KubeCon

North America 2017

You Have Stateful Apps - What if Kubernetes Would Also Run Your Storage?

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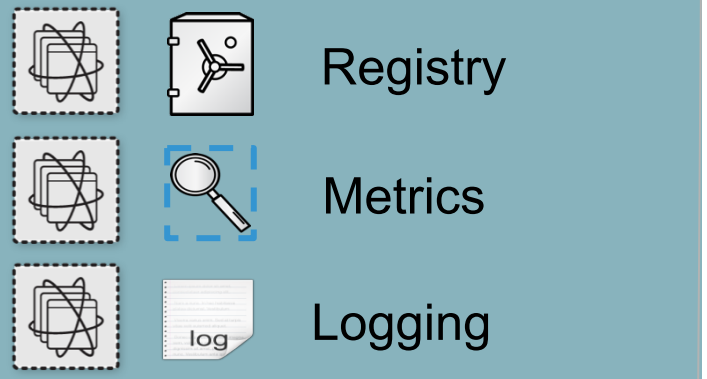
Agenda

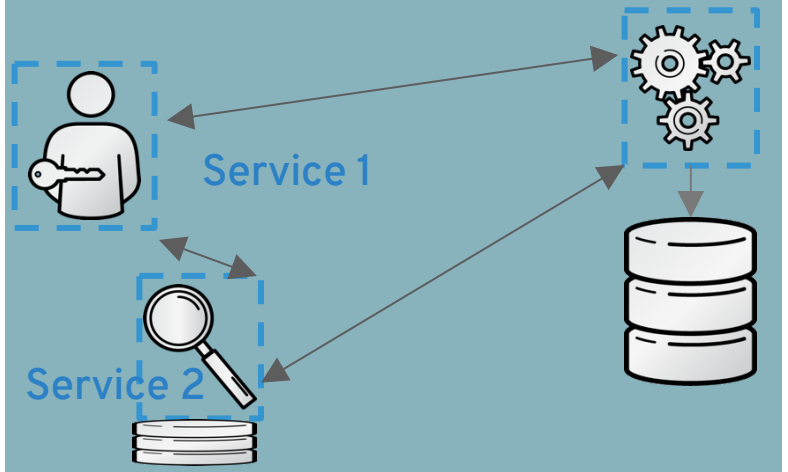
- Persistent Storage needs in Containers world
- Different Container Storage Options and Patterns with Kubernetes
- Kubernetes/Orchestrated Storage Runtime Pattern
- How Does it work?
- Live Demo
- Example – OpenShift (Kubernetes) + Red Hat Container Native Storage

Persistence Container Storage Requirement

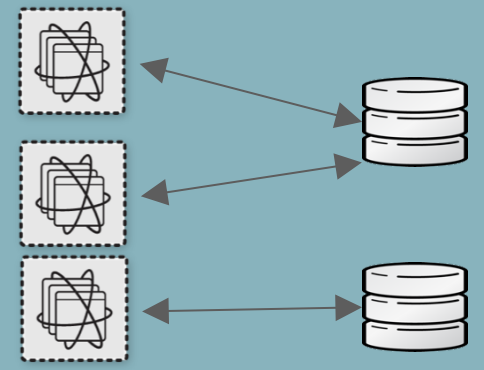
Infrastructure



Application



Local/Ephemeral Storage



Stateless Applications, Pod Images

PERSISTENT STORAGE FOCUS

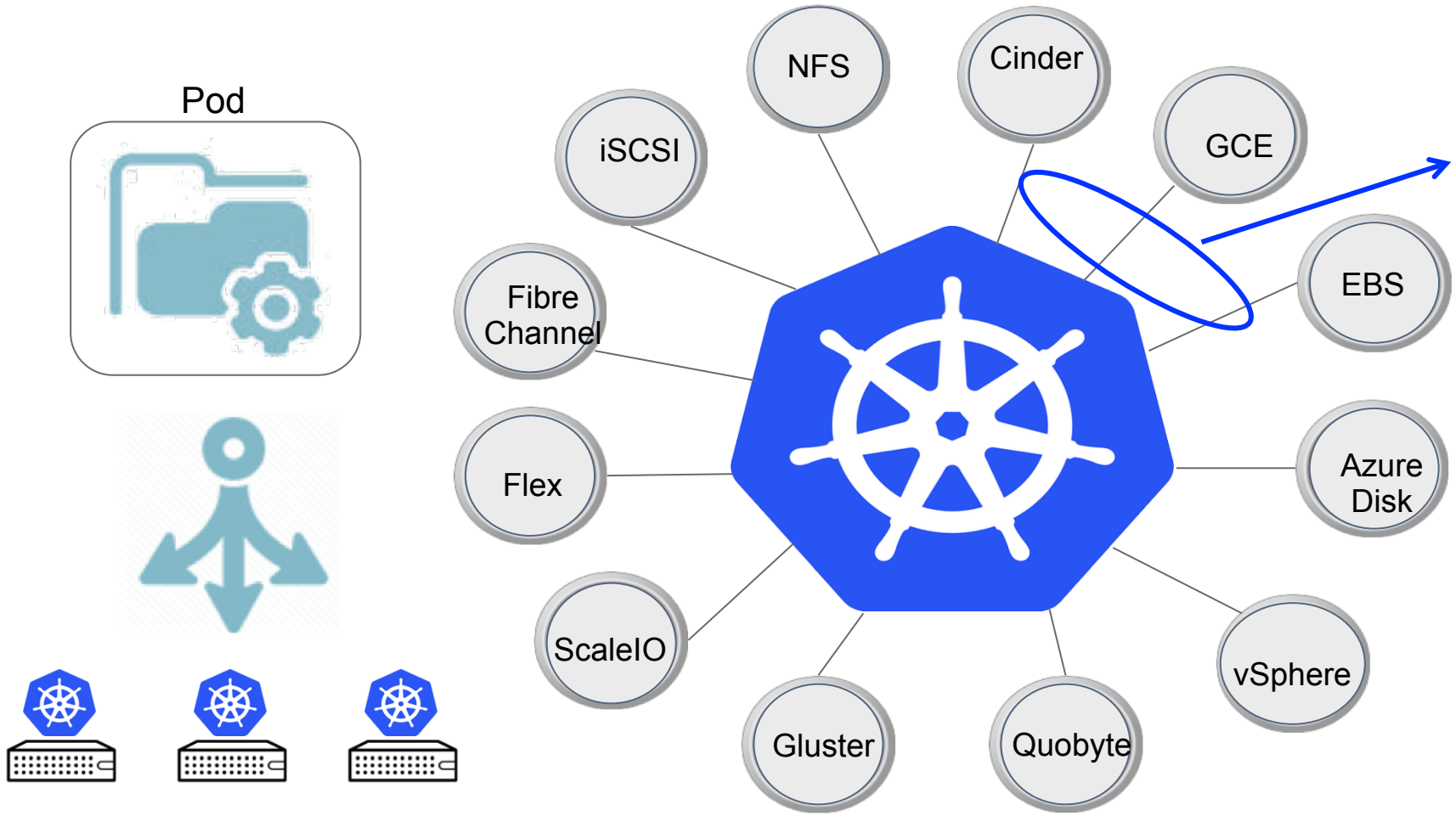
Persistence Container Storage Options

- Local NFS
- NAS
- SAN
- ISCSI
- Fiber Channel
- Flex
- ScaleIO
- Gluster
- Ceph
- AWS - EBS
- AWS EFS
- Azure
- Red Hat CNS
- GCP
- NetApp w/ Trident
- StorageOS
- Portworx
- Quobyte
- ….
- ….
- Many Options!

Multiple Options - What to choose? How to Decide? Differentiate?

Do they follow a Design Patterns ? If so what are they?

Container Storage Pattern – 1
Adapters to Network File and Block Storage



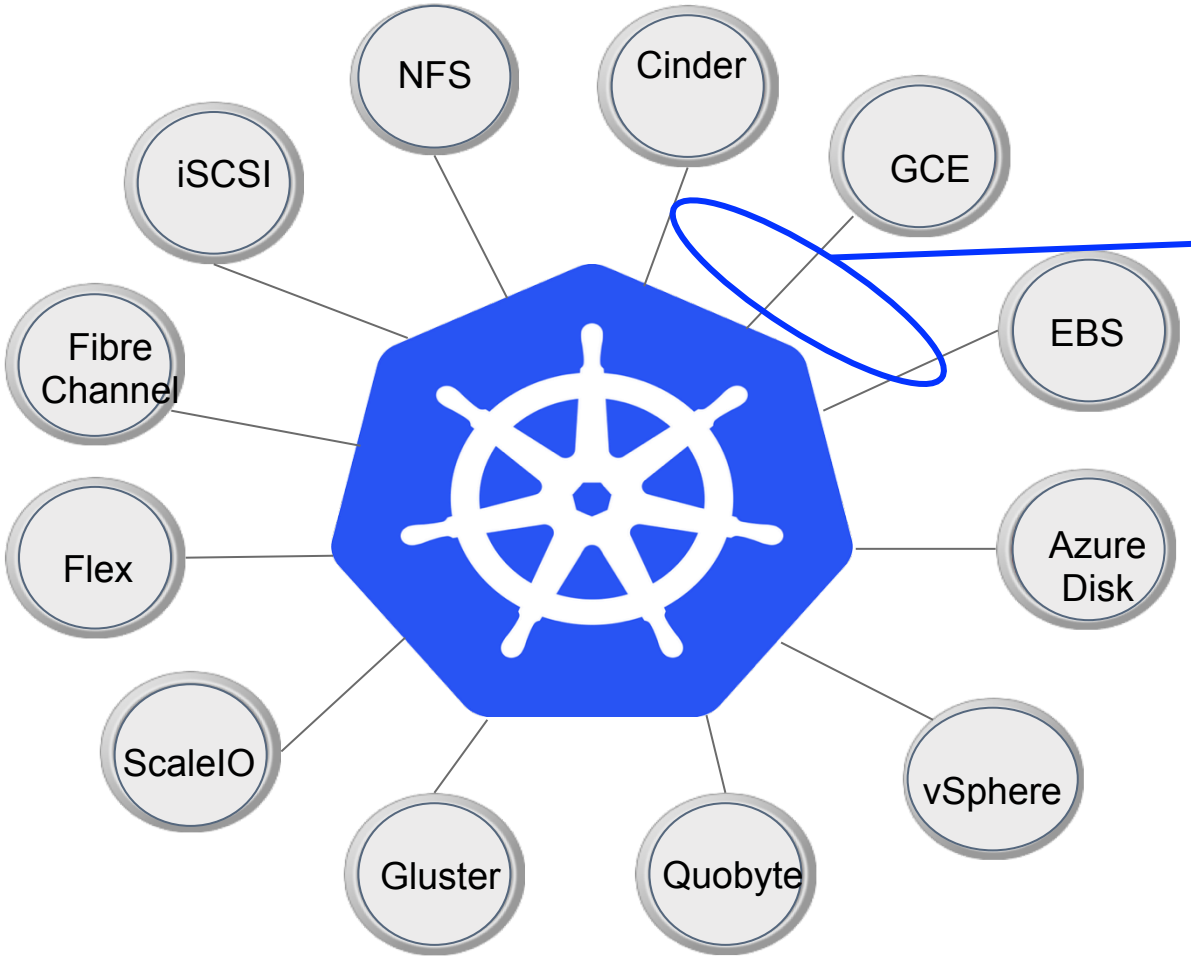
Plug-ins/Adapters → Traditional storage systems

Leverage what you Have

Limited leverage of Containers or Kubernetes

Separate Subsystem/ Mgmt

Pattern 1 Evolution → Container Storage Interface

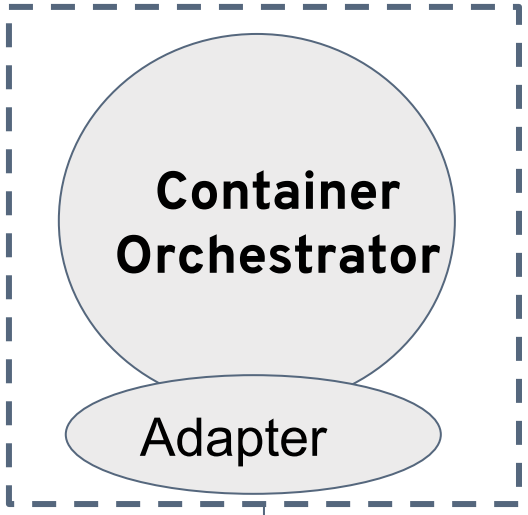


Other Container Orchestration Platforms?

Make interface standard

Container Storage Interface (CSI)

Pattern 2 - Exposing Service Interfaces to Orchestrators

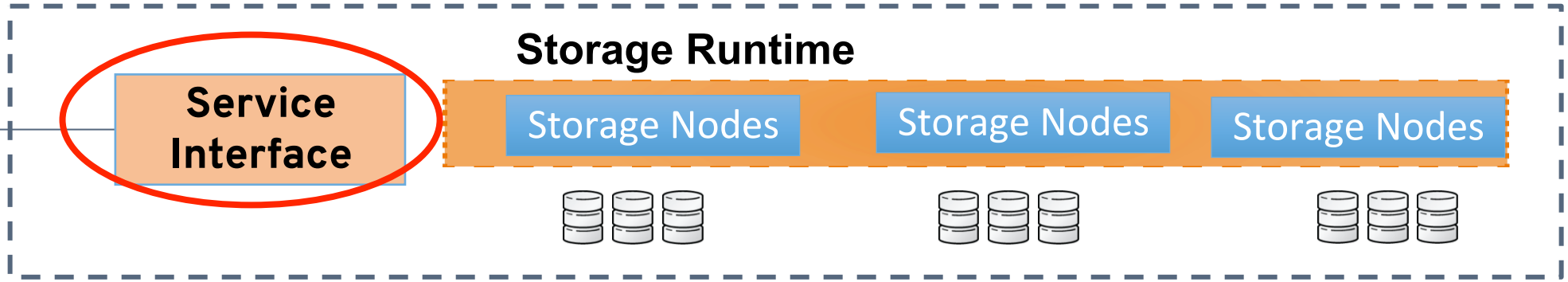


Cluster 1

- Administrator *not* provisioning storage - UI or CLI
- Developer via API / Service Broker

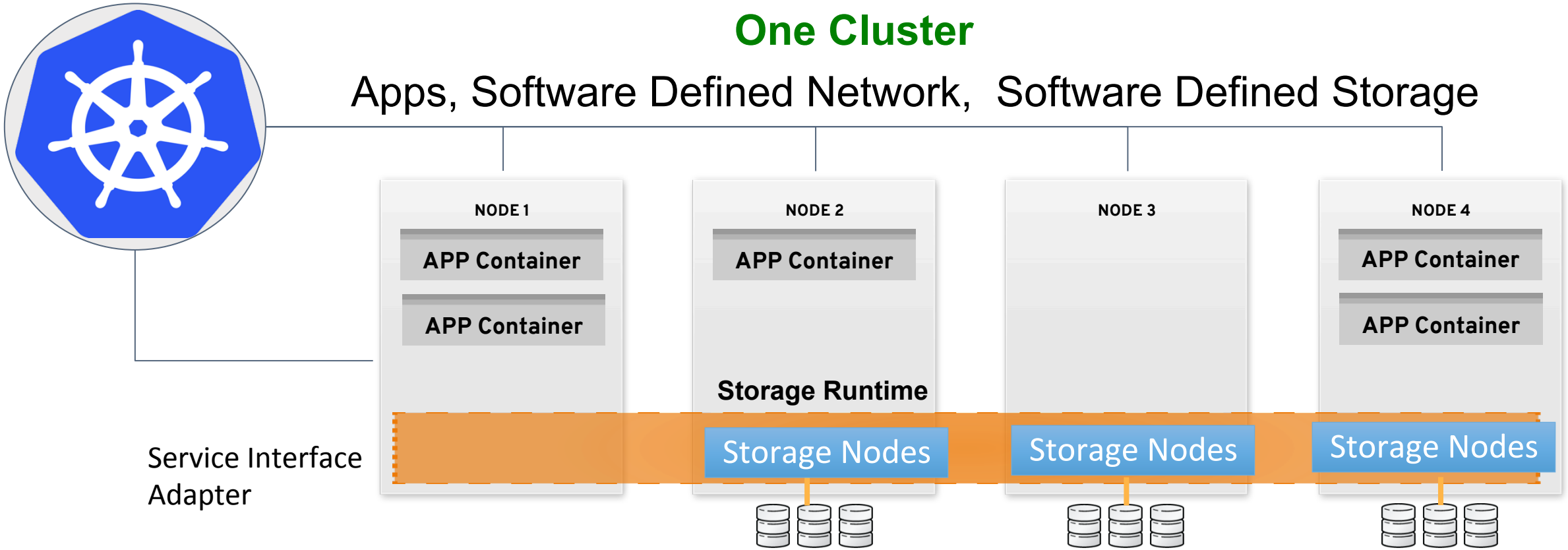
- Two Subsystem, Two Cluster/System
- Limited Leverage of Container + Kubernetes Value

Cluster 2



Pattern 3 → Orchestrated Storage Runtime

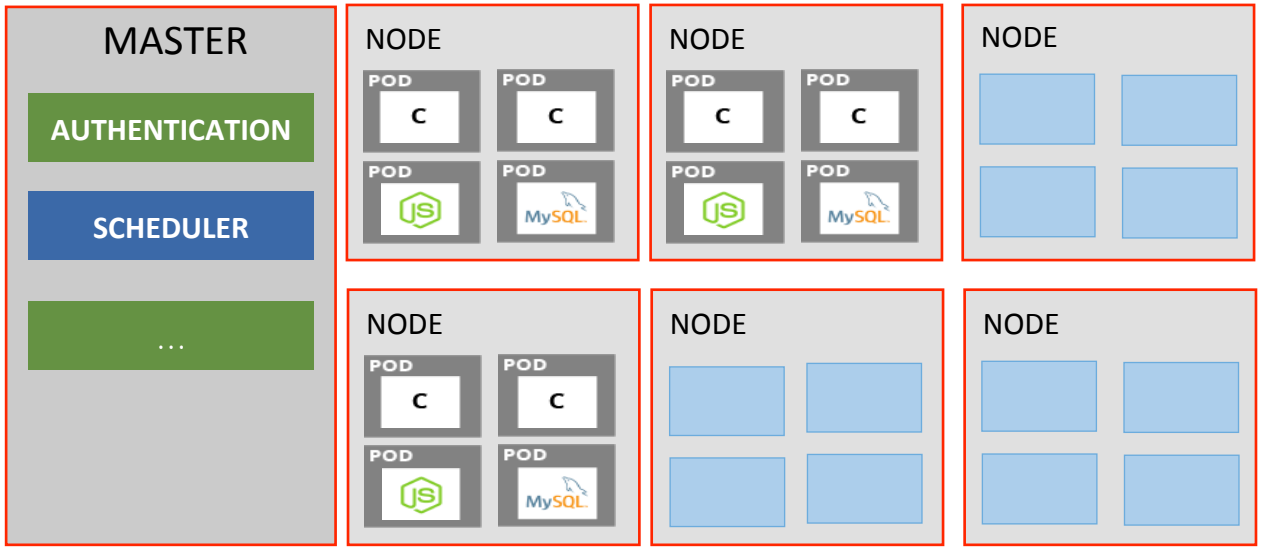
Container Native Storage , Let K8s run your Storage!



No separate Cluster, Storage like any other service on Kubernetes

Pattern 3 → Orchestrated Storage Runtime

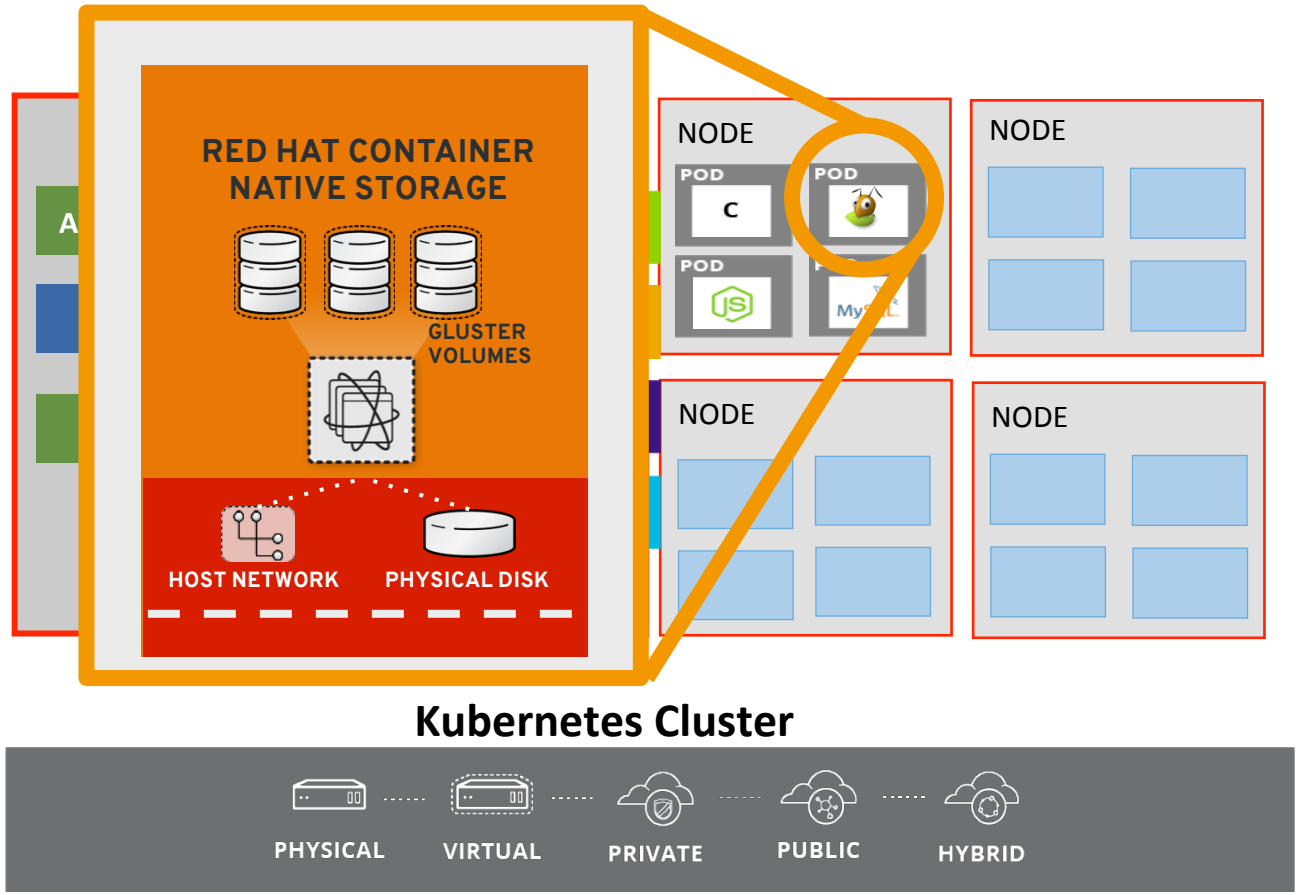
Example : Red Hat Container Native Storage, Let Kubernetes run your Storage!



Kubernetes Cluster

Red Hat Container Native Storage, Let Kubernetes run your Storage!

Kubernetes Platform + Container Value Proposition

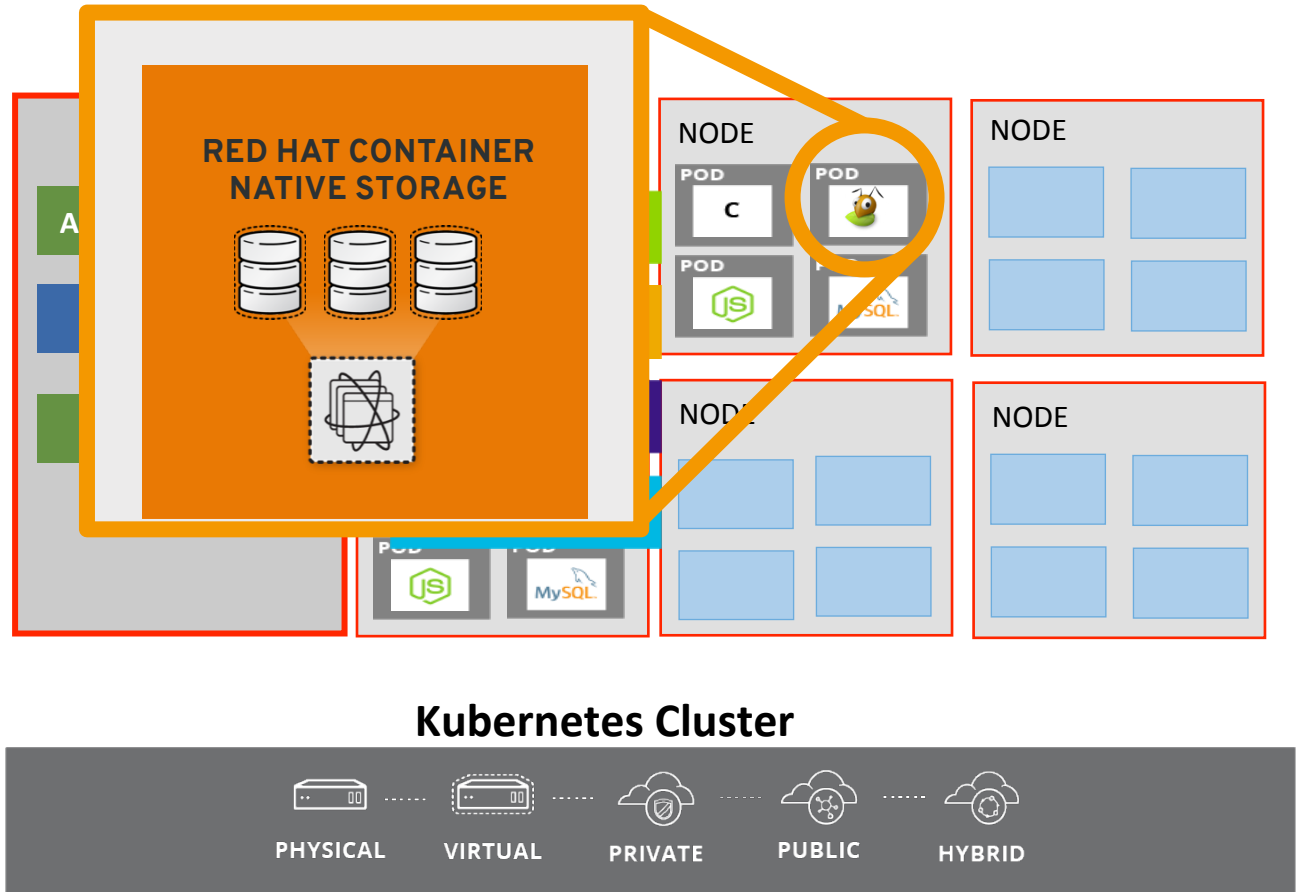


- Storage runs as a Container on K8s
- One Cluster, avoid Cluster Sprawl
- One Control and Management Plane
- Horizontal Scaling
- K8s maintains desired state

- Runs everywhere
- Private, Public, Virtual, Bare Metal, Hybrid

Red Hat Container Native Storage, Let Kubernetes run your Storage!

Kubernetes Platform + Container Value Proposition



Container Value Prop

- Faster Deployment
- Rolling Upgrade
- Isolation & Portability
- Versioning & Reusability
- Runs Everywhere
- Option to Co Locate with App

Pattern 3 →Orchestrated Storage Runtime
Example: Red Hat Container Native Storage

- One Cluster, One Infrastructure - storage like any other service
- One control plane end to end
- **Exploit full value proposition of**

Kubernetes + Containers + Software Defined Storage

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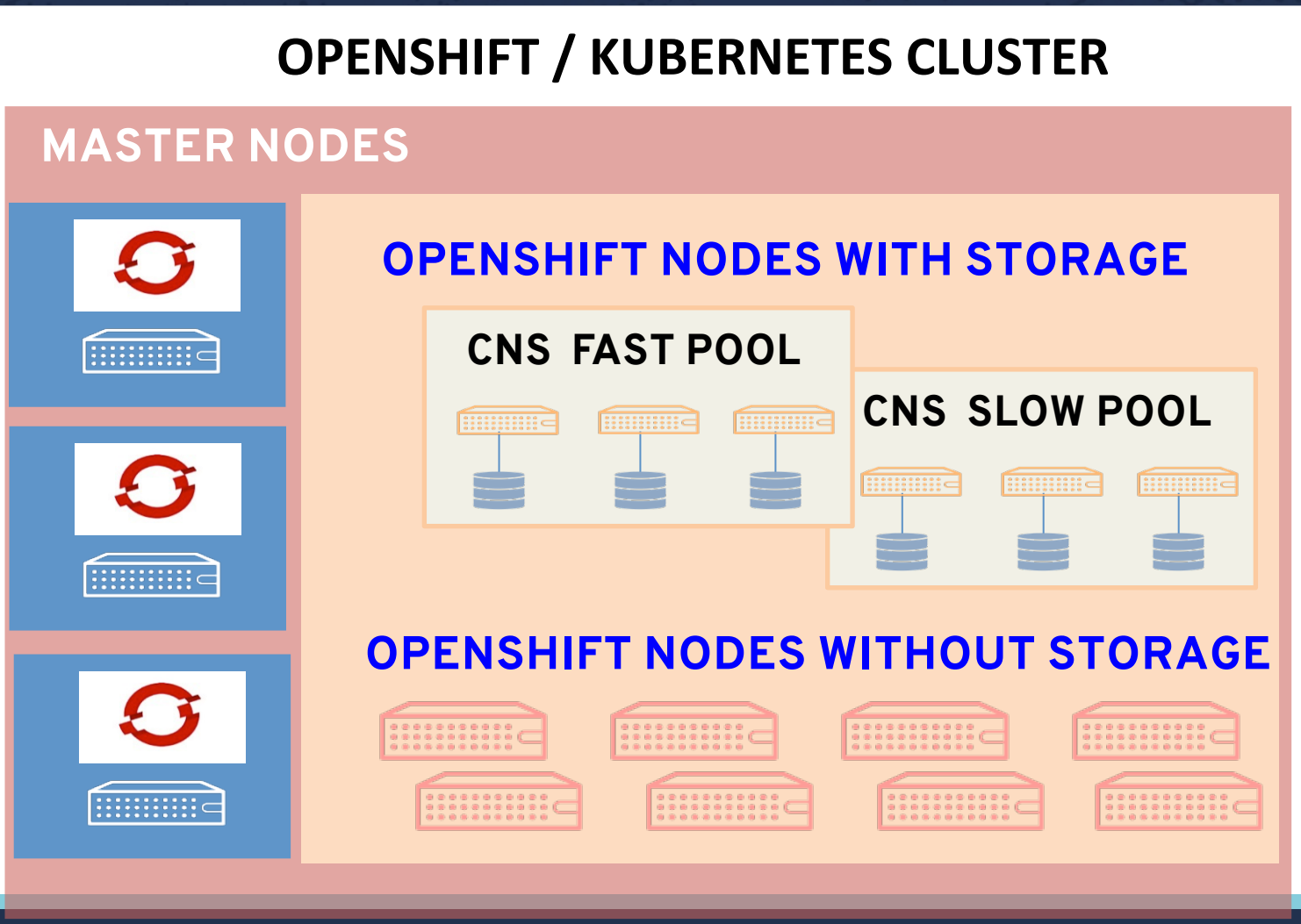
EXAMPLE

Demo Red Hat Container Native Storage

- OpenShift → Kubernetes Container Platform
- Red Hat Container Native Storage (CNS)
  - Pattern 3 Orchestrated Storage Runtimes
  - Based on Gluster – Kubernetes Open Source

OpenShift (Kubernetes) with Container Native Storage



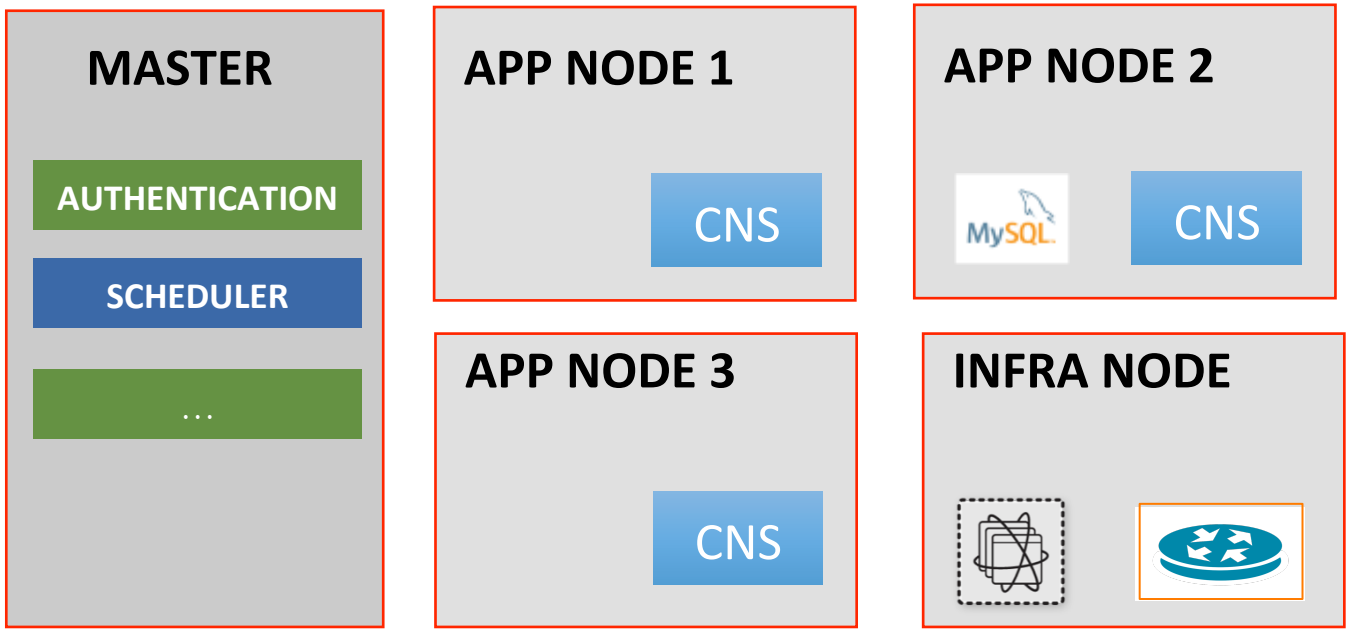
Storage Class Examples:

- Fast Pool: 3x node w/ SSDs
- Slow Pool: 3x node w/ HDDs

Pods on OCP nodes can mount volumes from Fast and Slow Storage Classes

Demo Configuration:

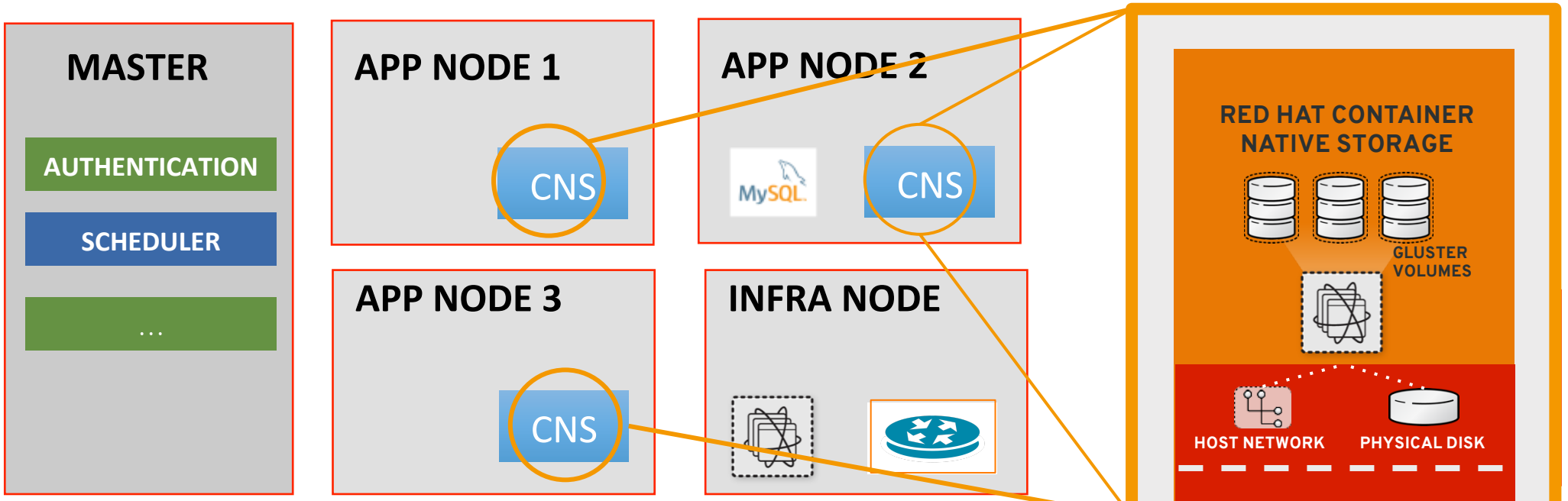
Red Hat Container Native Storage, Let Kubernetes run your Storage!



Demo OpenShift Cluster

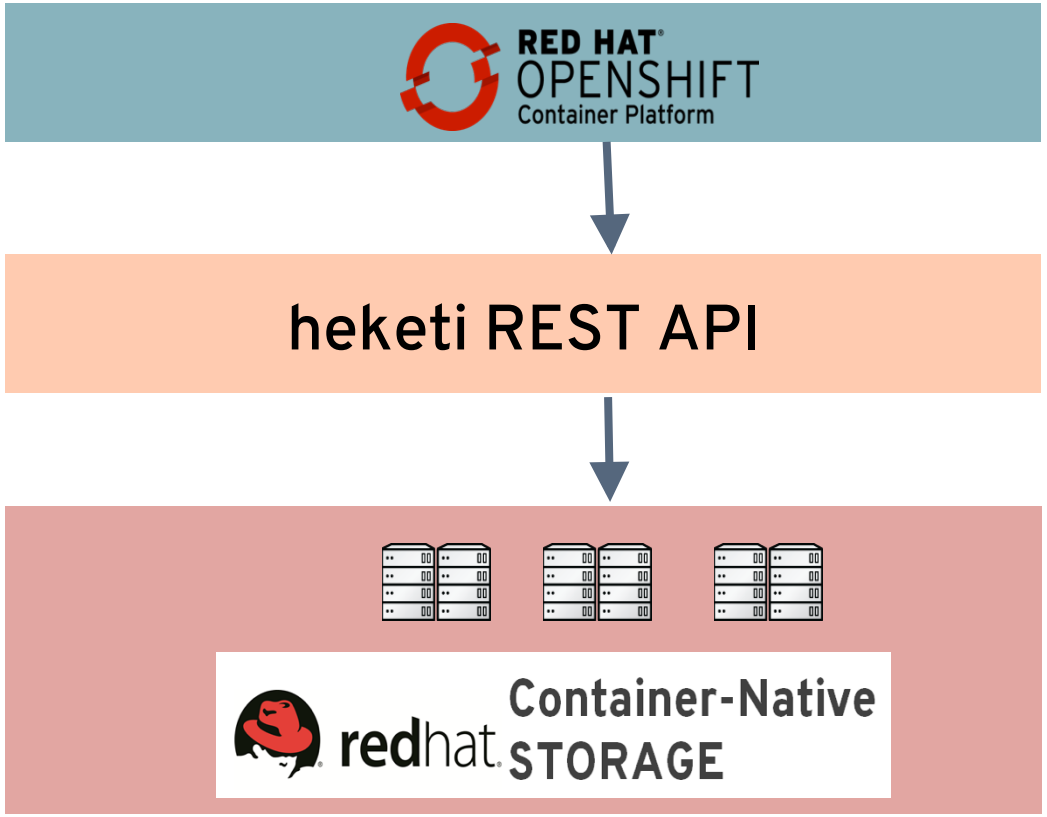
Demo Configuration:

Red Hat Container Native Storage, Let Kubernetes run your Storage!



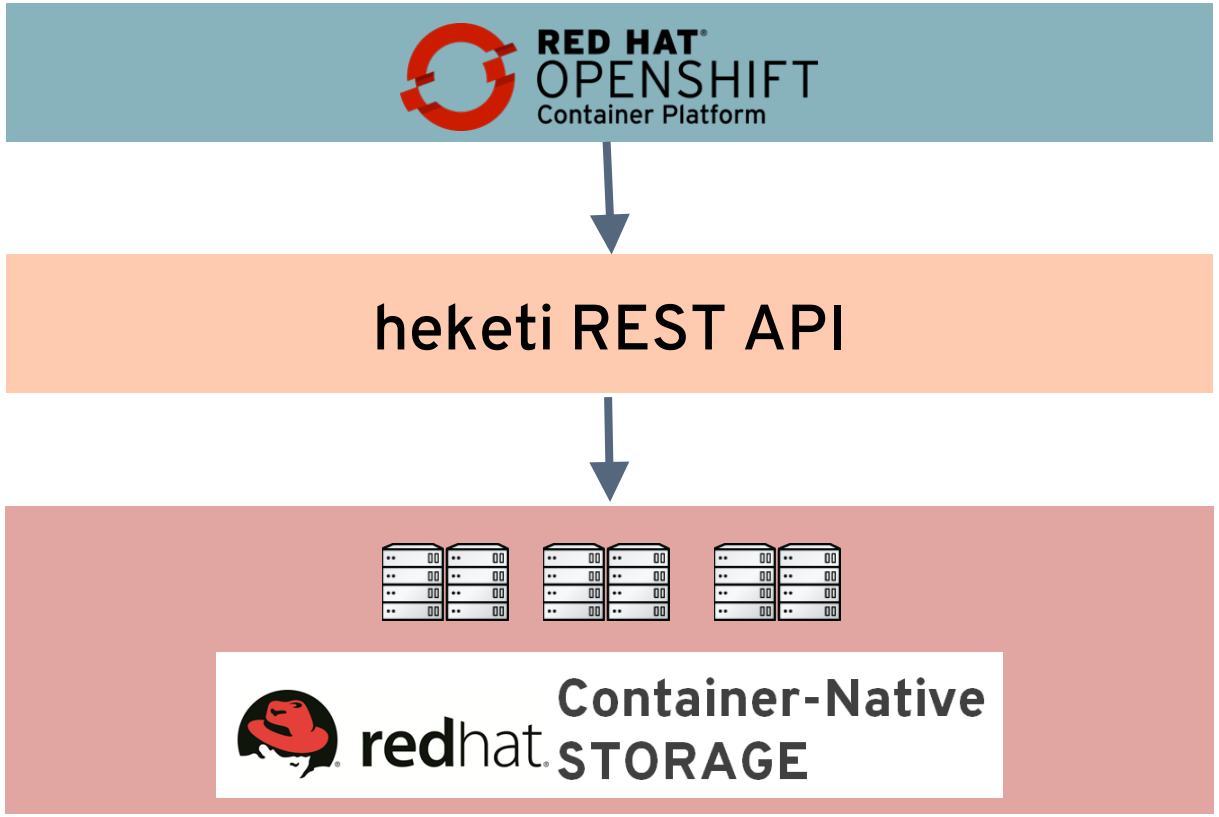
Demo OpenShift Cluster

Storage Class Example




```
# cat cns-fast-storageclass.yaml
apiVersion: storage.k8s.io/v1beta1
kind: StorageClass
metadata:
  name: cns01-vmdk-gluster-fast
provisioner: kubernetes.io/glusterfs
parameters:
  resturl: http://heketi-storage.apps.syseng.com
  clusterid: d0a035dc9022343480fcb0ec9de307
  restauthenabled: "true"
  restuser: "admin"
  secretNamespace: "default"
  secretName: "heketi-secret"
```

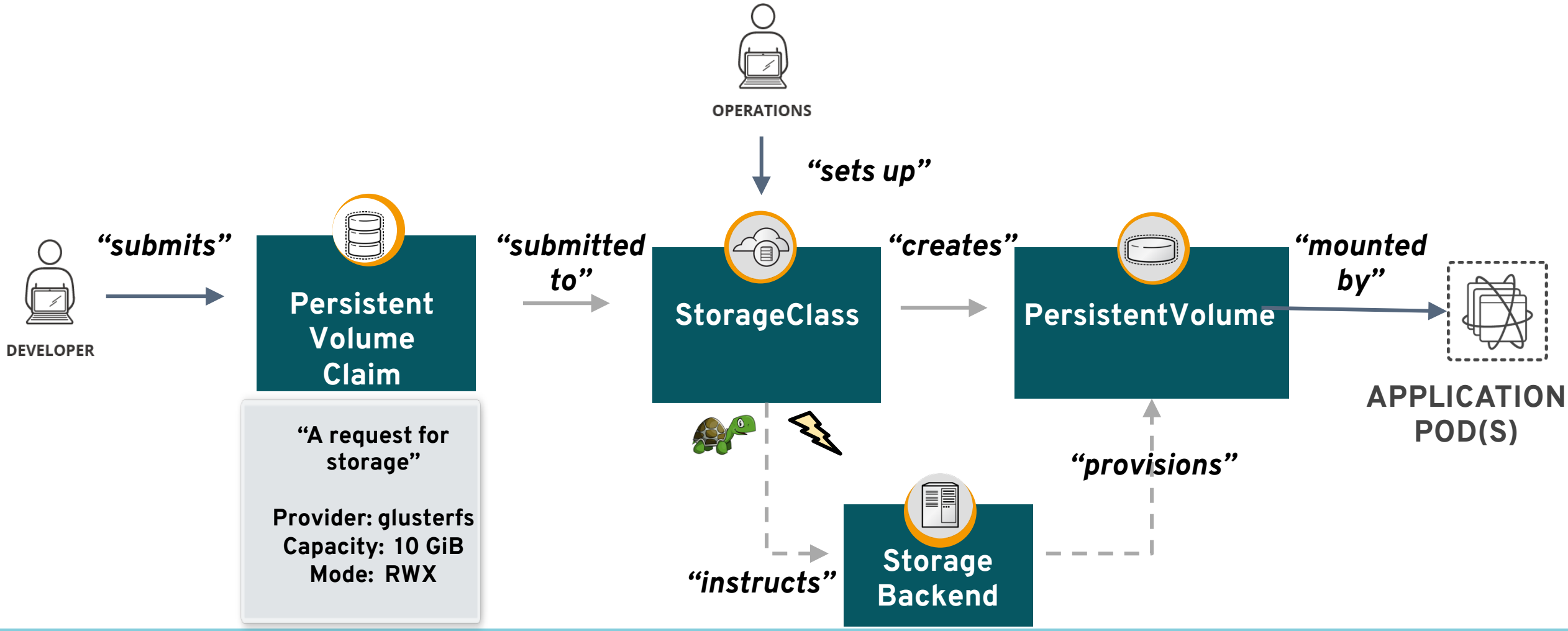
How does Kubernetes/OpenShift Apps get Persistent Volume ?



Steps:

- OpenShift calls heketi through REST API found in Storage Class object
- Heketi provisions volume on CNS
- 3x CNS PODs in CNS on 3x OCP nodes
- 3x minimum due to 3-way replication for Gluster volumes

How does Kubernetes/OpenShift Apps get Persistent Volume ?



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LIVE DEMO

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Questions?