☸ Kubernetes Interview Questions and Answers (1–50)

1. What is Kubernetes?

Answer: Kubernetes is an open-source container orchestration platform used to automate deployment, scaling, and management of containerized applications.

2. What are the main components of Kubernetes architecture?

Answer:

- Master Node (Control Plane): API Server, Scheduler, Controller Manager, etcd
- Worker Nodes: kubelet, kube-proxy, container runtime

3. What is a Pod in Kubernetes?

Answer: The smallest deployable unit that can contain one or more containers, sharing storage, network, and configuration.

4. What is a Node?

Answer: A physical or virtual machine that runs Pods and is managed by the Master.

5. What is a ReplicaSet?

Answer: Ensures a specified number of pod replicas are running at any given time.

6. What is a Deployment?

Answer: A higher-level controller that manages ReplicaSets and allows for rolling updates, rollbacks, etc.

7. What is a Service in Kubernetes?

Answer: An abstraction to expose an application running in a set of Pods. Types: ClusterIP, NodePort, LoadBalancer.

8. What is etcd?

Answer: A consistent and highly available key-value store used to store all cluster data.

9. What is kube-apiserver?

Answer: The frontend of the Kubernetes control plane, which handles REST requests.

10. What is kube-scheduler?

Answer: Assigns newly created pods to nodes based on resource availability and constraints.

11. What is kube-controller-manager?

Answer: Runs controller processes to manage various parts of the cluster state.

12. What is kubelet?

Answer: An agent that runs on each node and ensures containers are running in a Pod.

13. What is kube-proxy?

Answer: Handles network routing and load balancing on nodes.

14. How does Kubernetes handle service discovery?

Answer: Using environment variables or DNS names automatically created by Kubernetes for Services.

15. What are Labels and Selectors?

Answer: Labels are key-value pairs attached to resources; Selectors match resources based on labels.

16. What is a Namespace in Kubernetes?

Answer: A way to divide cluster resources between multiple users or projects.

17. What is the difference between a Pod and a Container?

Answer: A Pod can hold one or more containers, while a container is a single runtime instance.

18. What is a DaemonSet?

Answer: Ensures a copy of a Pod runs on all (or some) nodes.

19. What is a StatefulSet?

Answer: Manages the deployment of stateful applications, assigning stable identities and persistent storage.

20. What is a Job?

Answer: A controller that creates Pods to run a task and ensures it completes.

21. What is a CronJob?

Answer: A controller that creates Jobs on a scheduled time (like `cron`).

22. What is Helm?

Answer: A package manager for Kubernetes that helps in deploying applications using Helm charts.

23. What is a ConfigMap?

Answer: Stores configuration data in key-value pairs that can be used by Pods.

24. What is a Secret in Kubernetes?

Answer: Used to store sensitive information such as passwords, tokens, or keys.

25. How do you scale a deployment?

Answer: `kubectl scale deployment <name> --replicas=<count>`

26. What is horizontal pod autoscaling?

Answer: Automatically scales the number of Pods based on CPU/memory usage.

27. What is vertical pod autoscaling?

Answer: Adjusts the resource requests and limits of containers.

28. What is a persistent volume (PV)?

Answer: A piece of storage in the cluster that has been provisioned by an administrator or dynamically.

29. What is a persistent volume claim (PVC)?

Answer: A request for storage by a user.

30. What is the difference between PV and PVC?

Answer: PV is the actual storage; PVC is the user's request for that storage.

31. What is the use of Ingress in Kubernetes?

Answer: Manages external access to services, usually HTTP, with load balancing, SSL, and name-based routing.

32. What is RBAC in Kubernetes?

Answer: Role-Based Access Control – manages permissions and user roles.

33. What are Taints and Tolerations?

Answer:

- **Taints:** Prevent Pods from being scheduled on nodes
- **Tolerations:** Allow Pods to be scheduled on tainted nodes

34. What is affinity and anti-affinity?

Answer: Controls pod placement based on rules to keep Pods together or apart.

35. What is a sidecar container?

Answer: A helper container that runs alongside the main container to support it (e.g., for logging or proxy).

36. What is a headless service?

Answer: A service with no ClusterIP assigned. Used for direct pod-to-pod communication.

37. How do you perform a rolling update?

Answer: Using `kubectl apply` or `kubectl rollout` to update a deployment incrementally.

38. How do you rollback a deployment?

Answer: `kubectl rollout undo deployment <name>`

39. How can you debug a Pod?

Answer:

- `kubectl logs <pod>`
- `kubectl describe pod <pod>`
- `kubectl exec -it <pod> -- /bin/sh`

40. What is the use of readiness and liveness probes?

Answer:

- **Readiness:** Indicates if a Pod is ready to serve requests
- **Liveness:** Checks if the container is alive or needs a restart

41. What is a container runtime in Kubernetes?

Answer: Software responsible for running containers (e.g., Docker, containerd, CRI-O).

42. How does Kubernetes handle high availability?

Answer: By using multiple master nodes, replicated etcd, and distributed scheduling.

43. What is a Custom Resource Definition (CRD)?

Answer: Extends Kubernetes by defining your own resource types.

44. What is an Operator in Kubernetes?

Answer: A method of packaging, deploying, and managing a Kubernetes application using CRDs.

45. How does Kubernetes do load balancing?

Answer:

- Internally: via kube-proxy and Services
- Externally: using Ingress controllers or external LoadBalancers

46. What is a kubeconfig file?

Answer: Configuration file to access Kubernetes clusters using `kubectl`.

47. How do you connect to a cluster using kubectl?

Answer: `kubectl --kubeconfig=<path>`

48. What is the default namespace in Kubernetes?

Answer: If no namespace is specified, `default` is used.

49. What command lists all pods in all namespaces?

Answer: `kubectl get pods --all-namespaces`

50. What is Minikube?

Answer: A tool to run a single-node Kubernetes cluster locally for development and testing.