Week3 – day1

Understanding Docker – Shipping of container of softwares.
It creates a package of softwares in containers. Containers are isolated. Like a light weight virtual machine.

Key benefit – Works everywhere

Docker Architecture -

1. CLI (build, run)
2. Daemon (background service that manage everything)
3. Registery (store for docker images like github for docker images)

How Docker Works

1. **Dockerfile** → A script that defines how to build a Docker image.
2. **Docker Image** → A blueprint (snapshot) of an application, including its OS, dependencies, and code.
3. **Docker Container** → A running instance of a Docker image.
4. **Docker Registry** → A storage for Docker images (e.g., Docker Hub, AWS ECR).

Some docker comamnds-

1. docker pull <image>
   - Downloads a Docker image from a registry (e.g., Docker Hub).
2. docker build -t <imagename> .
   - Builds a Docker image from a Dockerfile in the current directory (.).
   - The -t flag assigns a tag (name) to the image.
   - Example:

     ```
     docker build -t myapp .
     ```

   - This builds an image named myapp.
3. docker push <repository/imagename>
   - Pushes a local image to a remote registry (e.g., Docker Hub, AWS ECR, GCR).
   - Example:

     ```
     docker push myusername/myapp
     ```

   - This uploads the myapp image to myusername's repository.
4. docker run <image>
   - Starts a container from an image.
   - Example:

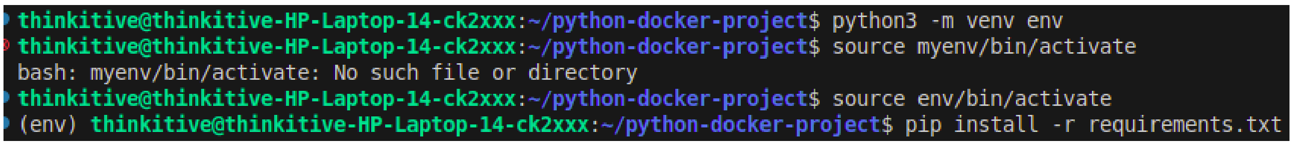
     ```
     docker run -d -p 8080:80 myapp
     ```

- Runs myapp in detached mode (-d) and maps port 8080 on the host to port 80 in the container.

5. docker ps

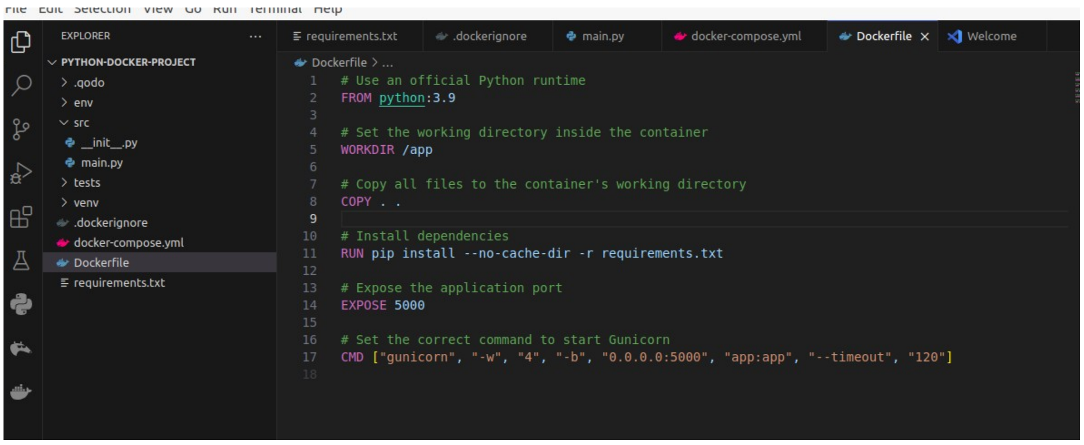
   - Lists running containers.
   - Shows container IDs, names, statuses, ports, and other details.
   - Use docker ps -a to list **all** containers, including stopped ones.

---Hands on docker!
Activating virtual environment before starting python project -



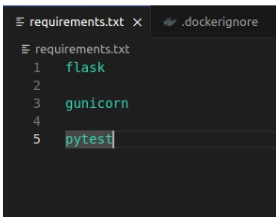
```
thinkitive@thinkitive-HP-Laptop-14-ck2xxx:~/python-docker-project$ python3 -m venv env
thinkitive@thinkitive-HP-Laptop-14-ck2xxx:~/python-docker-project$ source myenv/bin/activate
bash: myenv/bin/activate: No such file or directory
thinkitive@thinkitive-HP-Laptop-14-ck2xxx:~/python-docker-project$ source env/bin/activate
(env) thinkitive@thinkitive-HP-Laptop-14-ck2xxx:~/python-docker-project$ pip install -r requirements.txt
```

Create a docker file - It defines everything needed to create a containerized environment, including the base image, dependencies, configurations, and commands.



```
# Use an official Python runtime
FROM python:3.9

# Set the working directory inside the container
WORKDIR /app

# Copy all files to the container's working directory
COPY . .

# Install dependencies
RUN pip install --no-cache-dir -r requirements.txt

# Expose the application port
EXPOSE 5000

# Set the correct command to start Gunicorn
CMD ["gunicorn", "-w", "4", "-b", "0.0.0.0:5000", "app:app", "--timeout", "120"]
```

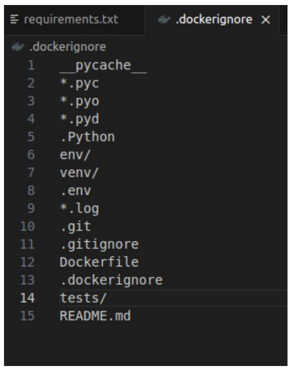
Installing all the requirements.txt -



```
flask

gunicorn

pytest
```

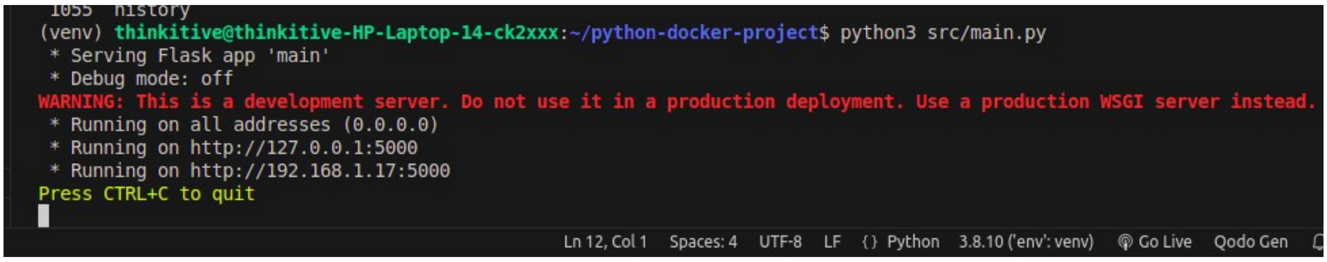
pip install -r requirements.txt

Adding contents to docker.ignore file



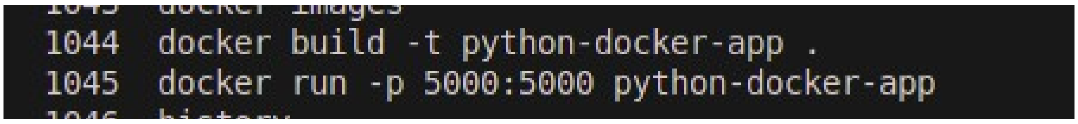
```
__pycache__
*.pyc
*.pyo
*.pyd
.Python
env/
venv/
.env
*.log
.git
.gitignore
Dockerfile
.dockerignore
tests/
README.md
```

Create src/main.py file and run using -



```
 1055  history
(venv) thinkitive@thinkitive-HP-Laptop-14-ck2xxx:~/python-docker-project$ python3 src/main.py
 * Serving Flask app 'main'
 * Debug mode: off
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
 * Running on all addresses (0.0.0.0)
 * Running on http://127.0.0.1:5000
 * Running on http://192.168.1.17:5000
Press CTRL+C to quit
```

To build and run the image -



```
1044  docker build -t python-docker-app .
1045  docker run -p 5000:5000 python-docker-app
```

Docker compose -
Docker Compose is a tool that helps you **run multiple Docker containers together** with just one command. Instead of running each container separately, you can define everything in **one file** (docker-compose.yml) and start them all at once.