

Kubernetes — Full Course Content

Advisent

Orchestration · Networking · Security · Helm · CI/CD · Interview Preparation

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Module 1 — Core Concepts & Installation

1. Introduction to Kubernetes

- What is Kubernetes & Why Kubernetes
- Benefits over Docker Swarm
- Kubernetes Architecture Overview
- Master & Node Level Components
- Kubernetes vs Docker vs Swarm

2. Core Concepts

- Cluster, Pod, ReplicaSet, Deployment
- Namespace, Labels & Selectors, Annotations

3. Kubernetes Installation

- Minikube Setup (local testing)
- kubeadm Setup (manual installation)
- Kind (Kubernetes in Docker)
- Managed Kubernetes — EKS, GKE, AKS overview

Module 2 — Workloads & Networking

4. Workload Management

- Deployments — Create, Update, Rollback
- ReplicaSets vs ReplicationController
- StatefulSets, DaemonSets
- Jobs and CronJobs

5. Kubernetes Networking

- Cluster Networking — CNI Plugins (Calico, Flannel)
- Pod-to-Pod Communication & DNS
- Services — ClusterIP, NodePort, LoadBalancer, ExternalName
- Ingress Controller — NGINX, Traefik
- Network Policies

Module 3 — Storage, Config & Security

6. Storage in Kubernetes

- Volumes — EmptyDir, hostPath, NFS

- Persistent Volumes (PV) & Claims (PVC)
- StorageClasses & Dynamic Volume Provisioning
- ConfigMaps vs Secrets

7. Configuration & Secrets

- ConfigMap & Secret (Opaque, TLS)
- Environment Variables
- Mounting Configuration in Pods

8. Kubernetes Security

- RBAC — Role Based Access Control
- Service Accounts & Network Policies
- Pod Security Standards — Restricted, Baseline
- Security Contexts & Admission Controllers

Module 4 — Monitoring, Cloud & Helm

9. Service Discovery & Load Balancing

- Internal Service Discovery & External Load Balancers
- Headless Services & DNS Resolution
- Ingress Controllers with SSL Termination

10. Monitoring and Logging

- Metrics Server & Kubernetes Dashboard
- Prometheus + Grafana Setup
- Logging with EFK (Elasticsearch + Fluentd + Kibana)
- Loki + Grafana Stack

11. Kubernetes in Cloud (Production)

- Amazon EKS Setup & EKSCTL / Terraform
- Node Groups — Auto Scaling
- IAM Roles for Service Accounts (IRSA)
- Logging, Monitoring & Scaling in AWS

12. Helm Package Manager

- What is Helm & Helm Chart Structure
- Installing and Using Charts
- Creating Custom Helm Charts
- Templating with values.yaml

Module 5 — Advanced, CI/CD & Interview Prep

13. Advanced Concepts

- Taints, Tolerations, Affinity & Anti-Affinity
- Init Containers & Sidecar Pattern

- Probes — Liveness, Readiness, Startup
- HPA & VPA — Autoscaling
- Resource Requests & Limits, Pod Disruption Budgets

14. CI/CD Integration

- Jenkins + Kubernetes Integration
- GitOps — ArgoCD & Flux
- Kustomize Basics
- Terraform for K8s Infrastructure

15. Troubleshooting & Debugging

- Describe, Logs, Exec Commands
- CrashLoopBackOff & ImagePullBackOff Errors
- Debugging Network Issues
- Tools — kubectl-debug, stern, k9s

16. Backup & Disaster Recovery

- ETCD Backup and Restore
- Velero Tool Usage
- Cluster Snapshot and Migration

17. Kubernetes Interview Preparation

- Important kubectl Commands
- YAML Writing Practice
- Real-world Scenarios & Troubleshooting
- Role-based Scenario Questions
- Daily Use Case Questions for DevOps Engineers