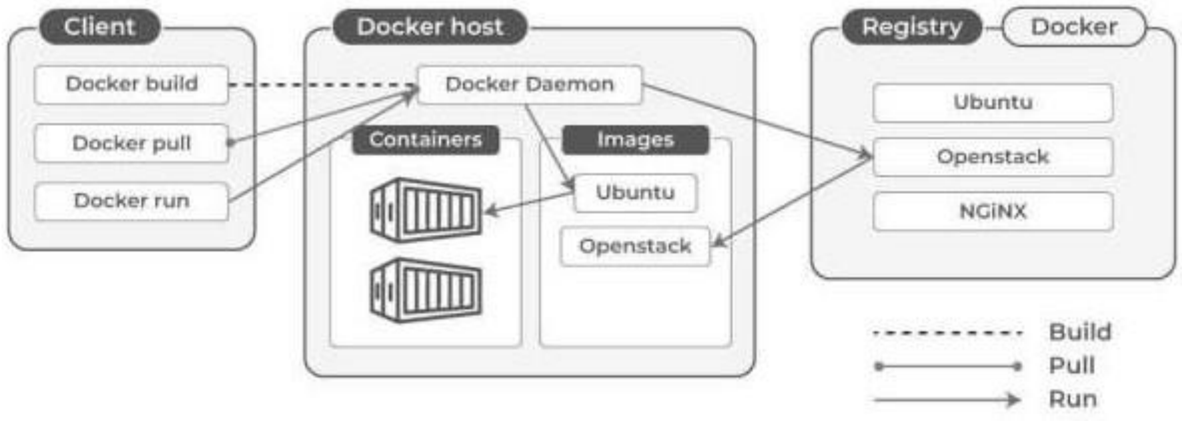
Experiment No.8
To understand Docker Architecture and Container Life Cycle, install Docker and execute docker commands to manage images and interact with containers**.**
Date of Performance:
Date of Submission:

Aim: To understand Docker Architecture and Container Life Cycle, install Docker and execute docker commands to manage images and interact with containers**.**

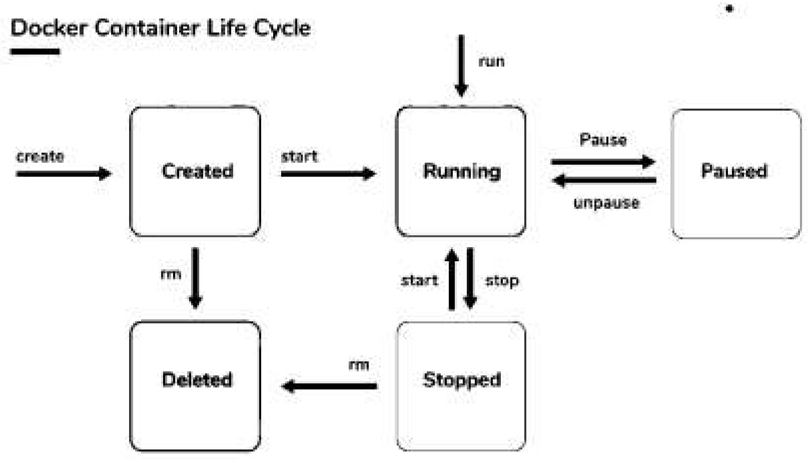
Objective: Objective is Docker's architecture and the lifecycle of containers, along with mastering essential Docker commands for managing images and interacting with containers, individuals can leverage Docker's capabilities to package, distribute, and run applications consistently across different environments

Theory: Docker is a containerization technology that allows developers to package their applications and dependencies into lightweight, portable containers. These containers can then be run on any system that supports Docker, making it easier to deploy and manage applications in various environments.
Docker Architecture:



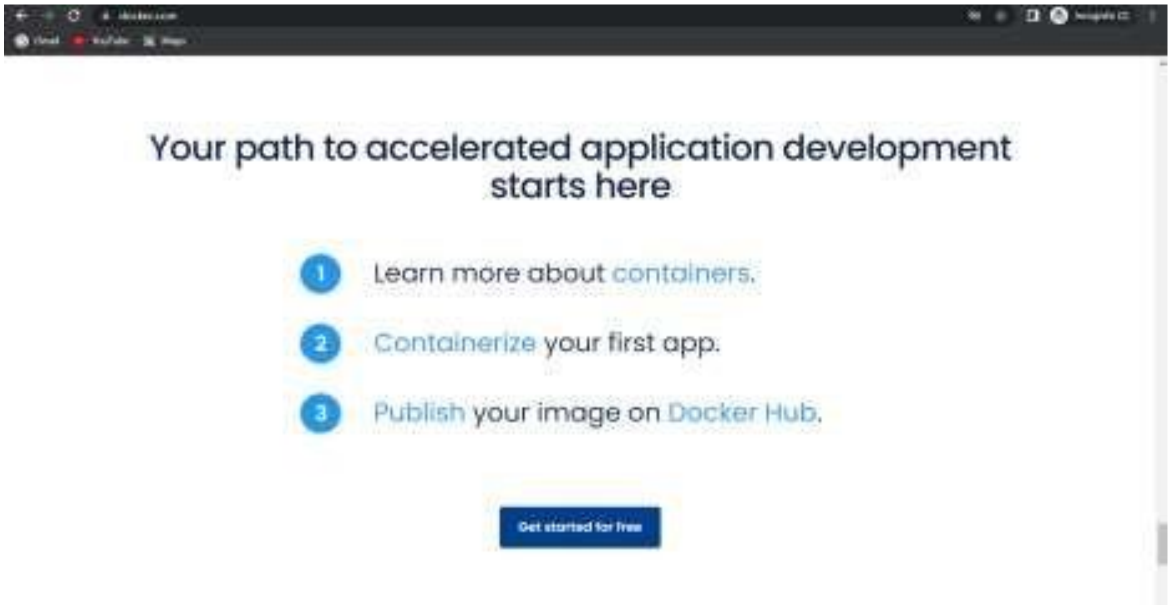
The Docker architecture consists of the following components:
Docker Client: This is the primary interface that developers use to interact with Docker. It sends commands to the Docker daemon and displays the output.
Docker Daemon: This is the background process that runs on the host machine and manages Docker objects such as images, containers, networks, and volumes.
Docker Registry: This is a storage and distribution system for Docker images. It allows developers to share and distribute their images with others.
Docker Image: This is a lightweight, standalone, executable package that includes everything needed to run an application, including the application code, runtime, libraries, dependencies, and system tools.
Docker Container: This is a runtime instance of a Docker image. It is isolated from the host system and other containers, providing a secure and predictable environment for the application to run in.

Container LifeCycle:



The lifecycle of a Docker container consists of the following stages:
Create: To create a container, you start by creating an image that includes all the necessary components to run the application. This image is then used to create the container.
Start: Once the container is created, you can start it using the docker start command. This launches the container and runs the application inside it.
Run: Once the container is started, you can interact with the application inside the container. You can run commands, access files, and make changes to the application.
Stop: When you're done using the container, you can stop it using the docker stop command. This stops the application inside the container and shuts down the container.
Remove: Finally, when you no longer need the container, you can remove it using the docker rm command. This removes the container from the system and frees up any resources it was using.

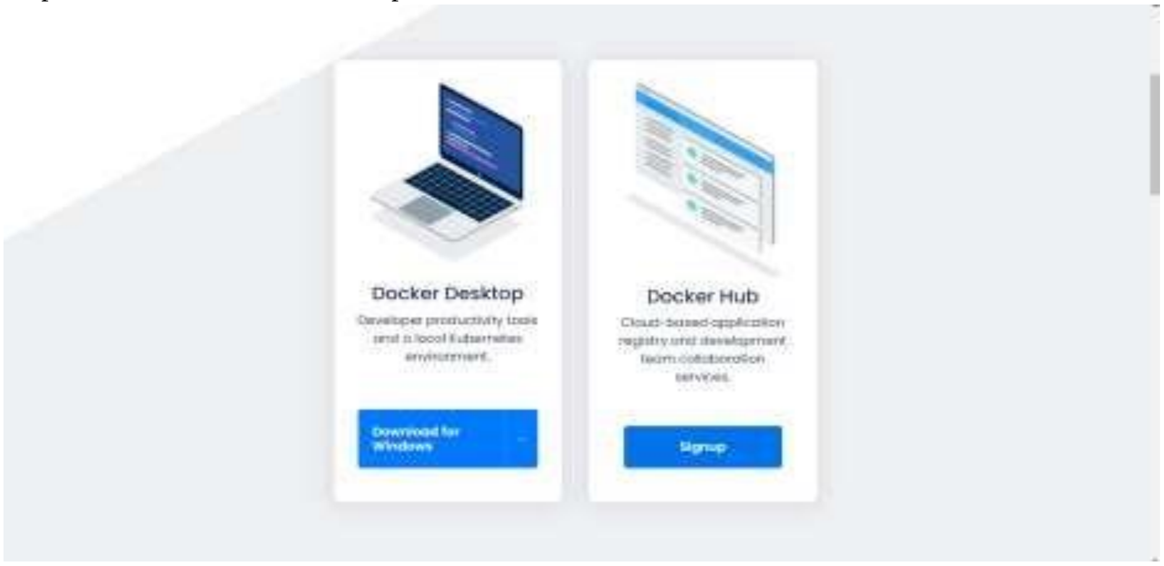
Steps for Installation:
Step 01: Open docker.com
Scroll down, Click on 'Get started for free' tab.



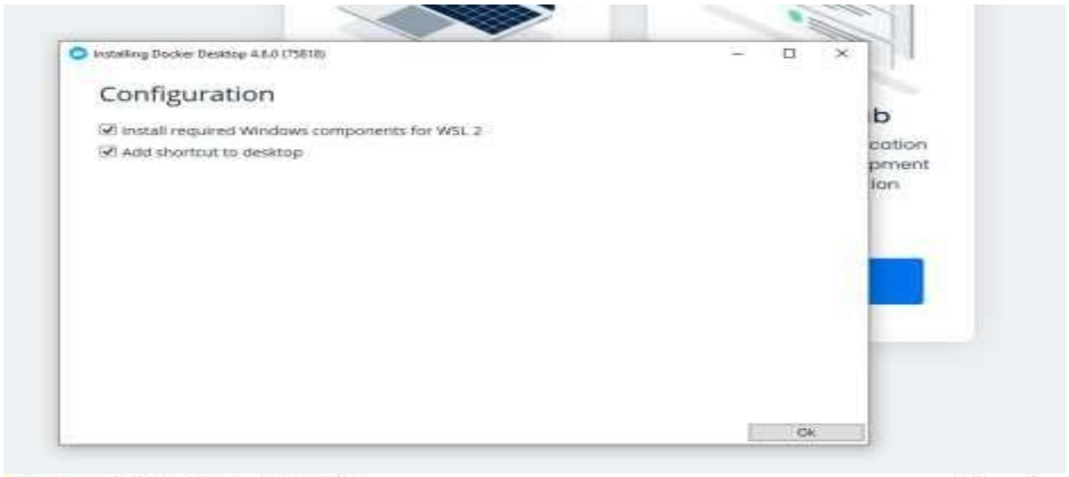
Your path to accelerated application development starts here

1. Learn more about containers.
2. Containerize your first app.
3. Publish your image on Docker Hub.

Step 02: Click on Docker Desktop, Download it.


Docker Desktop
Developer productivity tools and a local Kubernetes environment.
Download for Windows
Docker Hub
Cloud-based application registry and development team collaboration services.
Signup

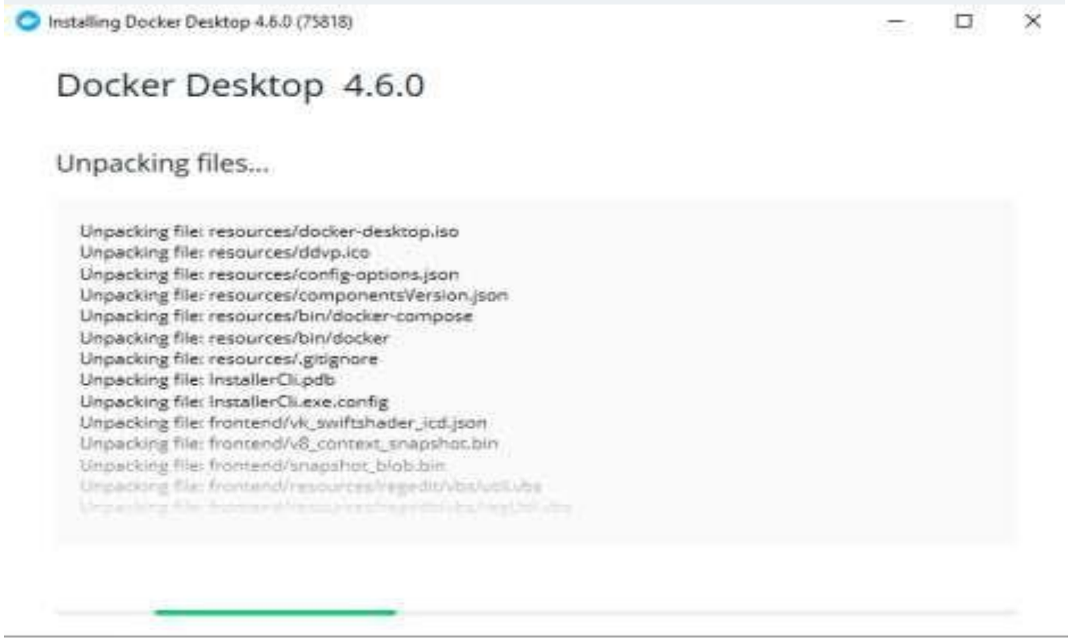
Step 03: After downloading, Open 'Docker Desktop Installer' & start installation.



Installing Docker Desktop 4.6.0 (75818)

Configuration

- [✓] Install required Windows components for WSL 2
- [✓] Add shortcut to desktop



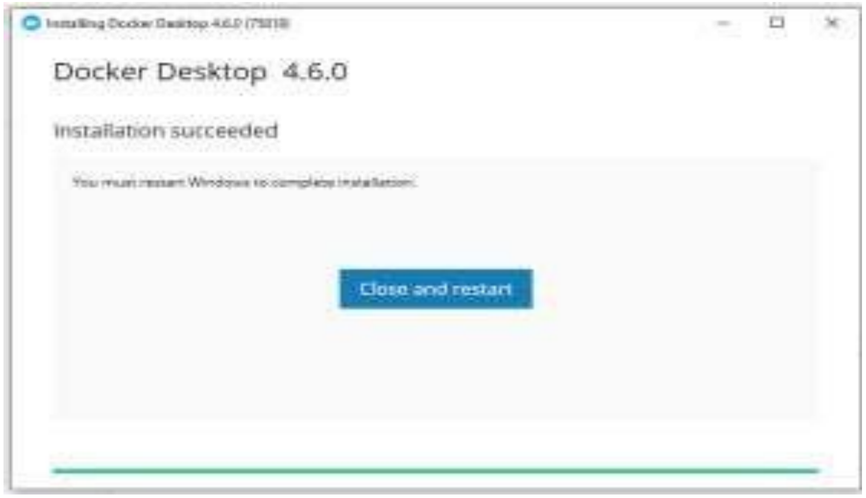
Installing Docker Desktop 4.6.0 (75818)

Docker Desktop 4.6.0

Unpacking files...

```
Unpacking file: resources/docker-desktop.iso
Unpacking file: resources/ddvp.ico
Unpacking file: resources/config-options.json
Unpacking file: resources/componentsVersion.json
Unpacking file: resources/bin/docker-compose
Unpacking file: resources/bin/docker
Unpacking file: resources/.gitignore
Unpacking file: InstallerCli.pdb
Unpacking file: InstallerCli.exe.config
Unpacking file: frontend/vk_swiftshader_icd.json
Unpacking file: frontend/v8_context_snapshot.bin
Unpacking file: frontend/snapshot_blob.bin
Unpacking file: frontend/resources/regedit/vbs/util.vbs
[illegible]
```

Step 04: After Installation, Restart your device.



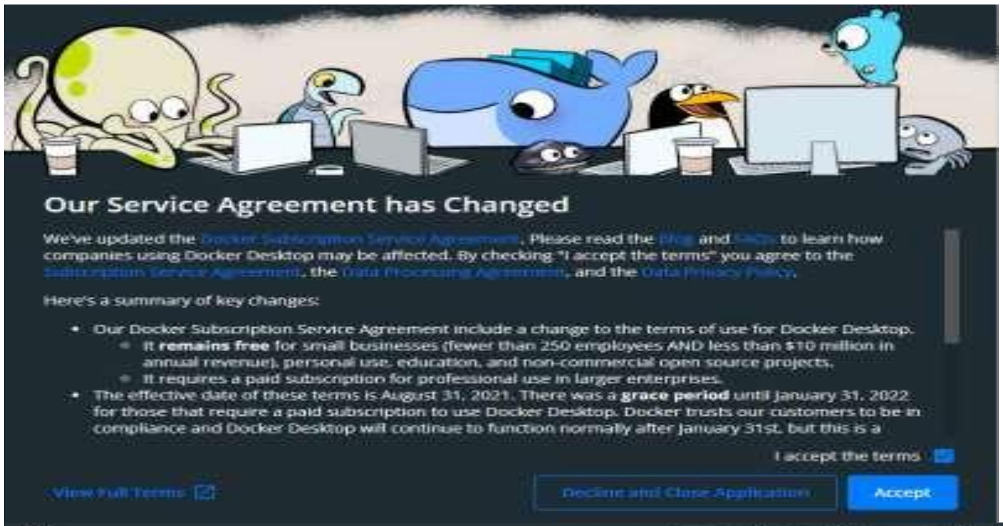
Installing Docker Desktop 4.6.0 (75818)

Docker Desktop 4.6.0

Installation succeeded

You must restart Windows to complete installation.

Step 05: Accept the terms and conditions, Click on Accept.

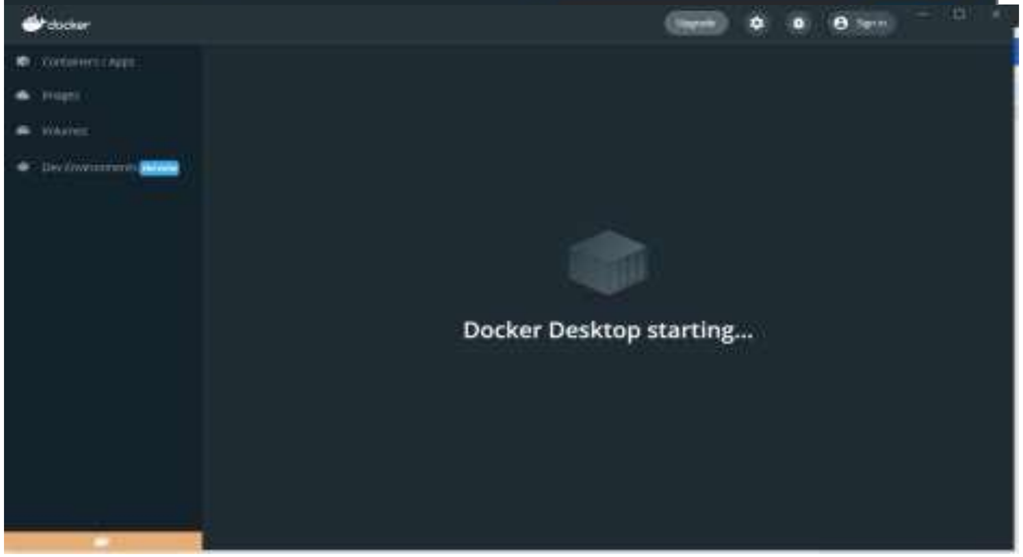


Our Service Agreement has Changed

We've updated the Docker Subscription Service Agreement. Please read the Blog and FAQs to learn how companies using Docker Desktop may be affected. By checking "I accept the terms" you agree to the Subscription Service Agreement, the Data Processing Agreement, and the Data Privacy Policy.

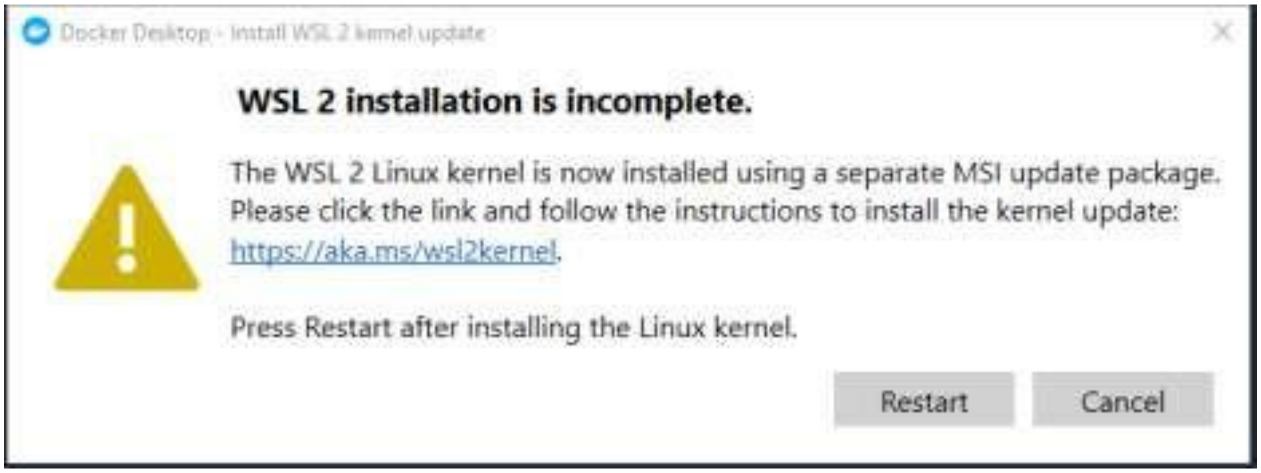
Here's a summary of key changes:

- Our Docker Subscription Service Agreement include a change to the terms of use for Docker Desktop.
  - It **remains free** for small businesses (fewer than 250 employees AND less than $10 million in annual revenue), personal use, education, and non-commercial open source projects.
  - It requires a paid subscription for professional use in larger enterprises.
- The effective date of these terms is August 31, 2021. There was a **grace period** until January 31, 2022 for those that require a paid subscription to use Docker Desktop. Docker trusts our customers to be in compliance and Docker Desktop will continue to function normally after January 31st, but this is a



Docker Desktop starting...

The following window should pop up.
Click on the link - https://aka.ms/wsl2kernel.
(Do not close this window).

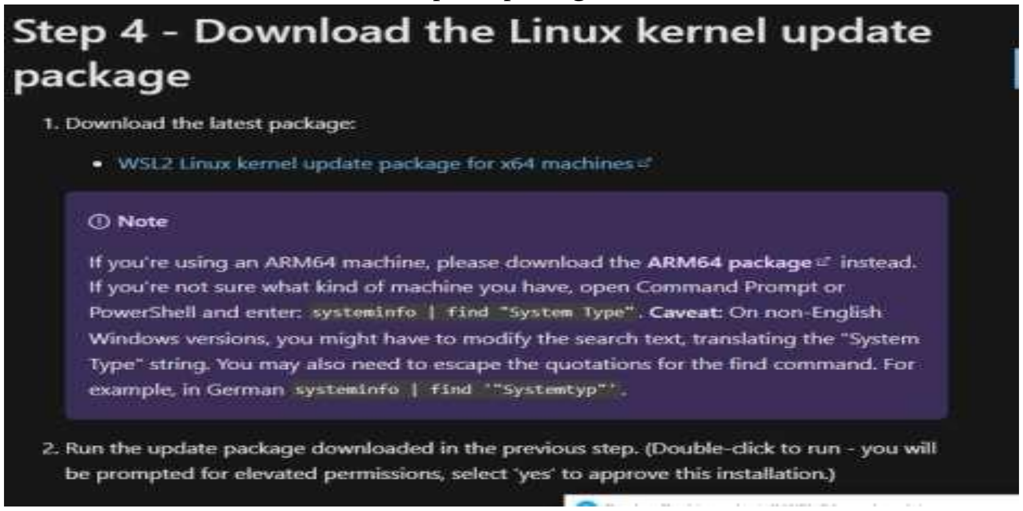


WSL 2 installation is incomplete.

The WSL 2 Linux kernel is now installed using a separate MSI update package. Please click the link and follow the instructions to install the kernel update: https://aka.ms/wsl2kernel.

Press Restart after installing the Linux kernel.

Download the WSL2 Linux kernel update package for x64 machines.



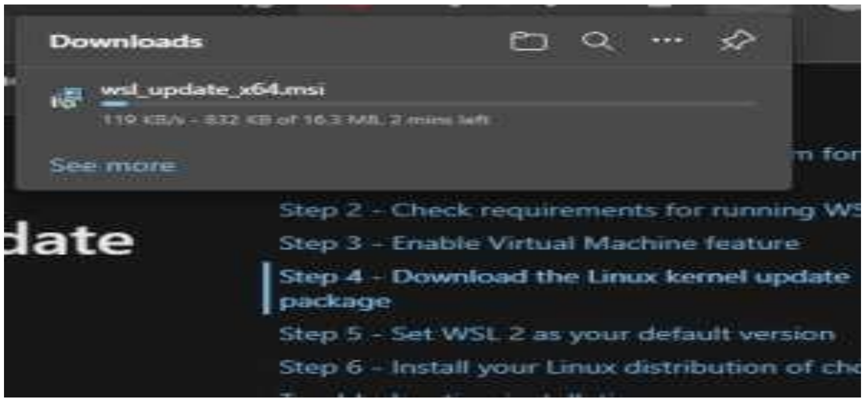
Step 4 - Download the Linux kernel update package

1. Download the latest package:
   - WSL2 Linux kernel update package for x64 machines

   Note

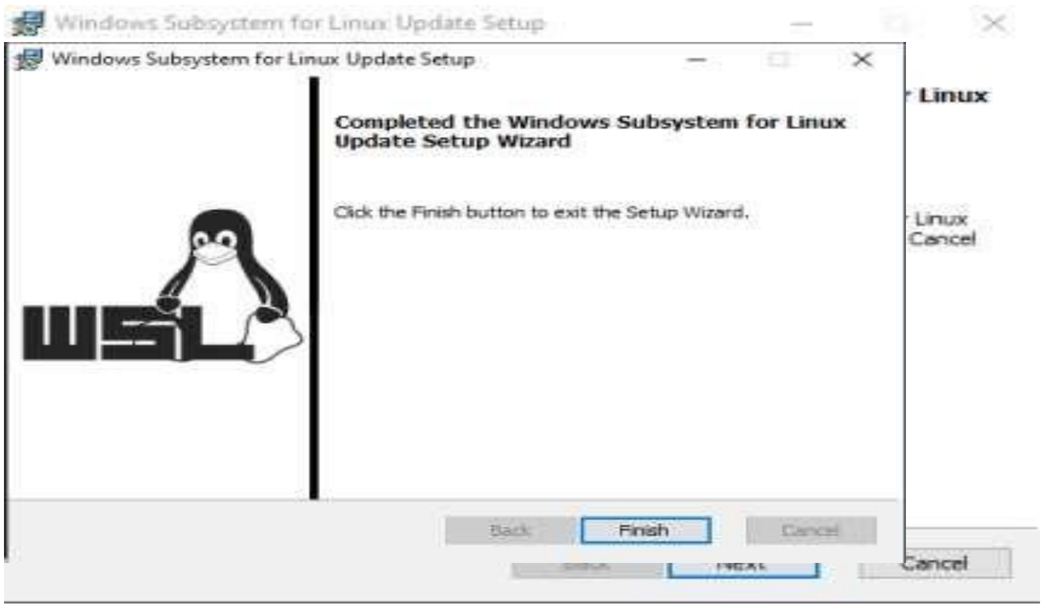
   If you're using an ARM64 machine, please download the **ARM64 package** instead. If you're not sure what kind of machine you have, open Command Prompt or PowerShell and enter: `systeminfo | find "System Type"`. **Caveat:** On non-English Windows versions, you might have to modify the search text, translating the "System Type" string. You may also need to escape the quotations for the find command. For example, in German `systeminfo | find '"Systemtyp"'`.

2. Run the update package downloaded in the previous step. (Double-click to run - you will be prompted for elevated permissions, select 'yes' to approve this installation.)



Step 2 - Check requirements for running WS
Step 3 - Enable Virtual Machine feature
Step 4 - Download the Linux kernel update package
Step 5 - Set WSL 2 as your default version
Step 6 - Install your Linux distribution of ch

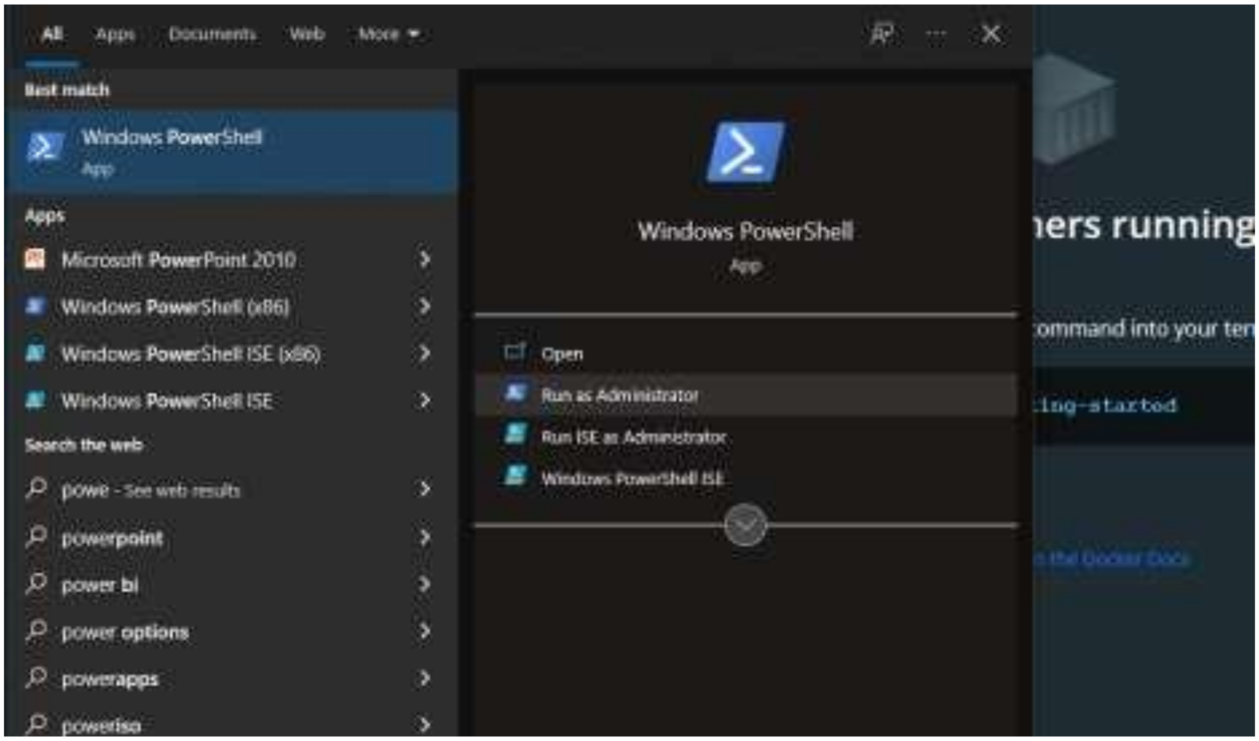
After Download is complete, Run the .msipackage.
Click on next.


Windows Subsystem for Linux Update Setup

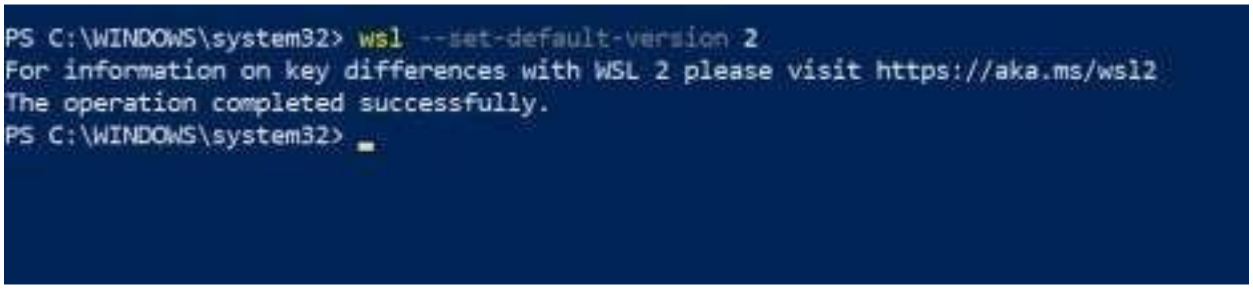
Completed the Windows Subsystem for Linux Update Setup Wizard

Click the Finish button to exit the Setup Wizard.

After, the setup is complete, Click on finish.
Open Powershell as an Administrator.

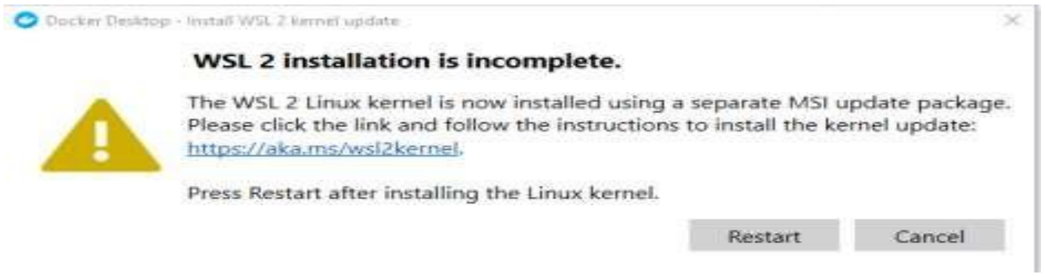


Run the following Command:
wsl --set-default-version 2



```
PS C:\WINDOWS\system32> wsl --set-default-version 2
For information on key differences with WSL 2 please visit https://aka.ms/wsl2
The operation completed successfully.
PS C:\WINDOWS\system32> _
```

Now, Click on Restart



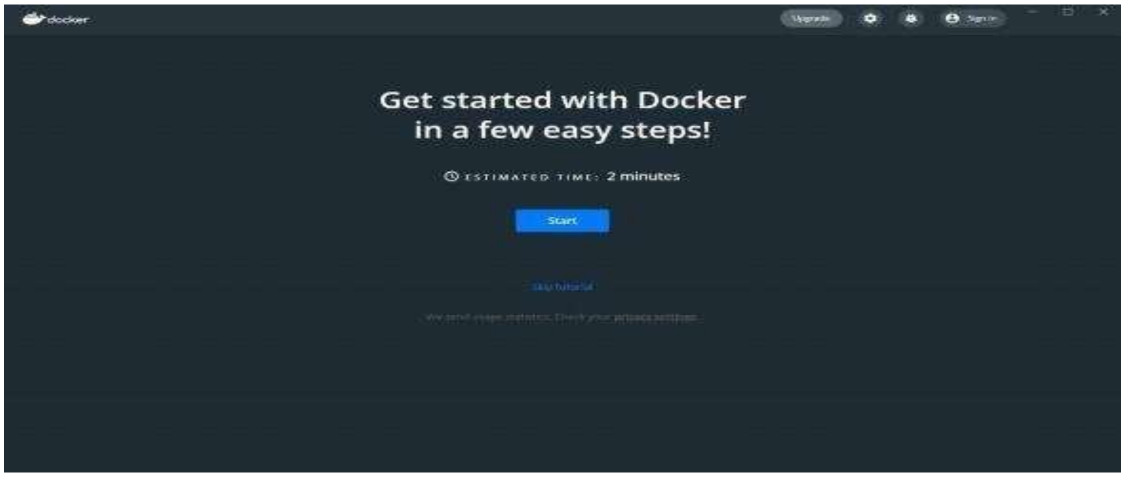
Docker Desktop - Install WSL 2 kernel update

WSL 2 installation is incomplete.

The WSL 2 Linux kernel is now installed using a separate MSI update package. Please click the link and follow the instructions to install the kernel update: https://aka.ms/wsl2kernel.

Press Restart after installing the Linux kernel.

Docker should now restart.
Click on Start.

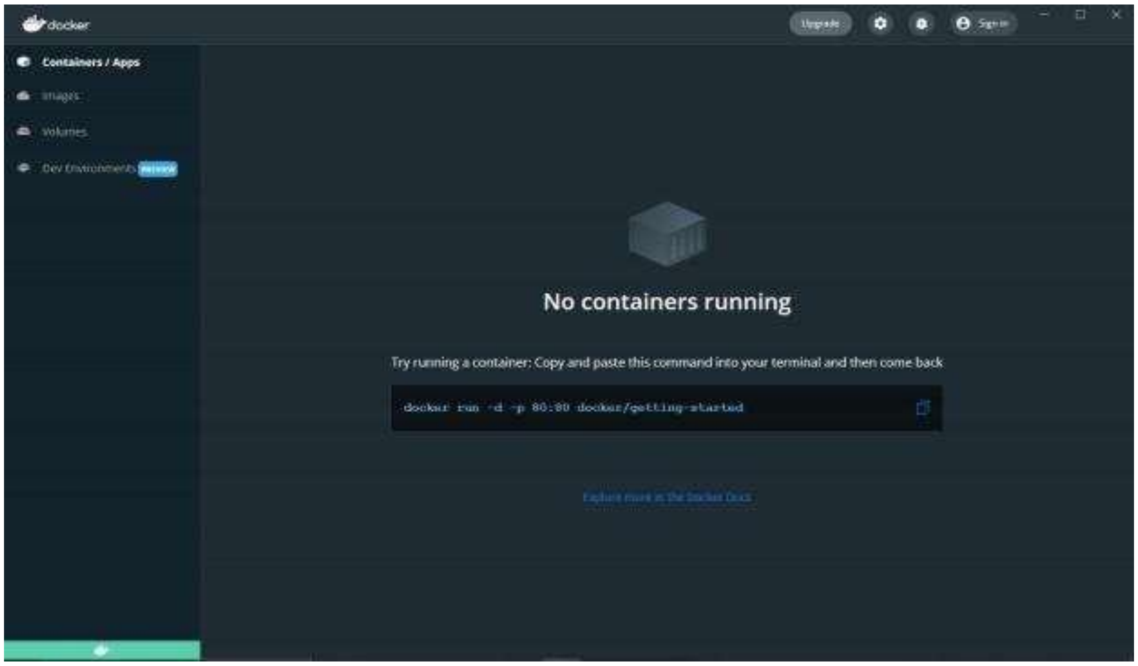


Get started with Docker
in a few easy steps!

ESTIMATED TIME: 2 minutes

We send usage statistics. Check your privacy settings.

The following window should pop up.
This means, Installation is now complete.



No containers running

Try running a container: Copy and paste this command into your terminal and then come back

```
docker run -d -p 80:80 docker/getting-started
```

Explore more in the Docker Docs

Output:

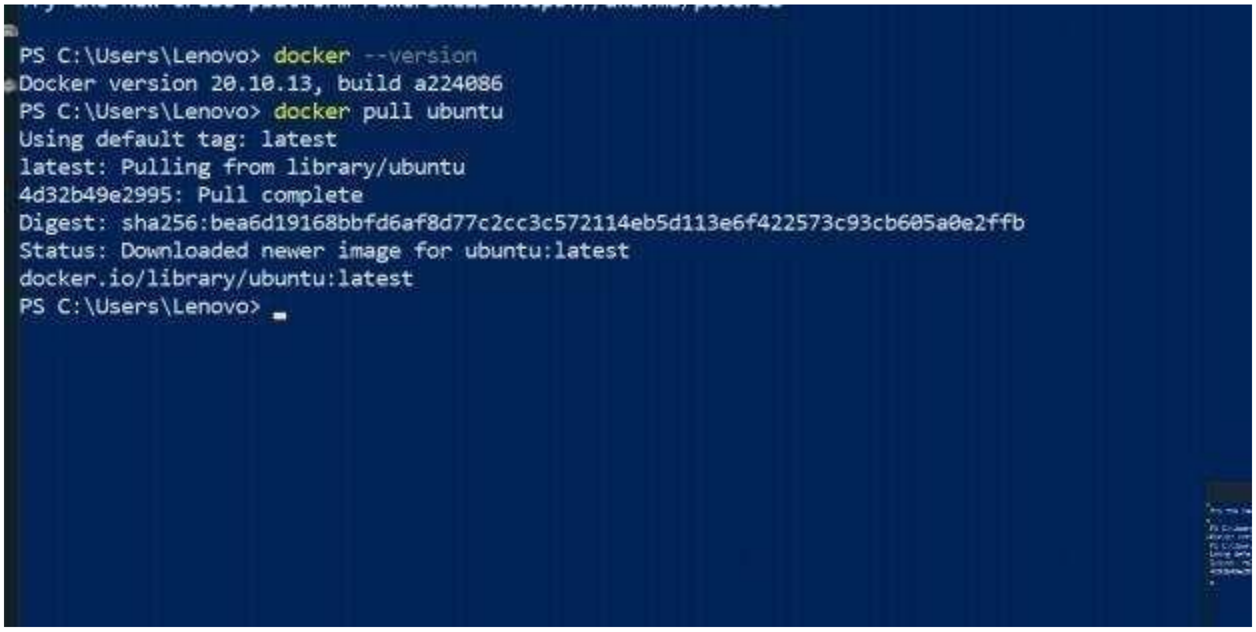
Open Command Prompt, run the following commands:

1) To check the version of Docker:

docker --version

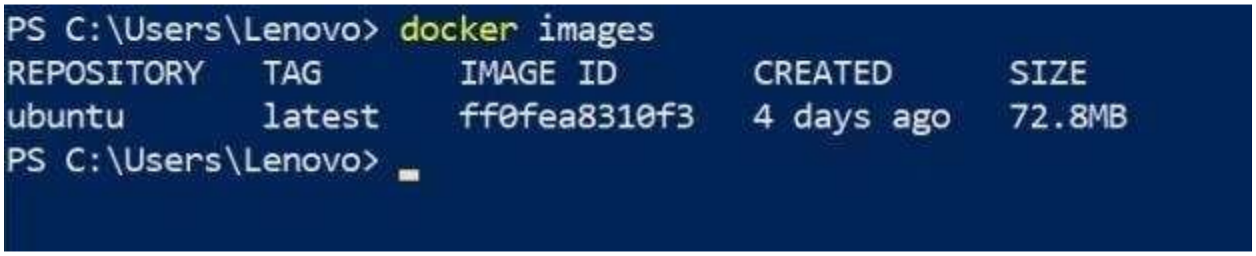
2) To install image of ubuntu

docker pull ubuntu



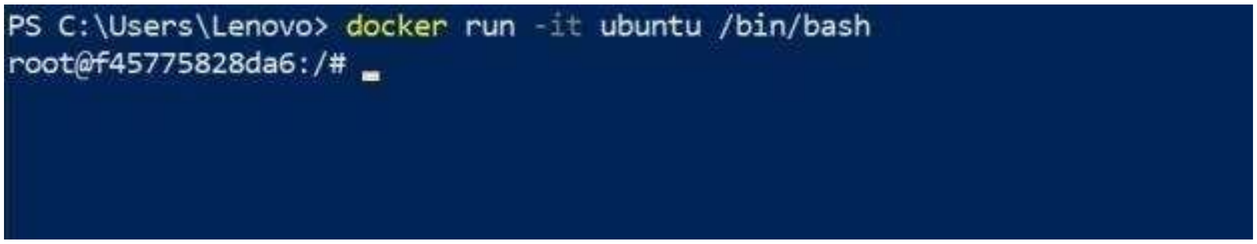
```
PS C:\Users\Lenovo> docker --version
Docker version 20.10.13, build a224086
PS C:\Users\Lenovo> docker pull ubuntu
Using default tag: latest
latest: Pulling from library/ubuntu
4d32b49e2995: Pull complete
Digest: sha256:bea6d19168bbfd6af8d77c2cc3c572114eb5d113e6f422573c93cb605a0e2ffb
Status: Downloaded newer image for ubuntu:latest
docker.io/library/ubuntu:latest
PS C:\Users\Lenovo> _
```

3) Check downloaded images,
docker images



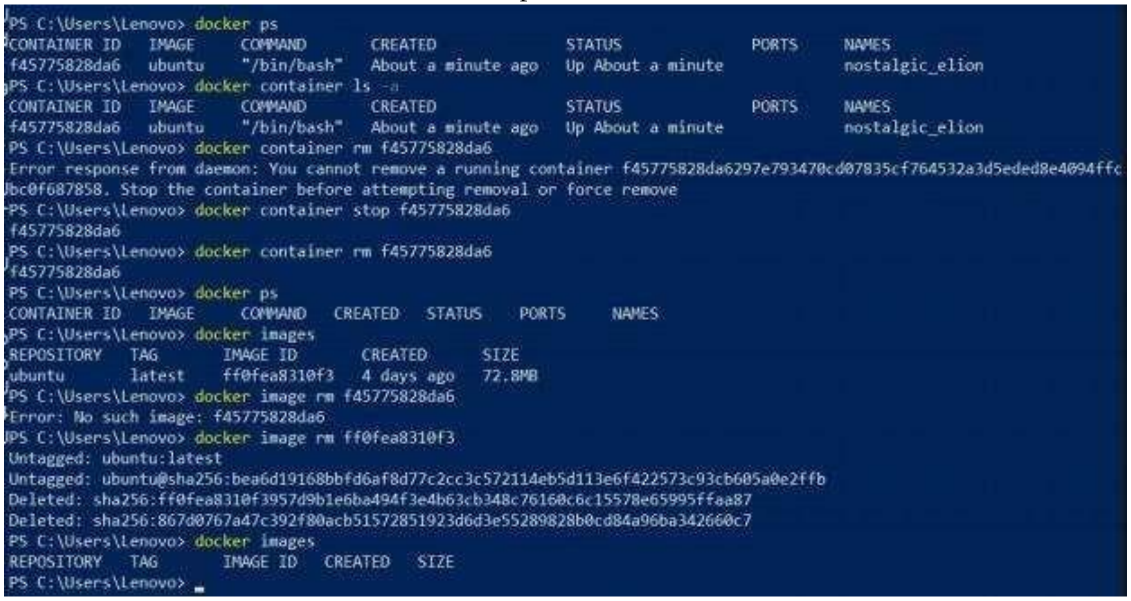
```
PS C:\Users\Lenovo> docker images
REPOSITORY    TAG       IMAGE ID       CREATED       SIZE
ubuntu        latest    ff0fea8310f3   4 days ago    72.8MB
PS C:\Users\Lenovo> _
```

4) Run ubuntu OS
docker run -it ubuntu /bin/bash



```
PS C:\Users\Lenovo> docker run -it ubuntu /bin/bash
root@f45775828da6:/# _
```

5) Open another Command Prompt and follow the steps shown below.
-docker ps
docker container ls –a
docker container rm b71e3e6b1118 //copy docker id for remove but first (Use your container ID in the above command)
stop your docker
- docker container stop b71e3e6b1118
- docker container rm b71e3e6b1118
- docker ps
- docker //list all docker commands
- docker images
- docker image rm ff0fea8310f3 // copy image id from previous output
(Use your image ID in the above command)
- docker run -it ubuntu /bin/bash //check output



```
PS C:\Users\Lenovo> docker ps
CONTAINER ID   IMAGE     COMMAND       CREATED              STATUS              PORTS     NAMES
f45775828da6   ubuntu    "/bin/bash"   About a minute ago   Up About a minute             nostalgic_elion
PS C:\Users\Lenovo> docker container ls -a
CONTAINER ID   IMAGE     COMMAND       CREATED              STATUS              PORTS     NAMES
f45775828da6   ubuntu    "/bin/bash"   About a minute ago   Up About a minute             nostalgic_elion
PS C:\Users\Lenovo> docker container rm f45775828da6
Error response from daemon: You cannot remove a running container f45775828da6297e793470cd07835cf764532a3d5eded8e4094ffc
bc0f687858. Stop the container before attempting removal or force remove
PS C:\Users\Lenovo> docker container stop f45775828da6
f45775828da6
PS C:\Users\Lenovo> docker container rm f45775828da6
f45775828da6
PS C:\Users\Lenovo> docker ps
CONTAINER ID   IMAGE     COMMAND   CREATED   STATUS    PORTS     NAMES
PS C:\Users\Lenovo> docker images
REPOSITORY   TAG       IMAGE ID       CREATED      SIZE
ubuntu       latest    ff0fea8310f3   4 days ago   72.8MB
PS C:\Users\Lenovo> docker image rm f45775828da6
Error: No such image: f45775828da6
PS C:\Users\Lenovo> docker image rm ff0fea8310f3
Untagged: ubuntu:latest
Untagged: ubuntu@sha256:bea6d19168bbfd6af8d77c2cc3c572114eb5d113e6f422573c93cb605a0e2ffb
Deleted: sha256:ff0fea8310f3957d9b1e6ba494f3e4b63cb348c76160c6c15578e65995ffaa87
Deleted: sha256:867d0767a47c392f80acb51572851923d6d3e55289828b0cd84a96ba342660c7
PS C:\Users\Lenovo> docker images
REPOSITORY   TAG       IMAGE ID   CREATED   SIZE
PS C:\Users\Lenovo> _
```

Conclusion:

Q1. What is the difference between containerization and virtualization?

Containerization and virtualization are both technologies used to create isolated environments for running applications, but they differ in their approaches. Virtualization involves creating virtual instances of entire operating systems, allowing multiple operating systems to run on a single physical machine. This requires a hypervisor to manage these virtual machines. On the other hand, containerization isolates applications from the underlying operating system, allowing them to share the same OS kernel. Containers package an application and its dependencies into a single unit, making it portable across different computing environments. Unlike virtual machines, containers are lightweight, start up quickly, and consume fewer resources because they do not require a full OS installation for each instance.

Q2. What is Docker Daemon?

The Docker Daemon is a vital component of the Docker ecosystem, serving as the background process responsible for managing Docker objects like images, containers, networks, and volumes. It operates as a service that runs on a host machine, handling requests from the Docker CLI (Command Line Interface) and API. Essentially, the Daemon is the heart of Docker, enabling users to build, run, and manage containers efficiently, by orchestrating their creation, execution, and interaction with the underlying system resources.