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Course/Section: CpE31S4	**Date Submitted: 11 - 14 - 2023**
Instructor: Engr. Jonathan Taylar	**Semester and SY: 1st Semester 2023 - 2024**

Activity 11: Containerization

1. Objectives

Create a Dockerfile and form a workflow using Ansible as Infrastructure as Code (IaC) to enable Continuous Delivery process

2. Discussion

Docker is an open platform for developing, shipping, and running applications. Docker enables you to separate your applications from your infrastructure so you can deliver software quickly. With Docker, you can manage your infrastructure in the same ways you manage your applications. By taking advantage of Docker's methodologies for shipping, testing, and deploying code quickly, you can significantly reduce the delay between writing code and running it in production.

Source: https://docs.docker.com/get-started/overview/

You may also check the difference between containers and virtual machines. Click the link given below.

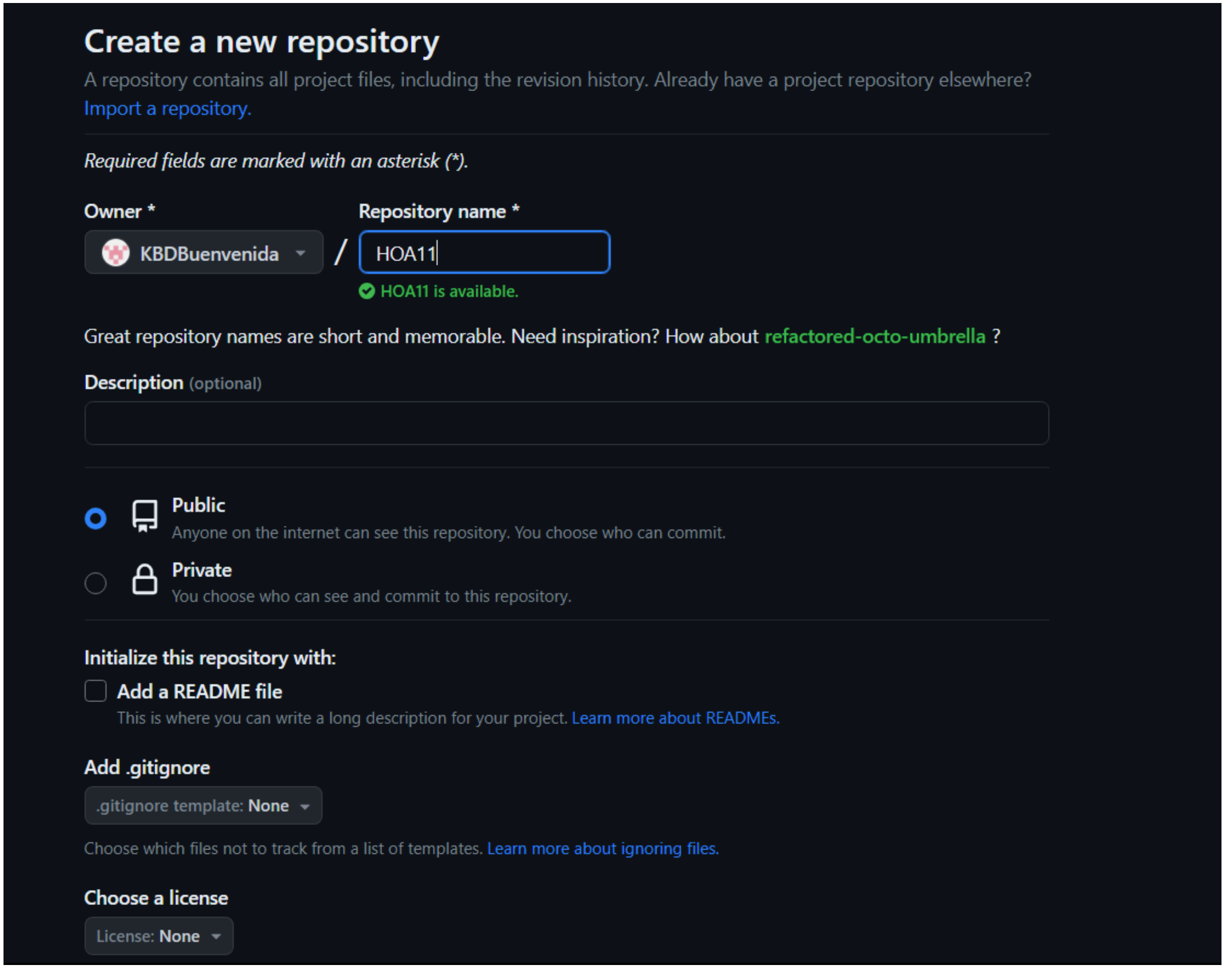
Source: https://docs.microsoft.com/en-us/virtualization/windowscontainers/about/containers-vs-vm

3. Tasks

1. Create a new repository for this activity.
2. Install Docker and enable the docker socket.
3. Add to Docker group to your current user.
4. Create a Dockerfile to install web and DB server.
5. Install and build the Dockerfile using Ansible.
6. Add, commit and push it to your repository.

4. Output (screenshots and explanations)

Step 1: Create a repository named 'HOA11'



Create a new repository

A repository contains all project files, including the revision history. Already have a project repository elsewhere? Import a repository.

Required fields are marked with an asterisk (*).

Owner * / Repository name *

KBDBuenvenida / HOA11

✓ HOA11 is available.

Great repository names are short and memorable. Need inspiration? How about refactored-octo-umbrella ?

Description (optional)

● Public
Anyone on the internet can see this repository. You choose who can commit.

○ Private
You choose who can see and commit to this repository.

Initialize this repository with:

□ Add a README file
This is where you can write a long description for your project. Learn more about READMEs.

Add .gitignore

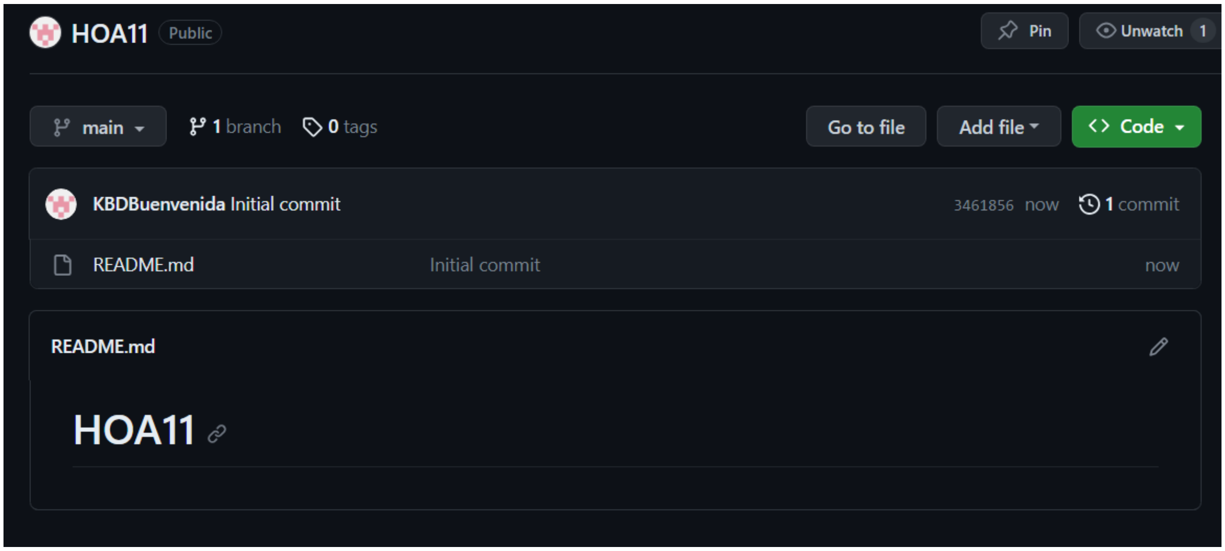
.gitignore template: None

Choose which files not to track from a list of templates. Learn more about ignoring files.

Choose a license

License: None

Step 2: Check if the repository you just created was successful.



HOA11 Public

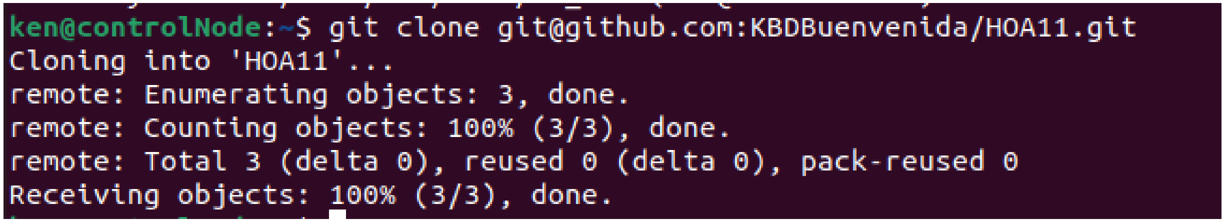
KBDBuenvenida Initial commit 3461856 now 1 commit

README.md Initial commit now

README.md

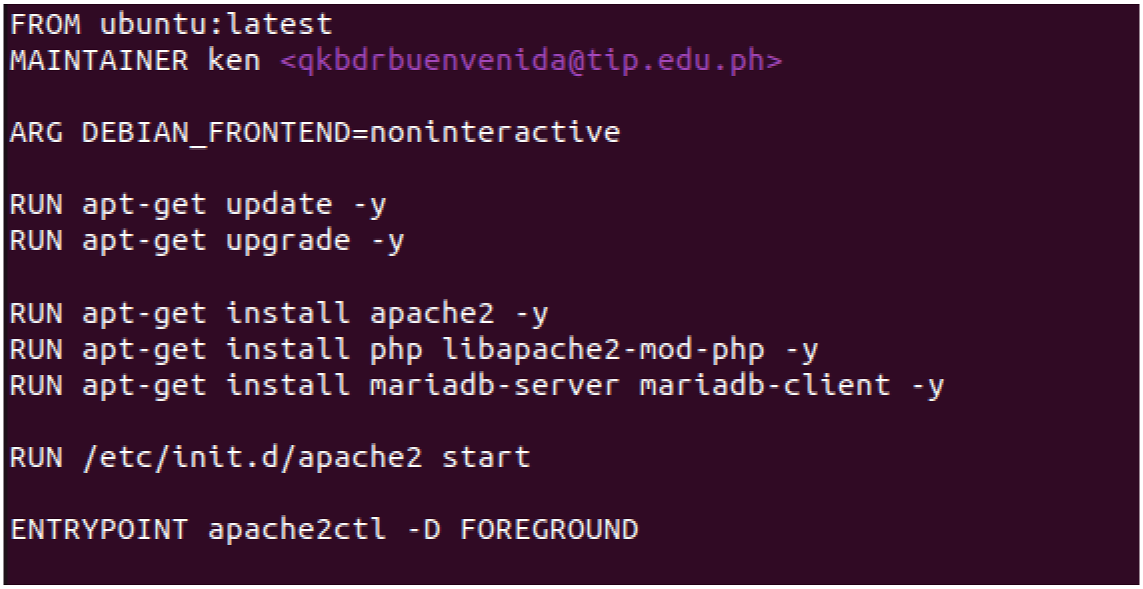
HOA11

Step 3: Clone the repository you just created.



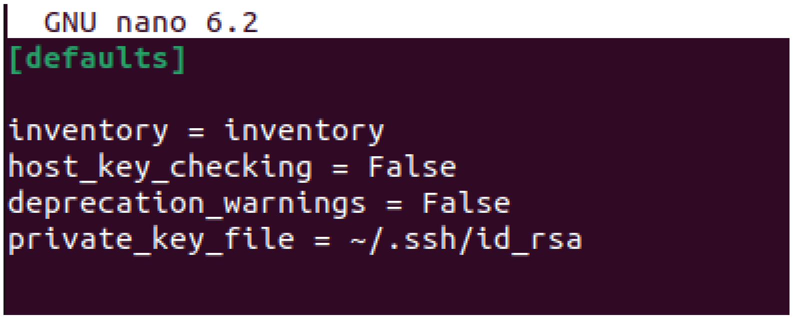
```
ken@controlNode:~$ git clone git@github.com:KBDBuenvenida/HOA11.git
Cloning into 'HOA11'...
remote: Enumerating objects: 3, done.
remote: Counting objects: 100% (3/3), done.
remote: Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
Receiving objects: 100% (3/3), done.
```

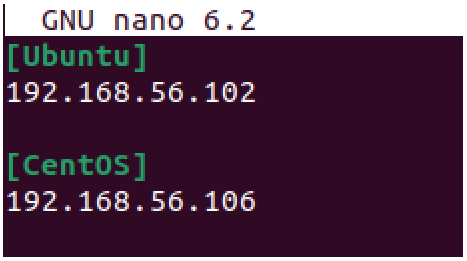
Create a dockerfile



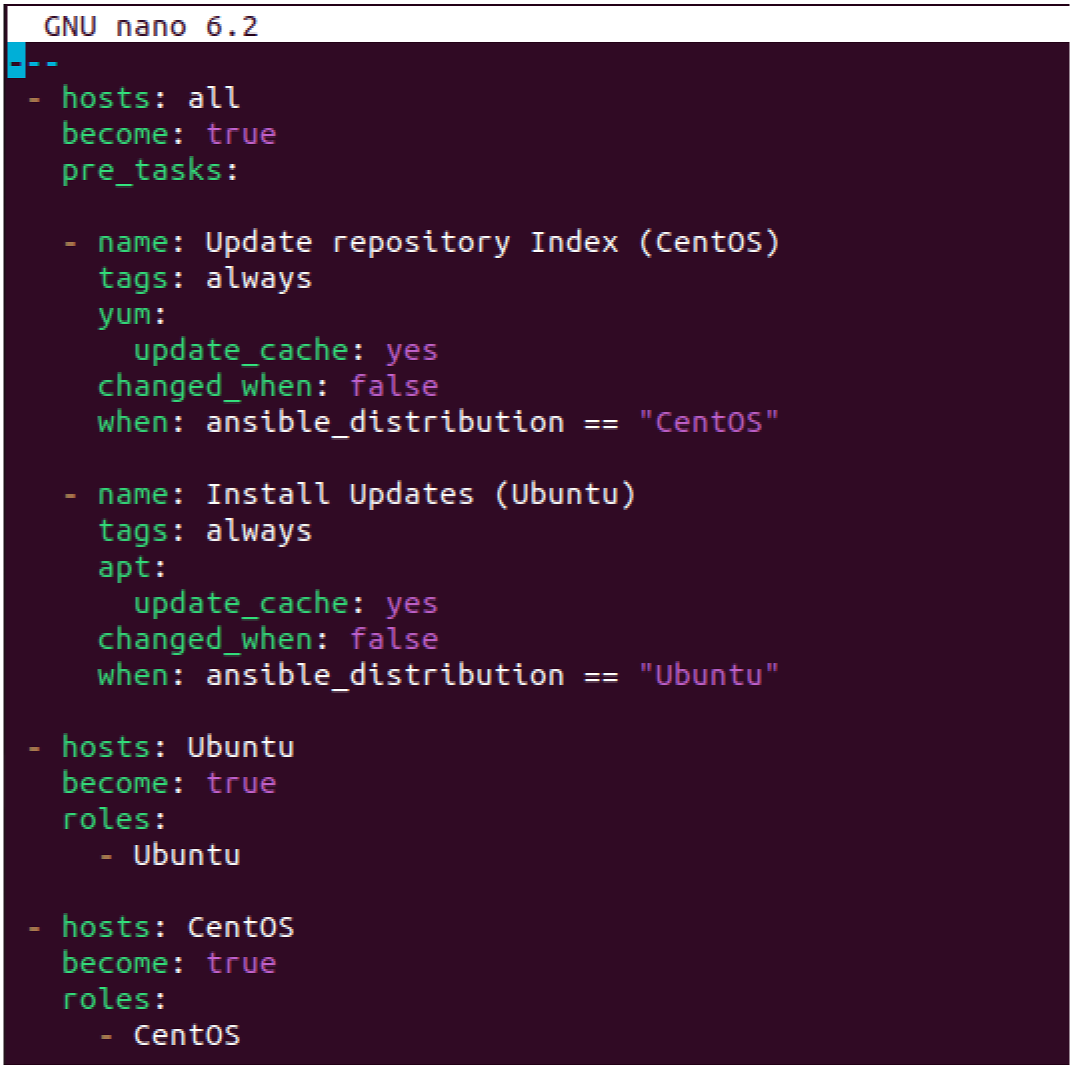
```
FROM ubuntu:latest
MAINTAINER ken <qkbdrbuenvenida@tip.edu.ph>

ARG DEBIAN_FRONTEND=noninteractive

RUN apt-get update -y
RUN apt-get upgrade -y

RUN apt-get install apache2 -y
RUN apt-get install php libapache2-mod-php -y
RUN apt-get install mariadb-server mariadb-client -y

RUN /etc/init.d/apache2 start

ENTRYPOINT apache2ctl -D FOREGROUND
```

Create an ansible.cfg and inventory file

ansible.cfg	
	GNU nano 6.2
	[defaults]
	
	inventory = inventory
	host_key_checking = False
	deprecation_warnings = False
	private_key_file = ~/.ssh/id_rsa

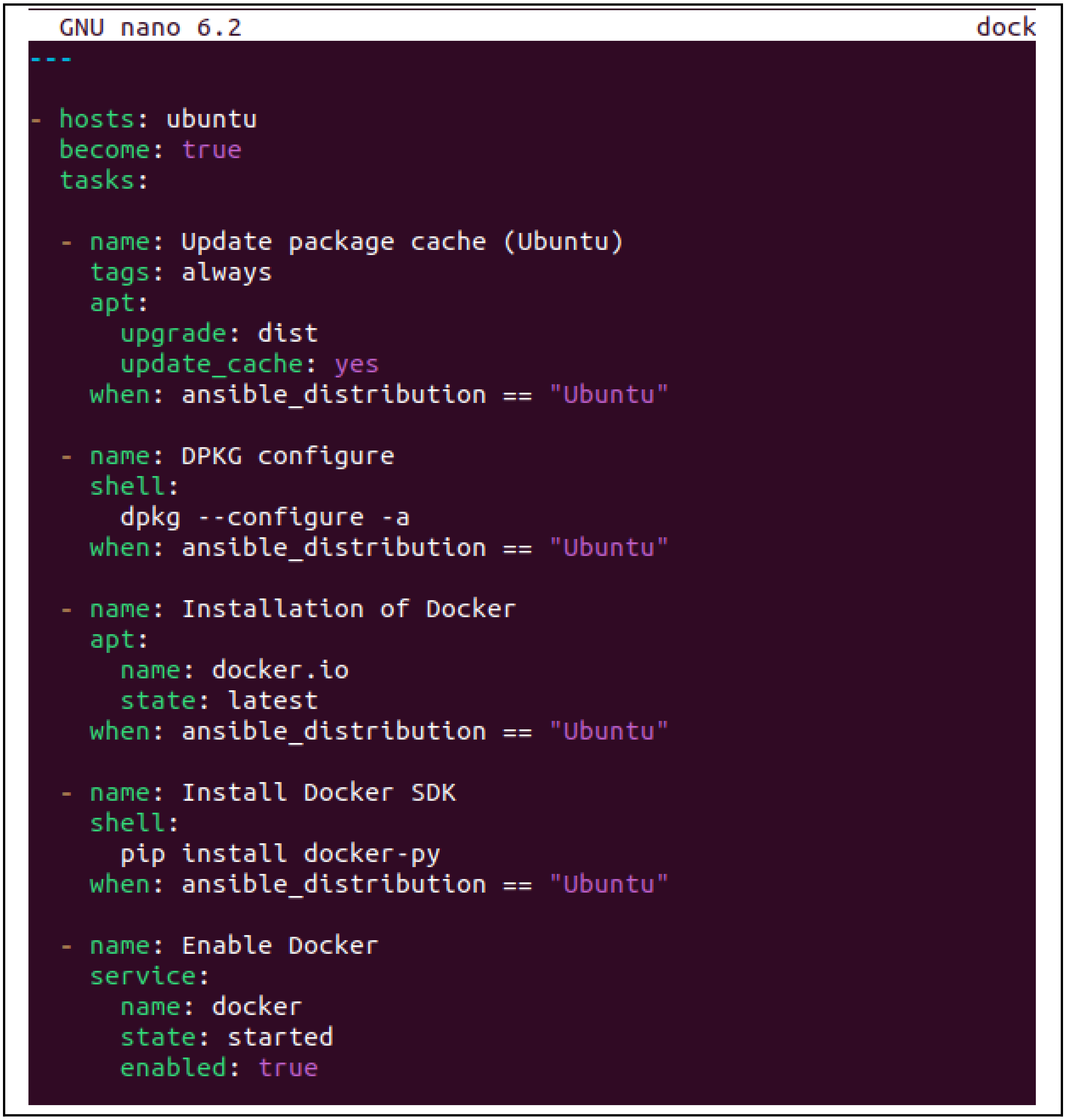
inventory	 GNU nano 6.2 [Ubuntu] 192.168.56.102 [CentOS] 192.168.56.106

Create a .yml file called ‘docker.yml’

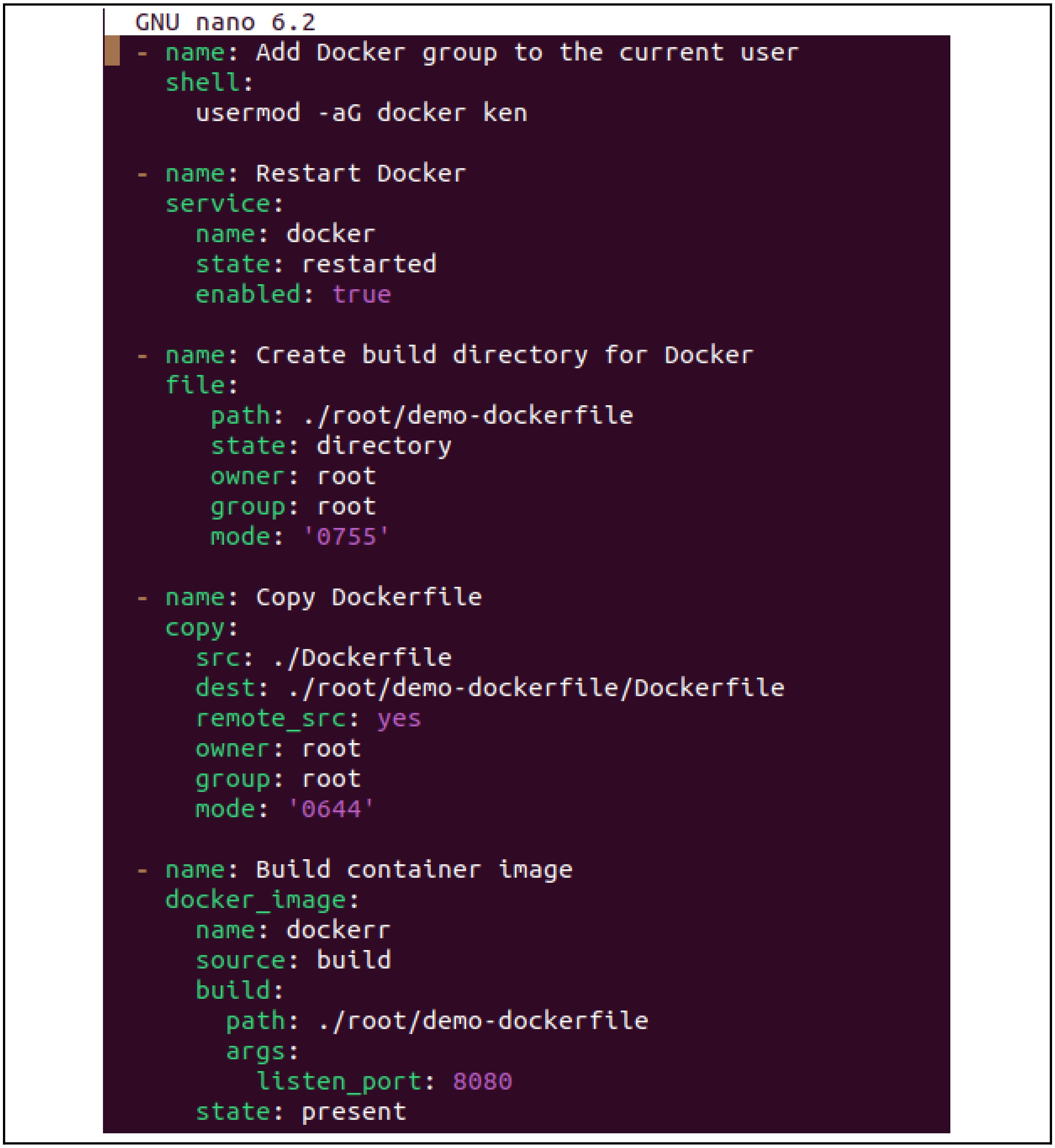


```
---
 - hosts: all
   become: true
   pre_tasks:

   - name: Update repository Index (CentOS)
     tags: always
     yum:
       update_cache: yes
     changed_when: false
     when: ansible_distribution == "CentOS"

   - name: Install Updates (Ubuntu)
     tags: always
     apt:
       update_cache: yes
     changed_when: false
     when: ansible_distribution == "Ubuntu"

 - hosts: Ubuntu
   become: true
   roles:
     - Ubuntu

 - hosts: CentOS
   become: true
   roles:
     - CentOS
```

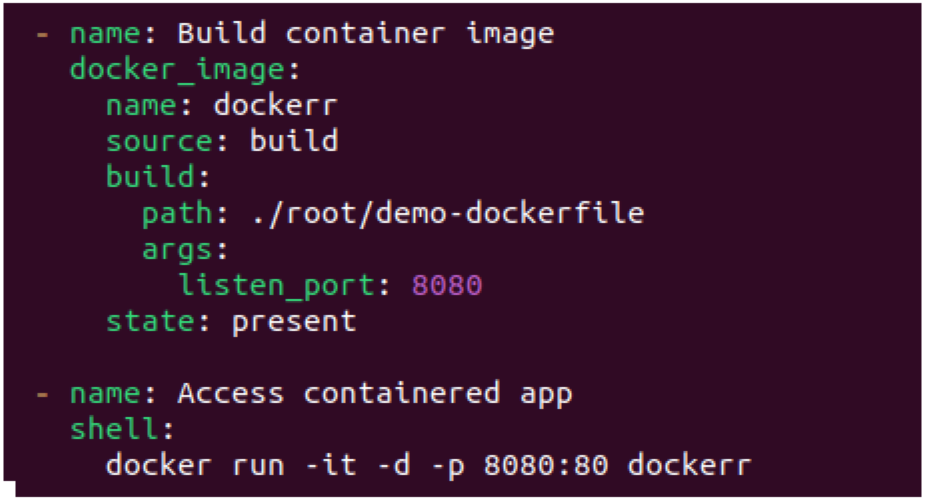
Create a .yml file dockerdb.yml



```
  GNU nano 6.2                                                     dock
---

- hosts: ubuntu
  become: true
  tasks:

  - name: Update package cache (Ubuntu)
    tags: always
    apt:
      upgrade: dist
      update_cache: yes
    when: ansible_distribution == "Ubuntu"

  - name: DPKG configure
    shell:
      dpkg --configure -a
    when: ansible_distribution == "Ubuntu"

  - name: Installation of Docker
    apt:
      name: docker.io
      state: latest
    when: ansible_distribution == "Ubuntu"

  - name: Install Docker SDK
    shell:
      pip install docker-py
    when: ansible_distribution == "Ubuntu"

  - name: Enable Docker
    service:
      name: docker
      state: started
      enabled: true
```

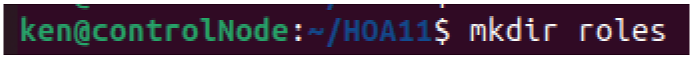


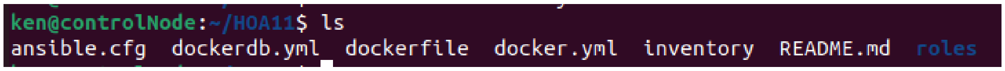
```
  GNU nano 6.2
- name: Add Docker group to the current user
  shell:
    usermod -aG docker ken

- name: Restart Docker
  service:
    name: docker
    state: restarted
    enabled: true

- name: Create build directory for Docker
  file:
     path: ./root/demo-dockerfile
     state: directory
     owner: root
     group: root
     mode: '0755'

- name: Copy Dockerfile
  copy:
    src: ./Dockerfile
    dest: ./root/demo-dockerfile/Dockerfile
    remote_src: yes
    owner: root
    group: root
    mode: '0644'

- name: Build container image
  docker_image:
    name: dockerr
    source: build
    build:
      path: ./root/demo-dockerfile
      args:
        listen_port: 8080
    state: present
```



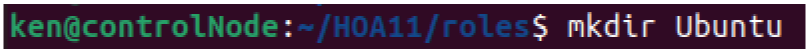
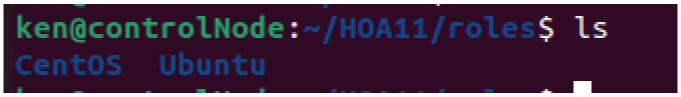
```
- name: Build container image
  docker_image:
    name: dockerr
    source: build
    build:
      path: ./root/demo-dockerfile
      args:
        listen_port: 8080
    state: present

- name: Access containered app
  shell:
    docker run -it -d -p 8080:80 dockerr
```

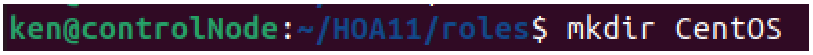
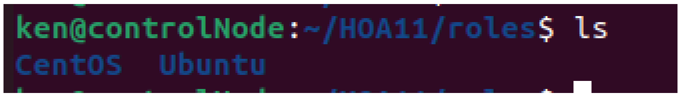
Create a directory named ‘roles’

INPUT	 `ken@controlNode:~/HOA11$ mkdir roles`

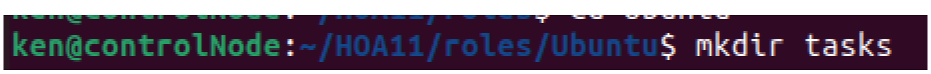
OUTPUT	
	`ken@controlNode:~/HOA11$ ls`
	`ansible.cfg  dockerdb.yml  dockerfile  docker.yml  inventory  README.md  roles`

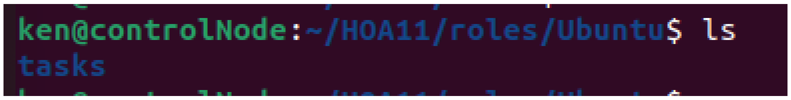
Create a directory inside ‘roles’ and name it ‘Ubuntu’ and ‘CentOS’

Ubuntu	
	`ken@controlNode:~/HOA11/roles$ mkdir Ubuntu`
	
	`ken@controlNode:~/HOA11/roles$ ls`
	`CentOS  Ubuntu`

CentOS	
	`ken@controlNode:~/HOA11/roles$ mkdir CentOS`
	
	`ken@controlNode:~/HOA11/roles$ ls`
	`CentOS  Ubuntu`

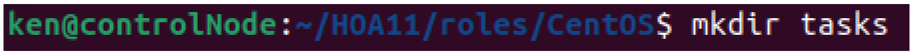
Create a tasks directory inside each operating system

Ubuntu	 `ken@controlNode:~/HOA11/roles/Ubuntu$ mkdir tasks`

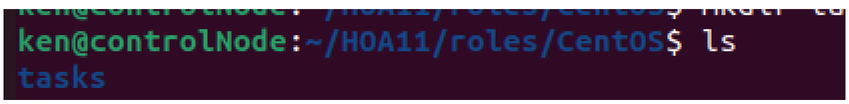


```
ken@controlNode:~/HOA11/roles/Ubuntu$ ls
tasks
```

CentOS



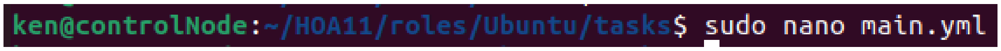
```
ken@controlNode:~/HOA11/roles/CentOS$ mkdir tasks
```



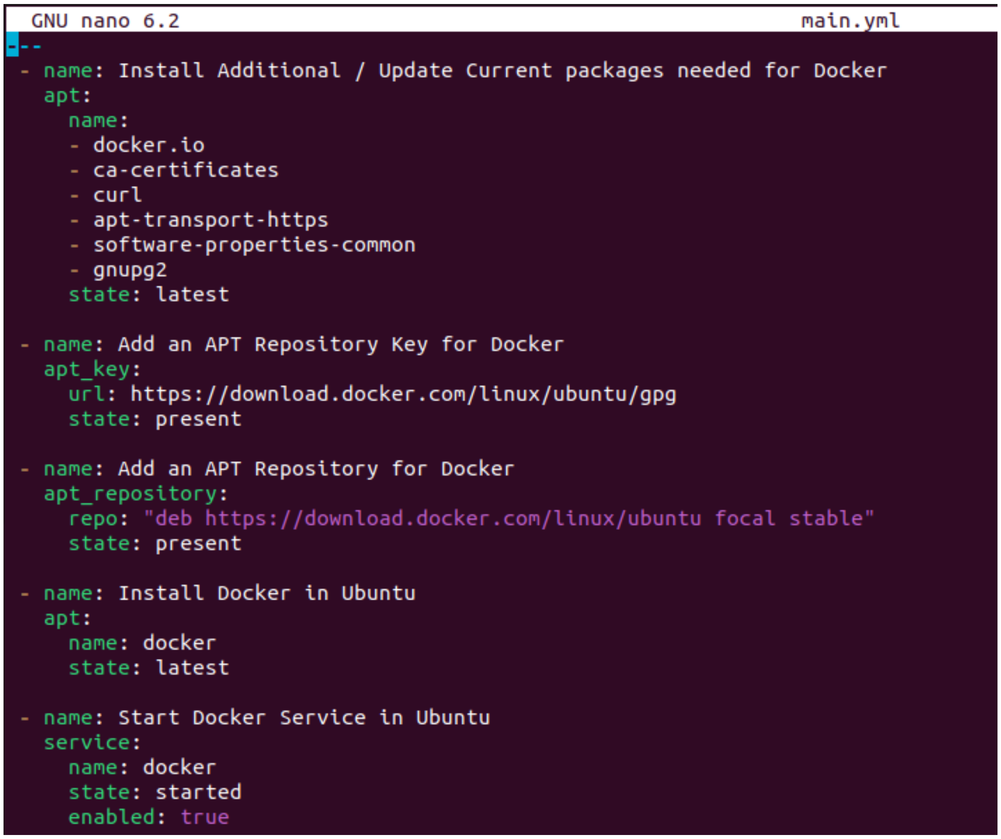
```
ken@controlNode:~/HOA11/roles/CentOS$ ls
tasks
```

Create a main.yml each operating system

Ubuntu



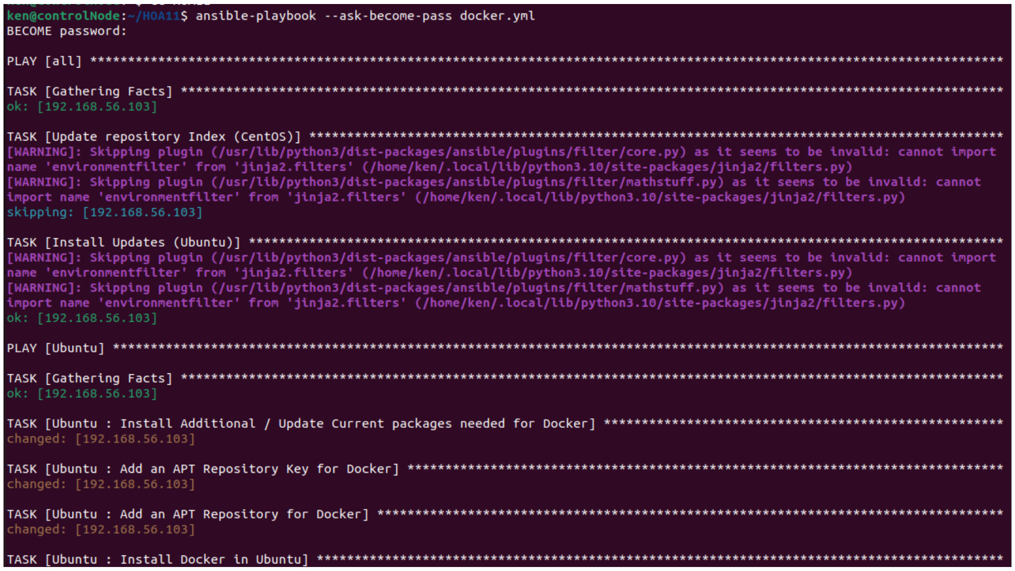
```
ken@controlNode:~/HOA11/roles/Ubuntu/tasks$ sudo nano main.yml
```



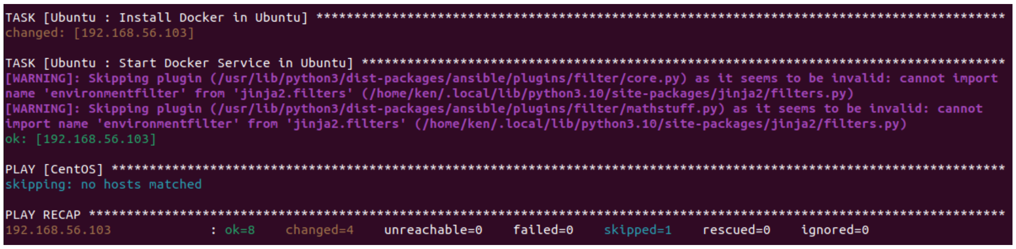
```
  GNU nano 6.2                                                main.yml
---
 - name: Install Additional / Update Current packages needed for Docker
   apt:
     name:
     - docker.io
     - ca-certificates
     - curl
     - apt-transport-https
     - software-properties-common
     - gnupg2
     state: latest

 - name: Add an APT Repository Key for Docker
   apt_key:
     url: https://download.docker.com/linux/ubuntu/gpg
     state: present

 - name: Add an APT Repository for Docker
   apt_repository:
     repo: "deb https://download.docker.com/linux/ubuntu focal stable"
     state: present

 - name: Install Docker in Ubuntu
   apt:
     name: docker
     state: latest

 - name: Start Docker Service in Ubuntu
   service:
     name: docker
     state: started
     enabled: true
```

CentOS

Test if the playbook works.

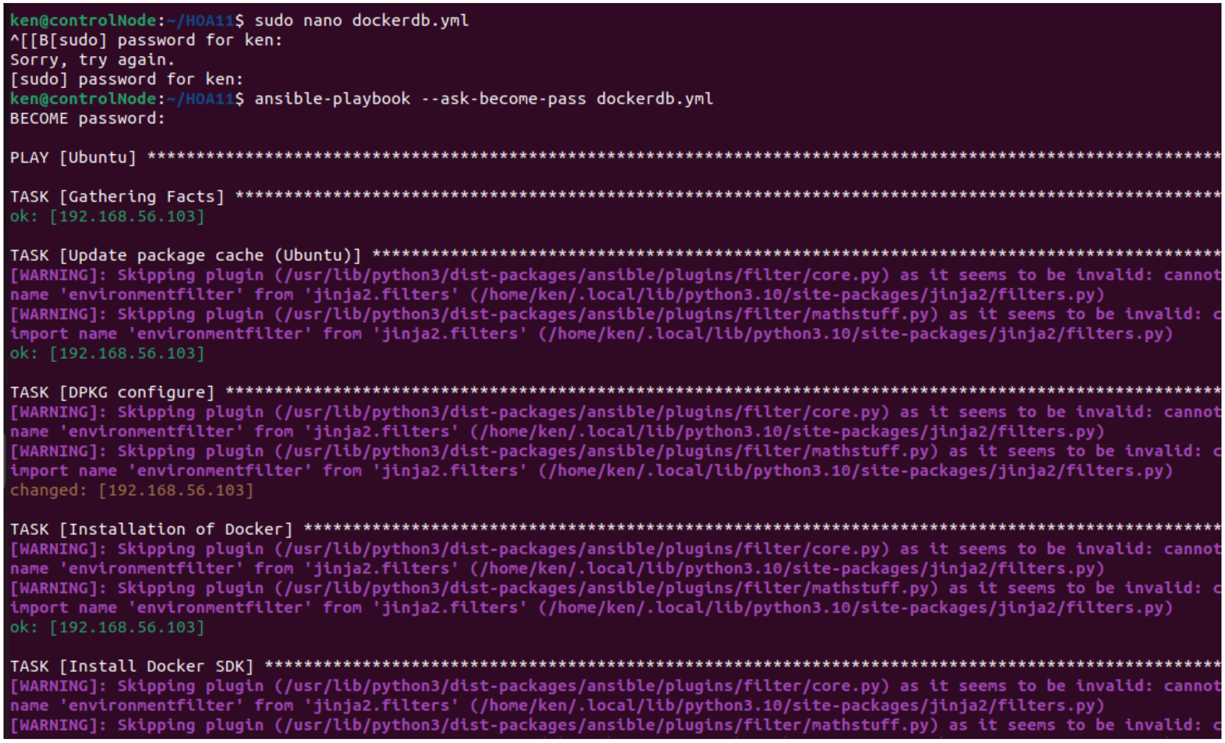
<table>
<tr>
<td><b>Ubuntu</b></td>
<td>


```
ken@controlNode:~/HOA11$ ansible-playbook --ask-become-pass docker.yml
BECOME password:

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

TASK [Gathering Facts] *************************************************************************************************************
ok: [192.168.56.103]

TASK [Update repository Index (CentOS)] ********************************************************************************************
[WARNING]: Skipping plugin (/usr/lib/python3/dist-packages/ansible/plugins/filter/core.py) as it seems to be invalid: cannot import
name 'environmentfilter' from 'jinja2.filters' (/home/ken/.local/lib/python3.10/site-packages/jinja2/filters.py)
[WARNING]: Skipping plugin (/usr/lib/python3/dist-packages/ansible/plugins/filter/mathstuff.py) as it seems to be invalid: cannot
import name 'environmentfilter' from 'jinja2.filters' (/home/ken/.local/lib/python3.10/site-packages/jinja2/filters.py)
skipping: [192.168.56.103]

TASK [Install Updates (Ubuntu)] ****************************************************************************************************
[WARNING]: Skipping plugin (/usr/lib/python3/dist-packages/ansible/plugins/filter/core.py) as it seems to be invalid: cannot import
name 'environmentfilter' from 'jinja2.filters' (/home/ken/.local/lib/python3.10/site-packages/jinja2/filters.py)
[WARNING]: Skipping plugin (/usr/lib/python3/dist-packages/ansible/plugins/filter/mathstuff.py) as it seems to be invalid: cannot
import name 'environmentfilter' from 'jinja2.filters' (/home/ken/.local/lib/python3.10/site-packages/jinja2/filters.py)
ok: [192.168.56.103]

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

TASK [Gathering Facts] *************************************************************************************************************
ok: [192.168.56.103]

TASK [Ubuntu : Install Additional / Update Current packages needed for Docker] *****************************************************
changed: [192.168.56.103]

TASK [Ubuntu : Add an APT Repository Key for Docker] *******************************************************************************
changed: [192.168.56.103]

TASK [Ubuntu : Add an APT Repository for Docker] ***********************************************************************************
changed: [192.168.56.103]

TASK [Ubuntu : Install Docker in Ubuntu] *******************************************************************************************
```

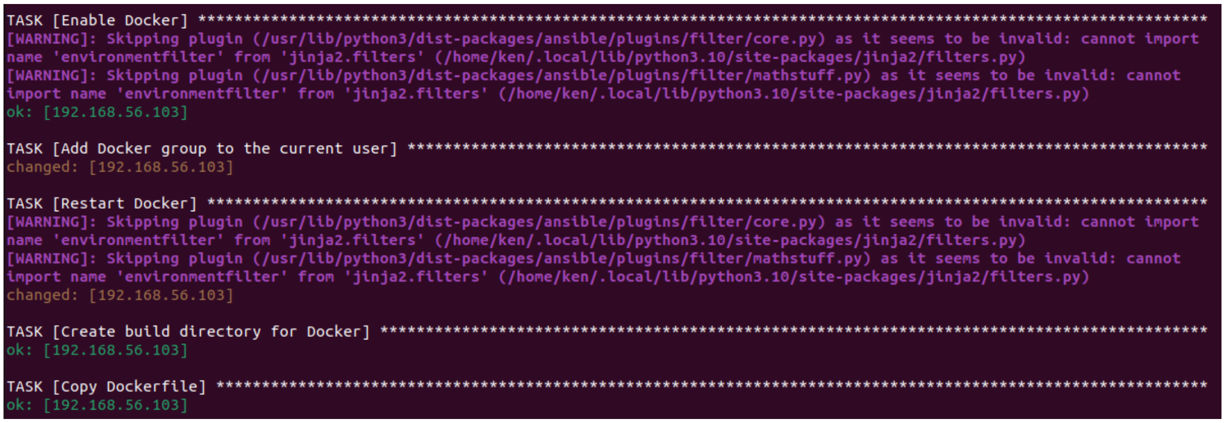


```
TASK [Ubuntu : Install Docker in Ubuntu] *******************************************************************************************
changed: [192.168.56.103]

TASK [Ubuntu : Start Docker Service in Ubuntu] *************************************************************************************
[WARNING]: Skipping plugin (/usr/lib/python3/dist-packages/ansible/plugins/filter/core.py) as it seems to be invalid: cannot import
name 'environmentfilter' from 'jinja2.filters' (/home/ken/.local/lib/python3.10/site-packages/jinja2/filters.py)
[WARNING]: Skipping plugin (/usr/lib/python3/dist-packages/ansible/plugins/filter/mathstuff.py) as it seems to be invalid: cannot
import name 'environmentfilter' from 'jinja2.filters' (/home/ken/.local/lib/python3.10/site-packages/jinja2/filters.py)
ok: [192.168.56.103]

PLAY [CentOS] **********************************************************************************************************************
skipping: no hosts matched

PLAY RECAP *************************************************************************************************************************
192.168.56.103             : ok=8    changed=4    unreachable=0    failed=0    skipped=1    rescued=0    ignored=0
```
</td>
</tr>
<tr>
<td><b>CentOS</b></td>
<td></td>
</tr>
</table>

Test dockerdb.yml

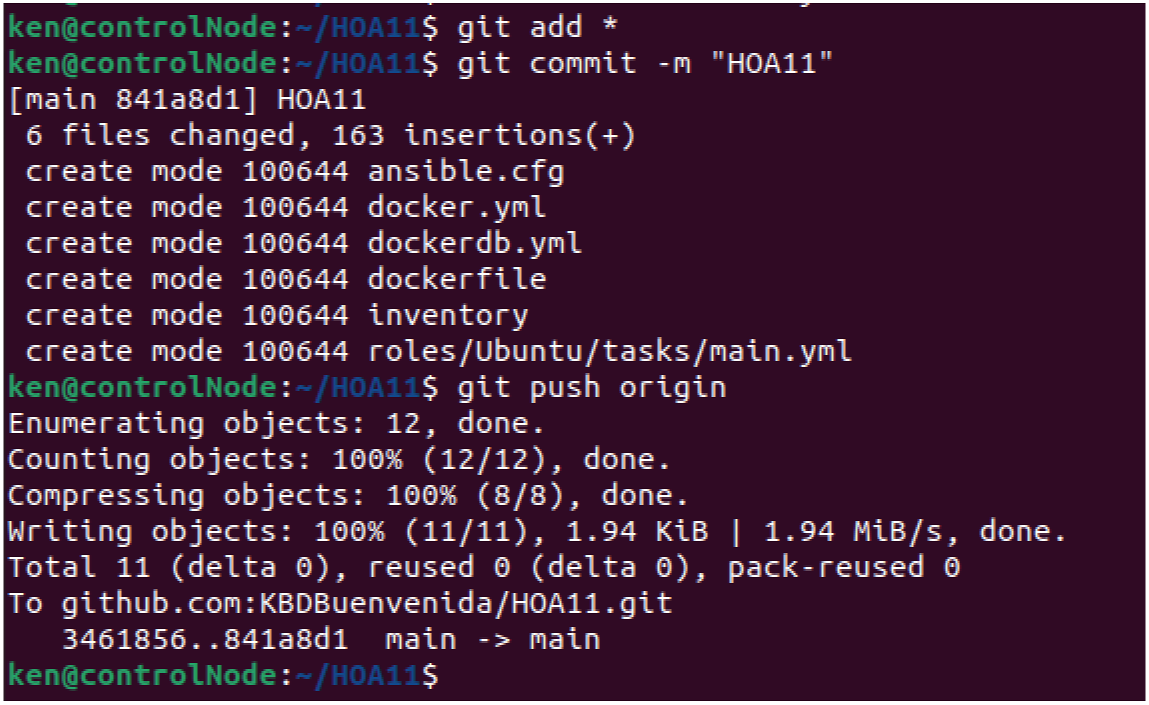


```
ken@controlNode:~/HOA11$ sudo nano dockerdb.yml
^[[B[sudo] password for ken:
Sorry, try again.
[sudo] password for ken:
ken@controlNode:~/HOA11$ ansible-playbook --ask-become-pass dockerdb.yml
BECOME password:

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

TASK [Gathering Facts] ******************************************************************************************
ok: [192.168.56.103]

TASK [Update package cache (Ubuntu)] ****************************************************************************
[WARNING]: Skipping plugin (/usr/lib/python3/dist-packages/ansible/plugins/filter/core.py) as it seems to be invalid: cannot
name 'environmentfilter' from 'jinja2.filters' (/home/ken/.local/lib/python3.10/site-packages/jinja2/filters.py)
[WARNING]: Skipping plugin (/usr/lib/python3/dist-packages/ansible/plugins/filter/mathstuff.py) as it seems to be invalid: c
import name 'environmentfilter' from 'jinja2.filters' (/home/ken/.local/lib/python3.10/site-packages/jinja2/filters.py)
ok: [192.168.56.103]

TASK [DPKG configure] *******************************************************************************************
[WARNING]: Skipping plugin (/usr/lib/python3/dist-packages/ansible/plugins/filter/core.py) as it seems to be invalid: cannot
name 'environmentfilter' from 'jinja2.filters' (/home/ken/.local/lib/python3.10/site-packages/jinja2/filters.py)
[WARNING]: Skipping plugin (/usr/lib/python3/dist-packages/ansible/plugins/filter/mathstuff.py) as it seems to be invalid: c
import name 'environmentfilter' from 'jinja2.filters' (/home/ken/.local/lib/python3.10/site-packages/jinja2/filters.py)
changed: [192.168.56.103]

TASK [Installation of Docker] ***********************************************************************************
[WARNING]: Skipping plugin (/usr/lib/python3/dist-packages/ansible/plugins/filter/core.py) as it seems to be invalid: cannot
name 'environmentfilter' from 'jinja2.filters' (/home/ken/.local/lib/python3.10/site-packages/jinja2/filters.py)
[WARNING]: Skipping plugin (/usr/lib/python3/dist-packages/ansible/plugins/filter/mathstuff.py) as it seems to be invalid: c
import name 'environmentfilter' from 'jinja2.filters' (/home/ken/.local/lib/python3.10/site-packages/jinja2/filters.py)
ok: [192.168.56.103]

TASK [Install Docker SDK] ***************************************************************************************
[WARNING]: Skipping plugin (/usr/lib/python3/dist-packages/ansible/plugins/filter/core.py) as it seems to be invalid: cannot
name 'environmentfilter' from 'jinja2.filters' (/home/ken/.local/lib/python3.10/site-packages/jinja2/filters.py)
[WARNING]: Skipping plugin (/usr/lib/python3/dist-packages/ansible/plugins/filter/mathstuff.py) as it seems to be invalid: c
```

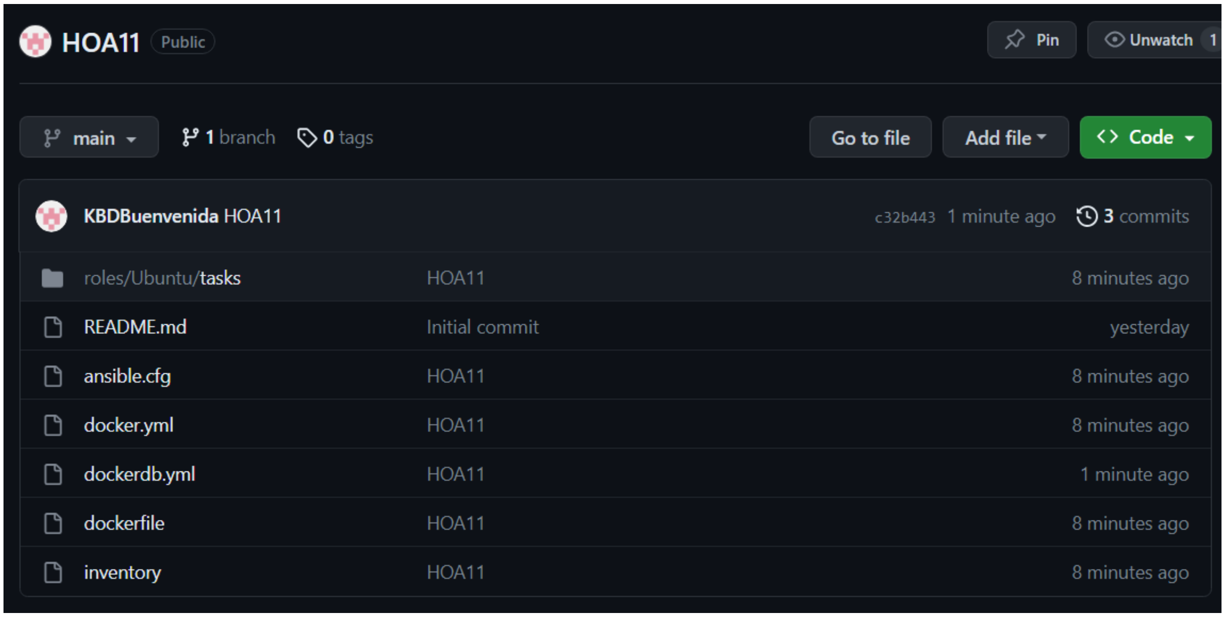


```
TASK [Enable Docker] ***************************************************************************************************
[WARNING]: Skipping plugin (/usr/lib/python3/dist-packages/ansible/plugins/filter/core.py) as it seems to be invalid: cannot import
name 'environmentfilter' from 'jinja2.filters' (/home/ken/.local/lib/python3.10/site-packages/jinja2/filters.py)
[WARNING]: Skipping plugin (/usr/lib/python3/dist-packages/ansible/plugins/filter/mathstuff.py) as it seems to be invalid: cannot
import name 'environmentfilter' from 'jinja2.filters' (/home/ken/.local/lib/python3.10/site-packages/jinja2/filters.py)
ok: [192.168.56.103]

TASK [Add Docker group to the current user] ****************************************************************************
changed: [192.168.56.103]

TASK [Restart Docker] **************************************************************************************************
[WARNING]: Skipping plugin (/usr/lib/python3/dist-packages/ansible/plugins/filter/core.py) as it seems to be invalid: cannot import
name 'environmentfilter' from 'jinja2.filters' (/home/ken/.local/lib/python3.10/site-packages/jinja2/filters.py)
[WARNING]: Skipping plugin (/usr/lib/python3/dist-packages/ansible/plugins/filter/mathstuff.py) as it seems to be invalid: cannot
import name 'environmentfilter' from 'jinja2.filters' (/home/ken/.local/lib/python3.10/site-packages/jinja2/filters.py)
changed: [192.168.56.103]

TASK [Create build directory for Docker] *******************************************************************************
ok: [192.168.56.103]

TASK [Copy Dockerfile] *************************************************************************************************
ok: [192.168.56.103]
```

Git the repository you just created and push



```
ken@controlNode:~/HOA11$ git add *
ken@controlNode:~/HOA11$ git commit -m "HOA11"
[main 841a8d1] HOA11
 6 files changed, 163 insertions(+)
 create mode 100644 ansible.cfg
 create mode 100644 docker.yml
 create mode 100644 dockerdb.yml
 create mode 100644 dockerfile
 create mode 100644 inventory
 create mode 100644 roles/Ubuntu/tasks/main.yml
ken@controlNode:~/HOA11$ git push origin
Enumerating objects: 12, done.
Counting objects: 100% (12/12), done.
Compressing objects: 100% (8/8), done.
Writing objects: 100% (11/11), 1.94 KiB | 1.94 MiB/s, done.
Total 11 (delta 0), reused 0 (delta 0), pack-reused 0
To github.com:KBDBuenvenida/HOA11.git
   3461856..841a8d1  main -> main
ken@controlNode:~/HOA11$
```



KBDBuenvenida HOA11 c32b443 1 minute ago 3 commits

roles/Ubuntu/tasks	HOA11	8 minutes ago
README.md	Initial commit	yesterday
ansible.cfg	HOA11	8 minutes ago
docker.yml	HOA11	8 minutes ago
dockerdb.yml	HOA11	1 minute ago
dockerfile	HOA11	8 minutes ago
inventory	HOA11	8 minutes ago

Reflections:

Answer the following:

1. What are the benefits of implementing containerizations?

   The benefits of implementing containerizations is that it can make the installation of packages easier and simpler but it does have a downside that doesn't allow the user to save progress on the container unless saved properly by using the right syntax.

Conclusions:

In conclusion, I was able to learn about the usage of containers in Ubuntu and CentOS by using Docker. I was able to install mariadb and apache2 in docker and I was able to use it as well.