Using Amazon EBS with EKS via CSI Driver

This document explains how to set up and use Amazon EBS volumes with Kubernetes pods running on Amazon EKS. It covers IAM role setup, storage class creation, PVC creation, and pod usage.

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1. Prerequisites

- An **EKS cluster** running.
- Worker nodes (EC2) with IAM roles attached.
- `kubectl` and `awscli` configured.

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2. Ensure the EBS CSI Driver is Installed

The EBS CSI driver must be deployed in your cluster. If not already installed, run:

```
eksctl create addon --name aws-ebs-csi-driver --cluster mycluster --region ap-south-1
```

This creates the driver required for dynamic provisioning of EBS volumes.

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3. Attach IAM Policy to Node Instance Role

Your nodes need permission to create and attach EBS volumes.

1. Find the **NodeInstanceRole**:

   ```
   aws eks describe-nodegroup
     --cluster-name mycluster
     --nodegroup-name ng-fc75
     --query "nodegroup.nodeRole"
   ```

2. Verify attached policies:

   ```
   aws iam list-attached-role-policies --role-name <NodeInstanceRoleName>
   ```

3. Ensure **AmazonEBSCSIDriverPolicy** is attached:

```
aws iam attach-role-policy
  --role-name <NodeInstanceRoleName>
  --policy-arn arn:aws:iam::aws:policy/service-role/
AmazonEBSCSIDriverPolicy
```

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4. Create a StorageClass for EBS

Example `StorageClass` using gp3 volumes:

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

Apply it:

```
kubectl apply -f storageclass.yaml
```

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5. Create a PersistentVolumeClaim (PVC)

```
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: pvc-ebs-po
spec:
  storageClassName: ebs-sc
  accessModes:
    - ReadWriteOnce
  resources:
    requests:
      storage: 8Gi
```

Apply it:

```
kubectl apply -f pvc.yaml
```

Check status:

```
kubectl get pvc pvc-ebs-po -w
```

It should move from `Pending` → `Bound`.

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6. Mount PVC in a Pod

Example pod using the PVC:

```
apiVersion: v1
kind: Pod
metadata:
  name: mypvc-pod
spec:
  containers:
  - name: app
    image: busybox
    command: ["sh", "-c", "while true; do echo $(date) >> /data/out.txt; sleep
5; done"]
    volumeMounts:
    - mountPath: /data
      name: myebs
  volumes:
  - name: myebs
    persistentVolumeClaim:
      claimName: pvc-ebs-po
```

Apply it:

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

Check logs:

```
kubectl logs -f mypvc-pod
```

You should see data being written to the mounted EBS volume.

7. Troubleshooting

- **PVC Pending with UnauthorizedOperation** → Ensure `AmazonEBSCSIDriverPolicy` is attached to NodeInstanceRole.
- **PVC Pending due to AZ mismatch** → Use `WaitForFirstConsumer` in StorageClass to delay volume creation until pod is scheduled.
- **Pod stuck in ContainerCreating** → Check if EBS CSI driver is running:

```
kubectl get pods -n kube-system | grep ebs-csi
```

✅Summary

1. Install EBS CSI driver.
2. Attach `AmazonEBSCSIDriverPolicy` to NodeInstanceRole.
3. Create StorageClass.
4. Create PVC.
5. Mount PVC in a Pod.

Now your EKS cluster can dynamically provision and use Amazon EBS volumes with pods.