of RabbitMQ, a **message queue** service, on the target system.

```
calderon@workstation:~/Group2_hoa13/etcd/tasks$ cat main.yml
#This is the main.yml file for installing etcd

- name: Installing Packages (etcd for Ubuntu)
  apt:
    name:
      - etcd
    state: latest

- name: Editing Config File
  lineinfile:
    dest: /etc/default/etcd
    regexp: '{{ item.regexp }}'
    line: '{{ item.line }}'
    state: present
    backup: yes

  with_items:
    - { regexp: 'ETCD_INITIAL_CLUSTER=', line: 'ETCD_INITIAL_C
LUSTER="controller=http://10.0.0.11:2380"'}
    - { regexp: 'ETCD_INITIAL_ADVERTISE_PEER_URLS=', line: 'ET
CD_INITIAL_ADVERTISE_PEER_URLS="http://10.0.0.11:2380"'}
    - { regexp: 'ETCD_ADVERTISE_CLIENT_URLS=', line: 'ETCD_ADV
ERTISE_CLIENT_URLS="http://10.0.0.11:2379"'}
    - { regexp: 'ETCD_LISTEN_PEER_URLS=', line: 'ETCD_LISTEN_P
EER_URLS="http://0.0.0.0:2380 " '}
    - { regexp: 'ETCD_LISTEN_CLIENT_URLS=', line: 'ETCD_LISTEN
_CLIENT_URLS="http:// 10.0.0.11:2379"   '}
calderon@workstation:~/Group2_hoa13/etcd/tasks$
```

This yml automate the installation and configuration of **etcd,** a distributed key-value store used for managing cluster configurations and state.



This yml automates the installation of **Memcached,** adjusts its configuration to listen on a specific IP address, and restarts the service to apply the changes.



```
calderon@workstation:~/Group2_hoa13/ntp/tasks$ cat main.yml
#this is the main.yml playbook for installing NTP

- name: Installing Chrony (Ubuntu)
  apt:
    name: chrony
    state: latest

- replace:
    dest: /etc/chrony/chrony.conf
    regexp: server NTP_SERVER iburst
    replace: server 192.168.56.102 iburst
    backup: yes

- name: add key to chrony.conf
  ansible.builtin.lineinfile:
    dest: /etc/chrony/chrony.conf
    line: allow 10.0.0.0/24
    backup: yes

- name: Verifying Installation (Chrony for Ubuntu)
  service:
    name: chrony
    state: restarted
    enabled: true
calderon@workstation:~/Group2_hoa13/ntp/tasks$ cd ..
```

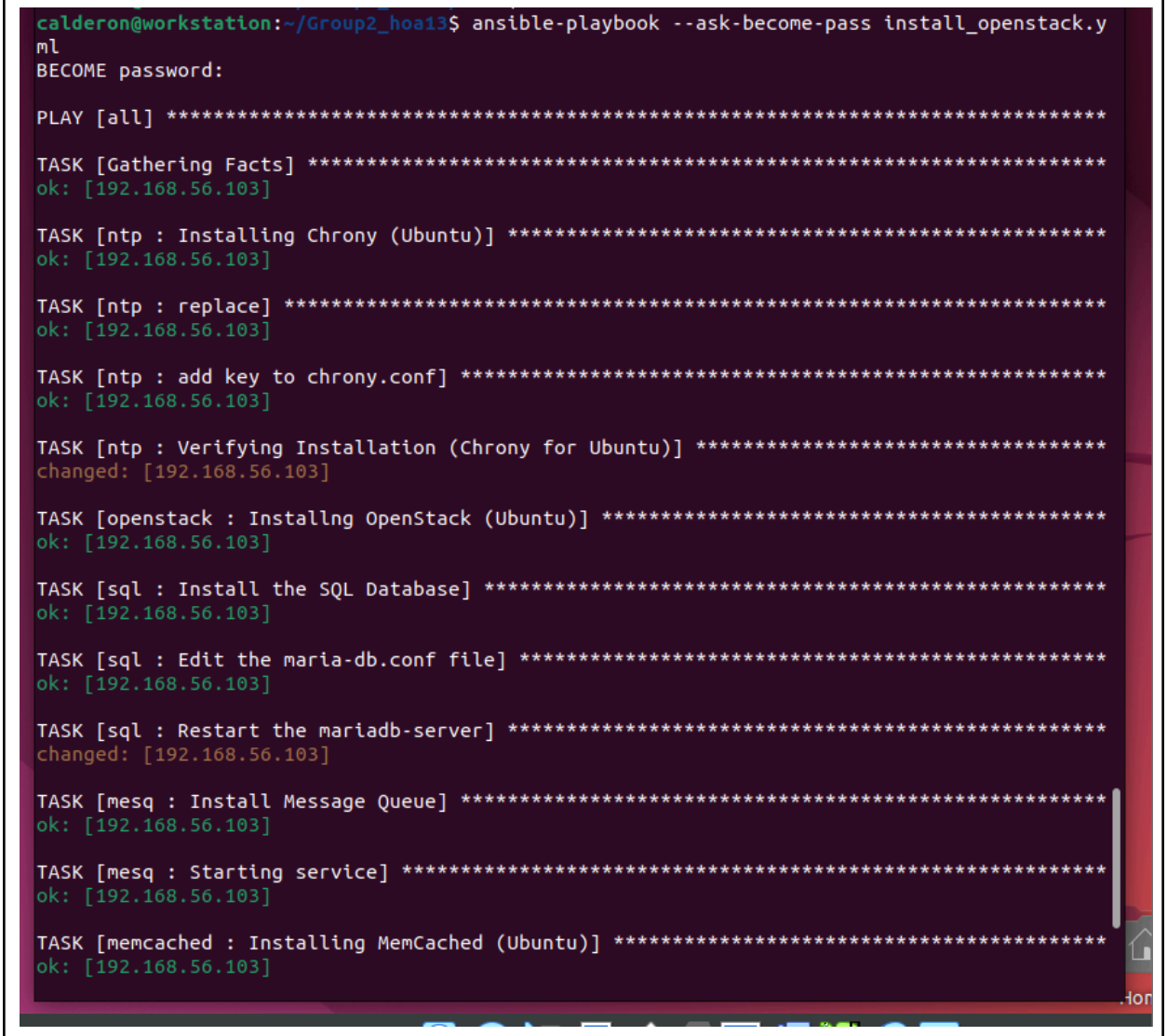
This YAML format, aimed at installing and configuring NTP (Network Time Protocol) using Chrony on Ubuntu systems.

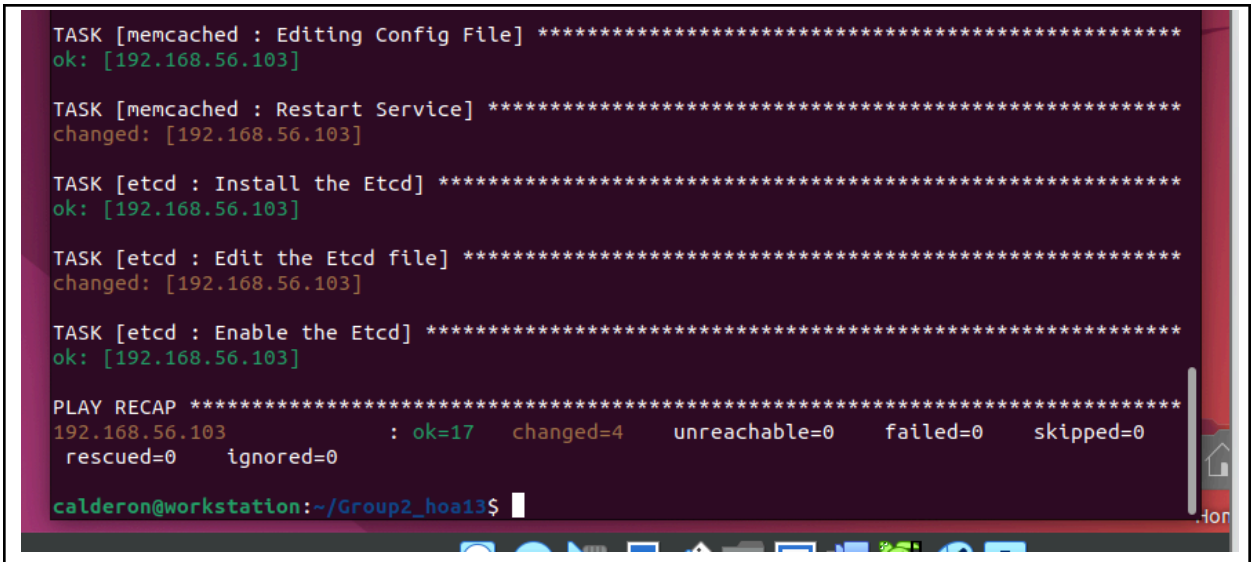
```
calderon@workstation:~/Group2_hoa13/openstack/tasks$ cat main.
yml
#this is the main.yml file for installing Openstack

- name: Installng OpenStack (Ubuntu)
  apt:
    name:
      - nova-compute
      - python3-openstackclient
    state: latest
calderon@workstation:~/Group2_hoa13/openstack/tasks$ cd ..
```

This Ansible playbook is intended for installing OpenStack components, specifically nova-compute and python3-openstackclient, on Ubuntu systems

```
calderon@workstation:~/Group2_hoa13/sql/tasks$ cat main.yml
- name: Install the SQL Database
  apt:
    name:
      - mariadb-server
      - python3-pymysql
    state: present
    update_cache: yes

- name: Edit the maria-db.conf file
  copy:
    content: |
      default-storage-engine = innodb
      innodb_file_per_table = on
      max_connections = 4096
      collation-server = utf_general_ci
      character-set-server = utf8
    dest: /etc/mysql/mariadb.conf.d/99-openstack.cnf
    mode: "0755"

- name: Restart the mariadb-server
  service:
     name: mysql
     state: restarted
     enabled: yes
calderon@workstation:~/Group2_hoa13/sql/tasks$
```

This Ansible playbook is designed to install and configure a SQL database server, specifically MariaDB, on a system.


calderon@workstation:~/Group2_hoa13$ ansible-playbook --ask-become-pass install_openstack.y
ml
BECOME password:
PLAY [all] ********
TASK [Gathering Facts] ********
ok: [192.168.56.103]
TASK [ntp : Installing Chrony (Ubuntu)] ********
ok: [192.168.56.103]
TASK [ntp : replace] ********
ok: [192.168.56.103]
TASK [ntp : add key to chrony.conf] ********
ok: [192.168.56.103]
TASK [ntp : Verifying Installation (Chrony for Ubuntu)] ********
changed: [192.168.56.103]
TASK [openstack : Installng OpenStack (Ubuntu)] ********
ok: [192.168.56.103]
TASK [sql : Install the SQL Database] ********
ok: [192.168.56.103]
TASK [sql : Edit the maria-db.conf file] ********
ok: [192.168.56.103]
TASK [sql : Restart the mariadb-server] ********
changed: [192.168.56.103]
TASK [mesq : Install Message Queue] ********
ok: [192.168.56.103]
TASK [mesq : Starting service] ********
ok: [192.168.56.103]
TASK [memcached : Installing MemCached (Ubuntu)] ********
ok: [192.168.56.103]



We ran an Ansible playbook with elevated privileges --ask-become-pass to install and configure OpenStack services on the target Ubuntu machine with the IP address 192.168.56.103. The playbook performed various tasks, including installing Chrony for time synchronization, setting up MariaDB as the SQL database, configuring Message Queue and Memcached for caching, and installing and enabling Etcd for distributed key-value storage. All of our tasks were completed successfully

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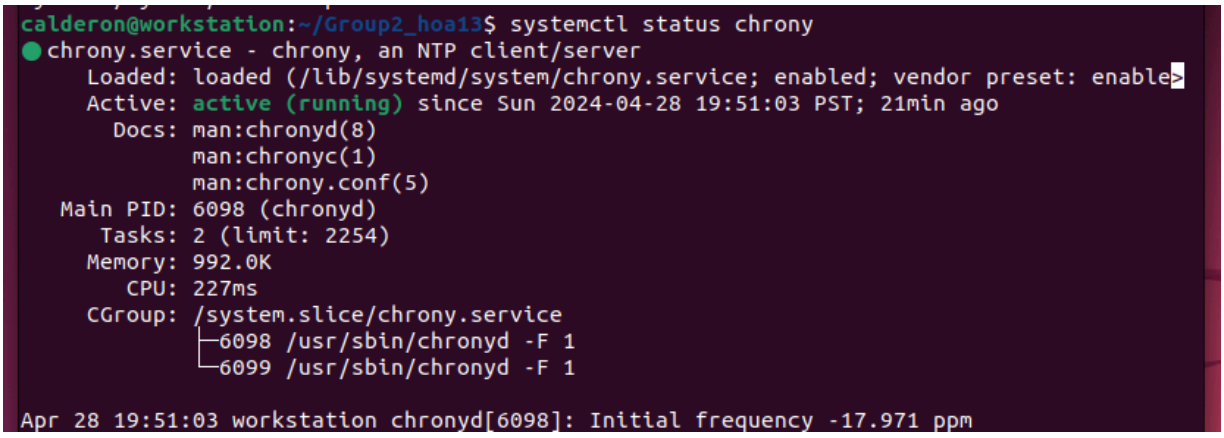
We will show whether all of our installations are currently active.



```
calderon@workstation:~/Group2_hoa13$ systemctl status mariadb
● mariadb.service - MariaDB 10.6.16 database server
     Loaded: loaded (/lib/systemd/system/mariadb.service; enabled; vendor preset: enabl>
     Active: active (running) since Sun 2024-04-28 19:58:15 PST; 14min ago
       Docs: man:mariadbd(8)
             https://mariadb.com/kb/en/library/systemd/
   Main PID: 7165 (mariadbd)
     Status: "Taking your SQL requests now..."
      Tasks: 8 (limit: 2254)
     Memory: 61.2M
        CPU: 1.050s
     CGroup: /system.slice/mariadb.service
             └─7165 /usr/sbin/mariadbd
```

```
calderon@workstation:~/Group2_hoa13$ systemctl status rabbitmq-server
● rabbitmq-server.service - RabbitMQ Messaging Server
     Loaded: loaded (/lib/systemd/system/rabbitmq-server.service; enabled; vendor prese>
     Active: active (running) since Sun 2024-04-28 19:59:47 PST; 13min ago
   Main PID: 7759 (beam.smp)
      Tasks: 23 (limit: 2254)
     Memory: 81.9M
        CPU: 12.316s
     CGroup: /system.slice/rabbitmq-server.service
             ├─7759 /usr/lib/erlang/erts-12.2.1/bin/beam.smp -W w -MBas ageffcbf -MHas >
             ├─7770 erl_child_setup 65536
             ├─7853 inet_gethost 4
             └─7854 inet_gethost 4
```

```
calderon@workstation:~/Group2_hoa13$ systemctl status memcached
● memcached.service - memcached daemon
     Loaded: loaded (/lib/systemd/system/memcached.service; enabled; vendor preset: ena>
     Active: active (running) since Sun 2024-04-28 20:00:15 PST; 13min ago
       Docs: man:memcached(1)
   Main PID: 8155 (memcached)
      Tasks: 10 (limit: 2254)
     Memory: 2.0M
        CPU: 337ms
     CGroup: /system.slice/memcached.service
             └─8155 /usr/bin/memcached -m 64 -p 11211 -u memcache -l 127.0.0.1 -P /var/>

Apr 28 20:00:15 workstation systemd[1]: Started memcached daemon.
lines 1-12/12 (END)

calderon@workstation:~/Group2_hoa13$ systemctl status etcd
● etcd.service - etcd - highly-available key value store
     Loaded: loaded (/lib/systemd/system/etcd.service; enabled; vendor preset: enabled)
     Active: active (running) since Sun 2024-04-28 20:00:53 PST; 13min ago
       Docs: https://etcd.io/docs
             man:etcd
   Main PID: 8502 (etcd)
      Tasks: 8 (limit: 2254)
     Memory: 6.0M
        CPU: 10.634s
     CGroup: /system.slice/etcd.service
             └─8502 /usr/bin/etcd
```

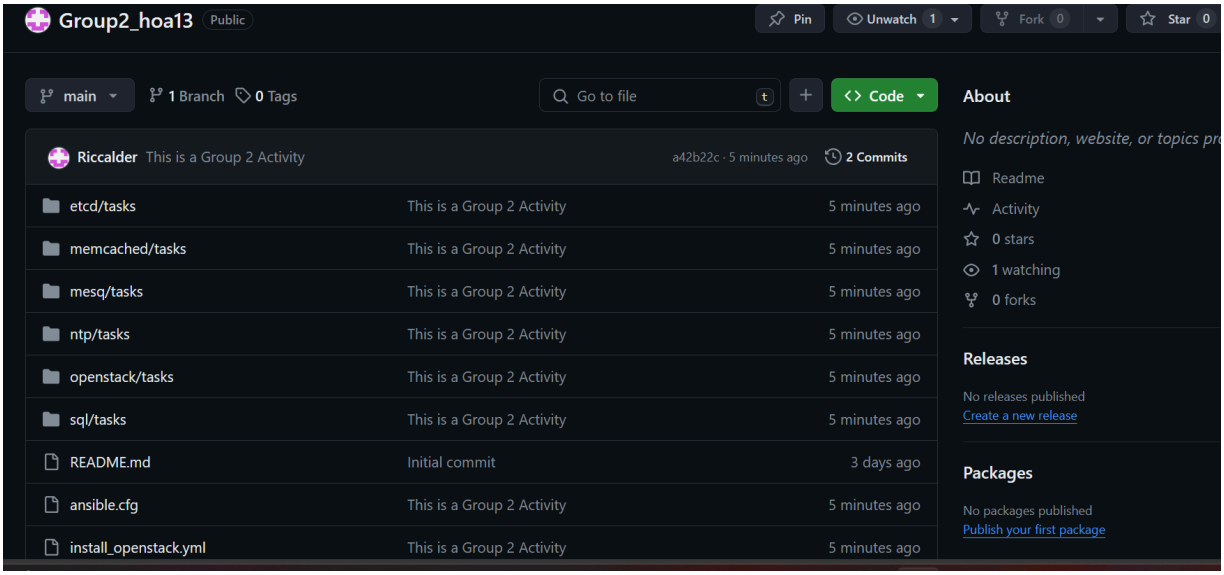
```
calderon@workstation:~/Group2_hoa13$ sudo systemctl status nova-compute
[sudo] password for calderon:
● nova-compute.service - OpenStack Compute
     Loaded: loaded (/lib/systemd/system/nova-compute.service; enabled; vendor >
     Active: active (running) since Mon 2024-04-29 08:41:08 PST; 30min ago
   Main PID: 2512 (nova-compute)
      Tasks: 2 (limit: 2254)
     Memory: 80.9M
        CPU: 8.453s
     CGroup: /system.slice/nova-compute.service
             └─2512 /usr/bin/python3 /usr/bin/nova-compute --config-file=/etc/n>

Apr 29 08:41:08 workstation systemd[1]: Started OpenStack Compute.
Apr 29 08:41:27 workstation nova-compute[2512]: Modules with known eventlet mon>
lines 1-12/12 (END)
calderon@workstation:~/Group2_hoa13$
```

```
calderon@workstation:~/Group2_hoa13$ openstack --version
openstack 5.8.0
calderon@workstation:~/Group2_hoa13$
```

We've successfully installed all the components, and they're now active. We've also added the version of OpenStack, indicating that we're on the right track.

```
calderon@workstation:~/Group2_hoa13$ git add .
calderon@workstation:~/Group2_hoa13$ git commit -m "This is a Group 2 Activity"
[main a42b22c] This is a Group 2 Activity
 9 files changed, 139 insertions(+)
 create mode 100644 ansible.cfg
 create mode 100644 etcd/tasks/main.yml
 create mode 100644 install_openstack.yml
 create mode 100644 inventory
 create mode 100644 memcached/tasks/main.yml
 create mode 100644 mesq/tasks/main.yml
 create mode 100644 ntp/tasks/main.yml
 create mode 100644 openstack/tasks/main.yml
 create mode 100644 sql/tasks/main.yml
calderon@workstation:~/Group2_hoa13$ git push origin main
Enumerating objects: 24, done.
Counting objects: 100% (24/24), done.
Delta compression using up to 2 threads
Compressing objects: 100% (10/10), done.
Writing objects: 100% (23/23), 2.72 KiB | 309.00 KiB/s, done.
Total 23 (delta 0), reused 0 (delta 0), pack-reused 0
To github.com:Riccalder/Group2_hoa13.git
   45d05b2..a42b22c  main -> main
calderon@workstation:~/Group2_hoa13$
```

These commands demonstrated successfully the typical workflow of making changes to files, committing those changes with a descriptive message, and then pushing those commits to a remote repository for collaboration and backup.



We can observe that all our files have been successfully transferred to GitHub, serving as a crucial backup for our project.

Github link:

[Riccalder/Group2_hoa13 (github.com)](https://github.com/Riccalder/Group2_hoa13)

Reflections:

Answer the following:

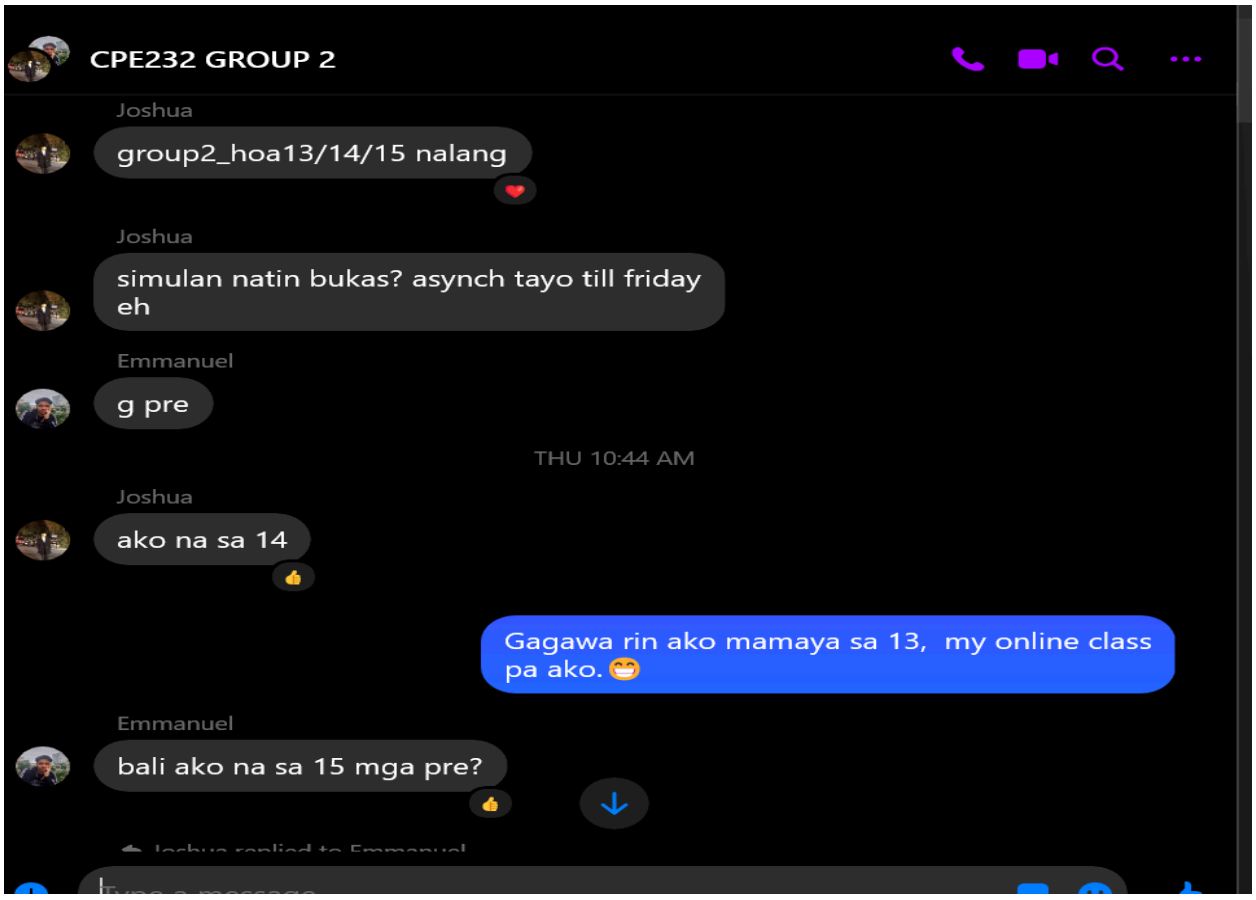
1. What are the benefits of implementing OpenStack?

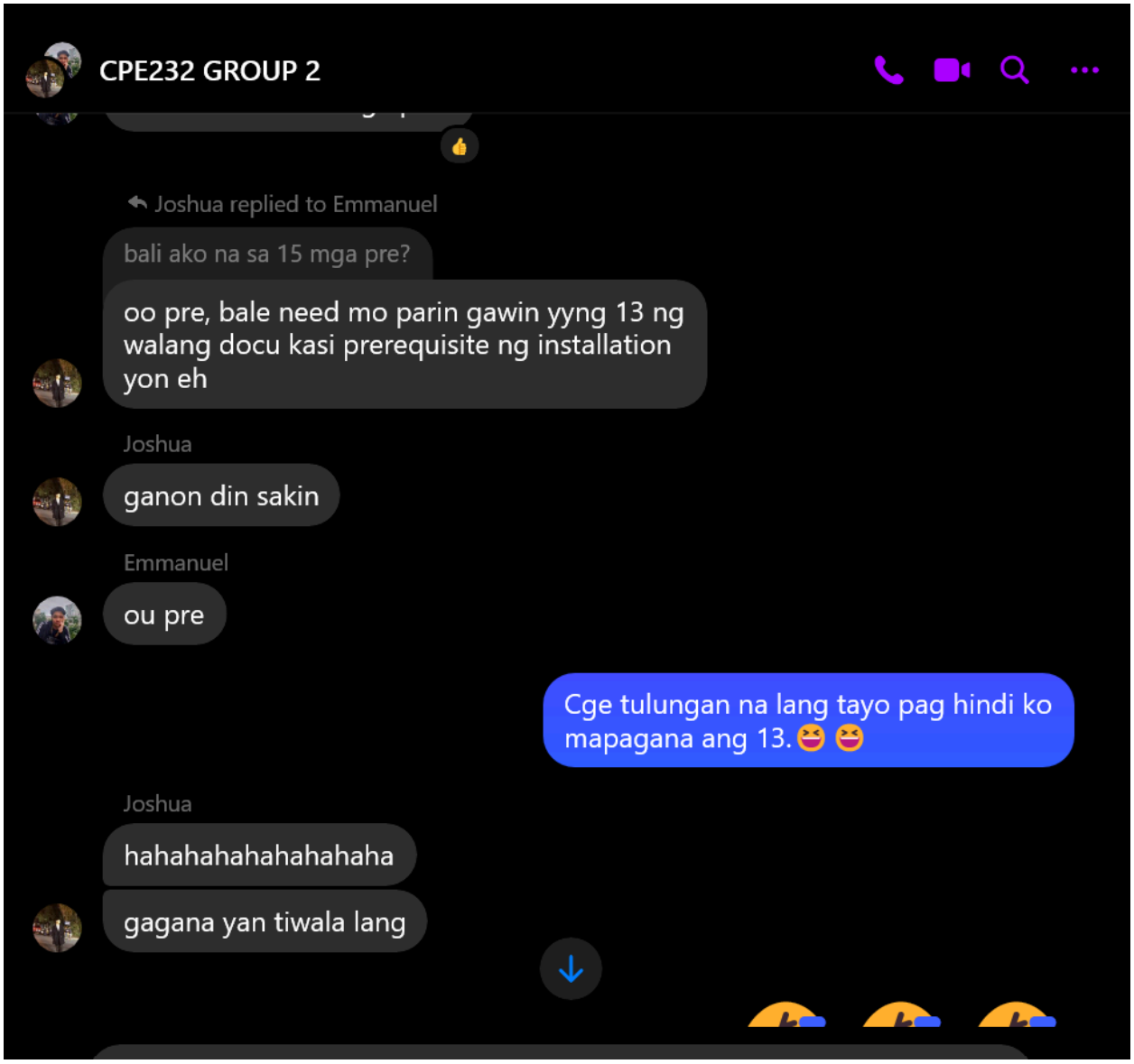
   Implementing OpenStack brings many benefits that can boost organizational success in the cloud era. OpenStack offers scalability, flexibility, cost-effectiveness, interoperability, and community support, providing a strong foundation for building resilient and innovative cloud infrastructure. As organizations embrace digital transformation, OpenStack becomes a powerful tool for achieving agility, efficiency, and competitiveness in the modern business landscape.

Conclusions:

We, Group 2, composed of Calderon Ricardo B., Castillo Joshua, and Cuyugan Emmanuel, collaborated on Activity 13: OpenStack Prerequisite Installation. Our goal was to establish a workflow for installing OpenStack using Ansible. We opted for Ubuntu and cloned the 'Group2_hoa13' GitHub repository onto our local machine, specifying Ubuntu for our Git operations. Within the 'Group2_hoa13' directory, we organized directories for various project components: etcd, memcached, mesq, ntp, openstack, and sql. Each directory contained a "tasks" directory housing code for installing the respective components via Ansible. We formulated a playbook to translate the installation steps outlined in the OpenStack install guide into Ansible tasks for NTP, OpenStack packages, SQL Database, Message Queue, Memcached, and Etcd

Our collaboration:





We affirm, unequivocally, that we have completed this activity collaboratively, without any unauthorized assistance, neither giving nor receiving any form of aid. The entirety of this work is solely the product of our own efforts and understanding, without the need for assistance from others.