Basic Kubernetes Questions:

1. **What is Kubernetes?**
   Kubernetes (K8s) is an open-source container orchestration platform that automates deploying, scaling, and managing containerized applications.

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

   - **Master Node (Control Plane):** Manages the cluster. Components:
     - API Server
     - Controller Manager
     - Scheduler
     - etcd (key-value store)
   - **Worker Nodes:** Run the containerized apps. Components:
     - Kubelet
     - Kube-proxy
     - Container runtime (like Docker)

3. **What is a Pod in Kubernetes?**
   A Pod is the smallest deployable unit in Kubernetes, containing one or more containers that share the same network and storage.

How do you create a Pod in Kubernetes?
Using a YAML file:

yaml
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```yaml
apiVersion: v1
kind: Pod
metadata:
  name: my-pod
spec:
  containers:
```

```
    - name: my-container
      image: nginx
      ports:
        - containerPort: 80
```

Deploy it:

bash
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```
kubectl apply -f pod.yaml
```

4.
5. **What is the difference between a Pod and a Deployment?**
    - **Pod:** A single instance of a running container.
    - **Deployment:** Manages the creation and scaling of Pods. It ensures the desired number of Pods are running.

🚀 Intermediate Kubernetes Questions:

What is a ReplicaSet?
A ReplicaSet ensures a specified number of Pod replicas are running at all times.
Example:

yaml
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```
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: my-replicaset
spec:
  replicas: 3
  selector:
    matchLabels:
      app: my-app
  template:
    metadata:
      labels:
        app: my-app
```

```
  spec:
    containers:
      - name: my-container
        image: nginx
```

Deploy it:

bash
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```
kubectl apply -f replicaset.yaml
```

6.
7. **What is a Service in Kubernetes?**
   A Service exposes a set of Pods as a network service.
   - **ClusterIP:** Internal access only.
   - **NodePort:** Exposes service on each node's IP at a static port.
   - **LoadBalancer:** Uses cloud provider's load balancer to expose the service externally.

How do you expose a Deployment as a Service?

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```
kubectl expose deployment my-deployment --type=NodePort --port=8080
```

Or using YAML:

yaml
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```
apiVersion: v1
kind: Service
metadata:
  name: my-service
spec:
  selector:
    app: my-app
  ports:
    - protocol: TCP
      port: 80
      targetPort: 8080
```

```
  type: NodePort
```

8.

What is a ConfigMap?
A ConfigMap is used to store non-confidential configuration data as key-value pairs.
Example:

bash
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```
kubectl create configmap my-config --from-literal=env=production
```
YAML:

yaml
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```
apiVersion: v1
kind: ConfigMap
metadata:
  name: my-config
data:
  env: "production"
```

9.

What is a Secret in Kubernetes?
A Secret is used to store sensitive data, like passwords or API keys.
Example:

bash
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```
kubectl create secret generic my-secret --from-literal=password=12345
```
YAML:

yaml
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```
apiVersion: v1
kind: Secret
metadata:
  name: my-secret
type: Opaque
data:
  password: MTIzNDU= # Base64 encoded value
```

10.

🔥 Advanced Kubernetes Questions:

11. **What is a StatefulSet?**
    A StatefulSet is used to manage stateful applications, ensuring each Pod has a unique identity and persistent storage.
    Example use cases: databases like MongoDB, Kafka.

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

    - **Deployment:** Best for stateless apps. Pods can be freely replaced.
    - **StatefulSet:** Used for apps requiring stable, unique network IDs and persistent storage.

13. **What is a DaemonSet?**
    A DaemonSet ensures that a copy of a Pod runs on all (or some) nodes.
    Example:

    - Running log collection agents or monitoring tools on every node (like Prometheus Node Exporter).

14. **How do you scale a Deployment?**

Using `kubectl`:

bash
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```
kubectl scale deployment my-deployment --replicas=5
```

    -

Or by updating the YAML:

yaml
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```
spec:
  replicas: 5
```

    -

What are Init Containers?
Init containers run before regular containers start. They're used for setup tasks like waiting for a service to be available or preparing configs.
Example:

yaml
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```
initContainers:
  - name: init-db
    image: busybox
    command: ['sh', '-c', 'until nslookup db; do echo waiting for db; sleep 2; done;']
```

15.

✅ Scenario-Based and Conceptual Questions:

How do you perform a rolling update in Kubernetes?
Rolling updates ensure zero downtime by incrementally updating Pods:

bash
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```
kubectl set image deployment/my-deployment my-container=my-image:v2
```

To check status:

bash
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```
kubectl rollout status deployment/my-deployment
```

16.
17. **What happens if a Pod dies in Kubernetes?**
    Kubernetes will automatically create a new Pod to match the desired state (if managed by a Deployment or ReplicaSet).

18. **How do you monitor Kubernetes clusters?**
    Common tools:

    - **Prometheus:** Collects metrics.
    - **Grafana:** Visualizes metrics.

- **ELK Stack (Elasticsearch, Logstash, Kibana):** Centralized logging.
- **Kubernetes Dashboard:** UI for cluster management.

19. **How does Kubernetes handle networking?**
    Kubernetes uses a flat network structure where all Pods can communicate with each other.
    - **CNI (Container Network Interface):** Used to configure networking plugins (like Calico, Flannel).
    - Each Pod gets a unique IP, and Services route traffic to Pods using selectors.
20. **How do you secure a Kubernetes cluster?**
    - Enable **RBAC (Role-Based Access Control)**.
    - Use **Network Policies** to control Pod communication.
    - Encrypt Secrets using **KMS**.
    - Audit logs for security monitoring.
    - Limit access to the **Kubernetes API Server**.