INTERVIEW QUESTIONS on PV, PVC , Storage Class, CSI Driver.

Understanding Storage in EKS (Kubernetes)

Kitchen/Restaurant (ECS Cluster). POD(Chef) Fridge(Disk/Storage) Cooking ingredience.

- Pods are **ephemeral** — they come and go. But container might need to store something.

So, you need **persistent storage** — a place to keep your data **outside** the Pod.

Why Can't We Just Attach Storage Directly?
In Kubernetes:

- Pods are **ephemeral** — they come and go.
- Containers inside pods are stateless by default.
- So, for **databases, logs, or files**, you need a way to:
  - Store data **even if the pod restarts**
  - Possibly share it with **multiple pods** (like shared folders)

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1. Persistent Volume (PV) – *The Actual Disk*

- Think of a **PV** like a **physical disk or drive** that exists **in the cluster**.
- It's **pre-created or dynamically created** by Kubernetes.
- Examples: AWS **EBS (like a USB drive)** or **EFS (like a network folder)**.

🔶 It's **not tied to any pod**, just **sits there waiting to be claimed**.

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2. Persistent Volume Claim (PVC) – *The Pod's Request*

- A **PVC** is like a **form** a pod fills out saying:

"I need 10GB of storage, please give me something I can write to."

- Kubernetes looks at available **PVs**, finds a match, and **binds it to the PVC**.

So **PVCs** are what **pods use to ask for storage**, and **PVs** are the actual storage.

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3. StorageClass
A **StorageClass** is like a **template** or **policy** for creating PVs.

- It defines:
  - **What type** of storage (e.g., EBS gp3, EFS)
  - **How fast** (IOPS, throughput)
  - **Where** (Availability Zone)

Without this, you'd have to manually create disks every time someone needs storage.
So:

- Pod → uses PVC → refers to a StorageClass → which creates a PV behind the scenes.

Deployment → Pod → needs persistent data
→ attaches PVC (storage request)
↓
Matches StorageClass
↓
Kubernetes provisions PV using CSI driver (like EBS or EFS)
↓
Pod uses the mounted storage

Example Use Case: Database Pod
You deploy **MySQL** on EKS. But MySQL needs disk storage to store data files. If the pod is deleted, you don't want to lose the database!
You do this:

1. Define a **StorageClass** using EBS.
2. Create a **PVC** requesting 10GB.
3. MySQL Pod attaches this PVC to /var/lib/mysql.
4. Data is stored on an EBS volume (PV).
5. Pod restarts? No problem — the PV is still there!

Key AWS Storage Types

Storage Type	Description	Good For	CSI Driver
EBS	Block storage, one EC2 at a time	Databases, single pod	aws-ebs-csi-driver
EFS	Shared file system	Multi-pod access, logs	aws-efs-csi-driver
S3	Object storage (not PV-compatible)	Backups, binaries	Not directly mountable

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Example YAML Snippet (EBS)
StorageClass
yaml

```
apiVersion: storage.k8s.io/v1
kind: StorageClass
metadata:
  name: ebs-sc
provisioner: ebs.csi.aws.com
volumeBindingMode: WaitForFirstConsumer
parameters:
  type: gp3
```
PVC
yaml

```
apiVersion: v1
```

```
kind: PersistentVolumeClaim
metadata:
  name: my-ebs-pvc
spec:
  accessModes:
    - ReadWriteOnce
  resources:
    requests:
      storage: 10Gi
  storageClassName: ebs-sc
```

Pod Using PVC

```
yaml
-------
apiVersion: v1
kind: Pod
metadata:
  name: my-db
spec:
  containers:
    - name: mysql
      image: mysql
      volumeMounts:
        - mountPath: /var/lib/mysql
          name: mysql-storage
  volumes:
    - name: mysql-storage
      persistentVolumeClaim:
        claimName: my-ebs-pvc
```

Concept	Think Of It As...	Purpose
PV	A disk in your cluster	Holds data for a pod
PVC	A request form for a disk	Pod asks for storage
StorageClass	Blueprint for how to create a disk	Auto-create PVs dynamically
CSI Driver	Bridge between AWS and Kubernetes	Allows EKS to create AWS storage

🔶 73. What are Persistent Volumes (PVs) and Persistent Volume Claims (PVCs)?

Imagine you're renting storage lockers (PVs), and people (pods) request a locker (PVC).

- **PV (Persistent Volume)**
  Think of it like a **storage locker** already set up in your system (e.g., EBS, EFS).
  - Created and managed by the Kubernetes system (admin).
  - It exists even if no one is using it right now.
  - It could be backed by AWS EBS, EFS, or NFS.
- **PVC (Persistent Volume Claim)**
  This is a **request for storage**.

- A pod says: “I need 10GB of storage that can be read and written by one pod.”
- Kubernetes finds a matching PV and gives it to the pod.

📦 **Analogy**: PV = available locker. PVC = a request to use a locker.

🔶 74. How do you integrate EBS volumes with EKS?

💽 **Amazon EBS = like attaching a USB drive to one specific server (node).**

Steps:

1. Make sure the pod and EBS volume are in the **same Availability Zone**.
2. Install the **EBS CSI driver** (a plugin to use EBS in EKS):

bash
---
eksctl create addon --name aws-ebs-csi-driver --cluster <cluster-name> --service-account-role-arn <role-arn>

3. Define a **StorageClass** that tells Kubernetes how to use EBS:

yaml
---
kind: StorageClass
metadata:
  name: ebs-sc
provisioner: ebs.csi.aws.com
volumeBindingMode: WaitForFirstConsumer

4. Create a **PVC** that uses this StorageClass.

✅ EBS is best when **only one pod** (like a database) needs to read/write the data.

🔶 75. How do you use EFS with EKS for shared storage?

📂 **Amazon EFS = a shared network drive (like Google Drive shared folder) that multiple pods can access together.**

Steps:

1. Create an **EFS file system** and **mount targets** in your VPC.
2. Install the **EFS CSI driver**:

bash
---
eksctl create addon --name aws-efs-csi-driver --cluster <cluster-name> --service-account-role-arn <role-arn>

3. Create an **Access Point** (like a doorway to the EFS folder).
4. Define a **StorageClass** using the EFS driver:

yaml
---
provisioner: efs.csi.aws.com

5. Create a **PVC** that uses this StorageClass.

✅ Use EFS when **multiple pods need to share files** (e.g., ML models, logs, shared websites).

🔶 76. What are StorageClasses in Kubernetes?

🧾 **A StorageClass is a recipe for how to create storage** in Kubernetes.

- It defines:
    - **What type** of storage to create (EBS, EFS, SSD, HDD)
    - **How fast** (IOPS, throughput)
    - **Where** to create it (region, AZ)

Example:
yaml
---
apiVersion: storage.k8s.io/v1
kind: StorageClass
metadata:
  name: fast
provisioner: ebs.csi.aws.com
parameters:
  type: gp3

📌 StorageClass allows **automatic/dynamic storage** creation instead of manually creating PVs.

🔶 77. How do you handle dynamic volume provisioning in EKS?

🛠️ **Dynamic provisioning = Kubernetes creates storage automatically when your pod asks for it.**

Steps:

1. Define a **StorageClass** with a CSI driver (like EBS or EFS).
2. Your pod (via PVC) requests storage using that StorageClass.
3. Kubernetes creates a matching **Persistent Volume (PV)** automatically.

🔧 EKS supports this via:

- aws-ebs-csi-driver (for block storage like EBS)
- aws-efs-csi-driver (for shared storage like EFS)

🔶 78. What are the different access modes for persistent volumes?

📖 **Access Modes = How many pods can use the storage and in what way.**

Access Mode	Description	EBS	EFS
ReadWriteOnce	One pod can read/write at a time	✅	✅
ReadOnlyMany	Many pods can read, but not write	❌	✅
ReadWriteMany	Many pods can read/write together	❌	✅

📌 Use:

- **EBS**: For single pod workloads (e.g., MySQL, MongoDB)
- **EFS**: For multi-pod workloads (e.g., web apps, file sharing)

Which analogy best describes PV and PVC?

A. PV = fridge, PVC = recipe
B. PV = locker, PVC = request for locker

C. PV = electricity, PVC = battery
D. PV = database, PVC = query

✅ **Answer:** B

Which of the following is TRUE about Amazon EBS?
A. It can be mounted on multiple pods at the same time
B. It works across all Availability Zones in one cluster
C. It is suitable for single-pod storage needs
D. It is used to store S3 objects

✅ **Answer:** C
📝 Explanation: EBS is like a **USB drive**, mounted to one node only — ideal for DB pods.

Amazon EFS is best suited for which of the following use cases?
A. Mounting as local block storage to one pod
B. Sharing files between multiple pods
C. Storing container logs temporarily
D. Serving as a backup to S3

✅ **Answer:** B
📝 Explanation: EFS is like a **shared Google Drive folder**, accessible by many pods.

Before using EFS with EKS, what must you do? (Choose all that apply)
A. Install the aws-efs-csi-driver
B. Create an EFS access point
C. Define an S3 bucket
D. Configure a StorageClass
✅ **Answer:** A, B, D

What is a StorageClass used for in Kubernetes?
A. Defining how to schedule a pod
B. Assigning roles to users
C. Creating and configuring storage automatically
D. Connecting to RDS databases
✅ **Answer:** C
📝 Explanation: StorageClass is a **template** to create storage (like EBS/EFS) dynamically.

What parameters can be defined in a StorageClass?
A. CPU limit, memory limit
B. Region, instance type

C. Type of storage, IOPS, throughput
D. Cluster name and AZ
✅ **Answer:** C

What is dynamic provisioning in Kubernetes?
A. Manually attaching S3 buckets
B. Automatically deleting unused volumes
C. Kubernetes creates a PV automatically when a PVC is created
D. Pods automatically delete unused storage
✅ **Answer:** C

Which access modes are supported by EBS volumes in EKS?
A. ReadWriteOnce
B. ReadWriteMany
C. ReadOnlyMany
D. WriteManyOnce
✅ **Answer:** A

You are deploying a MySQL pod in EKS. Which storage option is best?
A. EFS with ReadWriteMany
B. S3 bucket
C. EBS with ReadWriteOnce
D. Ephemeral storage

✅ **Answer:** C
📝 Explanation: MySQL is a **single-pod workload**, so EBS is ideal.