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Course/Section: CPE31S2	**Date Submitted: 10/24/25**
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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.

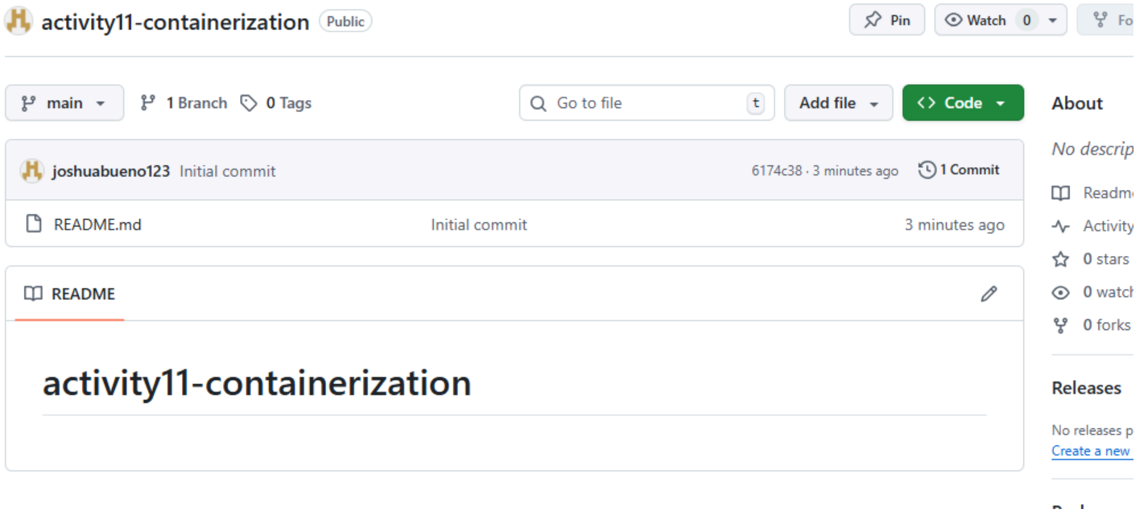
Source: https://docs.microsoft.com/en-us/virtualization/windowscontainers/about/containers-vs-vm

3. Tasks

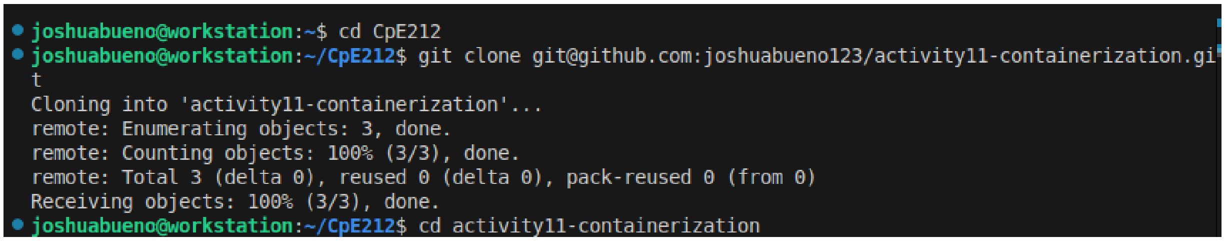
1. Create a new repository for this activity.
2. Install Docker and enable the docker socket.
3. Add to Docker group to your current user.
4. Create a Dockerfile to install web and DB server.
5. Install and build the Dockerfile using Ansible.
6. Add, commit and push it to your repository.

4. Output (screenshots and explanations)

1.



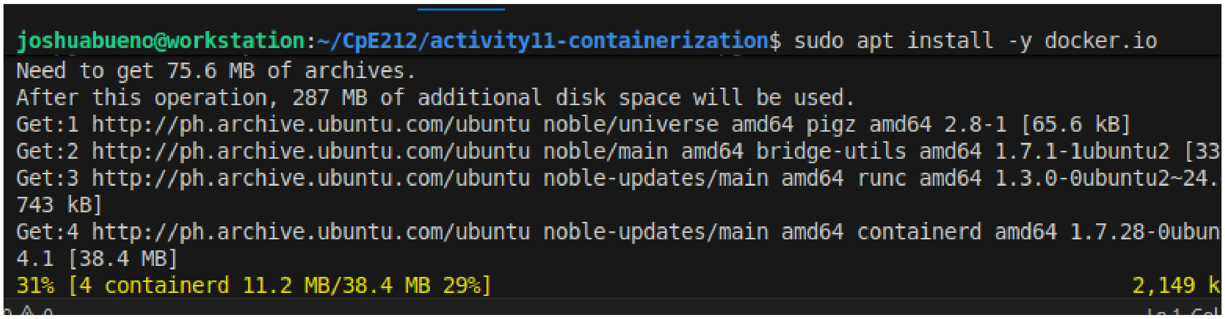
I successfully created a new repository on my github account



```
joshuabueno@workstation:~$ cd CpE212
joshuabueno@workstation:~/CpE212$ git clone git@github.com:joshuabueno123/activity11-containerization.gi
t
Cloning into 'activity11-containerization'...
remote: Enumerating objects: 3, done.
remote: Counting objects: 100% (3/3), done.
remote: Total 3 (delta 0), reused 0 (delta 0), pack-reused 0 (from 0)
Receiving objects: 100% (3/3), done.
joshuabueno@workstation:~/CpE212$ cd activity11-containerization
```

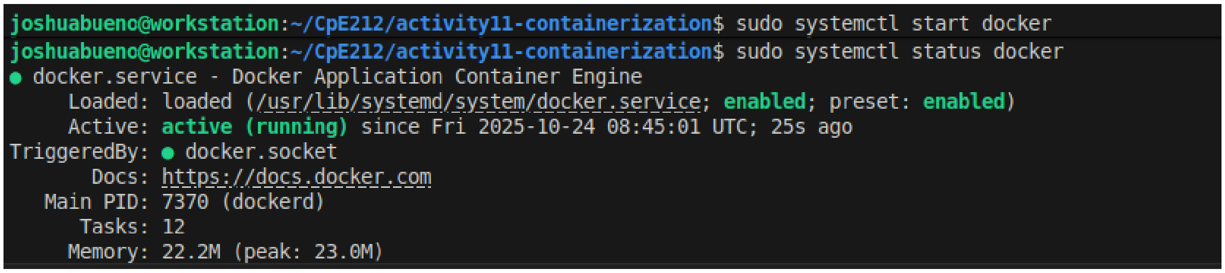
i cloned my new repository to my ubuntu so that I can use it and there I will do the activity

2.



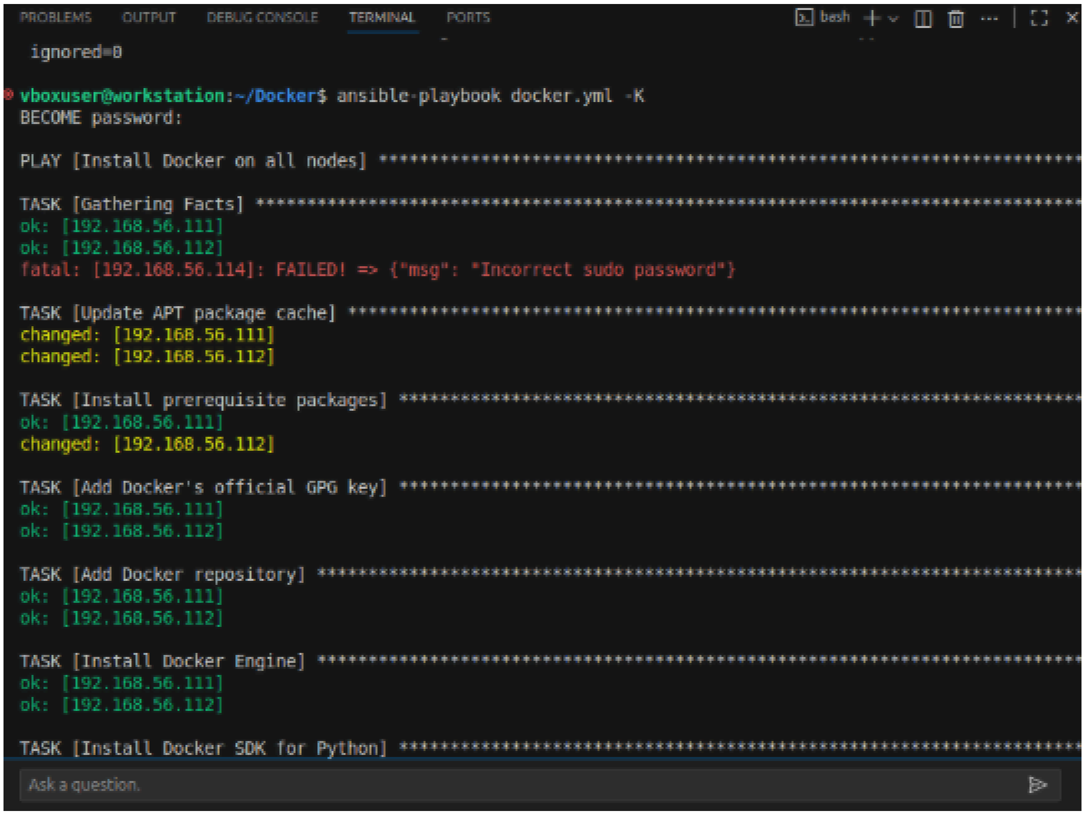
```
joshuabueno@workstation:~/CpE212/activity11-containerization$ sudo apt install -y docker.io
Need to get 75.6 MB of archives.
After this operation, 287 MB of additional disk space will be used.
Get:1 http://ph.archive.ubuntu.com/ubuntu noble/universe amd64 pigz amd64 2.8-1 [65.6 kB]
Get:2 http://ph.archive.ubuntu.com/ubuntu noble/main amd64 bridge-utils amd64 1.7.1-1ubuntu2 [33
Get:3 http://ph.archive.ubuntu.com/ubuntu noble-updates/main amd64 runc amd64 1.3.0-0ubuntu2~24.
743 kB]
Get:4 http://ph.archive.ubuntu.com/ubuntu noble-updates/main amd64 containerd amd64 1.7.28-0ubun
4.1 [38.4 MB]
31% [4 containerd 11.2 MB/38.4 MB 29%]                                                  2,149 k
```

Here is i used sudo apt install -y docker.io to install the docker.

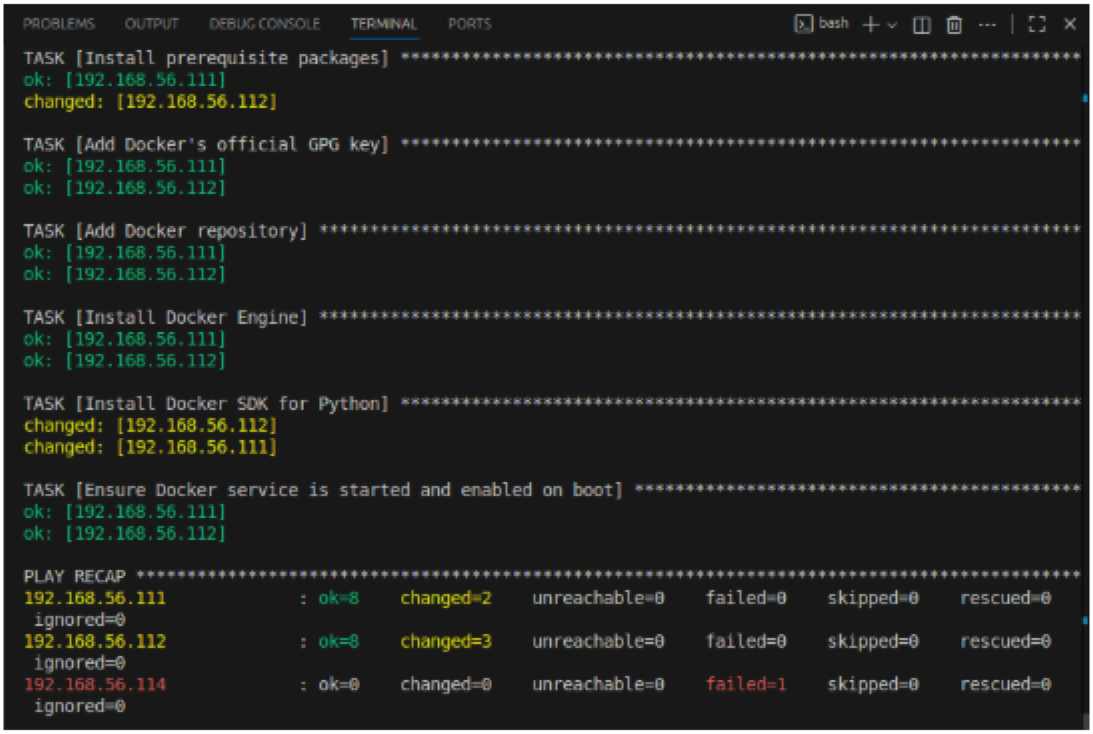


```
joshuabueno@workstation:~/CpE212/activity11-containerization$ sudo systemctl start docker
joshuabueno@workstation:~/CpE212/activity11-containerization$ sudo systemctl status docker
● docker.service - Docker Application Container Engine
     Loaded: loaded (/usr/lib/systemd/system/docker.service; enabled; preset: enabled)
     Active: active (running) since Fri 2025-10-24 08:45:01 UTC; 25s ago
TriggeredBy: ● docker.socket
       Docs: https://docs.docker.com
   Main PID: 7370 (dockerd)
      Tasks: 12
     Memory: 22.2M (peak: 23.0M)
```

After that, I start, enabled, and check the status of the docker and it said that it's running



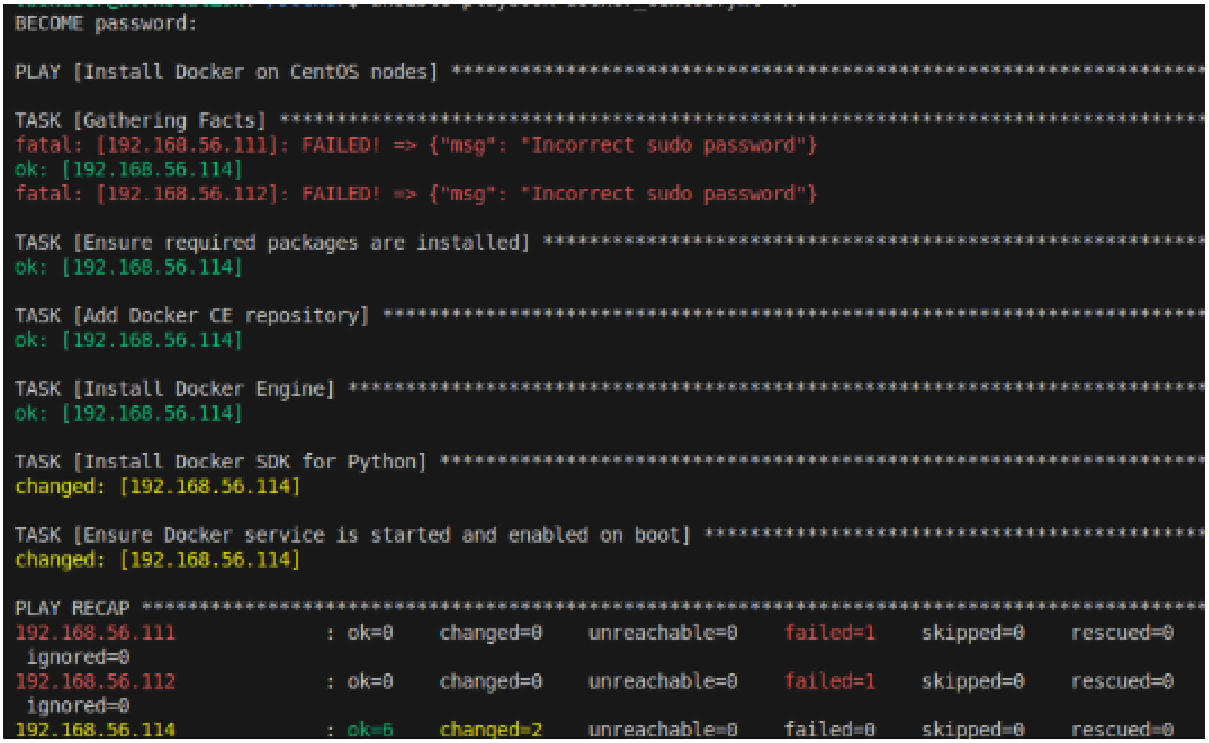
```
 ignored=0

vboxuser@workstation:~/Docker$ ansible-playbook docker.yml -K
BECOME password:

PLAY [Install Docker on all nodes] ***********************************************************************

TASK [Gathering Facts] ***********************************************************************************
ok: [192.168.56.111]
ok: [192.168.56.112]
fatal: [192.168.56.114]: FAILED! => {"msg": "Incorrect sudo password"}

TASK [Update APT package cache] **************************************************************************
changed: [192.168.56.111]
changed: [192.168.56.112]

TASK [Install prerequisite packages] *********************************************************************
ok: [192.168.56.111]
changed: [192.168.56.112]

TASK [Add Docker's official GPG key] *********************************************************************
ok: [192.168.56.111]
ok: [192.168.56.112]

TASK [Add Docker repository] *****************************************************************************
ok: [192.168.56.111]
ok: [192.168.56.112]

TASK [Install Docker Engine] *****************************************************************************
ok: [192.168.56.111]
ok: [192.168.56.112]

TASK [Install Docker SDK for Python] *********************************************************************
```



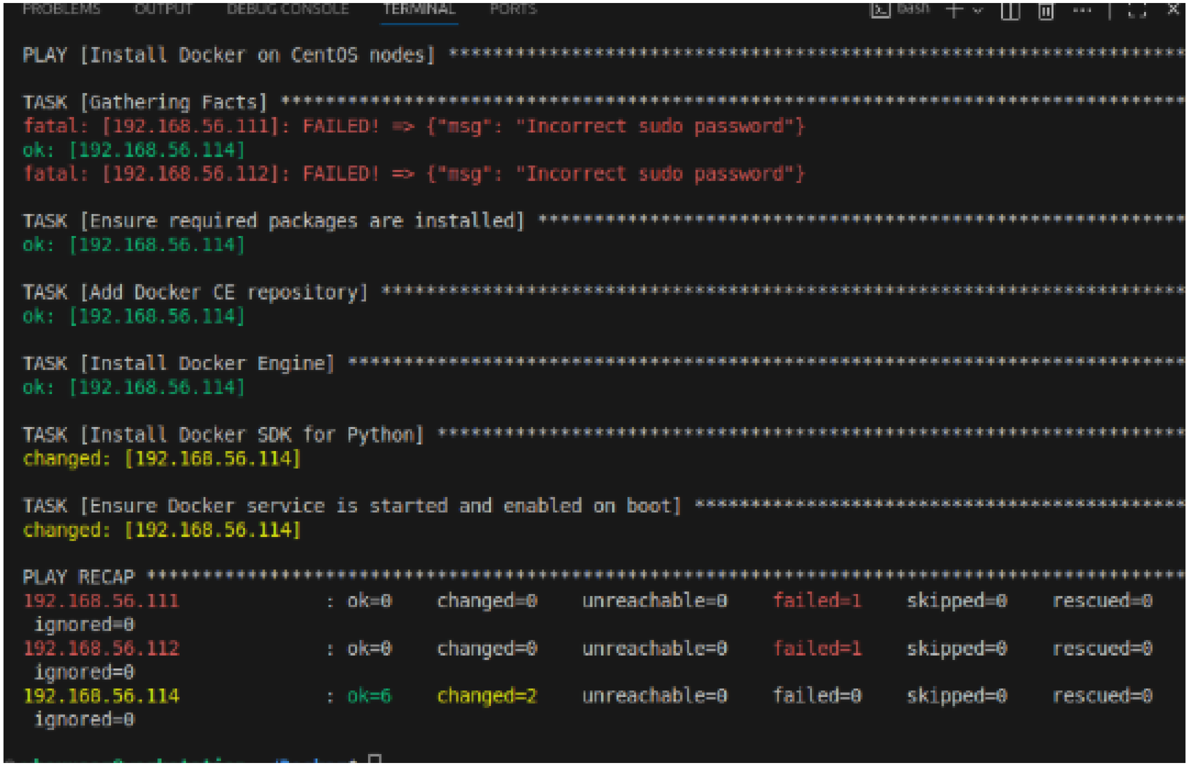
```
TASK [Install prerequisite packages] *******************************************************************
ok: [192.168.56.111]
changed: [192.168.56.112]

TASK [Add Docker's official GPG key] *******************************************************************
ok: [192.168.56.111]
ok: [192.168.56.112]

TASK [Add Docker repository] ***************************************************************************
ok: [192.168.56.111]
ok: [192.168.56.112]

TASK [Install Docker Engine] ***************************************************************************
ok: [192.168.56.111]
ok: [192.168.56.112]

TASK [Install Docker SDK for Python] *******************************************************************
changed: [192.168.56.112]
changed: [192.168.56.111]

TASK [Ensure Docker service is started and enabled on boot] ********************************************
ok: [192.168.56.111]
ok: [192.168.56.112]

PLAY RECAP *********************************************************************************************
192.168.56.111             : ok=8    changed=2    unreachable=0    failed=0    skipped=0    rescued=0
 ignored=0
192.168.56.112             : ok=8    changed=3    unreachable=0    failed=0    skipped=0    rescued=0
 ignored=0
192.168.56.114             : ok=0    changed=0    unreachable=0    failed=1    skipped=0    rescued=0
 ignored=0
```

Installing the docker using ansible

CentOS:



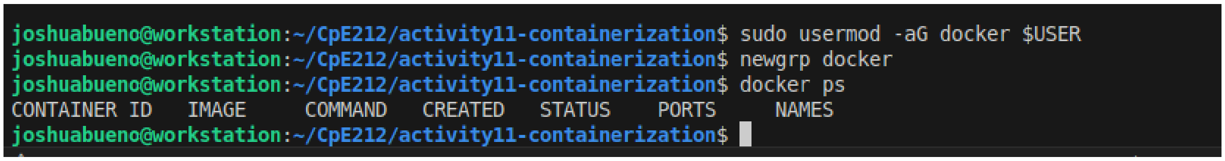
```
BECOME password:

PLAY [Install Docker on CentOS nodes] ******************************************************************

TASK [Gathering Facts] *********************************************************************************
fatal: [192.168.56.111]: FAILED! => {"msg": "Incorrect sudo password"}
ok: [192.168.56.114]
fatal: [192.168.56.112]: FAILED! => {"msg": "Incorrect sudo password"}

TASK [Ensure required packages are installed] **********************************************************
ok: [192.168.56.114]

TASK [Add Docker CE repository] ************************************************************************
ok: [192.168.56.114]

TASK [Install Docker Engine] ***************************************************************************
ok: [192.168.56.114]

TASK [Install Docker SDK for Python] *******************************************************************
changed: [192.168.56.114]

TASK [Ensure Docker service is started and enabled on boot] ********************************************
changed: [192.168.56.114]

PLAY RECAP *********************************************************************************************
192.168.56.111             : ok=0    changed=0    unreachable=0    failed=1    skipped=0    rescued=0
 ignored=0
192.168.56.112             : ok=0    changed=0    unreachable=0    failed=1    skipped=0    rescued=0
 ignored=0
192.168.56.114             : ok=6    changed=2    unreachable=0    failed=0    skipped=0    rescued=0
```



```
PLAY [Install Docker on CentOS nodes] ******************************************************************

TASK [Gathering Facts] *********************************************************************************
fatal: [192.168.56.111]: FAILED! => {"msg": "Incorrect sudo password"}
ok: [192.168.56.114]
fatal: [192.168.56.112]: FAILED! => {"msg": "Incorrect sudo password"}

TASK [Ensure required packages are installed] **********************************************************
ok: [192.168.56.114]

TASK [Add Docker CE repository] ************************************************************************
ok: [192.168.56.114]

TASK [Install Docker Engine] ***************************************************************************
ok: [192.168.56.114]

TASK [Install Docker SDK for Python] *******************************************************************
changed: [192.168.56.114]

TASK [Ensure Docker service is started and enabled on boot] ********************************************
changed: [192.168.56.114]

PLAY RECAP *********************************************************************************************
192.168.56.111             : ok=0    changed=0    unreachable=0    failed=1    skipped=0    rescued=0
 ignored=0
192.168.56.112             : ok=0    changed=0    unreachable=0    failed=1    skipped=0    rescued=0
 ignored=0
192.168.56.114             : ok=6    changed=2    unreachable=0    failed=0    skipped=0    rescued=0
 ignored=0
```

Installing of docker using CentOS

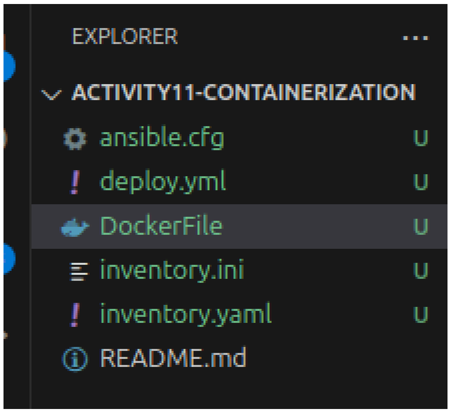
3.Add docker group to current user



```
joshuabueno@workstation:~/CpE212/activity11-containerization$ sudo usermod -aG docker $USER
joshuabueno@workstation:~/CpE212/activity11-containerization$ newgrp docker
joshuabueno@workstation:~/CpE212/activity11-containerization$ docker ps
CONTAINER ID   IMAGE     COMMAND   CREATED   STATUS    PORTS     NAMES
joshuabueno@workstation:~/CpE212/activity11-containerization$ 
```

I successfully added the docker group to the current user by using these commands.

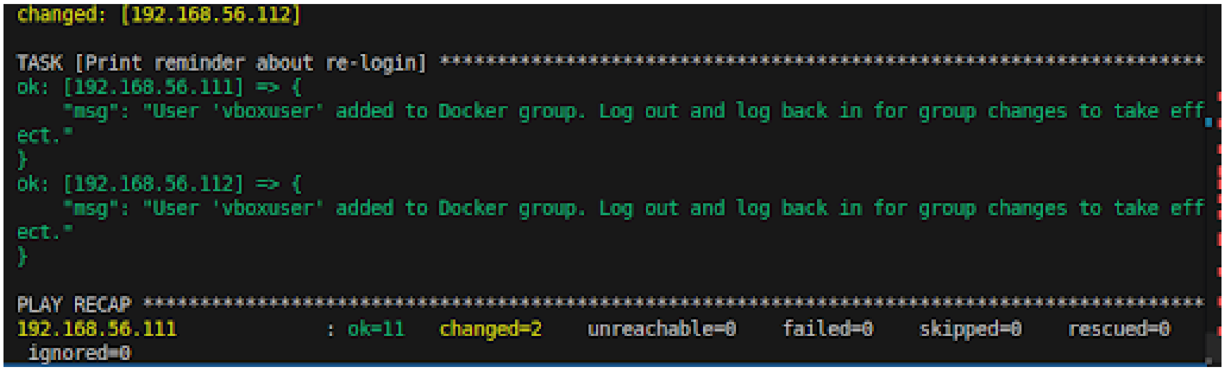
Adds a dockerfile



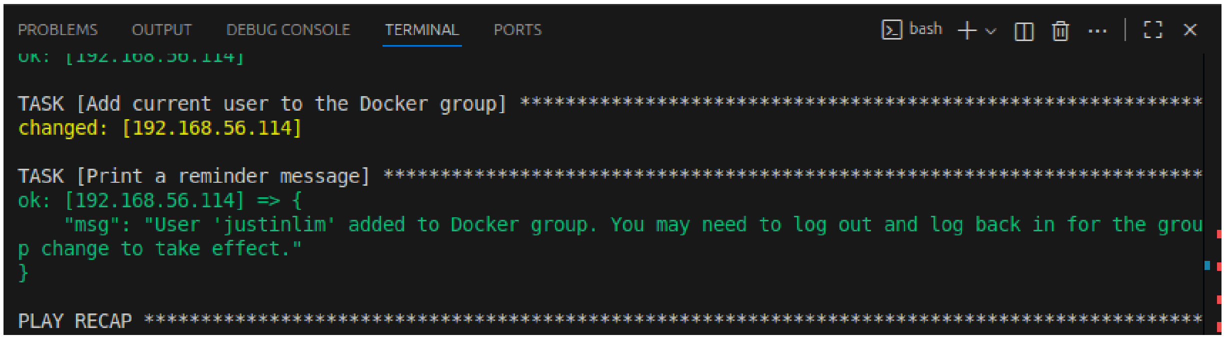
```
EXPLORER                              ...
∨ ACTIVITY11-CONTAINERIZATION
    ansible.cfg                       U
    deploy.yml                        U
    DockerFile                        U
    inventory.ini                     U
    inventory.yaml                    U
    README.md
```

Here is I add a dockerfile on where is my repository folder and i add it to my current user

Ubuntu:

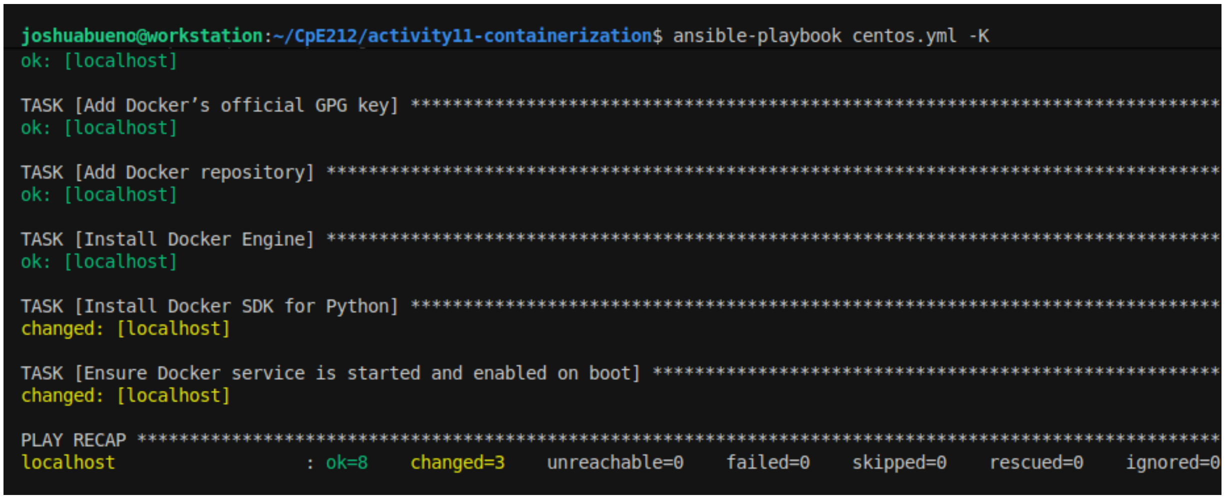


```
changed: [192.168.56.112]

TASK [Print reminder about re-login] ************************************************************
ok: [192.168.56.111] => {
    "msg": "User 'vboxuser' added to Docker group. Log out and log back in for group changes to take eff
ect."
}
ok: [192.168.56.112] => {
    "msg": "User 'vboxuser' added to Docker group. Log out and log back in for group changes to take eff
ect."
}

PLAY RECAP **************************************************************************************
192.168.56.111             : ok=11   changed=2    unreachable=0    failed=0    skipped=0    rescued=0
 ignored=0
```



```
ok: [192.168.56.114]

TASK [Add current user to the Docker group] ***************************************************
changed: [192.168.56.114]

TASK [Print a reminder message] *************************************************************
ok: [192.168.56.114] => {
    "msg": "User 'justinlim' added to Docker group. You may need to log out and log back in for the grou
p change to take effect."
}

PLAY RECAP ****************************************************************************************
```

CentOs:

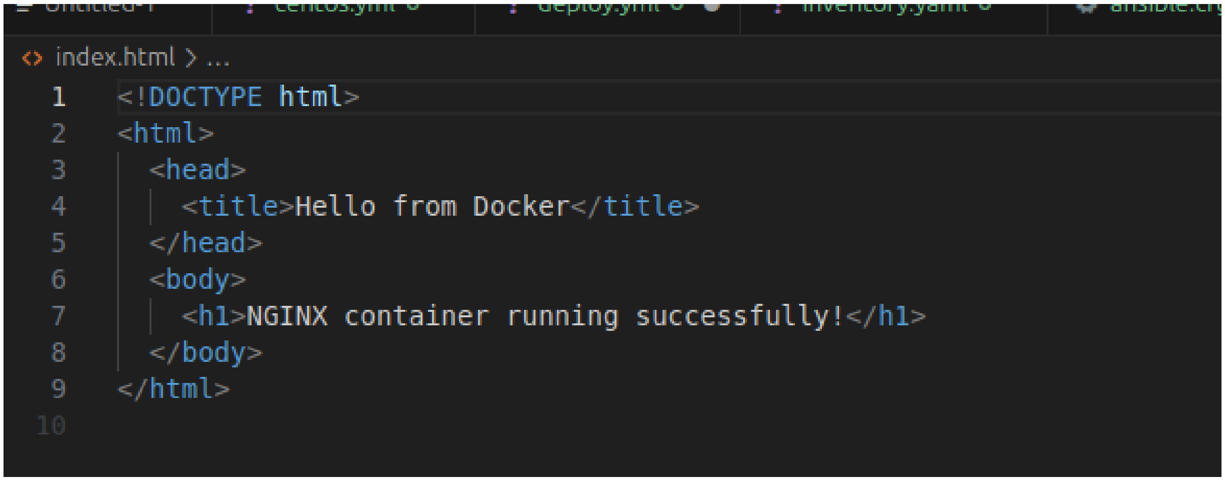


```
joshuabueno@workstation:~/CpE212/activity11-containerization$ ansible-playbook centos.yml -K
ok: [localhost]

TASK [Add Docker's official GPG key] ************************************************************
ok: [localhost]

TASK [Add Docker repository] *******************************************************************
ok: [localhost]

TASK [Install Docker Engine] *******************************************************************
ok: [localhost]

TASK [Install Docker SDK for Python] ***********************************************************
changed: [localhost]

TASK [Ensure Docker service is started and enabled on boot] ************************************
changed: [localhost]

PLAY RECAP *************************************************************************************
localhost                  : ok=8    changed=3    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
```

I successfully installed the webserver which is the CentOs using the dockerfile

4.

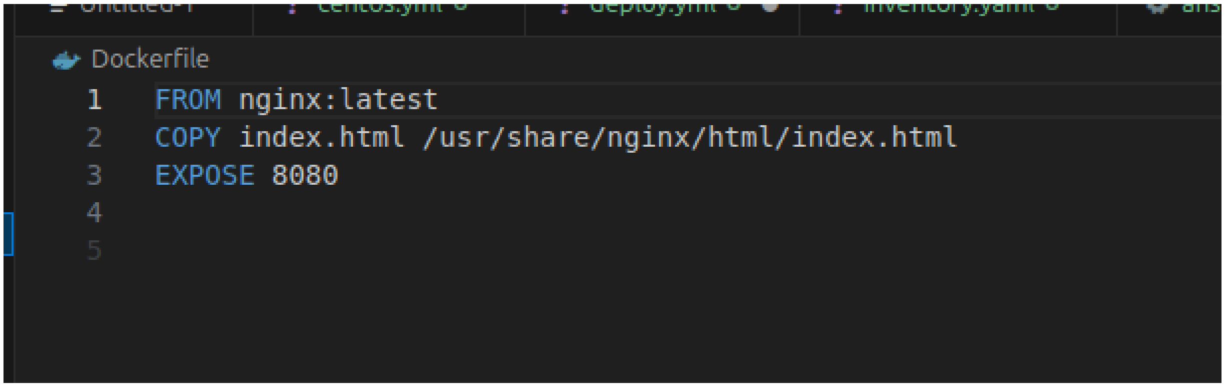
index.html file



```html
<!DOCTYPE html>
<html>
  <head>
    <title>Hello from Docker</title>
  </head>
  <body>
    <h1>NGINX container running successfully!</h1>
  </body>
</html>
```

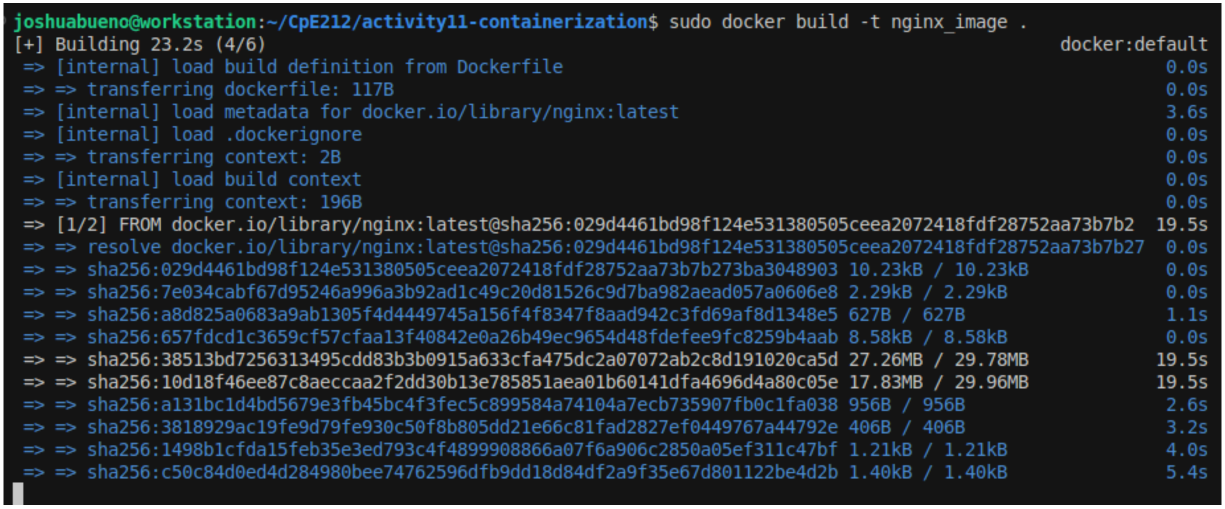
this is the code inside the index.html file

DockerFile:



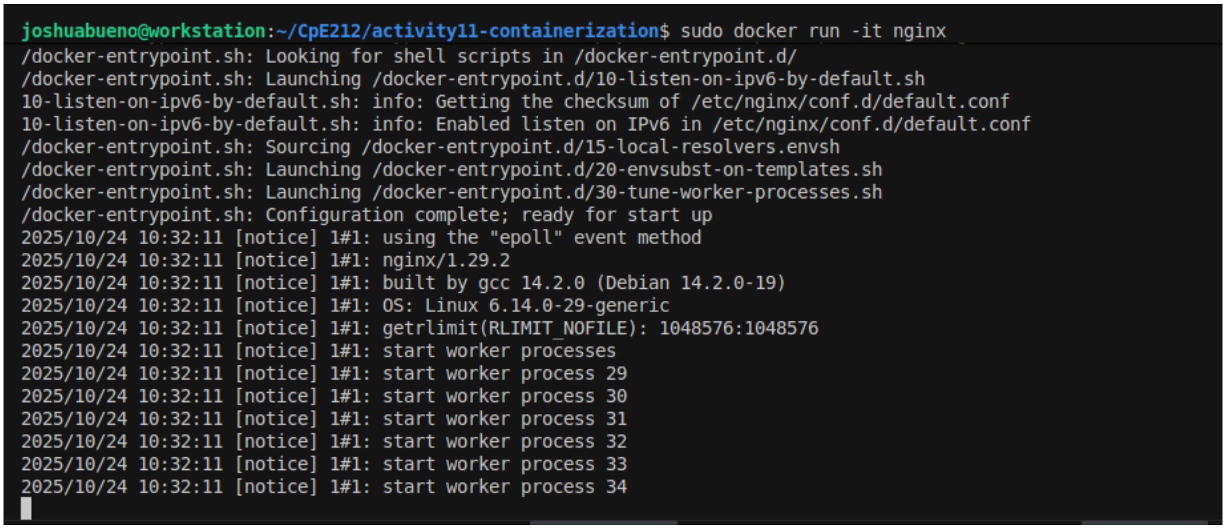
```dockerfile
FROM nginx:latest
COPY index.html /usr/share/nginx/html/index.html
EXPOSE 8080
```

this is the code for the dockerfile



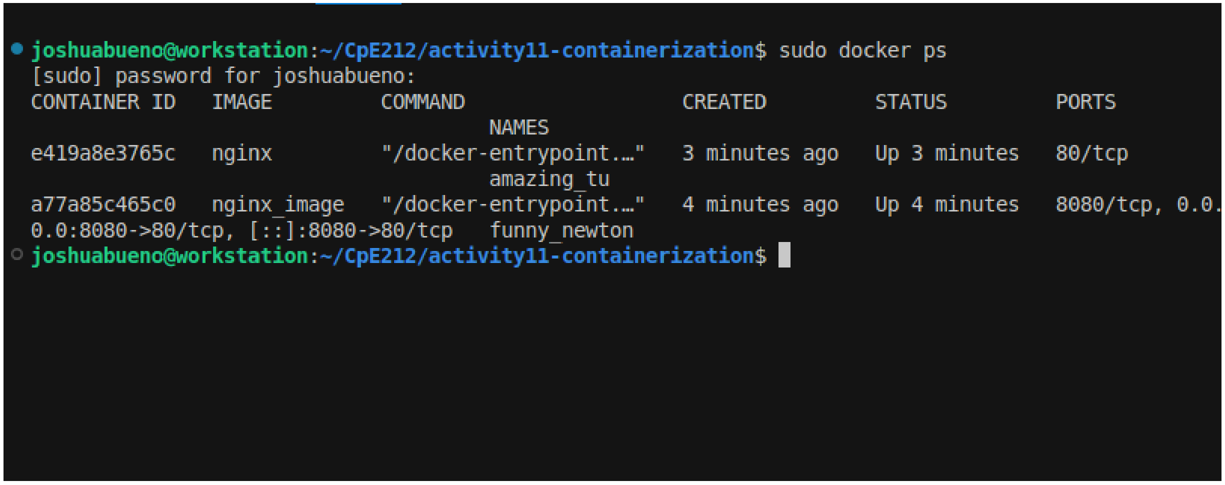
```
joshuabueno@workstation:~/CpE212/activity11-containerization$ sudo docker build -t nginx_image .
[+] Building 23.2s (4/6)                                                                      docker:default
 => [internal] load build definition from Dockerfile                                                    0.0s
 => => transferring dockerfile: 117B                                                                    0.0s
 => [internal] load metadata for docker.io/library/nginx:latest                                         3.6s
 => [internal] load .dockerignore                                                                       0.0s
 => => transferring context: 2B                                                                         0.0s
 => [internal] load build context                                                                       0.0s
 => => transferring context: 196B                                                                       0.0s
 => [1/2] FROM docker.io/library/nginx:latest@sha256:029d4461bd98f124e531380505ceea2072418fdf28752aa73b7b2  19.5s
 => => resolve docker.io/library/nginx:latest@sha256:029d4461bd98f124e531380505ceea2072418fdf28752aa73b7b27  0.0s
 => => sha256:029d4461bd98f124e531380505ceea2072418fdf28752aa73b7b273ba3048903 10.23kB / 10.23kB         0.0s
 => => sha256:7e034cabf67d95246a996a3b92ad1c49c20d81526c9d7ba982aead057a0606e8 2.29kB / 2.29kB           0.0s
 => => sha256:a8d825a0683a9ab1305f4d4449745a156f4f8347f8aad942c3fd69af8d1348e5 627B / 627B               1.1s
 => => sha256:657fdcd1c3659cf57cfaa13f40842e0a26b49ec9654d48fdefee9fc8259b4aab 8.58kB / 8.58kB           0.0s
 => => sha256:38513bd7256313495cdd83b3b0915a633cfa475dc2a07072ab2c8d191020ca5d 27.26MB / 29.78MB        19.5s
 => => sha256:10d18f46ee87c8aeccaa2f2dd30b13e785851aea01b60141dfa4696d4a80c05e 17.83MB / 29.96MB        19.5s
 => => sha256:a131bc1d4bd5679e3fb45bc4f3fec5c899584a74104a7ecb735907fb0c1fa038 956B / 956B               2.6s
 => => sha256:3818929ac19fe9d79fe930c50f8b805dd21e66c81fad2827ef0449767a44792e 406B / 406B               3.2s
 => => sha256:1498b1cfda15feb35e3ed793c4f4899908866a07f6a906c2850a05ef311c47bf 1.21kB / 1.21kB           4.0s
 => => sha256:c50c84d0ed4d284980bee74762596dfb9dd18d84df2a9f35e67d801122be4d2b 1.40kB / 1.40kB           5.4s
```

As you can see in the output. I successfully did create a docker file and started building and install a web or dbserver.



```
joshuabueno@workstation:~/CpE212/activity11-containerization$ sudo docker run -it nginx
/docker-entrypoint.sh: Looking for shell scripts in /docker-entrypoint.d/
/docker-entrypoint.sh: Launching /docker-entrypoint.d/10-listen-on-ipv6-by-default.sh
10-listen-on-ipv6-by-default.sh: info: Getting the checksum of /etc/nginx/conf.d/default.conf
10-listen-on-ipv6-by-default.sh: info: Enabled listen on IPv6 in /etc/nginx/conf.d/default.conf
/docker-entrypoint.sh: Sourcing /docker-entrypoint.d/15-local-resolvers.envsh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/20-envsubst-on-templates.sh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/30-tune-worker-processes.sh
/docker-entrypoint.sh: Configuration complete; ready for start up
2025/10/24 10:32:11 [notice] 1#1: using the "epoll" event method
2025/10/24 10:32:11 [notice] 1#1: nginx/1.29.2
2025/10/24 10:32:11 [notice] 1#1: built by gcc 14.2.0 (Debian 14.2.0-19)
2025/10/24 10:32:11 [notice] 1#1: OS: Linux 6.14.0-29-generic
2025/10/24 10:32:11 [notice] 1#1: getrlimit(RLIMIT_NOFILE): 1048576:1048576
2025/10/24 10:32:11 [notice] 1#1: start worker processes
2025/10/24 10:32:11 [notice] 1#1: start worker process 29
2025/10/24 10:32:11 [notice] 1#1: start worker process 30
2025/10/24 10:32:11 [notice] 1#1: start worker process 31
2025/10/24 10:32:11 [notice] 1#1: start worker process 32
2025/10/24 10:32:11 [notice] 1#1: start worker process 33
2025/10/24 10:32:11 [notice] 1#1: start worker process 34
```

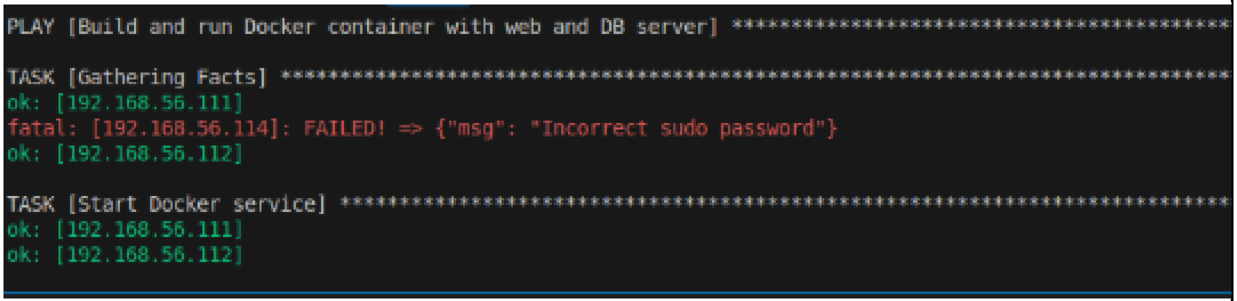
this command attempts to run a Docker container interactively using the Nginx image and the current directory



```
● joshuabueno@workstation:~/CpE212/activity11-containerization$ sudo docker ps
  [sudo] password for joshuabueno:
  CONTAINER ID   IMAGE         COMMAND                  CREATED         STATUS         PORTS
                                        NAMES
  e419a8e3765c   nginx         "/docker-entrypoint.…"   3 minutes ago   Up 3 minutes   80/tcp
                                        amazing_tu
  a77a85c465c0   nginx_image   "/docker-entrypoint.…"   4 minutes ago   Up 4 minutes   8080/tcp, 0.0.
  0.0:8080->80/tcp, [::]:8080->80/tcp   funny_newton
○ joshuabueno@workstation:~/CpE212/activity11-containerization$ 
```

sudo docker ps command to displays a list of all currently running Docker containers, showing details like container ID, image, status, and exposed ports.

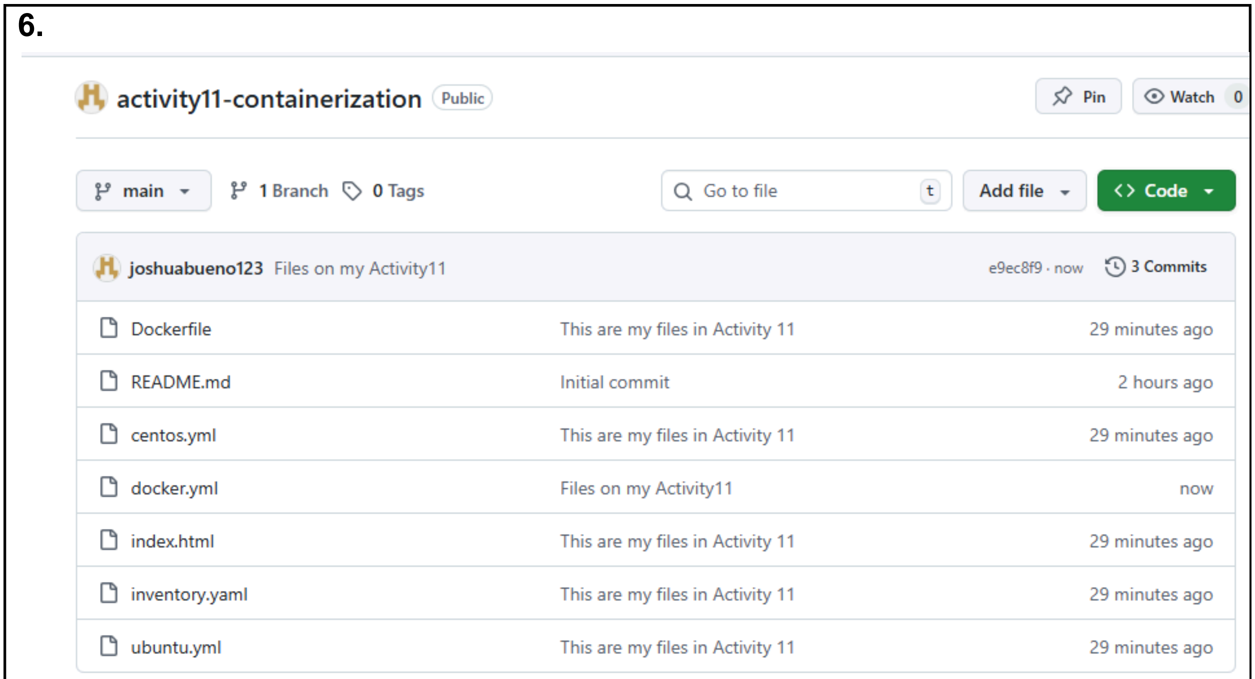
5 .Build a Docker file using Ansible



```
PLAY [Build and run Docker container with web and DB server] *********************************************

TASK [Gathering Facts] *************************************************************************************
ok: [192.168.56.111]
fatal: [192.168.56.114]: FAILED! => {"msg": "Incorrect sudo password"}
ok: [192.168.56.112]

TASK [Start Docker service] ********************************************************************************
ok: [192.168.56.111]
ok: [192.168.56.112]
```

I successfully build a docker file using the ansible

6.



activity11-containerization Public

joshuabueno123 Files on my Activity11 e9ec8f9 · now 3 Commits

Dockerfile	This are my files in Activity 11	29 minutes ago
README.md	Initial commit	2 hours ago
centos.yml	This are my files in Activity 11	29 minutes ago
docker.yml	Files on my Activity11	now
index.html	This are my files in Activity 11	29 minutes ago
inventory.yaml	This are my files in Activity 11	29 minutes ago
ubuntu.yml	This are my files in Activity 11	29 minutes ago

I successfully add, commit, and push all my files in my ubuntu to github.

Reflections:

Answer the following:

1. What are the benefits of implementing containerizations?
   - Implementing containerization offers benefits such as improved application portability, faster deployment, and easier scalability. It also ensures consistency across different environments and reduces resource usage compared to traditional virtual machines.

Conclusions:

-This activity enhanced my understanding of containerization and demonstrated how Docker can host both a database and a web server within the same environment. Using Ansible simplified the automation of installation, building, and deployment processes, eliminating the need for manual setup. I realized that containers keep applications isolated and portable, making them easier to share and test. My comprehension deepened when I successfully ran the container and accessed the webpage through my browser. Overall, this activity taught me how combining Docker with automation helps save time and reduce errors.