IMPLEMENTATION OF DOCKER CONTAINERS

Experiment Title

Implementation of Different Docker Containers

Aim

To install Docker and create, execute, and analyze different types of Docker containers such as **Hello-World**, **Ubuntu OS**, **Web Server (Nginx)**, and **Programming Environment (Python)** in order to understand containerization concepts.

Software Requirements

- **Operating System**: Kali Linux
- **Container Platform**: Docker Engine
- **Internet Connection**

Docker

Docker is a **containerization platform** that allows applications to run in isolated environments called **containers**. Unlike Virtual Machines, Docker containers do **not require a full guest operating system**.

Containers share the host OS kernel, making them:

- Lightweight
- Fast to start,Resource efficient

Procedure

Step 1: Installation of Docker

Docker Engine was installed on Kali Linux using the following commands:

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

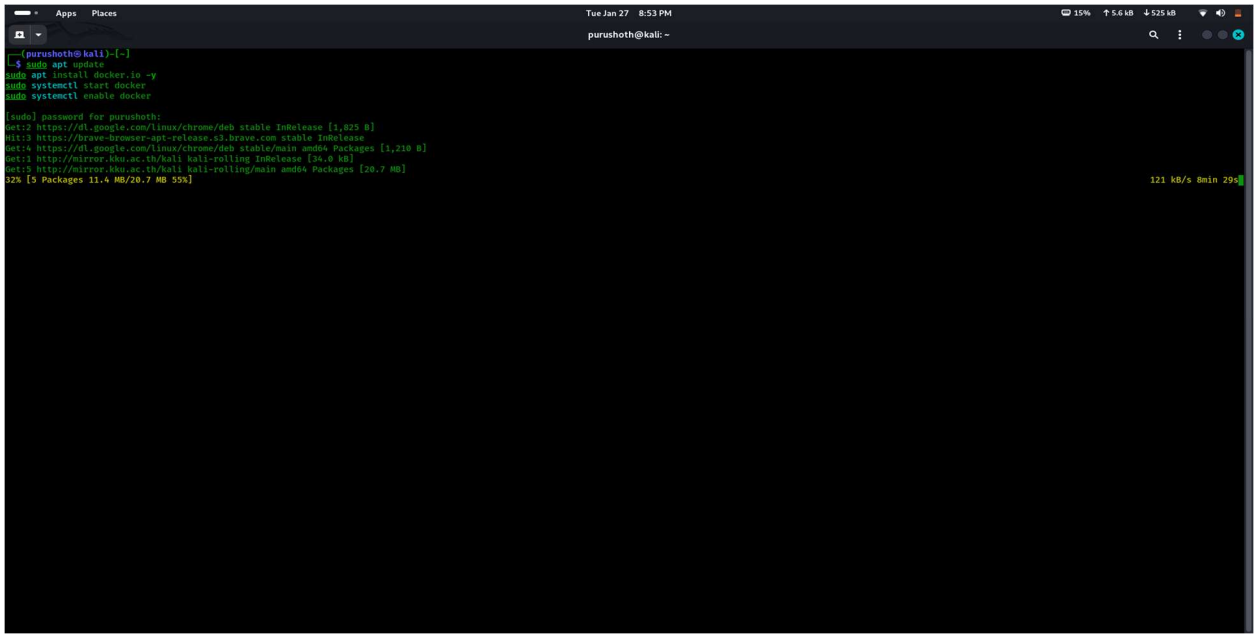
Explanation:

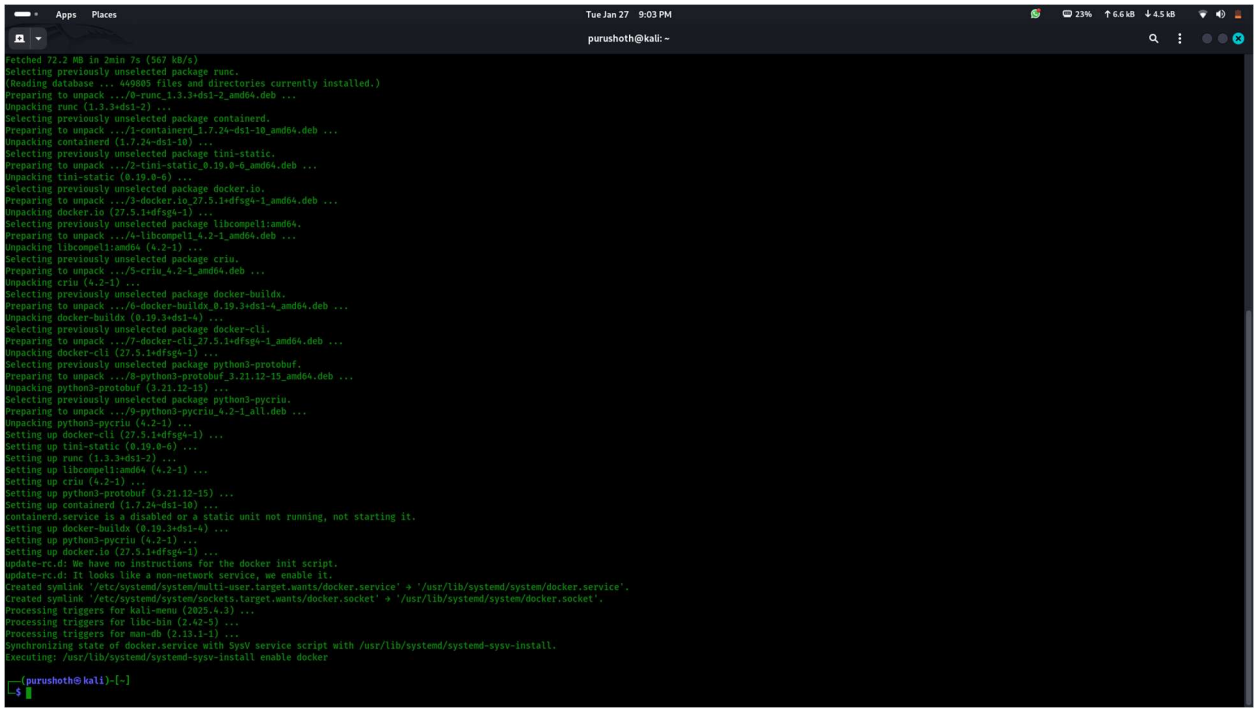
- `apt update` → Updates package list
- `apt install docker.io` → Installs Docker Engine
- `systemctl start docker` → Starts Docker service
- `systemctl enable docker` → Enables Docker at boot

Observation:

Docker service started successfully.

Screenshot–1: Docker installation / Docker version output




Apps Places
Tue Jan 27 9:03 PM
23% 6.6 kB 4.5 kB
purushoth@kali: ~
Fetched 72.2 MB in 2min 7s (567 kB/s)
Selecting previously unselected package runc.
(Reading database ... 449805 files and directories currently installed.)
Preparing to unpack .../0-runc_1.3.3+ds1-2_amd64.deb ...
Unpacking runc (1.3.3+ds1-2) ...
Selecting previously unselected package containerd.
Preparing to unpack .../1-containerd_1.7.24-ds1-10_amd64.deb ...
Unpacking containerd (1.7.24-ds1-10) ...
Selecting previously unselected package tini-static.
Preparing to unpack .../2-tini-static_0.19.0-6_amd64.deb ...
Unpacking tini-static (0.19.0-6) ...
Selecting previously unselected package docker.io.
Preparing to unpack .../3-docker.io_27.5.1+dfsg4-1_amd64.deb ...
Unpacking docker.io (27.5.1+dfsg4-1) ...
Selecting previously unselected package libcompel1:amd64.
Preparing to unpack .../4-libcompel1_4.2-1_amd64.deb ...
Unpacking libcompel1:amd64 (4.2-1) ...
Selecting previously unselected package criu.
Preparing to unpack .../5-criu_4.2-1_amd64.deb ...
Unpacking criu (4.2-1) ...
Selecting previously unselected package docker-buildx.
Preparing to unpack .../6-docker-buildx_0.19.3+ds1-4_amd64.deb ...
Unpacking docker-buildx (0.19.3+ds1-4) ...
Selecting previously unselected package docker-cli.
Preparing to unpack .../7-docker-cli_27.5.1+dfsg4-1_amd64.deb ...
Unpacking docker-cli (27.5.1+dfsg4-1) ...
Selecting previously unselected package python3-protobuf.
Preparing to unpack .../8-python3-protobuf_3.21.12-15_amd64.deb ...
Unpacking python3-protobuf (3.21.12-15) ...
Selecting previously unselected package python3-pycriu.
Preparing to unpack .../9-python3-pycriu_4.2-1_all.deb ...
Unpacking python3-pycriu (4.2-1) ...
Setting up docker-cli (27.5.1+dfsg4-1) ...
Setting up tini-static (0.19.0-6) ...
Setting up runc (1.3.3+ds1-2) ...
Setting up libcompel1:amd64 (4.2-1) ...
Setting up criu (4.2-1) ...
Setting up python3-protobuf (3.21.12-15) ...
Setting up containerd (1.7.24-ds1-10) ...
Setting up docker-buildx (0.19.3+ds1-4) ...
Setting up python3-pycriu (4.2-1) ...
Setting up docker.io (27.5.1+dfsg4-1) ...
update-rc.d: We have no instructions for the docker init script.
update-rc.d: It looks like a non-network service, we enable it.
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 kali-menu (2025.4.3) ...
Processing triggers for libc-bin (2.42-5) ...
Processing triggers for man-db (2.13.1-1) ...
Synchronizing state of docker.service with SysV service script with /usr/lib/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable docker
┌──(purushoth㉿kali)-[~]
└─$

Step 2: Verify Docker Installation

```
docker –version
```

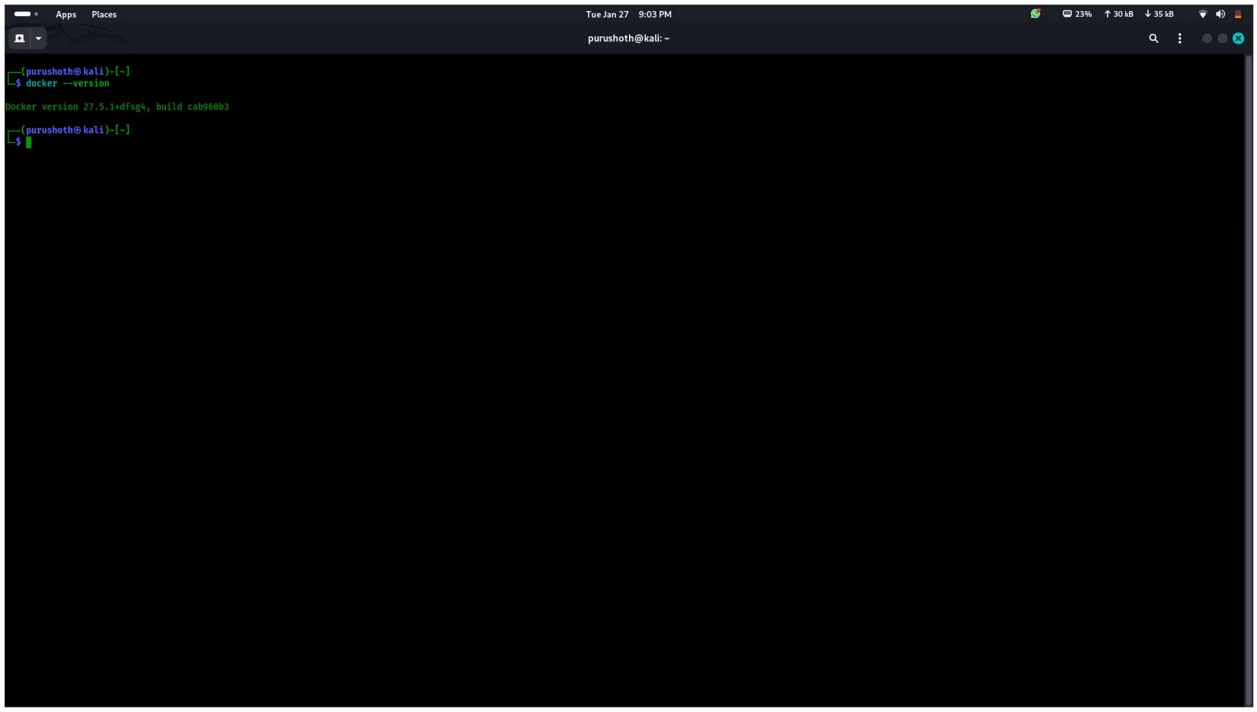
Explanation:

This command confirms that Docker is installed correctly and displays the installed version.

Observation:

Docker version is displayed without any error.

Screenshot–2: Docker version confirmation



Step 3: Create Ubuntu OS Container

```
docker run -it --name ubuntu_container ubuntu bash
```

Explanation:

- `-it` → Interactive terminal
- `--name ubuntu_container` → Assigns a custom name
- `ubuntu` → Base OS image
- `bash` → Opens Ubuntu shell

Commands executed inside the container:

```
ls
cat /etc/os-release
exit
```

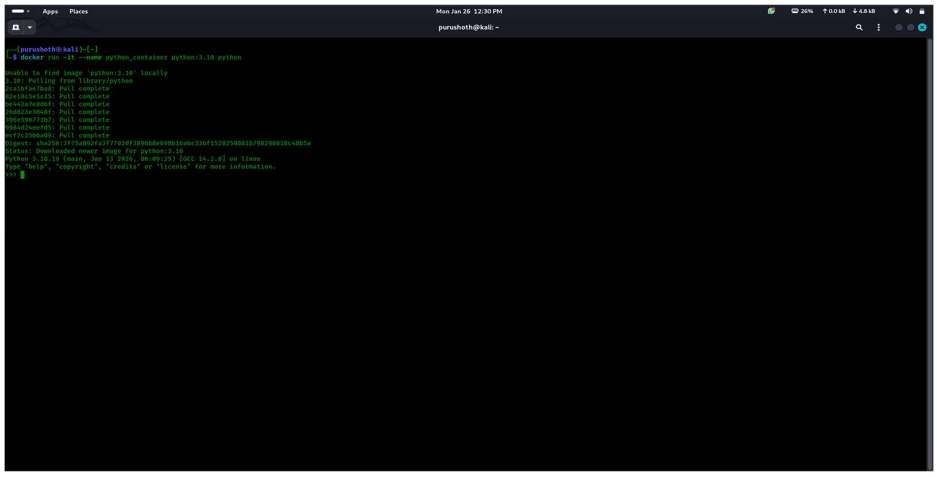
Explanation of commands:

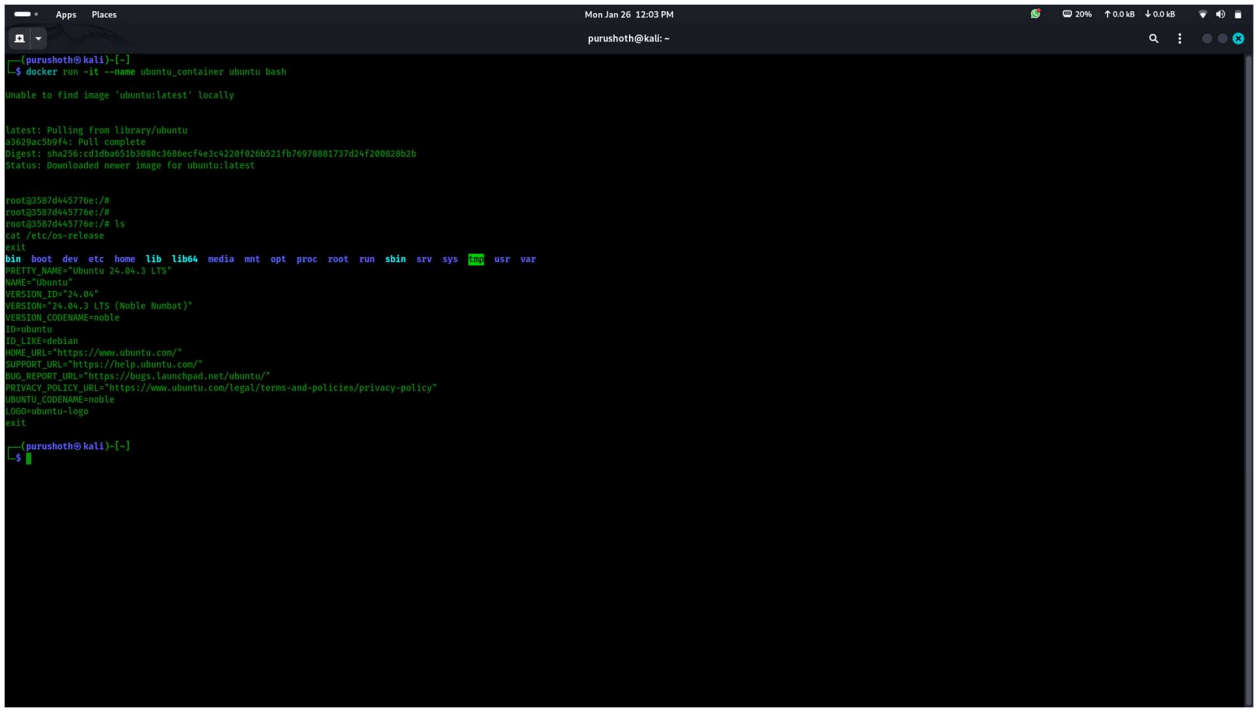
- `ls` → Lists directory contents
- `cat /etc/os-release` → Displays Ubuntu OS details
- `exit` → Exits container

Observation:

Ubuntu shell opened successfully, and OS details were displayed.

Screenshot–4: Ubuntu container terminal





Step 4: Create Web Server Container (Nginx)

```
docker run -d --name nginx_container -p 8080:80 nginx
```

Explanation:

- `-d` → Runs container in detached mode
- `--name nginx_container` → Container name
- `-p 8080:80` → Maps host port 8080 to container port 80
- `nginx` → Web server image

Accessing the Web Server:

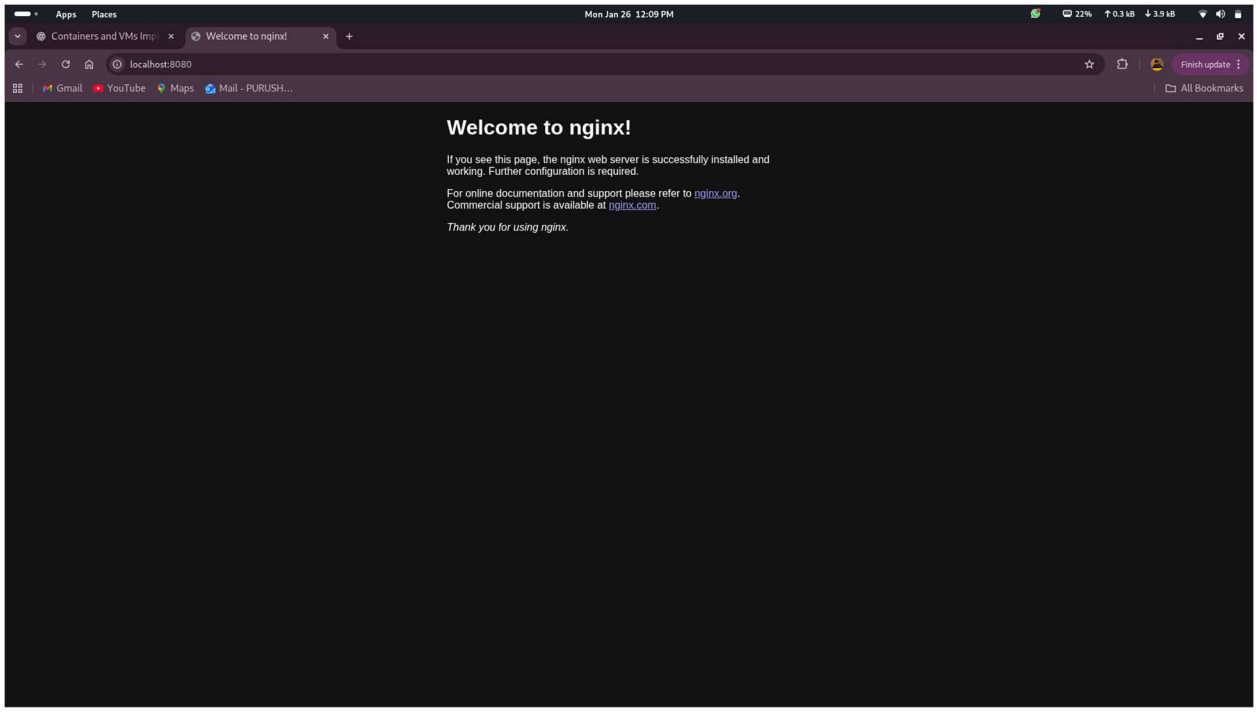
Open browser and visit:

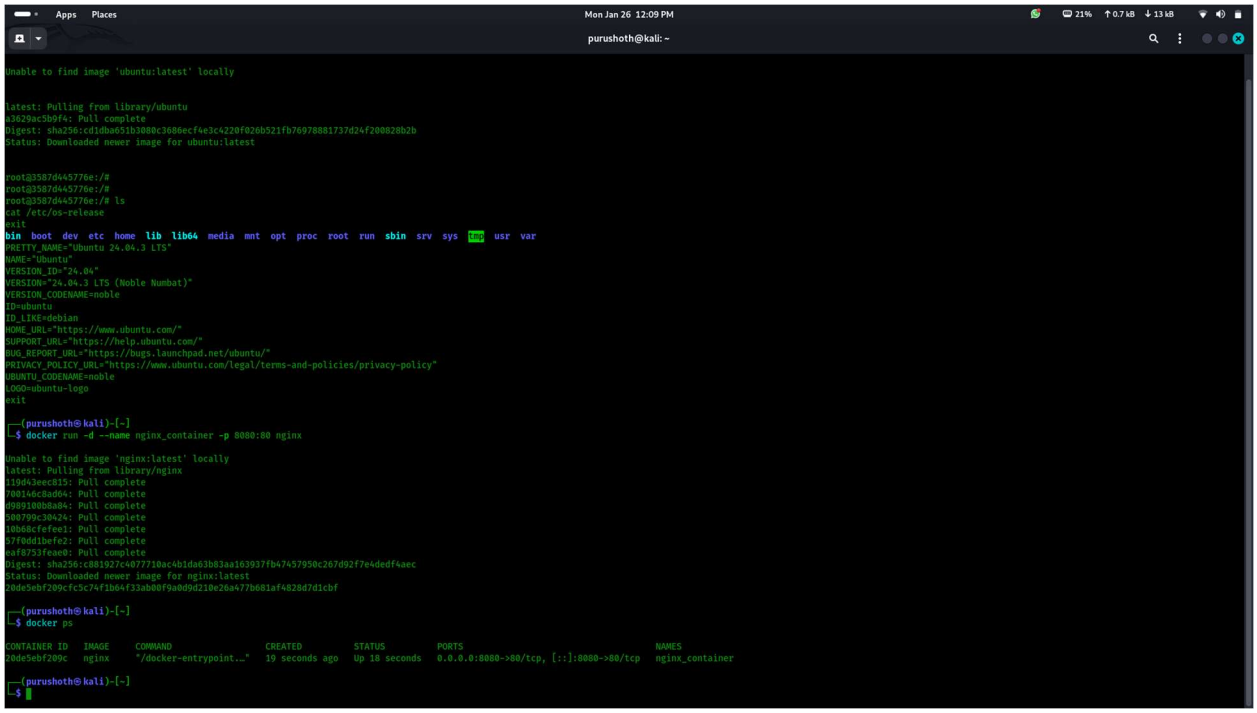
http://localhost:8080

Observation:

Nginx default welcome page loaded successfully in the browser.

Screenshot–4: Nginx welcome page





Step 5: Create Programming Container (Python)

```
docker run -it --name python_container python:3.10 python
```

Explanation:

- Uses official Python 3.10 image
- Launches Python interpreter inside the container

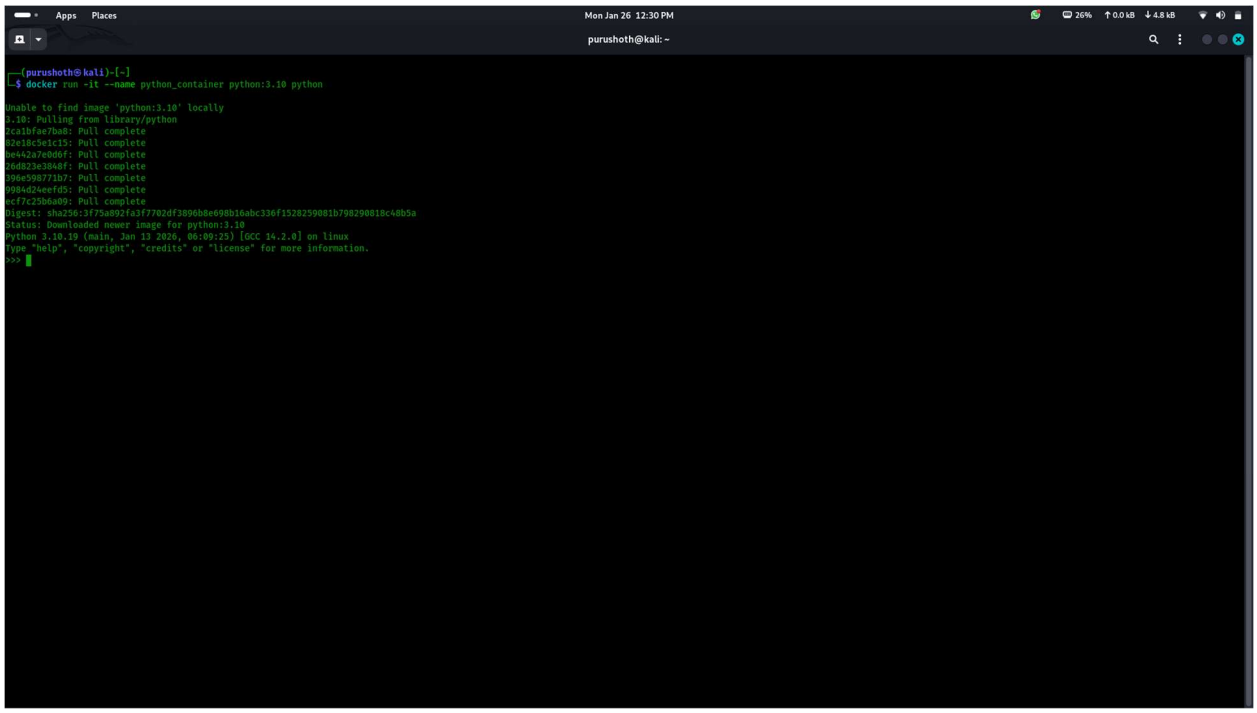
Commands executed inside Python shell:

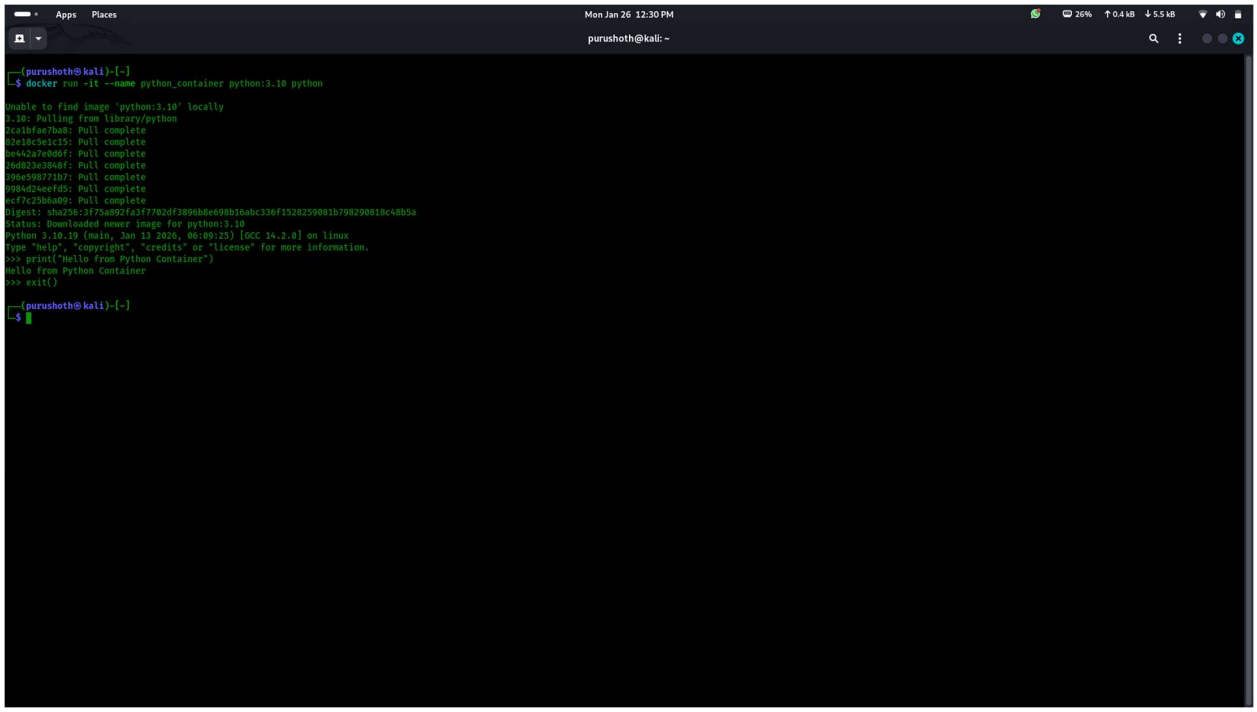
```
print("Hello from Python Container")
exit()
```

Observation:

Python code executed successfully inside container.

Screenshot–5: Python container output





Output

- Ubuntu OS container executed successfully
- Nginx web server container hosted a web page
- Python container executed a Python program
- All containers ran independently on the same host system

Result

Successfully implemented and executed **different Docker containers** including:

- Hello-World
- Ubuntu OS
- Nginx Web Server
- Python Programming Environment

Conclusion

Docker containers provide a **lightweight, fast, and efficient** method of application isolation.

Multiple containers can run on a single host without requiring separate operating systems, making Docker ideal for **development, deployment, and cloud environments**.