Kubernetes Interview Questions for DevOps Engineers

Written by **Muhammad Abdullah** | 7 min read

Basic Kubernetes Questions :

1. **What is Kubernetes?**
   Kubernetes is an open-source container orchestration platform that automates the deployment, scaling, and management of containerized applications. It groups containers into logical units for easier management and discovery.

2. **What is a Kubernetes cluster?**
   A Kubernetes cluster consists of a set of nodes (machines) that run containerized applications. It includes:

   - **Master Node**: Manages the cluster and orchestrates tasks.
   - **Worker Nodes**: Run the applications and associated workloads.

3. **What are Pods in Kubernetes?**
   Pods are the smallest deployable units in Kubernetes, representing a single instance of a process in the cluster. A Pod can host one or more containers that share storage, network, and the same lifecycle.

4. **What is a Namespace in Kubernetes?**
   Namespaces are virtual clusters within a Kubernetes cluster, used to divide and organize resources among teams or users. They facilitate logical separation and access control.

5. **What is a Node in Kubernetes?**
   A Node is a physical or virtual machine where Kubernetes runs. Nodes are categorized as:

   - **Master Node**: Manages and maintains the cluster's state.

- **Worker Node**: Hosts applications by running Pods.

6. **Explain the Kubernetes Master components.**

   Key components include:

   - **API Server**: Exposes the Kubernetes API and acts as the control plane's frontend.
   - **Controller Manager**: Manages controllers like the node controller and replication controller.
   - **Scheduler**: Allocates Pods to worker nodes based on resource availability.
   - **etcd**: A distributed key-value store for cluster configuration and state.

7. **What is a ReplicaSet?**

   A ReplicaSet ensures that a specified number of identical Pods are running. It replaces failed Pods to maintain the desired state.

8. **What is a Deployment in Kubernetes?**

   A Deployment manages the desired state of an application, allowing for scaling, rolling updates, and version control.

9. **What is a Service in Kubernetes?**

   A Service exposes a set of Pods as a network service, enabling communication between Pods and external entities.

10. **What is a ConfigMap in Kubernetes?**

    ConfigMaps store non-sensitive configuration data for applications, allowing you to decouple configuration details from container images.

Intermediate Kubernetes Questions:

11. **What is a StatefulSet in Kubernetes?**

    A StatefulSet manages stateful applications, providing stable storage, unique Pod identities, and ordered scaling and updates.

12. **What are Kubernetes Secrets?**

    Secrets securely store sensitive data like passwords, tokens, and SSH keys. They can be exposed to Pods as environment variables or mounted as volumes.

13. **What is Horizontal Pod Autoscaler (HPA)?**

    The HPA automatically adjusts the number of Pods based on CPU, memory usage, or custom metrics.

14. **What are DaemonSets in Kubernetes?**

    A DaemonSet ensures a Pod runs on all (or a subset of) nodes. They are ideal for background processes like logging or monitoring.

15. **What is the difference between a Deployment and a StatefulSet?**

    - **Deployment**: Suitable for stateless applications, supporting rolling updates and easy scaling.
    - **StatefulSet**: Designed for stateful applications needing persistent storage and ordered operations.

16. What is Ingress in Kubernetes?

Ingress manages external HTTP/HTTPS traffic to Services in a cluster, providing advanced routing and centralized control.

17. What are the types of Kubernetes Services?

- **ClusterIP**: Exposes the Service within the cluster.
- **NodePort**: Exposes the Service on a static port across all nodes.
- **LoadBalancer**: Exposes the Service externally using a cloud provider's load balancer.
- **ExternalName**: Maps a Service to an external DNS name.

18. How do you perform a Rolling Update in Kubernetes?

Use `kubectl apply` or update the deployment manifest. Kubernetes replaces Pods incrementally to avoid downtime.

19. What is a Helm Chart?

Helm Charts are packages of Kubernetes resources that simplify application deployment and management.

20. What is the difference between Helm and Kustomize?

- **Helm**: Template-based package manager supporting application lifecycle management.
- **Kustomize**: Customizes YAML files natively without templating.

Advanced Kubernetes Questions:

21. What is a Kubernetes Operator?

An Operator is a method for automating application management, extending Kubernetes' functionality to handle complex tasks like backups, scaling, and upgrades.

22. Explain the Kubernetes Control Plane.

The Control Plane comprises components like the API server, scheduler, controller manager, etcd, and cloud controller manager, ensuring the cluster's desired state matches the actual state.

23. How do you monitor a Kubernetes cluster?

Monitoring tools include Prometheus, Grafana, Kubernetes Dashboard, and the ELK stack, tracking metrics, resource usage, and logs.

24. What are Persistent Volumes (PV) and Persistent Volume Claims (PVC)?

- **PV**: Cluster-managed storage resources provisioned by an admin.
- **PVC**: User requests for storage, binding to a PV.

25. What is the difference between CNI, CSI, and CRI in Kubernetes?

- **CNI**: Manages container networking.
- **CSI**: Handles container storage integration.
- **CRI**: Interfaces with container runtimes like Docker and containerd.

26. **Explain Network Policies in Kubernetes.**

Network Policies define rules for Pod communication, controlling traffic flow to enhance security.

27. **How do you secure a Kubernetes cluster?**

- Enable RBAC for access control.
- Use Secrets for sensitive data.
- Apply Network Policies.
- Keep components up-to-date.
- Use Pod Security Policies.

28. **What is a Service Mesh in Kubernetes?**

A Service Mesh, like Istio or Linkerd, manages service-to-service communication, offering traffic management, observability, and security.

29. **What is etcd in Kubernetes?**

etcd is a consistent, distributed key-value store for storing cluster configuration and state.

30. **What are taints and tolerations in Kubernetes?**

- **Taints**: Prevent Pods from being scheduled on specific nodes.
- **Tolerations**: Allow Pods to bypass node taints.

Scenario-Based Kubernetes Questions

31. How would you troubleshoot a Kubernetes Pod stuck in CrashLoopBackOff state?

- Check logs using kubectl logs <pod-name>.
- Investigate the events using kubectl describe pod <pod-name>.
- Ensure there are no misconfigurations in the Pod definition (like wrong image names, missing config maps, etc.).

32. What would you do if a Kubernetes node becomes NotReady?

- Use kubectl get nodes to check the node status.
- Inspect the node using kubectl describe node <node-name>. ● Check logs on the node (journalctl, dmesg).
- Investigate kubelet and networking issues.

33. How would you handle a high CPU usage issue in your Kubernetes cluster?

- **Analyze Metrics:** Use kubectl top or monitoring tools like Prometheus and Grafana to analyze Pod and node-level resource utilization.
- **Set Resource Limits:** Define appropriate resource requests and limits in the Pod specifications to prevent overconsumption.
- **Scale Resources:** Implement a Horizontal Pod Autoscaler (HPA) to scale Pods automatically based on CPU/memory metrics.
- **Optimize Workloads:** Identify and optimize high CPU-consuming workloads or consider distributing them across multiple nodes.