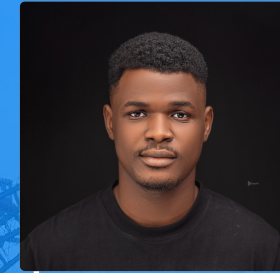


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Streamlining Storage Lifecycle Automation in Kubernetes: A SPDK-CSI Use Case



PRESENTER

Israel Chinedu Geoffrey
Software Engineer,
Simplyblock

Agenda

- Introduction to Kubernetes Storage Management
 - Introduction to Storage Performance Development Kit (SPDK)
 - Overview of Container Storage Interface (CSI)
 - Deploying SPDK-CSI on Kubernetes
 - Creating and Managing Storage Classes
 - Dynamic Volume Provisioning
 - Implementing Snapshots and Cloning
 - Conclusion
- 


Introduction to Kubernetes Storage Management

Kubernetes: Open-source container orchestration platform for automating deployment, scaling, and management of containerized applications.

Key Features:

- Automatic scaling
- Self-healing
- Rolling updates

Why Efficient Storage Management?:

- **Dynamic & Scalable Storage:** Containers need persistent, scalable storage across nodes.
 - **Distributed Applications:** Ensuring reliable storage access for diverse workloads.
 - **Data Availability:** Managing storage across on-premise and cloud environments.
- 

Introduction to Storage Performance Development Kit (SPDK)

SPDK (Storage Performance Development Kit) is an open-source framework designed for building high-performance storage applications. It enables user-space access to storage hardware like **NVMe** SSDs, achieving **low latency** and **high throughput** by bypassing the kernel. SPDK supports technologies like **NVMe over Fabrics (NVMe-oF)** for remote access to NVMe devices and utilizes **DPDK (Data Plane Development Kit)** to efficiently manage high-speed packet processing. This makes SPDK ideal for modern storage infrastructures where performance is critical, such as in data centers and high-performance computing.



Overview of Container Storage Interface (CSI)

What is CSI?



Controller Service

CreateVolume()
PublishVolume()
UnPublishVolume()
DeleteVolume()

Node Service

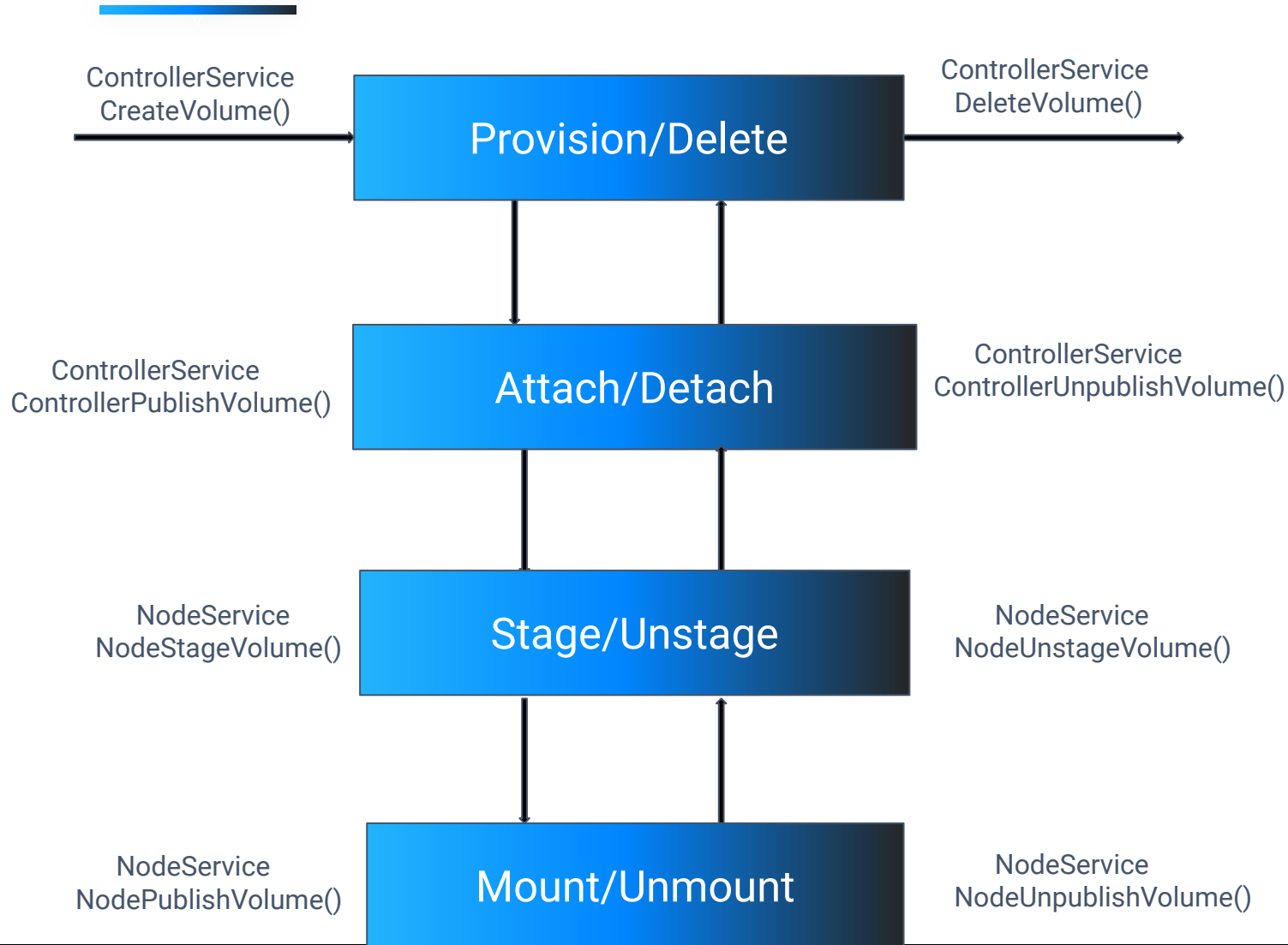
NodeStageVolume()
NodePublishVolume()
NodeUnstageVolume()
NodeUnpublishVolume()

Identity Service

GetPluginInfo()
GetPluginCapabilities()



WorkFlow Kubernetes API With CSI



Deploying SPDK-CSI on Kubernetes....

```
helm install -n spdk-csi --create-namespace spdk-csi spdk-csi/spdk-csi \  
  --set csiConfig.simplybk.uuid=ace14718-81eb-441f-9d4c-d71ce6904196 \  
  --set csiConfig.simplybk.ip=https://96xdzb9ne7.execute-api.us-east-1.amazonaws.com \  
  --set csiSecret.simplybk.secret=k6U5moyrY5vCVtSiCcKo \  
  --set logicalVolume.pool_name=testing1
```



Creating and Managing Storage Classes

```
---  
apiVersion: storage.k8s.io/v1  
kind: StorageClass  
metadata:  
  name: spdkcsi-sc  
provisioner: csi.spdk.io  
parameters:  
  csi.storage.k8s.io/fstype: ext4  
  pool_name: testing1  
  qos_rw_iops: "0"  
  qos_rw_mbytes: "0"  
  qos_r_mbytes: "0"  
  qos_w_mbytes: "0"  
  compression: "False"  
  encryption: "False"  
  distr_ndcs: "1"  
  distr_npcs: "1"  
reclaimPolicy: Delete  
volumeBindingMode: Immediate  
allowVolumeExpansion: true
```

```
---  
apiVersion: storage.k8s.io/v1  
kind: CSIDriver  
metadata:  
  name: csi.spdk.io  
spec:  
  attachRequired: true  
  volumeLifecycleModes:  
  - Persistent
```

Dynamic Volume Provisioning

```
---  
apiVersion: v1  
kind: PersistentVolumeClaim  
metadata:  
  name: spdkcsi-pvc  
spec:  
  storageClassName: spdkcsi-sc  
  accessModes:  
    - ReadWriteOnce  
  resources:  
    requests:  
      storage: 2Gi
```

```
---  
apiVersion: storage.k8s.io/v1  
kind: StorageClass  
metadata:  
  name: spdkcsi-sc  
provisioner: csi.spdk.io  
parameters:  
  csi.storage.k8s.io/fstype: ext4  
  pool_name: testing1  
  qos_rw_iops: "0"  
  qos_rw_mbytes: "0"  
  qos_r_mbytes: "0"  
  qos_w_mbytes: "0"  
  compression: "False"  
  encryption: "False"  
  distr_ndcs: "1"  
  distr_npcs: "1"  
reclaimPolicy: Delete  
volumeBindingMode: Immediate  
allowVolumeExpansion: true
```

Demo #1

v



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Snapshots and Cloning

Controller Service

....

CreateSnapshot()

ListSnapshot()

DeleteSnapshot()

Implementing Snapshots

```
---  
apiVersion: snapshot.storage.k8s.io/v1  
kind: VolumeSnapshotClass  
metadata:  
  name: csi-spdk-snapclass  
driver: csi.spdk.io  
deletionPolicy: Delete
```

```
---  
apiVersion: snapshot.storage.k8s.io/v1  
kind: VolumeSnapshot  
metadata:  
  name: spdk-snapshot  
spec:  
  volumeSnapshotClassName: csi-spdk-snapclass  
  source:  
    persistentVolumeClaimName: spdkcsi-pvc
```

```
---  
apiVersion: v1  
kind: PersistentVolumeClaim  
metadata:  
  name: spdkcsi-pvc  
spec:  
  storageClassName: spdkcsi-sc  
  accessModes:  
    - ReadWriteOnce  
  resources:  
    requests:  
      storage: 2Gi
```



Restore Volume from Snapshot

```
---  
apiVersion: snapshot.storage.k8s.io/v1  
kind: VolumeSnapshot  
metadata:  
  name: spdk-snapshot  
spec:  
  volumeSnapshotClassName: csi-spdk-snapclass  
  source:  
    persistentVolumeClaimName: spdkcsi-pvc
```

```
---  
apiVersion: v1  
kind: PersistentVolumeClaim  
metadata:  
  name: spdkcsi-pvc-restore  
spec:  
  storageClassName: spdkcsi-sc  
  dataSource:  
    name: spdk-snapshot  
    kind: VolumeSnapshot  
    apiGroup: snapshot.storage.k8s.io  
  accessModes:  
    - ReadWriteOnce  
  resources:  
    requests:  
      storage: 2Gi
```

Demo #2

v



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Volume Cloning

```
---  
apiVersion: v1  
kind: PersistentVolumeClaim  
metadata:  
  name: spdkcsi-pvc  
spec:  
  storageClassName: spdkcsi-sc  
  accessModes:  
  - ReadWriteOnce  
resources:  
  requests:  
    storage: 2Gi
```

```
---  
apiVersion: v1  
kind: PersistentVolumeClaim  
metadata:  
  name: spdkcsi-pvc-clone  
spec:  
  storageClassName: spdkcsi-sc  
  dataSource:  
    name: spdkcsi-pvc  
    kind: PersistentVolumeClaim  
    apiGroup: ""  
  accessModes:  
  - ReadWriteOnce  
resources:  
  requests:  
    storage: 2Gi
```


Demo #3

v

Thank you.

Questions?