

**Introduction to Docker and Kubernetes**

**Course Number:** CLD-122WA  
**Duration:** 3 days

**Overview**

This Docker and Kubernetes training course teaches students how to create and deploy applications using Docker to create containers and Kubernetes (K8s) to manage and deploy those containers. This Docker and K8s course also discusses Continuous Integration.

**Prerequisites**

All students must be somewhat familiar with Linux and have basic programming skills.

**Materials**

All Docker with Kubernetes training attendees receive comprehensive courseware.

**Software Needed on Each Student PC**

A complete remote environment is included for each student with the class. You will need Internet access, a modern web browser, and an SSH client to access the environment.

**Objectives**

* Create a Docker account and obtain an access token
* Manage containers
* Build images
* Work with Docker Compose
* Configure Minikube/Kubernetes to use a custom Docker account
* Access the Kubernetes API
* Work with Kubernetes workloads
* Schedule and manage nodes
* Access applications
* Use persistent storage
* Work with Helm
* Build CI Pipeline with Jenkins

**Outline**

* Docker and Linux Container Technology: Introduction and Use-Cases
  + Modern Infrastructure Terminology
  + Virtualization
  + Hypervisors
  + Hypervisor Types
  + Type 1 Hypervisors
  + Type 2 Hypervisors
  + Type 1 vs. Type 2 Processing
  + Paravirtualization
  + Virtualization Qualities
  + Disadvantages of Virtualization
  + Containerization
  + Virtualization vs. Containerization
  + Where to Use Virtualization and Containerization
  + Containerization: High-Level
  + Popular Containerization Systems
  + What are Linux Containers
  + Docker
  + OpenVZ
  + Solaris Zones (Containers)
  + Container Orchestration Tools
  + Docker Swarm
  + Kubernetes
  + Mesos and Marathon
  + Docker Use-Cases
  + Microservices
  + Microservices and Containers/Clusters
* Docker in Action
  + Docker Basics
  + Where Can I Run Docker?
  + Installing Docker Container Engine
  + Docker Toolbox
  + What is Docker?
  + Docker Architecture
  + Docker Architecture Diagram
  + Docker Images
  + Docker Containers
  + Docker Integration
  + Docker Services
  + Docker Application Container Public Repository
  + Docker Run Command
  + Starting, Inspecting, and Stopping Docker Containers
  + Docker Volume
  + Dockerfile
  + Docker Compose
  + Using Docker Compose
  + Dissecting docker-compose.yml
  + Specifying services
  + Dependencies between containers
  + Injecting Environment Variables
* Managing Docker State
  + State and Data in Docker
  + Volumes
  + More About Volumes
  + Uses for Volumes
  + Working With Volumes
  + Create Volume
  + Use Volumes with Containers
  + Bind Mounts
  + Using Bind Mounts
  + tmpfs Mounts
  + Storing Data in the Container
  + Storage Drivers
  + Remote Data Storage
  + Networking
  + The Default Bridge Network
  + User-Defined Bridge Networks
  + Docker Network Commands
  + Creating a User-Defined Bridge Network
* Open Container Initiative and Container Runtime Interface
  + Open Container Initiative (OCI)
  + Docker
  + Docker Engine Architecture
  + runC
  + containerd
  + containerd Benefits
  + CRI-O
  + CRI-O Components
  + Kubernetes and CRI-O
  + Using Container Runtimes with Minikube
  + Docker Runtime and Kubernetes
  + Putting Things Together
  + Summary
* Kubernetes Architecture
  + Kubernetes Basics
  + What is Kubernetes?
  + Container Orchestration
  + Architecture Diagram
  + Components
  + Kubernetes Cluster
  + Master Node
  + Kube-Control-Manager
  + Nodes
  + Pod
  + Using Pods to Group Containers
  + Label
  + Label Syntax
  + Label Selector
  + Annotation
  + Persistent Storage
  + Resource Quota
  + Interacting with Kubernetes
* Working with Kubernetes
  + Installation
  + Startup
  + Kubernetes Tools
  + kubectl Command Line Interface
  + API Proxy
  + Dashboard
  + Kubernetes Component Hierarchy
  + Deployments
  + Deployment Commands
  + Updating Deployments
  + Network Considerations
  + Services
  + Namespaces
  + Labels
  + Annotations
  + Other Useful Commands
  + Summary
* Kubernetes Workload
  + Kubernetes Workload
  + Managing Workloads
  + Imperative commands
  + Imperative Object Configuration
  + Declarative Object Configuration
  + Configuration File Schema
  + Understanding API Version
  + Obtaining API Versions
  + Stateless Applications
  + Sample Deployment Manifest File
  + Working with Deployments
  + Stateful Applications
  + Sample Stateful Manifest File
  + Working with StatefulSet
  + Jobs
  + Sample Job Manifest File
  + Working with Batch Job
  + DaemonSets
  + Sample Daemon Manifest File
  + Rolling Updates
* Scheduling and Node Management
  + Kubernetes Scheduler
  + Skip Kubernetes Scheduler
  + Scheduling Process
  + Scheduling Process - Predicates and Priorities
  + Scheduling Algorithm
  + Kubernetes Scheduling Algorithm
  + Scheduling Conflicts
  + Controlling Scheduling
  + Label Selectors
  + Node Affinity and Anti-affinity
  + Node Affinity Example
  + Node Antiaffinity Example
  + Taints and Tolerations
* Managing Networking
  + Kubernetes Networking Components
  + The Kubernetes Network Model
  + Networking Scenarios
  + Container-Container Communication
  + Pod-Pod Communication
  + 1.3 Pod-Service Communication
  + External-Service Communication
  + Accessing Applications
  + Useful Commands
  + Container Network Interface (CNI)
  + What is CNI’s Role?
  + CNI Configuration Format
  + Sample CNI Configuration
  + Running the CNI Plugins
* Managing Persistent Storage
  + Storage Methods
  + Container OS file system storage
  + Docker Volumes
  + Kubernetes Volumes
  + K8S Volume Types
  + Cloud Resource Types
  + configMaps
  + Creating configMaps from Literals
  + Creating configMaps from files
  + Using configMaps
  + emptyDir
  + Using an emptyDir Volume
  + Other Volume Types
  + Persistent Volumes
  + Creating a Volume
  + Persistent Volume Claim
  + Persistent Volume
  + Pod that uses Persistent Volume
  + Secrets
  + Creating Secrets from Files
  + Creating Secrets from Literals
  + Using Secrets
  + Security Context
  + Security Context Usage
* Working with Helm
  + What is Helm?
  + Installing Helm
  + Helm and KUBECONFIG
  + Helm Features
  + Helm Terminology
  + Searching for Charts with helm CLI
  + Adding Repositories
  + Helm Hub - Search
  + Helm Hub - Chart Page
  + Installing a Chart
  + Upgrading a Release
  + Rolling Back a Release
  + Creating Custom Charts
  + Common Chart Files
  + Helm Templates
  + Installing A Custom Chart
  + Packaging Custom Charts
* Logging, Monitoring, and Troubleshooting
  + Differences Between Logging and Monitoring
  + Logging in Kubernetes
  + Basic Logging
  + Logging Agents
  + Fluentd and Elastic Stack
  + Monitoring with Prometheus
  + Kubernetes and Prometheus - Metrics
  + Alerting
  + Debugging Pods
  + Debugging Nodes
  + Debugging Replication Controllers and Services
  + Upgrading Kubernetes
  + Upgrade Process
  + Determine Which Version to Upgrade To
  + Upgrade kubeadm
  + Upgrade Control Plane Node
  + Upgrade kubelet and kubectl
  + Upgrade Worker Nodes
  + Recovering From a Failure State
* Continuous Integration Fundamentals
  + Jenkins Continuous Integration
  + Jenkins Features
  + Running Jenkins
  + Downloading and Installing Jenkins
  + Running Jenkins as a Stand-Alone Application
  + Running Jenkins on an Application Server
  + Installing Jenkins as a Windows Service
  + Different types of Jenkins job
  + Configuring Source Code Management (SCM)
  + Working with Subversion
  + Working with Git
  + Build Triggers
  + Schedule Build Jobs
  + Polling the SCM
  + Maven Build Steps
  + Configuring Jenkins to Access Kubernetes
  + Jenkins Pipeline
  + Jenkins Pipeline Output
  + Installing Jenkins Plugins
* Conclusion