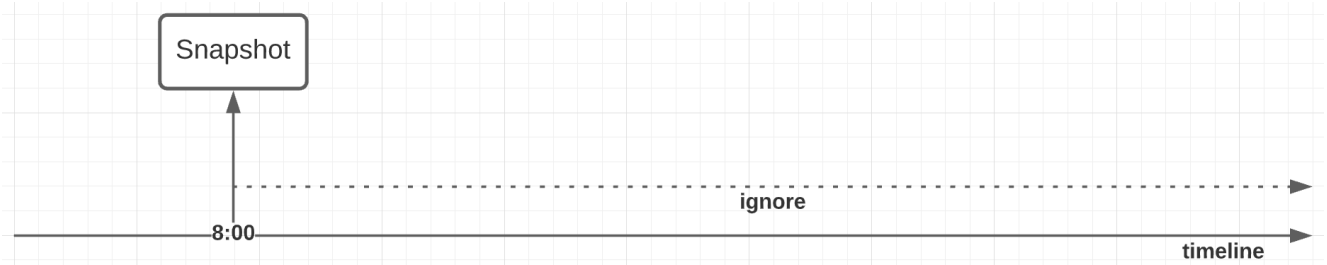
Volume Snapshot in Kubernetes

Agenda

1. What is Volume Snapshot?
2. Why we need Volume Snapshot?
3. How to use Volume Snapshot?
4. Demo

What is Volume Snapshot?

Many cloud storage systems provide the ability to create a snapshot of a persistent volume.



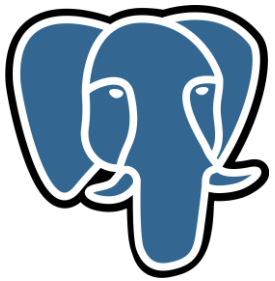
- A snapshot represents a **point-in-time** copy of a volume, it will ignore all changes after the point in time moment

Why we need Volume Snapshot?

Kubernetes snapshot provide application or cluster level backup solutions.

e.g. A database administrator may want to snapshot a database volume before starting a database operation.



- A snapshot can be used either to provision a new volume or to restore an existing volume to a previous state.

How to use Volume Snapshot?

1. Enable CSI driver in GKE

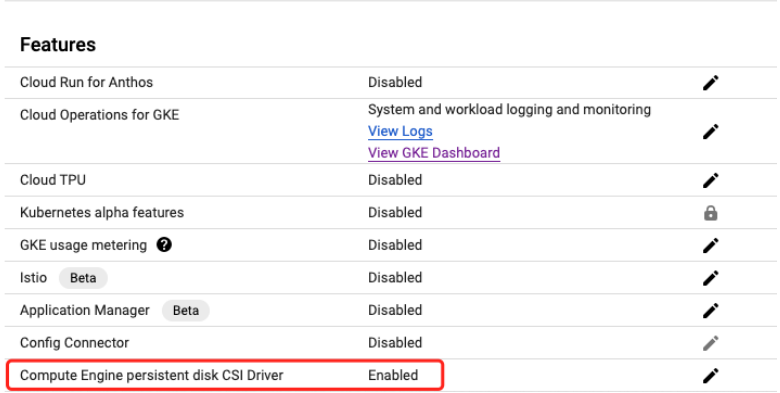
2. Kubectl get storageclass

```
$ kubectl get storageclass
NAME                 PROVISIONER
premium-rwo          pd.csi.storage.gke.io
standard-rwo         pd.csi.storage.gke.io
```

3. Create VolumeSnapshotClass

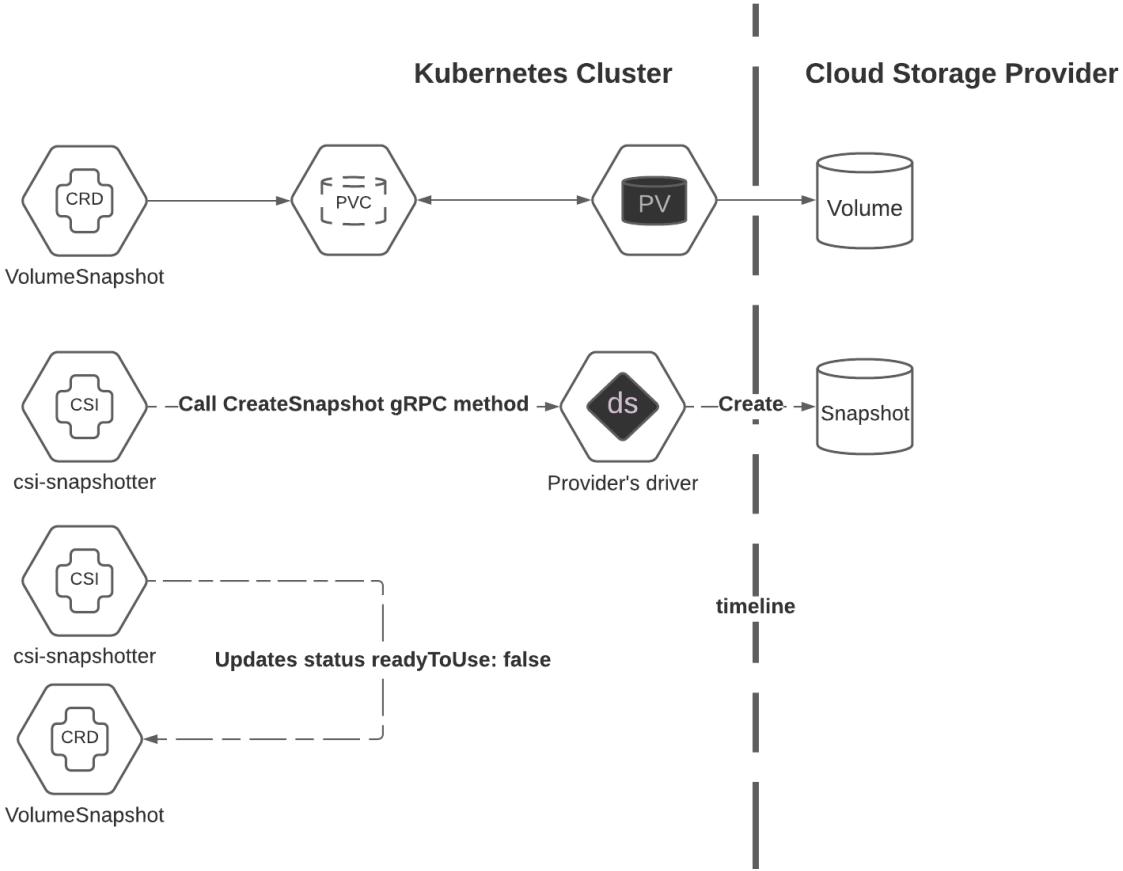
```
$ cat <<EOF | kubectl apply -f -
apiVersion: snapshot.storage.k8s.io/v1beta1
kind: VolumeSnapshotClass
metadata:
  name: csi-ssd
driver: pd.csi.storage.gke.io
deletionPolicy: Delete
EOF

$ kubectl get volumesnapshotclass
NAME      AGE
csi-ssd   7d
```

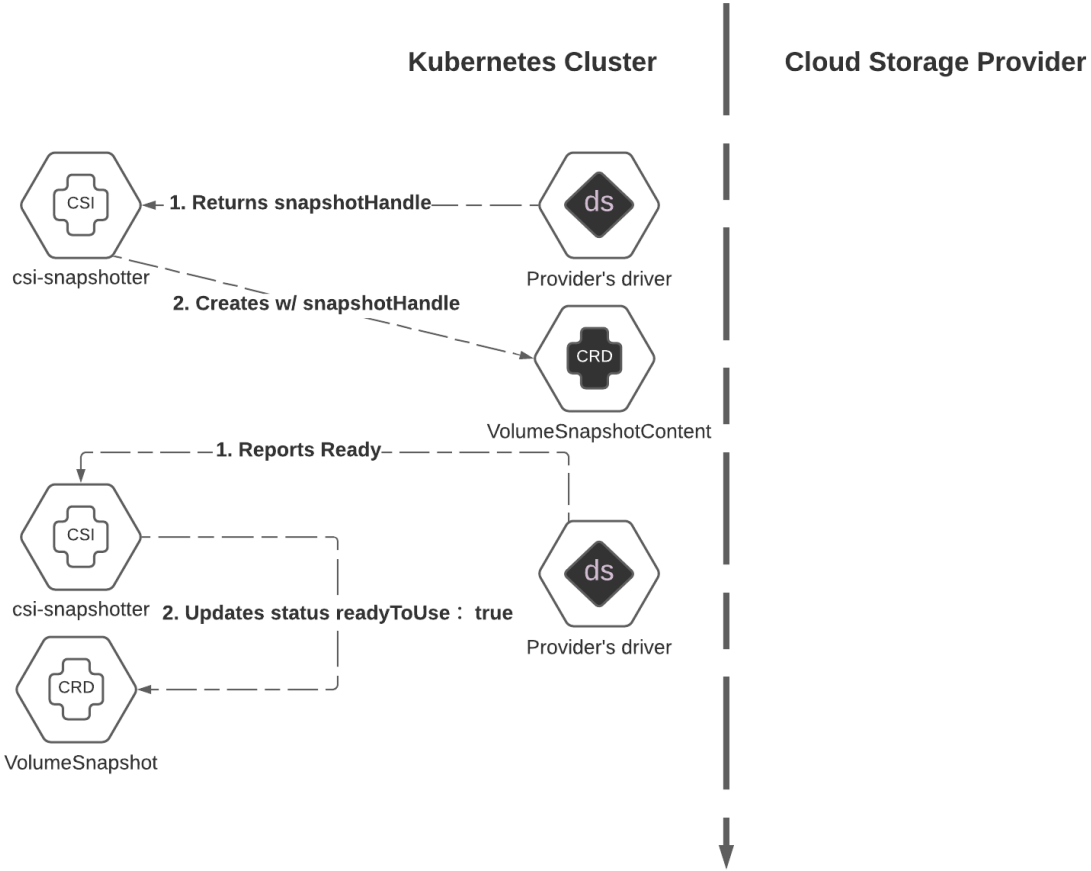


GCP Document: https://cloud.google.com/kubernetes-engine/docs/how-to/persistent-volumes/gce-pd-csi-driver
EKS Document: https://docs.aws.amazon.com/eks/latest/userguide/ebs-csi.html

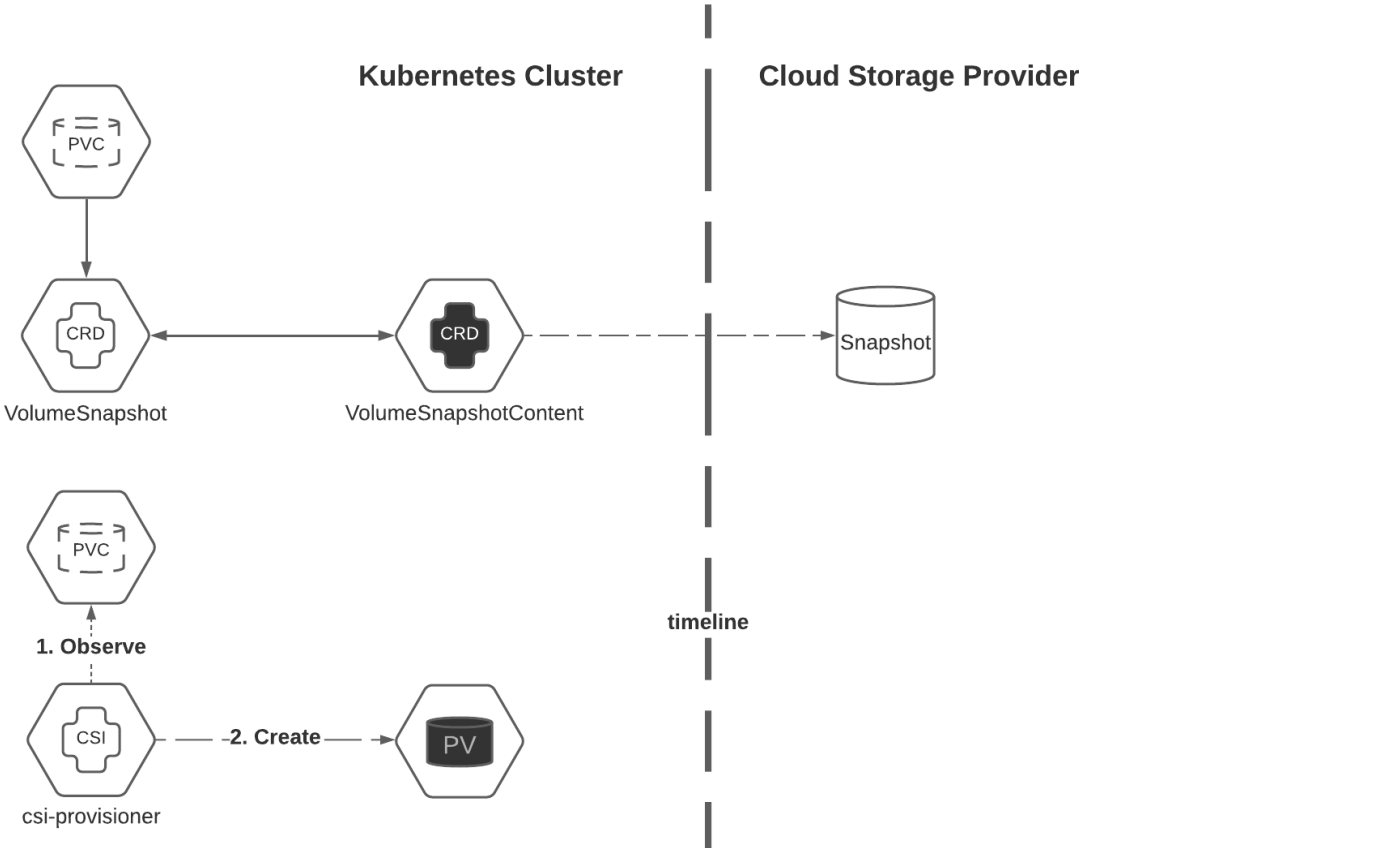
Snapshot(1/2)


Kubernetes Cluster
Cloud Storage Provider
CRD
VolumeSnapshot
PVC
PV
Volume
CSI
csi-snapshotter
Call CreateSnapshot gRPC method
ds
Provider's driver
Create
Snapshot
CSI
csi-snapshotter
Updates status readyToUse: false
timeline
CRD
VolumeSnapshot

Snapshot (2/2)

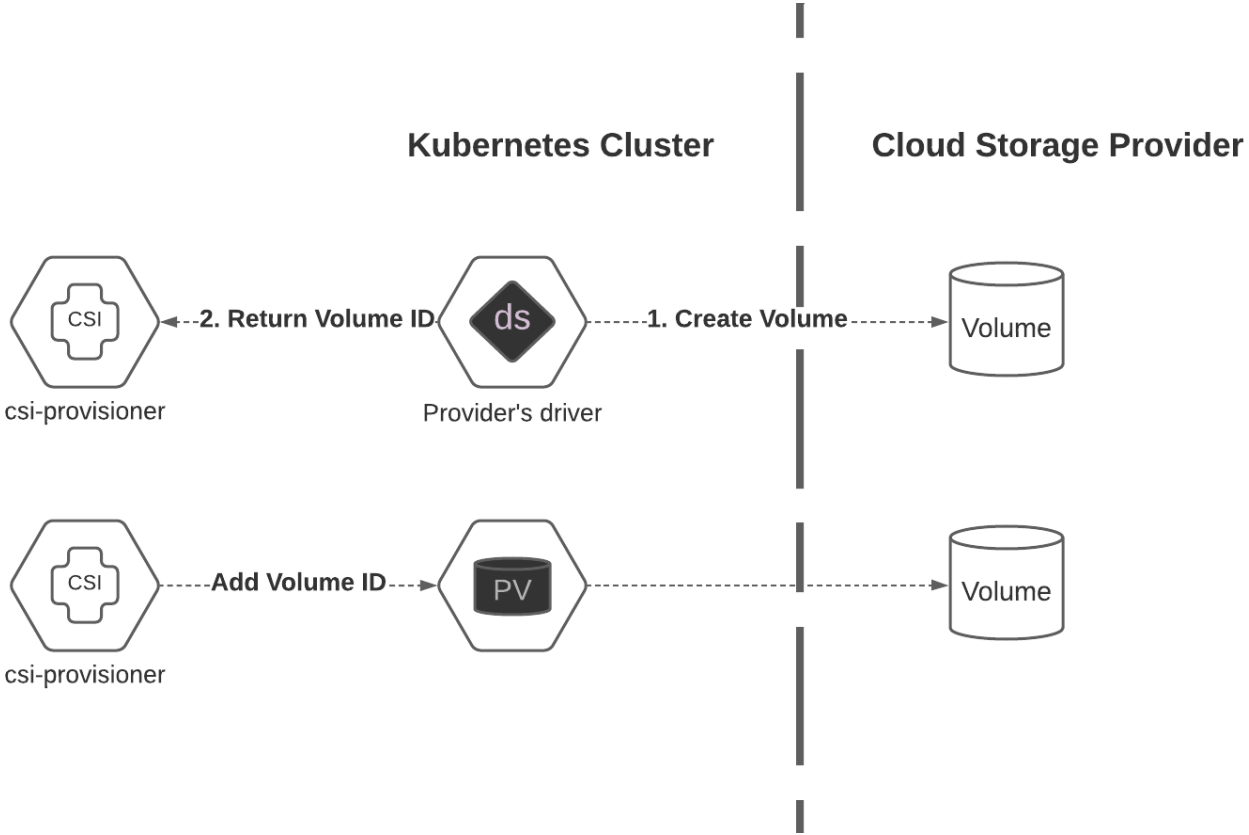

Kubernetes Cluster
Cloud Storage Provider
CSI
csi-snapshotter
1. Returns snapshotHandle
ds
Provider's driver
2. Creates w/ snapshotHandle
CRD
VolumeSnapshotContent
1. Reports Ready
CSI
csi-snapshotter
2. Updates status readyToUse： true
ds
Provider's driver
CRD
VolumeSnapshot

Restore (1/2)



Attention. We should mount pvc to a pod so as to trigger pv creation. Otherwise, the pvc status will always be `pending`.

Restore (2/2)


Kubernetes Cluster
Cloud Storage Provider
CSI
2. Return Volume ID
ds
1. Create Volume
Volume
csi-provisioner
Provider's driver
CSI
Add Volume ID
PV
Volume
csi-provisioner

Demo

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: app1
spec:
  containers:
  - name: app
    image: busybox
    command: ["/bin/sh"]
    args: ["-c", "while true; do date +%T >> /data/out.txt;sleep 5s; done"]
    volumeMounts:
    - name: data
      mountPath: /data
  volumes:
  - name: data
    persistentVolumeClaim:
      claimName: ebs-claim
---
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: ebs-claim
spec:
  accessModes:
    - ReadWriteOnce
  storageClassName: premium-rwo
  resources:
    requests:
      storage: 1Gi
```

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: app2
spec:
  containers:
  - name: app
    image: busybox
    command: ["/bin/sh"]
    args: ["-c", "tail -f /dev/null"]
    volumeMounts:
    - name: data
      mountPath: /data
  volumes:
  - name: data
    persistentVolumeClaim:
      claimName: ebs-snapshot
---
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: ebs-snapshot
spec:
  accessModes:
    - ReadWriteOnce
  storageClassName: premium-rwo
  resources:
    requests:
      storage: 1Gi
  dataSource:
    name: ebs-volume-snapshot
    kind: VolumeSnapshot
    apiGroup: snapshot.storage.k8s.io
```

Thank You!

Schedule Snapshot

```yaml
apiVersion: snapscheduler.backube/v1
kind: SnapshotSchedule
metadata:
  name: daily
spec:
  claimSelector:
    matchLabels:
      "schedule/daily": "enabled"
  retention:
    maxCount: 7
  schedule: "0 0 * * *"
```

```yaml
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: jenkins
  labels:
    "schedule/daily": "enabled"
spec:
  # ...omitted...
---
```

https://github.com/backube/snapscheduler