Agenda:

- **Understand Docker and It’s Architecture**
- **Java application Demo**

What is 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. By taking advantage of Docker's methodologies for shipping, testing, and deploying code, you can significantly reduce the delay between writing code and running it in production.

The Docker Platform:

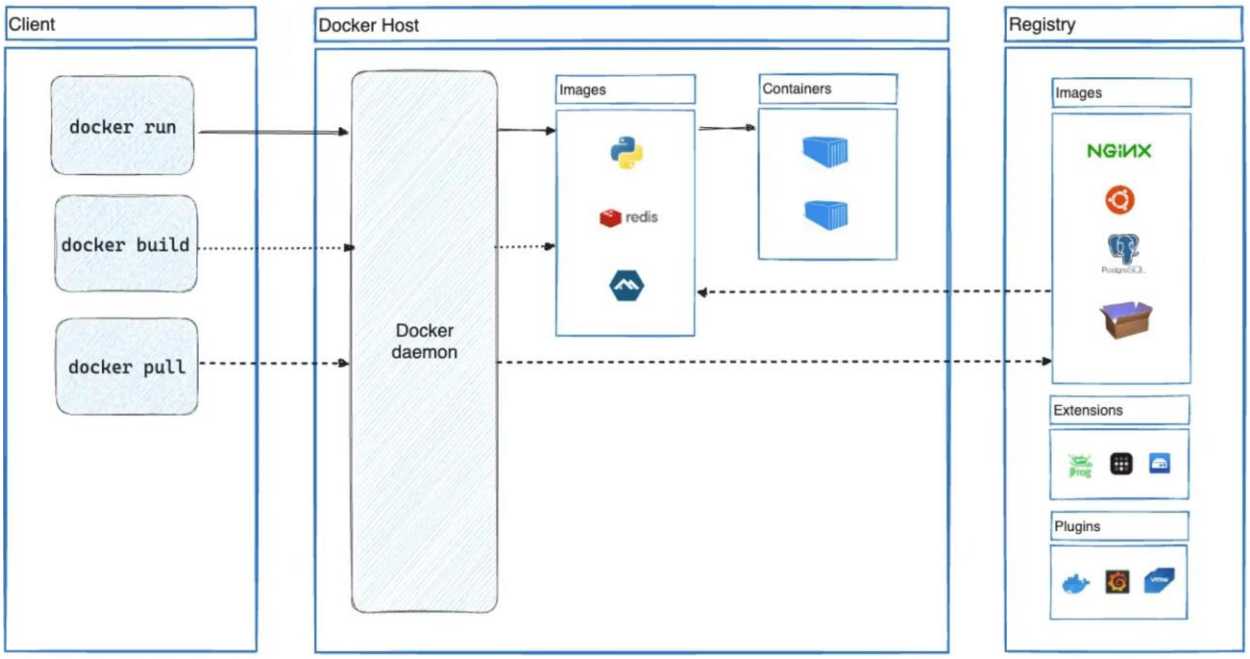
Docker provides the ability to package and run an application in a loosely isolated environment called a container. The isolation and security lets you run many containers simultaneously on a given host. Containers are lightweight and contain everything needed to run the application, so you don't need to rely on what's installed on the host. You can share containers while you work, and be sure that everyone you share with gets the same container that works in the same way.

Docker is lightweight and fast. It provides a viable, cost-effective alternative to hypervisor-based virtual machines, so you can use more of your server capacity to achieve your business goals. Docker is perfect for high density environments and for small and medium deployments where you need to do more with fewer resources.

Docker's container-based platform allows for highly portable workloads. Docker containers can run on a developer's local laptop, on physical or virtual machines in a data center, on cloud providers, or in a mixture of environments.

Docker's portability and lightweight nature also make it easy to dynamically manage workloads, scaling up or tearing down applications and services as business needs dictate, in near real time.

Docker Architecture:



Docker uses a client-server architecture. The Docker client talks to the Docker daemon, which does the heavy lifting of building, running, and distributing your Docker containers. The Docker client and daemon can run on the same system, or you can connect a Docker client to a remote Docker daemon. The Docker client and daemon communicate using a REST API, over UNIX sockets or a network interface.

1. **Docker Daemon**
   The Docker daemon (`dockerd`) listens for Docker API requests and manages Docker objects such as images, containers, networks, and volumes. A daemon can also communicate with other daemons to manage Docker services.
2. **Docker Client :**
   The **Docker client** (`docker`) is the primary way that many Docker users interact with Docker. When you use commands such as `docker run`, the client sends these commands to `dockerd`, which carries them out. The `docker` command uses the Docker API. The Docker client can communicate with more than one daemon.
3. **Docker Desktop :**
   Docker Desktop is an easy-to-install application for your Mac, Windows or Linux environment that enables you to build and share containerized applications and

microservices. Docker Desktop includes the Docker daemon (`dockerd`), the Docker client (`docker`), Docker Compose, Docker Content Trust, Kubernetes, and Credential Helper.

4. **Docker Registries :**
   A Docker registry stores Docker images. Docker Hub is a public registry that anyone can use, and Docker looks for images on Docker Hub by default. You can even run your own private registry.
5. **Images :**
   An image is a read-only template with instructions for creating a Docker container. Often, an image is based on another image, with some additional customization. For example, you may build an image which is based on the `ubuntu` image, but installs the Apache web server and your application, as well as the configuration details needed to make your application run.
   You might create your own images or you might only use those created by others and published in a registry. To build your own image, you create a Dockerfile with a simple syntax for defining the steps needed to create the image and run it. Each instruction in a Dockerfile creates a layer in the image. When you change the Dockerfile and rebuild the image, only those layers which have changed are rebuilt. This is part of what makes images so lightweight, small, and fast, when compared to other virtualization technologies.
6. **Containers :**
   A container is a runnable instance of an image. You can create, start, stop, move, or delete a container using the Docker API or CLI. You can connect a container to one or more networks, attach storage to it, or even create a new image based on its current state.
   By default, a container is relatively well isolated from other containers and its host machine. You can control how isolated a container's network, storage, or other underlying subsystems are from other containers or from the host machine.
   A container is defined by its image as well as any configuration options you provide to it when you create or start it. When a container is removed, any changes to its state that aren't stored in persistent storage disappear.

Demo

1. Below is Java program :

```
// HelloWorld.java
public class HelloWorld {
```

```
    public static void main(String[] args) {
        System.out.println("Hello, Docker!");
    }
}
```

2. Compile the Java application.

   javac HelloWorld.java
3. Create Dockerfile
4. Build Docker Image

   docker build -t my-java-app .
5. Run Docker container :

   docker run my-java-app

Build and Push Docker Image:

Step 1 : **Build Docker Image**

docker build -t my-java-app:latest .

Step 2 : **Log in to Docker Hub**

docker login

Step 3 : **Tag the Image for Docker Hub**

Docker Hub requires images to be tagged with your Docker Hub username and repository name. Use the following format:

docker tag <image-name>:<tag> <dockerhub-username>/<repository-name>:<tag>

eg : docker tag my-java-app:latest devopsera007/my-java-app:latest

Step 4 : **Push the Image to Docker Hub**

docker push <dockerhub-username>/<repository-name>:<tag>

docker push devopsera007/my-java-app:latest