KOENIG
step forward

KOENIG SOLUTIONS · COURSE OUTLINE

Custom - Kubernetes CKA + CKAD + CKS

Learn to deploy, secure and troubleshoot Kubernetes clusters, from core architecture and workloads to cluster hardening and supply chain security.

10 Days	26	88	75
8 HOURS A DAY	MODULES	TOPICS	HANDS-ON LABS

COURSE OVERVIEW

This comprehensive course equips you with the knowledge and skills to confidently manage and orchestrate containerized applications using Kubernetes. Through hands-on experience, you will gain mastery over core concepts, navigate the architecture, perform installation and configuration, manage resources and deployments, secure your environment, and monitor your Kubernetes cluster effectively. By the end, you'll be prepared to architect, implement, and maintain reliable and scalable containerized applications in production environments.

WHO THIS COURSE IS FOR

Kubernetes Administrators

DevOps Engineers **System Administrators**

Security Engineers **Cloud Engineers**

Site Reliability Engineers

PREREQUISITES

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

TOOLS AND REQUIREMENTS

- Kubernetes Version: Latest
- Lab Requirement: Koenig-DC

LEARNING OBJECTIVES

- Explain Kubernetes architecture and core container orchestration concepts
- Deploy pods, replica sets, services and daemon sets
- Apply manual scheduling, taints and tolerations
- Implement deployment strategies such as blue/green and canary
- Configure environment variables using config maps and secrets
- Manage persistent volumes, volume claims and storage classes
- Configure RBAC, security contexts and cluster authentication
- Assess cluster hardening and supply chain security practices

COURSE SYLLABUS

26 Modules, 88 Topics

01

Core Concepts

TOPICS

Overview of Container Orchestration · Introduction to Kubernetes · Understanding Kubernetes Architecture

02 3 Labs

Installation, Configuration & Validation

TOPICS

Design a Kubernetes Cluster

03 5 Labs

Creating Kubernetes Resources

TOPICS

- Understanding Pods, Labels & Selectors
- Understanding Replication Controller & Replica Set
- Understanding Services – ClusterIP, NodePort & LoadBalancer
- Understanding Daemon Sets

04 Lab

Scheduling

TOPICS

Manual Scheduling of Pods · Taint and Tolerations

05 2 Labs

Application Lifecycle Management

TOPICS

Overview of Deployment · Deployment Strategies – Blue/Green & Canary

06 2 Labs

Environment Variable

TOPICS

Plain Key · Config Map · Secret

07 Lab

Storage

TOPICS

Understanding Volume Management in K8s · Types of Volumes Provisioning · Persistent Volumes · Persistent Volume Claim · Understanding Storage Class

08 2 Labs

StatefulSet

TOPICS

Introduction to StatefulSet · Use cases of StatefulSet · Manage StatefulSet · Storage in StatefulSet · Headless Service

09

5 Labs

Security

TOPICS

- Understanding Kubernetes Authentication
- Understanding Role, ClusterRole, RoleBinding & ClusterRoleBinding
- Understanding Security Context

10

4 Labs

Cluster Maintenance

TOPICS

Understanding OS Upgrade · Static Pod · CronJob

11

2 Labs

Logging and Monitoring

TOPICS

- Understand how to Monitor Application and Cluster Components

12

3 Labs

Networking in Kubernetes

TOPICS

Understand Basics of Kubernetes Networking · Understand CNI overview · Understand Pod Networking Concepts · CoreDNS overview of K8s · Understanding Ingress · Understanding Namespace & Use-Cases · Metal Load Balancer

13

4 Labs

Multi Container Pod Design

TOPICS

Understanding Multi-Container Pods · Creating Multi-Container Pods

14

2 Labs

Helm Package Manager

TOPICS

Introduction to Helm · Work with Helm Charts · Create Helm Charts · Upgrade and Downgrade Helm Charts

15

2 Labs

Building Docker Images

TOPICS

- Introduction to Dockerfile
- Dockerfile Instructions
- Build Image Push Image to Centralized Registry

16

Lab

Readiness and Liveness Probe

TOPICS

Introduction to Readiness and Liveness Probe · Implement Readiness and Liveness in Pod

17

Troubleshooting

TOPICS

- Ways to Troubleshoot ETCD Failure
- Ways to Troubleshoot Kubelet Failure
- Ways to Troubleshoot Container Runtime Failure
- Ways to Troubleshoot Scheduler Failure

18

9 Labs

Cluster Hardening

TOPICS

- Use CIS Benchmark to Review the Security Configuration of Kubernetes Components
- Public Key Infrastructure (PKI) – Certificate Authority (CA)
- Minimize Use of, and Access to, GUI Elements
- Exercise Caution in Using Service Accounts e.g., Disable Defaults, Minimize Permissions on Newly Created Ones

19

9 Labs

Minimize Microservice Vulnerabilities

TOPICS

- Setup Appropriate OS Level Security Domains e.g. Using PSP, OPA, Security Contexts
- Pod Security Policy
- Container Runtime Sandboxes
- Open Container Initiative (OCI)
- Kata Containers - Sandbox
- Use Gvisor

20

4 Labs

Supply Chain Security

TOPICS

- Minimize Base Image Footprint Use Static Analysis of User Workloads (e.g. Kubernetes Resources, Docker Files)
- Scan Images for Known Vulnerabilities
- Secure Supply Chain
- ImagePolicyWebhook

21

5 Labs

Monitoring, Logging and Runtime Security

TOPICS

- Perform Behavioral Analytics of Syscall Process and File Activities at the Host and Container Level to Detect Malicious Activities
- Kernel vs User Space
- Falco
- Immutability of Containers at Runtime
- Use Audit Logs to Monitor Access

22

4 Labs

System Hardening

TOPICS

Kernel Hardening Tools · Linux Kernel Isolation · Minimize OS Footprint - Reduce Attack Surface

23

Lab

Ansible

TOPICS

Introduction to Ansible · Ansible Configuration and Inventory · Ansible Handlers · Benefits of Ansible

24 Lab

Kubespray

TOPICS

Introduction to Kubespray · Deploying Kubernetes Cluster with Kubespray · Benefits of Kubespray

25 2 Labs

Docker

TOPICS

Docker Architecture · Storage Overview

26 Lab

Kubeflow

TOPICS

Introduction to Kubeflow · Components of Kubeflow · Kubeflow Dashboard

HANDS-ON LABS

Practise What You Learn

#	MODULE	ACTIVITY
02	**Installation, Configuration & Validation**	■ Installation of Kubernetes 1-Master and 2-Nodes Cluster ■ Choose a Network Solution and Configure ■ Verify Installation with Kubectl command
03	**Creating Kubernetes Resources**	■ Deploying Applications as a Pod ■ Managing Labels & Selector ■ Deploying Replication Controller & Replica Set ■ Creating & Managing Service ■ Deploying Applications as Daemon Sets
04	**Scheduling**	Using Manual Scheduling or Taints and Tolerations
05	**Application Lifecycle Management**	■ Deploying Applications as Deployment ■ Implementing Deployment Strategies on Deployments
06	**Environment Variable**	■ Using Plain Keys, Config Map & Generic Secret as Environment Variables ■ Mount Environment Variable as Volumes
07	**Storage**	Using PV & PVC to attach Persistent Volume to a Pod as HostPath
08	**StatefulSet**	■ Deploying and Managing Stateful Sets ■ Creating Persistent Storage in Stateful Sets

#	MODULE	ACTIVITY
09	**Security**	■ Creating and Managing Users in Kubernetes ■ Creating Service Accounts ■ Managing Roles and Role Binding ■ Managing Cluster Role and Cluster Role Binding ■ Adding Security Context to Pod to enable ping
10	**Cluster Maintenance**	■ Upgrade a Kubernetes Cluster Version ■ Deploying Pods as Static Pod ■ ETCD Backup ■ Deploying Pod as CronJob
11	**Logging and Monitoring**	■ Understand how to Read Application & Cluster Component Logs ■ Deploying Prometheus & Grafana to Monitor K8s Cluster
12	**Networking in Kubernetes**	■ Configure and Manage Ingress Rule ■ Creating Namespace & Deploying K8s resources in Different Namespace ■ Deploying Metal Load Balancer
13	**Multi Container Pod Design**	■ Sidecar Pattern ■ Deploying Init Container ■ Ambassador Pattern ■ Adapter Pattern
14	**Helm Package Manager**	■ Installing Helm Package Manager ■ Deploying Kubernetes Resources using Helm Package Manager
15	**Building Docker Images**	■ Building Container images using Dockerfile ■ Pushing Container Image to a Public & Private Registry
16	**Readiness and Liveness Probe**	Creating Liveness and Readiness Probe for Pod
18	**Cluster Hardening**	■ Perform Security Benchmark checks using CIS-CAT Lite and Kube-Bench Tool ■ Find Certificates ■ Implementing Network Policies on Pods ■ Install Kubernetes Dashboard ■ Verify Platform Binaries - Theory and Hashes ■ Create User and assign RBAC (Role Based Access Control) ■ Disable Automount Service Account Token and Anonymous Access ■ Node Restriction Admission Controller ■ Update Kubernetes Frequently

#	MODULE	ACTIVITY
19	**Minimize Microservice Vulnerabilities**	■ Managing Secrets ■ Encrypting Secret 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 ■ Runtime Class ■ Custom Security Policies using OPA Gatekeeper
20	**Supply Chain Security**	■ Static Analysis with Kubesec ■ Static Analysis with OPA Conftest ■ Checking Image Vulnerabilities with Trivy ■ Whitelist Some Registering Using OPA
21	**Monitoring, Logging and Runtime Security**	■ Using Strace command to trace Syscall ■ Implementing Immutability on Containers ■ Enforce Read-Only Root Filesystem ■ Configure API Server To Store Audit Logs ■ Restrict Amount of Audit Logs to Collect
22	**System Hardening**	■ AppArmor ■ Kubernetes with AppArmor ■ Seccomp with Kubernetes ■ Reduce Attack Surface
23	**Ansible**	Ansible Variables and Playbooks
24	**Kubespray**	Deploying Kubernetes Cluster with Kubespray
25	**Docker**	■ Managing Containers with Docker ■ Creating and Managing Volumes in Docker
26	**Kubeflow**	Deploying Machine Learning Workflows on Kubeflow

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

ABOUT KOENIG

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.

FLEXIBLE DELIVERY

Learn the Way That Suits You

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