



# Docker with Kubernetes Administration

Course GL355

5 Days

Instructor-led, Hands on

This course combines the GL340 Docker and GL360 Kubernetes Administration courses.

Participants will first understand the core features of Docker including: container creation and management, interacting with Docker hub, using Dockerfile to create and manage custom images, advanced Docker networking (how to safely expose container services to the world, and link containers), the use of Docker volumes to manage persistent data, and Docker Compose to build multi-container applications. Emphasis is placed on best practices and how to secure Docker installations and containers.

The second part of the course introduces participants to the basic concepts and architecture of Kubernetes, its initial install & setup, Kubernetes Pods, deployments and services, persistent storage, networking, automating deployment, scaling & management of containerized applications, and finally it's logging and monitoring facilities.

Structure: 50% theory 50% hands on lab exercises

Target audience: System administrators and Devops professionals who want to understand and use Docker and Kubernetes in enterprise and cloud environments.

## Prerequisites:

- Proficiency with the Linux CLI (GL120 "Linux Fundamentals).
- A broad understanding of Linux system administration (GL250 "Enterprise Linux Systems Administration")

## Supported Distributions:

Red Hat Enterprise Linux 8

## Course Outline

### Module 1: Container Technology Overview

- Application Management Landscape
- Application Isolation
- Resource Measurement and Control
- Container Security
- OverlayFS Overview
- Container Security
- Open Container Initiative
- Docker Alternatives

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- Docker Ecosystem

#### Lab Tasks

- Container Concepts runC
- Container Concepts Systemd

## **Module 2: Installing Docker**

- Installing Docker
- Docker Architecture
- Starting the Docker Daemon
- Docker Daemon Configuration
- Docker Control Socket
- Enabling TLS for Docker
- Validating Docker Install

#### Lab Tasks

- Installing Docker
- Protecting Docker with TLS

## **Module 3: Managing Containers**

- Creating a New Container
- Listing Containers
- Managing Container Resources
- Running Commands in an Existing Container
- Interacting with a Running Container
- Stopping, Starting, and Removing Containers
- Copying files in/out of Containers
- Inspecting and Updating Containers
- Docker Output Filtering & Formatting

#### Lab Tasks

- Managing Containers
- Configure a docker container to start at boot.

## **Module 4: Managing Images**

- Docker Images
- Listing and Removing Images
- Searching for Images
- Downloading Images
- Uploading Images
- Export/Import Images
- Save/Load Images

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- Committing Changes

#### Lab Tasks

- Docker Images
- Docker Platform Images

### **Module 5: Creating Images with Dockerfile**

- Dockerfile
- Caching
- docker image build
- Dockerfile Instructions
- ENV and WORKDIR
- Running Commands
- Getting Files into the Image
- Defining Container Executable
- HEALTHCHECK
- Best Practices
- Multi-Stage builds with Dockerfile

#### Lab Tasks

- Dockerfile Fundamentals
- Optimizing Image Build Size
- Image Builds and Caching

### **Module 6: Docker Volumes**

- Volume Concepts
- The docker volume Command
- Creating and Using Internal Volumes
- Internal Volume Drivers
- Removing Volumes
- Creating and Using External Volumes
- SELinux Considerations
- Mapping Devices

#### Lab Tasks

- Docker Internal Volumes
- Docker External Volumes

### **Module 7: Docker Compose/Swarm**

- Writing YAML Files
- Concepts
- Compose CLI

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- Defining a Service Set
- Legacy Compose Versions
- Docker Engine Swarm Mode
- Docker Swarm Terms
- Docker Swarm Command Overview
- Creating a Swarm
- Creating Services
- Creating Secrets
- Stack Files
- Stack Command
- Swarm Placements
- Swarm Resource Limits & Reservations
- Swarm Networking
- Swarm Networking Troubleshooting

#### Lab Tasks

- Docker Compose
- Docker Engine Swarm Mode

### **Module 8: Docker Networking**

- Overview
- Data-Link Layer Details
- Network Layer Details
- Hostnames and DNS
- Service Reachability
- Container to Container Communication
- Container to Container: Links (deprecated)
- Container to Container: Private Network
- Managing Private Networks
- Remote Host to Container

#### Lab Tasks

- Docker Networking
- Exposing Ports

### **Module 9: Docker Logging**

- Docker Logging
- Docker Logging with json-file and journald
- Docker Logging with syslog
- Docker Logging with Graylog or Logstash
- Docker Logging with Fluentd
- Docker Logging with Amazon or Google
- Docker Logging with Splunk

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#### Lab Tasks

- Logging to syslog

### **Module 10: Kubernetes Core Concepts**

- CKA Objectives Covered
- Kubernetes Architecture
- Cluster Communication
- Objects
- Object Properties
- Labels & Selectors
- Annotations
- Object Management
- Object Management (cont.)
- Image Fundamentals
- Container Fundamentals
- Pod Fundamentals
- Working with Pods

#### Lab Tasks

- Container and Pod Fundamentals
- Single Node Install
- Pod Fundamentals

### **Module 11: Installation**

- CKA Objectives Covered
- Installing HA Control Plane (DEMO)

#### Lab Tasks

- Kubernetes HA Masters Install
- Kubernetes Install
- Joining Worker Nodes

### **Module 12: Application Lifecycle Management**

- CKA Objectives Covered
- Pod Lifecycle
- Container Lifecycle
- Init Containers
- Container: command and args
- Container: Defining Environment
- ReplicaSet
- Deployments
- Working with Deployments

- Deployment Rollouts

#### Lab Tasks

- Pod Lifecycle
- Init Containers
- Deployments

### **Module 13: Networking**

- CKA Objectives Covered
- Network Overview
- Service Discovery & CoreDNS
- Container Network Interface (CNI)
- Services
- Ingress Objects

#### Lab Tasks

- Ingress Controller
- Port-Forwarding
- Services
- Ingress

### **Module 14: Storage**

- CKA Objectives Covered
- Storage
- Volume Types
- Volume Types
- Static Volumes (DEMO)
- ConfigMaps
- ConfigMaps
- Secrets

#### Lab Tasks

- (DEMO) Static Volumes
- (DEMO) ConfigMaps & Secrets
- Static Volume Provisioning
- ConfigMaps and Secrets

### **Module 15: Scheduling**

- CKA Objectives Covered
- Controlling and Tracking Resources
- Scheduler Operation
- DaemonSet



- Node Affinity & Anti-affinity
- Pod Affinity & Anti-affinity
- Taints & Tolerations

#### Lab Tasks

- (DEMO) Affinity and Taints
- Pod Resources and Scheduling
- Static Scheduling and Daemonsets
- Pod and Node Affinities

### **Module 16: Docker Registry Lab Tasks**

- Docker Registry
- Docker Registry (secured)
- Docker Content Trust
- Jobs and CronJobs
- Jobs
- CronJobs

#### Lab Tasks

- Jobs
- CronJobs

### **Module 17: Linux Containers**

- Application Management Landscape
- Application Isolation
- Resource Measurement and Control
- Container Security
- OverlayFS Overview
- Container Security
- Open Container Initiative

#### Lab Tasks

- Container Concepts runC