50 Most Important Kubernetes Questions and Answers

1. **What is Kubernetes?**

Kubernetes is an **open-source** container **orchestration** platform that automates the deployment, scaling, and management of containerized applications.

2. **What are the main components of Kubernetes?**

- **Master Node Components**: API Server, Controller Manager, Scheduler, etcd.
- **Worker Node Components**: Kubelet, Kube-proxy, Container runtime.

3. **What is a Pod in Kubernetes?**

A Pod is the **smallest** deployable unit in Kubernetes, representing a single instance of a running process in a cluster. Pods can host one or more containers.

4. **What is a ReplicaSet?**

A ReplicaSet ensures a **specified number of pod replicas are running at any given time**, providing high availability.

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

A Deployment provides declarative updates for Pods and ReplicaSets, allowing you to manage applications more effectively.

6. **What is etcd?**

Etcd is a **distributed key-value** store used by Kubernetes to store all cluster data, ensuring high availability and consistency.

7. **What is the role of the Kubelet?**

The Kubelet is an **agent running on each worker node** that ensures containers are running as expected in Pods.

8. **What is the Kubernetes Scheduler?**

The Scheduler is responsible for **assigning Pods to specific nodes** based on resource requirements and constraints.

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

A Service is an abstraction that defines a logical set of Pods and enables external access to them via a stable IP address or DNS name.

10. **What are Namespaces in Kubernetes?**

Namespaces provide a way to divide a Kubernetes cluster into multiple virtual clusters, isolating resources and workloads.

11. **What is a ConfigMap?**

A ConfigMap is used to store configuration data in key-value pairs, which can be injected into Pods at runtime.

12. **What is a Secret?**

A Secret is similar to a ConfigMap but is designed to store sensitive information like passwords, tokens, or keys securely.

13. **What is the difference between a Service and an Ingress?**

- **Service**: Exposes Pods within or outside the cluster.
- **Ingress**: Provides HTTP and HTTPS routing to Services, including load balancing and SSL termination.

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

- **PV**: A storage resource provisioned by an administrator.
- **PVC**: A request for storage by a user, which binds to a PV.

15. **What is the Kubernetes Control Plane?**

The control plane consists of components like the API server, Controller Manager, Scheduler, and etcd, which manage the cluster.

16. **What is kube-proxy?**

Kube-proxy is a network proxy that maintains network rules on worker nodes and forwards requests to the appropriate Pods.

17. **How does Kubernetes handle scaling?**

Scaling can be managed manually or automatically:

- **Horizontal Pod Autoscaler (HPA)** scales Pods based on CPU/memory usage.
- **Cluster Autoscaler** scales nodes based on pending Pods.

18. **What is the purpose of a DaemonSet?**

A DaemonSet ensures that a copy of a Pod runs on all (or specific) nodes in a cluster, commonly used for logging or monitoring agents.

19. **What is the role of a StatefulSet?**

A StatefulSet manages stateful applications, ensuring Pods have unique identities and stable storage.

20. **What is a Kubernetes Ingress Controller?**

An Ingress Controller implements the Ingress API to provide HTTP and HTTPS routing to Services within the cluster.

21. **What is the difference between StatefulSet and Deployment?**

- **StatefulSet**: Manages stateful applications with stable identities and storage.
- **Deployment**: Manages stateless applications and provides rolling updates.

22. **What are Labels and Selectors in Kubernetes?**

- **Labels**: Key-value pairs attached to resources for organization and selection.
- **Selectors**: Used to identify resources based on labels.

23. **What is a Node in Kubernetes?**

A Node is a physical or virtual machine that runs workloads (Pods) and is managed by the control plane.

24. **What is the role of the Kubernetes API Server?**

The API Server serves as the front-end for the Kubernetes control plane, processing REST operations and managing cluster state.

25. **What is Kubernetes RBAC?**

Role-Based Access Control (RBAC) regulates access to Kubernetes resources based on roles assigned to users or groups.

26. **What is a ClusterIP Service?**

A ClusterIP Service is the default Kubernetes Service type, exposing Pods to other cluster-internal resources.

27. **What is NodePort?**

NodePort exposes a Service on a specific port of each node's IP address, enabling external access to the cluster.

28. **What is a LoadBalancer Service?**

A LoadBalancer Service exposes a Service externally using a cloud provider's load balancer.

29. **What is the difference between a Job and a CronJob?**

- **Job**: Runs tasks until completion.
- **CronJob**: Schedules tasks to run periodically at specified times.

30. **What is Helm in Kubernetes?**

Helm is a package manager for Kubernetes that simplifies the deployment and management of applications using Helm Charts.

31. **What is Taint and Toleration?**

- **Taint**: Restricts Pods from scheduling on certain nodes.
- **Toleration**: Allows Pods to be scheduled on nodes with specific taints.

32. **What is the Kubernetes Dashboard?**

The Kubernetes Dashboard is a web-based UI for managing Kubernetes clusters and resources.

33. **What is kubeadm?**

Kubeadm is a tool for bootstrapping Kubernetes clusters, simplifying the cluster setup process.

34. **How does Kubernetes handle updates?**

Kubernetes supports rolling updates and rollbacks using Deployments, ensuring minimal downtime.

35. **What is a Blue-Green Deployment?**

A Blue-Green Deployment reduces downtime by running two environments (blue for current and green for new) and switching traffic between them.

36. **What is Canary Deployment?**

Canary Deployment releases a new version of an application to a small subset of users before rolling it out to the entire environment.

37. **What is a Sidecar Container?**

A Sidecar Container runs alongside a main container in a Pod to provide additional functionality like logging or proxying.

38. **What is the difference between CPU Request and Limit?**

- **Request**: Minimum guaranteed resources for a container.
- **Limit**: Maximum resources a container can use.

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

HPA automatically adjusts the number of Pods in a deployment based on resource usage, like CPU or memory.

40. **What is the Kubernetes Network Policy?**

A Network Policy defines rules for controlling traffic flow between Pods and namespaces.

41. **What is a CNI in Kubernetes?**

A Container Network Interface (CNI) is a standard for configuring container networking, used by Kubernetes to manage network resources.

42. **What is CrashLoopBackOff?**

CrashLoopBackOff occurs when a Pod fails to start repeatedly due to configuration errors, code bugs, or resource constraints.

43. **What is the use of kubectl?**

Kubectl is the Kubernetes CLI tool used to manage cluster resources and perform operations like scaling, deployments, and debugging.

44. **What is Kubernetes Federation?**

Kubernetes Federation enables the management of multiple clusters from a single control plane.

45. **What is an Admission Controller?**

An Admission Controller intercepts requests to the Kubernetes API Server and enforces rules to validate or modify them.

46. **What are Init Containers?**

Init Containers run before regular containers in a Pod, performing initialization tasks like setting up configurations.

47. **What is kubeconfig?**

Kubeconfig is a configuration file used by kubectl to communicate with a Kubernetes cluster.

48. **What is the purpose of Kubernetes CRDs?**

Custom Resource Definitions (CRDs) allow users to define their own resources and extend Kubernetes functionalities.

49. **What are Finalizers in Kubernetes?**

Finalizers are used to perform cleanup tasks before deleting Kubernetes resources.

50. **How do you debug a Kubernetes Pod?**

- Use kubectl logs to check logs.
- Use kubectl describe pod for detailed information.
- Use kubectl exec to run commands inside a container for troubleshooting.