

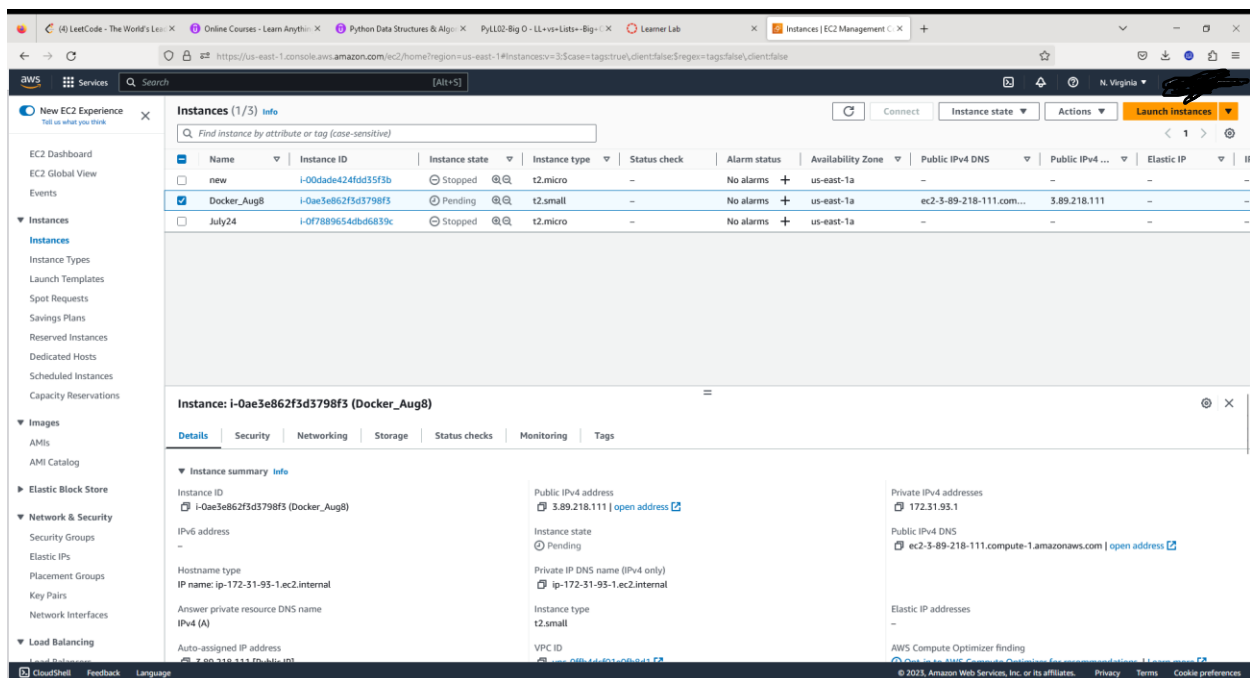
Docker

The goal

Following are the goals of this hands-on:

1. Working knowledge of EC2 instances with Ubuntu
2. Installing docker from scratch
3. Working with images and containers
4. Understanding the docker ecosystem

Create an Ubuntu Instance:



Connecting to the Instance through PUTTY:

```
ubuntu@ip-172-31-93-1:~$
* Using username "ubuntu".
* Authenticating with public key "Aug8"
Welcome to Ubuntu 22.04.2 LTS (GNU/Linux 5.19.0-1025-aws x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

System information as of Wed Aug  2 01:25:59 UTC 2023

System load:  0.15087890625   Processes:            105
Usage of /:   20.6% of 7.57GB   Users logged in:      0
Memory usage: 12%             IPv4 address for eth0: 172.31.93.1
Swap usage:   0%

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

The list of available updates is more than a week old.
To check for new updates run: sudo apt update

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/*copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

ubuntu@ip-172-31-93-1:~$
```

Installing Docker on Ubuntu Instance:

```
ubuntu@ip-172-31-93-1:~$
Fetched 72.4 MB in 2s (46.8 MB/s)
Preconfiguring packages ...
Selecting previously unselected package pigz.
(Reading database ... 64295 files and directories currently installed.)
Preparing to unpack .../0-pigz_2.6-1_amd64.deb ...
Unpacking pigz (2.6-1) ...
Selecting previously unselected package bridge-utils.
Preparing to unpack .../1-bridge-utils_1.7-1ubuntu3_amd64.deb ...
Unpacking bridge-utils (1.7-1ubuntu3) ...
Selecting previously unselected package runc.
Preparing to unpack .../2-runc_1.1.4-0ubuntu1-22.04.3_amd64.deb ...
Unpacking runc (1.1.4-0ubuntu1-22.04.3) ...
Selecting previously unselected package containerd.
Preparing to unpack .../3-containerd_1.6.12-0ubuntu1-22.04.3_amd64.deb ...
Unpacking containerd (1.6.12-0ubuntu1-22.04.3) ...
Selecting previously unselected package dns-root-data.
Preparing to unpack .../4-dns-root-data_2021011101_all.deb ...
Unpacking dns-root-data (2021011101) ...
Selecting previously unselected package dnsmasq-base.
Preparing to unpack .../5-dnsmasq-base_2.86-1.1ubuntu0.3_amd64.deb ...
Unpacking dnsmasq-base (2.86-1.1ubuntu0.3) ...
Selecting previously unselected package docker.io.
Preparing to unpack .../6-docker.io_20.10.21-0ubuntu1-22.04.3_amd64.deb ...
Unpacking docker.io (20.10.21-0ubuntu1-22.04.3) ...
Selecting previously unselected package ubuntu-fan.
Preparing to unpack .../7-ubuntu-fan_0.12.16_all.deb ...
Unpacking ubuntu-fan (0.12.16) ...
Setting up dnsmasq-base (2.86-1.1ubuntu0.3) ...
Setting up runc (1.1.4-0ubuntu1-22.04.3) ...
Setting up dns-root-data (2021011101) ...
Setting up bridge-utils (1.7-1ubuntu3) ...
Setting up pigz (2.6-1) ...
Setting up containerd (1.6.12-0ubuntu1-22.04.3) ...
Created symlink /etc/systemd/system/multi-user.target.wants/containerd.service → /lib/systemd/system/containerd.service.
Setting up ubuntu-fan (0.12.16) ...
Created symlink /etc/systemd/system/multi-user.target.wants/ubuntu-fan.service → /lib/systemd/system/ubuntu-fan.service.
Setting up docker.io (20.10.21-0ubuntu1-22.04.3) ...
Adding group 'docker' (GID 122) ...
Done.
Created symlink /etc/systemd/system/multi-user.target.wants/docker.service → /lib/systemd/system/docker.service.
Created symlink /etc/systemd/system/sockets.target.wants/docker.socket → /lib/systemd/system/docker.socket.
Processing triggers for dbus (1.12.20-2ubuntu4.1) ...
Processing triggers for man-db (2.10.2-1) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.

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-172-31-93-1:~$
```

Installing busybox:latest Image “Helloworld”

```
ubuntu@ip-172-31-93-1: /opt

Expanded Security Maintenance for Applications is not enabled.

98 updates can be applied immediately.
64 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

Last login: Wed Aug 2 01:28:45 2023 from 72.180.237.154
ubuntu@ip-172-31-93-1:~$ docker version
Client:
 Version:           20.10.21
 API version:       1.41
 Go version:        gol.18.1
 Git commit:        20.10.21-0ubuntu1-22.04.3
 Built:             Thu Apr 27 05:57:17 2023
 OS/Arch:           linux/amd64
 Context:           default
 Experimental:      true

Server:
 Engine:
  Version:          20.10.21
  API version:      1.41 (minimum version 1.12)
  Go version:       gol.18.1
  Git commit:       20.10.21-0ubuntu1-22.04.3
  Built:            Thu Apr 27 05:37:25 2023
  OS/Arch:          linux/amd64
  Experimental:     false
 containerd:
  Version:          1.6.12-0ubuntu1-22.04.3
  GitCommit:
 runc:
  Version:          1.1.4-0ubuntu1-22.04.3
  GitCommit:
 docker-init:
  Version:          0.19.0
  GitCommit:
ubuntu@ip-172-31-93-1:~$ sudo chown ubuntu:ubuntu -R /opt
chown: invalid group: 'ubuntu:ubuntu'
ubuntu@ip-172-31-93-1:~$ sudo chown ubuntu:ubuntu -R /opt
ubuntu@ip-172-31-93-1:~$ cd /opt
ubuntu@ip-172-31-93-1:/opt$ docker images
REPOSITORY    TAG       IMAGE ID       CREATED       SIZE
ubuntu@ip-172-31-93-1:/opt$ docker run --rm busybox:latest /bin/echo "Hello world"
Unable to find image 'busybox:latest' locally
latest: Pulling from library/busybox
3f4d90098f5b: Pull complete
Digest: sha256:3fbc632167424a6d997e74f52b878d7cc478225cfffac6bc977eedfe51c7f4e79
Status: Downloaded newer image for busybox:latest
Hello world
ubuntu@ip-172-31-93-1:/opt$
```

Successfully tagged “Helloworld:latest”

```
ubuntu@ip-172-31-93-1: /opt

8000K ..... 83% 25.5M 0s
8050K ..... 84% 45.9M 0s
8100K ..... 84% 262M 0s
8150K ..... 85% 240M 0s
8200K ..... 85% 272M 0s
8250K ..... 86% 274M 0s
8300K ..... 86% 264M 0s
8350K ..... 87% 229M 0s
8400K ..... 87% 273M 0s
8450K ..... 88% 274M 0s
8500K ..... 88% 279M 0s
8550K ..... 89% 248M 0s
8600K ..... 89% 237M 0s
8650K ..... 90% 268M 0s
8700K ..... 90% 271M 0s
8750K ..... 91% 230M 0s
8800K ..... 91% 278M 0s
8850K ..... 92% 238M 0s
8900K ..... 93% 275M 0s
8950K ..... 93% 5.06M 0s
9000K ..... 94% 11.8M 0s
9050K ..... 94% 39.3M 0s
9100K ..... 95% 267M 0s
9150K ..... 95% 215M 0s
9200K ..... 96% 271M 0s
9250K ..... 96% 279M 0s
9300K ..... 97% 279M 0s
9350K ..... 97% 221M 0s
9400K ..... 98% 272M 0s
9450K ..... 98% 278M 0s
9500K ..... 99% 257M 0s
9550K ..... 99% 219M 0s
9600K ..... 100% 330M=0.2s

2023-08-02 01:33:05 (38.7 MB/s) - 'HelloWorld.war' saved [9052807/9852807]

openjdk version "11.0.16" 2022-07-19
OpenJDK Runtime Environment 18.9 (build 11.0.16+8)
OpenJDK 64-Bit Server VM 18.9 (build 11.0.16+8, mixed mode, sharing)
Removing intermediate container 3f4206baba0f
--> 5236b3e90917
Step 5/7 : WORKDIR /opt/tomcat/webapps
--> c0fea8d0ec69
Removing intermediate container c0fea8d0ec69
--> c7c0d2305e23
Step 6/7 : EXPOSE 8080
--> Running in 84081633bcfd
Removing intermediate container 84081633bcfd
--> 8f5853990e68
Step 7/7 : CMD ["./opt/tomcat/bin/catalina.sh", "run"]
--> Running in 54c307a9bcb6
Removing intermediate container 54c307a9bcb6
--> fb96c22cc1d9
Successfully built fb96c22cc1d9
Successfully tagged helloworld:latest
ubuntu@ip-172-31-93-1:/opt$
```

Running helloworld container on detached mode (-d) and mapping to port 80:8080(-p)

```
ubuntu@ip-172-31-93-1: /opt
8100K ..... 84% 262M os
8150K ..... 85% 240M os
8200K ..... 85% 272M os
8250K ..... 86% 274M os
8300K ..... 86% 264M os
8350K ..... 87% 229M os
8400K ..... 87% 273M os
8450K ..... 88% 274M os
8500K ..... 88% 279M os
8550K ..... 89% 248M os
8600K ..... 89% 237M os
8650K ..... 90% 268M os
8700K ..... 90% 271M os
8750K ..... 91% 230M os
8800K ..... 91% 278M os
8850K ..... 92% 238M os
8900K ..... 93% 275M os
8950K ..... 93% 5.06M os
9000K ..... 94% 11.8M os
9050K ..... 94% 39.3M os
9100K ..... 95% 267M os
9150K ..... 95% 215M os
9200K ..... 96% 271M os
9250K ..... 96% 279M os
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Step 6/7 : EXPOSE 8080
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Removing intermediate container 84081633bcfd
--> 8f5853990e68
Step 7/7 : CMD ["opt/tomcat/bin/catalina.sh", "run"]
--> Running in 54c307a9bcb6
Removing intermediate container 54c307a9bcb6
--> fb96c22ccld9
Successfully built fb96c22ccld9
Successfully tagged helloworld:latest
ubuntu@ip-172-31-93-1: /opt$ docker run -d -p 80:8080 helloworld
135dc776dbd04a64d7aeb3e514297eb4ea46b90a997a45e52ee43cbd5460a450
ubuntu@ip-172-31-93-1: /opt$
```

Docker ps -a showing the container is up and running

```
ubuntu@ip-172-31-93-1: /opt
8250K ..... 86% 274M os
8300K ..... 86% 264M os
8350K ..... 87% 229M os
8400K ..... 87% 273M os
8450K ..... 88% 274M os
8500K ..... 88% 279M os
8550K ..... 89% 248M os
8600K ..... 89% 237M os
8650K ..... 90% 268M os
8700K ..... 90% 271M os
8750K ..... 91% 230M os
8800K ..... 91% 278M os
8850K ..... 92% 238M os
8900K ..... 93% 275M os
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9150K ..... 95% 215M os
9200K ..... 96% 271M os
9250K ..... 96% 279M os
9300K ..... 97% 279M os
9350K ..... 97% 221M os
9400K ..... 98% 272M os
9450K ..... 98% 278M os
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--> Running in 84081633bcfd
Removing intermediate container 84081633bcfd
--> 8f5853990e68
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--> Running in 54c307a9bcb6
Removing intermediate container 54c307a9bcb6
--> fb96c22ccld9
Successfully built fb96c22ccld9
Successfully tagged helloworld:latest
ubuntu@ip-172-31-93-1: /opt$ docker run -d -p 80:8080 helloworld
135dc776dbd04a64d7aeb3e514297eb4ea46b90a997a45e52ee43cbd5460a450
ubuntu@ip-172-31-93-1: /opt$ docker ps -a
CONTAINER ID   IMAGE          COMMAND                  CREATED        STATUS        PORTS                               NAMES
135dc776dbd0   helloworld    "/opt/tomcat/bin/cat..." 14 seconds ago Up 13 seconds 0.0.0.0:80->8080/tcp, :::80->8080/tcp sleepy_antonnelli
ubuntu@ip-172-31-93-1: /opt$
```

Docker container stopped

```
ubuntu@ip-172-31-93-1:/opt
OpenJDK Runtime Environment "11.0.16" 2022-07-19
OpenJDK Runtime Environment 18.9 (build 11.0.16+8)
OpenJDK 64-bit Server VM 18.9 (build 11.0.16+8, mixed mode, sharing)
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Step 6/7 : EXPOSE 8080
----> Running in 84081633bcfd
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----> 8f5853990e68
Step 7/7 : CMD ["opt/tomcat/bin/catalina.sh", "run"]
----> Running in 54c307a9bcb6
Removing intermediate container 54c307a9bcb6
----> fb96c22cc1d9
Successfully built fb96c22cc1d9
Successfully tagged helloworld:latest
ubuntu@ip-172-31-93-1:/opt$ docker run -d -p 80:8080 helloworld
135dc776dbd04a64d7aeb3e514297eb4ea46b90a997a45e52ee43cbd5460a450
ubuntu@ip-172-31-93-1:/opt$ docker ps -a
CONTAINER ID   IMAGE      COMMAND                  CREATED        STATUS        PORTS                               NAMES
135dc776dbd0   helloworld  "/opt/tomcat/bin/cat..." 14 seconds ago Up 13 seconds 0.0.0.0:80->8080/tcp, :::80->8080/tcp  sleepy_antone11i
ubuntu@ip-172-31-93-1:/opt$ docker rm ["^C
ubuntu@ip-172-31-93-1:/opt$ docker rm [135dc776dbd0]
Error: No such container: [135dc776dbd0]
ubuntu@ip-172-31-93-1:/opt$ docker rm 135dc776dbd0
Error response from daemon: You cannot remove a running container 135dc776dbd04a64d7aeb3e514297eb4ea46b90a997a45e52ee43cbd5460a450. Stop the container before attempting
removal or force remove
ubuntu@ip-172-31-93-1:/opt$ docker images
REPOSITORY    TAG       IMAGE ID       CREATED        SIZE
helloworld    latest    fb96c22cc1d9   2 minutes ago  710MB
busybox       latest    a416a98b71e2   2 weeks ago   4.26MB
openjdk       11        47a932d998b7   12 months ago 654MB
ubuntu@ip-172-31-93-1:/opt$ docker rmi fb96c22cc1d9
Error response from daemon: conflict: unable to delete fb96c22cc1d9 (cannot be forced) - image is being used by running container 135dc776dbd0
ubuntu@ip-172-31-93-1:/opt$ docker build -t helloworld
"docker build" requires exactly 1 argument.
See 'docker build --help'.

Usage:  docker build [OPTIONS] PATH | URL | -

Build an image from a Dockerfile
ubuntu@ip-172-31-93-1:/opt$ docker containers
docker: 'containers' is not a docker command.
See 'docker --help'
ubuntu@ip-172-31-93-1:/opt$ docker ps -a
CONTAINER ID   IMAGE      COMMAND                  CREATED        STATUS        PORTS                               NAMES
135dc776dbd0   helloworld  "/opt/tomcat/bin/cat..." 3 minutes ago  Up 3 minutes  0.0.0.0:80->8080/tcp, :::80->8080/tcp  sleepy_antone11i
135
ubuntu@ip-172-31-93-1:/opt$ docker ps -a
CONTAINER ID   IMAGE      COMMAND                  CREATED        STATUS        PORTS                               NAMES
135dc776dbd0   helloworld  "/opt/tomcat/bin/cat..." 4 minutes ago  Exited (143) 9 seconds ago          sleepy_antone11i
ubuntu@ip-172-31-93-1:/opt$
```

Docker started once again

```
ubuntu@ip-172-31-93-1:/opt
Step 5/7 : WORKDIR /opt/tomcat/webapps
----> Running in c0fea8d0ec69
Removing intermediate container c0fea8d0ec69
----> c7c0d2305e23
Step 6/7 : EXPOSE 8080
----> Running in 84081633bcfd
Removing intermediate container 84081633bcfd
----> 8f585390e68
Step 7/7 : CMD ["/opt/tomcat/bin/catalina.sh", "run"]
----> Running in 54c307a9bcb6
Removing intermediate container 54c307a9bcb6
----> fb96c22ccld9
Successfully built fb96c22ccld9
Successfully tagged helloworld:latest
ubuntu@ip-172-31-93-1:/opt$ docker run -d -p 80:8080 helloworld
135dc776dbd04a64d7aeb3e514297eb4ea46b90a997a45e52ee43cbd5460a450
ubuntu@ip-172-31-93-1:/opt$ docker ps -a
CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS        PORTS                               NAMES
135dc776dbd0   helloworld   "/opt/tomcat/bin/cat..." 14 seconds ago Up 13 seconds 0.0.0.0:80->8080/tcp, :::80->8080/tcp sleepy_antoneilli
ubuntu@ip-172-31-93-1:/opt$ docker rm 135dc776dbd0
Error: No such container: [135dc776dbd0]
ubuntu@ip-172-31-93-1:/opt$ docker rm 135dc776dbd0
Error response from daemon: You cannot remove a running container 135dc776dbd04a64d7aeb3e514297eb4ea46b90a997a45e52ee43cbd5460a450. Stop the container before attempting removal or force remove
ubuntu@ip-172-31-93-1:/opt$ docker images
REPOSITORY    TAG        IMAGE ID       CREATED        SIZE
helloworld    latest    fb96c22ccld9   2 minutes ago  710MB
busybox       latest    a416a98b71e2   2 weeks ago   4.26MB
openjdk       11        47a932d998b7   12 months ago 654MB
ubuntu@ip-172-31-93-1:/opt$ docker rmi fb96c22ccld9
Error response from daemon: conflict: unable to delete fb96c22ccld9 (cannot be forced) - image is being used by running container 135dc776dbd0
ubuntu@ip-172-31-93-1:/opt$ docker build -t helloworld
"docker build" requires exactly 1 argument.
See 'docker build --help'.

Usage:  docker build [OPTIONS] PATH | URL | -

Build an image from a Dockerfile
ubuntu@ip-172-31-93-1:/opt$ docker containers
docker: 'containers' is not a docker command.
See 'docker --help'
ubuntu@ip-172-31-93-1:/opt$ docker ps -a
CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS        PORTS                               NAMES
135dc776dbd0   helloworld   "/opt/tomcat/bin/cat..." 3 minutes ago Up 3 minutes 0.0.0.0:80->8080/tcp, :::80->8080/tcp sleepy_antoneilli
ubuntu@ip-172-31-93-1:/opt$ docker stop 135
135
ubuntu@ip-172-31-93-1:/opt$ docker ps -a
CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS        PORTS                               NAMES
135dc776dbd0   helloworld   "/opt/tomcat/bin/cat..." 4 minutes ago Exited (143) 9 seconds ago         sleepy_antoneilli
ubuntu@ip-172-31-93-1:/opt$ docker start 135
135
ubuntu@ip-172-31-93-1:/opt$ docker ps -a
CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS        PORTS                               NAMES
135dc776dbd0   helloworld   "/opt/tomcat/bin/cat..." 4 minutes ago Up 4 seconds 0.0.0.0:80->8080/tcp, :::80->8080/tcp sleepy_antoneilli
ubuntu@ip-172-31-93-1:/opt$
```

Accessing the Apache Tomcat webpage through the publicIP

