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IT | CLOUD ENGINEER

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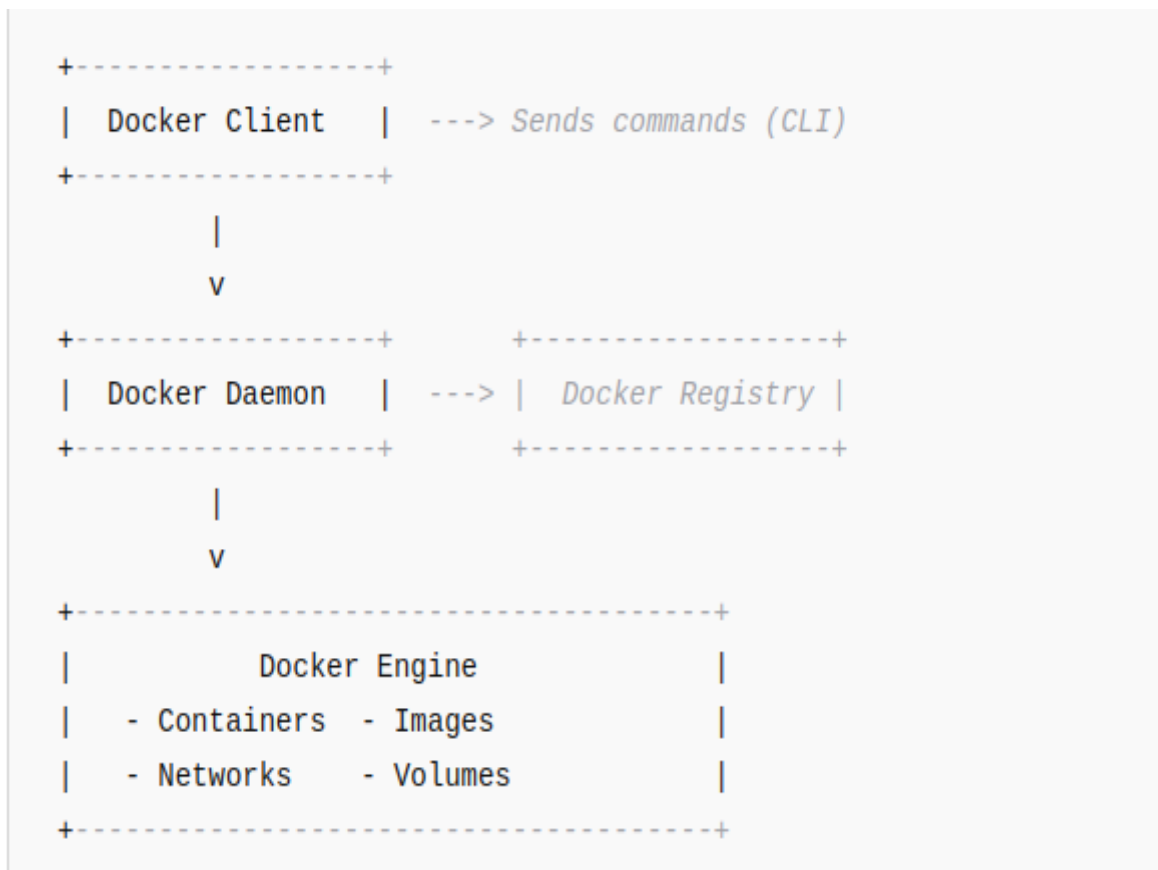
Role: Cloud Engineer

1. Explain Docker Architecture?

Docker is a client – server architecture.

That allow user to users to build, package and run application.

Docker consist several architecture.



Docker client – Docker cli (User interact with Docker)

Docker Daemon – Listen API request and manage containers, images, Volumes and networks.

Docker engine – Runtime that allow container to run.

Docker image – Read only template used to create a docker container.

Docker container – Lightweight, portable and isolation instance of running application

Docker registry – Centralized repo for storing docker images.

Docker Networks – Create a communication between container Securely.

Docker Volumes – User persistent storage across containers restart.

2. What is FROM Statement in Dockerfile?

From instructions used which images to download and start from.

From instruction is a first command of **docker file**.

Its a mandatory instruction, and its define the base image.

Syntax:

FROM <Base Image>:<tag>

Base images: Ubuntu, Alpine, NodeJs, Python...etc

Tag : Latest, 20.04..etc

Using official Base image:

FROM Ubuntu:22.04

Using lightweight images

FROM Alpine:Latest

FROM instrctions helps to optimize image size and minimize dependencies.

```
nahendrakumar-v@thinkpad-e14-gen-3:~/Study/Microservie_App/Microservice_Project/ecommerce-ui$ cat Dockerfile | grep -i "FROM"
FROM node:14
nahendrakumar-v@thinkpad-e14-gen-3:~/Study/Microservie_App/Microservice_Project/ecommerce-ui$ cat Dockerfile | head -n 10
# Use the official Node.js image as the base image
FROM node:14

# Set the working directory inside the container
WORKDIR /app

# Copy the server code to the working directory
COPY server /app/server

# Change to the server directory
nahendrakumar-v@thinkpad-e14-gen-3:~/Study/Microservie_App/Microservice_Project/ecommerce-ui$
```

3. Diff btw COPY and ADD in Dockerfile?

ADD and **COPY** instruction use cases are similarly

COPY : Copy files and Directorys from the local hostmachine in to inside the docker image

There is no other functionalities.

ADD: Using add instructions can extract compresses files and copy files from a remote location via URL.

Local compressed files are copy in to remote files using **ADD** instruction.

But in **RUN** Instrcutions supports both curl and wget is safe and more efficiency.

RUN curl http://source.file/package.file.tar.gz \

| tar -xjC /tmp/ package.file.tar.gz \

&& make -C /tmp/ package.file.tar.gz

```
nahendrakumar-v@thinkpad-e14-gen-3:~/Study/Microservie_App/Microservice_Project/ecommerce-ui$ cat Dockerfile | grep -i "COPY"
# Copy the server code to the working directory
COPY server /app/server
# Copy the client code to the client directory
COPY client /app/client
nahendrakumar-v@thinkpad-e14-gen-3:~/Study/Microservie_App/Microservice_Project/ecommerce-ui$ cat Dockerfile | grep -i "RUN"
RUN npm install
RUN npm install
RUN npm run build
# Run the Node.js server when the container starts
nahendrakumar-v@thinkpad-e14-gen-3:~/Study/Microservie_App/Microservice_Project/ecommerce-ui$
```

4. Diff btw CMD & ENTRYPOINT in Dockerfile?

Both CMD and ENTRYPOINT define the default command that run those command when a container starts.

CMD : Provide a default command can be overridden when running a container.

ENTRYPOINT : is a fixed behaviour, We can't override, we can pass additional arguments.

mahendrakumar-v@thinkpad-e14-gen-3:~/Study/Microservie_App/Microservice_Project/ecommerce-ui\$ cat Dockerfile | grep -i "CMD"

CMD ["node", "server.js"]

Here ENTRYPOINT is a main process.

If the new command passed ENTRYPOINT can't be overridden.

5. Diff btw RUN & CMD & ENTRYPOINT in Dockerfile?

RUN – Execute command in new layer. Creating a new image. Commonly used for installing software package

CMD – Is a default command. To run a command when container starts.

ENTRYPOINT – is a fixed executable, Configure container to run as an executable.

6. Diff btw ENTRYPOINT & ARGS?

ENTRYPOINT – is a fixed executable, Configure container to run as an executable, Its a fixed command that always run when the container starts.

ARG : Define build time variable, That can be pass when building the image.

Ex: During the docker build.

```
FROM ubuntu:latest
```

```
ARG MY_VERSION=1.0
```

```
RUN echo "Application Version: $MY_VERSION"
```

7. How will you expose your container?

When docker container expose in outside using port, You can expose port in different method.

Ex: if you have web application running inside a container with the port 8080, You can expose it to the host system by running the container.

Running container you can use -p or --publish flag followed by the format

```
docker run -d --name <Docker container name> -p <Hostport>:<Network Port> <Image name>
```

```
root@thinkpad-e14-gen-3:/home/mahendrakumar-v/Study/Microservie_App/Microservice_Project/ecommerce-ui# docker run -d --name Expose2 -p
```

```
root@thinkpad-e14-gen-3:/home/mahendrakumar-v/Study/Microservice_Project/ecommerce-ui# docker run -d --name Expose2 -p 4001:4001 order-management
8fd47b1c3cd2f74d12bc480096b645273eff471bd9158187e87cec43db7a
root@thinkpad-e14-gen-3:/home/mahendrakumar-v/Study/Microservice_Project/ecommerce-ui# docker ps
CONTAINER ID   IMAGE          COMMAND                  CREATED        STATUS        PORTS                               NAMES
8fd47b1c3cd2f74d12bc480096b645273eff471bd9158187e87cec43db7a   order-management   "/usr/local/bin/mvn..." 5 seconds ago   Up 4 seconds   0.0.0.0:4001->4001/tcp, :::4001->4001/tcp, 9090/tcp   Expose2
20195c665396   ecommerce-ui      "docker-entrypoint.s..." 6 weeks ago    Up 14 hours    0.0.0.0:4000->4000/tcp, :::4000->4000/tcp             ecommerce-ui2
def35cf22b4e   product-inventory "python3 inventory_a..." 6 weeks ago    Up 14 hours    0.0.0.0:3002->3002/tcp, :::3002->3002/tcp             product-inventory2
ccc840f8d96d   product-catalog   "docker-entrypoint.s..." 6 weeks ago    Up 14 hours    0.0.0.0:3001->3001/tcp, :::3001->3001/tcp             product-catalog2
b33cd333983e   contact-support-team "python3 server.py"      6 weeks ago    Up 14 hours    0.0.0.0:8000->8000/tcp, :::8000->8000/tcp             contact-support-team2
4a6f60b2d075   order-management   "/usr/local/bin/mvn..." 6 weeks ago    Up 14 hours    0.0.0.0:9090->9090/tcp, :::9090->9090/tcp             order-management2
34fda9942b7c   profile-management "docker-entrypoint.s..." 6 weeks ago    Up 14 hours    0.0.0.0:3003->3003/tcp, :::3003->3003/tcp             profile-management2
95ae27901561   mysql:5.7         "docker-entrypoint.s..." 7 months ago    Restarting (1) 21 seconds ago                        mysql
```

4001:4001 order-management

```
cat Dockerfile | grep -i "Expose"
```

```
mahendrakumar-v@thinkpad-e14-gen-3:~/Study/Microservie_App/Microservice_Project/ecommerce-ui$ cat Dockerfile | grep -i "EXPOSE"
# Expose the port that the server listens on
EXPOSE 4000
mahendrakumar-v@thinkpad-e14-gen-3:~/Study/Microservie_App/Microservice_Project/ecommerce-ui$
```

```
root@thinkpad-e14-gen-3:/home/mahendrakumar-v/Study/Microservie_App/Microservice_Project/ecommerce-ui# docker run -d --name Expose3 --publish-all order-management
```

```
root@thinkpad-e14-gen-3:/home/mahendrakumar-v/Study/Microservie_App/Microservice_Project/ecommerce-ui# docker run -d --name Expose3 --publish-all order-management
2a6e37d1d7a3
root@thinkpad-e14-gen-3:/home/mahendrakumar-v/Study/Microservie_App/Microservice_Project/ecommerce-ui# docker ps
CONTAINER ID   IMAGE          COMMAND                  CREATED        STATUS        PORTS                               NAMES
2a6e37d1d7a3   order-management   "/usr/local/bin/mvn..." 6 seconds ago   Up 5 seconds   0.0.0.0:32768->9090/tcp, [::]:32768->9090/tcp   Expose3
8fd47b1c3cd2f74d12bc480096b645273eff471bd9158187e87cec43db7a   order-management   "/usr/local/bin/mvn..." 6 minutes ago   Up 6 minutes   0.0.0.0:4001->4001/tcp, :::4001->4001/tcp, 9090/tcp   Expose2
20195c665396   ecommerce-ui      "docker-entrypoint.s..." 6 weeks ago    Up 14 hours    0.0.0.0:4000->4000/tcp, :::4000->4000/tcp             ecommerce-ui2
def35cf22b4e   product-inventory "python3 inventory_a..." 6 weeks ago    Up 14 hours    0.0.0.0:3002->3002/tcp, :::3002->3002/tcp             product-inventory2
ccc840f8d96d   product-catalog   "docker-entrypoint.s..." 6 weeks ago    Up 14 hours    0.0.0.0:3001->3001/tcp, :::3001->3001/tcp             product-catalog2
b33cd333983e   contact-support-team "python3 server.py"      6 weeks ago    Up 14 hours    0.0.0.0:8000->8000/tcp, :::8000->8000/tcp             contact-support-team2
4a6f60b2d075   order-management   "/usr/local/bin/mvn..." 6 weeks ago    Up 14 hours    0.0.0.0:9090->9090/tcp, :::9090->9090/tcp             order-management2
34fda9942b7c   profile-management "docker-entrypoint.s..." 6 weeks ago    Up 14 hours    0.0.0.0:3003->3003/tcp, :::3003->3003/tcp             profile-management2
95ae27901561   mysql:5.7         "docker-entrypoint.s..." 7 months ago    Restarting (1) 7 seconds ago                        mysql
```

8. How will you check CPU/Mem usage of the container?

We can check docker container CPU and Memory usage by using docke stats command.

```
docker stats – Real time Monitoring
```

CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
2a6e37d1d7a3	Expose3	0.29%	380.9MiB / 14.46GiB	2.57%	51.6MB / 1.05MB	1.67MB / 63MB	75
8fd47b1c3cd2f74d12bc480096b645273eff471bd9158187e87cec43db7a	Expose2	0.27%	432.2MiB / 14.46GiB	2.92%	51.6MB / 1.1MB	30MB / 61MB	75
20195c665396	ecommerce-ui2	0.00%	14.76MiB / 14.46GiB	0.10%	584kB / 397kB	14.7MB / 0B	11
def35cf22b4e	product-inventory2	0.02%	32.82MiB / 14.46GiB	0.22%	581kB / 0B	20.5MB / 0B	1
ccc840f8d96d	product-catalog2	0.00%	10.59MiB / 14.46GiB	0.07%	581kB / 0B	7.64MB / 0B	7
b33cd333983e	contact-support-team2	0.01%	32.35MiB / 14.46GiB	0.22%	581kB / 0B	19.5MB / 0B	1
4a6f60b2d075	order-management2	0.26%	392.4MiB / 14.46GiB	2.65%	581kB / 0B	92.1MB / 87.4MB	70
34fda9942b7c	profile-management2	0.00%	12.54MiB / 14.46GiB	0.08%	581kB / 0B	25.5MB / 0B	7
95ae27901561	mysql	0.00%	0B / 0B	0.00%	0B / 0B	0B / 0B	0

```
Chekc CPU and Menory for specific container
```

CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
2a6e37d1d7a3	Expose3	0.30%	381.1MiB / 14.46GiB	2.57%	51.6MB / 1.05MB	1.67MB / 64MB	75

CPU% - Cpu Percentage Usage.

MEM USAGE / LIMIT – Memory used and Allocated Memory

MEM % - Percentage of Total Memory Usage

NET IO – Network Traffic

BLOCK IO – Disk Read / Write

PIDS -No of process running.

docker top – Process – level info

```
root@thinkpad-e14-gen-3: /home/mahendrakumar-v/Study/Microservie_App/Microservice_Project/ecommerce-ui# docker top 2a6e37d1d7a3
UID                PID                PPID                C                   TIME              TTY               TIME              CMD
root               202791            202771              2                   00:34             ?                 00:00:16          /usr/java/openjdk-17/bin/java -classpath /usr/share/maven/boot/plexus-c
lassworlds-2.6.0.jar -Dclassworlds.conf=/usr/share/maven/bin/n2.conf -Dnaven.home=/usr/share/maven -Dlibrary.jansi.path=/usr/share/maven/lib/jansi-native -Dnaven.multiModuleProjectDirectory=/app org.codehaus.ple
xus.classworlds.launcher.Launcher spring-boot:run
root               202956            202791              0                   00:34             ?                 00:00:03          /usr/java/openjdk-17/bin/java -XX:TieredStopAtLevel=1 -cp /app/target/c
lasses:/root/.m2/repository/org/springframework/boot/spring-boot/3.2.3/spring-boot-3.2.3.jar:/root/.m2/repository/org/springframework/boot/spring-boot-autoconfigure/3.2.3/spring-boot-autoconfigure-3.2.3.jar:/roo
t/.m2/repository/ch/qos/logback/logback-classic/1.4.14/logback-classic-1.4.14.jar:/root/.m2/repository/ch/qos/logback/logback-core/1.4.14/logback-core-1.4.14.jar:/root/.m2/repository/org/apache/logging/log4j/log
4j-to-slf4j/2.21.1/log4j-to-slf4j-2.21.1.jar:/root/.m2/repository/org/apache/logging/log4j/log4j-api/2.21.1/log4j-api-2.21.1.jar:/root/.m2/repository/org/slf4j/jul-to-slf4j/2.0.12/jul-to-slf4j-2.0.12.jar:/root/.
m2/repository/jakarta/annotation/jakarta.annotation-api/2.1.1/jakarta.annotation-api-2.1.1.jar:/root/.m2/repository/org/yanl/snakeyaml/2.2/snakeyaml-2.2.jar:/root/.m2/repository/com/fasterxml/jackson/core/jackso
n-databind/2.15.4/jackson-databind-2.15.4.jar:/root/.m2/repository/com/fasterxml/jackson/core/jackson-annotations/2.15.4/jackson-annotations-2.15.4.jar:/root/.m2/repository/com/fasterxml/jackson/core/jackson-cor
e/2.15.4/jackson-core-2.15.4.jar:/root/.m2/repository/com/fasterxml/jackson/datatype/jackson-datatype-jdk8/2.15.4/jackson-datatype-jdk8-2.15.4.jar:/root/.m2/repository/com/fasterxml/jackson/datatype/jackson-data
type-jsr310/2.15.4/jackson-datatype-jsr310-2.15.4.jar:/root/.m2/repository/com/fasterxml/jackson/module/jackson-module-parameter-names/2.15.4/jackson-module-parameter-names-2.15.4.jar:/root/.m2/repository/org/ap
ache/tomcat/embed/tomcat-embed-core/10.1.19/tomcat-embed-core-10.1.19.jar:/root/.m2/repository/org/apache/tomcat/embed/tomcat-embed-el/10.1.19/tomcat-embed-el-10.1.19.jar:/root/.m2/repository/org/apache/tomcat/e
mbed/tomcat-embed-websocket/10.1.19/tomcat-embed-websocket-10.1.19.jar:/root/.m2/repository/org/springframework/spring-web/6.1.4/spring-web-6.1.4.jar:/root/.m2/repository/org/springframework/spring-beans/6.1.4/s
pring-beans-6.1.4.jar:/root/.m2/repository/io/micrometer/micrometer-observation/1.12.3/micrometer-observation-1.12.3.jar:/root/.m2/repository/io/micrometer/micrometer-commons/1.12.3/micrometer-commons-1.12.3.jar
:/root/.m2/repository/org/springframework/spring-webmvc/6.1.4/spring-webmvc-6.1.4.jar:/root/.m2/repository/org/springframework/spring-aop/6.1.4/spring-aop-6.1.4.jar:/root/.m2/repository/org/springframework/sprin
g-context/6.1.4/spring-context-6.1.4.jar:/root/.m2/repository/org/springframework/spring-expression/6.1.4/spring-expression-6.1.4.jar:/root/.m2/repository/org/slf4j/slf4j-api/2.0.12/slf4j-api-2.0.12.jar:/root/.m
2/repository/org/springframework/spring-core/6.1.4/spring-core-6.1.4.jar:/root/.m2/repository/org/springframework/spring-jcl/6.1.4/spring-jcl-6.1.4.jar con.ltp.ordermanagement.OrderManagementApplication
```

9. How will you reduce your size of the docker image?

You can Optimize your docker image size that improve performace, Deployment speed, and Security.

1> Use minimal base image

FROM alpine:latest

2> Use multi stage docker build.

Stage 1: Build

FROM node:18-alpine AS builder

WORKDIR /app

COPY package.json package-lock.json ./

RUN npm install

COPY . .

RUN npm run build

Stage 2: Production Image (only final build artifacts)

FROM node:18-alpine

WORKDIR /app

COPY --from=builder /app/dist ./dist

COPY --from=builder /app/node_modules ./node_modules

CMD ["node", "dist/index.js"]

3> Minimize layer by combining commands.

RUN apt-get update && \

apt-get install -y curl vim && \

apt-get clean && rm -rf /var/lib/apt/lists/*

4> Remove unnessary files

.dockerignore file to execute unnessary files.

node_modules

.git

*.log

.env

Dockerfile

5> Use `--no-cache` and remove unused package.

Docker build `--no-cache -t myimage .`

RUN `apk add --no-cache curl && rm -rf /var/cache/apk/*` - After installing Dependencies remove unnecessary files.

6> Use minimal Dependencies

FROM scratch

COPY myapp /myapp

CMD ["/myapp"]

7> Use `docker image prune` – used to clear unused images, containers, Volumes, Networks.

`docker system prune -a`

10. How will you secure your docker images & containers?

We can secure our `docker images` and `container` is critical to prevent

Vulnerabilities

Unauthorized access

Malicious attack

Secure your docker images:

Use official and Trusted images : Pull images from the trusted source (Docker hub, Verified Repo)

`docker trust inspect --pretty <image>` : Check image signature before using them.


```

root@thinkpad-e14-gen-3: /home/mahendrakumar-v/Study/Microservie App/Microservice Project/ecommerce-ui# docker trust inspect --pretty httpd
time="2025-03-22T01:03:19+05:30" level=warning msg="certificate with CN docker.io/library/httpd is near expiry"
time="2025-03-22T01:03:23+05:30" level=warning msg="certificate with CN docker.io/library/httpd is near expiry"
time="2025-03-22T01:03:23+05:30" level=warning msg="certificate with CN docker.io/library/httpd is near expiry"
time="2025-03-22T01:03:24+05:30" level=warning msg="certificate with CN docker.io/library/httpd is near expiry"
time="2025-03-22T01:03:24+05:30" level=warning msg="certificate with CN docker.io/library/httpd is near expiry"

Signatures for httpd

SIGNED TAG      DIGEST
2
2-alpine        391a8eb0c1ed464163da46099606a5ec293705118f3054d6c60f5957e2485bd0
2-alpine3.13    4aec2953509e2d3aa5a8d73c580a381be44803fd2481875b15d9ad7d2810d7ca
2-alpine3.14    b0fca692af92787bfd21ccaad1e5b7bea723ca4009dda4eb8018101b9c47cad2
2-alpine3.15    c9bc2ff8e47b7a8cd60c9790eac5e16a847c55c3398862a4f5a1e6116a9748c2
2-alpine3.16    4eb4177b9245c686696dd8120c79cd64b7632b27d890db4cad3b0e844ed737af
2-alpine3.17    4658c554fe215c8a17d57adbd9f8595e4922abda40d1e67a276456d2f142400e
2-alpine3.18    03c154f29d68648c335a19c8bfca1562251bc8af534e10c6f87361551c381d21
2-alpine3.19    b0fc22603ede0b405bbb5ed6d87acae61ebab28d2aca894488b2b0ad6d3edfab
2-alpine3.20    68f6f714169b70ca33126c46f60cc802eb602c6435f4ebf08349d871d500d3e70
2-alpine3.21    64b5734fbc0fbb8fb995d5cc29a2ff2d86ed4c83df4d4f4d82d183f2a66daed4
2-bookworm      4aec2953509e2d3aa5a8d73c580a381be44803fd2481875b15d9ad7d2810d7ca
2-bullseye      391a8eb0c1ed464163da46099606a5ec293705118f3054d6c60f5957e2485bd0
2-buster        4bdb49b01ab1a7b019410337588f772eebe6ae01d038987aa849fcb798fbf26f
2.2             f03a63735d3653045a3b1f5490367415e9534d8abfe0b21252454dc85ca09800
2.2-alpine      9784d70c8ea466fabd52b0bc8cde84980324f9612380d22fbad2151df9a430eb
2.2.29          b2d2ae238e35c3a45eb54f2aa4a288b34caa21e0976e6779b6bc85a1fea1097
2.2.31          0a39699d267aaee04382c6b1b4fe2fc30737450f8ed4fabd88eeea13e0a016144
2.2.31-alpine   f31fd1fb2b45b6a4fb90f4644a505262f631a18f83c3acf7d426621b592a1411f
2.2.32          0d0bd21c1ac80e75732ad89a0db4640886431ec443b3f94e7b441fee40ce927
2.2.32-alpine   a28a1a54ee7c4e03249b5eb3fed0c387399ffa5bb422ab50cbb19ffde76e58e7
2.2.34          274130e43cfb7b54423a4a56af3f6fdec60e2d0dee5cbe1058fb31809d588839
2.2.34-alpine   9784d70c8ea466fabd52b0bc8cde84980324f9612380d22fbad2151df9a430eb
2.4             b2d2ae238e35c3a45eb54f2aa4a288b34caa21e0976e6779b6bc85a1fea1097
2.4-alpine      391a8eb0c1ed464163da46099606a5ec293705118f3054d6c60f5957e2485bd0
2.4-alpine3.13  4aec2953509e2d3aa5a8d73c580a381be44803fd2481875b15d9ad7d2810d7ca
2.4-alpine3.14  b0fca692af92787bfd21ccaad1e5b7bea723ca4009dda4eb8018101b9c47cad2
2.4-alpine3.15  c9bc2ff8e47b7a8cd60c9790eac5e16a847c55c3398862a4f5a1e6116a9748c2
2.4-alpine3.16  4eb4177b9245c686696dd8120c79cd64b7632b27d890db4cad3b0e844ed737af
2.4-alpine3.17  4658c554fe215c8a17d57adbd9f8595e4922abda40d1e67a276456d2f142400e
2.4-alpine3.18  03c154f29d68648c335a19c8bfca1562251bc8af534e10c6f87361551c381d21
2.4-alpine3.19  b0fc22603ede0b405bbb5ed6d87acae61ebab28d2aca894488b2b0ad6d3edfab
2.4-alpine3.20  68f6f714169b70ca33126c46f60cc802eb602c6435f4ebf08349d871d500d3e70
2.4-alpine3.21  64b5734fbc0fbb8fb995d5cc29a2ff2d86ed4c83df4d4f4d82d183f2a66daed4
2.4-bookworm    4aec2953509e2d3aa5a8d73c580a381be44803fd2481875b15d9ad7d2810d7ca
2.4-bullseye    391a8eb0c1ed464163da46099606a5ec293705118f3054d6c60f5957e2485bd0
2.4-buster      4bdb49b01ab1a7b019410337588f772eebe6ae01d038987aa849fcb798fbf26f
2.4.10          f03a63735d3653045a3b1f5490367415e9534d8abfe0b21252454dc85ca09800
2.4.12          8efedc9b862c9615c2c411f8e8426e011706233b3c613ba8a357006b835e33a
2.4.16          6754b079c30820fb7d185defd5a7cc730385591eb95b1edbc2389f7e73b52
2.4.17          c255ac3661a472b54e10bf02bb4c490c00c29d0979357fb82fb6f7bb9788999
2.4.18          ff734d5b9bfc1d33936211a9564e1811665ee9487d7ab38732ae38180dd613b9
2.4.20          bcfceef8e6942a96c0b1ee9c2f1aaaca9c5d0f9d261ed48dff50f41ad31e1ac
2.4.20          ba28a514d23e9e77e2e46a6e0ab0c88d9b43b7fe85388ff3d9a528d7742347eb

```

Avoid using :Latest tag as it may introduce **unexpected updates**.

You can use insted of latest **FROM nagios:1.21-alpine**

Scan docker images for **vulnerability**:

trivy image <Image name>

root@thinkpad-e14-gen-3:/home/mahendrakumar-v/Study/Microservie App/Microservice Project/ecommerce-ui# trivy image order-management

```

root@thinkpad-e14-gen-3:/home/mahendrakumar-v/Study/Microservie App/Microservice Project/ecommerce-ui# trivy image order-management
2025-03-22T01:00:48+05:30 INFO Need to update DB
2025-03-22T01:00:48+05:30 INFO Downloading DB... repository="ghcr.io/aquasecurity/trivy-db:2"
61.21 MiB / 61.21 MiB [-----] 100.00% 4.27 MiB p/s 15s
2025-03-22T01:01:14+05:30 INFO Vulnerability scanning is enabled
2025-03-22T01:01:14+05:30 INFO Secret scanning is enabled
2025-03-22T01:01:14+05:30 INFO If your scanning is slow, please try '--scanners vuln' to disable secret scanning
2025-03-22T01:01:14+05:30 INFO Please see also https://aquasecurity.github.io/trivy/v0.52/docs/scanner/secret/#recommendation for faster secret detection
2025-03-22T01:01:17+05:30 FATAL Fatal error image scan error: scan error: unable to initialize a scanner: unable to find the specified image "order-management"
in ["docker": "containerd": "podman": "remote"]: 4 errors occurred:
* docker error: unable to inspect the image (order-management): permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Get "http://%2Fvar%2Frun%2Fdocker.sock/v1.45/images/order-management/json": dial unix /var/run/docker.sock: connect: permission denied
* containerd error: failed to parse image reference: order-management
* podman error: unable to initialize Podman client: no podman socket found: stat /run/user/0/snap.trivy/podman/podman.sock: no such file or directory
* remote error: GET https://index.docker.io/v2/library/order-management/manifests/latest: UNAUTHORIZED: authentication required; [map[action:pull Class: Name:library/order-management Type:repository]]

```

Remove Sensitive data from the image:

✗ Bad Example: Storing Secrets in Image

RUN echo "DB_PASSWORD=SuperSecret" > /app/config.env

✓ Secure Alternative: Use ENV variables at runtime

ENV DB_PASSWORD=\${DB_PASSWORD}

Secure your docker container

Use least privilege principle (--user flag)

In Docker file

RUN adduser -D myuser

USER myuser

docker run --user 1001 -d order-management

```
root@thinkpad-e14-gen-3:/home/mahendrakumar-v/Study/Microservie_App/Microservice_Project/eCommerce-ui# docker run --user 1001 -d order-management
71343d0833c33c91173e4724ecfd53ae1ed21b7a9e01dbc93510e1e147b0d58d
root@thinkpad-e14-gen-3:/home/mahendrakumar-v/Study/Microservie_App/Microservice_Project/eCommerce-ui# docker ps
CONTAINER ID   IMAGE          COMMAND                  CREATED        STATUS        PORTS                               NAMES
2ae37d1d7a3   order-management  "/usr/local/bin/mvn-..." 45 minutes ago Up 45 minutes 0.0.0.0:32768->9090/tcp, [::]:32768->9090/tcp  Expose3
8fd447b1c3   order-management  "docker-entrypoint.s..." 51 minutes ago Up 51 minutes 0.0.0.0:4001->4001/tcp, [::]:4001->4001/tcp  Expose2
20195c6d5396   ecommerce-ui     "docker-entrypoint.s..." 6 weeks ago   Up 15 hours   0.0.0.0:4000->4000/tcp, [::]:4000->4000/tcp  ecommerce-ui2
def33cf22b4e   product-inventory  "python3 inventory_a..." 6 weeks ago   Up 15 hours   0.0.0.0:3002->3002/tcp, [::]:3002->3002/tcp  product-inventory2
ccc840f8d96d   product-catalog  "docker-entrypoint.s..." 6 weeks ago   Up 15 hours   0.0.0.0:3001->3001/tcp, [::]:3001->3001/tcp  product-catalog2
b33cd333983e   contact-support-team  "python3 server.py"      6 weeks ago   Up 15 hours   0.0.0.0:8000->8000/tcp, [::]:8000->8000/tcp  contact-support-team2
4a6f6b2d075   order-management  "/usr/local/bin/mvn-..." 6 weeks ago   Up 15 hours   0.0.0.0:9090->9090/tcp, [::]:9090->9090/tcp  order-management2
34fda9042b7c   profile-management  "docker-entrypoint.s..." 6 weeks ago   Up 15 hours   0.0.0.0:3003->3003/tcp, [::]:3003->3003/tcp  profile-management2
95ae27901561   mysql:5.7        "docker-entrypoint.s..." 7 months ago   Restarting (1) 46 seconds ago 0.0.0.0:3003->3003/tcp, [::]:3003->3003/tcp  mysql
```

root@thinkpad-e14-gen-3:/home/mahendrakumar-

v/Study/Microservie_App/Microservice_Project/eCommerce-ui# docker inspect

71343d0833c33c91173e4724ecfd53ae1ed21b7a9e01dbc93510e1e147b0d58d | grep -i "user"

```
    "IPPrefixLen": 0,
    "IPv6Gateway": "",
    "GlobalIPv6Address": "",
    "GlobalIPv6PrefixLen": 0,
    "DNSNames": null
  }
}
}
}
root@thinkpad-e14-gen-3:/home/mahendrakumar-v/Study/Microservie_App/Microservice_Project/eCommerce-ui# docker inspect 71343d0833c33c91173e4724ecfd53ae1ed21b7a9e01dbc93510e1e147b0d58d | grep -i "user"
  "UserMode": "",
  "User": "1001",
```

Disable privileged mode:

docker run --privileged=false order-management

```
root@thinkpad-e14-gen-3:/home/mahendrakumar-v/Study/Microservie_App/Microservice_Project/eCommerce-ui# docker inspect 71343d0833c33c91173e4724ecfd53ae1ed21b7a9e01dbc93510e1e147b0d58d | grep -i "priv"
  "Privileged": false,
```

Use read only file system:

docker run --read-only -d order-management

```
root@thinkpad-e14-gen-3:/home/mahendrakumar-v/Study/Microservie_App/Microservice_Project/eCommerce-ui# docker inspect 71343d0833c33c91173e4724ecfd53ae1ed21b7a9e01dbc93510e1e147b0d58d | grep -i "read"
  "OomScoreAdj": 0,
  "ReadOnlyRootfs": false,
  "BlkioDeviceReadBps": [],
  "BlkioDeviceReadIOps": [],
  "ReadOnlyPaths": [
```

11. Explain some security practices for your docker images and containers?

We can secure our docker images and container is critical to prevent

Vulnerabilities

Un authorized access

Malicious attack

Secure your docker images:

Use official and Trusted images : Pull images from the trusted source (Docker hub, Verified Repo)

docker trust inspect --pretty <image> : Check image signature before using them.

```
root@thinkpad-e14-gen-3:/home/mahendrakumar-v/Study/Microservie_App/Microservice_Project/ecommerce-ui# docker trust inspect --pretty httpd
time="2025-03-22T01:03:19+05:30" level=warning msg="certificate with CN docker.io/library/httpd is near expiry"
time="2025-03-22T01:03:23+05:30" level=warning msg="certificate with CN docker.io/library/httpd is near expiry"
time="2025-03-22T01:03:23+05:30" level=warning msg="certificate with CN docker.io/library/httpd is near expiry"
time="2025-03-22T01:03:24+05:30" level=warning msg="certificate with CN docker.io/library/httpd is near expiry"
time="2025-03-22T01:03:24+05:30" level=warning msg="certificate with CN docker.io/library/httpd is near expiry"

Signatures for httpd

SIGNED TAG          DIGEST                                SIGNERS
2                   391a8eb0c1ed464163da46099606a5ec293705118f3054d6c60f5957e2485bd0 (Repo Admin)
2-alpine            4aec2953509e2d3aa5a8d73c580a381be44803fd2481875b15d9ad7d2810d7ca (Repo Admin)
2-alpine3.13        b0fca692af92787bfd21ccaad1e5b7bea723ca4009dda4eb8018101b9c47cad2 (Repo Admin)
2-alpine3.14        c9bc2ff8e47b7a8cd60c9790eac5e16a847c55c3398862a4f5a1e6116a9748c2 (Repo Admin)
2-alpine3.15        4eb4177b9245c686696dd8120c79cd64b7632b27d890db4cad3b0e844ed737af (Repo Admin)
2-alpine3.16        4658c554fe215c8a17d57adb9f8595e4922abda40d1e67a276456d2f142400e (Repo Admin)
2-alpine3.17        03c154f29d68648c335a19c8bfca1562251bc8af534e10c6f87361551c381d21 (Repo Admin)
2-alpine3.18        b0fc22603ede0b405bbb5edd6d87acae61ebab28d2aca894488b2b0ad6d3edfab (Repo Admin)
2-alpine3.19        68f6714169b70ca33126c46f60cc802eb602c6435f4ebf08349d871d500d3e70 (Repo Admin)
2-alpine3.20        b64b5734fbc0fb8bf995d5cc29a2ff2d86ed4c83df4d4f4d82d183f2a66daed4 (Repo Admin)
2-alpine3.21        4aec2953509e2d3aa5a8d73c580a381be44803fd2481875b15d9ad7d2810d7ca (Repo Admin)
2-bookworm          391a8eb0c1ed464163da46099606a5ec293705118f3054d6c60f5957e2485bd0 (Repo Admin)
2-bullseye          4dbd49b01ab1a7b19410337588f772eeb6eae0d038987aa849fcb798fbf26f (Repo Admin)
2-buster            f03a63735d3653045a3b1f5490367415e9534d8abfe0b21252454dc85ca09800 (Repo Admin)
2.2                 9784d70c8ea466fabd52b0bc8cde84980324f9612380d22fbad2151df9a430eb (Repo Admin)
2.2-alpine          b2dbea238e35c3a45eb54f2aa4a288b34caa21e0976e6779b6bc85a1fea1097 (Repo Admin)
2.2.29              0a39699d267a4ee04382c6b1b4fe2fc30737450f8ed4fabd88eeea1a3e0016144 (Repo Admin)
2.2.31              f3f1dfb245b6a4fb90f4644a505262f631a18f83c3acf7d426621b592a1411f (Repo Admin)
2.2.31-alpine       d0d0bd21c1ac80e75732ad89a0db4640886431ecd443b3f94e7b441fee40ce927 (Repo Admin)
2.2.32              a28a1a54ee7c4e03249b5eb3fed0c387399ffa5bb422ab50cbb19ffde76e58e7 (Repo Admin)
2.2.32-alpine       274130e43cfb7b54423a4a56af3f6fdec60e2d0dee5cbe1058fb31809d588839 (Repo Admin)
2.2.34              9784d70c8ea466fabd52b0bc8cde84980324f9612380d22fbad2151df9a430eb (Repo Admin)
2.2.34-alpine       b2dbea238e35c3a45eb54f2aa4a288b34caa21e0976e6779b6bc85a1fea1097 (Repo Admin)
2.4                 391a8eb0c1ed464163da46099606a5ec293705118f3054d6c60f5957e2485bd0 (Repo Admin)
2.4-alpine          4aec2953509e2d3aa5a8d73c580a381be44803fd2481875b15d9ad7d2810d7ca (Repo Admin)
2.4-alpine3.13      b0fca692af92787bfd21ccaad1e5b7bea723ca4009dda4eb8018101b9c47cad2 (Repo Admin)
2.4-alpine3.14      c9bc2ff8e47b7a8cd60c9790eac5e16a847c55c3398862a4f5a1e6116a9748c2 (Repo Admin)
2.4-alpine3.15      4eb4177b9245c686696dd8120c79cd64b7632b27d890db4cad3b0e844ed737af (Repo Admin)
2.4-alpine3.16      4658c554fe215c8a17d57adb9f8595e4922abda40d1e67a276456d2f142400e (Repo Admin)
2.4-alpine3.17      03c154f29d68648c335a19c8bfca1562251bc8af534e10c6f87361551c381d21 (Repo Admin)
2.4-alpine3.18      b0fc22603ede0b405bbb5edd6d87acae61ebab28d2aca894488b2b0ad6d3edfab (Repo Admin)
2.4-alpine3.19      68f6714169b70ca33126c46f60cc802eb602c6435f4ebf08349d871d500d3e70 (Repo Admin)
2.4-alpine3.20      b64b5734fbc0fb8bf995d5cc29a2ff2d86ed4c83df4d4f4d82d183f2a66daed4 (Repo Admin)
2.4-alpine3.21      4aec2953509e2d3aa5a8d73c580a381be44803fd2481875b15d9ad7d2810d7ca (Repo Admin)
2.4-bookworm        391a8eb0c1ed464163da46099606a5ec293705118f3054d6c60f5957e2485bd0 (Repo Admin)
2.4-bullseye        4dbd49b01ab1a7b19410337588f772eeb6eae0d038987aa849fcb798fbf26f (Repo Admin)
2.4-buster          f03a63735d3653045a3b1f5490367415e9534d8abfe0b21252454dc85ca09800 (Repo Admin)
2.4.10              8efedca98b62c9615c2c411f8e8426e011706233b3c613ba8a357006b835e33a (Repo Admin)
2.4.12              6d54b079cb30820fb7d185defd5a7cc730385591eb95b1edbcdd2389f7e73b52 (Repo Admin)
2.4.16              c725ac3661a472b54e10bfb02bb4c490c00c29d0979357fb82fb6f7bb9788999 (Repo Admin)
2.4.17              ff734d5b9bfc1d33936211a9564e1811665ee9487d7ab38732ae38180dd613b9 (Repo Admin)
2.4.18              bcfcee1f86942a96c0b1ee9c2f1aaaca9c5d0f9d261ed48dff50f41ad31e1ac (Repo Admin)
2.4.20              ba28a514d23e977e2e40a6e0ab0c88d9b43b7fe85388ff3d9a528d7742347eb (Repo Admin)
```

Avoid using :latest tag as it may introduce unexpected updates.

You can use insted of latest FROM nagios:1.21-alpine

Scan docker images for vulnerability:

trivy image <Image name>

root@thinkpad-e14-gen-3:/home/mahendrakumar-v/Study/Microservie_App/Microservice_Project/ecommerce-ui# trivy image order-management

```
root@thinkpad-e14-gen-3:/home/mahendrakumar-v/Study/Microservie_App/Microservice_Project/ecommerce-ui# trivy image order-management
2025-03-22T01:00:48+05:30 INFO Need to update DB
2025-03-22T01:00:48+05:30 INFO Downloading DB... repository="ghcr.io/aquasecurity/trivy-db:2"
61.21 MiB / 61.21 MiB [-----] 100.00% 4.27 MiB p/s 15s
2025-03-22T01:01:14+05:30 INFO Vulnerability scanning is enabled
2025-03-22T01:01:14+05:30 INFO Secret scanning is enabled
2025-03-22T01:01:14+05:30 INFO If your scanning is slow, please try '--scanners vuln' to disable secret scanning
2025-03-22T01:01:14+05:30 INFO Please see also https://aquasecurity.github.io/trivy/v0.52/docs/scanner/secret/#recommendation for faster secret detection
2025-03-22T01:01:17+05:30 FATAL Fatal error image scan error: scan error: unable to initialize a scanner: unable to initialize an image scanner: unable to find the specified image "order-management"
in ["docker": "containerd": "podman": "remote"]: 4 errors occurred:
* docker error: unable to inspect the image (order-management): permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Get "http://%2Fvar%2Frun%2Fdocker.sock/v1.45/images/order-management/json": dial unix /var/run/docker.sock: connect: permission denied
* containerd error: failed to parse image reference: order-management
* podman error: unable to initialize Podman client: no podman socket found: stat /run/user/0/snap.trivy/podman/podman.sock: no such file or directory
* remote error: GET https://index.docker.io/v2/library/order-management/manifests/latest: UNAUTHORIZED: authentication required; [map(Action:pull Class: Name:library/order-management Type:repository)]
```

Remove Sensitive data from the image:

❌ Bad Example: Storing Secrets in Image

RUN echo "DB_PASSWORD=SuperSecret" > /app/config.env

✅ Secure Alternative: Use ENV variables at runtime

ENV DB_PASSWORD=\${DB_PASSWORD}

Secure your docker container

Use least privilege principle (--user flag)

In Docker file

```
RUN adduser -D myuser
```

USER myuser

```
docker run --user 1001 -d order-management
```

```
root@thinkpad-e4-gen-31:/home/maheन्द्रnarayan-vjudy/Microservice_App/Microservice_Project/ecommerce-uW# docker run --user 1001 -d order-management
1f34d0083c33c91173742c6fd53ae12b7a9e0bd1267479e0db0580
root@thinkpad-e4-gen-31:/home/maheन्द्रnarayan-vjudy/Microservice_App/Microservice_Project/ecommerce-uW# docker ps
CONTAINER ID        IMAGE               COMMAND                  CREATED              STATUS              PORTS              NAMES
2ae637f01d7a3      order-management   /usr/local/bin/nvm-... 45 minutes ago      Up 45 minutes      0.0.0.0:32768->9090/tcp, [::]:32768->9090/tcp   Expose3
8bfd4a7bf1c3      order-management   /usr/local/bin/nvm-... 51 minutes ago      Up 51 minutes      0.0.0.0:4001->4001/tcp, [::]:4001->4001/tcp, 9090/tcp   Expose2
c331001016d7       product-inventory  python3 inventory.s... 6 weeks ago         Up 15 hours        0.0.0.0:8000->8000/tcp, [::]:8000->8000/tcp           product-ex-ut2
fe8f5c3f22b4e     product-inventory  python3 inventory.s... 6 weeks ago         Up 15 hours        0.0.0.0:3002->3002/tcp, [::]:3002->3002/tcp           product-inventory2
cc340f8fd9ed      product-catalog    "docker-entryptool.s... 6 weeks ago         Up 15 hours        0.0.0.0:3001->3001/tcp, [::]:3001->3001/tcp           product-catalog2
bccc48339983e     contact-support-team "python3 server.py"    6 weeks ago         Up 15 hours        0.0.0.0:8000->8000/tcp, [::]:8000->8000/tcp           contact-support-team2
74961961d7         order-management   /usr/local/bin/nvm-... 15 minutes ago      Up 15 minutes      0.0.0.0:8080->8080/tcp, [::]:8080->8080/tcp           order-managemen2
4fd4a924b7c       profile-managemen  "docker-entryptool.s... 6 weeks ago         Up 15 hours        0.0.0.0:3003->3003/tcp, [::]:3003->3003/tcp           profile-managemen2
95ae279015e1      mysql:5.7          "docker-entryptool.s... 7 months ago        Restarting (1) 46 seconds ago                        mysql
```

root@thinkpad-e14-gen-3:/home/mahendrakumar-

```
v/Study/Microservie_App/Microservice_Project/ecommerce-ui# docker inspect
```

```
71343d0833c33c91173e4724ecfd53ae1ed21b7a9e01dbc93510e1e147b0d58d | grep -i "user"
```

```

    "IPPrefixLen": 0,
    "IPv6Gateway": "",
    "GlobalIPv6Address": "",
    "GlobalIPv6PrefixLen": 0,
    "DNSNames": null
  }
}
}
}
root@thinkpad-e14-gen-3:/home/nahendrakumar-v/Study/Microservice_App/Microservice_Project/eCommerce-UAT# docker inspect 71343d0833c3c91173e4724ecfd53ae1ed21b7a9e01dbc93510e147bd58d | grep -i "user"
      "UsersNode": "",
      "User": "1001"

```

Disable privileged mode:

```
docker run --privileged=false order-management
```

```
root@thinkpad-e14-gen-3:/home/mahendrakumar-v/Study/Microservice_App/Microservice_Project/ecommerce-ui# docker inspect 71343d0833c33c91173e4724ecfd53ae1ed21b7a9e01dbc93510e1e147b0d58d | grep -i "privi"
  "Privileged": false,
```

Use read only file system:

```
docker run --read-only -d order-management
```

```
root@thinkpad-e14-gen-3: /home/mahendrakumar-v/Study/Microservice_App/Microservice_Project/eCommerce-ui# docker inspect 71343d0833c33c91173e4724ecfd53ae1ed21b7a9e01dbc93510e1e47b0d58d | grep -i "read"
```

12. How will you Monitor your docker container in Production?

Monitoring docker container in production is critical for ensuring performance, Stability and security.

You need to track CPU Usage, Memory, Disk io, Network traffic, logs.

Built in Command:

```
docker ps
```

```
root@thinkpad-e14-gen-3: /home/mahendrakumar-v/Study/Microservice App/Microservice Project/e-commerce-ui# docker ps
```

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS	NAMES
02195c6c5396	order-management	"/usr/local/bin/wmv..."	2 hours ago	Up 2 hours	0.0.0.0:32768->9990/tcp, :::32768->9990/tcp	Expose3
8fd474bf71c3	order-management	"/usr/local/bin/wmv..."	2 hours ago	Up 2 hours	0.0.0.0:4061->4061/tcp, :::4061->4061/tcp, 9990/tcp	Expose2
e1959c6c5396	e-commerce-ui	"docker-entrypoint.s..."	6 weeks ago	Up 16 hours	0.0.0.0:4000->4000/tcp, :::4000->4000/tcp	e-commerce-ui2
de35cc32b24e	product-inventory	"python3 inventory.a..."	6 weeks ago	Up 16 hours	0.0.0.0:3082->3082/tcp, :::3082->3082/tcp	product-inventory2
02195c6c5396	product-inventory	"python3 inventory.a..."	6 weeks ago	Up 16 hours	0.0.0.0:3001->3001/tcp, :::3001->3001/tcp	product-inventory
b33cd33983e	contact-support-team	"python3 server.py..."	6 weeks ago	Up 16 hours	0.0.0.0:8080->8080/tcp, :::8080->8080/tcp	contact-support-team2
4a6f66b2d75	order-management	"/usr/local/bin/wmv..."	6 weeks ago	Up 16 hours	0.0.0.0:9990->9990/tcp, :::9990->9990/tcp	order-management2
4a6f66b2d75	order-management	"docker-entrypoint.s..."	6 weeks ago	Up 16 hours	0.0.0.0:3003->3003/tcp, :::3003->3003/tcp	profile-management2
68b07b1bnsd	mysql	"docker-entrypoint.s..."	7 months ago	Restarting (1) 54 seconds ago		mysql

Monitor Real time CPU and Memory:

```
docker stats
```

CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIIDS
2ae0e37d1d7a3	Expose3	0.18%	391.4MiB / 14.4GiB	2.64%	51.7MB / 1.05MB	1.67MB / 75.2MB	75
8df4a7b7fc13	Expose2	0.19%	442MB / 14.4GiB	2.99%	51.7MB / 1.1MB	30MB / 72.7MB	75
20195ec65396	e-commerce-u2	0.00%	14.76MiB / 14.4GiB	0.10%	659KB / 397KB	14.72MB / 0B	11
def35cf2b24e	product-inventory2	0.01%	9.61MiB / 14.4GiB	0.13%	658KB / 0B	20.5MB / 0B	1
ecc840f8d96d	product-catalog2	0.00%	10.59MiB / 14.4GiB	0.07%	658KB / 0B	7.64MB / 0B	7
3b3cd333983e	contact-support-team2	0.01%	19.56MiB / 14.4GiB	0.13%	656KB / 0B	19.5MB / 0B	1
4a6f60b2d075	order-management2	0.20%	349.8MiB / 14.4GiB	2.36%	656KB / 0B	92.1MB / 98.9MB	70
34fd9942b7c7	profile-management2	0.00%	12.54MiB / 14.4GiB	0.08%	658KB / 0B	25.5MB / 0B	7
5ae2790150a1	mysql	0.00%	0B / 0B	0.00%	0B / 0B	0B / 0B	0

```
docker logs -f <Container name>
```

[illegible]

```
docker inspect <Container name>
```

```
root@thinkpad-e14-gen-3:/home/nahandrakurav-v/StudyMicroservice/App/Microservice/uia_docker inspect 2a6e37d1d7a3a3f3c7b1c33b92821f0da32b5bc8bac68a22c74f994a0953f"
{
  "Id": "2a6e37d1d7a3a3f3c7b1c33b92821f0da32b5bc8bac68a22c74f994a0953f",
  "Created": "2025-03-21T19:03:59.066017569Z",
  "Path": "/usr/local/bin/mvn-entrypoint.sh",
  "Args": [
    "mvn",
    "spring-boot:run"
  ],
  "State": {
    "Status": "running",
    "Running": true,
    "Paused": false,
    "Restarting": false,
    "OOMKilled": false,
    "Dead": false,
    "Pid": 202793,
    "ExitCode": 0,
    "Error": "",
    "StartedAt": "2025-03-21T19:04:00.06928638Z",
    "FinishedAt": "0001-01-01T00:00:00Z"
  },
  "Image": "sha256:9873b79145c11dbcf2106794a3425e8f82fe50b9182209205acdcc5efa8f6ad",
  "ResolvConfPath": "/var/lib/docker/containers/2a6e37d1d7a3a3f3c7b1c33b92821f0da32b5bc8bac68a22c74f994a0953f/resolv.conf",
  "HostnamePath": "/var/lib/docker/containers/2a6e37d1d7a3a3f3c7b1c33b92821f0da32b5bc8bac68a22c74f994a0953f/hostname",
  "HostsPath": "/var/lib/docker/containers/2a6e37d1d7a3a3f3c7b1c33b92821f0da32b5bc8bac68a22c74f994a0953f/hosts",
  "LogPath": "/var/lib/docker/containers/2a6e37d1d7a3a3f3c7b1c33b92821f0da32b5bc8bac68a22c74f994a0953f/2a6e37d1d7a3a3f3c7b1c33b92821f0da32b5bc8bac68a22c74f994a0953f-json.log",
  "Name": "/Expose",
  "RestartCount": 0,
  "Driver": "overlay2",
  "Platform": "linux",
  "MountLabel": "",
  "ProcessLabel": "",
  "AppArmorProfile": "docker-default",
  "ExecIDs": null,
  "HostConfig": {
    "Binds": null,
    "ContainerIDFile": "",
    "LogConfig": {
      "Type": "json-file",
      "Config": {}
    },
    "NetworkMode": "bridge",
    "PortBindings": {},
    "RestartPolicy": {

```

13. What is docker swarm? Diff btw Docker & Docker Swarm?

Docker swarm is a **native cluster tool** – Its used to manage group of containers.

Docker swarm multi node architecture

Docker swarm provide the following:

Docker swarm support load balancing

Docker swarm, Overlay network support

Failover automation

Docker swarm doing **scaling automatically**.

Docker swarm is a **multi host app**.

scalability

High availability

Load Balancing

Support **service discovery** and **rolling Updates**

Docker – Is a core technology to enable the creation of container.

Docker is a **containerize platform**.

Docker is a **single node architecture**.

Docker not **supported load balancing**

Docker support **bridge, None, host, Overlay** networks.

Docker no **failover automate**

Docker need to do **manually scaling**.

Docker is **single host apps**.

14. Diff Btw Docker swarm & Kubernetes?

Docker swarm is a native cluster tool – Its used to manage group of containers.

Docker swarm is a **simpler, Light weight, Container orchestration**.

Managing docker container across a cluster.

Use **manager** and **worker node**, Tasks are distributed across workers.

Built in load balancing.

Manager node replicating **high availability**.

Uses a **Overlay** for Multi container communication.

Manual Scaling using docker service scale.

Supports local and **shared storage**. Limited option.

Docker Swarm **limited logging** with **docker logs**.

Kubernetes is a more complex, powerful and versatile platform for orchestration containers.

Especially for **large scale** cloud native **application**

Kubernetes uses **Master** and **worker nodes**.

Ingress and **extranet** load balancing.

Built in **self healing** with pod **rescheduling** if node is **failed**.

Using Docker **container network interface** with better customization.

Kubernetes auto **scaling** with **horizontal** pod auto scaler based on cpu and memory.

Multi **storage** backend (AWS EBS, NSF, Azure Disk)

Kubernetes integrate with **prometheus**, **grafana**, **ELK Stack** for monitoring and logging.

Kubernetes	Docker
Kubernetes is an ecosystem for managing a cluster of Docker containers known as Pods.	Docker is a container platform for building, configuring and distributing Docker containers.
Kubernetes is not a complete solution and uses custom plugins to extend its functionality.	Docker uses its very own native clustering solution for Docker containers called Docker Swarm.
Load balancing comes out of the box in Kubernetes because of its architecture and it's very convenient	The load balancer is deployed on its own single node swarm when pods in the container are defined as service.
Takes relatively more time for installation.	Setup is quick and easy compared to Kubernetes.

15. When .dockerignore file is used?

A **.dockerignore** file is more over similier to **.gitignore** file.

When creating docker image **.dockerignore** file to **exclude files and directories** from docker build.

Reduce image size: Prevent unnecesary file from being added to the image.

Speed up Builds: Avoid copying large or irrelevant file to docker build.

Improve Security: Keep sensitive files out of the image.

Prevent Unwanted Changes: Avoid Unnessary rebuilds caused by Unchanged files.

Create a **.dockerignore** file in the **same directory** where the docker file available.

```
oot@thinkpad-e14-gen-3:/home/mahendrakumar-v/Study/Microservie App/Microservice_Project/ecommerce-ui# ls -ltrca
total 28
-rw-r--r-- 1 mahendrakumar-v mahendrakumar-v 2768 Jan 10 01:42 README.md
-rwxrwxrwx 1 mahendrakumar-v mahendrakumar-v 772 Jan 10 01:42 Dockerfile
-rwxr-xr-x 3 mahendrakumar-v mahendrakumar-v 4096 Jan 10 01:42 server
-rw-r--r-- 1 mahendrakumar-v mahendrakumar-v 20 Jan 10 01:42 .dockerignore
-rwxr-xr-x 5 mahendrakumar-v mahendrakumar-v 4096 Jan 10 01:42 client
-rwxr-xr-x 4 mahendrakumar-v mahendrakumar-v 4096 Feb 12 11:54 .
-rwxr-xr-x 10 mahendrakumar-v mahendrakumar-v 4096 Mar 5 10:47 ..
oot@thinkpad-e14-gen-3:/home/mahendrakumar-v/Study/Microservie_App/Microservice_Project/ecommerce-ui# cat .dockerignore
Dockerfile
```

All The Best

