Kubernetes

kloudsavvy
Applied Cloud Training

Module 1: Introduction to Kubernetes

- **What is Kubernetes?**
  - History and Evolution
  - Use Cases
- **Kubernetes Architecture**
  - Components of Kubernetes (Master Node, Worker Nodes)
  - API Server, Controller Manager, Scheduler, Kubelet, Kube-Proxy
- **Basic Concepts**
  - Pods, Nodes, Namespaces
  - Labels, Selectors, Annotations
- **Setting Up a Kubernetes Cluster**
  - Installing Minikube/Kubeadm
  - Hands-on: Deploying a Local Kubernetes Cluster

Module 2: Kubernetes Objects and Resources

- **Pods**
  - Pod Lifecycle
  - Multi-Container Pods
- **Replication Controllers & ReplicaSets**
  - Maintaining Desired State
- **Deployments**
  - Rolling Updates and Rollbacks
- **Services**
  - ClusterIP, NodePort, LoadBalancer
  - Service Discovery and DNS
- **ConfigMaps and Secrets**
  - Storing Configuration Data
  - Handling Sensitive Information
- **Hands-on Labs**
  - Creating and Managing Pods
  - Deploying a Web Application with Kubernetes

Module 3: Advanced Kubernetes Concepts

- **Volumes and Persistent Storage**
  - EmptyDir, HostPath, PersistentVolume, PersistentVolumeClaim
  - StorageClasses
- **StatefulSets**
  - Managing Stateful Applications
- **DaemonSets**
  - Running a Pod on Every Node
- **Jobs and CronJobs**
  - Batch Processing
  - Scheduled Tasks
- **Hands-on Labs**
  - Implementing Persistent Storage
  - Creating Stateful Applications

Module 4: Kubernetes Networking

- **Networking Overview**
  - CNI Plugins (Calico, Flannel, Weave)
  - Pod-to-Pod Communication
- **Service Networking**
  - Service IP, DNS
- **Ingress**
  - Ingress Controllers and Ingress Resources
  - TLS Termination
- **Network Policies**
  - Controlling Traffic in a Cluster
- **Hands-on Labs**
  - Configuring Ingress for a Web Application
  - Implementing Network Policies

Module 5: Kubernetes Security

- **Authentication and Authorization**
  - RBAC (Role-Based Access Control)
- **Network Security**
  - Securing Communication between Components
- **Pod Security**
  - Pod Security Policies
  - Securing Containers with SecurityContext
- **Secrets Management**
  - Storing and Managing Sensitive Data
- **Hands-on Labs**
  - Configuring RBAC
  - Implementing Pod Security Policies

Module 6: Kubernetes Observability

- **Logging and Monitoring**
  - Using Kubernetes with Prometheus and Grafana
  - Fluentd, ElasticSearch, Kibana (EFK Stack)
- **Debugging and Troubleshooting**
  - Debugging Pods and Deployments
  - Troubleshooting Cluster Issues
- **Resource Quotas and Limits**
  - Managing Resource Usage
- **Hands-on Labs**
  - Setting up Monitoring and Logging
  - Debugging a Kubernetes Cluster

Module 7: Kubernetes in Production

- **High Availability and Scalability**
    - Horizontal Pod Autoscaler
    - Cluster Autoscaler
    - Multi-Cluster Management
- **Disaster Recovery**
    - Backup and Restore Strategies
    - Managing etcd Backups
- **Continuous Integration and Continuous Deployment (CI/CD)**
    - Integrating Kubernetes with CI/CD Pipelines
- **Hands-on Labs**
    - Setting up Autoscaling
    - Implementing a CI/CD Pipeline with Kubernetes