



# RED HAT® OPENSIFT Container Platform

## What is OpenShift ?

**OpenShift** is an enterprise-grade container platform built on Kubernetes that helps organizations **build, deploy, secure, and manage applications at scale.**

An **OpenShift Engineer / Platform Engineer** is someone who:

- Deploys applications on Kubernetes using OpenShift
- Manages containerized workloads securely
- Controls traffic, scaling, and availability
- Integrates CI/CD pipelines
- Ensures applications run reliably in production

Think of an OpenShift Engineer as the person who:

- Turns application code into running services
- Manages how traffic enters the platform
- Secures applications using enterprise-grade controls
- Keeps systems stable, scalable, and production-ready

**In short** 🙌:

OpenShift Engineers don't just run containers — they run production platforms.

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## Course Content:

### Module 1: Environment Setup & Container Concepts Refresher

- Course Orientation & Learning Flow
- Creating Cloud Account for OpenShift Labs
- What is a Container Image
- Container Image vs Running Container
- Container Registries (Public vs Private)

### Module 2: Kubernetes & OpenShift Architecture

- Need for Container Orchestration
- Introduction to Kubernetes
- Kubernetes Control Plane and Worker Node Components
- Introduction to OpenShift
- OpenShift Architecture Overview
- OpenShift vs Kubernetes

### Module 3: Install, Configure & Access OpenShift Cluster (Cloud)

- OpenShift Installation Options (Cloud / Managed / Self-Managed)
- Understanding OpenShift Cluster Prerequisites
- Creating OpenShift Cluster on Cloud Platform
- OpenShift Cluster Components and Initial Configuration
- Accessing OpenShift via Web Console
- Installing and Configuring oc CLI
- Logging into OpenShift Cluster (CLI & Console)
- Exploring Cluster Resources

### Module 4: Application Deployment in OpenShift

- Understanding Pods in OpenShift
- Deployments and ReplicaSets

- Creating Applications using Web Console
- Creating Applications using oc CLI
- Source-to-Image (S2I) Overview
- Builder Images and Image Catalog
- Image Streams and Build Configurations
- Exposing Applications using Routes
- Application Scaling (Scale In / Scale Out)

### Module 5: Services, Networking & Traffic Management

- Understanding Services in OpenShift
- Service Types (ClusterIP, NodePort, LoadBalancer)
- Endpoints and Service Discovery
- Exposing service as routes
- Load Balancing and Traffic Flow
- Application Connectivity inside the Cluster
- External Access to Applications

### Module 6: Deployment Strategies & Application Rollouts

- Application Deployment Concepts in OpenShift
- Kubernetes Deployment (Preferred & Recommended)
- OpenShift DeploymentConfig (Legacy)
- Deployment vs DeploymentConfig – Differences & Use Cases
- Rolling Update Strategy
- Recreate Strategy
- Rollouts, Rollbacks and Revision History
- Image Change and Configuration Change Triggers
- Handling Application Upgrade & Failure Scenarios

### Module 7: OpenShift Router, Routes & TLS Security

- Role of Router in OpenShift
- Difference between Service and Route
- OpenShift Router vs Kubernetes Ingress
- HTTP vs HTTPS in OpenShift Routes
- SSL/TLS Fundamentals
- TLS Termination Types:
  - i. Edge
  - ii. Passthrough
  - iii. Re-encrypt
- Securing Routes with TLS Certificates
- Using Custom Certificates in Routes

### Module 8: Builds, BuildConfig & ImageStreams

- Overview of Build Process in OpenShift
- Understanding Builds and Build Lifecycle
- BuildConfig Concepts and Structure

- Source-to-Image (S2I) Build Strategy
- Docker Build Strategy
- ImageStreams and ImageStreamTags
- Relationship between BuildConfig, Build and ImageStream
- Git-based Builds and Webhook Triggers

### Module 9: Storage & Stateful Applications in OpenShift

- Storage Concepts in Container Platforms
- Ephemeral vs Persistent Storage
- Persistent Volumes (PV)
- Persistent Volume Claims (PVC)
- Storage Classes
- Access Modes and Volume Types
- Mounting Volumes into Pods
- Deploying Stateful Applications
- Multi-Tier Application with Persistent Storage

### Module 10: Configuration & Secrets Management

- Application Configuration in OpenShift
- ConfigMaps – Concepts and Use Cases
- Creating and Managing ConfigMaps
- Injecting ConfigMaps into Applications
- Secrets – Concepts and Types
- Creating and Managing Secrets
- Using Secrets in Applications
- Securing Sensitive Configuration Data

### Module 11: Authentication, Authorization, RBAC & Identity Management

- Identity and Access Management Concepts
- Identity and Access Management (IAM) Concepts in OpenShift
- Authentication Mechanisms in OpenShift
- OAuth and Identity Providers
- htpasswd-based Authentication
- User and Group Management in OpenShift
- Creating, Modifying and Deleting Users
- Managing User Passwords and Group Permissions
- Understanding Contexts and Configuration Files
- Role-Based Access Control (RBAC) Fundamentals
- Roles, RoleBindings and ClusterRoles
- Assigning RBAC to Users and Groups
- Creating Custom Roles based on Use Cases
- Service Accounts – Concepts and Creation
- Applying Permissions using Security Context Constraints (SCC)
- Disabling kubeadmin Login
- API Impersonation and Access Testing

**Module 12: OpenShift Security Context Constraints (SCC) & Pod Security**

- OpenShift Security Model Overview
- Security Context Constraints (SCC) Concepts
- Default SCCs in OpenShift
- Pod Security and Permission Boundaries
- Linux Capabilities in Containers
- Running Containers as Non-Root
- Assigning SCCs to Users, Groups and Service Accounts
- Troubleshooting Permission & Security Errors
- Best Practices for Secure Application Deployment

**Module 13: Network Policies & Traffic Control**

- OpenShift Networking Overview
- Network Policy Concepts
- Ingress and Egress Traffic Rules
- Pod-to-Pod Communication Control
- Namespace-based Network Isolation
- Default Network Behavior in OpenShift
- Creating and Applying Network Policies
- Testing and Verifying Network Policies
- Common Network Policy Use Cases

**Module 14: Advanced Scheduling & Pod Placement Controls**

- Overview of Pod Scheduling in OpenShift
- Kubernetes Scheduler Fundamentals
- Node Labels and Pod Node Selection
- Node Selectors
- Node Affinity and Anti-Affinity
- Taints and Tolerations
- Controlling Pod Placement across Nodes
- Use Cases for High Availability and Fault Tolerance
- Scheduling Considerations in Multi-Node Clusters

**Module 15: Multi-Tenancy, Resource Management & Quotas**

- Multi-Tenancy Concepts in OpenShift
- Projects and Namespaces
- Resource Requests and Limits
- CPU and Memory Management
- Resource Quota
- LimitRanges
- Controlling Resource Consumption per Namespace
- Designing Multi-Tenant OpenShift Clusters
- Best Practices for Resource Isolation

**Module 16: Templates & Self-Service Application Deployment**

- Introduction to OpenShift Templates
- Template Objects and Structure
- Parameters and Default Values
- Processing Templates using oc process
- Generating Resources from Templates
- Self-Service Application Deployment Model
- Reusable and Standardized Deployments
- Managing Application Variations using Templates

**Module 17: Integrating OpenShift with CI/CD Pipelines**

- Integrating CI/CD Pipelines with OpenShift
- Automating Application Build & Deployment