

Kubernetes Security and CI/CD (Cloud Native Computing Foundation (CNCF))

Learn to secure Kubernetes clusters and build CI/CD pipelines with Jenkins, GitLab, ArgoCD and Istio.

10 Days

8 HOURS A DAY

9

MODULES

61

TOPICS

60

HANDS-ON LABS

COURSE OVERVIEW

This comprehensive DevOps Tools course, covering implementation of container orchestration and managing containerized application with CI/CD pipeline and security best practices, is designed to equip learners with the skills needed to successfully to implement DevOps practices securely.

WHO THIS COURSE IS FOR

DevOps Engineers

Kubernetes Administrators

Platform Engineers

Security Engineers

Site Reliability Engineers

PREREQUISITES

- Basic knowledge of Linux Server Administration.
- Basic knowledge of Containers

TOOLS AND REQUIREMENTS

- Kubernetes and DevOps Tools Version: Latest
- Lab Requirement: Koenig-DC and AWS EKS

LEARNING OBJECTIVES

- Describe Kubernetes architecture, pods, services and deployment strategies
- Configure StatefulSets, autoscaling and Helm packages
- Apply CIS Benchmark checks and RBAC for cluster hardening
- Implement pod security policies, secrets and sandboxed runtimes
- Assess supply chain security using image scanning and policy webhooks
- Build CI/CD pipelines using Jenkins, GitLab and ArgoCD
- Configure Istio service mesh traffic management and mTLS
- Deploy monitoring with Prometheus, Grafana and Zabbix

9 Modules, 61 Topics

01

[16 - hours]

17 Labs

Kubernetes Recap

TOPICS

- Overview of Container Orchestration
- Introduction to Kubernetes
- Understanding Kubernetes Architecture
- Understanding Pods, Labels & Selectors
- Understanding Replica Set
- Understanding Services - ClusterIP, NodePort & LoadBalancer
- Understanding Daemon Sets
- Overview of Deployment
- Deployment Strategies - Blue/Green & Canary
- Understanding Volume Management in K8s
- Types of Volumes Provisioning
- Persistent Volumes
- Persistent Volume Claim
- Understanding Kubernetes Authentication
- Understanding Role, ClusterRole, RoleBinding & ClusterRoleBinding
- Understand Basics of Kubernetes Networking
- Understand CNI overview
- Understand Pod Networking Concepts
- Understanding DNS of K8s
- Understanding Ingress
- Understanding Namespace & Use-Cases
- Metal Load Balancer

02

[12 - hours]

9 Labs

Kubernetes Extras

TOPICS

- Introduction to StatefulSet
- Use cases of StatefulSet
- Manage StatefulSet
- Storage in StatefulSet
- Headless Service
- Introduction to Readiness and Liveness Probe
- Implement Readiness and Liveness in Pod
- Kubernetes Autoscaling using VPA, HPA, CA and Karpenter
- Understanding Kubernetes package manager - Helm

03

[10 - hours]

6 Labs

Cluster Hardening

TOPICS

- Use CIS Benchmark to Review the Security Configuration of Kubernetes Components
- Pod to Pod Communication
- Public Key Infrastructure (PKI) - Certificate Authority (CA)

04

[10 - hours]

8 Labs

Minimize Microservice Vulnerabilities

TOPICS

- Managing Secrets
- Setup Appropriate OS Level Security Domains using PSP, OPA, Security Contexts
- Pod Security Policy
- Container Runtime Sandboxes
- Open Container Initiative
- Kata Containers - Sandbox

05

[10 - hours]

6 Labs

Supply Chain Security

TOPICS

- Container Image creation using Dockerfile
- Minimize Base Image Footprint Use Static Analysis of User Workloads (e.g. Kubernetes Resources and Docker Files)
- Secure Supply Chain
- ImagePolicyWebhook

06

[10 - hours]

8 Labs

CI/CD with Jenkins, GitLab and ArgoCD

TOPICS

- What is CI/CD
- Introduction to Jenkins
- Jenkins Management
- Introduction to Jenkins Pipeline
- Introduction to Gitlab
- Gitlab Architecture and Runner
- Introduction JFrog Artifactory
- What and why of ArgoCD
- ArgoCD Architecture

07

[06 - hours]

2 Labs

Service Mesh Tool - Istio

TOPICS

What and why of service mesh · Service mesh architecture · Admission controller · Sidecar containers · Service mesh vs Ingress

08

[04 - hours]

3 Labs

Logging and Monitoring

TOPICS

- Understand how to Monitor Application and Cluster Components

09

[02 - hours]

Lab

Managing Multi Kubernetes Cluster with Rancher

TOPICS

- Rancher overview
- Exploring available external authentication to Rancher

Practise What You Learn

#	MODULE	ACTIVITY
01	Kubernetes Recap	■ Installation of Kubernetes 1-Master and 2-Nodes Cluster ■ Choose a Network Solution and Configure ■ Verify Installation with Kubectl command ■ Deploying Applications as a Pod ■ Managing Labels & Selector ■ Deploying Replica Set ■ Creating & Managing Service ■ Deploying Applications as Daemon Sets ■ Deploying Applications as Deployment ■ Implementing Deployment Strategies on Deployments ■ Using PV & PVC to attach Persistent Volume to a Pod as HostPath ■ Creating Service Accounts ■ Managing Roles and Role Binding ■ Managing Cluster Role and Cluster Role Binding ■ Configure and Manage Ingress Rule ■ Creating Namespace & Deploying K8s resources in Different Namespaces ■ Deploying Metal Load Balancer
02	Kubernetes Extras	■ Deploying and Managing Stateful Sets ■ Creating Persistent Storage in Stateful Sets ■ Headless Service ■ Creating Liveness and Readiness Probe for Pod ■ Implementing VPA in EKS cluster ■ Implementing HPA in EKS cluster ■ Implementing cluster node autoscaling ■ Implementing cluster node autoscaling using Karpenter ■ Deploying application using Helm
03	Cluster Hardening	■ Perform Security Benchmark checks using CIS-CAT Lite and Kube-Bench Tool ■ Find Certificates ■ Implementing Network Policies on Pods ■ Create User and assign RBAC (Role Based Access Control) ■ Disable Automount Service Account Token and Anonymous Access ■ Node Restriction Admission Controller

#	MODULE	ACTIVITY
04	Minimize Microservice Vulnerabilities	■ Managing Secrets ■ Encrypt Secrets in ETCD ■ Implementing Security Context in Pods and Containers ■ Creating privileged containers using security context ■ Disable Privilege Escalation ■ Contact the Linux Kernel of worker node From Inside a Container ■ Implementing Gvisor on pods ■ Custom Security Policies using OPA Gatekeeper
05	Supply Chain Security	■ Creating container image using Dockerfile ■ Static Analysis with Kubesec ■ Static Analysis with OPA Conftest ■ Checking Image Vulnerabilities with Trivy ■ Whitelist Some Registries Using OPA ■ ImagePolicyWebhook
06	CI/CD with Jenkins, GitLab and ArgoCD	■ Jenkins Installation ■ Run Jobs on Remote Machines ■ Building Jenkins Pipeline ■ Installing and Configuring Gitlab Runner ■ Building a CI-CD Pipeline Using Gitlab ■ Deploying artifacts with JFrog ■ Installing and configuring ArgoCD ■ Deploying Java application on Kubernetes using ArgoCD
07	Service Mesh Tool - Istio	■ Istio installation and configuration ■ Configure traffic management, virtual services, mutual TLS [mTLS] and Observability
08	Logging and Monitoring	■ Understand how to Read Application & Cluster Component Logs ■ Deploying Prometheus & Grafana to Monitor K8s Cluster ■ Monitoring k8s with Zabbix
09	Managing Multi Kubernetes Cluster with Rancher	Importing Kubernetes cluster to Rancher

WHAT IS INCLUDED

Everything You Need to Succeed

- Koenig course material for every module
- Delivery by certified instructors and subject matter experts
- Hands-on exercises throughout the course
- Course completion certificate from Koenig

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Who We Are

Established in 1993, Koenig Solutions is a globally recognised training provider with 35+ technology partnerships, 5,000+ training programmes and a network of certified instructors and subject matter experts, supporting individuals and enterprise teams worldwide.

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