

Using Storage in Kubernetes



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Overview



Kubernetes Storage: The Big Picture

Decoupling Application & Data Lifecycles

The Kubernetes Persistent Volume Subsystem

The Container Storage Interface (CSI)

Hands-on: Static Provisioning

Hands-on: Dynamic Provisioning

Advanced Volume Features

Recap

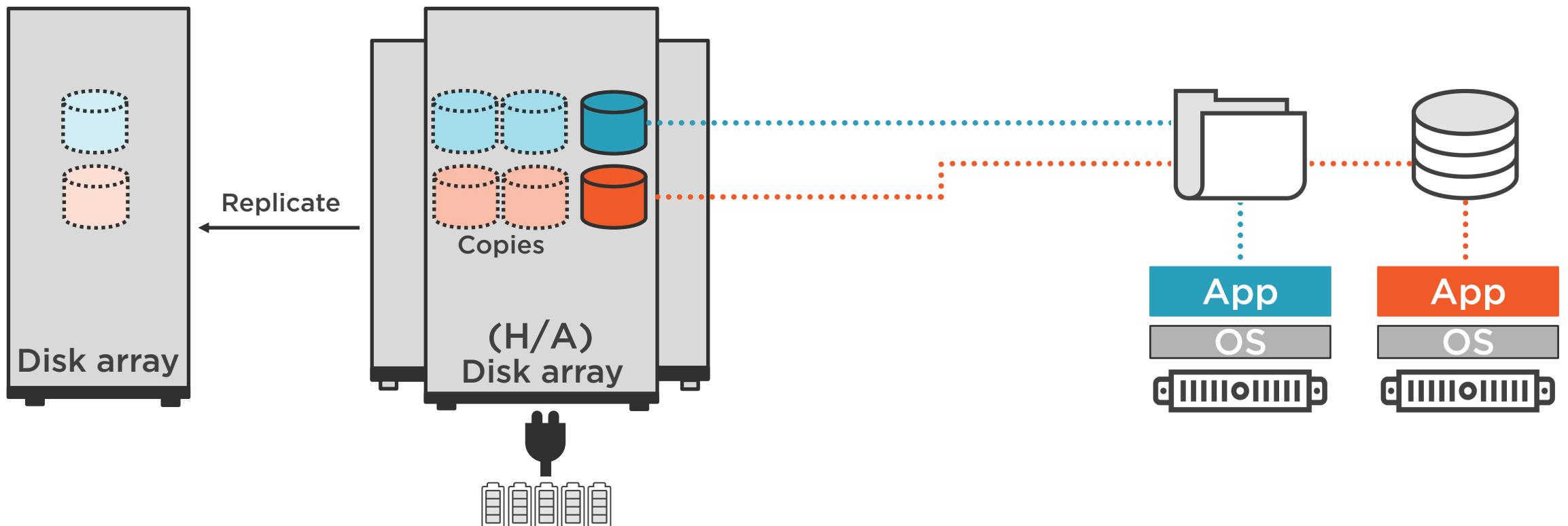


Kubernetes Storage: The Big Picture



Data

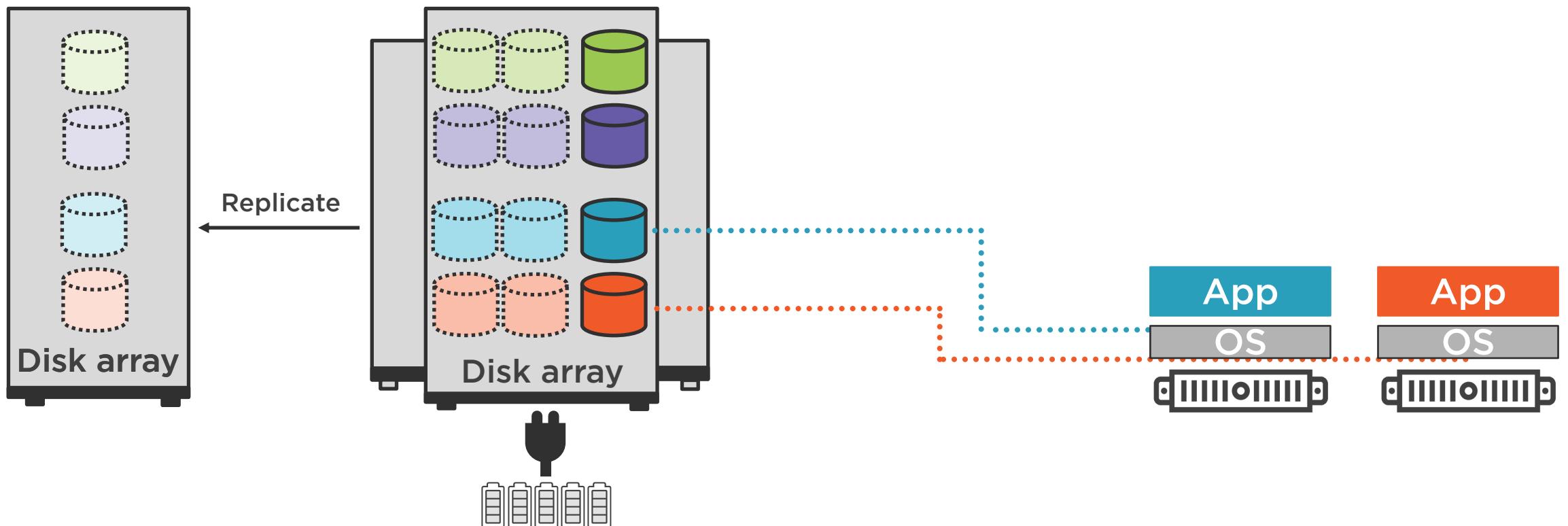




Remote site

On-premises data center

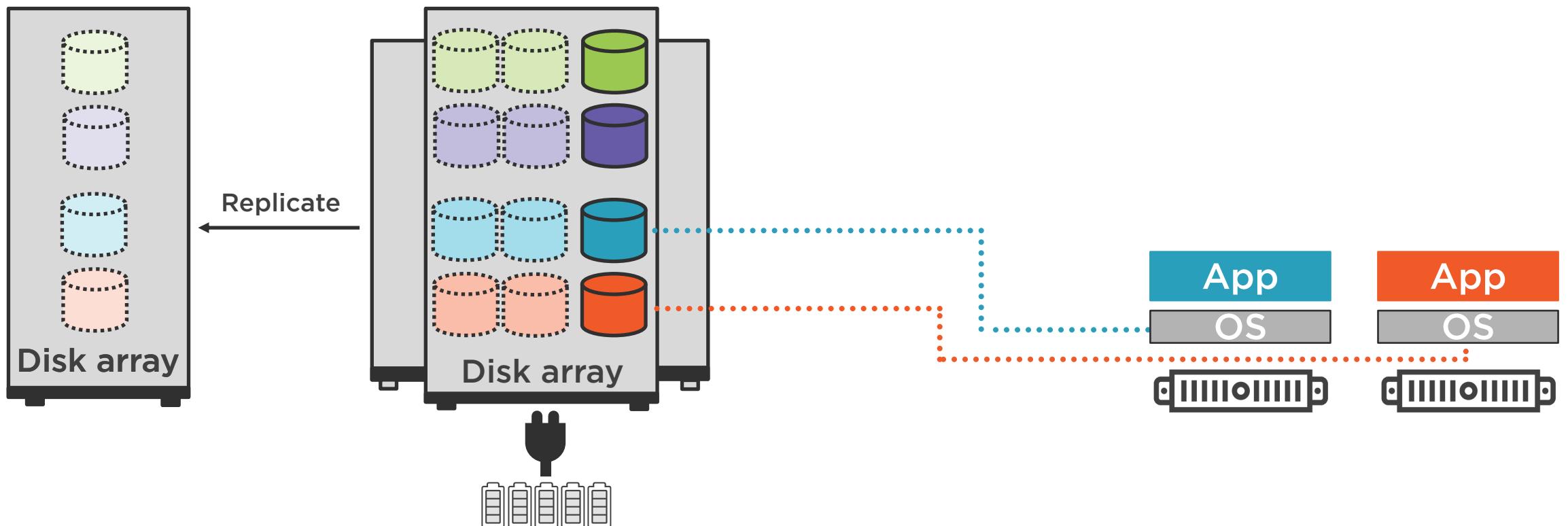




Remote site

On-premises data center

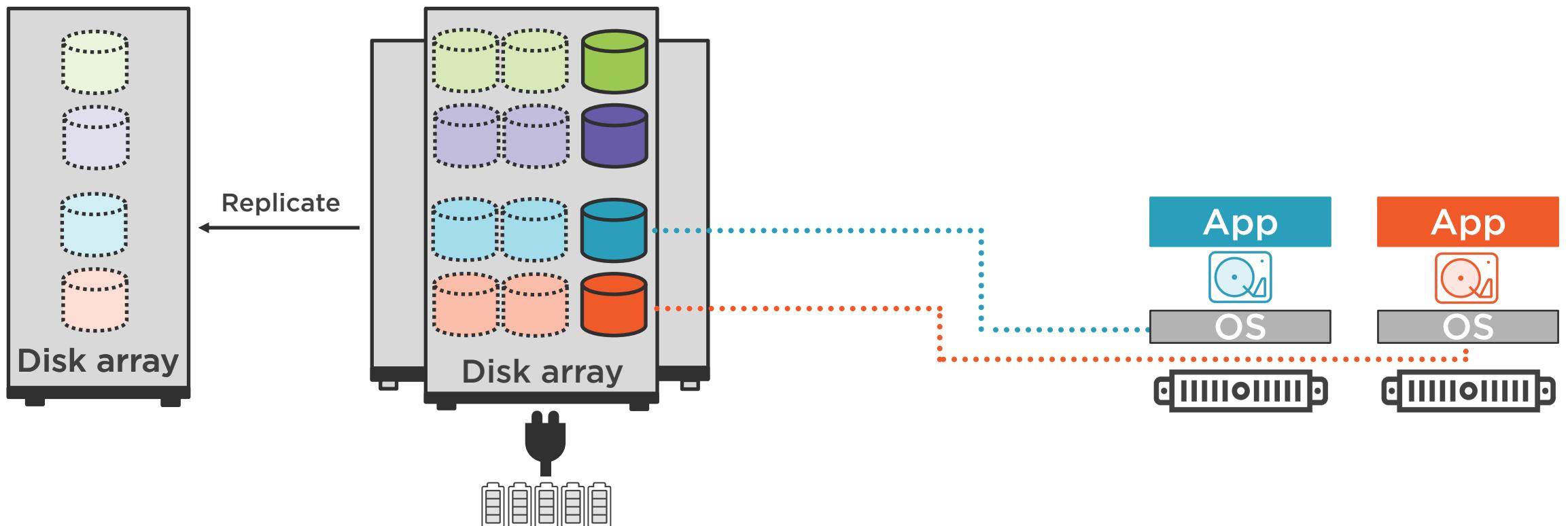




Remote site

On-premises data center

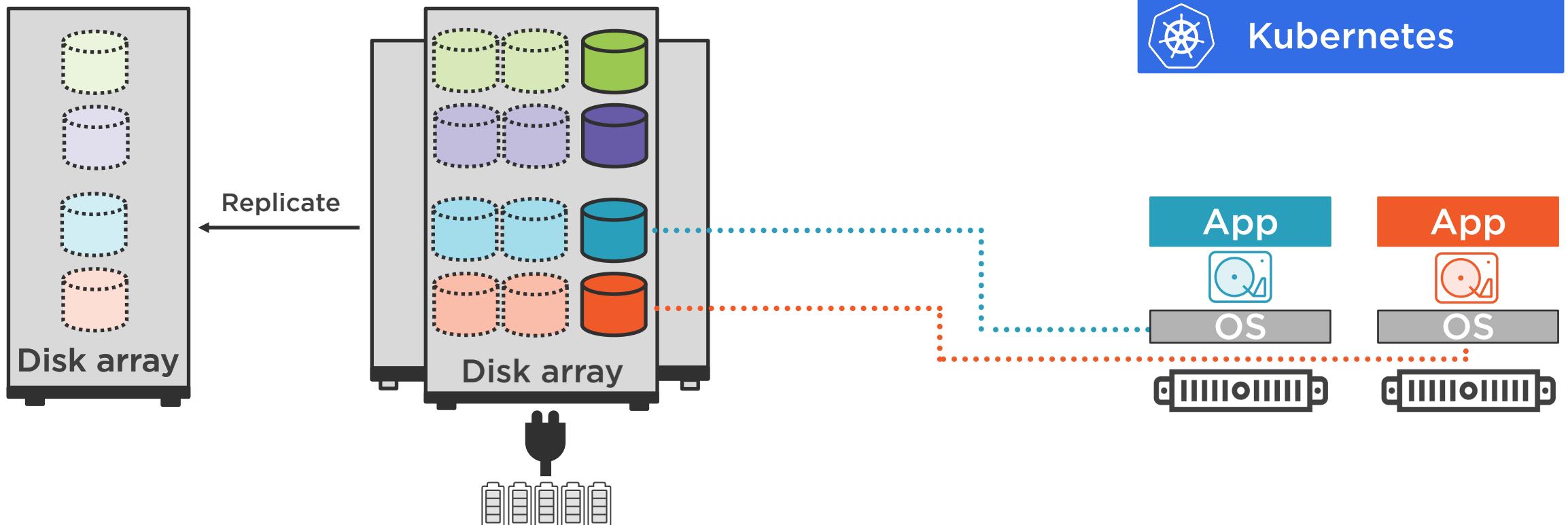




Remote site

On-premises data center

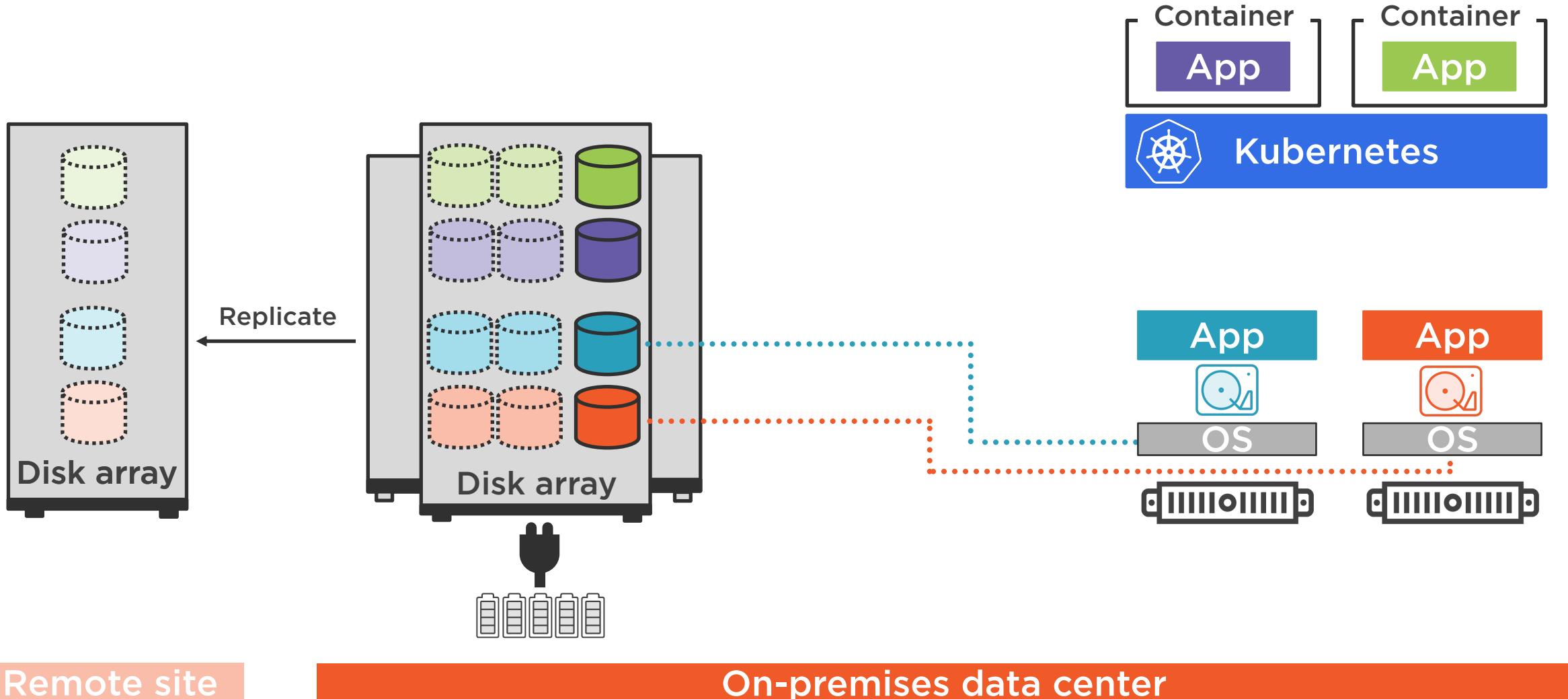


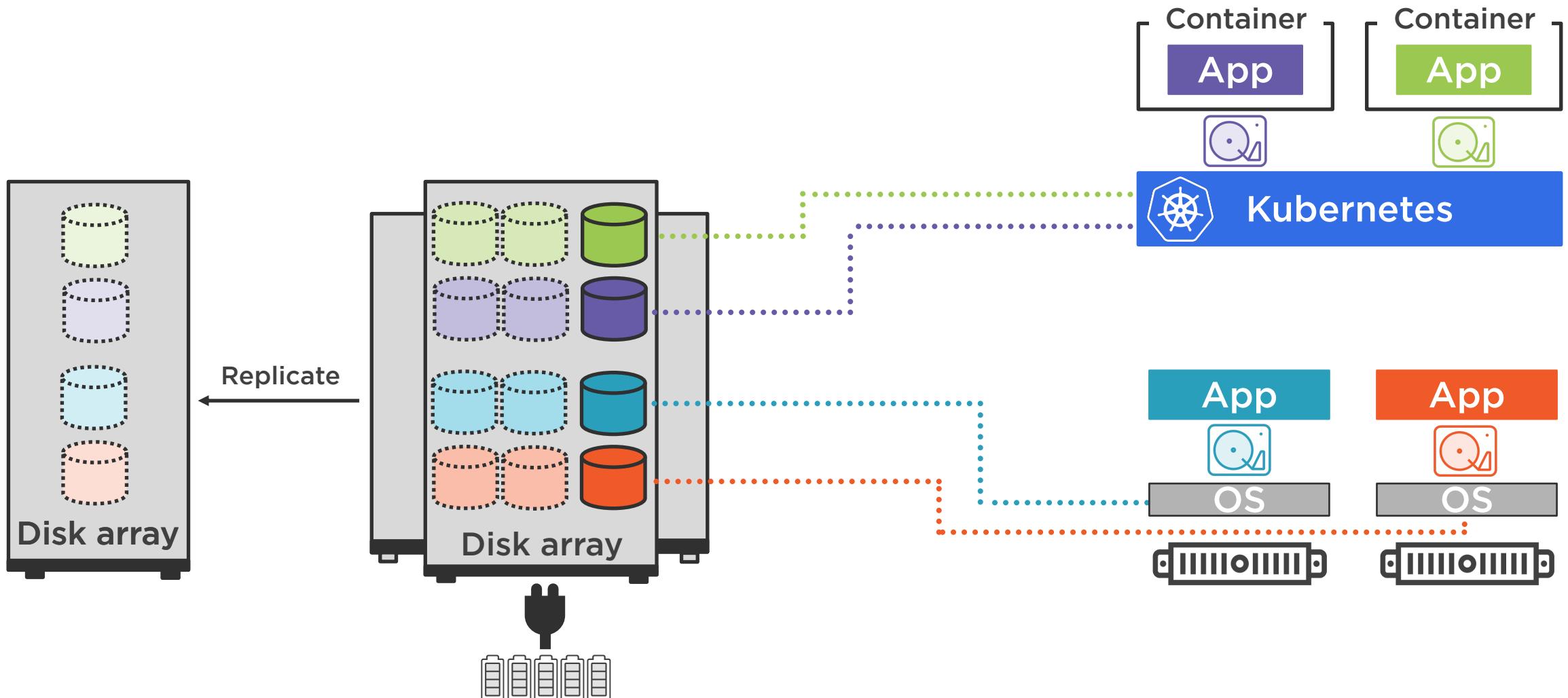


Remote site

On-premises data center



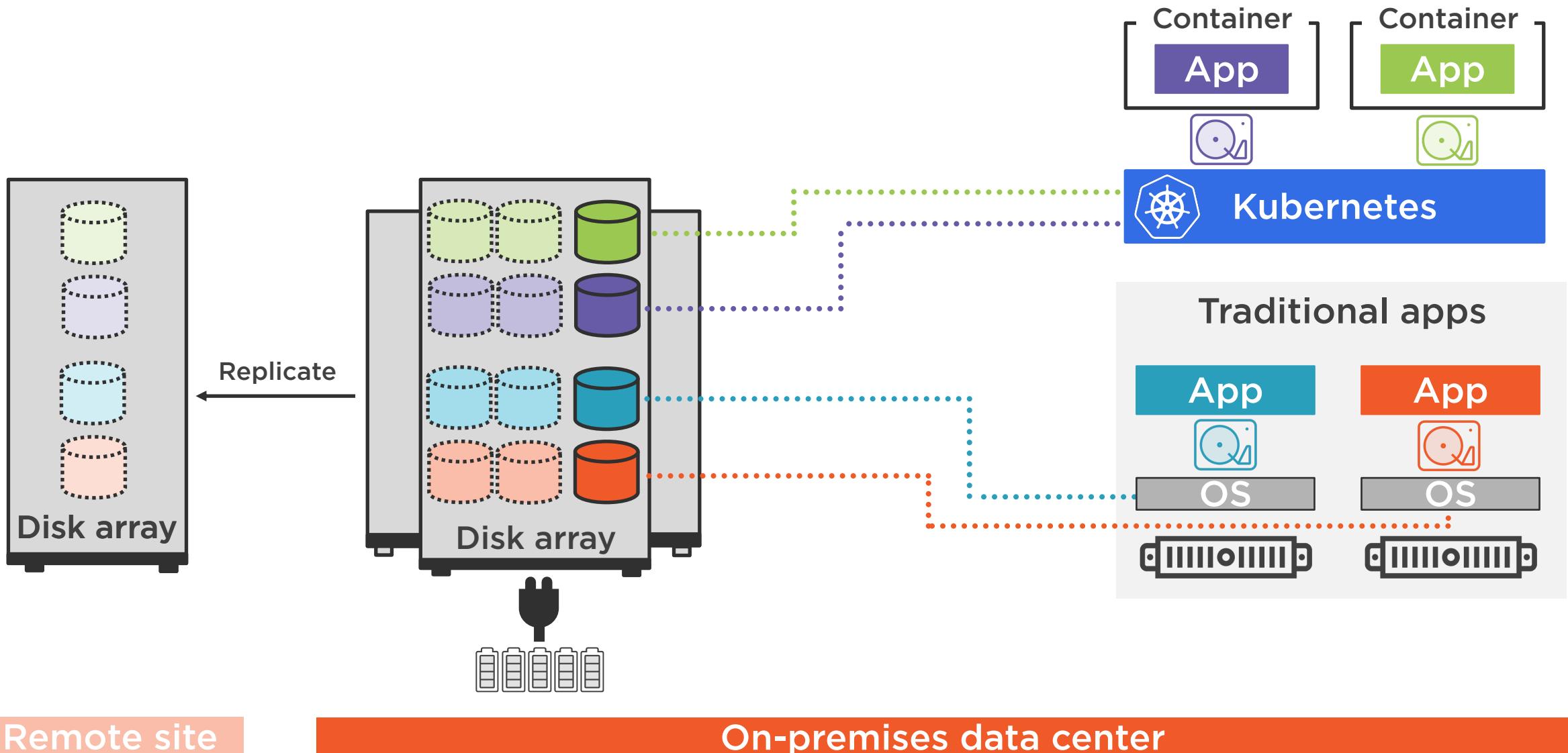


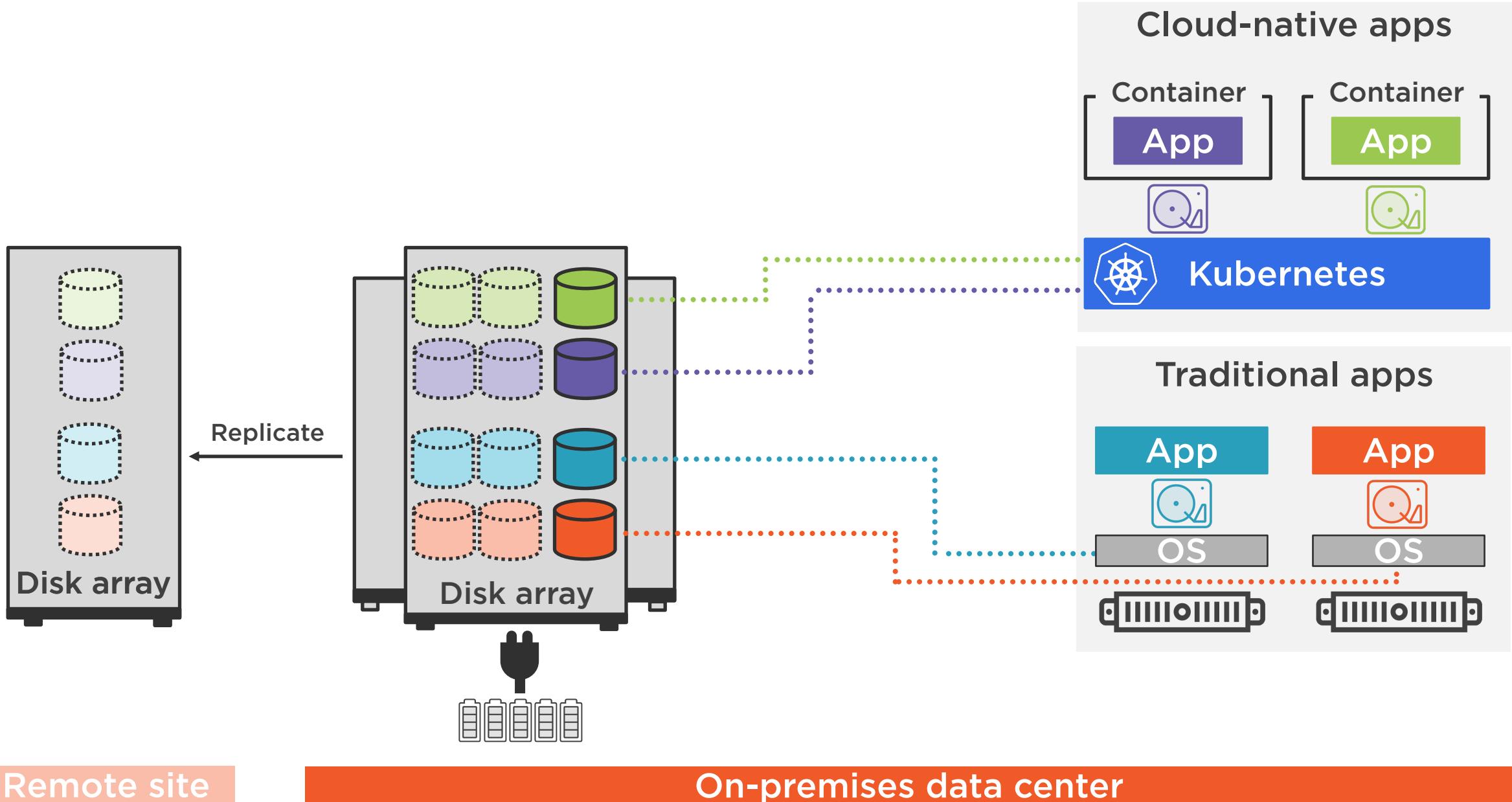


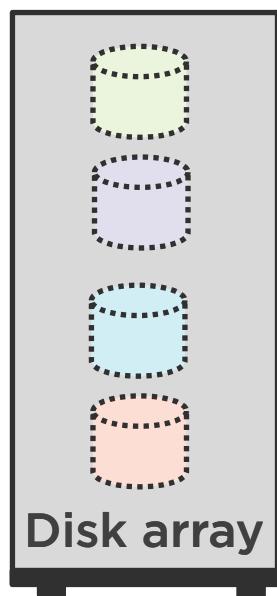
Remote site

On-premises data center

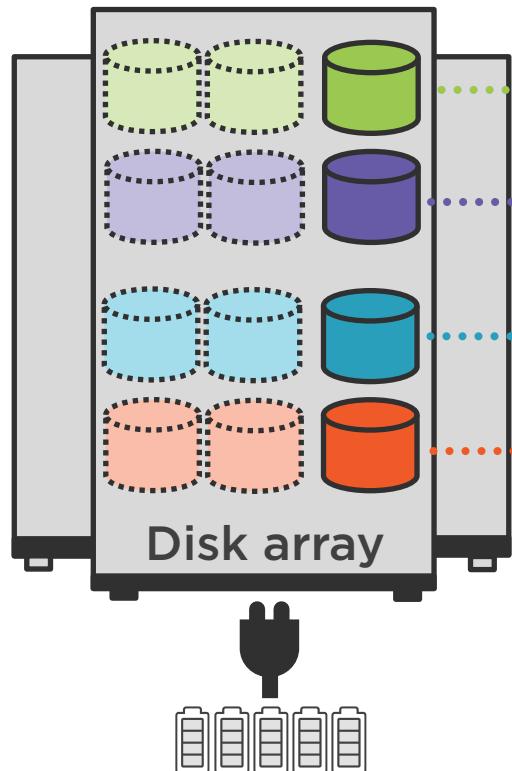




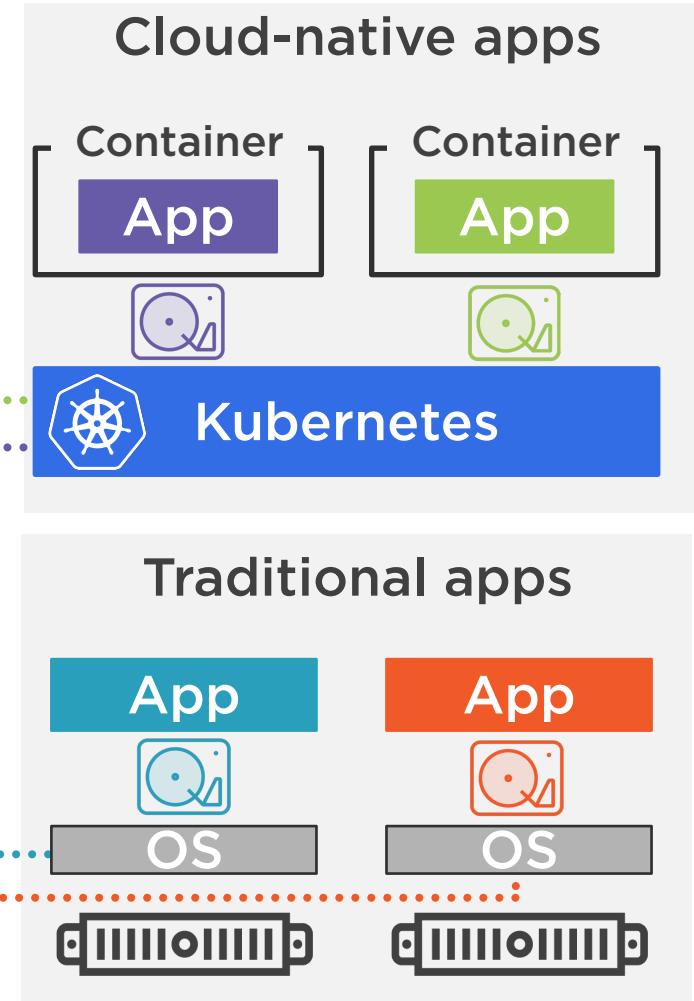


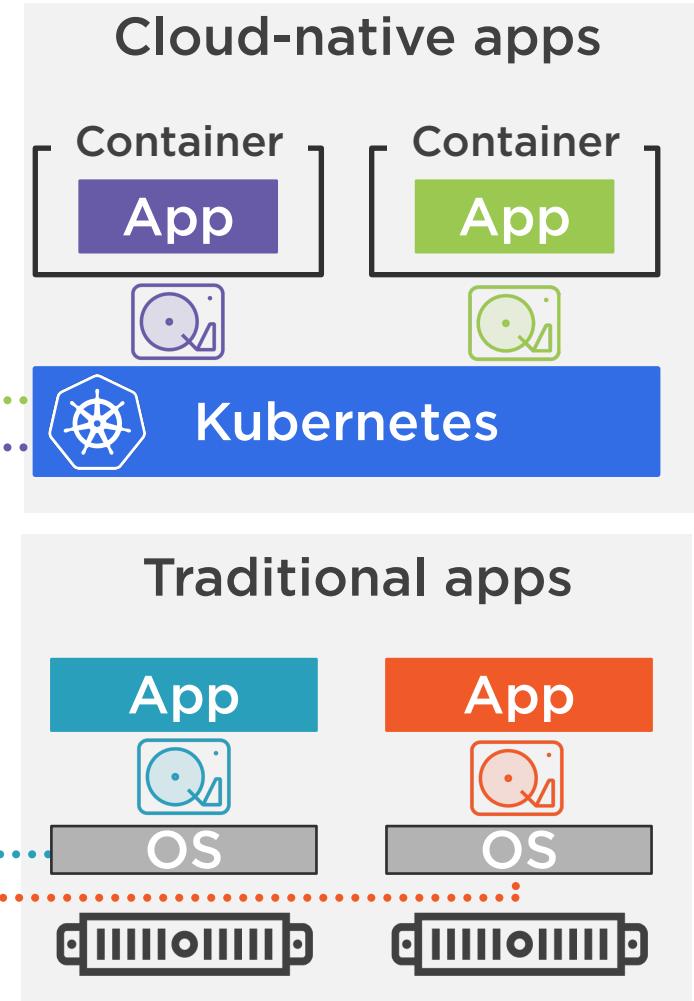


Replicate



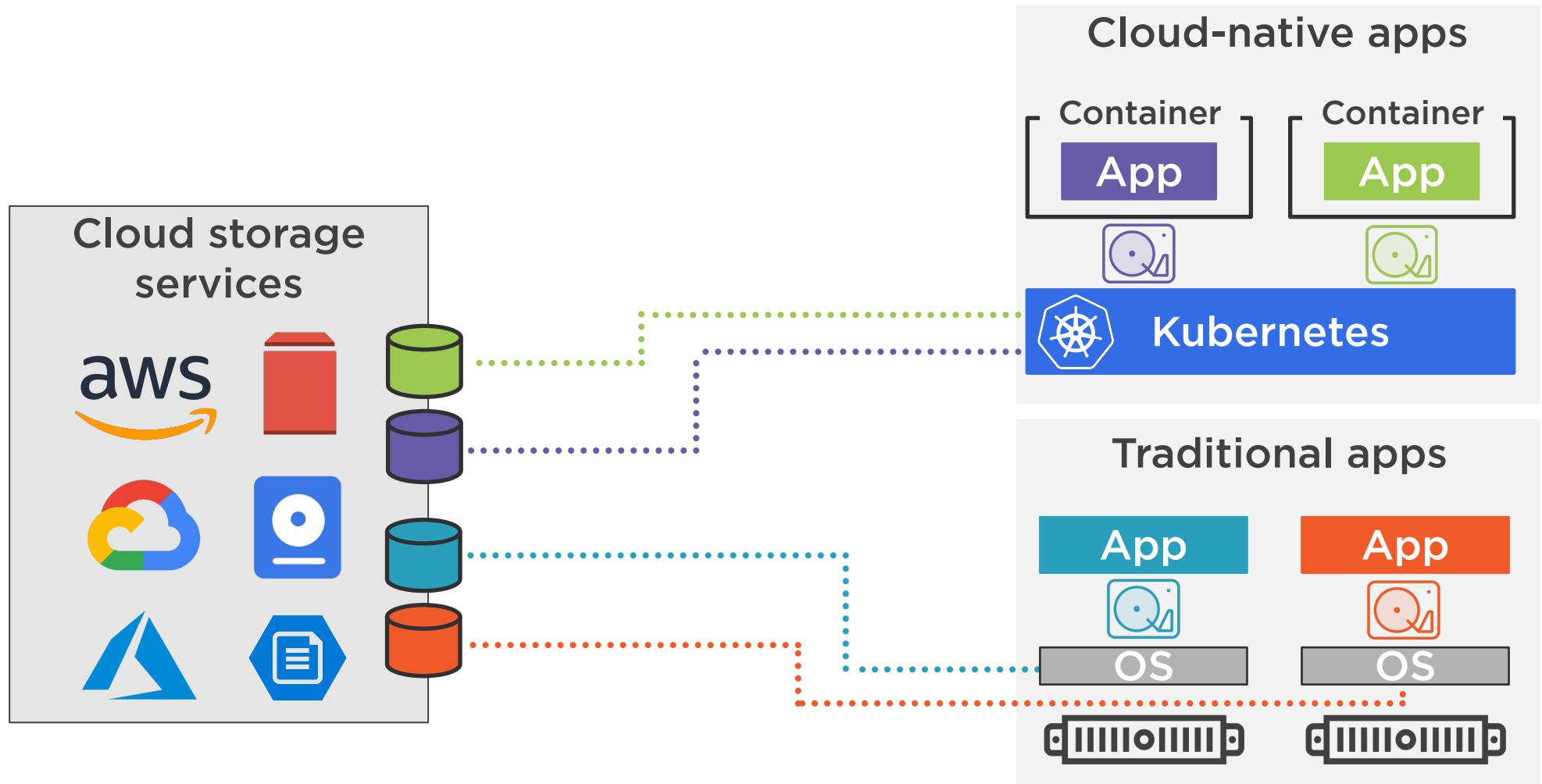
Public cloud





Public cloud





Public cloud



Stateful Application

An application that creates and saves data that needs to be kept.



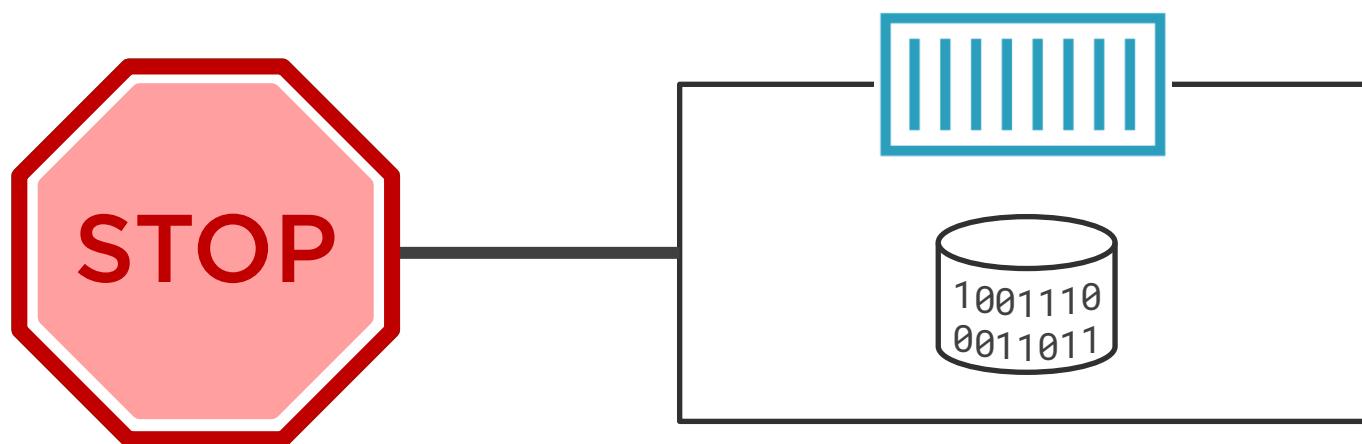
Up Next:

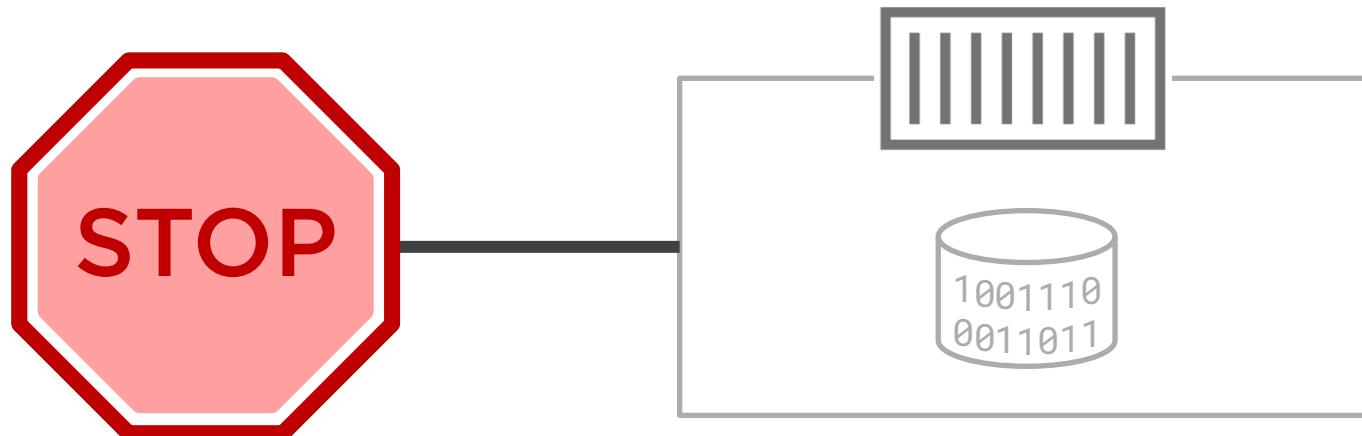
Application and Data Lifecycles

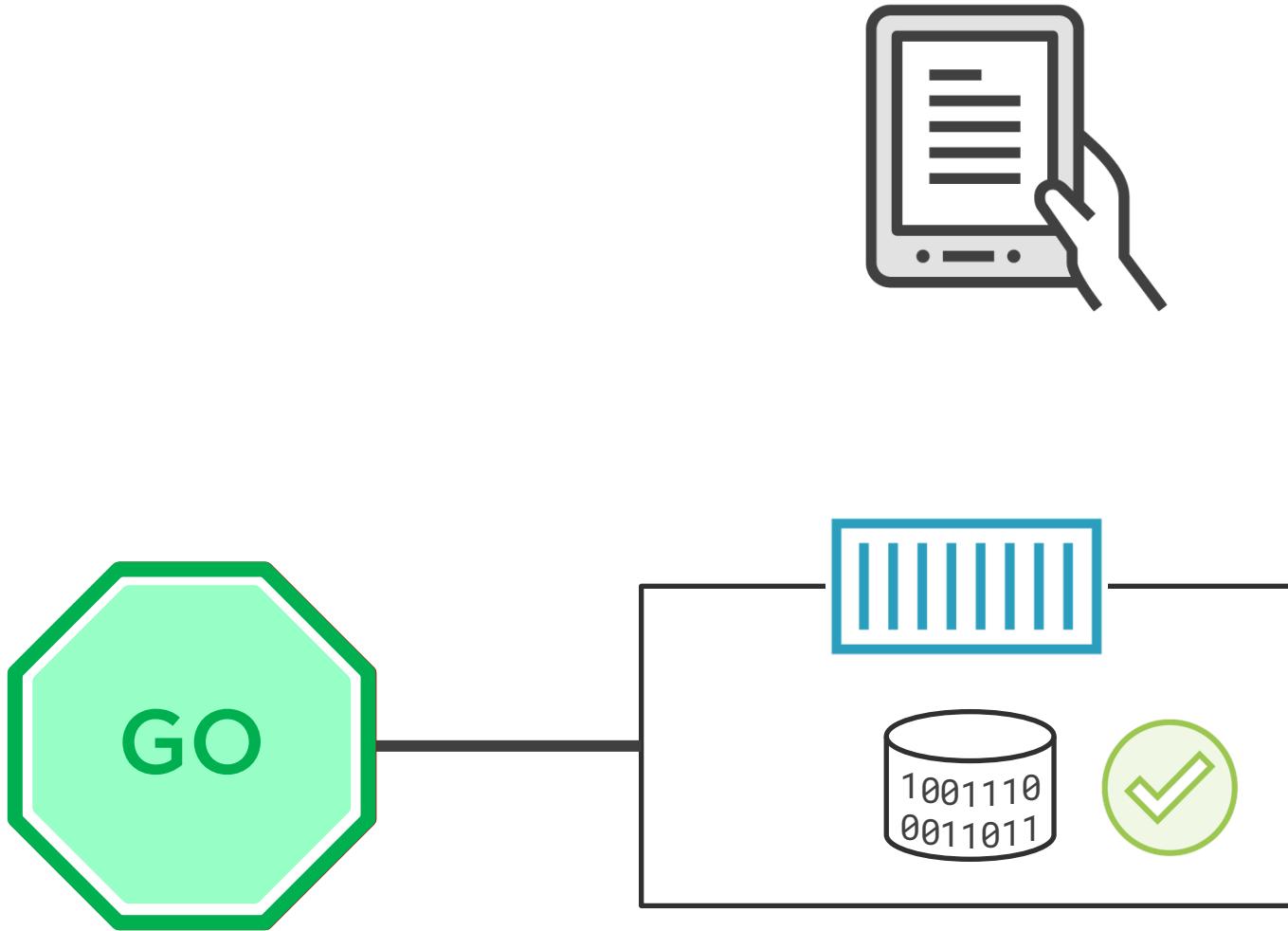


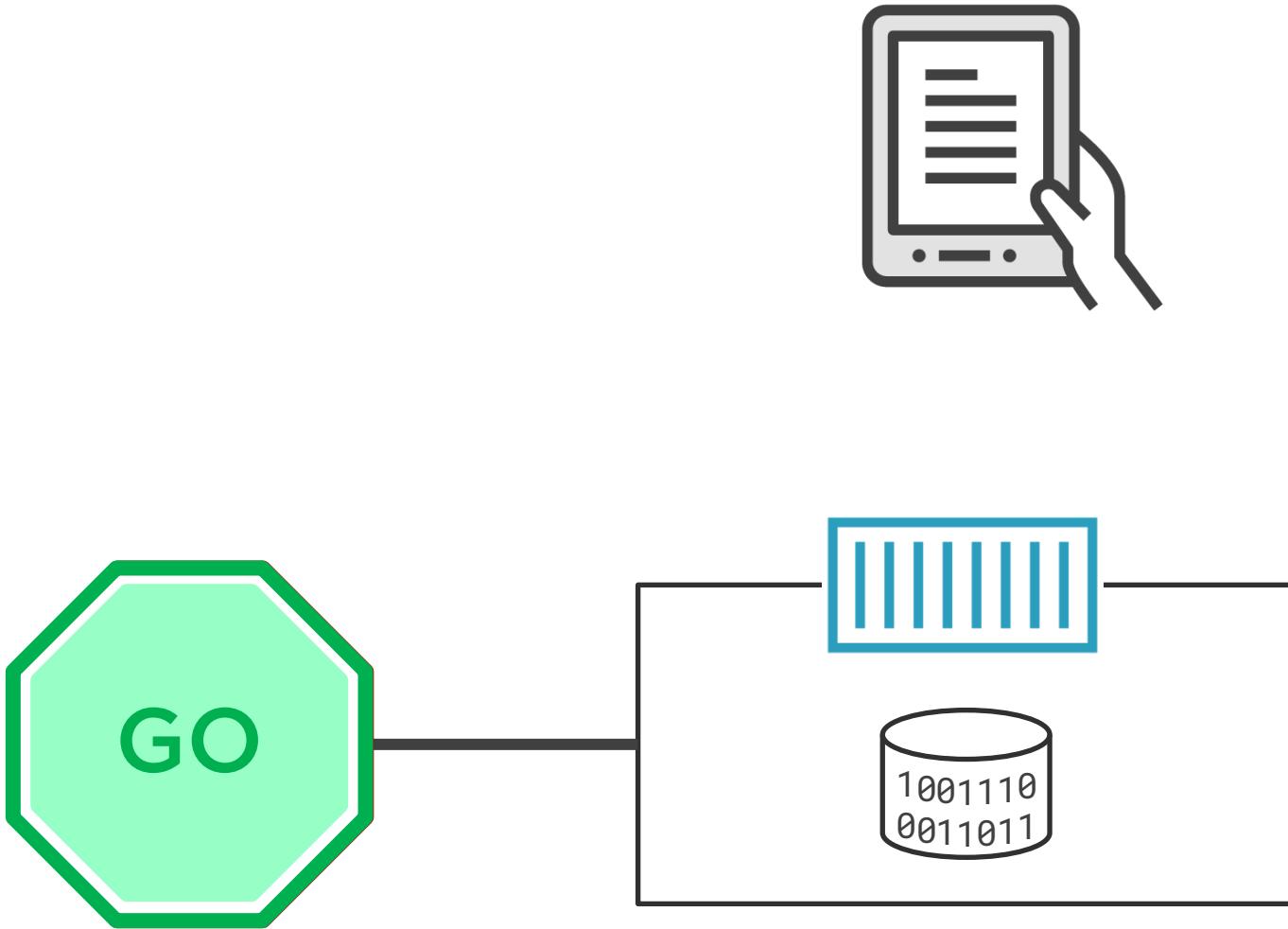
Decoupling Application & Data Lifecycles



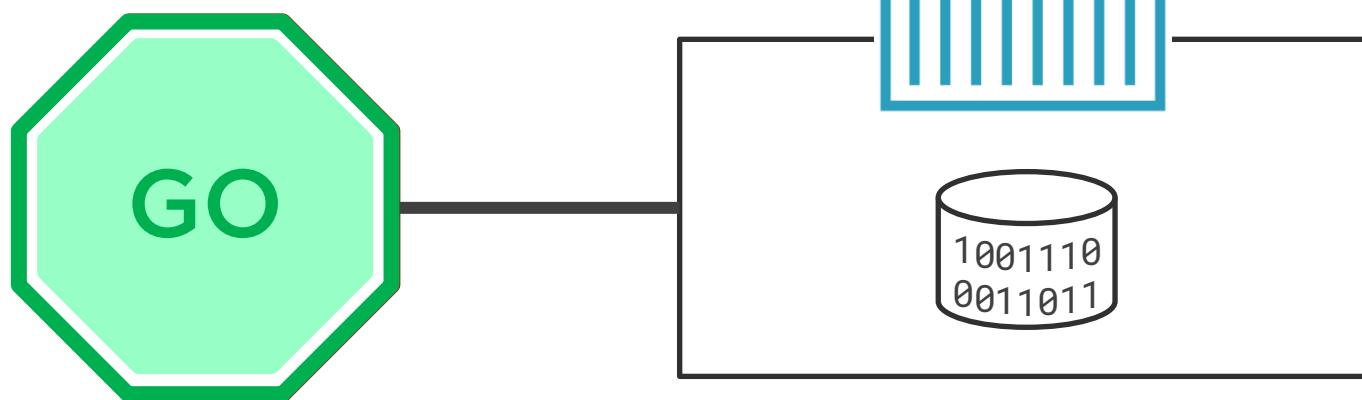


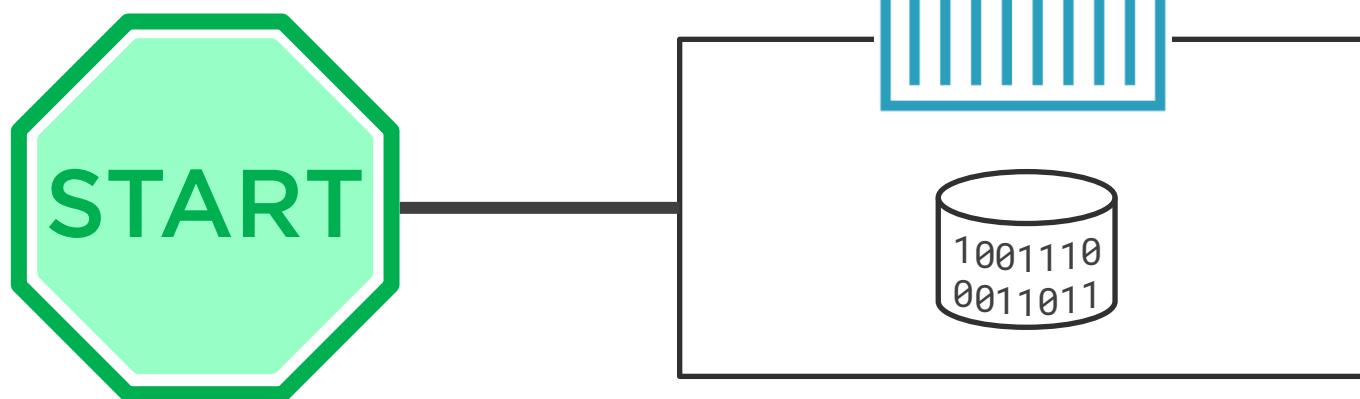


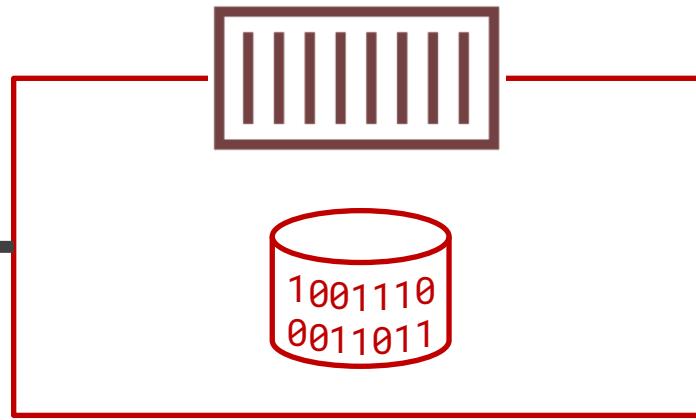


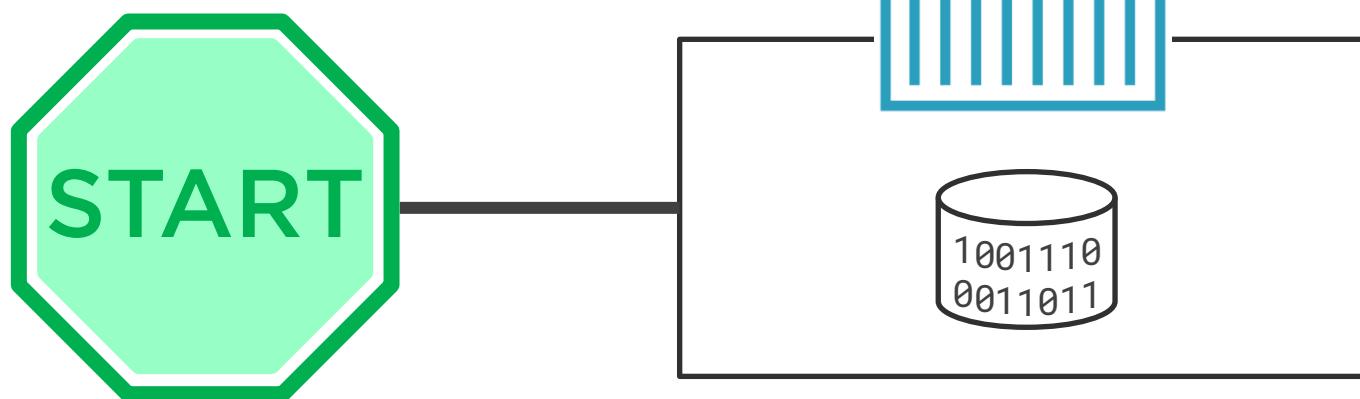


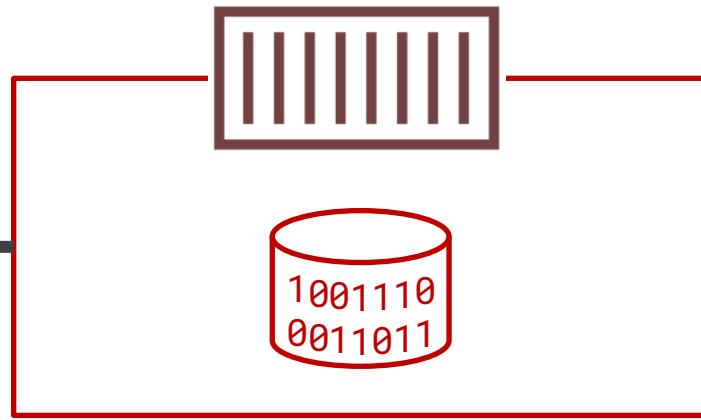


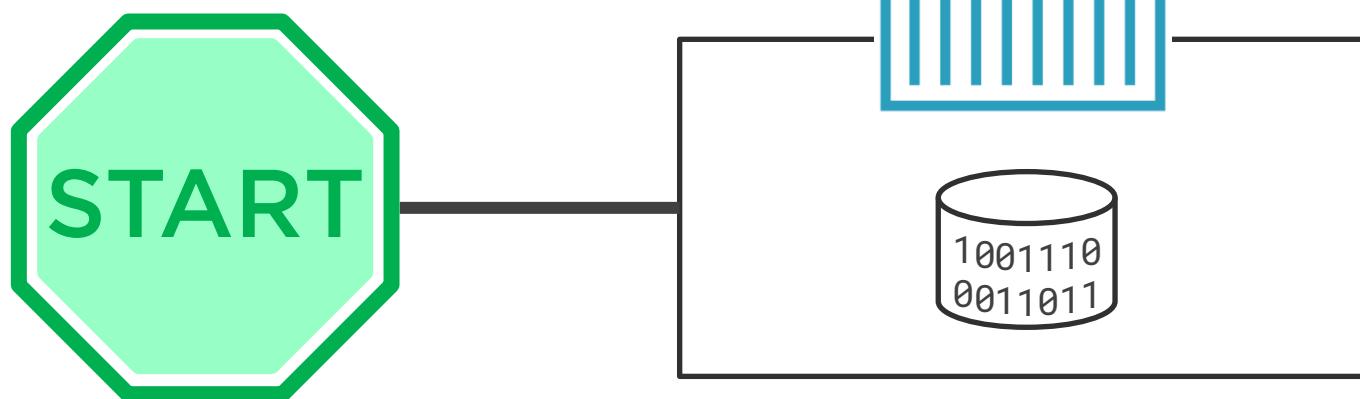


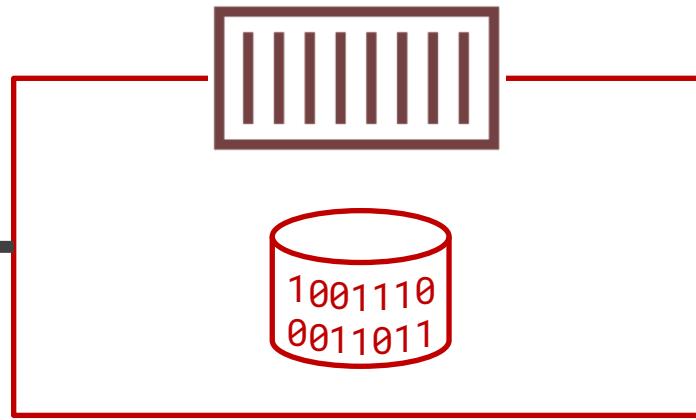


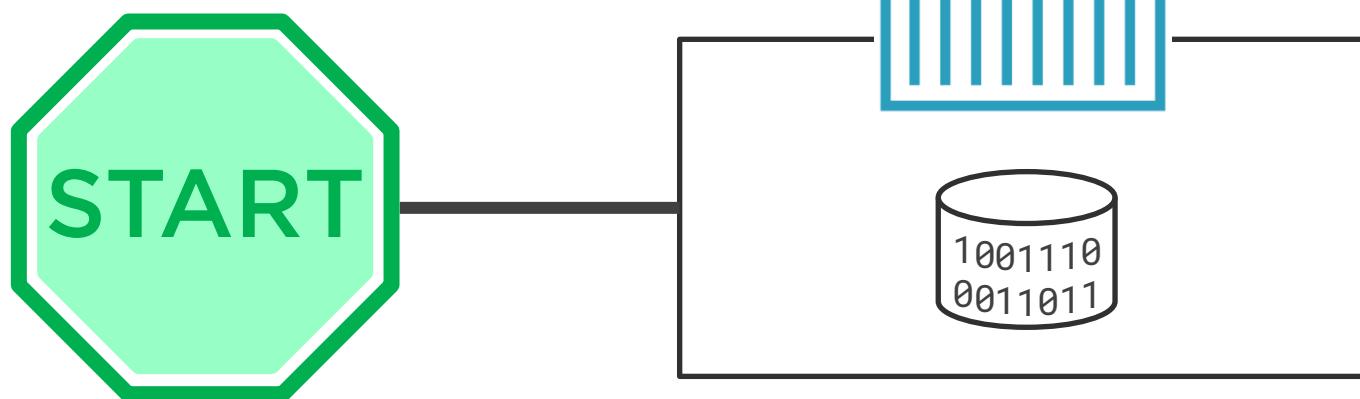


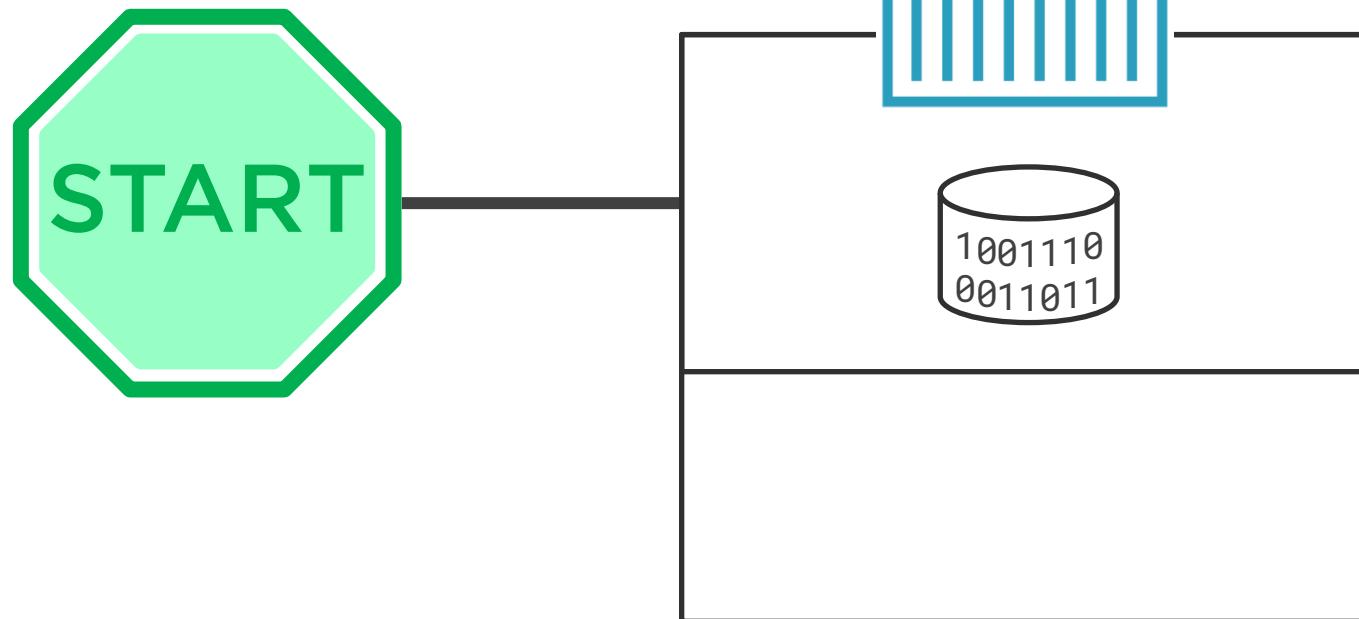


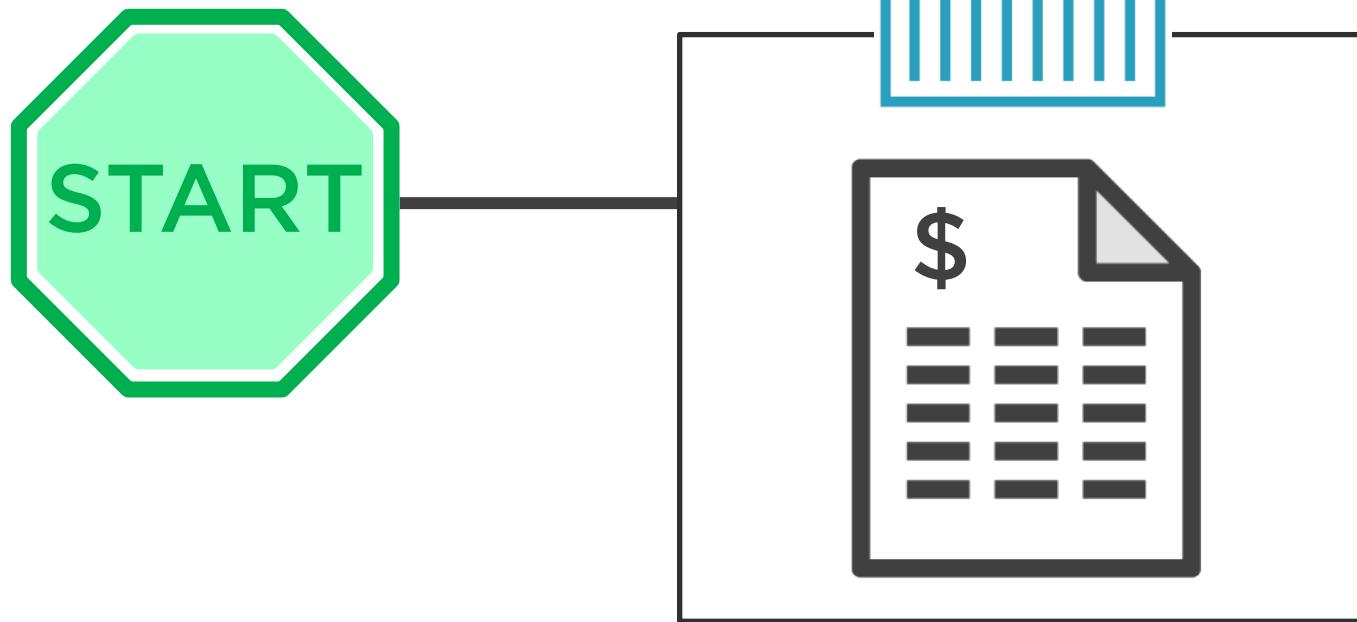


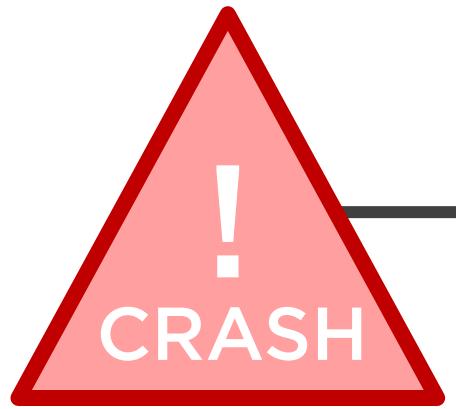


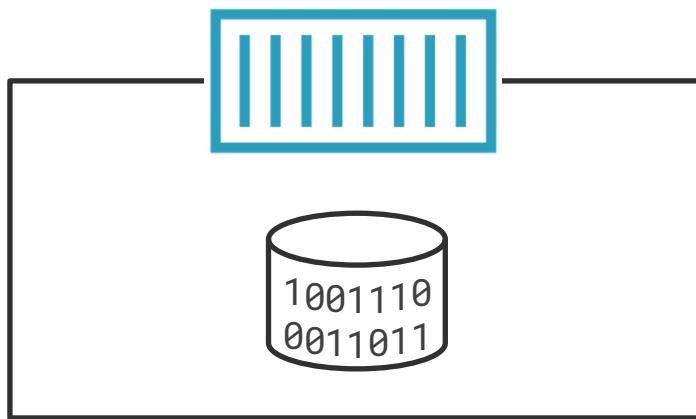


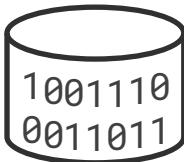






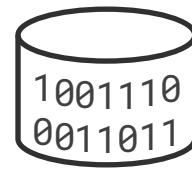
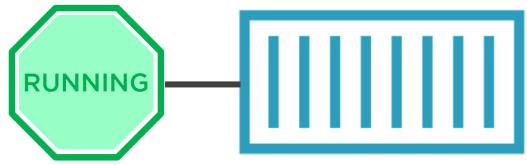
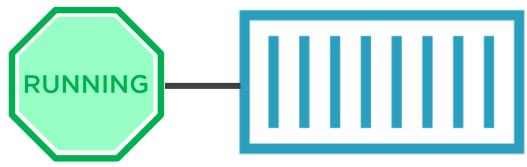
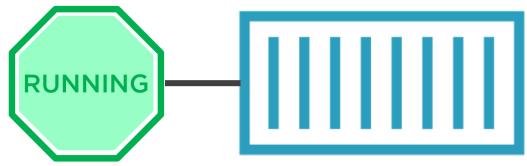


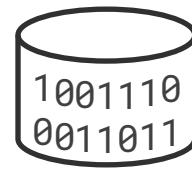
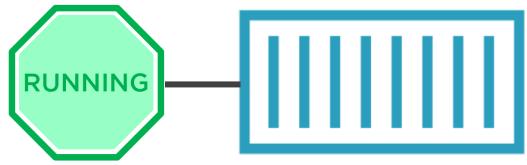
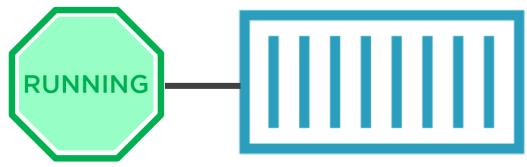
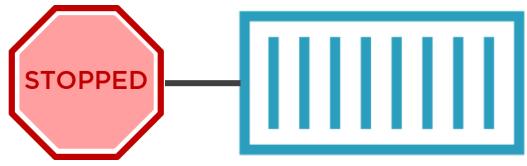


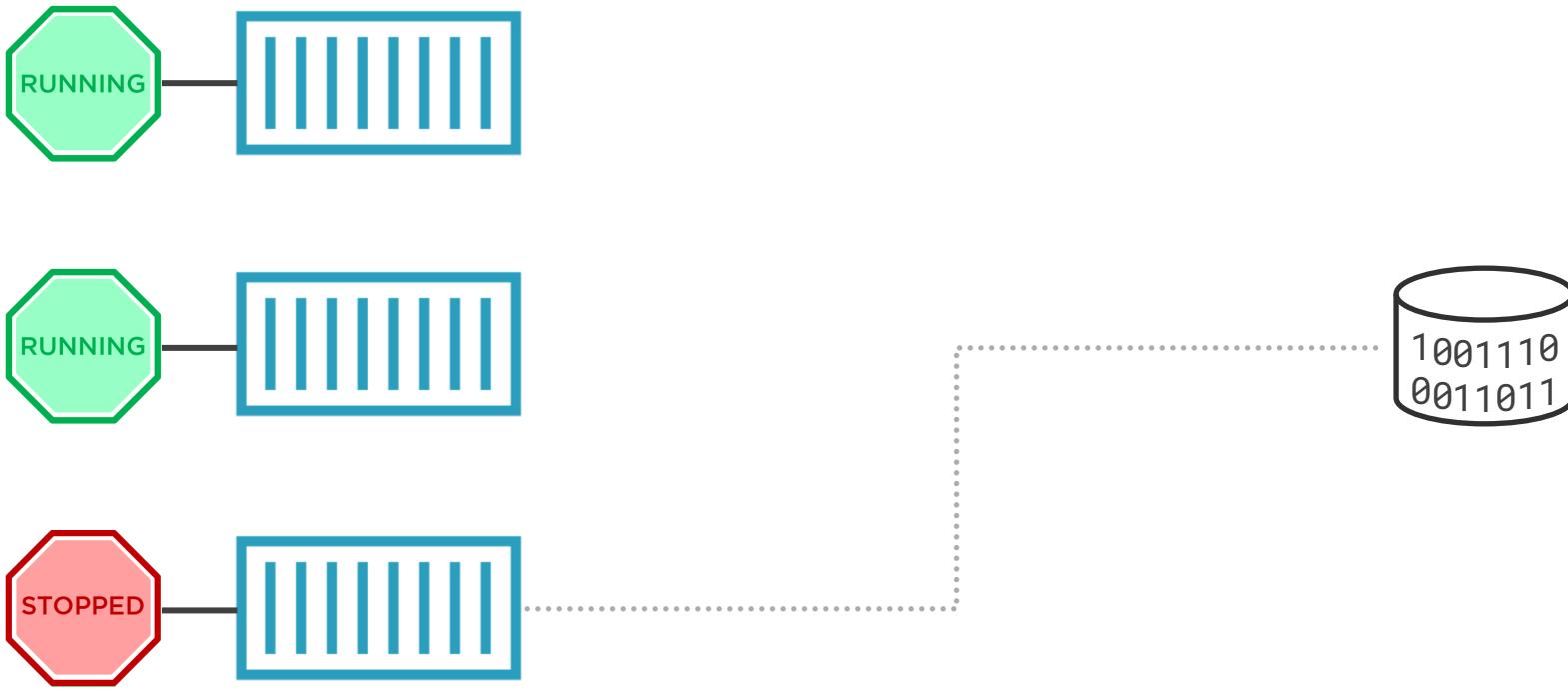


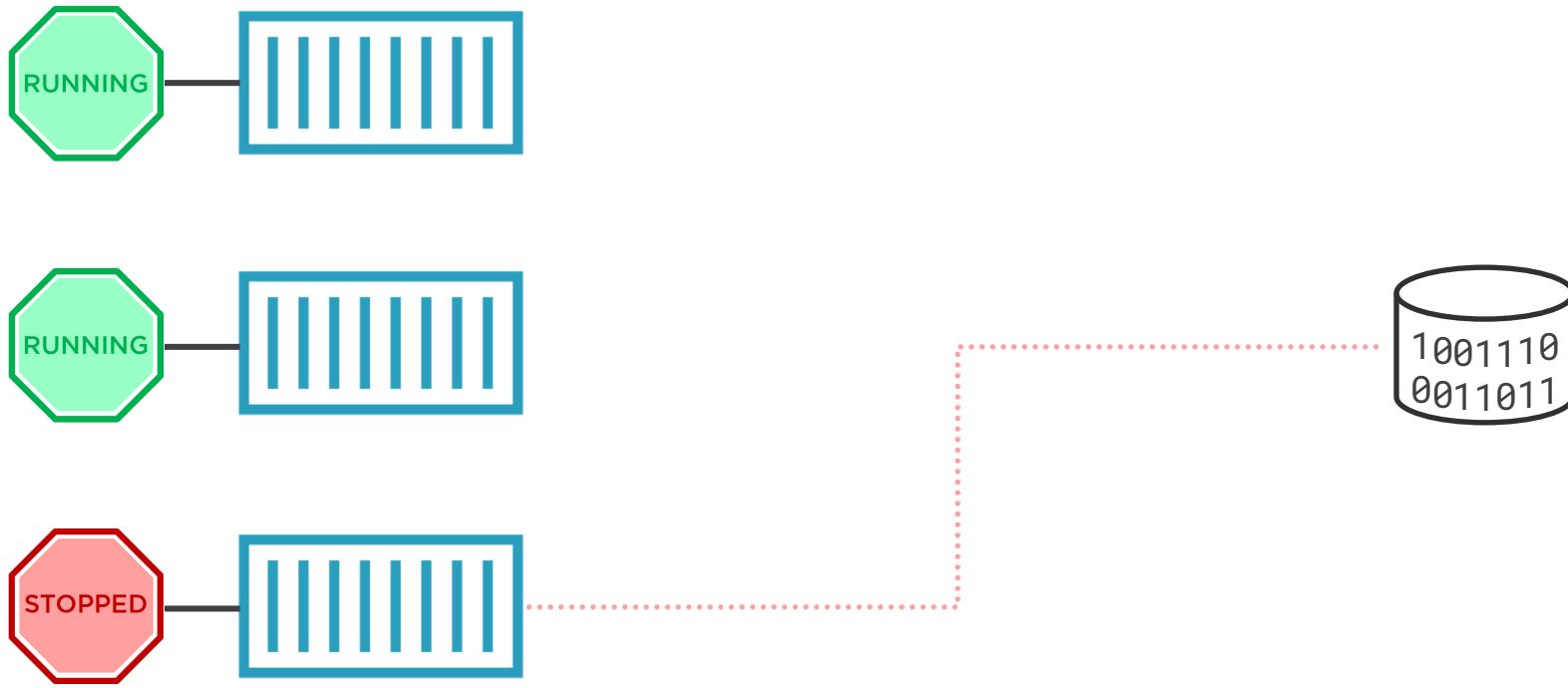
```
$ kubectl apply  
$ kubectl describe  
$ kubectl delete  
...  
...
```

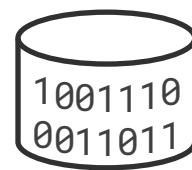
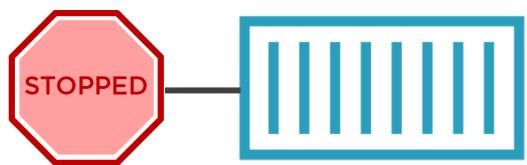
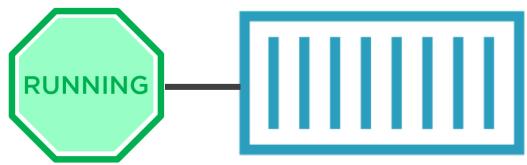
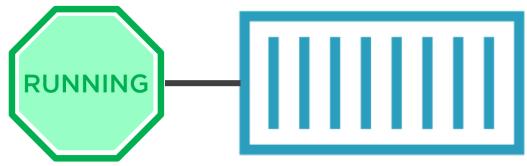


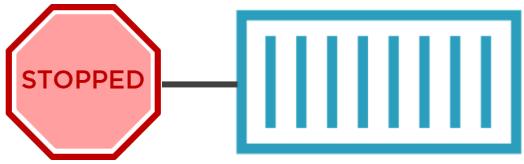
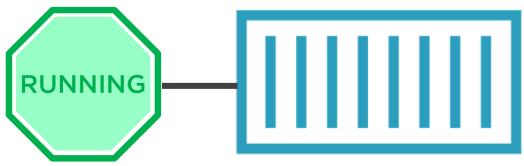
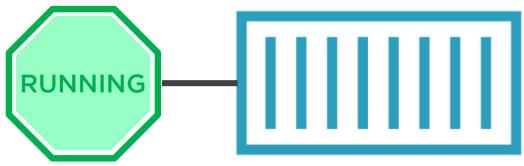


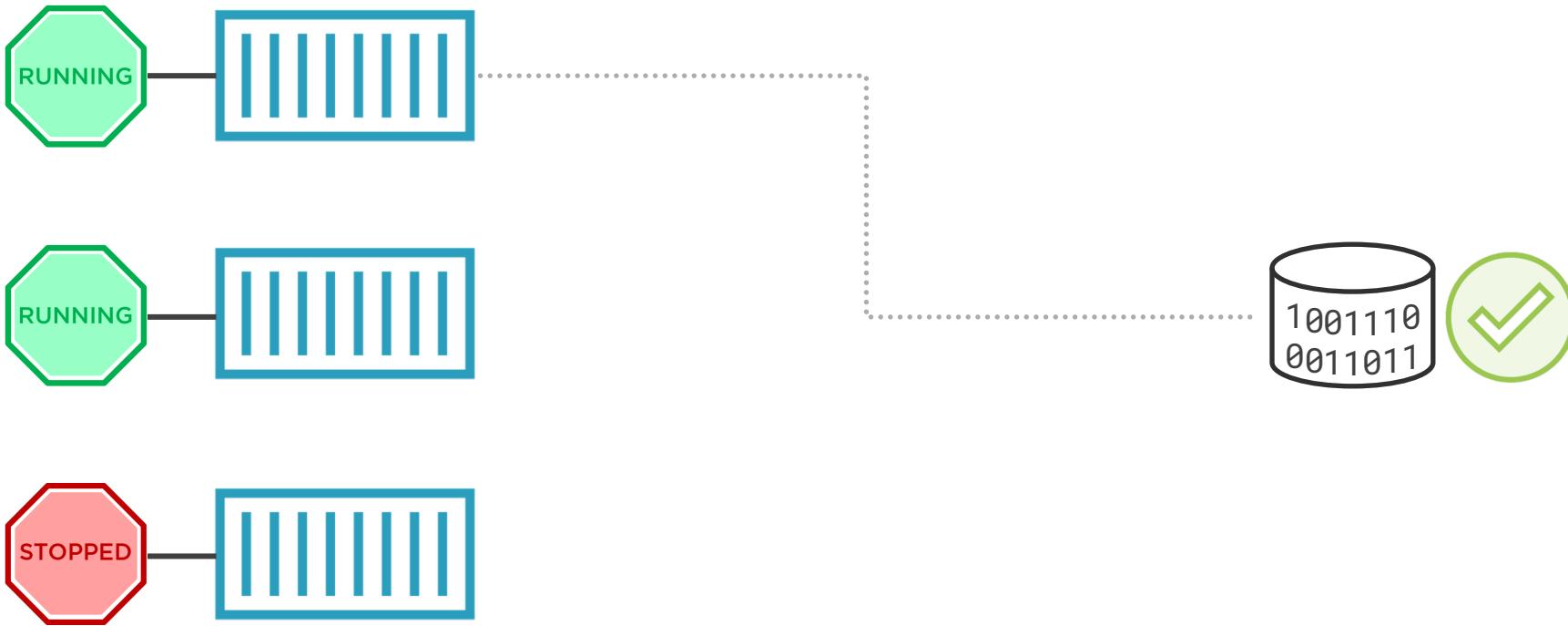


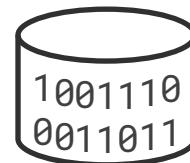
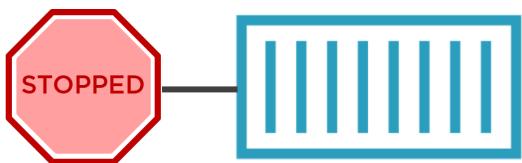
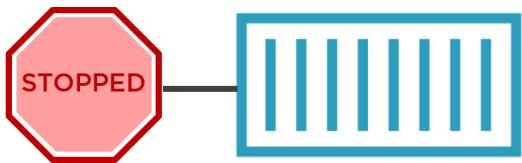
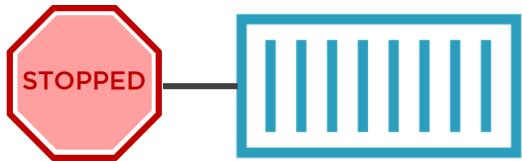






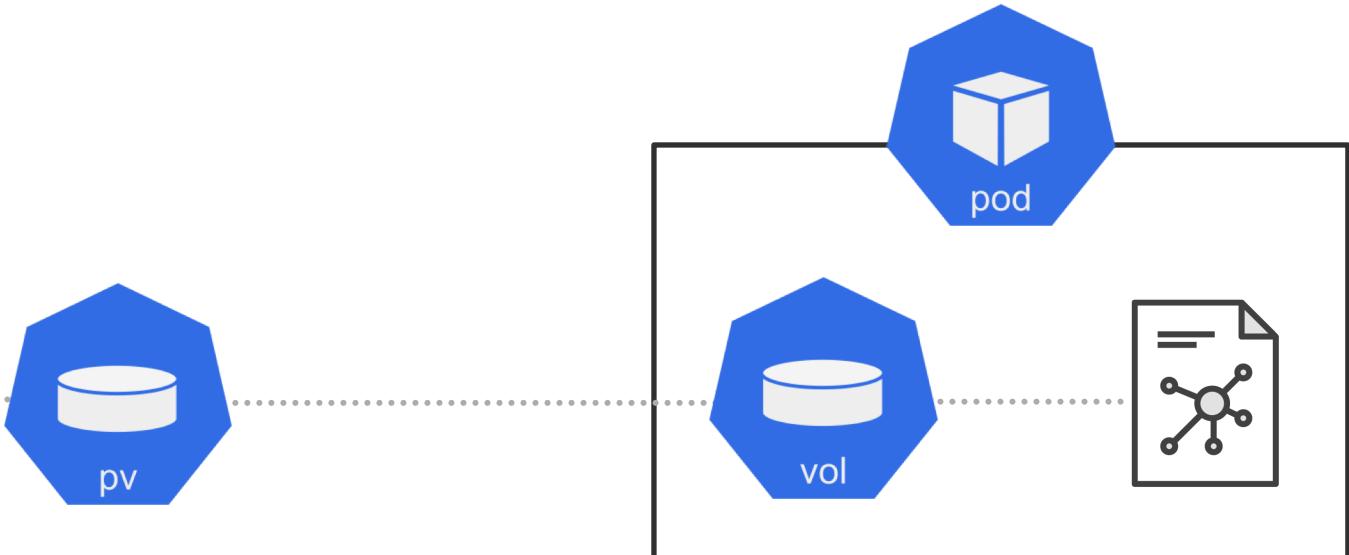
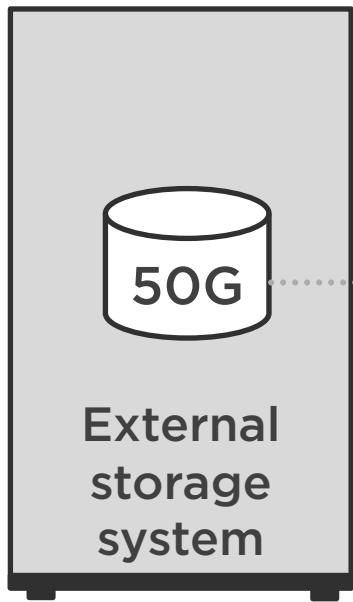


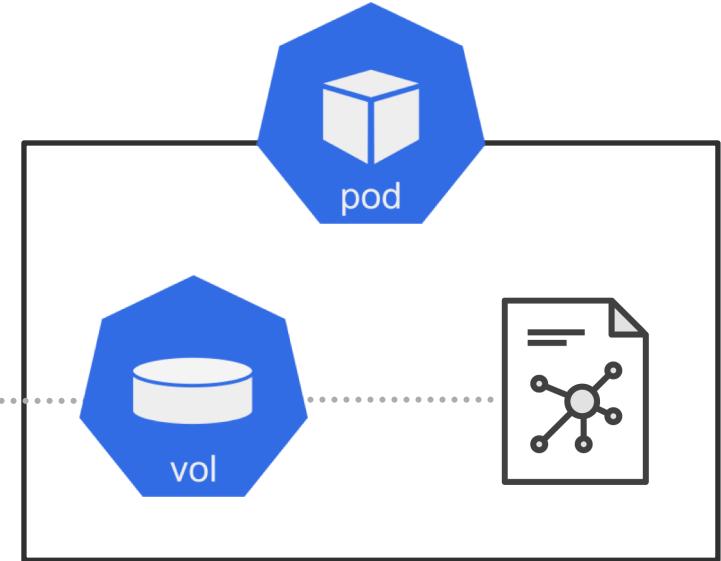




```
$ kubectl delete...
```







Kubernetes Persistent Volume Subsystem

Decouples data from application Pods and Containers,
and abstracts implementation detail.



Up Next: The Kubernetes Persistent Volume Subsystem



The Kubernetes Persistent Volume Subsystem





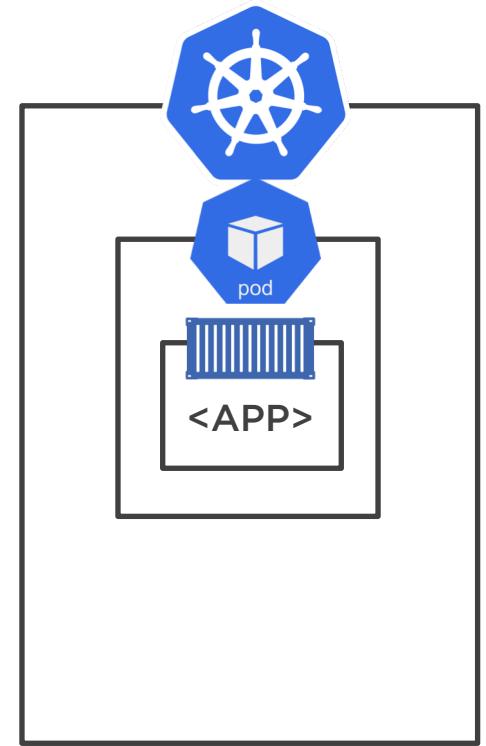
Ext storage

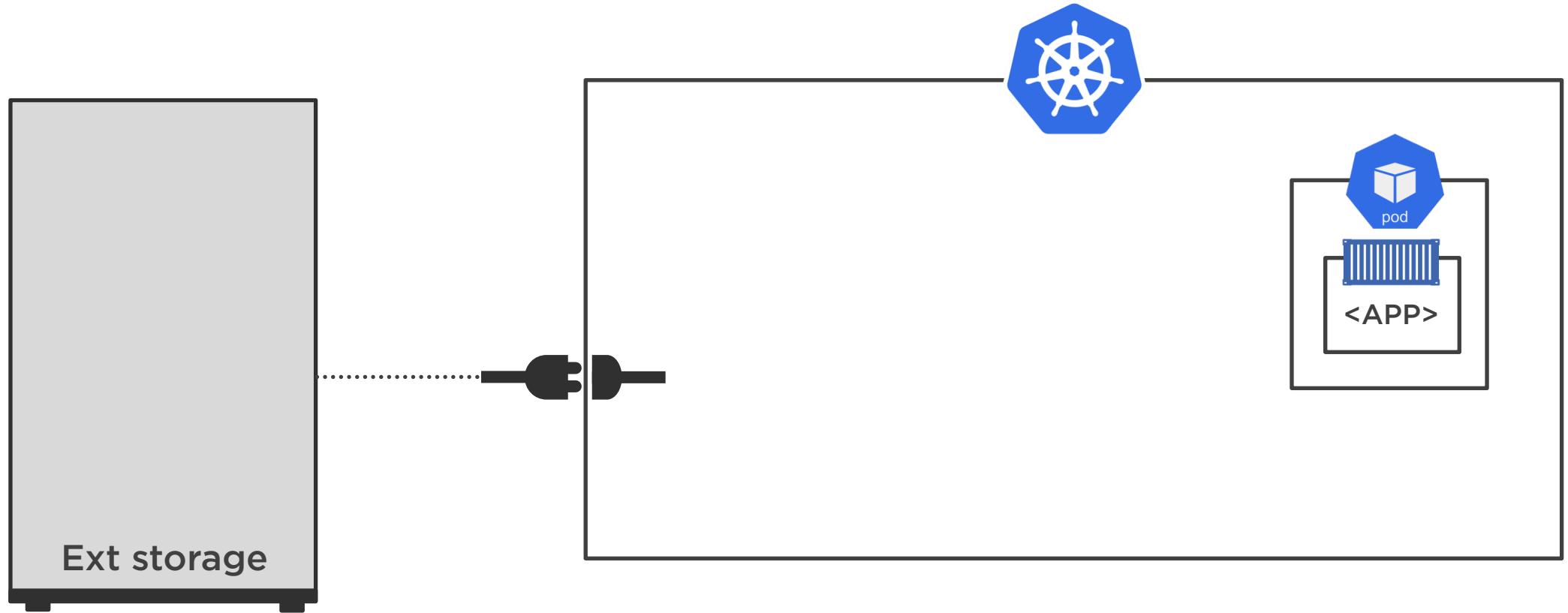


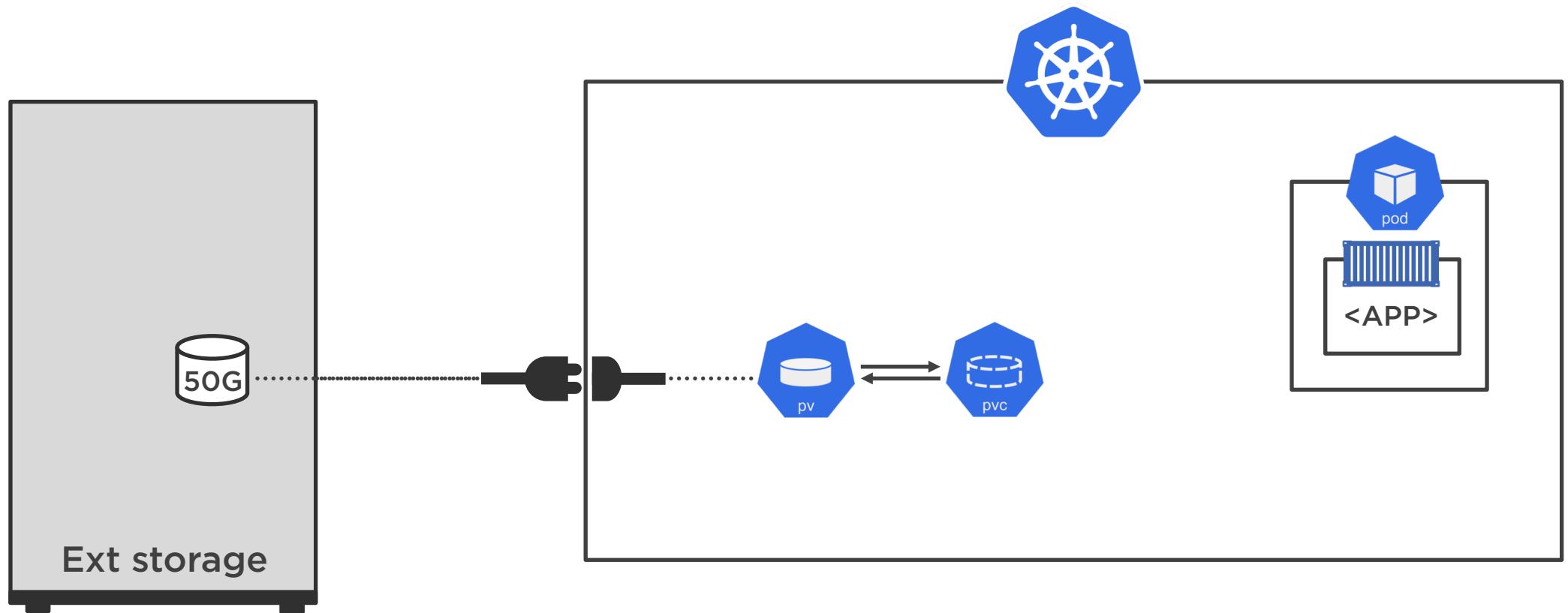


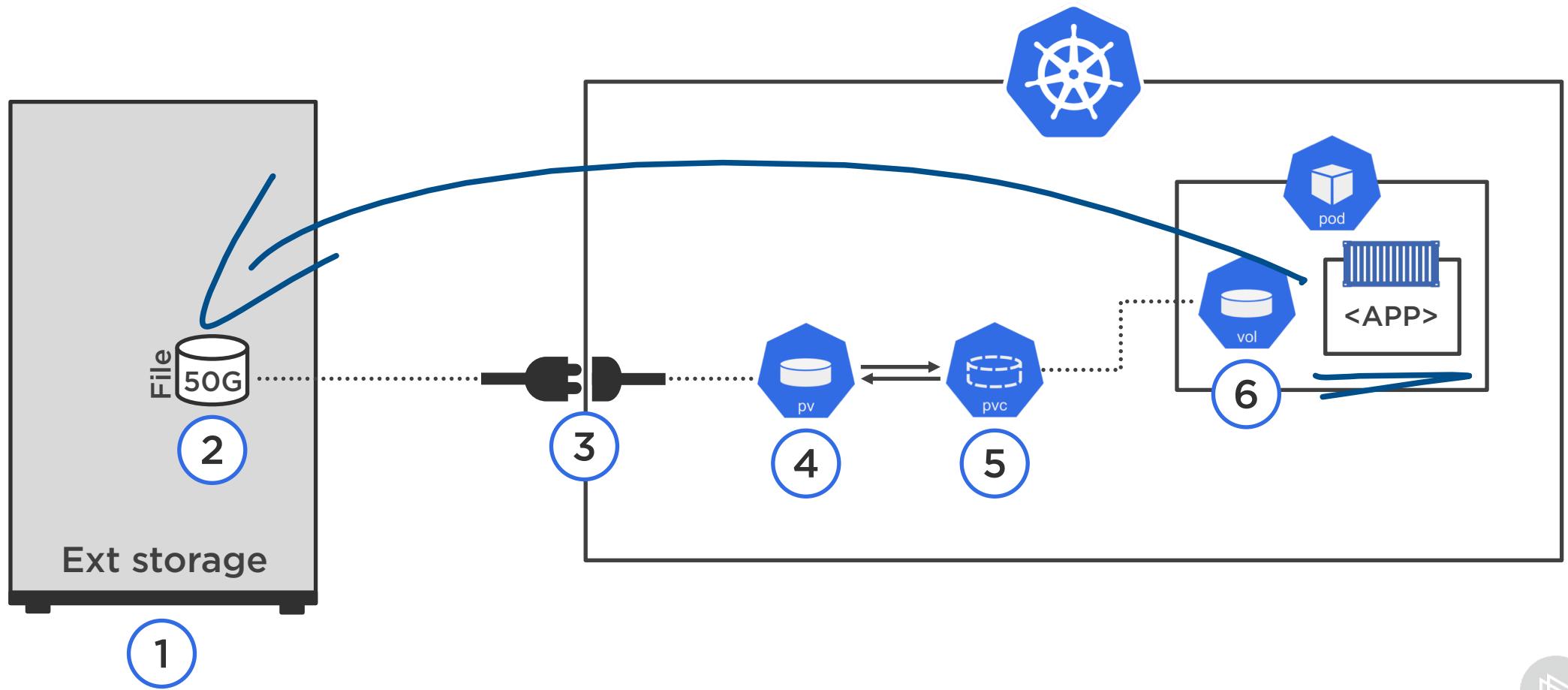
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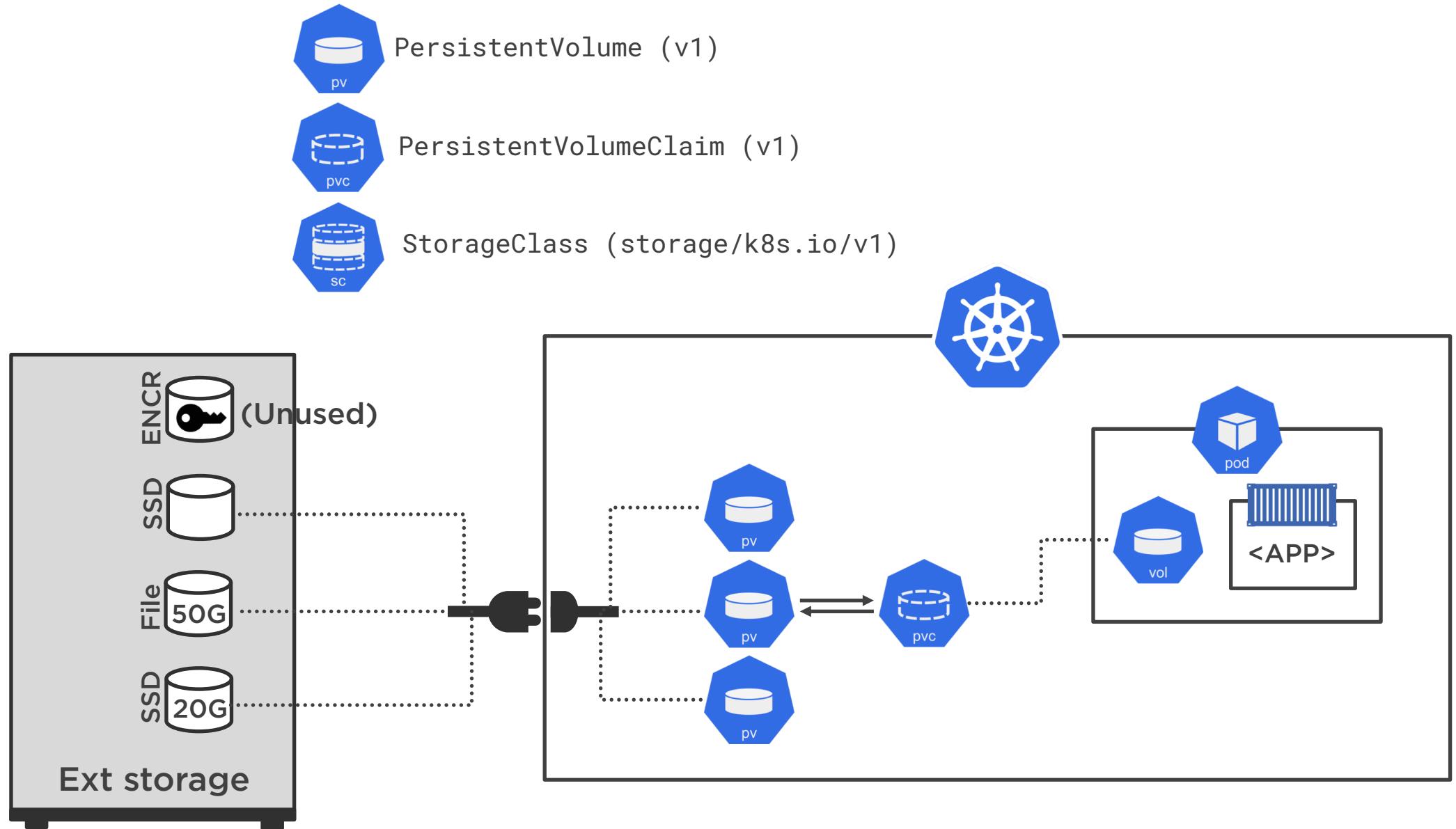


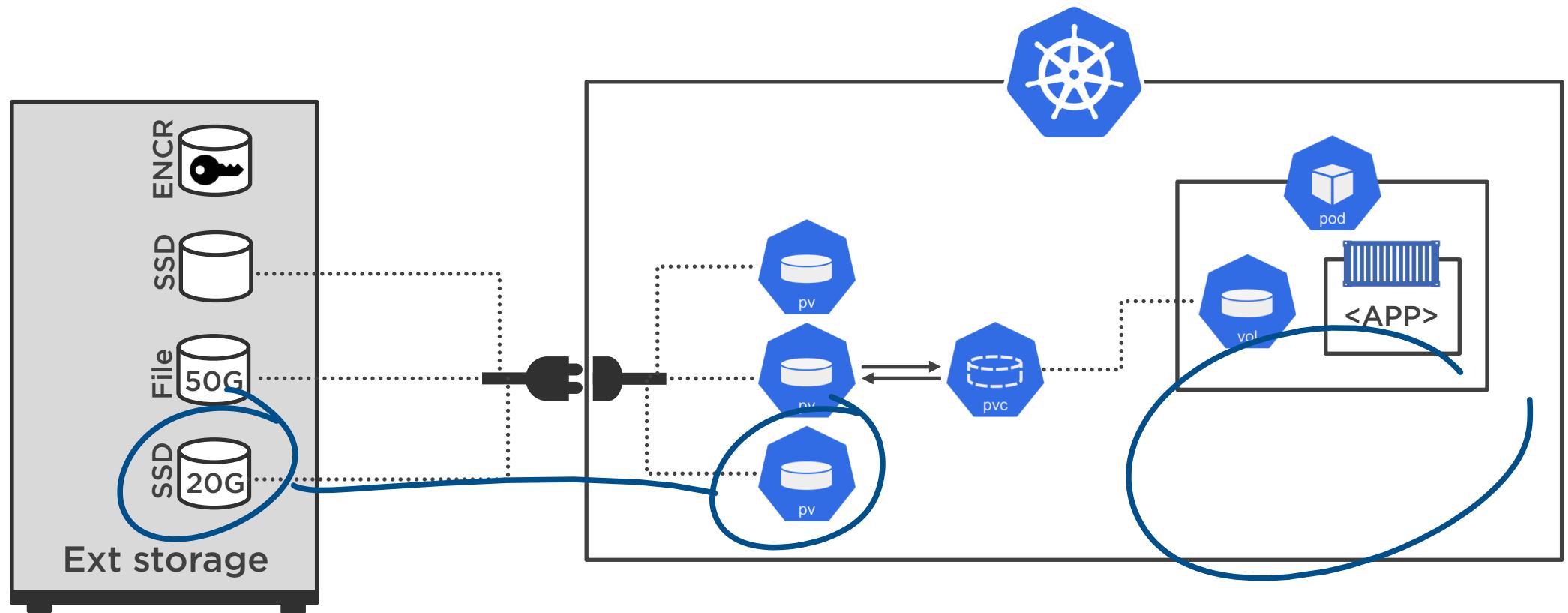


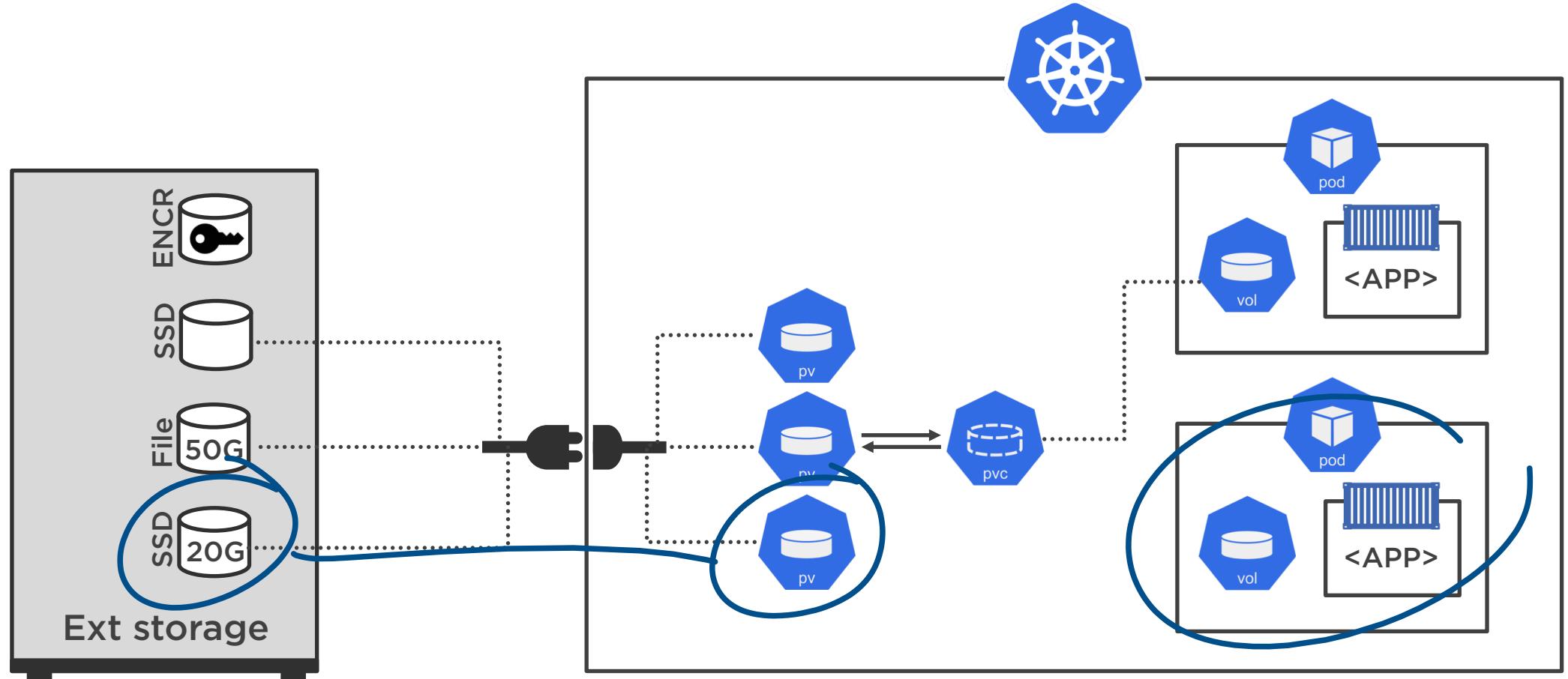


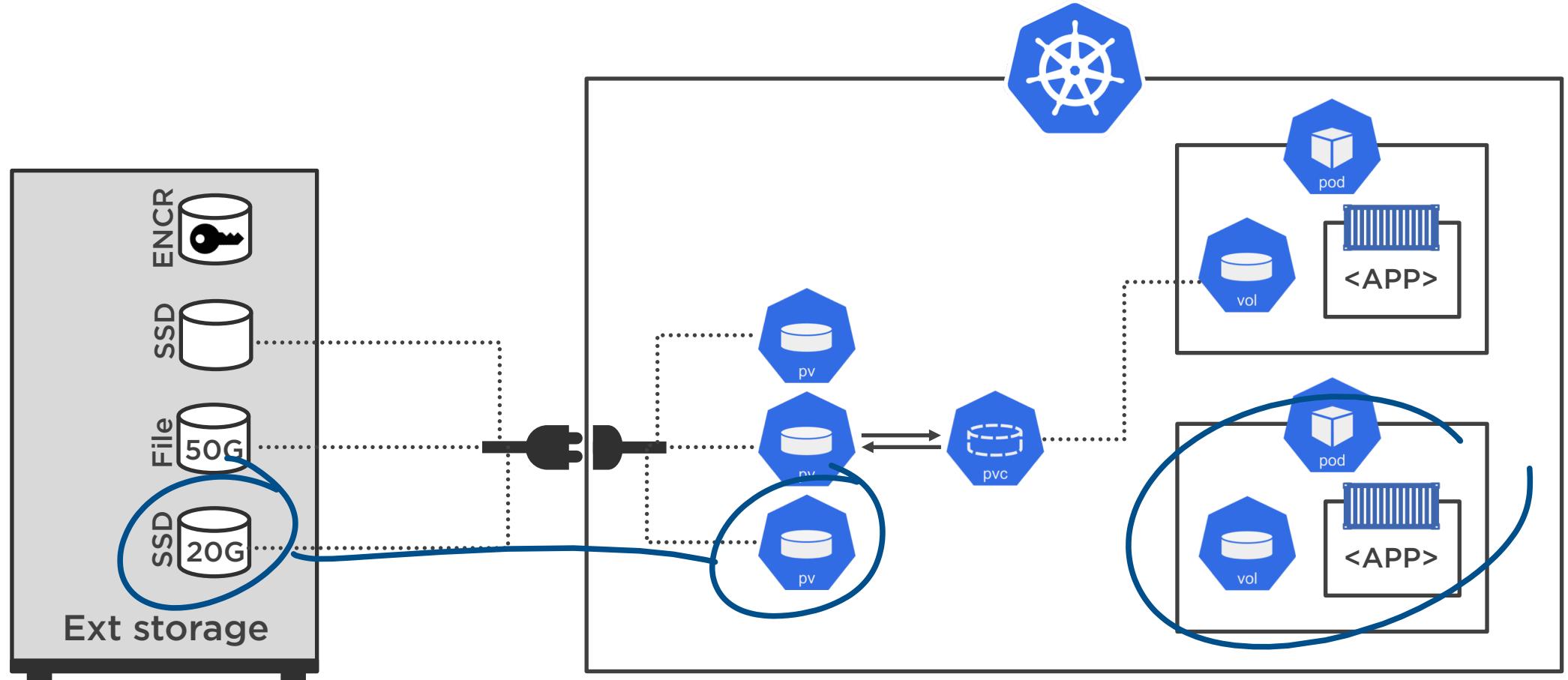


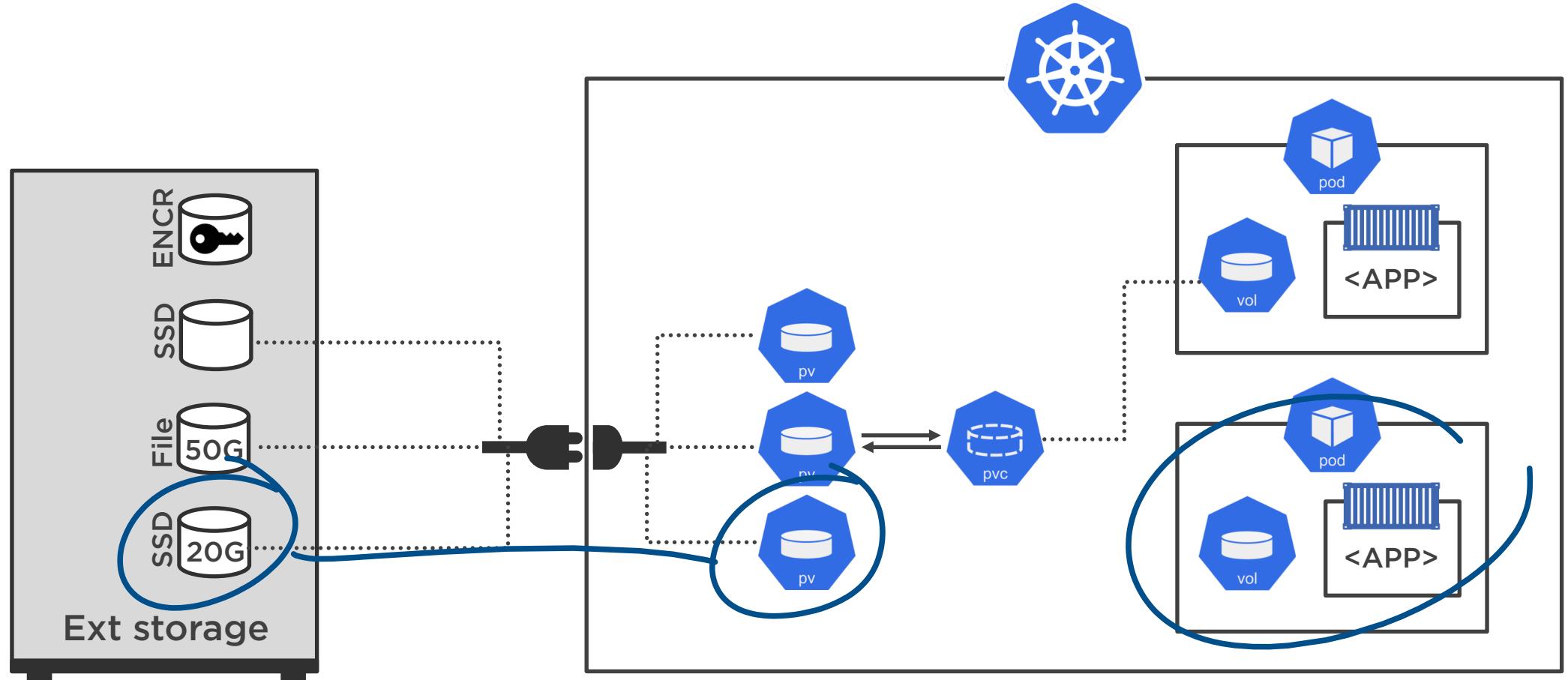


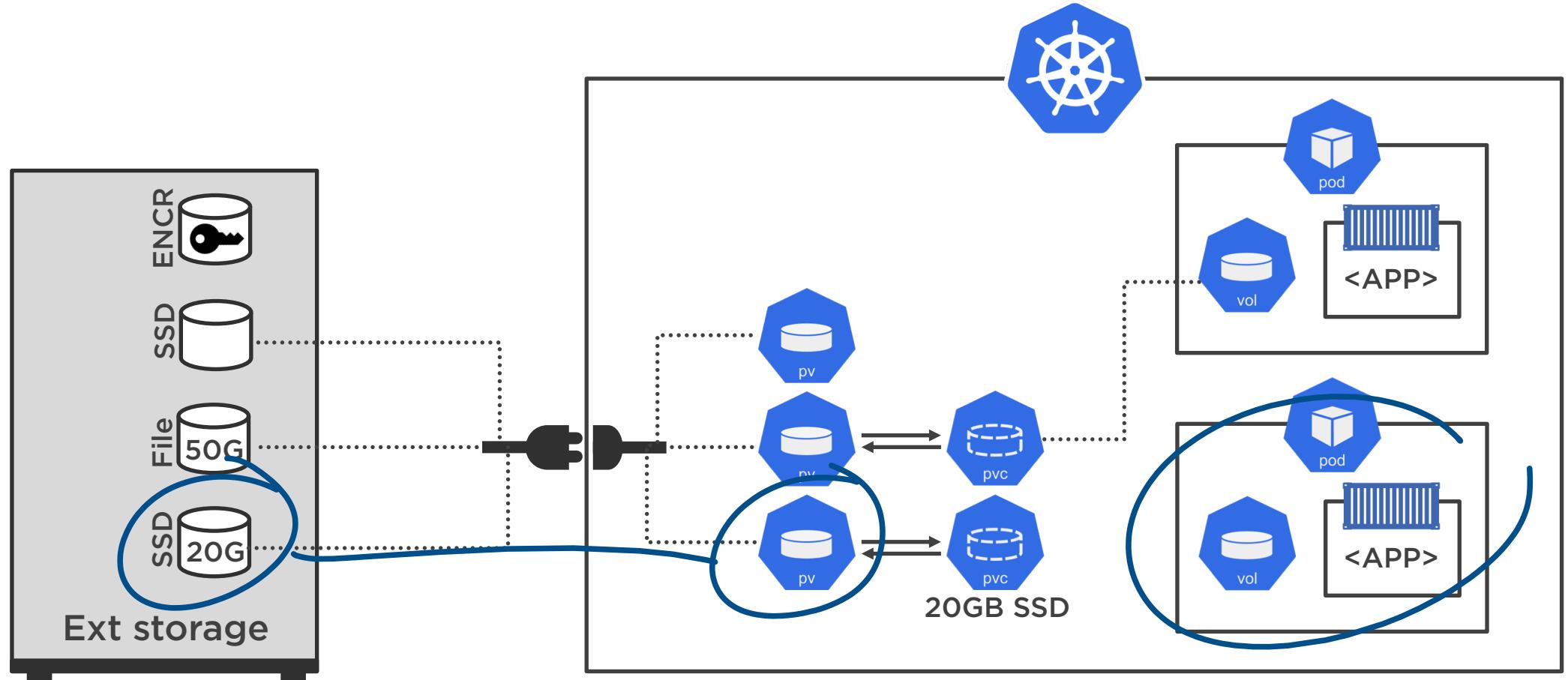


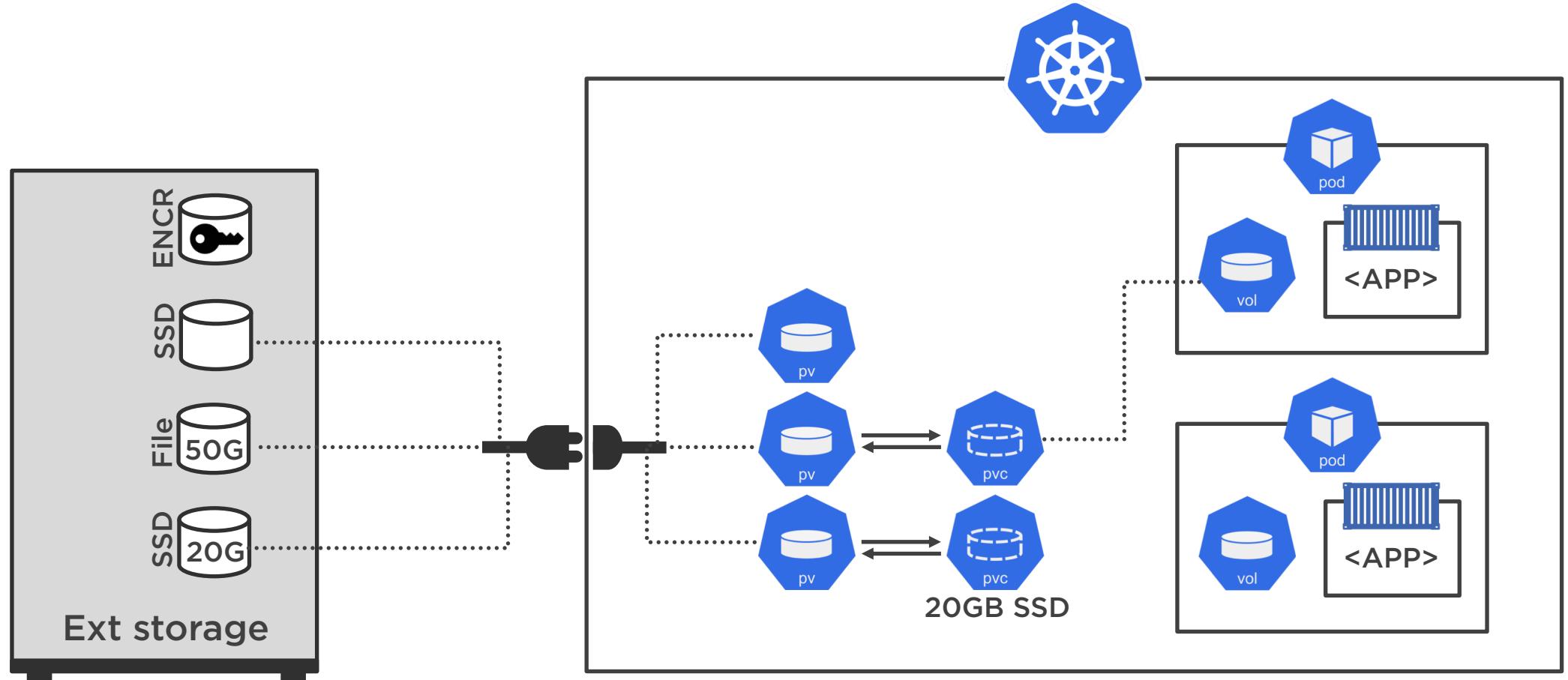


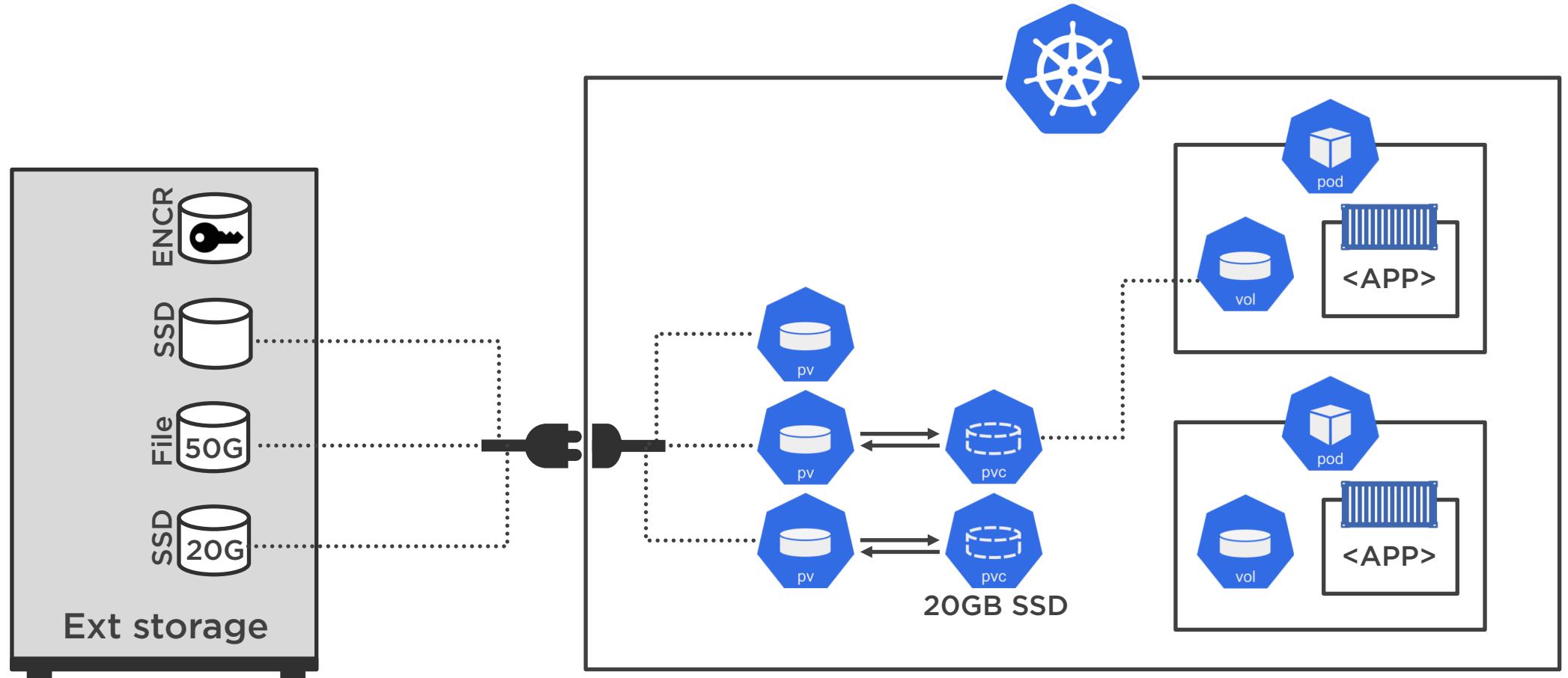


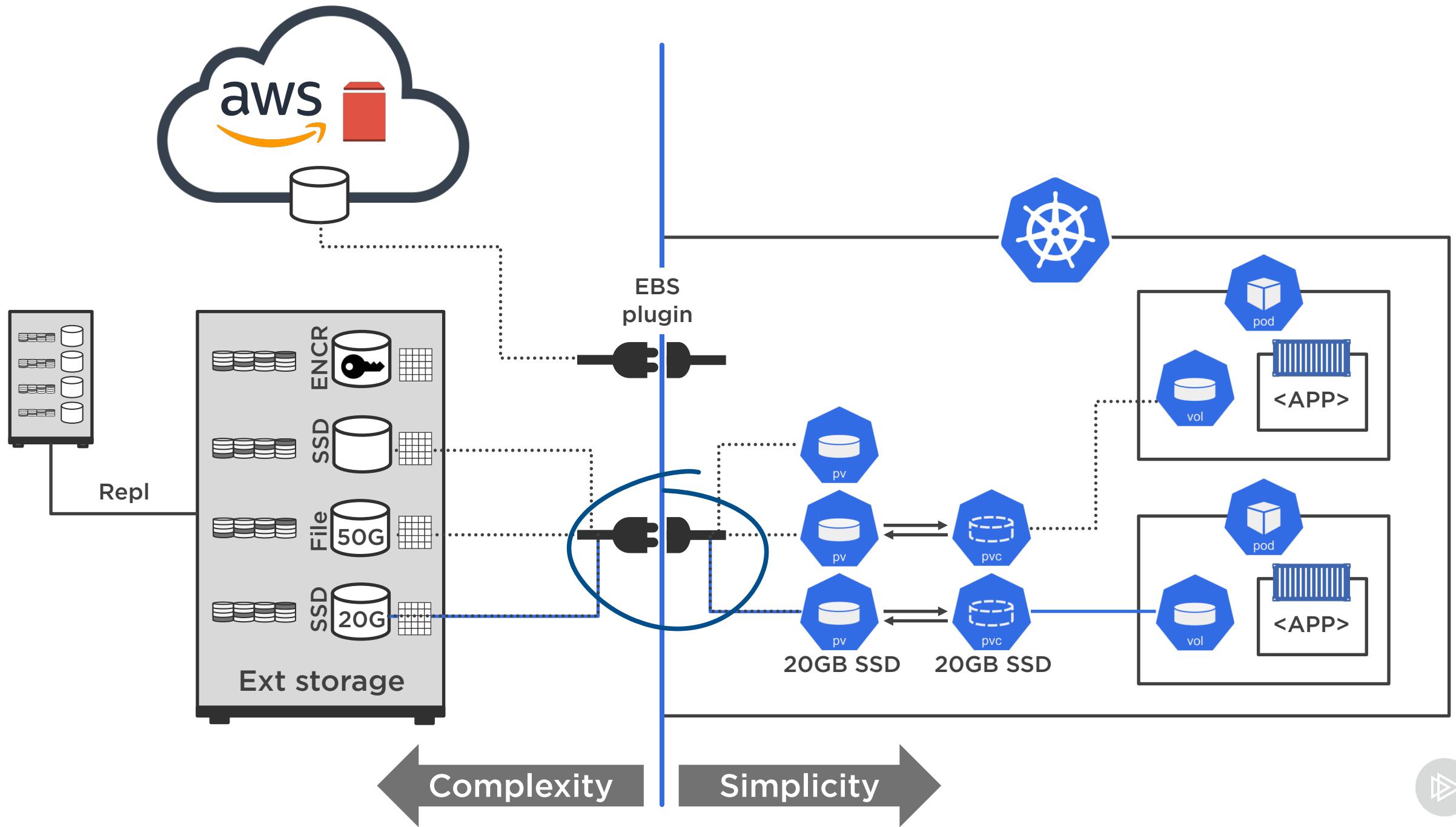












YAML Files

Tying the pieces together

ps-pv.yml

```
apiVersion: v1
kind: PersistentVolume
metadata:
  name: ps-pv
spec:
  accessModes:
  - ReadWriteOnce
  storageClassName: ps-fast
  capacity:
    storage: 50Gi
  persistentVolumeReclaimPolicy: Retain
  gcePersistentDisk:
    pdName: ps-vol
```



YAML Files

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  storageClassName: ps-fast
  capacity:
    storage: 50Gi
  persistentVolumeReclaimPolicy: Retain
  gcePersistentDisk:
    pdName: ps-vol
```

ps-pvc.yml

```
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: ps-pvc
spec:
  accessModes:
  - ReadWriteOnce
  storageClassName: ps-fast
  resources:
    requests:
      storage: 50Gi
```



YAML Files

Tying the pieces together

ps-pv.yml

```
apiVersion: v1
kind: PersistentVolume
metadata:
  name: ps-pv
spec:
  accessModes:
    - ReadWriteOnce
  storageClassName: ps-fast
  capacity:
    storage: 50Gi
  persistentVolumeReclaimPolicy: Retain
  gcePersistentDisk:
    pdName: ps-vol
```

ps-pvc.yml

```
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: ps-pvc
spec:
  accessModes:
    - ReadWriteOnce
  storageClassName: ps-fast
  resources:
    requests:
      storage: 50Gi
```

ps-pod.yml

```
apiVersion: v1
kind: Pod
metadata:
  name: first-pod
spec:
  volumes:
    - name: fast50g
      persistentVolumeClaim:
        claimName: ps-pvc
  containers:
    - image: ubuntu:latest
      name: ctr1
      command:
        - /bin/bash
        - "-c"
        - "sleep 60m"
  volumeMounts:
    - mountPath: /data
      name: fast50g
```

YAML Files

Tying the pieces together

ps-pv.yml

```
apiVersion: v1
kind: PersistentVolume
metadata:
  name: ps-pv
spec:
  accessModes:
    - ReadWriteOnce
  storageClassName: ps-fast
  capacity:
    storage: 50Gi
  persistentVolumeReclaimPolicy: Retain
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```

ps-pvc.yml

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  name: ps-pvc
spec:
  accessModes:
    - ReadWriteOnce
  storageClassName: ps-fast
  resources:
    requests:
      storage: 50Gi
```

ps-pod.yml

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apiVersion: v1
kind: Pod
metadata:
  name: first-pod
spec:
  volumes:
    - name: fast50g
      persistentVolumeClaim:
        claimName: ps-pvc
  containers:
    - image: ubuntu:latest
      name: ctr1
      command:
        - /bin/bash
        - "-c"
        - "sleep 60m"
      volumeMounts:
        - mountPath: /data
          name: fast50g
```

Container spec

```
apiVersion: v1
kind: Pod
metadata:
  name: first-pod
spec:
  volumes:
    - name: fast50g
      persistentVolumeClaim:
        claimName: ps-pvc
  containers:
    - image: ubuntu:latest
      name: ctr1
      command:
        - /bin/bash
        - "-c"
        - "sleep 60m"
      volumeMounts:
        - mountPath: /data
          name: fast50g
      ◀ Volume name
      ◀ Creating the volume using the PVC
      ◀ Referencing the volume to be mounted
```



Volume

```
apiVersion: v1
kind: Pod
metadata:
  name: first-pod
spec:
  volumes:
    - name: fast50g
      persistentVolumeClaim:
        claimName: ps-pvc
  containers:
    - image: ubuntu:latest
      name: ctr1
      command:
        - /bin/bash
        - "-c"
        - "sleep 60m"
      volumeMounts:
        - mountPath: /data
          name: fast50g
```

◀ Volume name

◀ Creating the volume using the PVC

Container spec

◀ Referencing the volume to be mounted

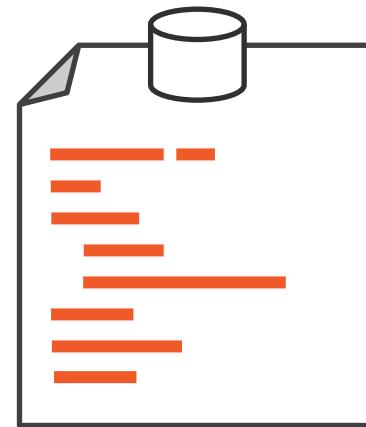
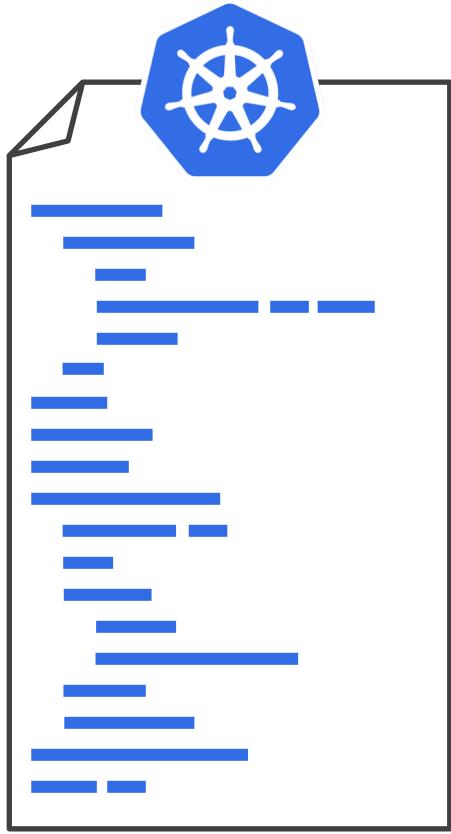


Up Next: The Container Storage Interface (CSI)



The Container Storage Interface (CSI)







Pros:

Quick & simple

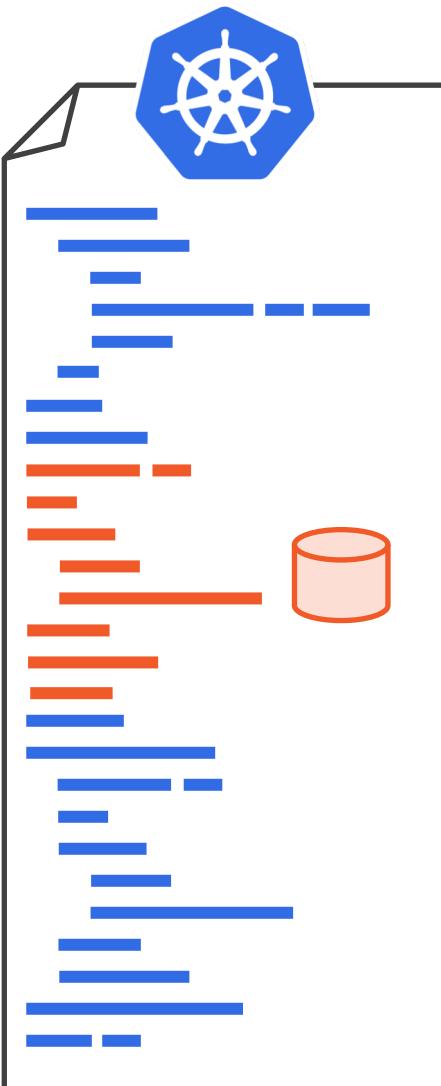
Cons:

Mixing third-party code

Open source*

Release cycles





Pros:

Quick & simple

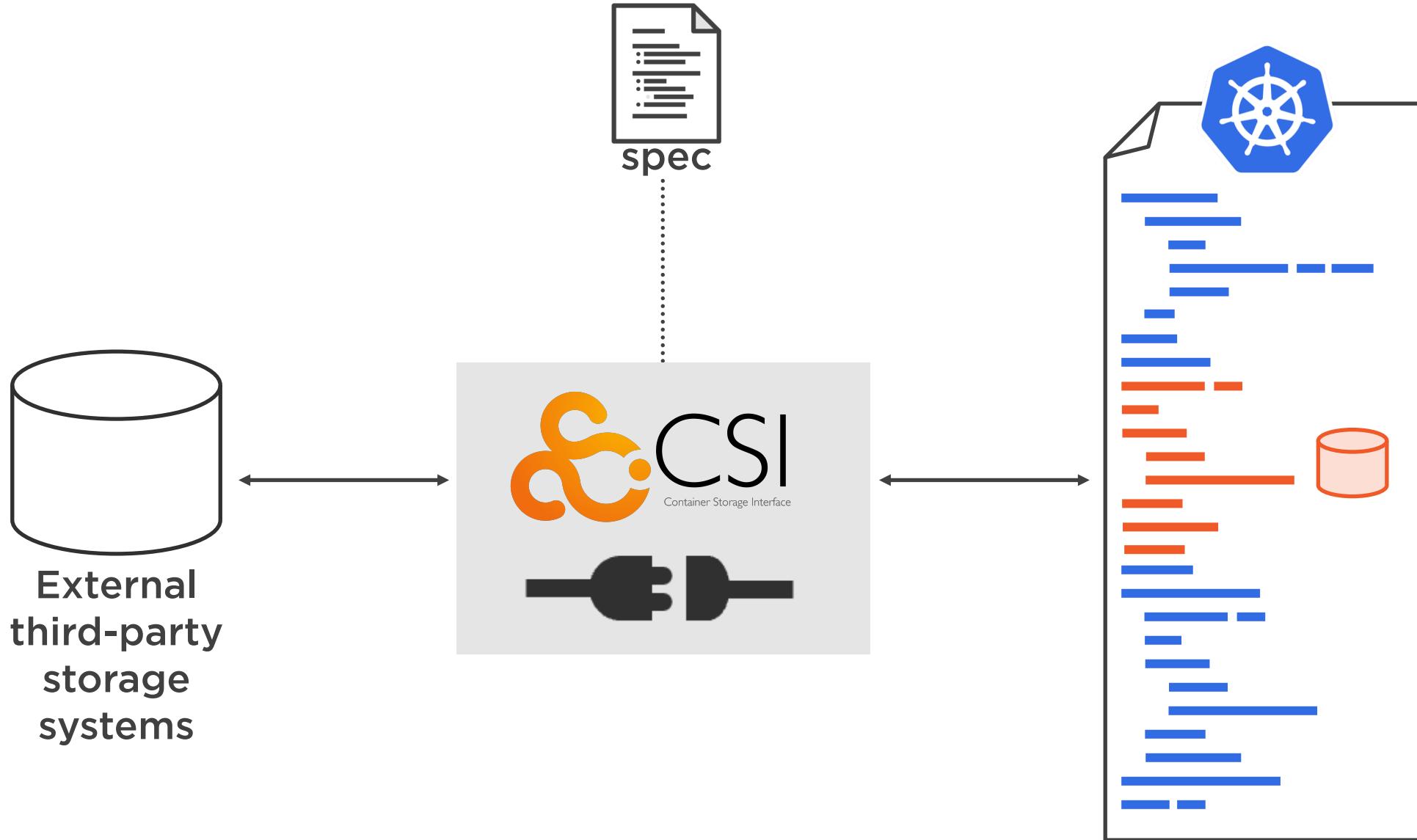
Cons:

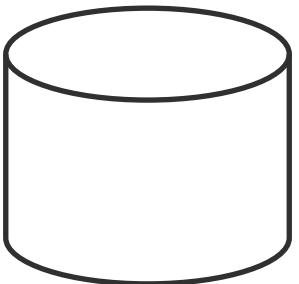
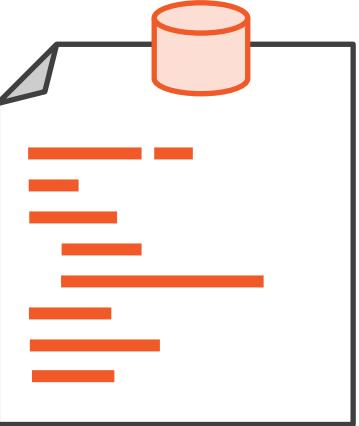
Mixing third-party code

Open source*

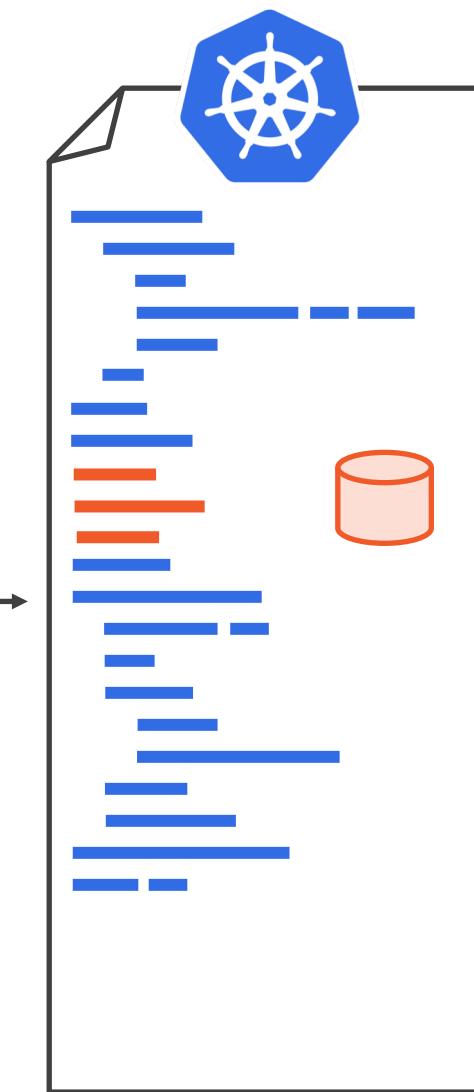
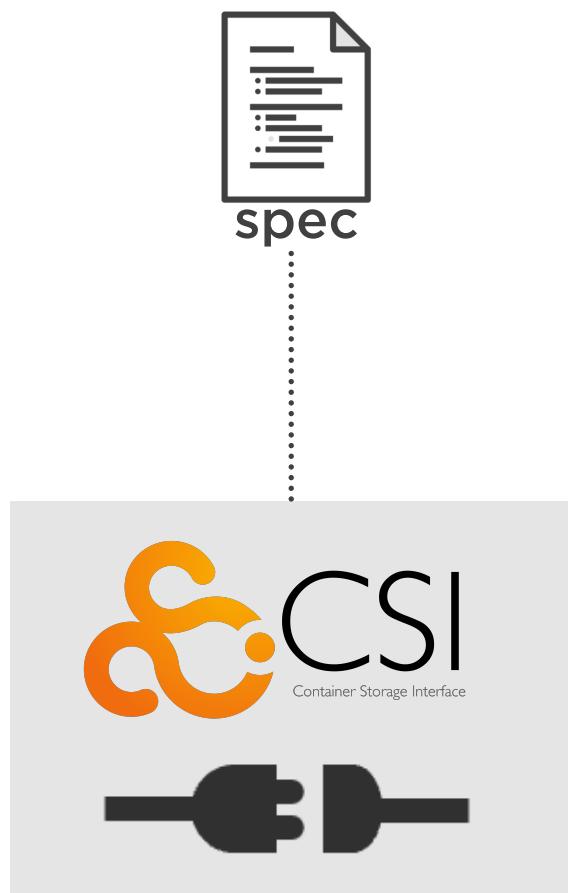
Release cycles

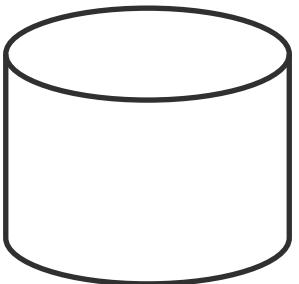




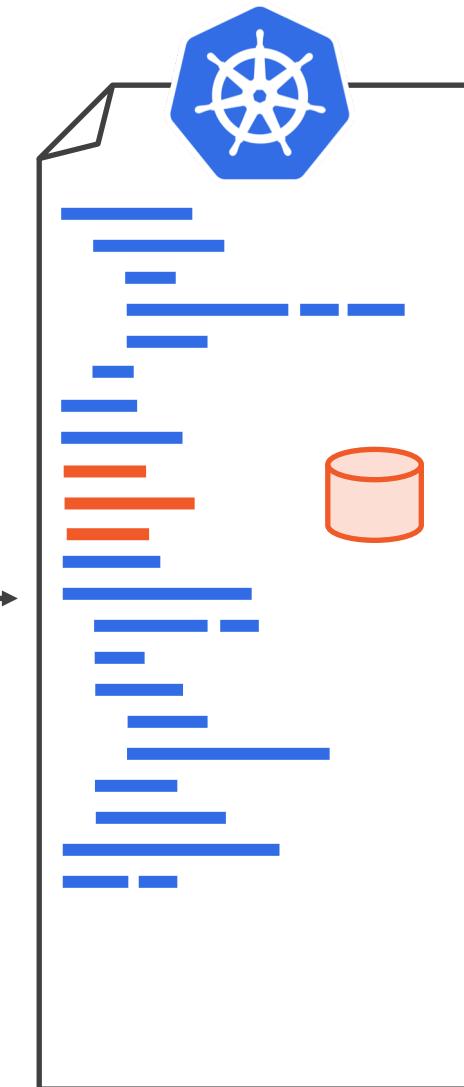
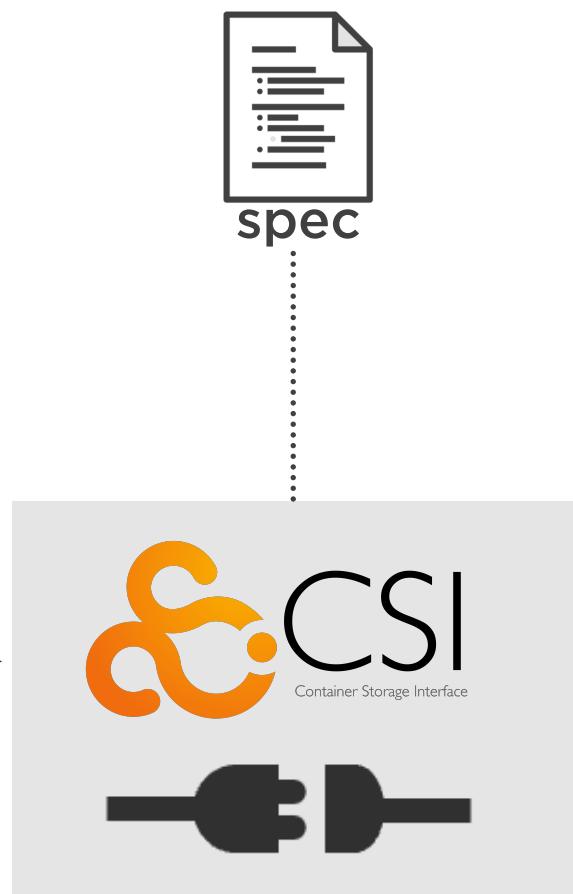


External
third-party
storage
systems





External
third-party
storage
systems



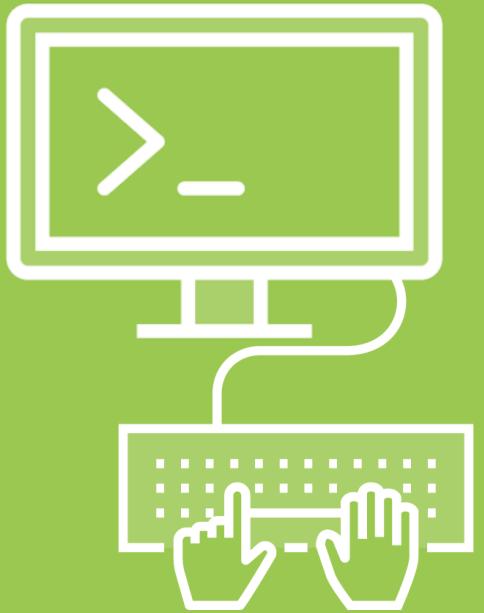
Up Next:

Hands-on with Static Provisioning



Hands-on: Static Provisioning

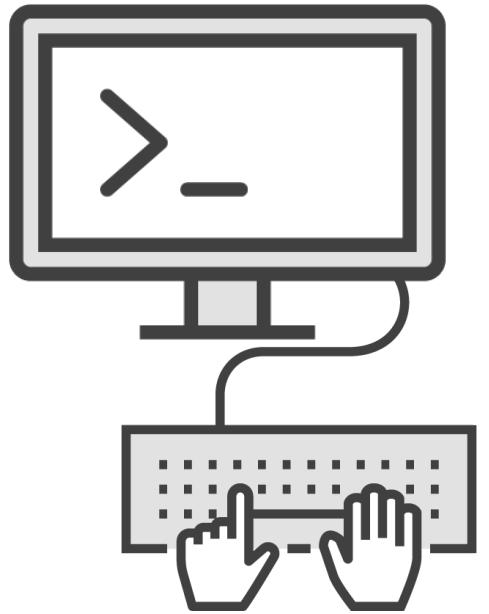


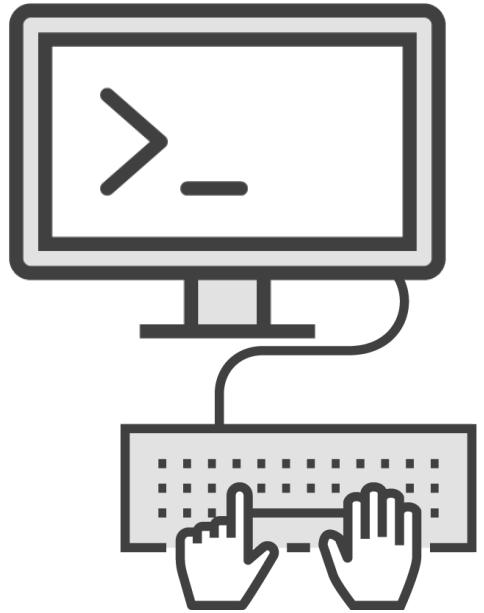


Hands-on

Examples are mainly on GKE, but should work on most other platforms. Kubernetes is Kubernetes!





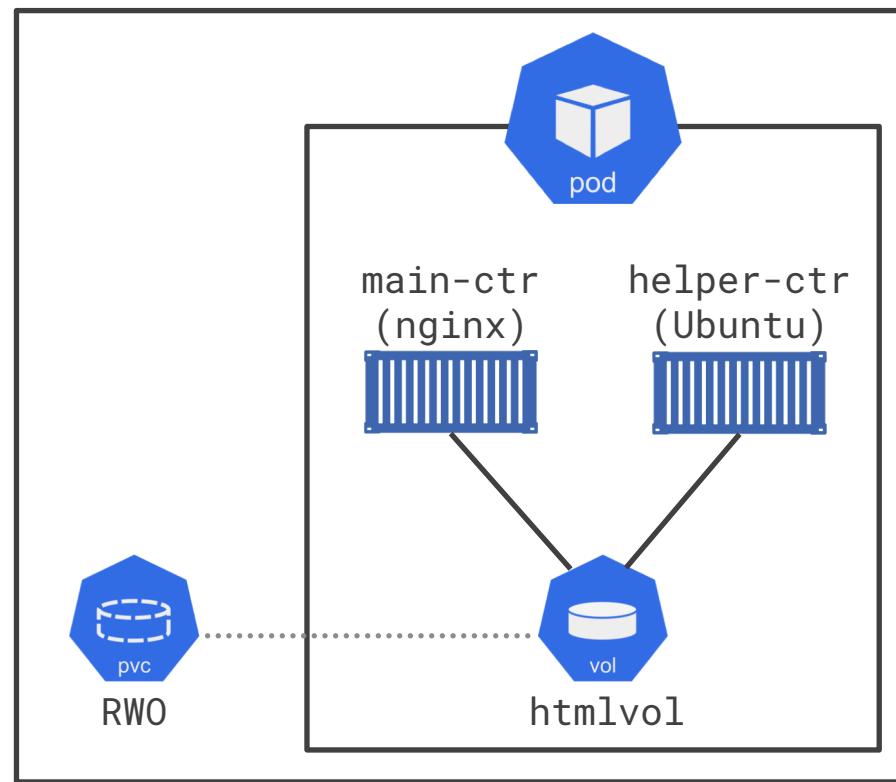


GKE



- RWO: Read-write once
- RWM: Read-write many
- ROM: Read-only many





YAML Files

Tying the pieces together

ps-pv.yml

```
apiVersion: v1
kind: PersistentVolume
metadata:
  name: ps-pv
spec:
  accessModes:
  - ReadWriteOnce
  storageClassName: ps-fast
  capacity:
    storage: 50Gi
  persistentVolumeReclaimPolicy: Retain
  gcePersistentDisk:
    pdName: ps-vol
```

ps-pvc.yml

```
apiVersion: v1
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spec:
  volumes:
    - name: fast50g
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  containers:
    - image: ubuntu:latest
      name: ctr1
      command:
        - /bin/bash
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Up Next:

Hands-on with Dynamic Provisioning



Hands-on: Dynamic Provisioning



**Dynamic
volume creation**

Classes/tiers



Up Next:
Advanced Volume Features



Advanced Volume Features





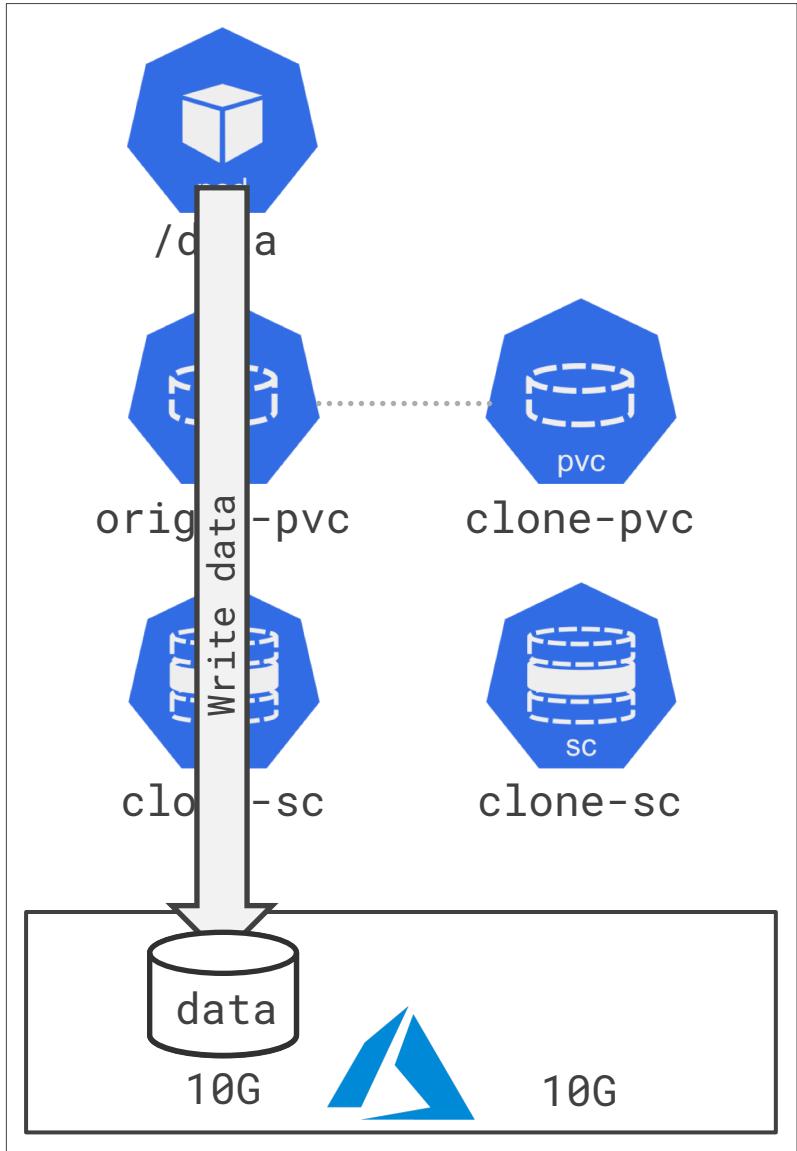
Clones

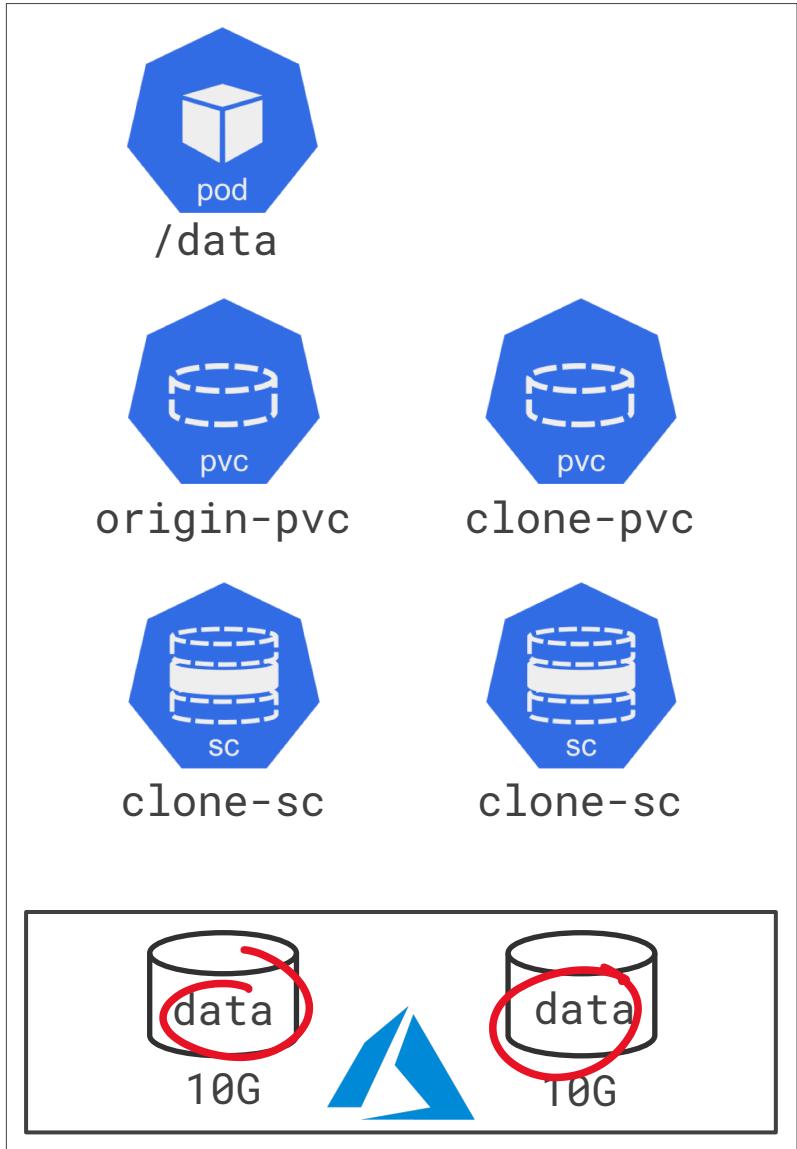


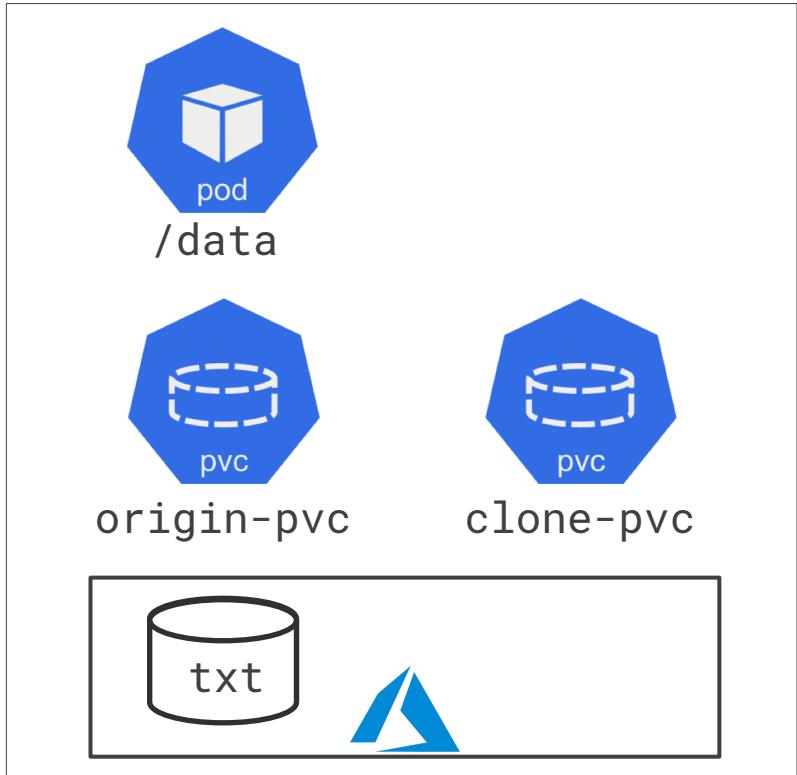


Clones







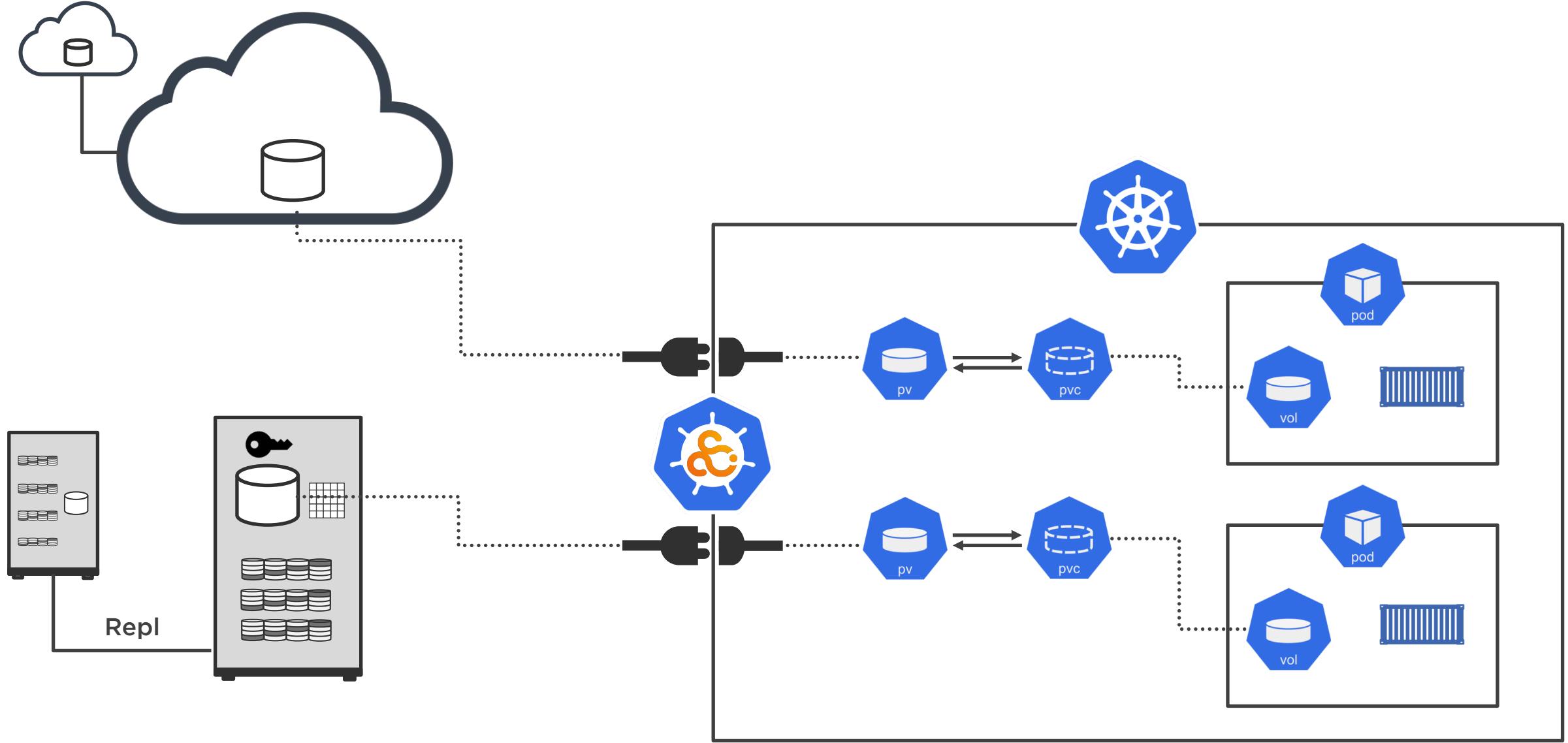


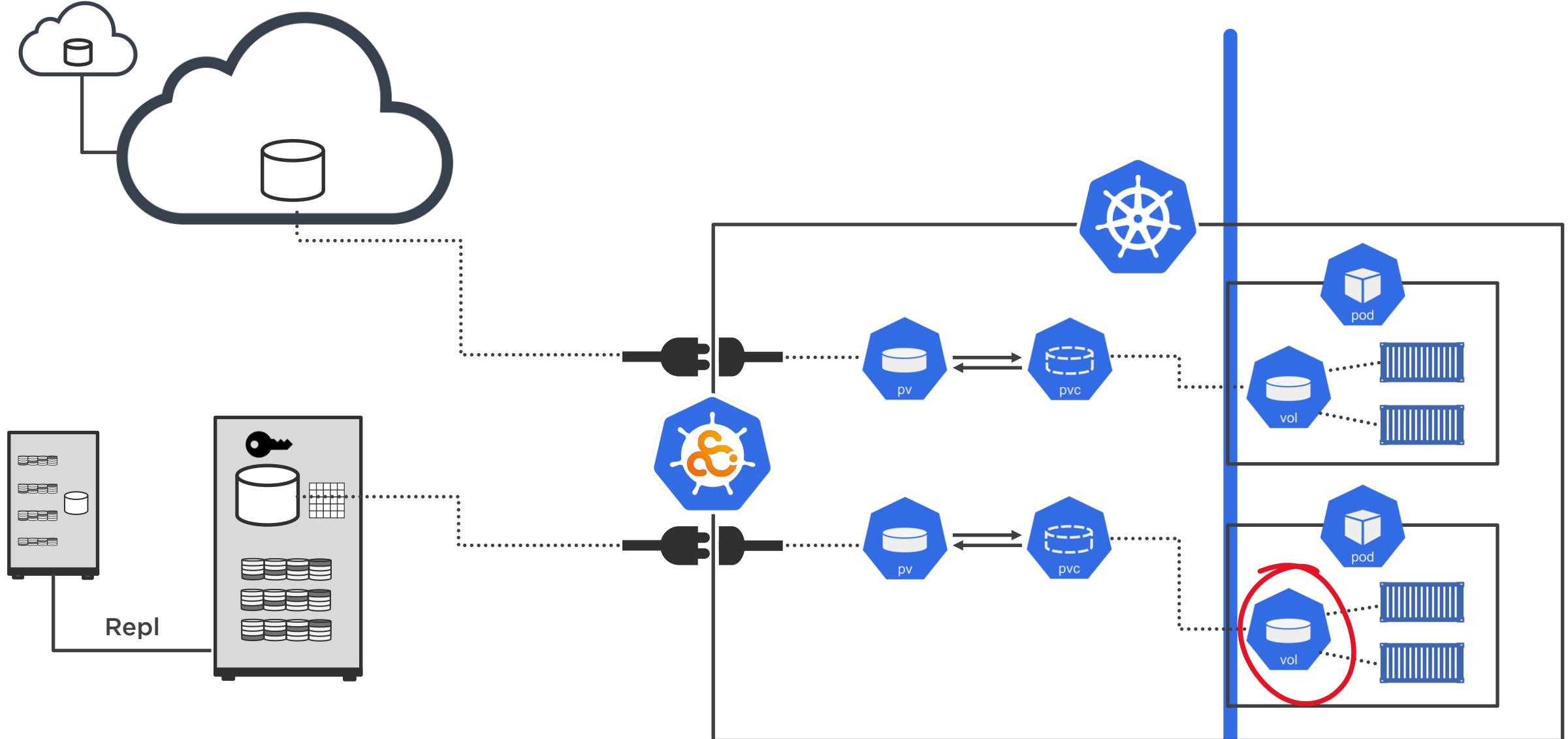
Up Next: Quick Recap



Quick Recap







Complex machinery

Volume

