

DevOps { PW Assignment }

Assignment : Theoretical Overview of Docker and Containerization

Theoretical Overview of Docker and Containerization

➤ What is Docker?

Docker is a **containerization platform** that automates the deployment of applications inside containers. It provides tools to **build, ship, and run** applications as portable containers.

➤ Key Components:

- **Docker Engine:** Core service to run containers.
- **Docker Images:** Read-only templates with app code + dependencies.
- **Docker Containers:** Running instances of Docker images.
- **Dockerfile:** Script to automate image creation.
- **Docker Hub:** Cloud-based registry to store and share Docker images.

➤ Why Use Docker?

- **Portability:** Runs the same way across environments (dev, test, prod).
- **Efficiency:** Less resource usage than VMs.
- **Isolation:** Each app runs in its own container.
- **Speed:** Faster startup and deployment.

➤ What is Containerization?

Containerization is a technology that packages applications and their dependencies together into a single unit called a **container**. Containers run on a shared operating system kernel but are isolated from each other.

✓ Key Characteristics:

- Lightweight (no need for a full OS like VMs)
- Portable across environments (Dev → Test → Prod)
- Fast startup and shutdown
- Isolated execution environment

1. Install Docker and create Dockerfiles to containerize applications?



```
Setting up docker-ce (5:28.2.2-1~ubuntu.24.04~noble) ...
Created symlink /etc/systemd/system/multi-user.target.wants/docker.service → /usr/lib/systemd/system/docker.service.
Created symlink /etc/systemd/system/sockets.target.wants/docker.socket → /usr/lib/systemd/system/docker.socket.
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for libc-bin (2.39-0ubuntu8.4) ...
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No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.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-172-31-19-58:~$ sudo docker --version
Docker version 28.2.2, build e6534b4
ubuntu@ip-172-31-19-58:~$
ubuntu@ip-172-31-19-58:~$
ubuntu@ip-172-31-19-58:~$
```

i-0a2da02035cb44ae6 (Ubuntu)

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```
ubuntu@ip-172-31-19-58:~$ vi index.html
ubuntu@ip-172-31-19-58:~$ vi dockerfile
ubuntu@ip-172-31-19-58:~$
ubuntu@ip-172-31-19-58:~$ sudo docker build -t myapp .
[+] Building 2.7s (8/8) FINISHED
=> [internal] load build definition from dockerfile                                docker:default 0.0s
=> => transferring dockerfile: 268B                                              0.0s
=> [internal] load metadata for docker.io/library/nginx:alpine                  0.3s
=> [internal] load .dockerignore                                                 0.0s
=> => transferring context: 2B                                                    0.0s
=> [1/3] FROM docker.io/library/nginx:alpine@sha256:65645c7bb6a0661892a8b03b89d0743208a18dd2f3f17a54ef4b76fb8e2f2a10 1.7s
=> => resolve docker.io/library/nginx:alpine@sha256:65645c7bb6a0661892a8b03b89d0743208a18dd2f3f17a54ef4b76fb8e2f2a10 0.0s
=> => sha256:6769dc3a703c719c1d2756bda113659be28ae16cf0da58dd5fd823d6b9a050ea 10.79kB / 10.79kB 0.0s
=> => sha256:f18232174bc91741fdf3da96d85011092101a032a93a388b79e99e69c2d5c870 3.64MB / 3.64MB 0.1s
=> => sha256:61ca4f733c802afd9e05a32f0de0361b6d713b8b53292dc15fb093229f648674 1.79MB / 1.79MB 0.1s
=> => sha256:b464cfd2a6319875aeb27359ec549790ce14d8214fcb16ef915e4530e5ed235 629B / 629B 0.1s
=> => sha256:65645c7bb6a0661892a8b03b89d0743208a18dd2f3f17a54ef4b76fb8e2f2a10 10.33kB / 10.33kB 0.0s
=> => sha256:62223d644fa234c3a1cc785ee14242ec47a77364226f1c811d2f669f96dc2ac8 2.50kB / 2.50kB 0.0s
=> => extracting sha256:f18232174bc91741fdf3da96d85011092101a032a93a388b79e99e69c2d5c870 0.3s
=> => sha256:d7e5070240863957ebb0b5a4a5729963c3462666baa2947d00628cb5f2d5773 955B / 955B 0.2s
=> => sha256:81bd8ed7ec6789b0cb7f1b47ee731c522f6dba83201ec73cd6bca1350f582948 402B / 402B 0.1s
=> => sha256:39c2ddfd6010082a4a646e7ca44e95aca9bf3eae00f17f7ccc2954004f2a7d 15.52MB / 15.52MB 0.4s
```

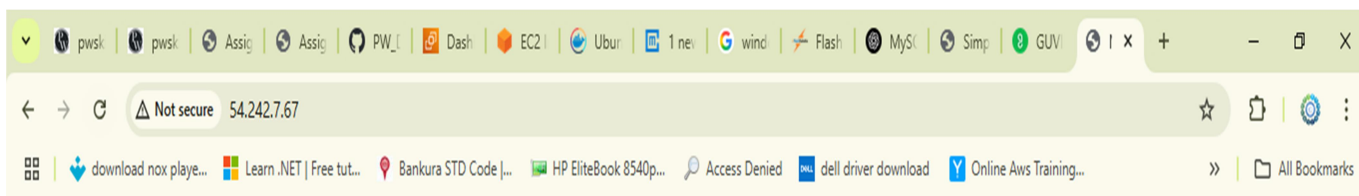
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```
=> extracting sha256:d7e5070240863957ebb0b5a44a5729963c3462666baa2947d00628cb5f2d5773 0.0s
=> extracting sha256:81bd8ed7ec6789b0cb7f1b47ee731c522f6dba83201ec73cd6bca1350f582948 0.0s
=> extracting sha256:197eb75867ef4fced4724f17b0972ab0489436860a594a9445f8eaff8155053 0.0s
=> extracting sha256:34a64644b756511a2e217f0508e11d1a572085d66cd6dc9a555a082ad49a3102 0.0s
=> extracting sha256:39c2ddfd6010082a4a646e7ca44e95aca9bf3eaeabc00f17f7ccc2954004f2a7d 0.6s
=> [internal] load build context 0.0s
=> transferring context: 616B 0.0s
=> [2/3] RUN rm -rf /usr/share/nginx/html/* 0.5s
=> [3/3] COPY index.html /usr/share/nginx/html/index.html 0.1s
=> exporting to image 0.1s
=> exporting layers 0.0s
=> writing image sha256:fe8e25241ba33e90c5ea2f91bdb0c7b4c7be6b0c3acb47fd3e9a5bf82d570486 0.0s
=> naming to docker.io/library/myapp 0.0s
ubuntu@ip-172-31-19-58:~$
ubuntu@ip-172-31-19-58:~$
ubuntu@ip-172-31-19-58:~$ sudo docker run -d -p 80:80 myapp
b0d6555aa738aefdc2f02b3a514bb51977c98547a0d46c7dd578003191cabb3d
ubuntu@ip-172-31-19-58:~$
ubuntu@ip-172-31-19-58:~$ sudo docker ps -a
CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS        PORTS                               NAMES
b0d6555aa738   myapp     "/docker-entrypoint. ..." 10 seconds ago Up 10 seconds 0.0.0.0:80->80/tcp, [::]:80->80/tcp  sleepy_cerf
ubuntu@ip-172-31-19-58:~$
```

i-0a2da02035cb44ae6 (Ubuntu)

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