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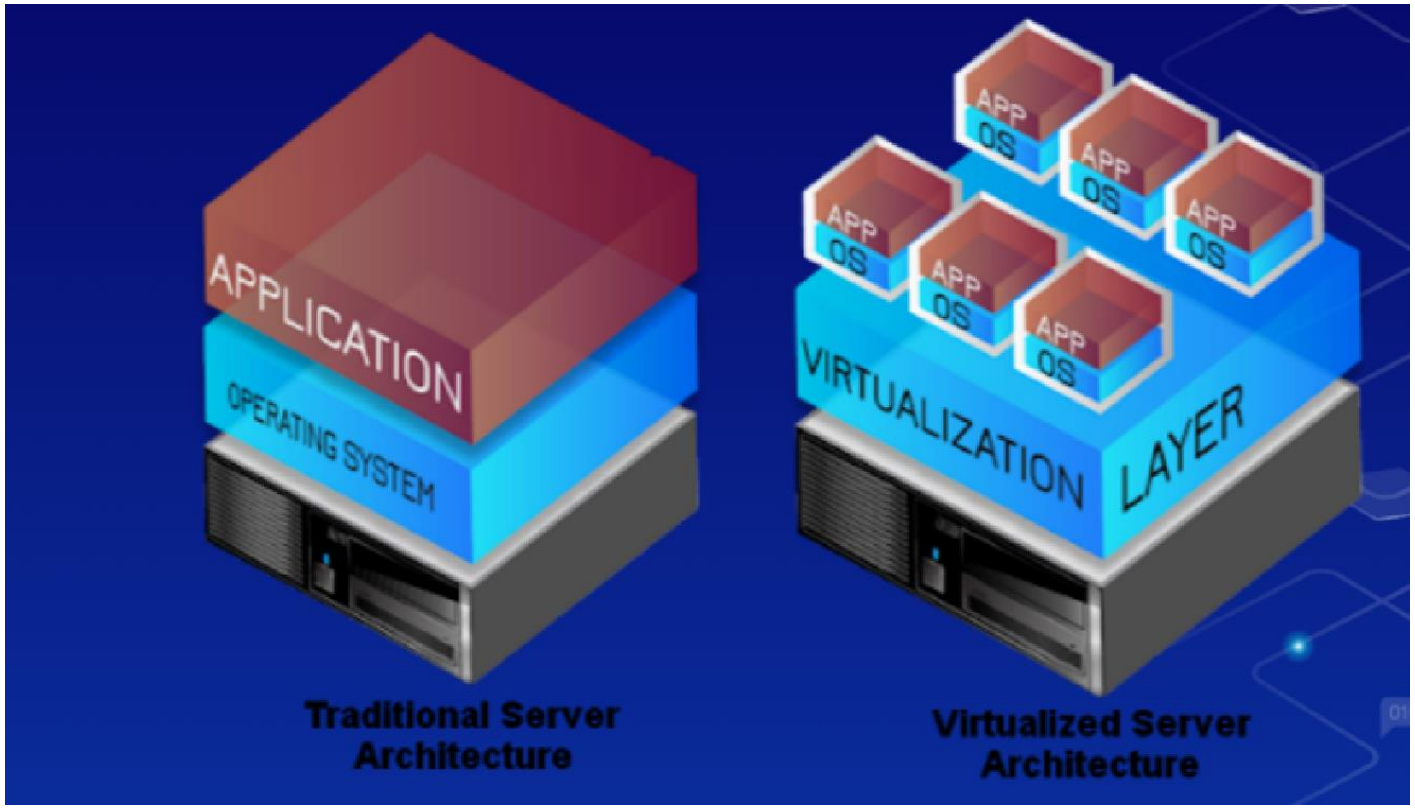
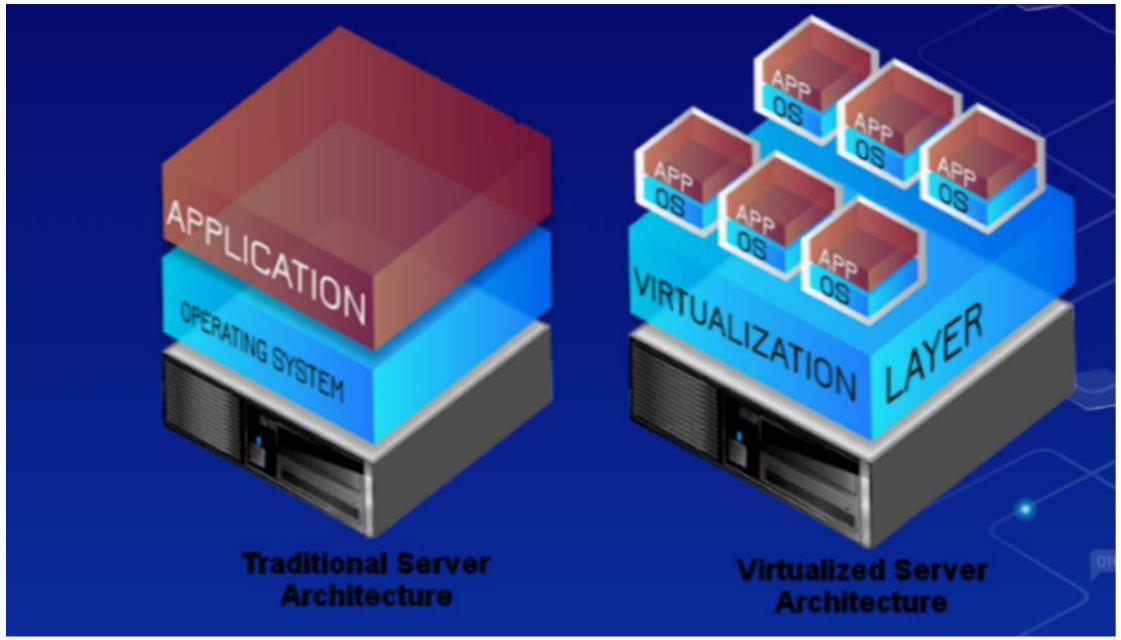
DELAWARE

TABLE OF CONTENT

What is virtualization - It refers to running multiple operating systems on a server or computer system simultaneously. [A server can be a computer]





The virtualization above is possible because of a software called hypervisor.

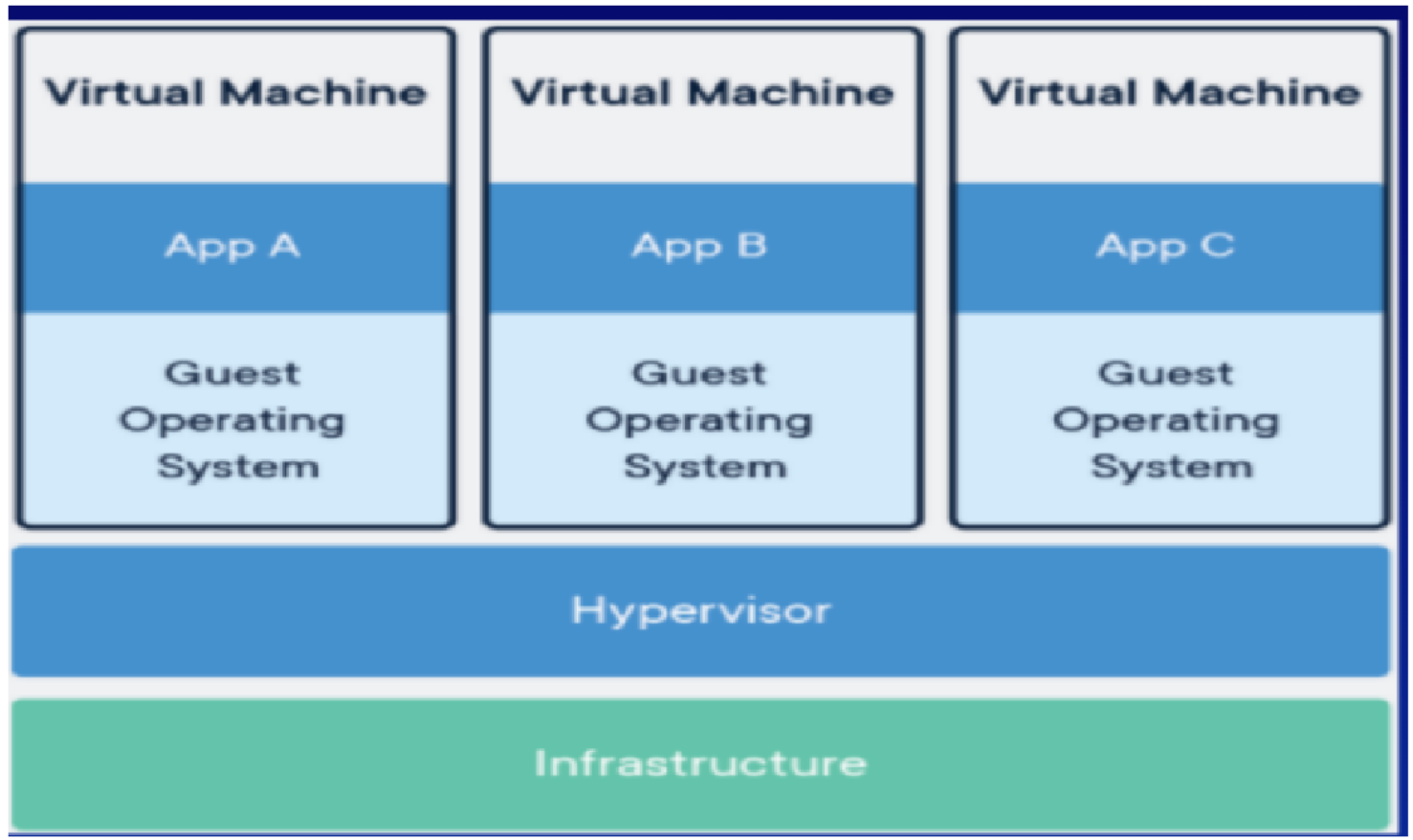
Let define hypervisor

This is a software that make it possible for the vitualization process to occur in a server/computer system.

There are 2 types of hypervisors.

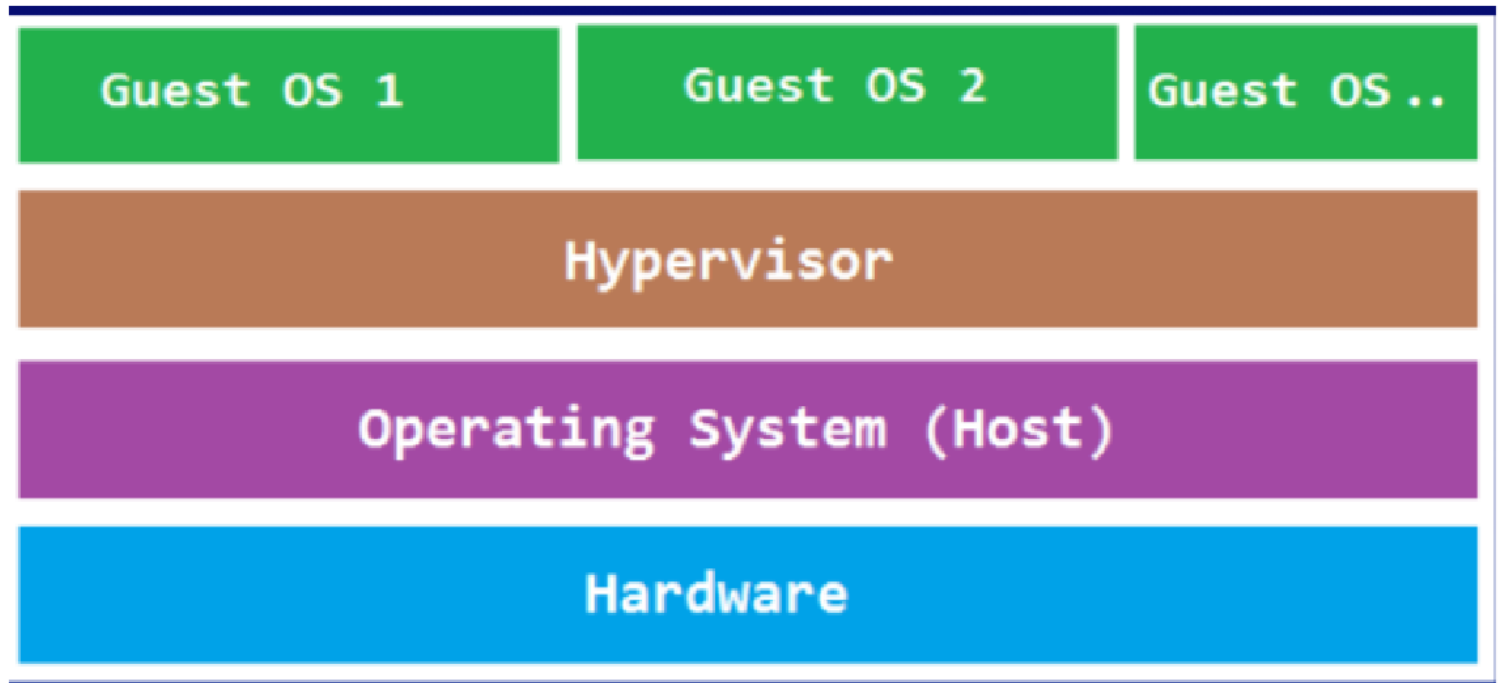
- Hypervisor type 1

Hypervisor type 1



There is no host operating system. Only guest Operating system is available.
Infrastructure can be the hardware component of the computer/server

Hypervisor 2



We have an OS, for the host, between the hardware and the hypervisor

A Good Question

Which hypervisor did we install on our system to do virtualization?

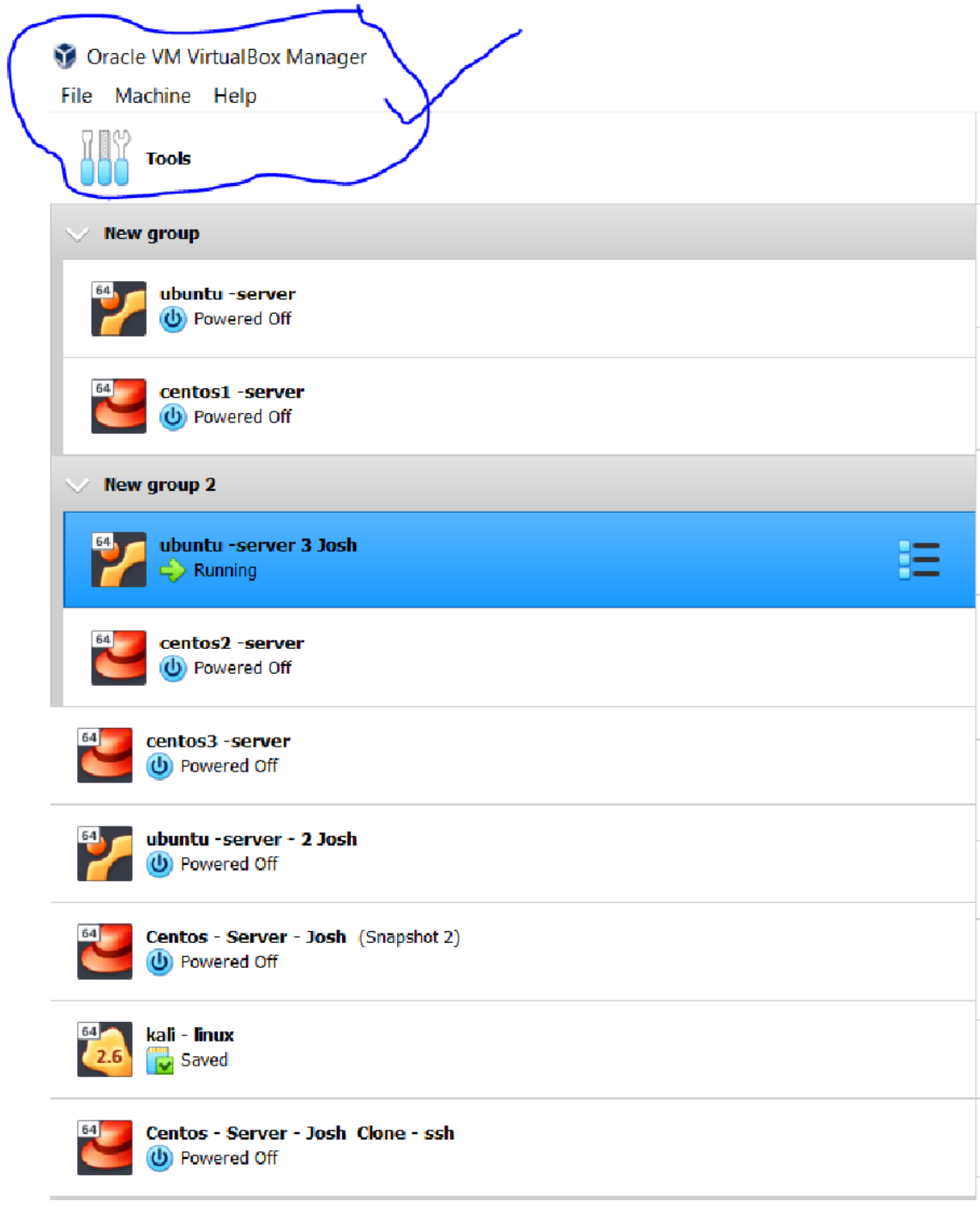
Orcale Virtual Box

Can you determine its type?

Hypervisor 2

- We have a host OS in the Oracle virtual box between the hardware and the hypervisor .
- We have the guest OS from the dowloaded servers such as UBUNTU, Centos and Kali]

Able to run different servers with different OS systems simultenously


Oracle VM VirtualBox Manager
File Machine Help
Tools
New group
ubuntu -server
Powered Off
centos1 -server
Powered Off
New group 2
ubuntu -server 3 Josh
Running
centos2 -server
Powered Off
centos3 -server
Powered Off
ubuntu -server - 2 Josh
Powered Off
Centos - Server - Josh (Snapshot 2)
Powered Off
kali - linux
Saved
Centos - Server - Josh Clone - ssh
Powered Off

An improvement to the hypervisor was enabled and this gave birth to Docker.

Now we know where Docker came from.

What is docker

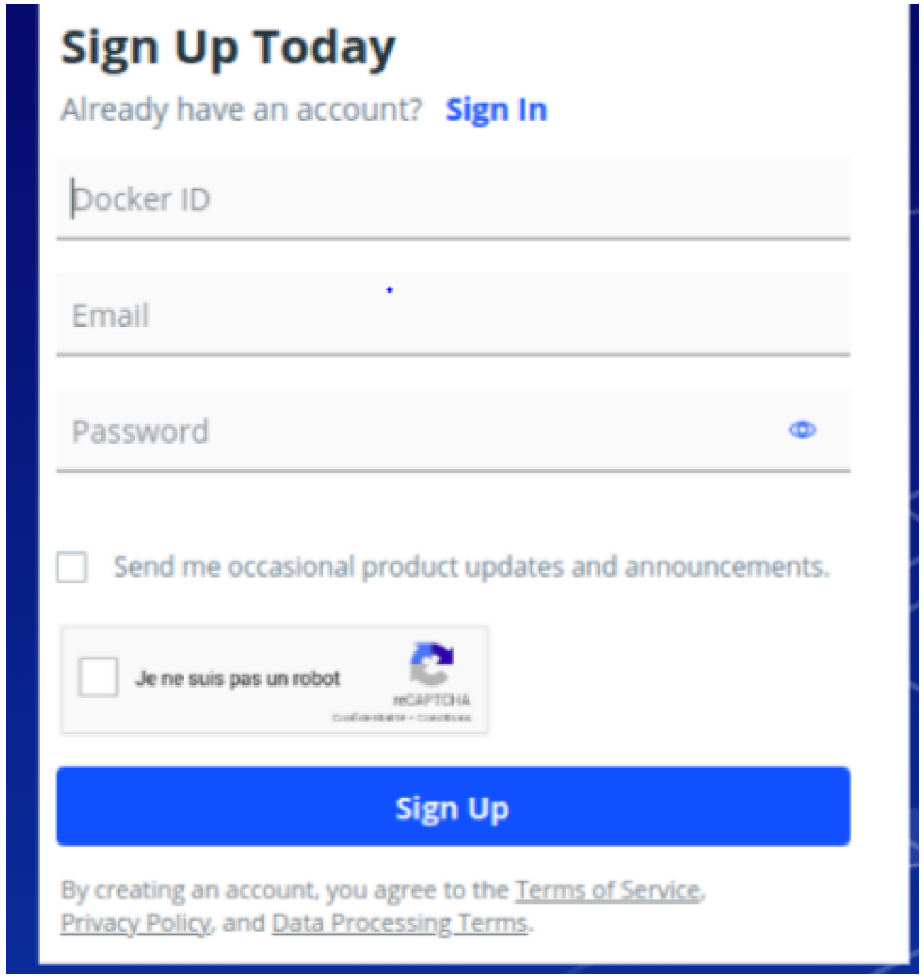
- **Docker is a containerization software.**
- **It used to create and manage containers.**
- **A container is a standard unit of software that packages up code and all its dependencies.**
- **So the application runs quickly and reliably from one computing environment to another.**

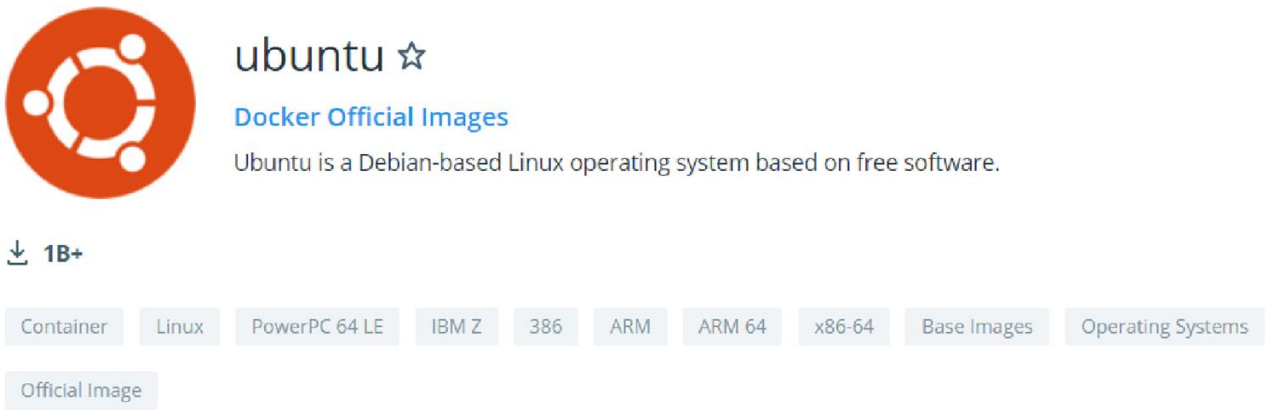
Docker image

A Docker container image is **an executable package** of software that includes everything needed to run an application: **code, runtime, system tools, system libraries and settings**.

Click on the link

https://hub.docker.com/ and serch for the **UBUNTU Image** and you will get the following


Sign Up Today
Already have an account? Sign In
Docker ID
Email
Password
Send me occasional product updates and announcements.
Je ne suis pas un robot
reCAPTCHA
Sign Up
By creating an account, you agree to the Terms of Service, Privacy Policy, and Data Processing Terms.


ubuntu ☆
Docker Official Images
Ubuntu is a Debian-based Linux operating system based on free software.
1B+
Container
Linux
PowerPC 64 LE
IBM Z
386
ARM
ARM 64
x86-64
Base Images
Operating Systems
Official Image

Let work on our laptop a little bit

If you have an issue with ssh in Ubuntu

1. # apt install openssh.server

```
root@osboxes:/home/osboxes# apt install openssh.server
Reading package lists... Done
Building dependency tree
Reading state information... Done
Note, selecting 'openssh-server' for regex 'openssh.server'
openssh-server is already the newest version (1:7.6p1-4ubuntu0.3).
0 upgraded, 0 newly installed, 0 to remove and 162 not upgraded.
root@osboxes:/home/osboxes#
```

Check your network

2. # /etc/init.d/networking restart

OK should appear

```
root@osboxes:/home/osboxes# /etc/init.d/networking restart
[ ok ] Restarting networking (via systemctl): networking.service.
root@osboxes:/home/osboxes#
```

3. # apt install docker.io

```
root@osboxes:/home/osboxes# apt install docker.io
Reading package lists... Done
Building dependency tree
Reading state information... Done
docker.io is already the newest version (20.10.2-0ubuntu1~18.04.2).
0 upgraded, 0 newly installed, 0 to remove and 162 not upgraded.
```

4. # apt -get update

```
root@osboxes:/home/osboxes# apt -get update
E: Command line option 'g' [from -get] is not understood in combination with th
e other options.
```

This will update your ubuntu downloads.

5. # hostname -I

```
root@osboxes:/home/osboxes# hostname -I
10.80.110.110 172.17.0.1
```

6. #systemctl status docker

```
root@osboxes:/home/osboxes# systemctl status docker
● docker.service - Docker Application Container Engine
   Loaded: loaded (/lib/systemd/system/docker.service; enabled; vendor preset:
   Active: active (running) since Sat 2021-07-17 10:53:57 EDT; 2h 21min ago
     Docs: https://docs.docker.com
 Main PID: 1103 (dockerd)
    Tasks: 15
   CGroup: /system.slice/docker.service
           └─1103 /usr/bin/dockerd -H fd:// --containerd=/run/containerd/contai
```

Should be active and running

7. # docker info

```
root@osboxes:/home/osboxes# docker info
Client:
 Context:    default
 Debug Mode: false

Server:
 Containers: 11
  Running: 2
  Paused: 0
  Stopped: 9
 Images: 11
 Server Version: 20.10.2
```

This will display the version, images and containers - I have 11 containers and 11 images

8. # docker -v

```
root@osboxes:/home/osboxes# docker -v
Docker version 20.10.2, build 20.10.2-0ubuntu1~18.04.2
```

Version of docker

9. # docker ps

```
root@osboxes:/home/osboxes# docker ps
CONTAINER ID   IMAGE     COMMAND   CREATED   STATUS    PORTS     NAMES
```

I did not have a container running

10. # docker ps -a

```
root@osboxes:/home/osboxes# docker ps -a
CONTAINER ID   IMAGE                COMMAND                  CREATED      STATUS
780f5fad197a   josh1991/httpd:v2    "httpd-foreground"       3 days ago   Exited
a6f7308aaa0e   httpd                "httpd-foreground"       3 days ago   Exited
0d68f41e684d   httpd                "httpd-foreground"       3 days ago   Created
1cd65cf060a7   httpd                "httpd-foreground"       3 days ago   Created
83f007bd8f3e   httpd                "httpd-foreground"       3 days ago   Exited
8890b8a94242   httpd                "httpd-foreground"       3 days ago   Created
f7384efaa19a   httpd                "httpd-foreground"       3 days ago   Exited
ae92beea2a41   centos:7             "bash"                   3 days ago   Exited
7b62405b287d   ubuntu               "bash"                   3 days ago   Exited
f27b0c65c9ec   centos               "bash"                   3 days ago   Exited
b1e686e35aae   centos:6             "bash"                   3 days ago   Exited
```

Show both the running and exited container.

11. # docker images

```
root@osboxes:/home/osboxes# docker images
REPOSITORY              TAG       IMAGE ID       CREATED         SIZE
josh1991/httpd          v2        43920c2f5f1f   3 days ago      189MB
josh1991/httpd1         latest    4c2485d6a198   3 days ago      189MB
joshwahome2001/httpd1   latest    155984681ee0   3 days ago      189MB
<none>                  <none>    42912e5f9cdb   3 days ago      189MB
httpd                   2.4       bd29370f84ea   8 days ago      138MB
httpd                   latest    bd29370f84ea   8 days ago      138MB
debian                  10        7a4951775d15   3 weeks ago     114MB
debian                  latest    7a4951775d15   3 weeks ago     114MB
ubuntu                  latest    9873176a8ff5   4 weeks ago     72.7MB
centos                  latest    300e315adb2f   7 months ago    209MB
centos                  7         8652b9f0cb4c   8 months ago    204MB
centos                  6         d0957ffdf8a2   2 years ago     194MB
```

Ubuntu

docker pull ubuntu - if you do not specify, it will pull the latest image

12. # docker pull ubuntu

 # docker pull centos:5

13. # docker pull httpd:2.4

```
root@osboxes:/home/osboxes# docker pull httpd:2.4
2.4: Pulling from library/httpd
Digest: sha256:1fd07d599a519b594b756d2e4e43a72edf7e30542ce646f5eb3328cf3b12341a
Status: Image is up to date for httpd:2.4
```

14. # docker run - will allow you to get stright to the container

example: # docker run ubuntu:latest

```
root@osboxes:/home/osboxes# docker run ubuntu:latest
root@osboxes:/home/osboxes# docker ps
CONTAINER ID   IMAGE     COMMAND   CREATED         STATUS         PORTS     NAME
b8d25fee2c13   ubuntu    "bash"    6 minutes ago   Up 6 minutes             dazz
root@osboxes:/home/osboxes# docker ps -a
CONTAINER ID   IMAGE                COMMAND              CREATED          STATUS
c8fb63e38c3d   ubuntu:latest        "bash"               13 seconds ago   Exited
```

Docker run but exited

we can solve this by giving the container - it (interactive terminal) and specifying where the shell the of the (bash)

Let recall the command and add the following: # docker run -it ubuntu:latest bash

It takes you straight to the container

```
root@osboxes:/home/osboxes# docker run -it ubuntu:latest bash
root@204c8355bb90:/#
```

Exit and run the command # docker ps and # docker ps -a

Let recall the command and add the following: # docker run -it ubuntu:latest bash

```
root@osboxes:/home/osboxes# docker run -it ubuntu:latest bash
root@204c8355bb90:/#
```

Ctrl p + q the ENTER and run the command # docker ps and # docker ps -a

Remove the running container

 # docker rm -f [container ID]

```
root@osboxes:/home/osboxes# docker rm -f 5a 20 b8
5a
20
b8
root@osboxes:/home/osboxes# docker ps
CONTAINER ID   IMAGE     COMMAND   CREATED   STATUS    PORTS     NAMES
root@osboxes:/home/osboxes#
```

To get back to a running container:

docker attach [container id]

```
root@osboxes:/home/osboxes# docker ps
CONTAINER ID   IMAGE           COMMAND   CREATED          STATUS          PORTS     NAMES
03e556629ff2   ubuntu:latest   "bash"    31 seconds ago   Up 31 seconds             modest_tereshkova
root@osboxes:/home/osboxes# docker attach 03e556629ff2
root@03e556629ff2:/#
```

Since we are inside ubuntu container, let do some updates

 # apt-get updates

Since we are inside ubuntu container, let do some updates

 # apt-get updates

```
root@03e556629ff2:/# apt-get update
Get:1 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Get:2 http://archive.ubuntu.com/ubuntu focal InRelease [265 kB]
Get:3 http://archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:4 http://security.ubuntu.com/ubuntu focal-security/main amd64 Packages [930 kB]
Get:5 http://archive.ubuntu.com/ubuntu focal-backports InRelease [101 kB]
Get:6 http://security.ubuntu.com/ubuntu focal-security/restricted amd64 Packages [368 kB]
Get:7 http://security.ubuntu.com/ubuntu focal-security/multiverse amd64 Packages [27.6 kB]
Get:8 http://archive.ubuntu.com/ubuntu focal/main amd64 Packages [1275 kB]
Get:9 http://security.ubuntu.com/ubuntu focal-security/universe amd64 Packages [782 kB]
Get:10 http://archive.ubuntu.com/ubuntu focal/universe amd64 Packages [11.3 MB]
Get:11 http://archive.ubuntu.com/ubuntu focal/restricted amd64 Packages [33.4 kB]
Get:12 http://archive.ubuntu.com/ubuntu focal/multiverse amd64 Packages [177 kB]
Get:13 http://archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 Packages [32.0 kB]
Get:14 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [1367 kB]
Get:15 http://archive.ubuntu.com/ubuntu focal-updates/restricted amd64 Packages [416 kB]
Get:16 http://archive.ubuntu.com/ubuntu focal-updates/universe amd64 Packages [1053 kB]
Get:17 http://archive.ubuntu.com/ubuntu focal-backports/universe amd64 Packages [6303 B]
Get:18 http://archive.ubuntu.com/ubuntu focal-backports/main amd64 Packages [2668 B]
Fetched 18.4 MB in 4s (4764 kB/s)
Reading package lists... Done
root@03e556629ff2:/#
```

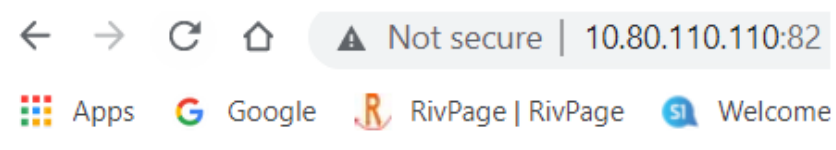
 # docker run -itd -p 82:80 httpd

Do not add the bash shell We want it to be in the detach mode. Othwewise it will not work

Go to ifconfig and get your IP address

Mine is 10:80:110:110:82

Results



It works!

A docker image will behave the same regardless of the the environment.

When you install docker, a path is created:

var/lib/docker

#cd /var/lib/docker

```
root@osboxes:/home/osboxes# cd /var/lib/docker
root@osboxes:/var/lib/docker# ls
buildkit    image    overlay2  runtimes  tmp    volumes
containers  network  plugins   swarm     trust
root@osboxes:/var/lib/docker#
```

Giving a container a name and port number

docker run -itd --name web -p 84:80 httpd

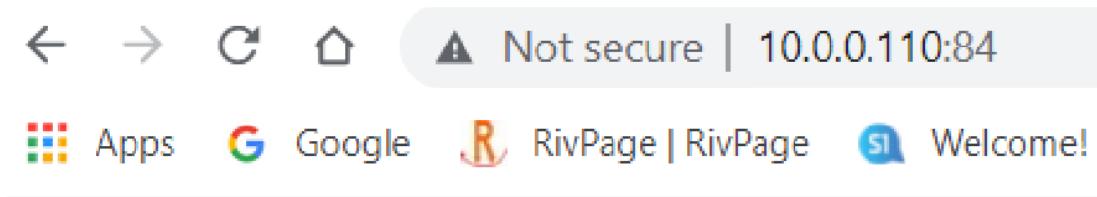
-itd means in detach mode - do not put the intercatice shell like bash. It will not work

NB - no need to put = sign

```
root@osboxes:/var/lib/docker# docker run -d --name web -p 84:80 httpd
97b651533a6b8b8f86a3454ae93e7f235c8952171cbf0e0f57773f549674ab16
root@osboxes:/var/lib/docker# docker ps
CONTAINER ID   IMAGE     COMMAND              CREATED          STATUS
PORTS                  NAMES
97b651533a6b   httpd     "httpd-foreground"   50 seconds ago   Up 48 seconds
0.0.0.0:84->80/tcp   web
```

Again let run the IP address on the web

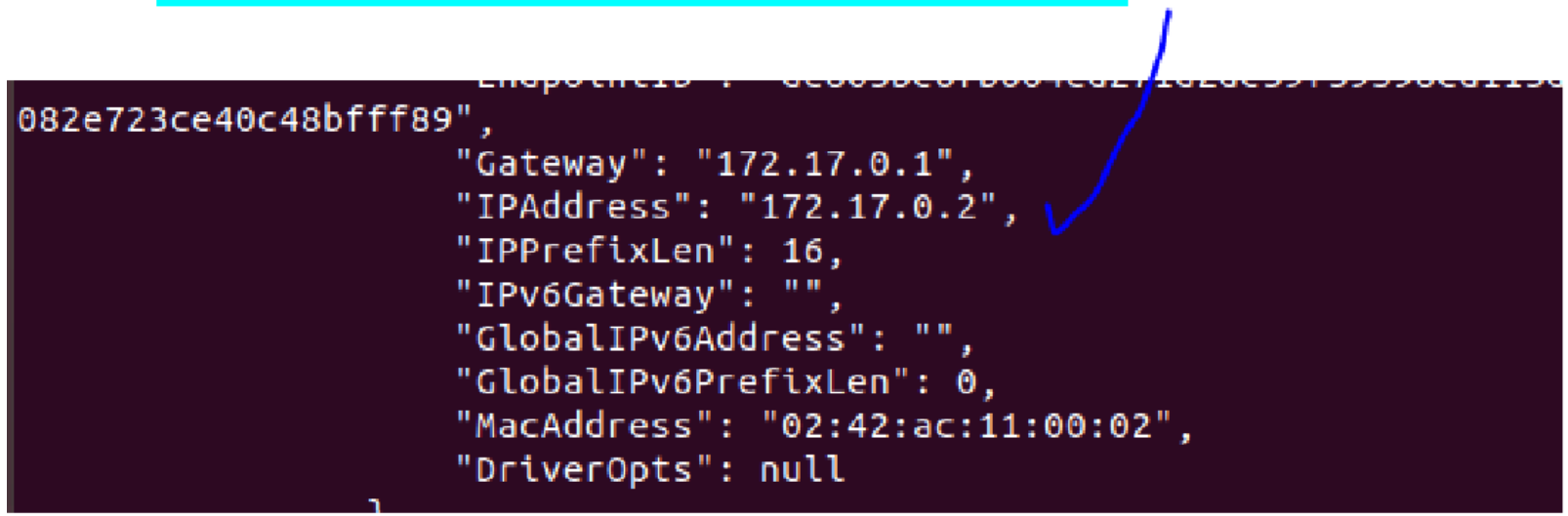
Mine:10.0.0.110:84



It works!

What if we want our own information to display instead of IT WORKS

Run # docker inspect [container ID]



Make sure you are in the root directory. You do not want to mess with anything in the /var/lib/docker

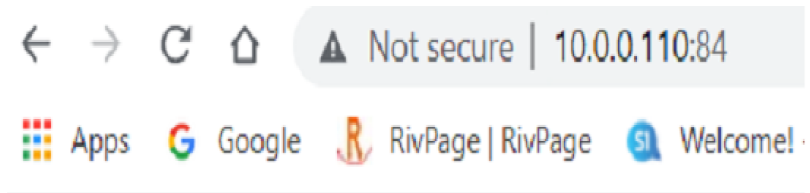
The conatiner ip is: 172.17.0.2

volume - Mounting a container

Make sure you are in the home directory [root directory might not work well]

Again let run the IP address on the web

Mine:10.0.0.110:84



It works!

it works! is using the path : /usr/local/apache2/htdocs/

-v /home/html : /usr/local/apache2/htdocs/

-v is for mounting the volume

Volume is the ability to create a host folder (HTML) that will mount on the container folder (HTDOCS) and save the information incase we lose the container.

Run the command

docker run -itd --name web 2 -v /home/html : /usr/local/apache2/htdocs/ -p 87:80 httpd

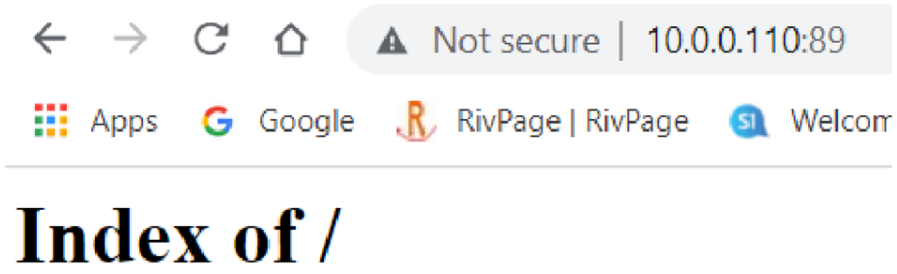
volume - Mounting a container

Run the command

 # docker run -itd --name web 3 -v /home/html : /usr/local/apache2/htdocs/ -p 89:80 httpd

```
root@osboxes:/home# docker run -itd --name web3 -v /home/html:/usr/local/apache
2/htdocs/ -p 89:80 httpd
2996b57cf6c02d5344a5172c8b2a0ce07bcc7c1722630f0df9dc154c78987045
root@osboxes:/home#
```

Run your IP Address on a web server: 10.0.0.110:89



volume - Mounting a container

Let us put information on the container and display the information on the host

Run the command

 # docker run -itd --name web 5 -v /home/html://usr/local/apache2/htdocs/ -p 89:80 httpd

```
root@osboxes:/home# docker run -itd --name web4 -v /home/html://usr/local/apache2/htdocs/ -p 89:80 httpd
0bf6b9eb81261a717e5e9d93ee52f960896911652f0e05cf13f836913e8a2a2c
root@osboxes:/home# ls
html  josh  lost+found  osboxes
root@osboxes:/home# cd html
```

Home directory

 # ls

 # vi html

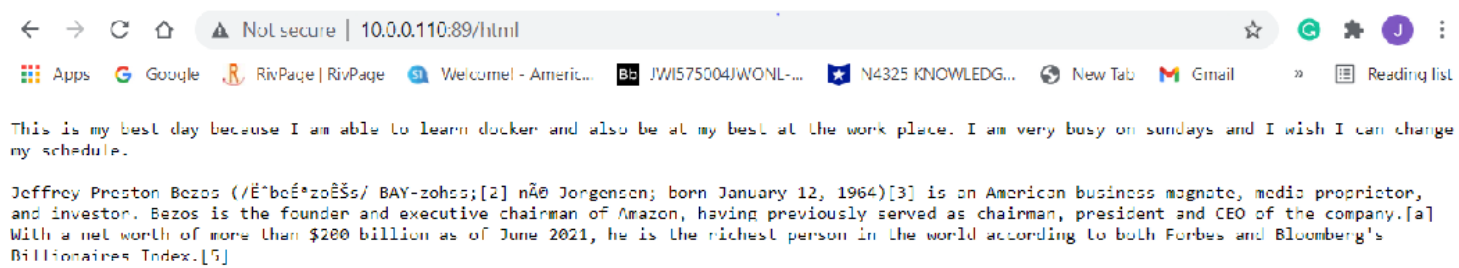
put the following content from this link

https://en.wikipedia.org/wiki/Jeff_Bezos

:wq

Go on your webserver and type the ip address: Mine is 10.0.0.110:89

Results



Important Information

You can create many containers using different ports but mounted on the same volume

For example: 89:80 87:80 86:80 85:80 84:80 83:80 etc

#docker run -itd --name web 6 -v /home/html://usr/local/apache2/htdocs/ -p 89:80 httpd

A link between html and htdocs was created. The content you put on the html folder will also go to the htdocs folder in the container

How to Build our own Image

Create a file called Dockerfile

 # touch Dockerfile

Very Important:

Create INDEX.HTML file

#vim index.html

Put this content

<h1> this is my images for httpd </h1>

:wq

 # vim Dockerfile

FROM httpd:2.4 [take instructions from]

MAINTAINER [put your email or your name]

RUN apt-get update [update all the information]

COPY ./index.html /usr/local/apache2/htdocs/

:wq

DO NOT FORGET THE DOT infront of /index.html/ file

Run the build command

 # docker build -t josh-httpd .

The dot is import because it says [Dockerfile is right here]

make sure you are logged to your docker account

Results

```
root@osboxes:/home# docker build -t josh-httpd .
Sending build context to Docker daemon  38.89MB
Step 1/4 : FROM httpd:2.4
 ---> bd29370f84ea
Step 2/4 : MAiNTAINER josh.kidfileapp@gmail.com
 ---> Using cache
 ---> 6e2acea31ecd
Step 3/4 : RUN apt-get update
 ---> Using cache
 ---> dad7f7f87839
Step 4/4 : COPY ./index.html /usr/local/apache2/htdocs/
 ---> Using cache
 ---> c6d6837e9cdd
Successfully built c6d6837e9cdd
Successfully tagged josh-httpd:latest
root@osboxes:/home#
```

docker images

Results

```
root@osboxes:/home# docker images
REPOSITORY                TAG       IMAGE ID       CREATED          SIZE
josh-httpd                latest    c6d6837e9cdd   16 minutes ago   155MB
josh1991/httpd            v2        43920c2f5f1f   4 days ago       189MB
josh1991/httpd1           latest    4c2485d6a198   4 days ago       189MB
joshwahome2001/httpd1     latest    155984681ee0   4 days ago       189MB
<none>                    <none>    42912e5f9cdb   4 days ago       189MB
ubuntu                    latest    c29284518f49   4 days ago       72.8MB
ubuntu                    18.04     fbf60236a8e3   4 days ago       63.1MB
httpd                     2.4       bd29370f84ea   9 days ago       138MB
httpd                     latest    bd29370f84ea   9 days ago       138MB
debian                    10        7a4951775d15   3 weeks ago      114MB
debian                    latest    7a4951775d15   3 weeks ago      114MB
ubuntu                    <none>    9873176a8ff5   4 weeks ago      72.7MB
centos                    latest    300e315adb2f   7 months ago     209MB
centos                    7         8652b9f0cb4c   8 months ago     204MB
centos                    6         d0957ffdf8a2   2 years ago      194MB
centos                    5         1ae98b2c895d   4 years ago      285MB
```

```
root@osboxes:/home# docker images
REPOSITORY              TAG       IMAGE ID       CREATED          SIZE
josh-httpd              latest    c6d6837e9cdd   21 minutes ago   155MB
```

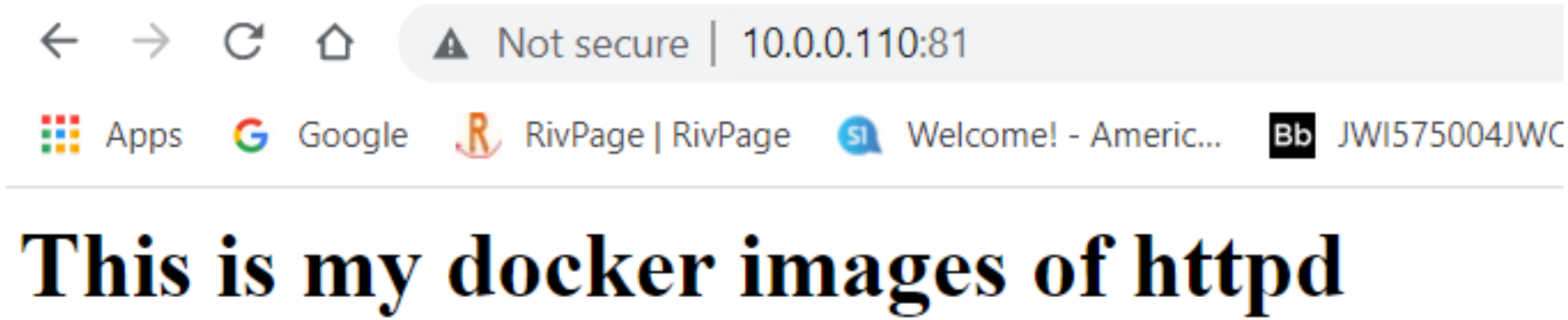
Run the created image on docker engine as a container

```
root@osboxes:/home# docker run -itd josh-httpd
4d136cf7a39b154cb006315b4dd97a6cb83d2491ab2a740eb9d0ccbb2b18569b
root@osboxes:/home# docker ps
CONTAINER ID   IMAGE        COMMAND                  CREATED             STATUS              PORTS                  NAMES
4d136cf7a39b   josh-httpd   "httpd-foreground"       7 seconds ago       Up 6 seconds        80/tcp                 nice_shannon
0bf6b9eb8126   httpd        "httpd-foreground"       About an hour ago   Up 3 minutes        0.0.0.0:89->80/tcp     web4
b30f8570d108   httpd        "httpd-foreground"       4 hours ago         Up About an hour    0.0.0.0:86->80/tcp     web1
97b651533a6b   httpd        "httpd-foreground"       4 hours ago         Up About an hour    0.0.0.0:84->80/tcp     web
```

Add the port number and name and access the container on webserver

```
root@osboxes:/home# docker run -itd --name kingori -p 81:80 josh-httpd
e0b0563385e1f76b9a485efbae0f74a7a4e9fbdbb2f89d0a2074fecc46ca294e
```

IP Address: 10.0.0.110:81



Creating a repository

docker tag name of the image hub.docker.com account/name of the image

```
root@osboxes:/home# docker ps
CONTAINER ID   IMAGE            COMMAND                  CREATED          STATUS          PORTS                  NAMES
a6b6aaad3432   josh-httpd:5.0   "httpd-foreground"       4 minutes ago    Up 4 minutes    0.0.0.0:82->80/tcp     kingorij
2e2dbbb6d418   josh-httpd:5.0   "httpd-foreground"       4 minutes ago    Up 4 minutes    80/tcp                 ecstatic_bhaskara
e0b0563385e1   josh-httpd       "httpd-foreground"       20 minutes ago   Up 20 minutes   0.0.0.0:81->80/tcp     kingori
4d136cf7a39b   josh-httpd       "httpd-foreground"       22 minutes ago   Up 22 minutes   80/tcp                 nice_shannon
0bf6b9eb8126   httpd            "httpd-foreground"       2 hours ago      Up 25 minutes   0.0.0.0:89->80/tcp     web4
b30f8570d108   httpd            "httpd-foreground"       4 hours ago      Up 2 hours      0.0.0.0:86->80/tcp     web1
97b651533a6b   httpd            "httpd-foreground"       5 hours ago      Up 2 hours      0.0.0.0:84->80/tcp     web
root@osboxes:/home# docker tag josh-httpd:5.0 josh1991/josh-httpd:1
root@osboxes:/home# docker images
REPOSITORY              TAG       IMAGE ID       CREATED          SIZE
josh1991/josh-httpd     1         c6d6837e9cdd   48 minutes ago   155MB
```

docker push repository name:tag

```
root@osboxes:/home# docker push josh1991/josh-httpd:1
The push refers to repository [docker.io/josh1991/josh-httpd]
52399a1f5390: Pushed
cbf2dac46d71: Pushed
239871c4cac5: Mounted from josh1991/httpd
9262f7dd1498: Mounted from josh1991/httpd
61172cb5065c: Mounted from josh1991/httpd
9fbbeddcc4e4: Mounted from josh1991/httpd
764055ebc9a7: Mounted from josh1991/httpd
1: digest: sha256:d4d9467d0419803187be8e6ecc6a4c1f250906ee22b43b72e593920079abe02c size: 1785
root@osboxes:/home#
```

Go to hub.docker.com