Module 3: Docker Part 1

Assignment-1

Tasks To Be Performed:

1. Pull Ubuntu container
2. Run this container and map port 80 on the local
3. Install Apache2 on this container
4. Check if you are able to access the Apache page on your browser

Solutions:

Launch an instance with Ubuntu image

	Name	Instance ID	Instance state		Instance type		Status check	Alarm status	Availa
☐	docker-demo1	i-095b92c7e529fbd2c	⊘ Running ⊕ ⊖		t2.micro		⊘ 2/2 checks passed	View alarms +	ap-sou
☐	jenkins-slave	i-0d73b886be4f40c9d	⊖ Stopped ⊕ ⊖		t2.micro		–	View alarms +	ap-sou
☐	kubernetes-w...	i-008ad77e0f3363031	⊖ Stopped ⊕ ⊖		t2.medium		–	View alarms +	ap-sou

Connect to the Ubuntu machine, and run the following command.

$ sudo apt update

$ sudo apt install docker.io –y

$ docker --version

$ sudo systemctl status docker

The below picture shows it is actively running.

```
No services need to be restarted.

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
ubuntu@ip-172-31-26-5:~$ docker --version
Docker version 24.0.7, build 24.0.7-0ubuntu2~22.04.1
ubuntu@ip-172-31-26-5:~$ sudo systemctl status docker
● docker.service - Docker Application Container Engine
     Loaded: loaded (/lib/systemd/system/docker.service; enabled; vendor preset: enabled)
     Active: active (running) since Sat 2024-06-15 08:20:13 UTC; 52s ago
TriggeredBy: ● docker.socket
       Docs: https://docs.docker.com
   Main PID: 2925 (dockerd)
      Tasks: 8
     Memory: 24.7M
        CPU: 295ms
     CGroup: /system.slice/docker.service
             └─2925 /usr/bin/dockerd -H fd:// --containerd=/run/containerd/containerd.sock

Jun 15 08:20:12 ip-172-31-26-5 systemd[1]: Starting Docker Application Container Engine...
```

Task1: To pull Ubuntu container, first we should pull the docker image from docker hub

Search Ubuntu in search engine
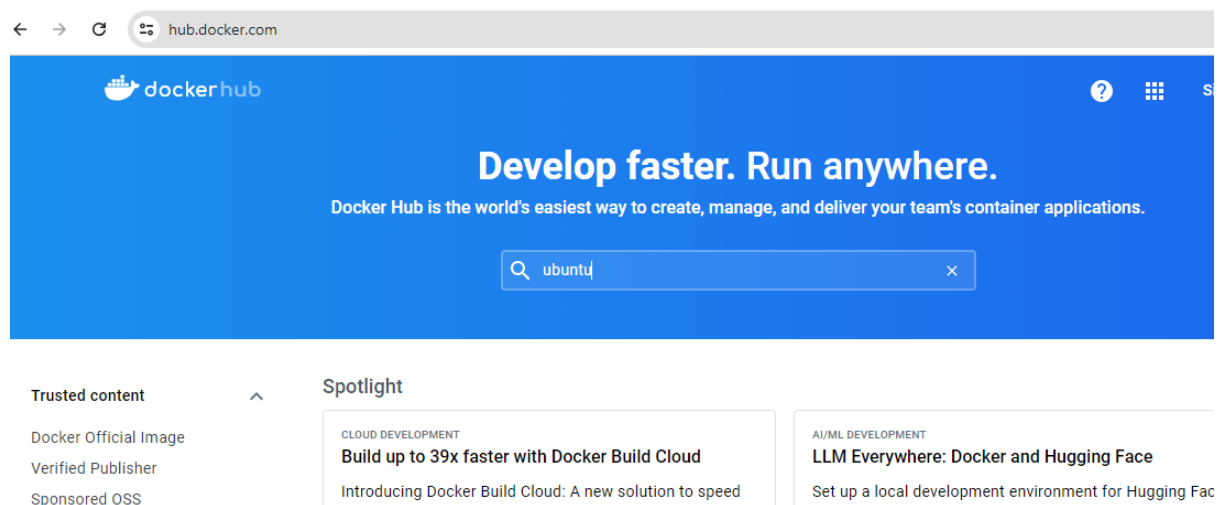
Copy the command

And paste in the Ubuntu server.

```
ubuntu@ip-172-31-26-5:~$ sudo docker pull ubuntu
Using default tag: latest
latest: Pulling from library/ubuntu
00d679a470c4: Pull complete
Digest: sha256:e3f92abc0967a6c19d0dfa2d55838833e947b9d74edbcb0113e48535ad4be12a
Status: Downloaded newer image for ubuntu:latest
docker.io/library/ubuntu:latest
ubuntu@ip-172-31-26-5:~$
```

$ sudo docker pull ubuntu

```
ubuntu@ip-172-31-26-5:~$ sudo docker pull ubuntu
Using default tag: latest
latest: Pulling from library/ubuntu
Digest: sha256:e3f92abc0967a6c19d0dfa2d55838833e947b9d74edbcb0113e48535ad4be12a
Status: Image is up to date for ubuntu:latest
docker.io/library/ubuntu:latest
ubuntu@ip-172-31-26-5:~$
```

$ sudo docker run –itd –p 80:80 ubuntu (To containerize this image)

$ sudo docker ps

```
ubuntu@ip-172-31-26-5:~$ sudo docker run –itd –p 80:80 ubuntu
e171753c67b9cad43ceb2eb51fc786360b9930c8b0da245d580e774fa58da041
ubuntu@ip-172-31-26-5:~$ sudo docker ps
CONTAINER ID   IMAGE     COMMAND       CREATED        STATUS          PORTS                               NAMES
e171753c67b9   ubuntu    "/bin/bash"   14 seconds ago Up 13 seconds   0.0.0.0:80->80/tcp, :::80->80/tcp   stupe
ubuntu@ip-172-31-26-5:~$
```

$ sudo docker exec –it containerid bash

```
ubuntu@ip-172-31-26-5:~$ sudo docker exec –it e171753c67b9 bash
root@e171753c67b9:/# apt-get update
Get:1 http://archive.ubuntu.com/ubuntu noble InRelease [256 kB]
Get:2 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Get:3 http://security.ubuntu.com/ubuntu noble-security/main amd64 Packages [185 kB]
Get:4 http://archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Get:5 http://archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Get:6 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Packages [50.3 kB]
Get:7 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 Packages [84.8 kB]
Get:8 http://archive.ubuntu.com/ubuntu noble/restricted amd64 Packages [117 kB]
Get:9 http://archive.ubuntu.com/ubuntu noble/multiverse amd64 Packages [331 kB]
Get:10 http://archive.ubuntu.com/ubuntu noble/universe amd64 Packages [19.3 MB]
Get:11 http://archive.ubuntu.com/ubuntu noble/main amd64 Packages [1808 kB]
Get:12 http://archive.ubuntu.com/ubuntu noble-updates/universe amd64 Packages [77.6 kB]
Get:13 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 Packages [209 kB]
Get:14 http://archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Packages [3097 B]
Get:15 http://archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Packages [84.8 kB]
Get:16 http://archive.ubuntu.com/ubuntu noble-backports/universe amd64 Packages [7519 B]
Fetched 22.9 MB in 9s (2686 kB/s)
Reading package lists... Done
root@e171753c67b9:/#
```

Installing apache2 server inside the container

```
root@e171753c67b9:/# apt-get install apache2 –y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  adduser apache2-bin apache2-data apache2-utils ca-certific
  libaprutil1t64 libbrotli1 libcurl4t64 libdb5.3t64 libexpat
```

Start and check the status of apache2 server

```
root@e171753c67b9:/# service apache2 start
 * Starting Apache httpd web server apache2
AH00558: apache2: Could not reliably determine the serve:
lly to suppress this message
 *
root@e171753c67b9:/# service apache2 status
 * apache2 is running
```

Give the public ip of the instance followed by the port number 80
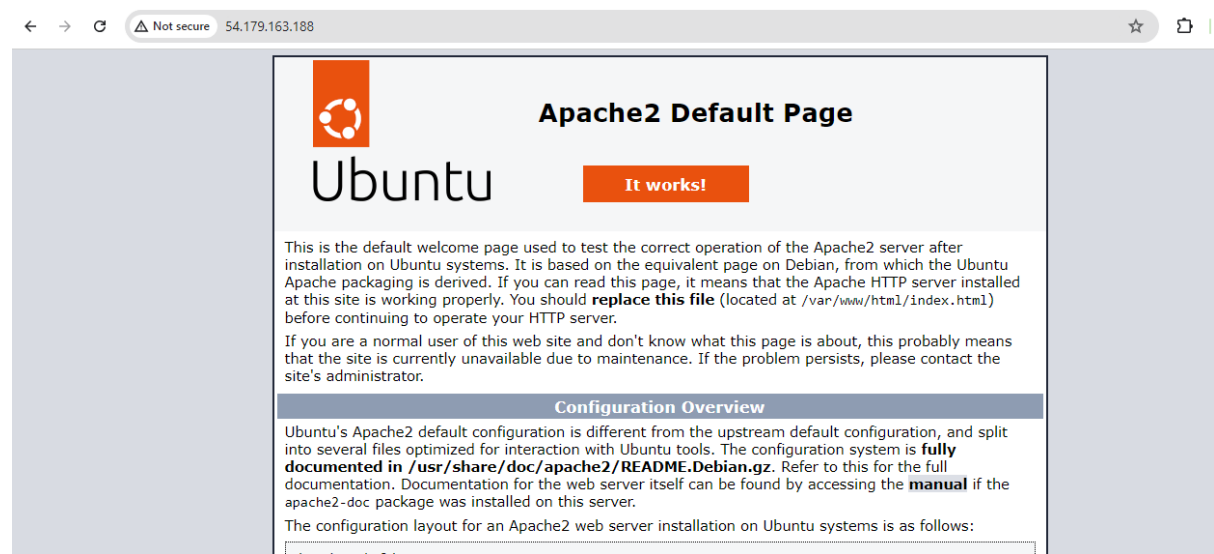
Assignment- 2

Tasks To Be Performed:

1. Save the image created in assignment 1 as a Docker image
2. Launch container from this new image and map the port to 81
3. Go inside the container and start the Apache2 service
4. Check if you are able to access it on the browser

Solutions:

$ sudo docker ps

$ sudo docker commit commit containerID bash new-img

$ sudo docker image

```
ubuntu@ip-172-31-26-5:~$ sudo docker ps
CONTAINER ID    IMAGE       COMMAND        CREATED              STATUS
e171753c67b9    ubuntu      "/bin/bash"    About an hour ago    Up About an hour
ubuntu@ip-172-31-26-5:~$ sudo docker commit e171753c67b9 new-img
sha256:2514d8e7474d8fc6ddb175b8ed32a690540c73bf0269752e22cc5b003a19bc81
ubuntu@ip-172-31-26-5:~$ sudo docker images
REPOSITORY      TAG         IMAGE ID       CREATED         SIZE
new-img         latest      2514d8e7474d   45 seconds ago  222MB
ubuntu          latest      17c0145030df   2 weeks ago     76.2MB
```

$ sudo docker run –itd –p 81:80 new-img

$ sudo docker ps

```
ubuntu@ip-172-31-26-5:~$ sudo docker run -itd -p 81:80 new-img
85a7b8d9a02e2c23b87ef926ced01f29fb5fa4d3f5dae911ab0ae708300f1baa
ubuntu@ip-172-31-26-5:~$ sudo docker ps
CONTAINER ID    IMAGE       COMMAND        CREATED             STATUS              PORTS
85a7b8d9a02e    new-img     "/bin/bash"    11 seconds ago      Up 10 seconds       0.0.0.0:81->80,
e171753c67b9    ubuntu      "/bin/bash"    About an hour ago   Up About an hour    0.0.0.0:80->80,
ubuntu@ip-172-31-26-5:~$ ☐
```

Containerize and update it

```
ubuntu@ip-172-31-26-5:~$ sudo docker exec -it 85a7b8d9a02e bash
root@85a7b8d9a02e:/# apt-get update
Hit:1 http://archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://security.ubuntu.com/ubuntu noble-security InRelease
Get:3 http://archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Hit:4 http://archive.ubuntu.com/ubuntu noble-backports InRelease
Fetched 126 kB in 2s (74.4 kB/s)
Reading package lists... Done
```

Start the Apache2 server and check the status


```
root@85a7b8d9a02e:/# service apache2 start
 * Starting Apache httpd web server apache2
AH00558: apache2: Could not reliably determine the
lly to suppress this message
 *
root@85a7b8d9a02e:/# service apache2 status
 * apache2 is running
root@85a7b8d9a02e:/#
```

Give the public Ip address followed by the port 81 which is changed
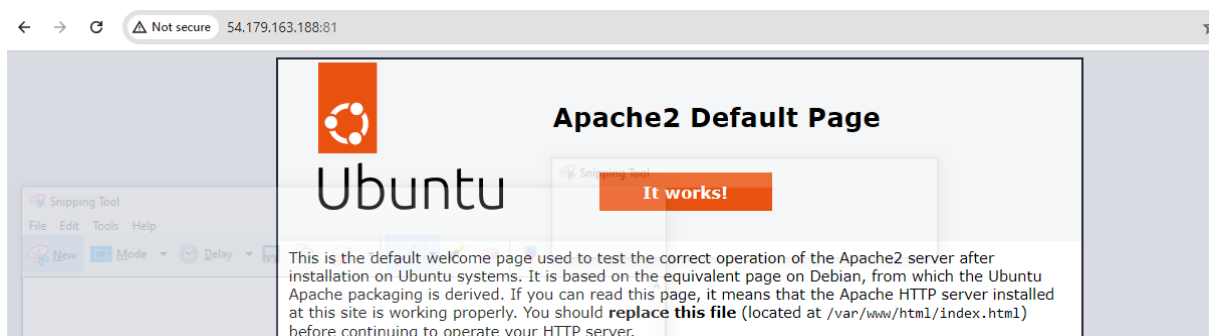
Assignment: 3

Tasks To Be Performed:

1. Use the saved image in the previous assignment
2. Upload this image on Docker Hub
3. On a separate machine pull this Docker Hub image and launch it on port 80
4. Start the Apache2 service
5. Verify if you are able to see the Apache2 service

Solutions:

Create an account in the Docker Hub and run the command –sudo docker login

Give username and password

```
ubuntu@ip-172-31-26-5:~$ sudo docker login
Log in with your Docker ID or email address to push and pull images from Docker Hub
cker.com/ to create one.
You can log in with your password or a Personal Access Token (PAT). Using a limited
zations using SSO. Learn more at https://docs.docker.com/go/access-tokens/

Username: ruchithabtgowda
Password:
WARNING! Your password will be stored unencrypted in /root/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store

Login Succeeded
ubuntu@ip-172-31-26-5:~$
```

You need to create a tag with an image name and new image name and push this image to Docker Hub

$ sudo docker tag new-img ruchithabtgowda/new-image

$ sudo docker push ruchithabtgowda/new-image

```
ubuntu@ip-172-31-26-5:~$ sudo docker tag new-img ruchithabtgowda/new-image
ubuntu@ip-172-31-26-5:~$ sudo docker push ruchithabtgowda/new-image
Using default tag: latest
The push refers to repository [docker.io/ruchithabtgowda/new-image]
902171e0d5cd: Pushed
42d3f8788282: Mounted from library/ubuntu
latest: digest: sha256:36b4d20970a22383be76fc7dbbd4dc2eee5916a2acd09525f046
ubuntu@ip-172-31-26-5:~$
```

You can see the image pushed, in the docker hub

ruchithabtgowda ▾   Search by repository name 🔍   All Content ▾

ruchithabtgowda / **new-image**
Contains: Image • Last pushed: 1 minute ago   ☆ 0
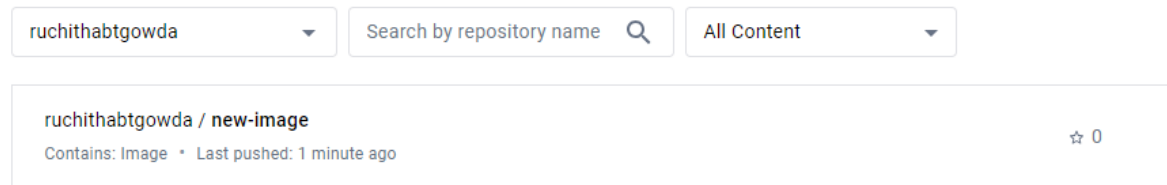
Launch the new instance – docker-demo2

☐	docker-demo1	i-095b92c7e529fbd2c	✓ Running 🔍 🔍	t2.micro	✓ 2/2 checks passed	View alarms ╋	ap-s
☑	docker-demo2	i-0c189f5381bc700c7	✓ Running 🔍 🔍	t2.micro	⏱ Initializing	View alarms ╋	ap-s
☐	jenkins-slave	i-0d73b886be4f40c9d	⊖ Stopped 🔍 🔍	t2.micro	–	View alarms ╋	ap-s

Connect to the new instance, update and Intall the docker in it.

Check the status of the docker

```
ubuntu@ip-172-31-23-68:~$ sudo systemctl status docker
● docker.service - Docker Application Container Engine
     Loaded: loaded (/lib/systemd/system/docker.service; enabled; vendor preset: enabled)
     Active: active (running) since Sat 2024-06-15 11:18:28 UTC; 1min 12s ago
TriggeredBy: ● docker.socket
       Docs: https://docs.docker.com
   Main PID: 2512 (dockerd)
      Tasks: 8
     Memory: 26.0M
        CPU: 280ms
     CGroup: /system.slice/docker.service
             └─2512 /usr/bin/dockerd -H fd:// --containerd=/run/containerd/containerd.sock

Jun 15 11:18:28 ip-172-31-23-68 systemd[1]: Starting Docker Application Container Engine..
Jun 15 11:18:28 ip-172-31-23-68 dockerd[2512]: time="2024-06-15T11:18:28.143941434Z" level
Jun 15 11:18:28 ip-172-31-23-68 dockerd[2512]: time="2024-06-15T11:18:28.151178377Z" level
Jun 15 11:18:28 ip-172-31-23-68 dockerd[2512]: time="2024-06-15T11:18:28.284899298Z" level
Jun 15 11:18:28 ip-172-31-23-68 dockerd[2512]: time="2024-06-15T11:18:28.595860796Z" level
Jun 15 11:18:28 ip-172-31-23-68 dockerd[2512]: time="2024-06-15T11:18:28.622325395Z" level
```

Pull the image from the docker hub which is pushed from the previous instance

$ sudo docker pull ruchithabtgowda/new-image

$ sudo docker images

```
ubuntu@ip-172-31-23-68:~$ sudo docker pull ruchithabtgowda/new-image
Using default tag: latest
latest: Pulling from ruchithabtgowda/new-image
00d679a470c4: Pull complete
e67386a48b66: Pull complete
Digest: sha256:36b4d20970a22383be76fc7dbbd4dc2eee5916a2acd09525f04614754eac8a9e
Status: Downloaded newer image for ruchithabtgowda/new-image:latest
docker.io/ruchithabtgowda/new-image:latest
ubuntu@ip-172-31-23-68:~$ sudo docker images
REPOSITORY                   TAG       IMAGE ID       CREATED          SIZE
ruchithabtgowda/new-image    latest    2514d8e7474d   About an hour ago   222MB
ubuntu@ip-172-31-23-68:~$
```

Containerize the image

$ Sudo docker run –itd –p 80:80 ruchithabtgowda/new-image

$ sudo docker ps

```
ubuntu@ip-172-31-23-68:~$ sudo docker run -itd -p 80:80 ruchithabtgowda/new-image
e4a5272673cfe08d1d3689839d86dff8ea8a372876d13b304aefe91388fb9ca0
ubuntu@ip-172-31-23-68:~$ sudo docker ps
CONTAINER ID   IMAGE                        COMMAND       CREATED         STATUS         PORTS
e4a5272673cf   ruchithabtgowda/new-image    "/bin/bash"   6 seconds ago   Up 5 seconds   0.0.0.0:80->8
ubuntu@ip-172-31-23-68:~$
```

Go inside the container -- $ sudo docker exec –it containerID bash

Start and check the status of the service apache2 running

```
ubuntu@ip-172-31-23-68:~$ sudo docker exec -it e4a5272673cf bash
root@e4a5272673cf:/# apt-get update
Hit:1 http://security.ubuntu.com/ubuntu noble-security InRelease
Hit:2 http://archive.ubuntu.com/ubuntu noble InRelease
Get:3 http://archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Hit:4 http://archive.ubuntu.com/ubuntu noble-backports InRelease
Fetched 126 kB in 2s (54.7 kB/s)
Reading package lists... Done
root@e4a5272673cf:/# service apache2 start
 * Starting Apache httpd web server apache2
AH00558: apache2: Could not reliably determine the server's fully quali
y to suppress this message
 *
root@e4a5272673cf:/# service apache2 status
 * apache2 is running
```

Copy the Ip address of the instance followed by the port number 80 and Check in the browser.
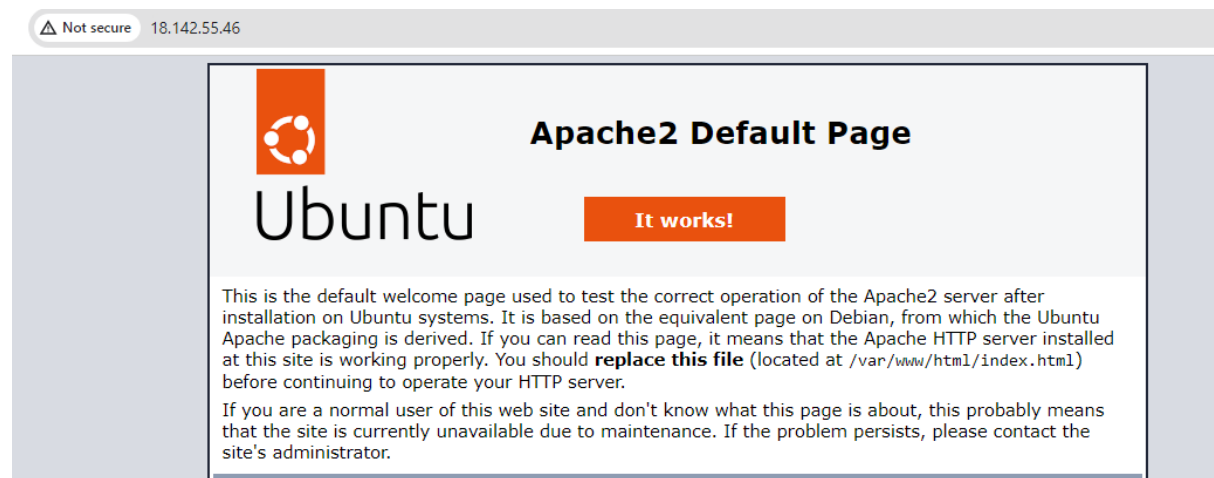
Assignment – 4

Tasks To Be Performed:

1. Create a Dockerfile with the following specs:
   - Ubuntu container
   - Apache2 installed
   - Apache2 should automatically run once the container starts

2. Submit the Dockerfile for assignment completion

Solutions:

Create a new Dockerfile - $ sudo nano Dockerfile

```
ubuntu@ip-172-31-26-5:~$ sudo nano Dockerfile
ubuntu@ip-172-31-26-5:~$
```

Write the file according to the question asked

```
  GNU nano 6.2
FROM ubuntu
RUN apt-get update
RUN apt-get install apache2 -y
ENTRYPOINT apachectl -D FOREGROUND
```

$ sudo docker images

```
ubuntu@ip-172-31-26-5:~$ sudo docker images
REPOSITORY                    TAG      IMAGE ID       CREATED          SIZE
docker-image                  latest   0780475c626f   11 seconds ago   222MB
docker-img                    latest   326c9966c083   2 hours ago      222MB
new-img                       latest   2514d8e7474d   2 hours ago      222MB
ruchithabtgowda/new-image     latest   2514d8e7474d   2 hours ago      222MB
ubuntu                        latest   17c0145030df   2 weeks ago      76.2MB
```

Containerize the image

```
ubuntu@ip-172-31-26-5:~$ sudo docker run -itd -p 83:80 docker-image
c324eb9f1920dc25264526538377e483ce37859bf4f3ca7ab04aaa5a178d5acf
ubuntu@ip-172-31-26-5:~$ sudo docker p
docker: 'p' is not a docker command.
See 'docker --help'
ubuntu@ip-172-31-26-5:~$ sudo docker ps
CONTAINER ID    IMAGE          COMMAND              CREATED          STATUS
c324eb9f1920    docker-image   "/bin/sh -c 'apachec…"  8 seconds ago    Up 7 s
85a7b8d9a02e    new-img        "/bin/bash"          2 hours ago      Up 2 h
e171753c67b9    ubuntu         "/bin/bash"          3 hours ago      Up 3 h
ubuntu@ip-172-31-26-5:~$
```

Go inside the image and you can directly check the status of the service that should automatically run once the container starts.

```
ubuntu@ip-172-31-26-5:~$ sudo docker exec -it c324eb9f1920 bash
root@c324eb9f1920:/# service apache2 status
 * apache2 is running
root@c324eb9f1920:/#
```

Assignment- 5

Tasks To Be Performed:

1. Create a sample HTML file
2. Use the Dockerfile from the previous task
3. Replace this sample HTML file inside the Docker container with the default page

Solutions:

$ sudo nano index.html

```
<!DOCTYPE html>

<html>

<head>

        <title>HTML Calculator</title>

        <!-- For styling -->
        <style>
                table {
                        border: 1px solid black;
                        margin-left: auto;
                        margin-right: auto;
                }

                input[type="button"] {
                        width: 100%;
                        padding: 20px 40px;
```

```css
                    background-color: green;

                    color: white;

                    font-size: 24px;

                    font-weight: bold;

                    border: none;

                    border-radius: 5px;

            }


            input[type="text"] {

                    padding: 20px 30px;

                    font-size: 24px;

                    font-weight: bold;

                    border: none;

                    border-radius: 5px;

                    border: 2px solid black;

            }

    </style>

</head>


<body>


    <!-- Create table -->

    <table id="calcu">

        <tr>

            <td colspan="3">

                    <input type="text" id="result">
```

```html
                        </td>
            <td><input type="button" value="c"></td>
    </tr>


    <tr>
            <td><input type="button" value="1"></td>
            <td><input type="button" value="2"></td>
            <td><input type="button" value="3"></td>
            <td><input type="button" value="/"></td>
    </tr>
    <tr>
            <td><input type="button" value="4"></td>
            <td><input type="button" value="5"></td>
            <td><input type="button" value="6"></td>
            <td><input type="button" value="*"></td>
    </tr>
    <tr>
            <td><input type="button" value="7"></td>
            <td><input type="button" value="8"></td>
            <td><input type="button" value="9"></td>
            <td><input type="button" value="-"></td>
    </tr>
    <tr>
            <td><input type="button" value="0"></td>
            <td><input type="button" value="."></td>
            <td><input type="button" value="="></td>
```

```
        <td><input type="button" value="+"></td>

    </tr>

</table>

</body>


</html>
```

Modify the Docker file, save and exit

```
FROM ubuntu
RUN apt-get update
RUN apt-get install apache2 -y
COPY index.html /var/www/html/
ENTRYPOINT apachectl -D FOREGROUND
EXPOSE 85
```

Build the docker file and containerize with spec port no.

$ sudo docker build . –t img2

$ sudo docker run –itd –p 86:80 img2

Ipaddress:86