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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.

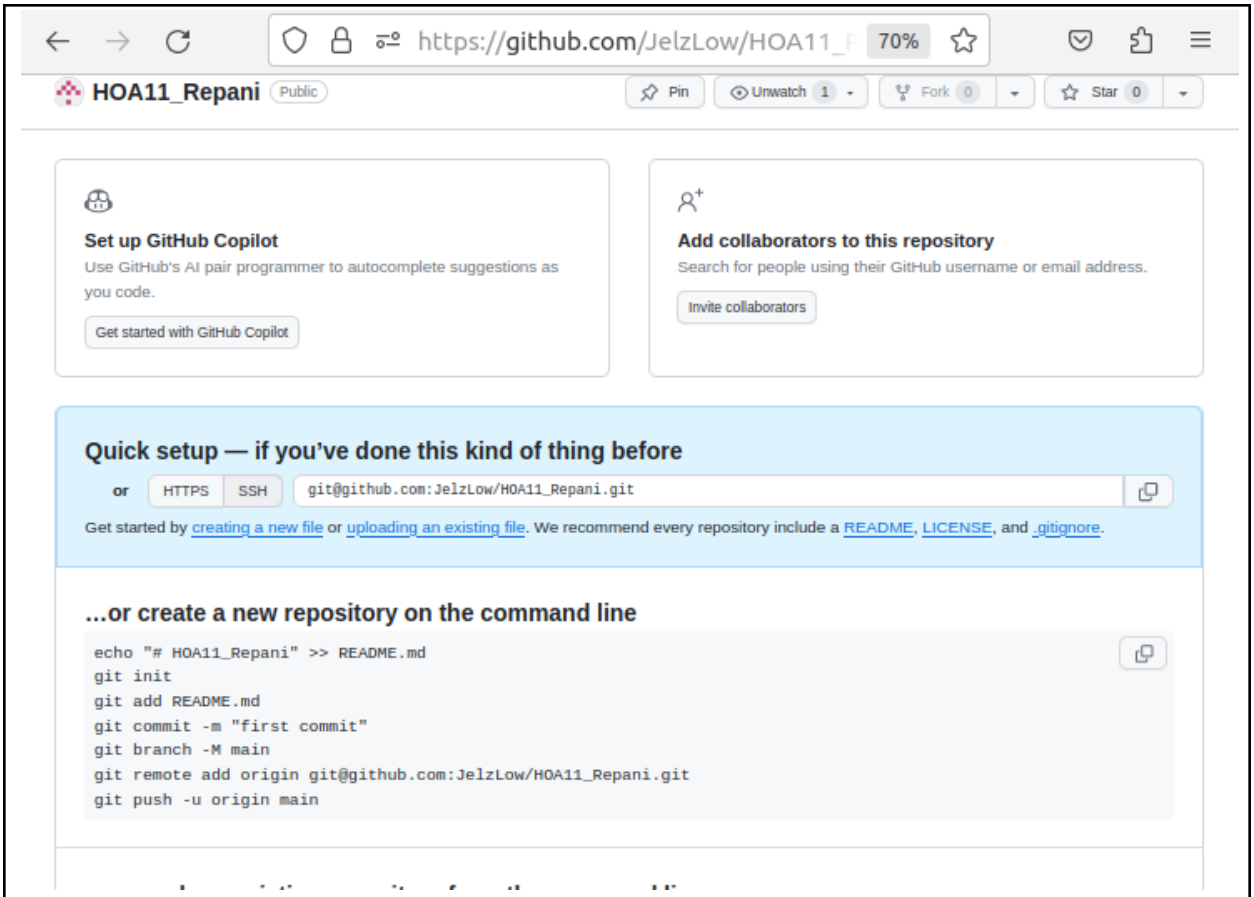
Source: https://docs.microsoft.com/en-us/virtualization/windowscontainers/about/containers-vs-vm

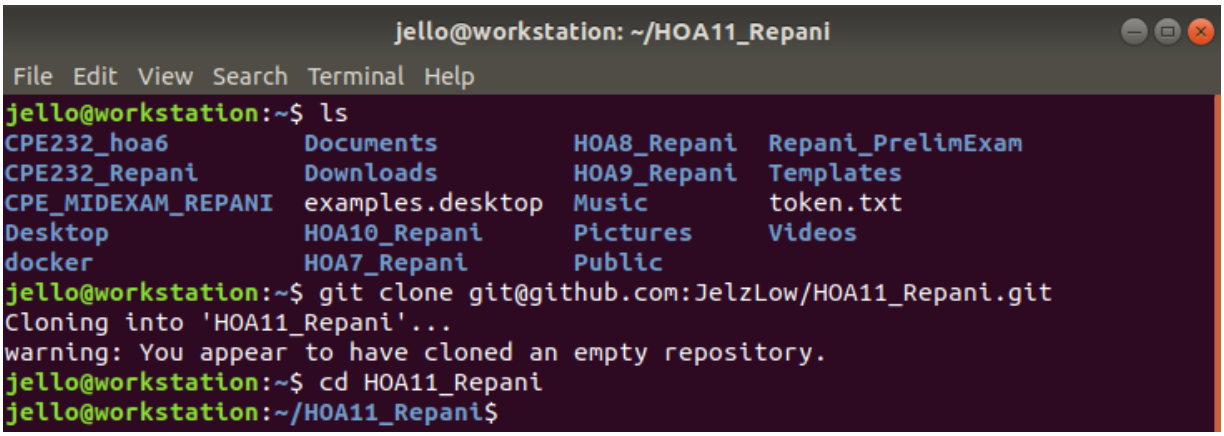
3. Tasks

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)

First step is to create a new git repository for activity 11. And then clone this into the workstation





Next step is to copy the ansible.cfg and inventory files from the previous activity and create a roles directory that contains centos and ubuntu each with their own tasks and main.yml

```
jello@workstation:~/HOA11_Repani$ cd ~/HOA10_Repani
jello@workstation:~/HOA10_Repani$ ls
ansible.cfg  elasticstack.yml  inventory  roles
jello@workstation:~/HOA10_Repani$ cp ansible.cfg ~/HOA11_Repani
jello@workstation:~/HOA10_Repani$ cp inventory ~/HOA11_Repani
jello@workstation:~/HOA10_Repani$ cd ~/HOA11_Repani
jello@workstation:~/HOA11_Repani$ ls
ansible.cfg  inventory
```

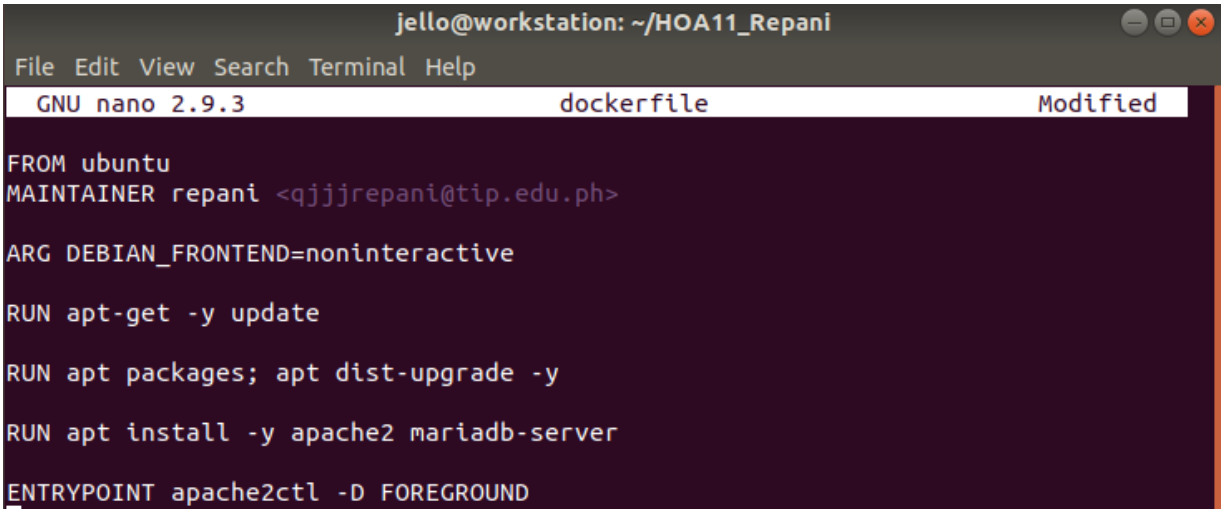
The next step is to create a directory for the ubuntu docker, it has a similar structure to the roles directory where it has subdirectories containing the different yml files and dockerfile.

```
jello@workstation:~/HOA11_Repani$ tree
.
├── ansible.cfg
├── dockerfile
├── ins_dock.yml
├── install_docker.yml
├── inventory
└── roles
    ├── centos
    │   └── tasks
    │       └── main.yml
    └── ubuntu
        └── tasks
            └── main.yml

5 directories, 7 files
```

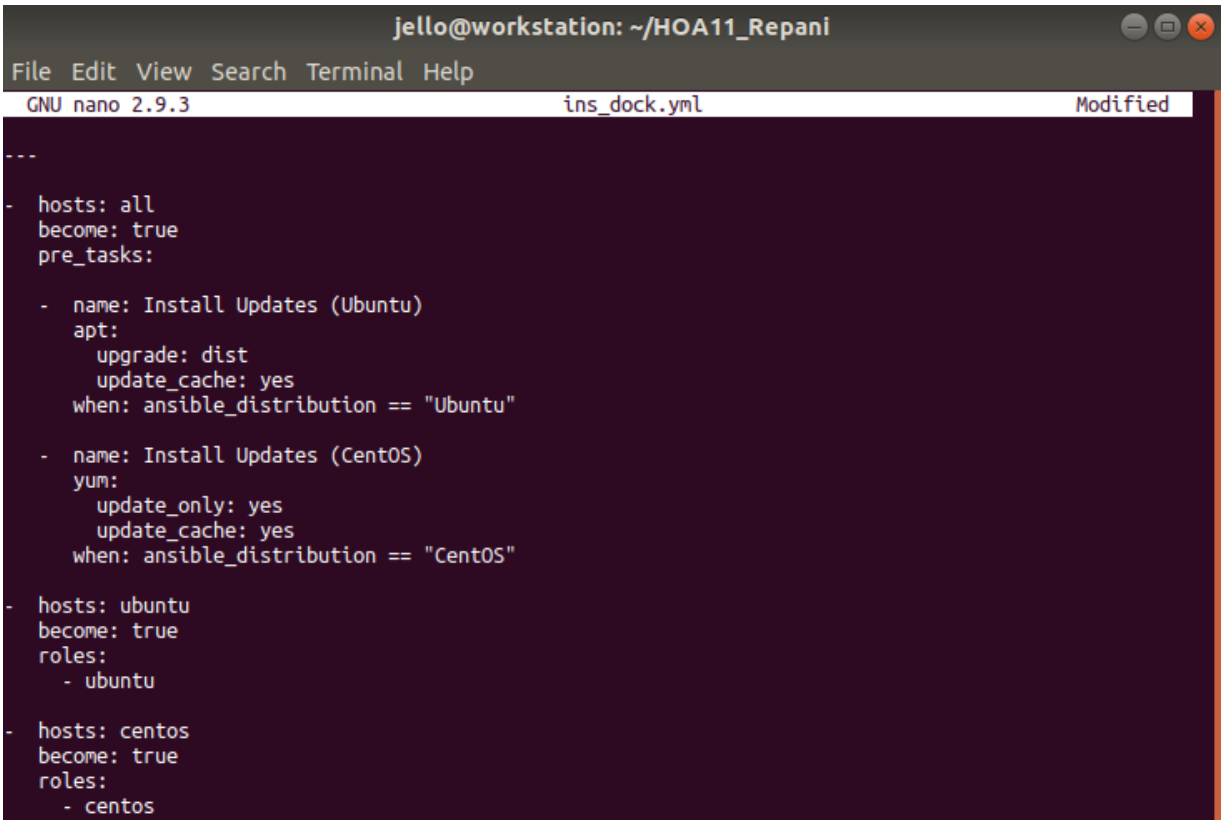
The inventory file

```
jello@workstation: ~/HOA11_Repani
File  Edit  View  Search  Terminal  Help
 GNU nano 2.9.3                  inventory                       Modified

[all]
192.168.56.102
192.168.56.104

[ubuntu]
192.168.56.102

[centos]
192.168.56.104
```

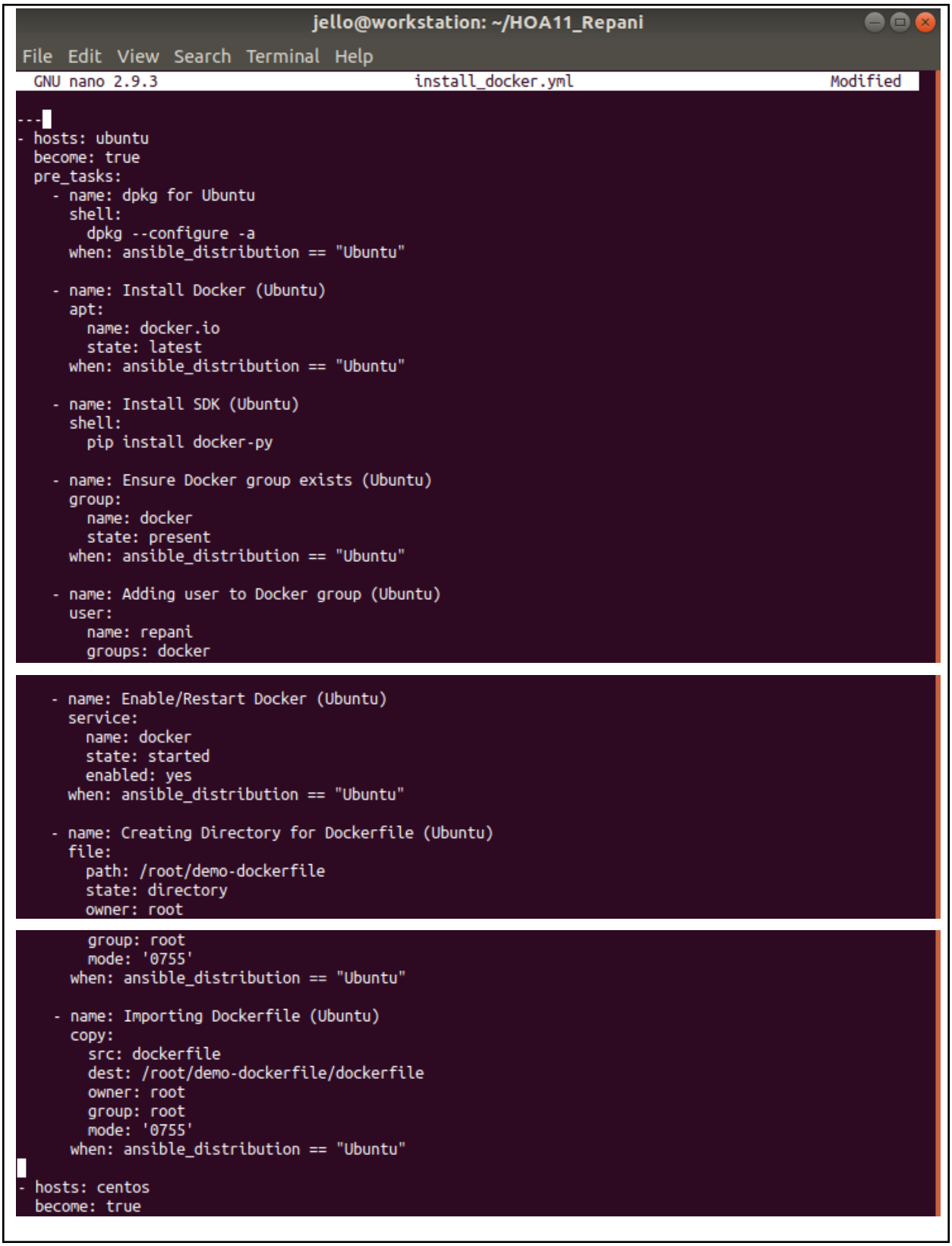
The dockerfile



ins_dock.yml



The install_docker.yml contains all the necessary codes needed in order to make

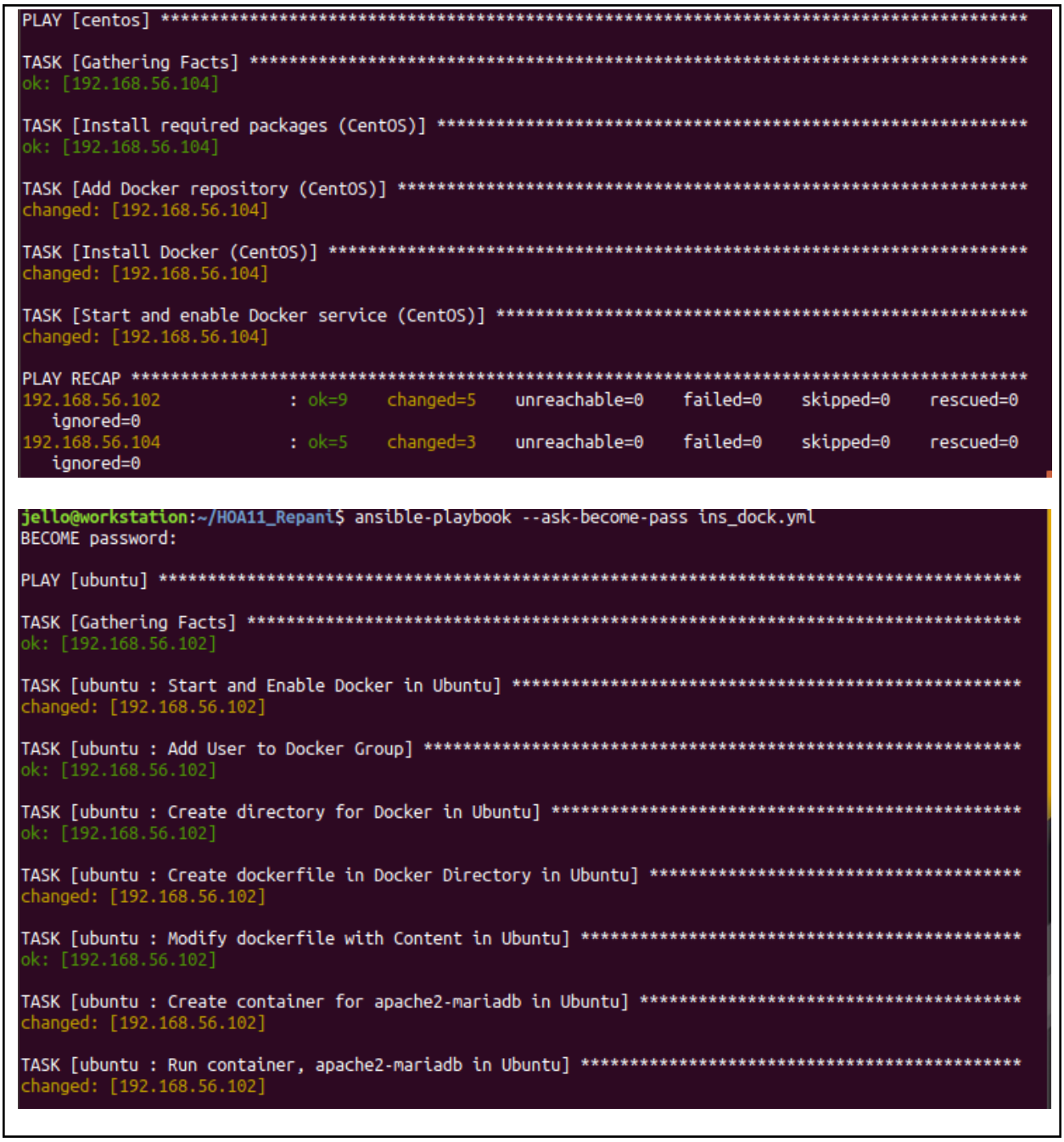

jello@workstation: ~/HOA11_Repani
File Edit View Search Terminal Help
GNU nano 2.9.3 install_docker.yml Modified

- hosts: ubuntu
become: true
pre_tasks:
- name: dpkg for Ubuntu
shell:
dpkg --configure -a
when: ansible_distribution == "Ubuntu"
- name: Install Docker (Ubuntu)
apt:
name: docker.io
state: latest
when: ansible_distribution == "Ubuntu"
- name: Install SDK (Ubuntu)
shell:
pip install docker-py
- name: Ensure Docker group exists (Ubuntu)
group:
name: docker
state: present
when: ansible_distribution == "Ubuntu"
- name: Adding user to Docker group (Ubuntu)
user:
name: repani
groups: docker
- name: Enable/Restart Docker (Ubuntu)
service:
name: docker
state: started
enabled: yes
when: ansible_distribution == "Ubuntu"
- name: Creating Directory for Dockerfile (Ubuntu)
file:
path: /root/demo-dockerfile
state: directory
owner: root
group: root
mode: '0755'
when: ansible_distribution == "Ubuntu"
- name: Importing Dockerfile (Ubuntu)
copy:
src: dockerfile
dest: /root/demo-dockerfile/dockerfile
owner: root
group: root
mode: '0755'
when: ansible_distribution == "Ubuntu"
- hosts: centos
become: true

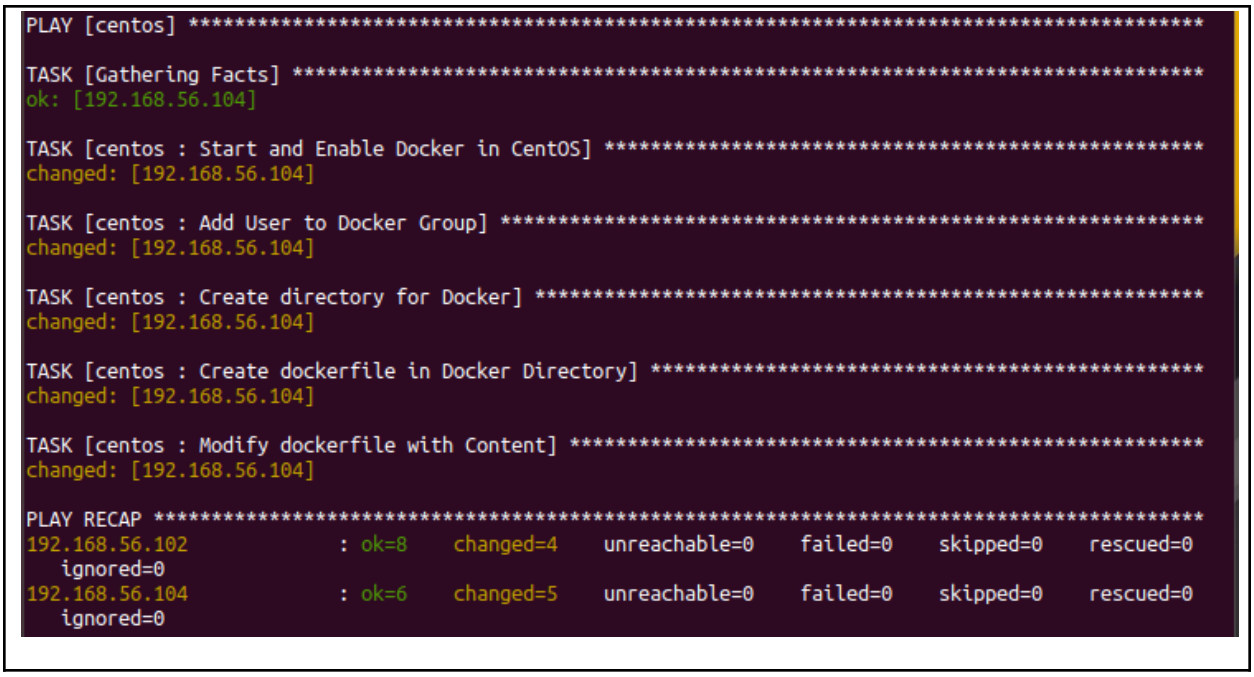
```
  pre_tasks:
    - name: Install required packages (CentOS)
      yum:
        name:
          - yum-utils
          - device-mapper-persistent-data
          - lvm2
        state: present
      when: ansible_distribution == "CentOS"

    - name: Add Docker repository (CentOS)
      yum_repository:
        name: docker-ce
        description: Docker CE Stable - $basearch
        baseurl: https://download.docker.com/linux/centos/7/$basearch/stable
        gpgkey: https://download.docker.com/linux/centos/gpg
        enabled: yes
      when: ansible_distribution == "CentOS"

    - name: Install Docker (CentOS)
      yum:
        name: docker-ce
        state: present
      when: ansible_distribution == "CentOS"

    - name: Start and enable Docker service (CentOS)
      systemd:
        name: docker
        state: started
        enabled: yes
      when: ansible_distribution == "CentOS"
```

Running the install_docker.yml

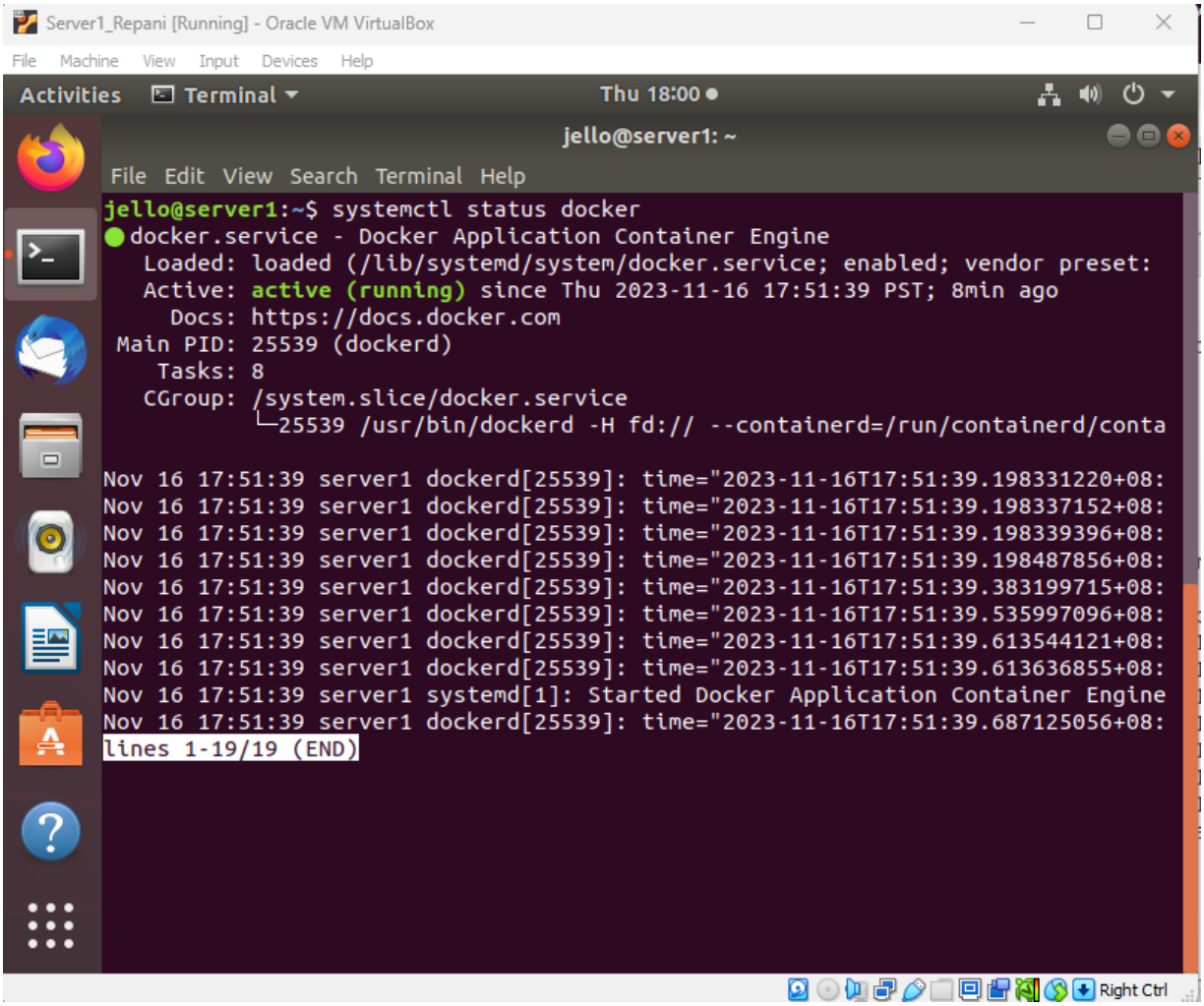
```
jello@workstation:~/HOA11_Repani$ ansible-playbook --ask-become-pass install_docker.yml
BECOME password:

PLAY [ubuntu] ******************************************************************************

TASK [Gathering Facts] *********************************************************************
ok: [192.168.56.102]

TASK [dpkg for Ubuntu] *********************************************************************
changed: [192.168.56.102]

TASK [Install Docker (Ubuntu)] *************************************************************
ok: [192.168.56.102]

TASK [Install SDK (Ubuntu)] ****************************************************************
changed: [192.168.56.102]

TASK [Ensure Docker group exists (Ubuntu)] *************************************************
ok: [192.168.56.102]

TASK [Adding user to Docker group (Ubuntu)] ************************************************
changed: [192.168.56.102]

TASK [Enable/Restart Docker (Ubuntu)] ******************************************************
ok: [192.168.56.102]

TASK [Creating Directory for Dockerfile (Ubuntu)] ******************************************
changed: [192.168.56.102]

TASK [Importing Dockerfile (Ubuntu)] *******************************************************
changed: [192.168.56.102]
```

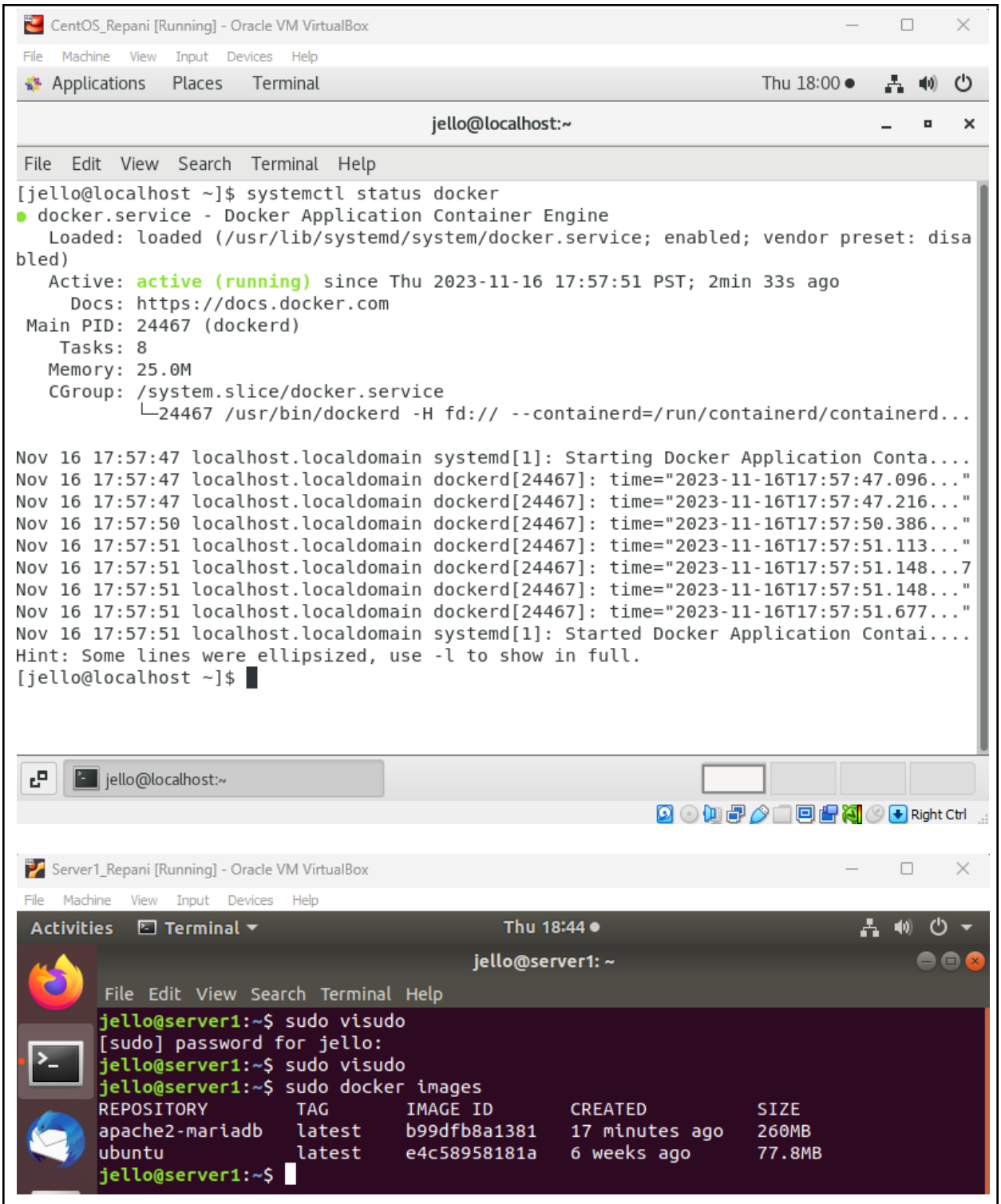


```
PLAY [centos] ******************************************************************************

TASK [Gathering Facts] *********************************************************************
ok: [192.168.56.104]

TASK [Install required packages (CentOS)] **************************************************
ok: [192.168.56.104]

TASK [Add Docker repository (CentOS)] ******************************************************
changed: [192.168.56.104]

TASK [Install Docker (CentOS)] *************************************************************
changed: [192.168.56.104]

TASK [Start and enable Docker service (CentOS)] ********************************************
changed: [192.168.56.104]

PLAY RECAP *********************************************************************************
192.168.56.102             : ok=9    changed=5    unreachable=0    failed=0    skipped=0    rescued=0
   ignored=0
192.168.56.104             : ok=5    changed=3    unreachable=0    failed=0    skipped=0    rescued=0
   ignored=0

jello@workstation:~/HOA11_Repani$ ansible-playbook --ask-become-pass ins_dock.yml
BECOME password:

PLAY [ubuntu] ******************************************************************************

TASK [Gathering Facts] *********************************************************************
ok: [192.168.56.102]

TASK [ubuntu : Start and Enable Docker in Ubuntu] ******************************************
changed: [192.168.56.102]

TASK [ubuntu : Add User to Docker Group] ***************************************************
ok: [192.168.56.102]

TASK [ubuntu : Create directory for Docker in Ubuntu] **************************************
ok: [192.168.56.102]

TASK [ubuntu : Create dockerfile in Docker Directory in Ubuntu] ****************************
changed: [192.168.56.102]

TASK [ubuntu : Modify dockerfile with Content in Ubuntu] ***********************************
ok: [192.168.56.102]

TASK [ubuntu : Create container for apache2-mariadb in Ubuntu] *****************************
changed: [192.168.56.102]

TASK [ubuntu : Run container, apache2-mariadb in Ubuntu] ***********************************
changed: [192.168.56.102]
```


PLAY [centos] **
TASK [Gathering Facts] **
ok: [192.168.56.104]
TASK [centos : Start and Enable Docker in CentOS] **
changed: [192.168.56.104]
TASK [centos : Add User to Docker Group] **
changed: [192.168.56.104]
TASK [centos : Create directory for Docker] **
changed: [192.168.56.104]
TASK [centos : Create dockerfile in Docker Directory] **
changed: [192.168.56.104]
TASK [centos : Modify dockerfile with Content] **
changed: [192.168.56.104]
PLAY RECAP **
192.168.56.102 : ok=8 changed=4 unreachable=0 failed=0 skipped=0 rescued=0
ignored=0
192.168.56.104 : ok=6 changed=5 unreachable=0 failed=0 skipped=0 rescued=0
ignored=0

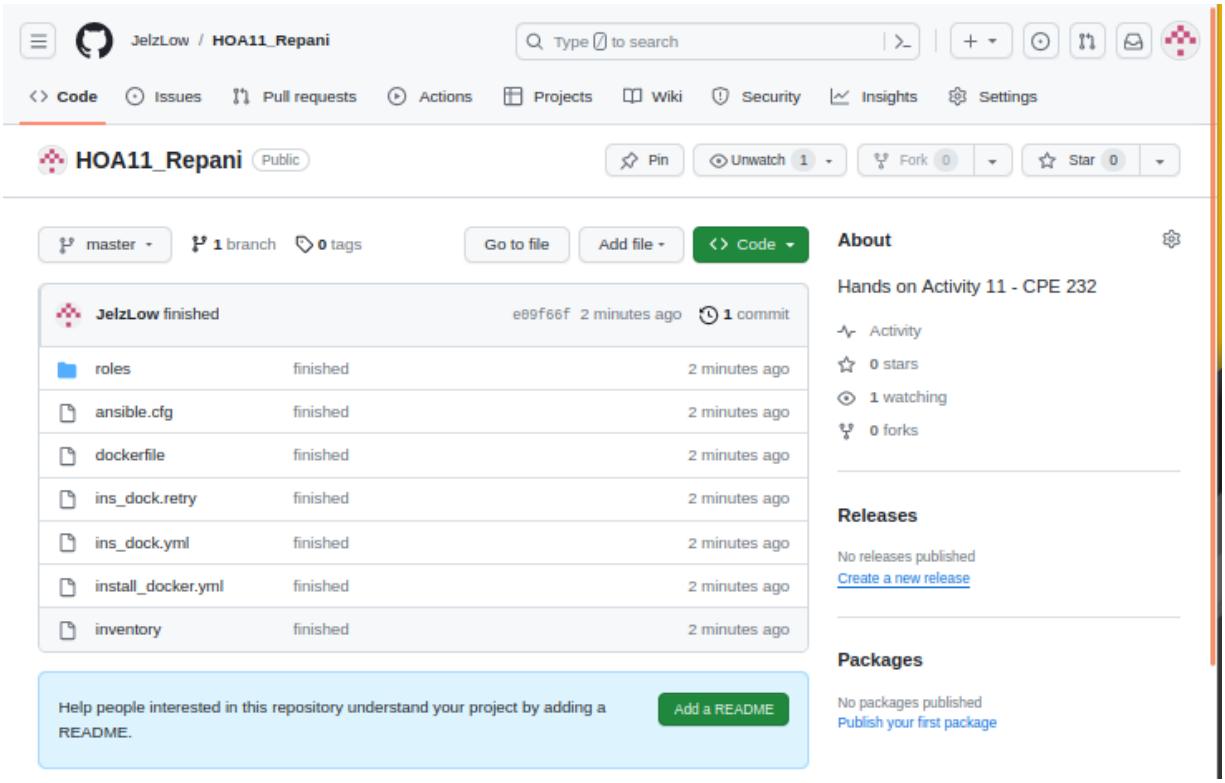
Proof:


Server1_Repani [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities
Terminal
Thu 18:00
jello@server1: ~
File Edit View Search Terminal Help
jello@server1:~$ systemctl status docker
docker.service - Docker Application Container Engine
Loaded: loaded (/lib/systemd/system/docker.service; enabled; vendor preset:
Active: active (running) since Thu 2023-11-16 17:51:39 PST; 8min ago
Docs: https://docs.docker.com
Main PID: 25539 (dockerd)
Tasks: 8
CGroup: /system.slice/docker.service
└─25539 /usr/bin/dockerd -H fd:// --containerd=/run/containerd/conta
Nov 16 17:51:39 server1 dockerd[25539]: time="2023-11-16T17:51:39.198331220+08:
Nov 16 17:51:39 server1 dockerd[25539]: time="2023-11-16T17:51:39.198337152+08:
Nov 16 17:51:39 server1 dockerd[25539]: time="2023-11-16T17:51:39.198339396+08:
Nov 16 17:51:39 server1 dockerd[25539]: time="2023-11-16T17:51:39.198487856+08:
Nov 16 17:51:39 server1 dockerd[25539]: time="2023-11-16T17:51:39.383199715+08:
Nov 16 17:51:39 server1 dockerd[25539]: time="2023-11-16T17:51:39.535997096+08:
Nov 16 17:51:39 server1 dockerd[25539]: time="2023-11-16T17:51:39.613544121+08:
Nov 16 17:51:39 server1 dockerd[25539]: time="2023-11-16T17:51:39.613636855+08:
Nov 16 17:51:39 server1 systemd[1]: Started Docker Application Container Engine
Nov 16 17:51:39 server1 dockerd[25539]: time="2023-11-16T17:51:39.687125056+08:
lines 1-19/19 (END)
Right Ctrl



Sync with Git repository

```
jello@workstation:~/HOA11_Repani$ git add *
jello@workstation:~/HOA11_Repani$ git commit -m "finished"
[master (root-commit) e09f66f] finished
 8 files changed, 243 insertions(+)
 create mode 100644 ansible.cfg
 create mode 100644 dockerfile
 create mode 100644 ins_dock.retry
 create mode 100644 ins_dock.yml
 create mode 100644 install_docker.yml
 create mode 100644 inventory
 create mode 100644 roles/centos/tasks/main.yml
 create mode 100644 roles/ubuntu/tasks/main.yml
jello@workstation:~/HOA11_Repani$ git push origin
Counting objects: 15, done.
Delta compression using up to 2 threads.
Compressing objects: 100% (10/10), done.
Writing objects: 100% (15/15), 2.54 KiB | 2.54 MiB/s, done.
Total 15 (delta 1), reused 0 (delta 0)
remote: Resolving deltas: 100% (1/1), done.
To github.com:JelzLow/HOA11_Repani.git
 * [new branch]      master -> master
```



https://github.com/JelzLow/HOA11_Repani

Reflections:

Answer the following:

1. What are the benefits of implementing containerizations?

- The benefits of using containerization is that it is more efficient than performing the different tasks traditionally; this is because making use of containerization does not require the user to have an entirely different system.

Conclusions:

This hands-on-activity is quite confusing because of the introduction of docker. With the help of lots of online resources the activity was accomplished with the roles application from the previous lessons as well as the installation of docker and the groups with the different images. Combining these concepts enabled me to accomplish the given task in the activity and achieve the output required.