Assignment-Week 4

Task 2 - Docker: Installation, Basic Container Operations & Image Building using Dockerfile

Introduction to Docker

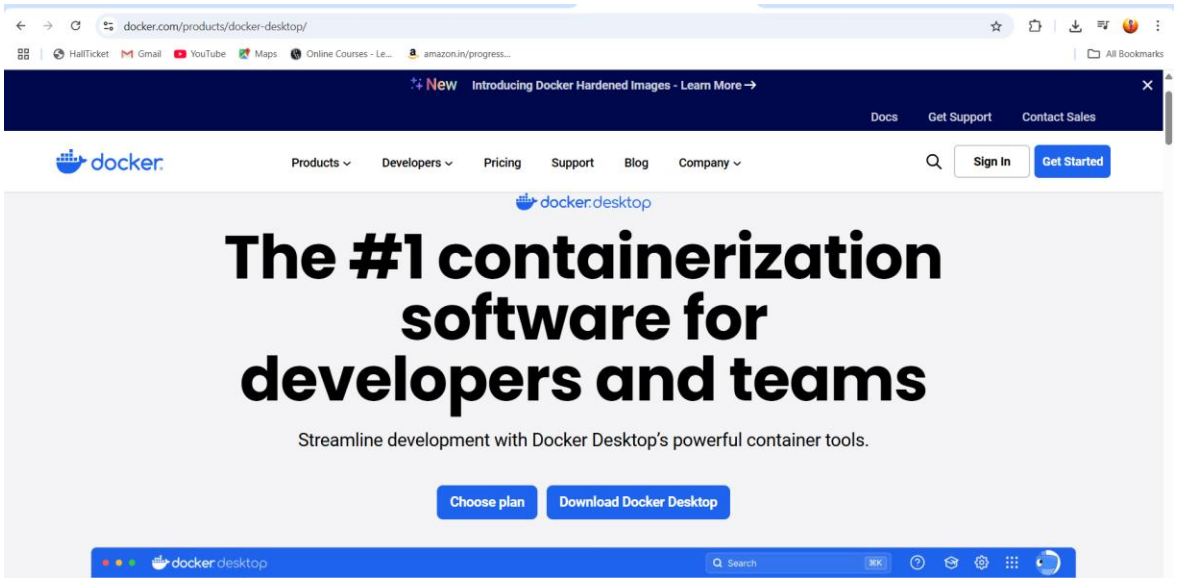
Docker is an open-source platform that simplifies application development and deployment by using containerization. A container is a lightweight, standalone, executable package of software that includes everything needed to run an application—code, runtime, libraries, and system tools.

Unlike traditional virtual machines, containers are more efficient because they share the same OS kernel and consume fewer resources.

Docker Installation

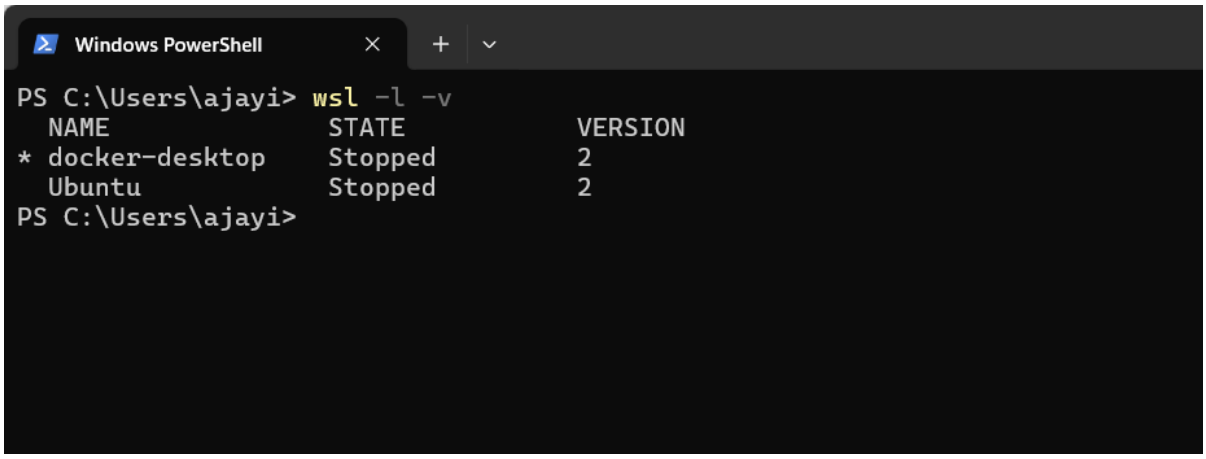
On Windows (Using Docker Desktop)

1. Download Docker Desktop from the official website: https://www.docker.com/products/docker-desktop



2. Run the installer and follow the setup steps.

3. Enable WSL 2 (Windows Subsystem for Linux) when prompted.



4. Restart your system after installation.

5. Open a terminal (Command Prompt or PowerShell) and verify Docker installation:

$ docker –version

On Linux (Ubuntu)

1. Update your system:

$ sudo apt update && sudo apt upgrade

2. Install Docker:

$ sudo apt install docker.io

3. Enable and start Docker service:

$ sudo systemctl enable docker

$ sudo systemctl start docker

4. Verify installation:

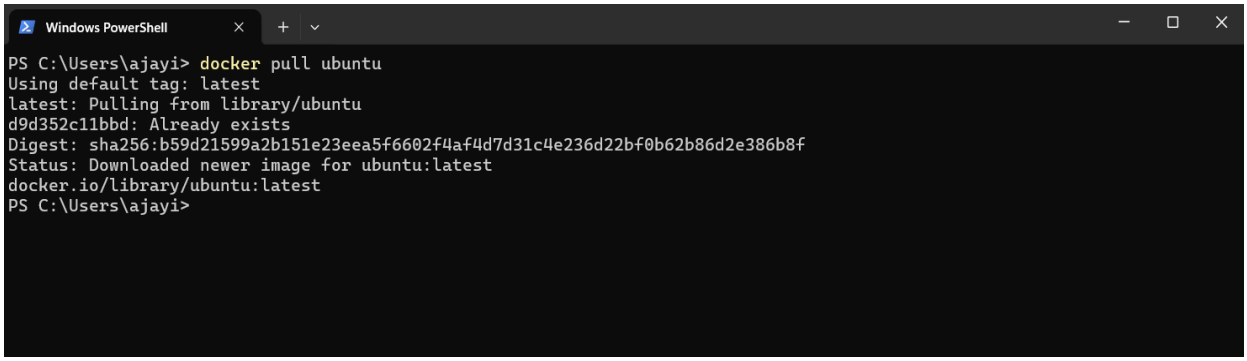
$ docker –version

Basic Docker Container Operations

Once Docker is installed, you can start using it to run and manage containers.

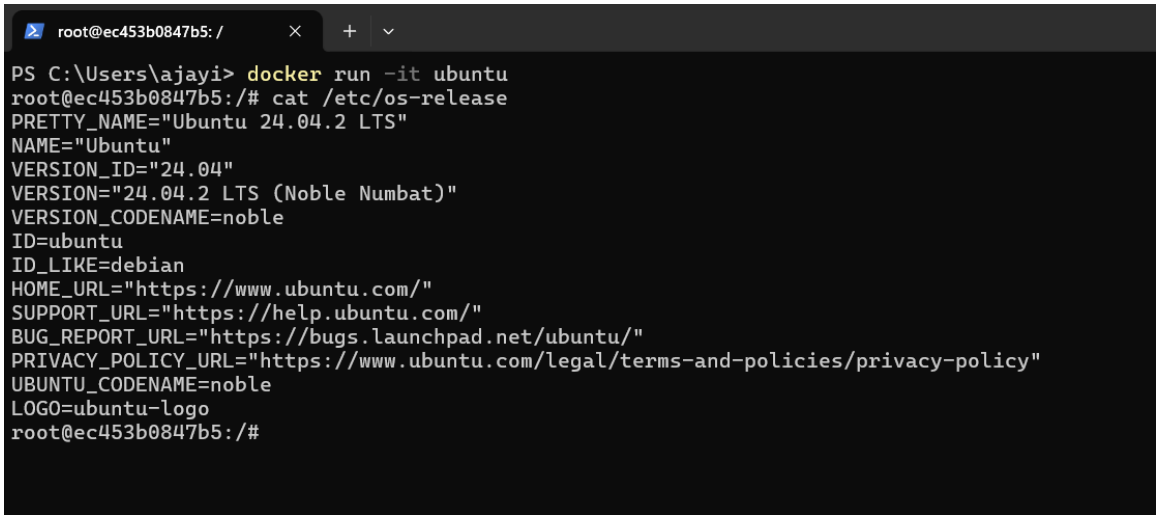
Pulling an Image

$ docker pull ubuntu



Running a Container

$ docker run -it ubuntu



Listing Running Containers

$ docker ps

Listing All Containers

$ docker ps -a

Stopping a Container

$ docker stop <container_id>

Removing a Container

$ docker rm <container_id>

Removing an Image

$ docker rmi <image_name>

Running a Web App

$ docker run -d -p 8080:80 nginx

- This runs the Nginx web server in a container and maps port 8080 on the host to port 80 in the container.

Creating and Building Docker Images Using a Dockerfile

A Dockerfile is a script with instructions to build a custom Docker image.

Sample Dockerfile

FROM ubuntu:20.04

LABEL maintainer="ajayingle3878@gmail.com"

RUN apt update && apt install -y curl

CMD ["echo", "Hello from my first Docker image!"]

```
~
FROM ubuntu:20.04

LABEL maintainer="ajayingle3878@gmail.com"

RUN apt update && apt install -y curl

CMD ["echo", "Hello from my first Docker image!"]

~
~
~
~
~
~
~
~
~
~
~
Dockerfile [unix] (14:25 27/06/2025)                    8,0-1 All
```

Steps to Build an Image

1. Create a file named Dockerfile (without any extension).

2. Place it in a working directory.

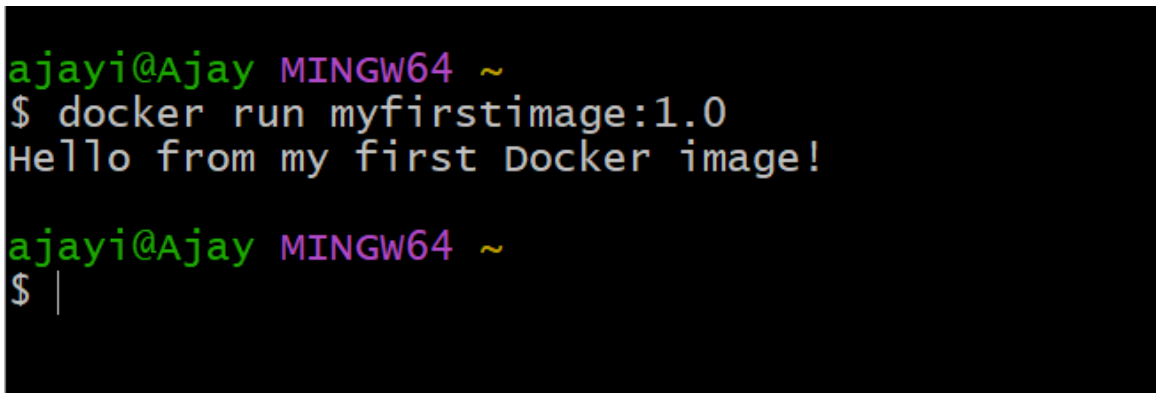
3. Build the image:

    $ docker build -t myfirstimage:1.0 .

```
ajayi@Ajay MINGW64 ~
$ docker build -t myfirstimage:1.0 .
[+] Building 52.0s (7/7) FINISHED                          docker:desktop-linux
 => [internal] load build definition from Dockerfile                       0.0s
 => => transferring dockerfile: 193B                                       0.0s
 => [internal] load metadata for docker.io/library/ubuntu:20.04            5.1s
 => [auth] library/ubuntu:pull token for registry-1.docker.io              0.0s
 => [internal] load .dockerignore                                          0.0s
 => => transferring context: 2B                                            0.0s
 => [1/2] FROM docker.io/library/ubuntu:20.04@sha256:8feb4d8ca5354def3d8  10.8s
 => => resolve docker.io/library/ubuntu:20.04@sha256:8feb4d8ca5354def3d8f   0.0s
 => => sha256:8feb4d8ca5354def3d8fce243717141ce31e2c42870 6.69kB / 6.69kB  0.0s
 => => sha256:c664f8f86ed5a386b0a340d981b8f81714e21a8b9c73f65 424B / 424B   0.0s
 => => sha256:b7bab04fd9aa0c771e5720bf0cc7cbf993fd6946645 2.30kB / 2.30kB   0.0s
 => => sha256:13b7e930469f6d3575a320709035c6acf6f5485a7 27.51MB / 27.51MB   8.8s
 => => extracting sha256:13b7e930469f6d3575a320709035c6acf6f5485a76abcf03   1.7s
 => [2/2] RUN apt update && apt install -y curl                           35.8s
 => exporting to image                                                     0.3s
 => => exporting layers                                                    0.2s
 => => writing image sha256:1170a9fbcbec1b03363285f39fec82b5c76e4e9bf350b  0.0s
 => => naming to docker.io/library/myfirstimage:1.0                        0.0s
```

4. Run the image:

$ docker run myfirstimage:1.0



Explanation

- FROM: Base image

- RUN: Execute commands during image build

- CMD: Default command to run when container starts

- -t: Tags the image with a name and version

Benefits of Docker

- Lightweight and fast

- Portable across environments

- Simplifies CI/CD

- Isolates applications

- Works with microservices architecture

Conclusion

Docker has revolutionized the way we build, ship, and run applications. With simple installation steps, powerful container commands, and the ability to create custom images using Dockerfiles, it is an essential tool in modern DevOps and development pipelines.

By mastering Docker basics, you can efficiently manage application environments, reduce dependency conflicts, and enhance deployment consistency across different stages of software development.