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DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING
(Autonomous College Affiliated to the University of Mumbai)
NAAC Accredited with "A" Grade (CGPA : 3.18)

Department of Information Technology

COURSE CODE: DJS22ITL601 **DATE:**
COURSE NAME: Software Engineering Laboratory **CLASS: T.Y.BTech**

EXPERIMENT NO. 9

CO/LO Analyze real world problem using software engineering principles.
AIM / OBJECTIVE: To install and configure Docker.
DESCRIPTION OF EXPERIMENT:

Introduction to docker:

Docker is an open platform for developing, shipping, and running applications. Docker enables you to separate your applications from your infrastructure so you can deliver software quickly. With Docker, you can manage your infrastructure in the same ways you manage your applications. By taking advantage of Docker's methodologies for shipping, testing, and deploying code quickly, you can significantly reduce the delay between writing code and running it in production.

Why is Docker used?

Docker is a basic tool, like git or java, that you should start incorporating into your daily development and ops practices.

o Use Docker as version control system for your entire app's operating system

o Use Docker when you want to distribute/collaborate on your app's operating system with a team
o Use Docker to run your code on your laptop in the same environment as you have on your server (try the building tool)

o Use Docker whenever your app needs to go through multiple phases of development (dev/test/qa/prod, try Drone or Shippable, both do Docker CI/CD)

o Use Docker with your Chef Cookbooks and Puppet Manifests (remember, Docker doesn't do configuration management)

What role docker plays in dev-ops?

Docker is just another tool available to DevOps Engineers. What Docker does is it encapsulates code and code dependencies in a single unit (a container) that can be run anywhere where the Docker engine is installed.

Why is this useful?

For multiple reasons; but in terms of CI/CD it can help Engineers separate Configuration from Code, decrease the amount of time spent doing dependency management etc., can use it to scale

(with the help of some other tools of course). The list goes on. For example: If I had a single code repository, in my build script I could pull in environment specific dependencies to create a Container that functionally behaves the same in each environment, as I'm building from the same source repository, but it can contain a set of environment specific certificates and configuration files etc. Having said all of that, there really is a great deal you can do to utilize Docker in your CI/CD Pipelines.

Containerization and its features:

Containers are made possible by operating system (OS) process isolation and virtualization, which enable multiple application components to share the resources of a single instance of an OS kernel in much the same way that machine virtualization enables multiple virtual machines (VMs) to share the resources of a single hardware server. Containers offer all the benefits of VMs, including application isolation, cost-effective scalability, and disposability. But the additional layer of abstraction (at the OS level) offers important additional advantages:

o Lighter weight: Unlike VMs, containers don't carry the payload of an entire OS instance—they include only the OS processes and dependencies necessary to execute the code.

o Greater resource efficiency: With containers, you can run several times as many copies of an application on the same hardware as you can using VMs. This can reduce your cloud spending.

o Improved developer productivity: Compared to VMs, containers are faster and easier to deploy, provision, and restart. This makes them ideal for use in continuous integration and continuous delivery (CI/CD) pipelines and a better fit for development teams adopting Agile and DevOps practices.

What is docker image?

A Docker image is a read-only template that contains a set of instructions for creating a container that can run on the Docker platform. It provides a convenient way to package up applications and preconfigured server environments, which you can use for your own private use or share publicly with other Docker users.

Is docker image and VM same?

Containers and virtual machines have similar resource isolation and allocation benefits, but function differently because containers virtualize the operating system instead of hardware. Containers are more portable and efficient. Containers Virtual Machines Containers are an abstraction at the app layer that packages code and dependencies together. Multiple containers can run on the same machine and share the OS kernel with other containers, each running as isolated processes in user space. Containers take up less space than VMs (container images are typically

tens of MBs in size), can handle more applications and require fewer VMs and Operating systems. Virtual machines (VMs) are an abstraction of physical hardware turning one server into many servers. The hypervisor allows multiple VMs to run on a single machine. Each VM includes a full copy of an operating system, the application, necessary binaries and libraries - taking up tens of GBs. VMs can also be slow to boot

Steps of Installation:

- The following hardware prerequisites are required to successfully run WSL 2 on Windows 10 or Windows 11:
  - 64-bit processor with Second Level Address Translation (SLAT)
  - 4GB system RAM
  - BIOS-level hardware virtualization support must be enabled in the BIOS settings. For more information, see Virtualization.
- Download and install the Linux kernel update package.

Install Docker hub from

https://docs.docker.com/docker-for-windows/install/ and the follow

the steps

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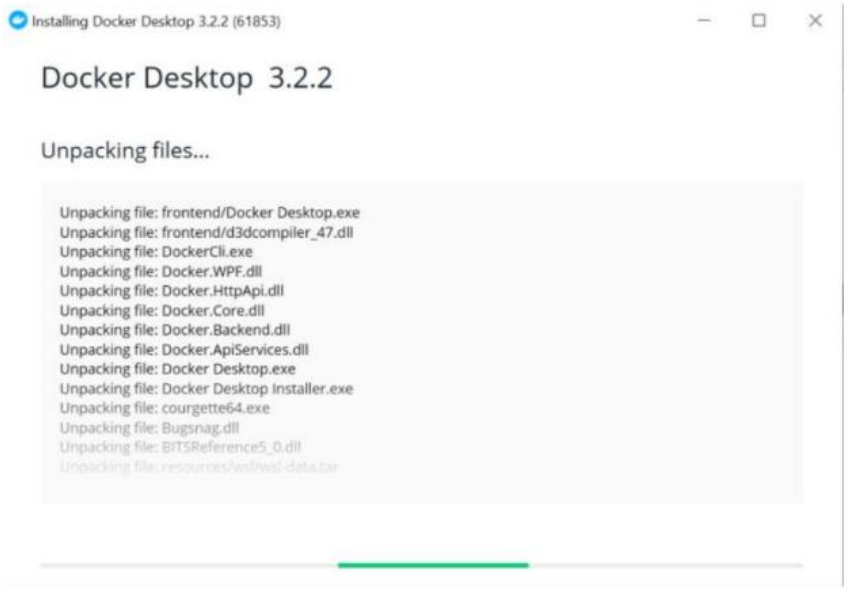

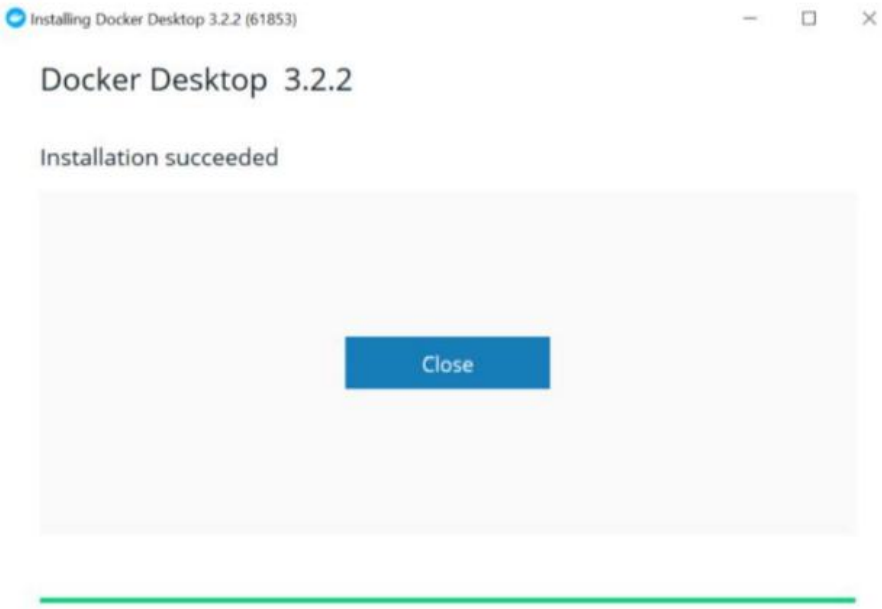

After installation in command prompt execute this command if you are getting error for linux kernel

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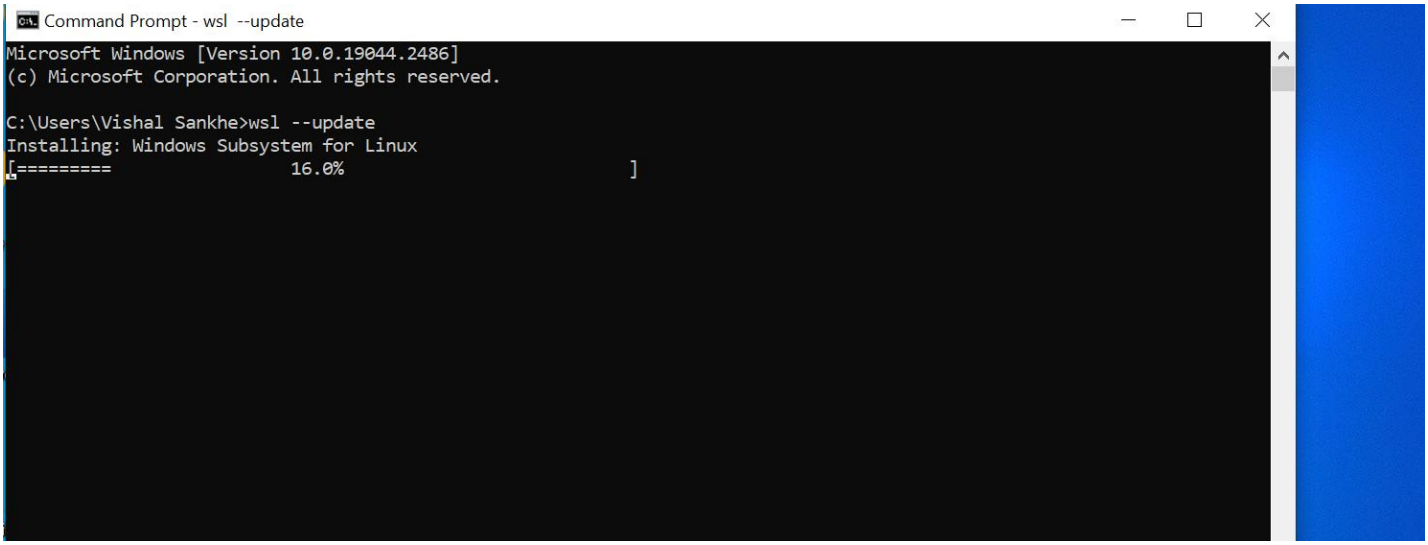

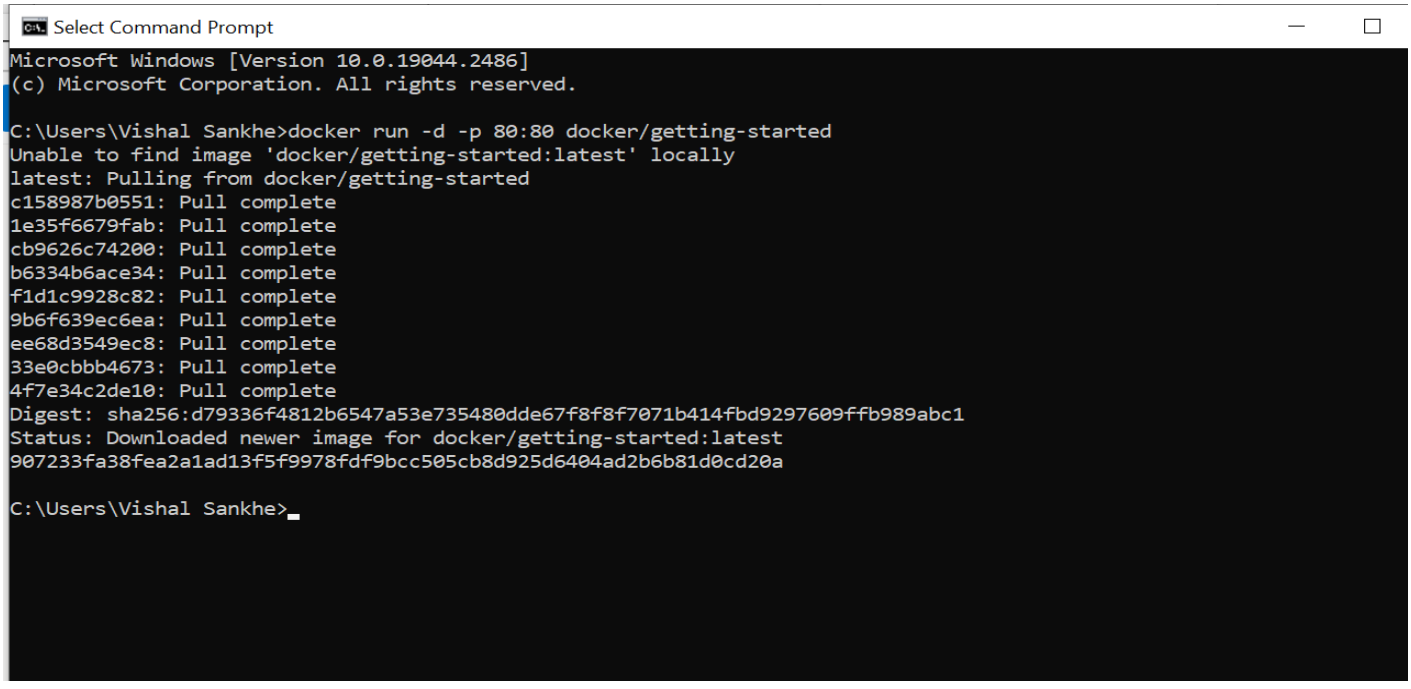

Execute the first docker container using command given below

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Command Prompt

```
C:\Users\Vishal Sankhe>docker run hello-world
Unable to find image 'hello-world:latest' locally
latest: Pulling from library/hello-world
2db29710123e: Pull complete
Digest: sha256:ffb13da98453e0f04d33a6eee5bb8e46ee50d08ebe17735fc0779d0349e889e9
Status: Downloaded newer image for hello-world:latest

Hello from Docker!
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:
 1. The Docker client contacted the Docker daemon.
 2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
    (amd64)
 3. The Docker daemon created a new container from that image which runs the
    executable that produces the output you are currently reading.
 4. The Docker daemon streamed that output to the Docker client, which sent it
    to your terminal.

To try something more ambitious, you can run an Ubuntu container with:
 $ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker ID:
 https://hub.docker.com/

For more examples and ideas, visit:
 https://docs.docker.com/get-started/


C:\Users\Vishal Sankhe>
```

```
C:\Users\Vishal Sankhe>docker image ls
REPOSITORY                TAG       IMAGE ID       CREATED         SIZE
docker/getting-started    latest    3e4394f6b72f   3 months ago    47MB
hello-world               latest    feb5d9fea6a5   18 months ago   13.3kB

C:\Users\Vishal Sankhe>
```

```
C:\Users\Vishal Sankhe>docker ps --all
CONTAINER ID   IMAGE                  COMMAND                  CREATED             STATUS                          PO
RTS               NAMES
3ada9a8ee49a   hello-world            "/hello"                 About a minute ago  Exited (0) About a minute ago
                  angry_pare
907233fa38fe   docker/getting-started   "/docker-entrypoint.…"   7 minutes ago       Up 7 minutes                    0.
0.0.0:80->80/tcp   adoring_lehmann

C:\Users\Vishal Sankhe>
```

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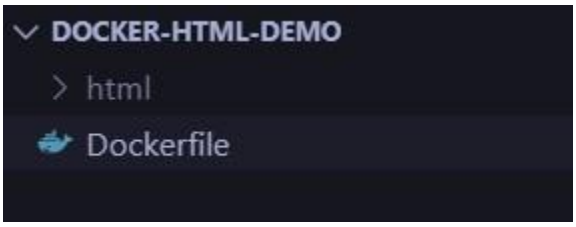
QUESTIONS:

1. Explain the concept of a Docker container and its key components.
2. How does Docker facilitate the development and deployment of applications?

OUTPUT:

3.Implementation



DockerFile

```
FROM nginx:alpine

COPY html /usr/share/nginx/html

EXPOSE 80
```

Index.html

```
<!DOCTYPE html>

<html lang="en">

<head>

  <meta charset="UTF-8">

  <meta name="viewport" content="width=device-width, initial-scale=1">

  <title>Welcome to Dockerized Webpage</title>

  <style>

    :root {

      --primary: #1e90ff;
```

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```
    --accent: #ffb347;
    --bg: #f7f9fa;
   --text: #222;
   --header-bg: #fff;
  }

  body { margin: 0; font-family:
'Segoe UI', Arial, sans-serif;
background: var(--bg); color: var(--
text); line-height: 1.6;
  }

  header { background:
var(--header-bg);
padding: 3rem 1rem 2rem
1rem;
   text-align: left; box-shadow: 0 2px
8px rgba(30,144,255,0.04); display: flex;
flex-direction: column; align-items: flex-
start; min-height: 60vh; justify-
content: center;
  }

  header h1 {
   font-size: 3rem;
 margin: 0 0 1rem
 0; color: var(--
```

```
  primary);    font-
  weight: 700;
     letter-spacing: -1px;
    }
    header p {
    font-size:
    1.25rem;
    margin-
    bottom:
    2rem;
    color: #444;
max-width: 500px;
   }

   .cta-btn {      background: var(--primary);
color: #fff;      padding: 0.9em 2em;
border: none;      border-radius: 4px;
font-size: 1.1rem;      cursor: pointer;
font-weight: 600;      transition:
background 0.2s, transform 0.2s;      box-
shadow: 0 2px 4px rgba(30,144,255,0.1);
   }
   .cta-btn:hover {
background: var(--
accent);      color:
#222;
     transform: translateY(-2px) scale(1.03);
   }
```

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```
nav {
margin-top:
2rem;
} nav a {
text-
decoration:
none; color:
var(--primary);
font-weight:
500; margin-
right: 2rem;
transition: color
0.2s;

} nav
a:hover {
color: var(--
accent);
}

main {
padding: 2rem 1rem; max-width:
900px; margin: auto; background: #fff;
border-radius: 12px; box-shadow: 0 4px
24px rgba(30,144,255,0.07); margin-top: -
3rem; position: relative; z-index: 2;
}
```

```
  main h2 {
color: var(--
primary);
font-size: 2rem;
margin-bottom:
1rem;
  }      main  ul  {
list-style:      disc
inside;    margin-
bottom: 2rem;
  }
  main img {
max-width:
100%;
border-radius:
8px;
    margin-bottom: 1rem;    box-
 shadow: 0 1px 8px rgba(0,0,0,0.07);
  }

  footer {
  text-
  align:
  center;
  padding:
  2rem
  1rem
  1rem
  1rem;
```

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```
    color:
    #888;
    font-size:
    1rem;
    backgrou
    nd: var(--
    header-
    bg);
    margin-top: 3rem;
  }

   @media (max-width:
600px) {      header h1 {
font-size: 2rem;
    }            main  {
padding:        1rem
0.5rem;      margin-
top: -1.5rem;
    }
  }
 </style>
</head>
<body>
 <header>
  <h1>🚀 Deployed with Docker</h1>
  <p>
```

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```
    This modern, responsive webpage is running inside a Docker container
    using Nginx. Experience the power of containerization and modern web
    design!
  </p>
  <button class="cta-btn" onclick="alert('Thank you for visiting!')">Get
    Started</button>
  <nav>
    <a href="#features">Features</a>
    <a href="#about">About</a>
  </nav>
</header>
<main>
  <section id="features">
    <h2>✨ Features</h2>
    <ul>
      <li>Containerized deployment with Docker & Nginx</li>
      <li>Responsive and accessible design</li>
      <li>Modern UI/UX with clear visual hierarchy</li>
      <li>Fast loading and optimized for all devices</li>
      <li>Micro-interactions and hover effects</li>
    </ul>
    <img src="https://images.unsplash.com/photo-
    1461749280684dccba630e2f6?auto=format&fit=crop&w=800&q=80"
    alt="Modern web design illustration">
  </section>
  <section id="about">
    <h2>About This Demo</h2>
```

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```
    <p>
      This webpage demonstrates best practices in modern web design for 2025, including minimalism, whitespace, accessibility, and engaging microinteractions. It’s built to be simple, fast, and visually appealing, making it a perfect candidate for containerized deployment.
    </p>
  </section>
</main>
<footer>
  &copy; 2025 Docker Web Demo &mdash; Crafted for containerization experiments.
</footer>
</body>
</html>
```

```
docker build -t my-nginx-html .
```

```
[+] Building 33.3s (7/7) FINISHED                                                                  docker:desktop-linux
 => [internal] load build definition from Dockerfile                                                              0.0s
 => => transferring dockerfile: 100B                                                                              0.0s
 => [internal] load metadata for docker.io/library/nginx:alpine                                                   5.9s
 => [internal] load .dockerignore                                                                                 0.0s
 => => transferring context: 2B                                                                                   0.0s
 => [internal] load build context                                                                                 0.0s
 => => transferring context: 4.41kB                                                                               0.0s
 => [1/2] FROM docker.io/library/nginx:alpine@sha256:65645c7bb6a0661892a8b03b89d0743208a18dd2f3f17a54ef4b76fb8e2f2a10  27.1s
 => => resolve docker.io/library/nginx:alpine@sha256:65645c7bb6a0661892a8b03b89d0743208a18dd2f3f17a54ef4b76fb8e2f2a10  0.0s
 => => sha256:6769dc3a703c719c1d2756bda113659be28ae16cf0da58dd5fd823d6b9a050ea 10.79kB / 10.79kB                 0.0s
 => => sha256:f18232174bc91741fdf3da96d85011092101a032a93a388b79e99e69c2d5c870 3.64MB / 3.64MB                   5.6s
 => => sha256:61ca4f733c802afd9e05a32f0de0361b6d713b8b53292dc15fb093229f648674 1.79MB / 1.79MB                   4.5s
 => => sha256:65645c7bb6a0661892a8b03b89d0743208a18dd2f3f17a54ef4b76fb8e2f2a10 10.33kB / 10.33kB                 0.0s
 => => sha256:62223d644fa234c3a1cc785ee14242ec47a77364226f1c811d2f669f96dc2ac8 2.50kB / 2.50kB                   0.0s
 => => sha256:b464cfdf2a6319875aeb27359ec549790ce14d8214fcb16ef915e4530e5ed235 629B / 629B                       1.1s
 => => sha256:d7e5070240863957ebb0b5a44a5729963c3462666baa2947d00628cb5f2d5773 955B / 955B                       1.6s
 => => sha256:81bd8ed7ec6789b0cb7f1b47ee731c522f6dba83201ec73cd6bca1350f582948 402B / 402B                       2.1s
 => => sha256:197eb75867ef4fcecd4724f17b0972ab0489436860a594a9445f8eaff8155053 1.21kB / 1.21kB                   3.3s
 => => sha256:34a64644b756511a2e217f0508e11d1a572085d66cd6dc9a555a082ad49a3102 1.40kB / 1.40kB                   3.8s
 => => sha256:39c2ddfd6010082a4a646e7ca44e95aca9bf3eaebc00f17f7ccc2954004f2a7d 15.52MB / 15.52MB                26.4s
 => => extracting sha256:f18232174bc91741fdf3da96d85011092101a032a93a388b79e99e69c2d5c870                        0.1s
 => => extracting sha256:61ca4f733c802afd9e05a32f0de0361b6d713b8b53292dc15fb093229f648674                        0.1s
 => => extracting sha256:b464cfdf2a6319875aeb27359ec549790ce14d8214fcb16ef915e4530e5ed235                        0.0s
 => => extracting sha256:d7e5070240863957ebb0b5a44a5729963c3462666baa2947d00628cb5f2d5773                        0.0s
 => => extracting sha256:81bd8ed7ec6789b0cb7f1b47ee731c522f6dba83201ec73cd6bca1350f582948                        0.0s
 => => extracting sha256:197eb75867ef4fcecd4724f17b0972ab0489436860a594a9445f8eaff8155053                        0.0s
 => => extracting sha256:34a64644b756511a2e217f0508e11d1a572085d66cd6dc9a555a082ad49a3102                        0.0s
 => => extracting sha256:39c2ddfd6010082a4a646e7ca44e95aca9bf3eaebc00f17f7ccc2954004f2a7d                        0.4s
 => [2/2] COPY html /usr/share/nginx/html                                                                         0.1s
 => exporting to image                                                                                            0.1s
 => => exporting layers                                                                                           0.0s
 => => writing image sha256:e1646179d9d73f2e07fad75a715ca7eee20b13b4dd8f191600a1e6b971c8ee66                     0.0s
 => => naming to docker.io/library/my-nginx-html                                                                  0.0s
```

docker run -d -p 5050:80 --name my-nginx-container my-nginx-html

```
C:\Engineering\Third Year\Sem VI\SE\Exps\Exp 8\docker-html-demo>docker run -d -p 5050:80 --name my-nginx-container my-nginx-html
997678e1442078714baff9a68e2a853350669800611b3141edc0261698c6519f
```

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Localhost:5050

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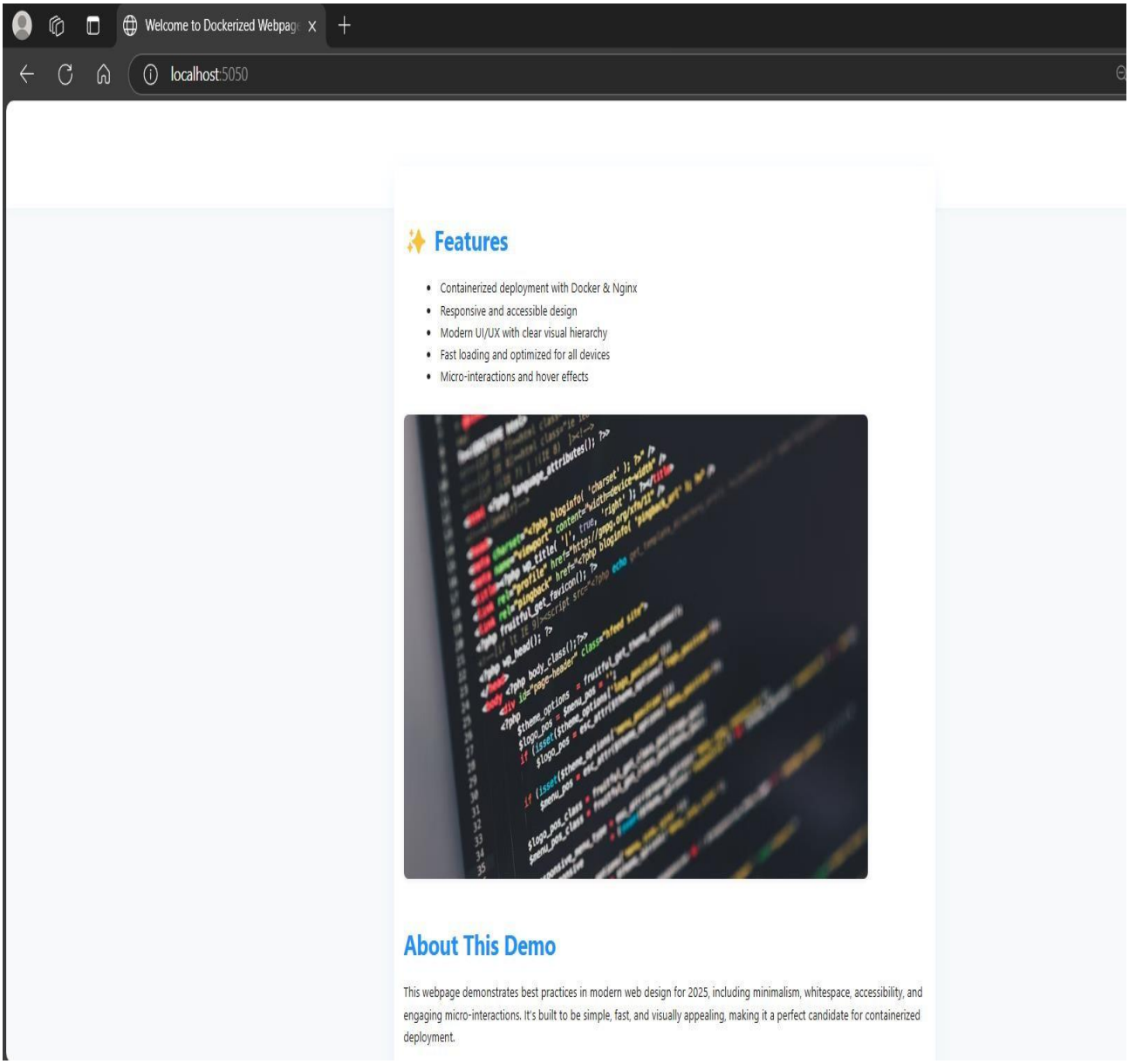

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Step	Command/Action	Screenshot To Take
Install Docker	`docker --version`	Docker version output
Create Project Directory	`mkdir docker-html-demo && cd docker-html-demo`	Terminal in project directory
Create HTML Page	Create `html/index.html`	File content or editor screenshot
Create Dockerfile	Create `Dockerfile`	Dockerfile content
Build Docker Image	`docker build -t my-nginx-html .`	Build output
Run Docker Container	`docker run -d -p 8080:80 --name my-nginx-container my-nginx-html`	`docker ps` output
View Webpage	Open `http://localhost:8080` in browser	Browser showing webpage
Stop/Remove Container	`docker stop` / `docker rm`	Terminal showing cleanup

Conclusion

Containerization with Docker enables consistent, portable deployment of web applications by packaging both code and dependencies together. Deploying a basic HTML webpage in a Docker container demonstrates how easily environments can be replicated across systems. This approach streamlines development, testing, and deployment, ensuring reliability and efficiency

REFERNCE:

https://www.tutorialspoint.com/