20-Day Kubernetes Mastery Plan - Enhanced with Security Focus

Introduction:

This 20-day mastery plan is designed to help you learn Kubernetes from scratch, with a focus on security topics, to help you become a Kubernetes professional. The plan covers fundamental concepts, security practices, and advanced topics like CI/CD, service mesh, and disaster recovery.

Day 1: Kubernetes Basics & Architecture

Topics: Kubernetes introduction, architecture, Master vs Worker nodes, Kubernetes components.

Project: Set up Minikube/Kind, deploy Nginx.

Day 2: Pods, Deployments, and Services

Topics: Pods, ReplicaSets, Deployments, Services (ClusterIP, NodePort, LoadBalancer).

Project: Deploy simple web app with a LoadBalancer.

Day 3: ConfigMaps, Secrets, and Volumes

Topics: Environment variables, mounting secrets/configs, volume types.

Project: Deploy app with config injected from ConfigMaps and Secrets.

Day 4: Namespaces, Labels, and Probes

Topics: Namespaces, Labels, Annotations, Liveness and Readiness Probes.

Project: App with health checks and namespaces.

Day 5: StatefulSets and Persistent Storage

Topics: StatefulSets, PVCs, PVs, StorageClasses, dynamic provisioning.

Project: Deploy MongoDB or MySQL with persistent storage.

Day 6: DaemonSets, Jobs, CronJobs

Topics: DaemonSets, Jobs, CronJobs.

Project: Scheduled job for data processing.

Day 7: Ingress Controllers and Networking

Topics: Ingress rules, TLS termination, NGINX ingress, service discovery.

Project: Deploy app with multiple paths and TLS via Ingress.

Day 8: Helm Basics

Topics: Helm charts, values.yaml, templating basics.

Project: Package and deploy multi-tier app using Helm.

Day 9: Advanced Helm and Kustomize

Topics: Advanced templating, Helmfile, Kustomize overlays.

Project: Build Helm chart with stage-specific overrides.

Day 10: Security: RBAC, PSS, Secrets

Topics: RBAC roles and bindings, Pod Security Standards (PSS), encrypted secrets.

Project: Role-based access with secure secret storage.

Day 11: Resource Management and Autoscaling

Topics: Requests & Limits, HPA, VPA, ResourceQuotas, LimitRanges.

Project: Auto-scaled app with resource limits.

Day 12: Logging & Monitoring

Topics: Prometheus + Grafana setup, Fluent Bit for logs.

Project: Deploy monitored app with alerts and logs.

Day 13: CI/CD with Kubernetes

Topics: GitHub Actions, Jenkins pipelines, rolling updates, canary deployments.

Project: Full CI/CD pipeline with GitHub Actions + Helm.

Day 14: Kubernetes on Cloud (EKS/GKE/AKS)

Topics: Provision clusters on cloud, use cloud-native storage and load balancers.

Project: Deploy app to EKS with IAM roles.

Day 15: Cluster Upgrades and Node Maintenance

Topics: Node draining, cordoning, upgrading clusters, taints & tolerations.

Project: Node maintenance drill with zero downtime.

Day 16: Network Policies and Security

Topics: Network segmentation with Calico/Cilium, restricting access.

Project: Secure multi-namespace app with network policies.

Day 17: Disaster Recovery & HA

Topics: Etcd backup/restore, Velero, multi-master setup.

Project: Simulate backup and restore with Velero.

Day 18: GitOps with ArgoCD or Flux

Topics: GitOps concepts, ArgoCD, syncing, app of apps pattern.

Project: Git-driven deployment with rollback support.

Day 19: Service Mesh with Istio

Topics: Sidecars, mTLS, traffic shifting, dashboards.

Project: Deploy Istio, manage microservices with traffic rules.

Day 20: Kubernetes Internals & Operators

Topics: API server, scheduler, controllers, CRDs, writing operators.

Project: Build custom operator with Kubebuilder.

Additional Security Topics:

1. Image Scanning and Vulnerability Management

2. Kubernetes Audit Logs

3. Container Runtime Security

4. Pod Security Policies (PSP) in older versions

5. Advanced RBAC for fine-grained access control

6. ServiceAccount Security and API Server Authentication