Advanced Docker Concepts and Container Orchestration

Duration: 5 Days

Prerequisites:

- Basic understanding of Linux command line operations, as Docker is commonly used in a Linux environment.
- Fundamental knowledge of software development principles and processes, which will help in comprehending the application lifecycle within containers.
- Familiarity with the concepts of virtualization and microservices architecture, as Docker is a containerization platform that operates within these paradigms.
- Experience with using package managers (like apt, yum) and version control systems (such as Git) can be beneficial, as Docker often interacts with software dependencies and source code repositories.
- An introductory level of networking knowledge, including IP addressing, DNS, and port usage, is beneficial for managing container networking.
- Some prior exposure to basic system administration tasks, including managing services, editing configuration files, and monitoring system resources, will be helpful.

Course Description:

The "Advanced Docker Concepts and Container Orchestration" course is designed to deepen learners' understanding of containerization, Docker, and orchestration tools like Docker Swarm and Kubernetes. Starting with Docker advanced concepts, participants will explore complex components and operations necessary to run sophisticated Docker environments. Through hands-on lessons, they'll learn installation procedures, client operations, custom image creation, and dive into the intricacies of container management, including storage, networking, and security. By mastering Docker advanced concepts, students will be equipped to manage containerized applications efficiently. The course also covers container orchestration in depth, teaching how to scale, update, and maintain container clusters using Docker Swarm and Kubernetes, ensuring high availability and resource optimization in production environments. This comprehensive knowledge will be invaluable for professionals looking to excel in the field of DevOps and container management.

Target Audience:

- DevOps Engineers
- Software Developers
- System Administrators
- Cloud Infrastructure Engineers
- IT Professionals with a focus on automation and deployment
- Technical Architects
- QA Engineers involved in environment setup and deployment processes
- Release Managers
- Network Professionals looking to understand container networking
- Security Professionals interested in application/container security
- Professionals working with microservices architectures
- Product Managers who need to understand Docker and Kubernetes workflows
- Technical Project Managers overseeing DevOps teams
- Technical Support Engineers
- Application Developers looking to containerize and scale applications
- Site Reliability Engineers (SREs)

Course Outlines:

Module 1 - Installation of Docker
- Introduction to Docker
- Docker Architecture
- Docker Components: Docker Client, Docker Host and Docker Registry
- Installation of Docker

Module 2 – Docker Client Operations
- Running a Container
- Container Lifecycle
- Managing Containers
- Executing Commands in Running Containers

Module 3 – Building Custom Images and Docker Registry
- Creating Docker Images using Docker Commit
- Building a Dockerfile
- Tagging an Image
- Pull and Push Images
- Creating Private Registries

Module 4 – Container Deep Dive
- Cgroups
- Namespaces
- Container Resource Limits

Module 5 – Storage & Container Networking
- Storage Overview
- Creating and Managing Volumes
- Using Bind Mounts
- Using tmpfs
- Overview of Container Networking
- Managing Network Bridges

Module 6 – Docker Compose
- Understand YAML
- Create Docker Compose Files
- Deploying and configuring applications
- Build Images

Module 7 – Docker Swarm
- Container Orchestration
- Creating Swarm Cluster
- Manage Nodes in Swarm Node Cluster
- Manage Services
- Secrets
- Rolling Service Updates
- Monitoring
- Scaling

Module 8 – Core Concepts of Kubernetes
- Understand the Kubernetes Cluster Architecture
- Master/Node
- Kubectl
- Kubelet
- Kube-Proxy
- Etcd
- Controllers

Module 9 – Installation of Kubernetes Cluster
- Design a Kubernetes Cluster
- Install Kubernetes masters and nodes, including the use of TLS Bootstrapping
- Configure Network Solution
- Analyse end-to-end test results

Module 10 – Using Kubernetes Features
- Kubectl
- Understand YAML
- Creating and Managing Pods
- Managing Labels
- Managing Services
- Managing Replica Set & Replication Controller
- Resource Quota

Module 11 – Networking in Kubernetes
- Kubernetes Networking
- Understand CNI
- Understand Pod Networking Concepts
- Configure DNS
- Configure and Manage Ingress Rule
- Namespace

Module 12 – Security in Kubernetes
- Managing RBAC
- Security Context
- Secrets
- Work with Image Securely
- Configure Network Policie