Docker Assignment – Assignment 8

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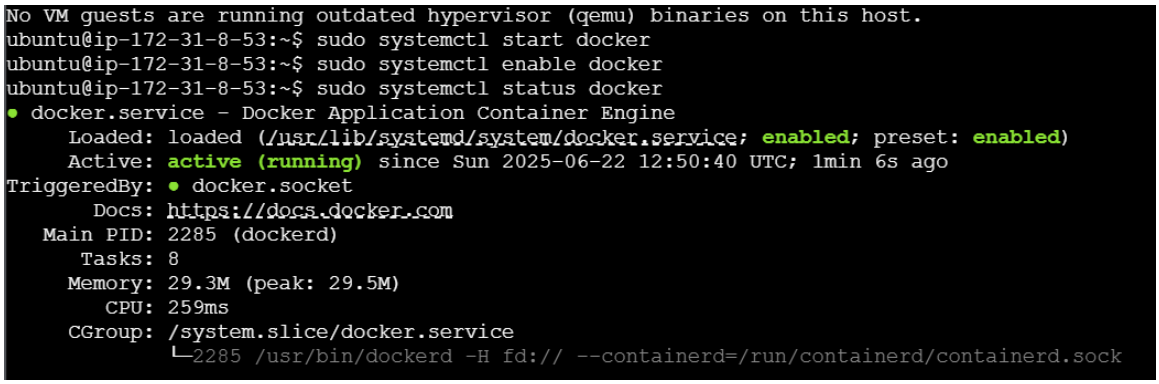
Step-by-Step Docker Instructions

1. Install Docker on Your Local Machine

If you're using **Ubuntu** or an **Ubuntu-based EC2 instance**, run the following:

```
bash
CopyEdit
sudo apt update
sudo apt install docker.io -y
sudo systemctl start docker
sudo systemctl enable docker
sudo systemctl status docker
```

Ensure it shows: `active (running)`.



2. Pull Nginx Image and Run as a Container

Step 1: Pull the image:

```
docker pull nginx
```

Step 2: Run the container:

```
docker run -it -d --name my-nginx -p 80:80 nginx
```

This creates a container named `my-nginx` and maps port 80 of your machine to the container.

☑ 3. Create a Custom Docker Network and Connect Nginx

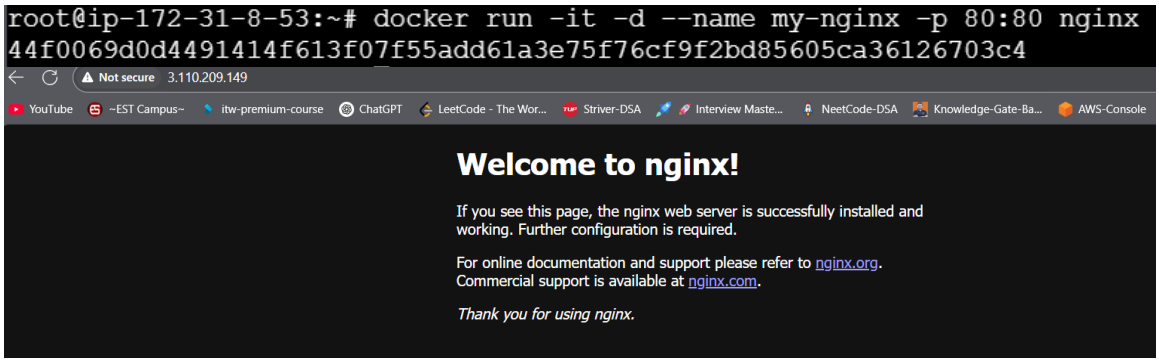
Step 1: Create a bridge network:

```
docker network create my-custom-net
```

Step 2: Connect the container to the network:

```
docker network connect my-custom-net my-nginx
```

Now, `my-nginx` is connected to both the default bridge and custom network.



☑ 4. Verify Network Connection

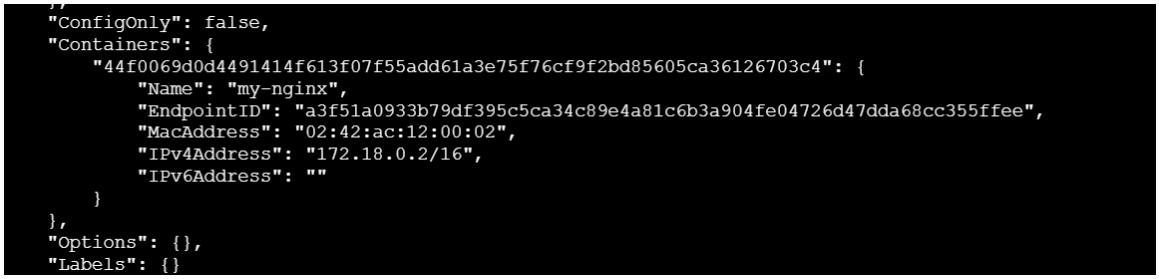
Inspect the custom network:

```
docker network inspect my-custom-net
```

Look for:

- Container ID of `my-nginx`
- Assigned internal IP

```
root@ip-172-31-8-53:~# docker network create my-custom-net
6eac5509b73aa7dd5af0b587c638242301ccb64c8358bbb398e7d2b693976600
root@ip-172-31-8-53:~# docker network connect my-custom-net my-nginx
```



🧠 Docker & Virtualization – Theory

💻 What is a Hypervisor?

A hypervisor allows multiple virtual machines (VMs) to run on a single physical machine. It allocates resources like CPU, memory, and disk.

◇ *Types of Hypervisors:*

Type	Description	Examples
Type 1	Bare-metal (runs on hardware)	VMware ESXi, Hyper-V
Type 2	Runs on OS as app	VirtualBox, VMware Workstation

📦 What is Containerization?

Containerization packages software + dependencies into a container. Unlike VMs, containers share the host OS kernel.

Tool: Docker

🚀 Docker Use Case – Node.js Deployment

🧱 Traditional VM-based Setup:

1. Create VM
2. Install Node.js
3. Place project files
4. Run `npm install`
5. Use Nginx/Apache as reverse proxy

❌ **Problems**: Version mismatch, dependency errors, inconsistent environments.

🐳 Docker-based Node.js Setup:

1. Create a `Dockerfile`
2. Inside Dockerfile:

```
Dockerfile
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FROM node
COPY package.json .
RUN npm install
COPY . .
EXPOSE 3000
CMD ["npm", "start"]
```

✅ **Benefits**:

- Consistent environments
- No manual installs
- Shareable images
- Better resource efficiency

🔧 Docker Installation on Ubuntu EC2

```
sudo su
cd
sudo apt update
```

```
sudo apt install docker.io -y
sudo systemctl start docker
sudo systemctl enable docker
sudo systemctl status docker
```

Running Docker Containers – Nginx Example

```
bash
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docker run -it -d -p 80:80 nginx
```

Detach Mode (-d)

- Runs in background
- Doesn't show logs
- Use for long-running services
- Access logs via:

```
bash
CopyEdit
docker logs <container_id>
```

Managing Containers

Stopping:

```
bash
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docker container ls
docker stop <container_id>
```

Listing:

```
bash
```

```
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docker ps        # Running only
docker ps -a     # All containers
```

❌ Removing:

```
bash
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docker rm <container_id>
```

👥 Allow Non-Root User to Use Docker

```
bash
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sudo su - ubuntu
sudo usermod -aG docker $USER
sudo su
sudo su - ubuntu
docker
```

If no error on running `docker`, the setup is successful.

🐳 Running Multiple Containers

Run Nginx again:

```
docker run -it -d -p 80:80 nginx
```

Run Ubuntu container:

```
docker run -it -d ubuntu
```

Check Containers

```
docker container ls
docker ps -a
```

You should see containers for both `nginx` and `ubuntu`.

Creating a Docker Image with Dockerfile

9.1 Create Dockerfile:

```
vi Dockerfile
```

Inside:

```
Dockerfile
FROM nginx:1.27.5
```

Save with `:wq`.

9.2 Build the Docker Image

```
docker build -t test .
```

9.3 Verify Image

```
docker image ls
```

Should show the image `test`.

9.4 Run Container from Custom Image

```
docker run -it -d -p 80:80 test
```

9.5 Check Running Containers

```
docker container ls
```