Docker in One Shot

TrainWithShubham

1. Introduction to Docker

- What is Docker?
- Why Use Containers?
- History and Evolution of Docker
- Key Docker Components Overview (Images, Containers, Registries, Networks, Volumes)
- Differences between Virtual Machines and Containers
- Benefits of Using Docker
- Use Cases for Docker in Development, Testing, and Production

2. Docker Architecture

- Docker Daemon - Role and main responsibilities
- Docker Client - Interaction with the daemon and key commands
- Docker Registries (Docker Hub, Private Registries, third-party registries like ECR, GCR)
- Docker Images and Containers - Building blocks and differences
- Docker Networking Basics - Overview of Docker networking and network types

3. Installing Docker

- Installation on Linux (Ubuntu/CentOS)
- Installation on Windows (Docker Desktop, WSL2 setup)

- Installation on Mac (Docker Desktop, ARM compatibility)
- Docker Desktop Alternatives (e.g., Colima, Minikube)
- Common Installation Issues and Solutions

4. Docker Images

- Dockerfile Basics - Key instructions: FROM, RUN, COPY, EXPOSE, ENTRYPOINT, CMD
- Building Docker Images (docker build) - Examples, syntax
- Tagging Images - Versioning and semantic tagging conventions
- Pushing and Pulling Images from Docker Hub
- Image Layers and Caching - Layer caching impact
- Image Optimization and Multi-Stage Builds
- Managing and Cleaning Up Images - Commands like docker images, docker rmi

5. Docker Containers

- Creating and Running Containers (docker run) - Key options: -d, -p, -v, -e, --name
- Container Lifecycle Management - Starting, stopping, pausing, and restarting
- Attaching to and Detaching from Containers - docker attach, detaching with Ctrl+P Ctrl+Q
- Executing Commands in Running Containers - docker exec
- Data Persistence with Volumes and Bind Mounts - Types and uses
- Inspecting and Logging Containers - docker inspect and docker logs
- Cleaning Up Stopped Containers - docker rm, docker system prune
- Container Resource Management - Limiting CPU and memory usage

6. Docker Networking

- Introduction to Container Networking
- Types of Docker Networks - Bridge, Host, None, Custom (Overlay, Macvlan)
- Connecting Containers in the Same Network
- Port Mapping and Exposing Services
- Networking Commands and Troubleshooting
- DNS and Service Discovery - Using container DNS

7. Docker Volumes and Storage

- Introduction to Docker Volumes - Persistent storage for containers
- Types of Volumes - Volumes, Bind Mounts, tmpfs
- Creating and Managing Volumes - docker volume create, docker volume ls
- Data Sharing Between Containers
- Backing Up and Restoring Volumes
- Managing Disk Space for Containers and Volumes

8. Docker Compose

- Introduction to Docker Compose and YAML Syntax
- Installing Docker Compose
- Defining Services in Docker Compose - Building multi-container applications
- Networking with Docker Compose - Custom networks
- Managing Dependencies Between Services - depends_on, healthcheck
- Environment Variables and Secrets in Docker Compose - Using .env files

- Docker Compose Commands - docker-compose up, down, logs, ps
- Scaling Services with Docker Compose - docker-compose up --scale

9. Docker Registry

- Understanding Docker Registries
- Setting Up a Private Docker Registry - Local or cloud-hosted
- Pushing and Pulling Images to/from a Private Registry - Authentication
- Securing Your Docker Registry - SSL/TLS, basic authentication
- Using Third-Party Registries - AWS ECR, Google GCR

10. Advanced Docker Concepts

- Multi-Stage Builds - Example use cases for optimization
- Dockerfile Best Practices - Layer optimization, secrets handling
- Image Security and Vulnerability Scanning - docker scan, Trivy, Clair
- Managing Secrets and Credentials in Containers - Secure practices
- Docker CLI Tips and Tricks - Productivity tips, flags, aliases
- Docker in CI/CD - Integrating with Jenkins, GitLab CI, GitHub Actions

11. Monitoring and Logging in Docker

- Docker Logs and Inspecting Logs in Real-Time
- Setting Up Logging Drivers - Available drivers (json-file, syslog)
- Docker Events and Monitoring Container States - docker events

- Integrating Docker with Monitoring Tools - Prometheus, Grafana, ELK stack

12. Orchestrating Docker with Kubernetes (Brief Introduction)

- Why Kubernetes? - Comparison with Docker Swarm
- How Docker Works with Kubernetes - Basics of container runtime
- Overview of Kubernetes Concepts - Pods, Deployments, Services
- Basic Kubernetes Commands for Docker Users - kubectl basics

Projects

- Project 1: Microservices Application with Docker Compose
  - Objective: Multi-container application (e-commerce app example)
  - Networking and Logging setup

- Project 2: Deploying a Web Application with Nginx and MySQL
  - Objective: Full-stack web app deployment
  - Scaling and Load Balancing setup