

# Simplifying running stateful Container Workloads with NetApp

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Goal for this talk:

**Show how NetApp can help running  
stateful legacy and new applications  
on Containers**

# Why put stateful Applications in Containers?

- Easier standard **repeatable** deployments
- Easier **upgrades**
- Increase overall **reliability** and **availability**
- **Automated** and repeatable configuration
- Manage DBs not VMs/hosts
- **Speed, efficiency** and better CPU/memory **utilization**



# Stateful App in VMs vs. Containers

## VM

Guest	• Provision a VM
OS	• Install a supported OS
Prepare Host	• Install required packages
Storage	• Provision storage
Install	• Download and install App
Run	• Configure and run App
Test	• Test App

## Containers

K8S	• kubectl create -f my-app.yaml
-----	---------------------------------

Backup? Restore?  
Testing Upgrades?



Free up  
time





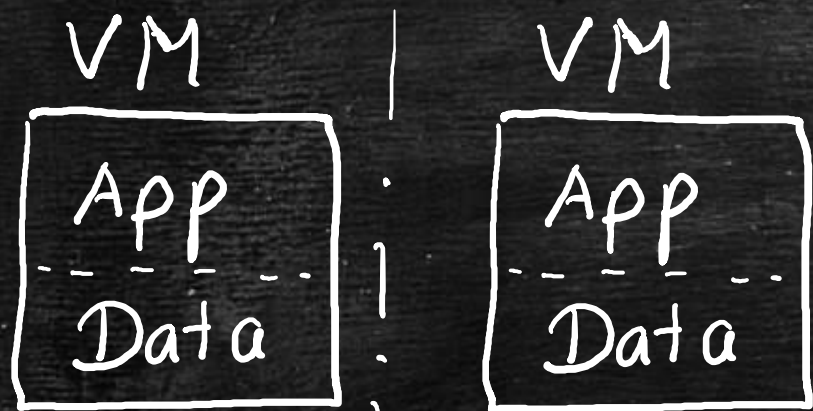
**Do more  
meaningful  
things**



# The Challenge

# Today

# Tomorrow



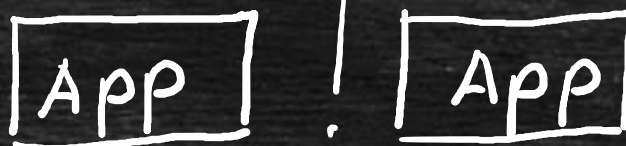
Move VM →



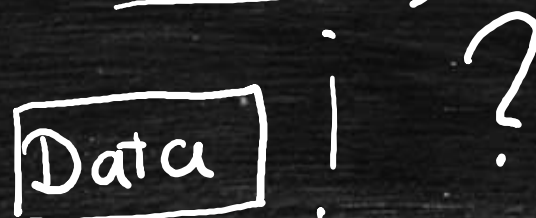
Server A

Server B

Container Container



Move Container →



Server A

Server B

AWS Lambda



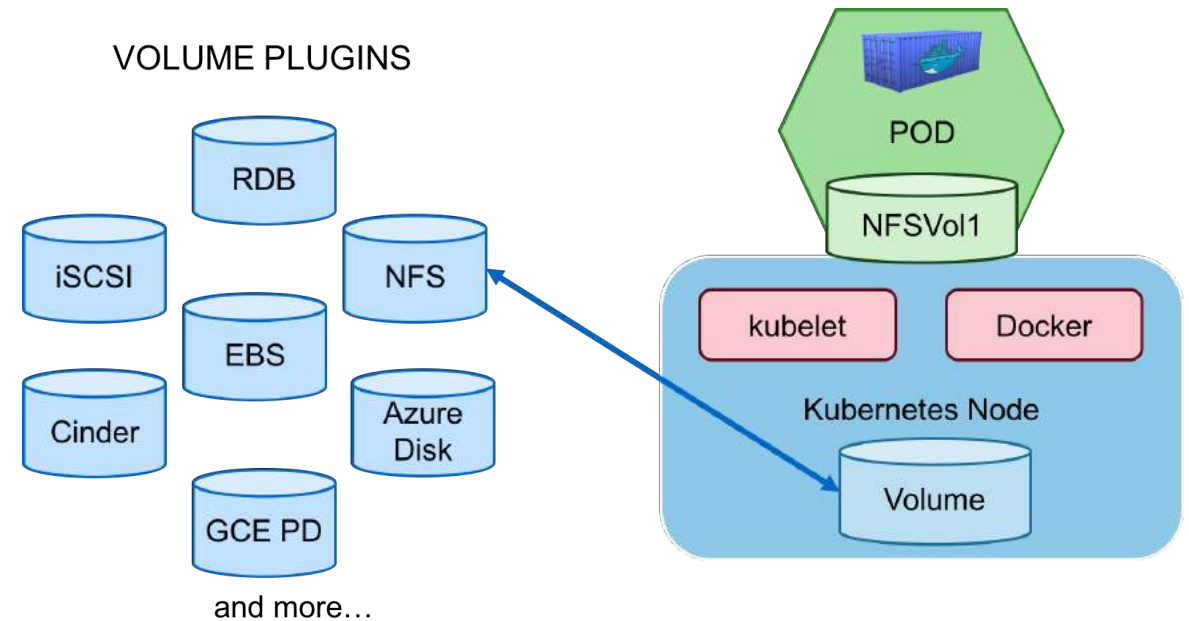
Invisible Server





# Kubernetes Persistent Volumes

- Kubernetes understands
  - iSCSI
  - NFS
  - EBS, GCE PD, Azure disk, ...
- Why external storage?
  - **So that volumes can persist beyond the lifetime of a single host**
  - **That you can run workloads at scale and reliably on containers**
  - **Solve backup/restore, geo-replication, test/dev (cloning), and others**
- Static versus dynamic provisioning



# OpenShift Static Provisioning

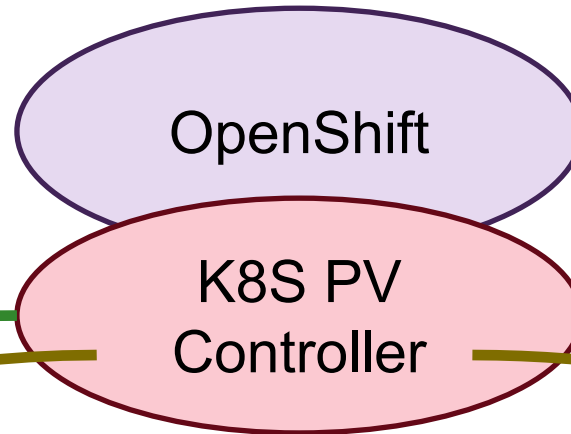
Without NetApp Integration



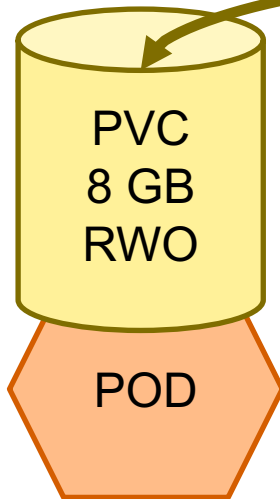
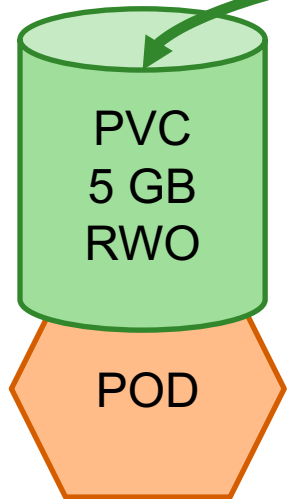
Users &  
Developers



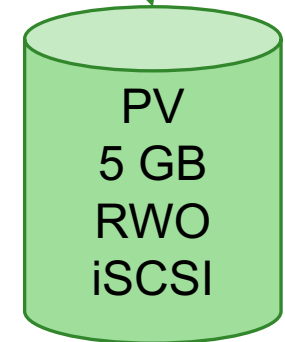
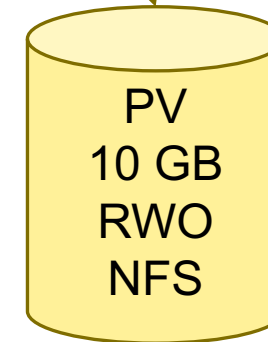
Ops Team / IT Admins



Storage



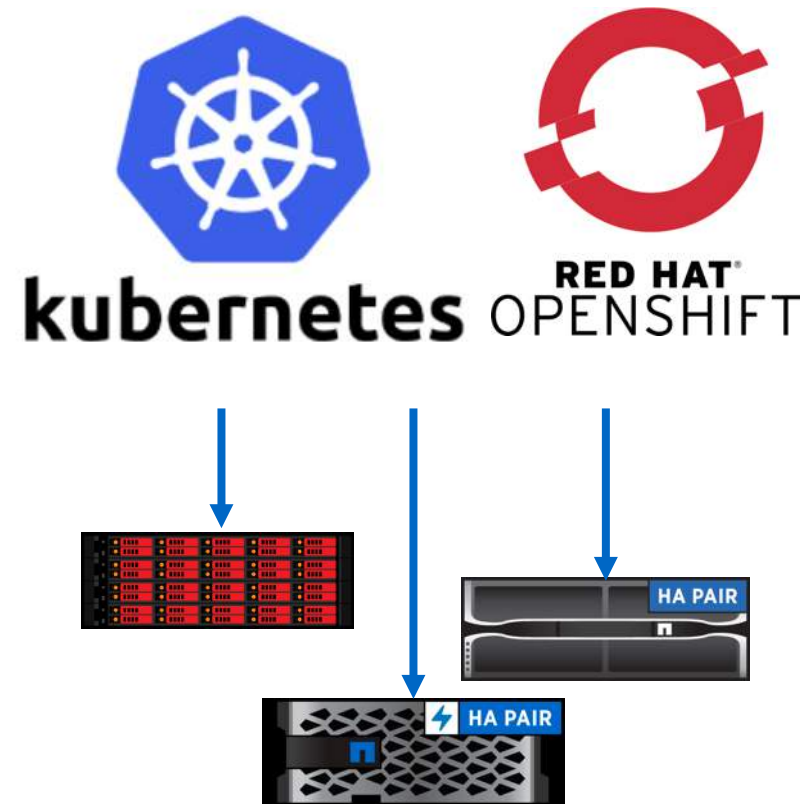
PersistentVolumeClaim



PersistentVolume

# Trident: Kubernetes Integration for NetApp storage

- NetApp's Open Source **dynamic storage provisioner** supporting:
  - NetApp ONTAP
  - NetApp SolidFire
  - E-Series
- Automates volume creation and mapping
- Compatible with:
  - OpenShift Origin & Enterprise
  - Kubernetes
- Available on GitHub:  
<https://github.com/NetApp/trident>



# OpenShift Dynamic Provisioning

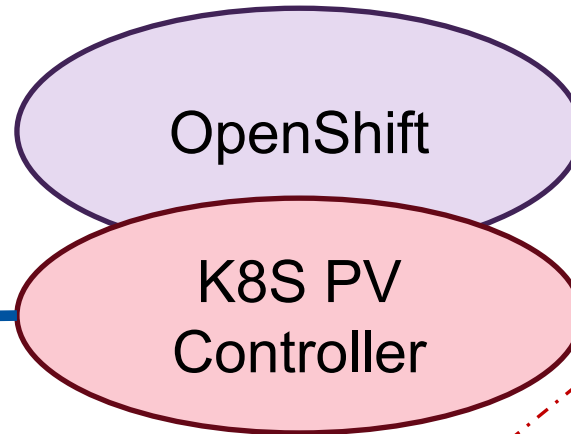
With NetApp Trident Integration



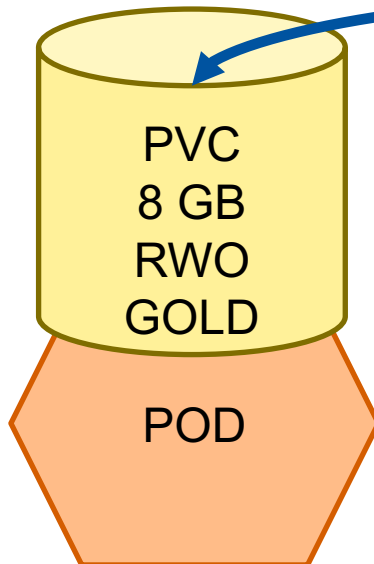
Users &  
Developers



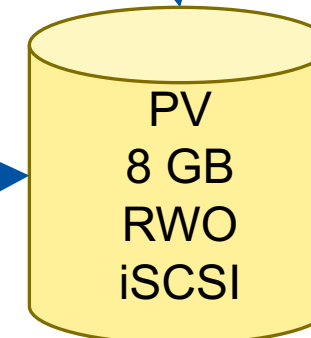
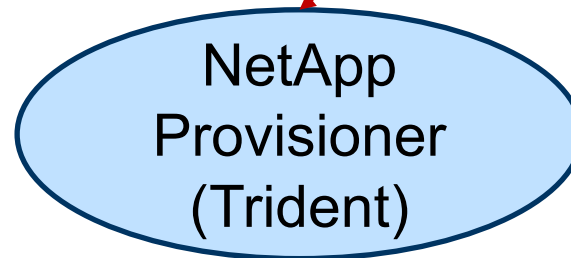
Ops Team / IT Admins



NetApp  
SolidFire



PersistentVolumeClaim



StorageClass

**Gold**  
IOPS:  
3000/6000/10000

**Silver**  
IOPS:  
2000/4000/8000

**Bronze**  
IOPS:  
1000/2000/4000



# Why NetApp for Containers?

#1 Flash Vendor in  
EMEA

Space + Time  
neutral cloning for  
automated testing

Performance  
(#1 in SPEC SFS  
2014 benchmark)

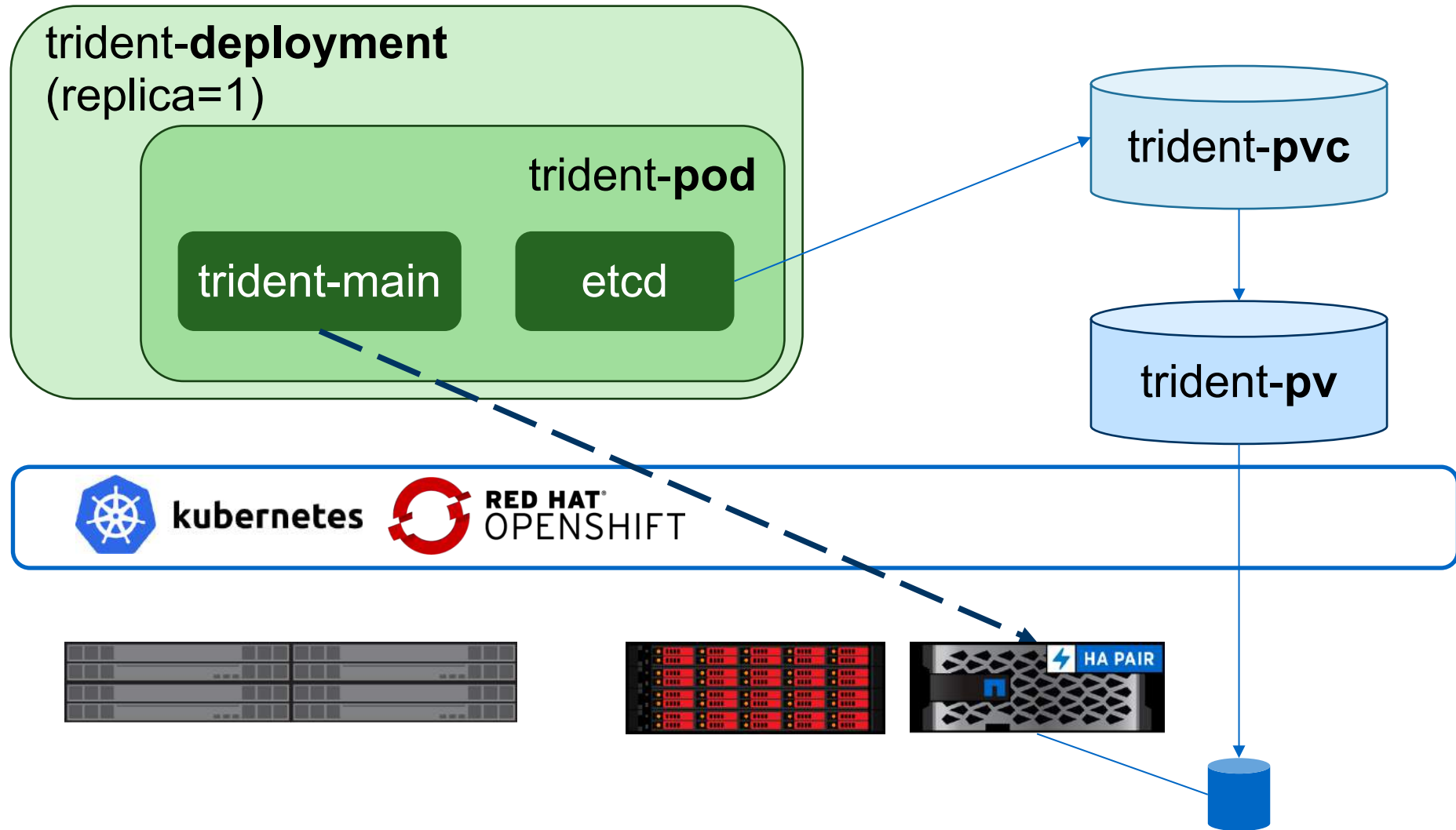
Backup capabilities

No-Lock In  
(independent of  
Platform)

Cloud-connected  
HCI

# Trident Config

# Trident Deployment

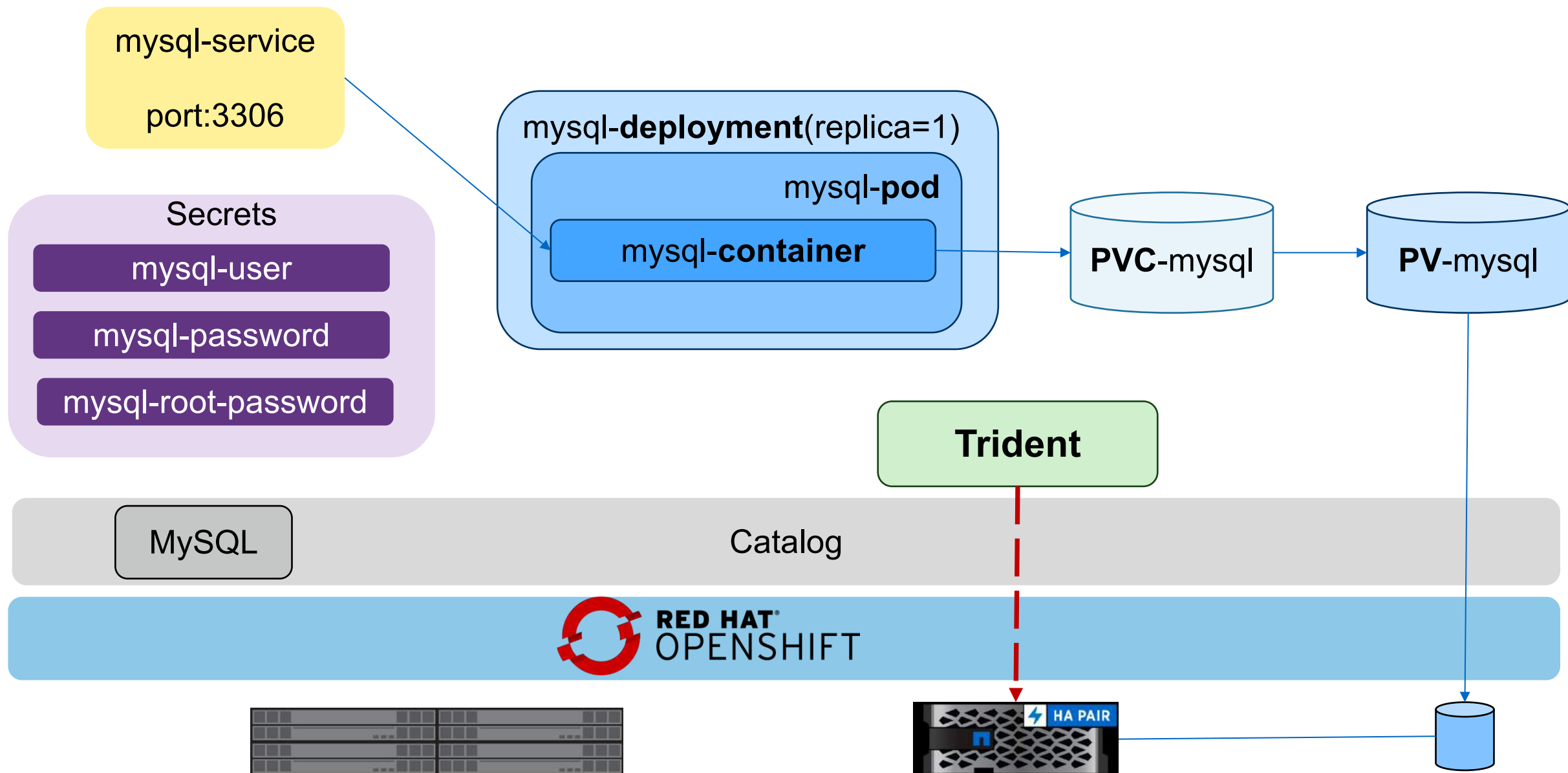


root@akapila-openshift:/#

Y



# Deploying a stateful App in OpenShift





## OPENSIFT ORIGIN

Username

Password

Log In

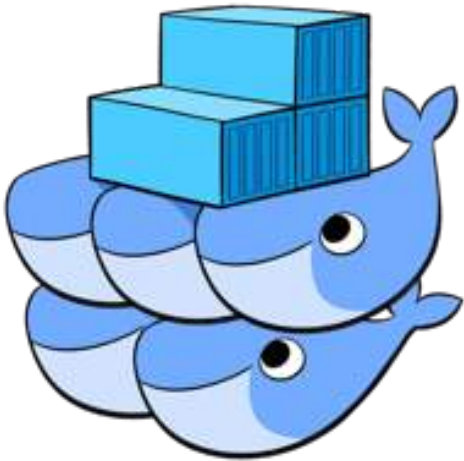
Welcome to OpenShift Origin.

Activate Windows

Go to System in Control Panel to activate Windows.

# Docker + Swarm

## NetApp Docker Volume Plugin



- Directly provision persistent storage for containers on ONTAP, E/EF-Series or SolidFire
- Docker Store certified plugin
- Open Source: <https://github.com/NetApp/netappdvp>
- Exposes Snapshots, Cloning (incl. Splitting) to Docker CLI

```
docker plugin install --alias ontap netapp/ndvp-plugin:17.07
```

```
docker volume create -d ontap --name new_vol
```

```
docker run -it -v new_vol:/mnt/new_vol alpine ash
```

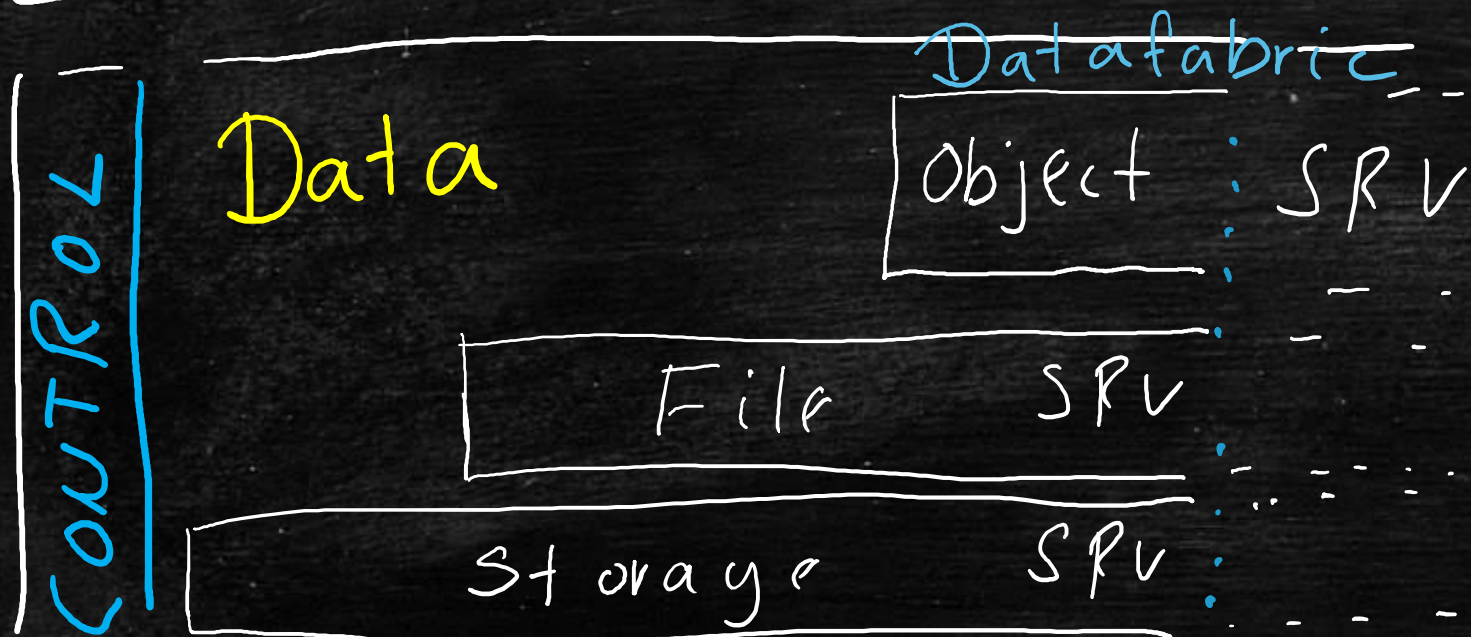
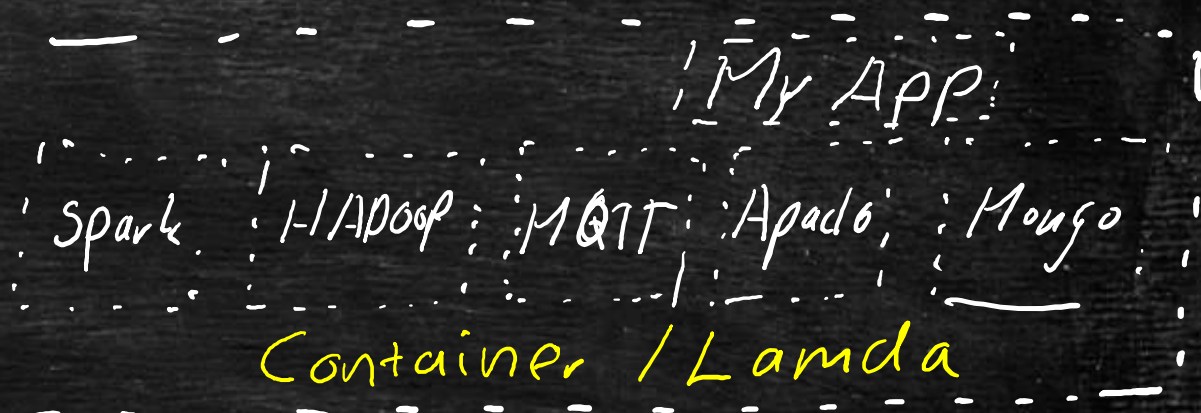
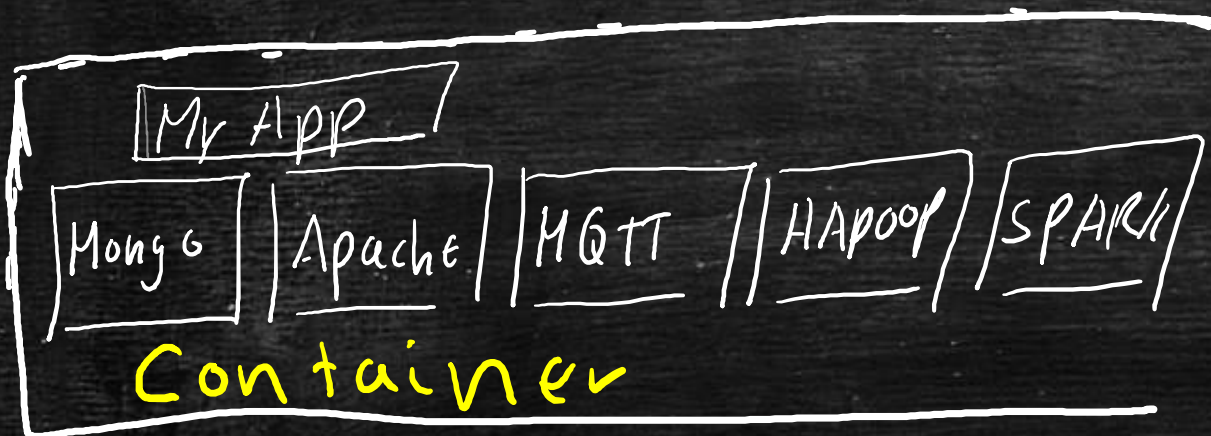


# Running workloads anywhere



# on Premise

# Cloud



# More Information



Keith Tenzer, RedHat

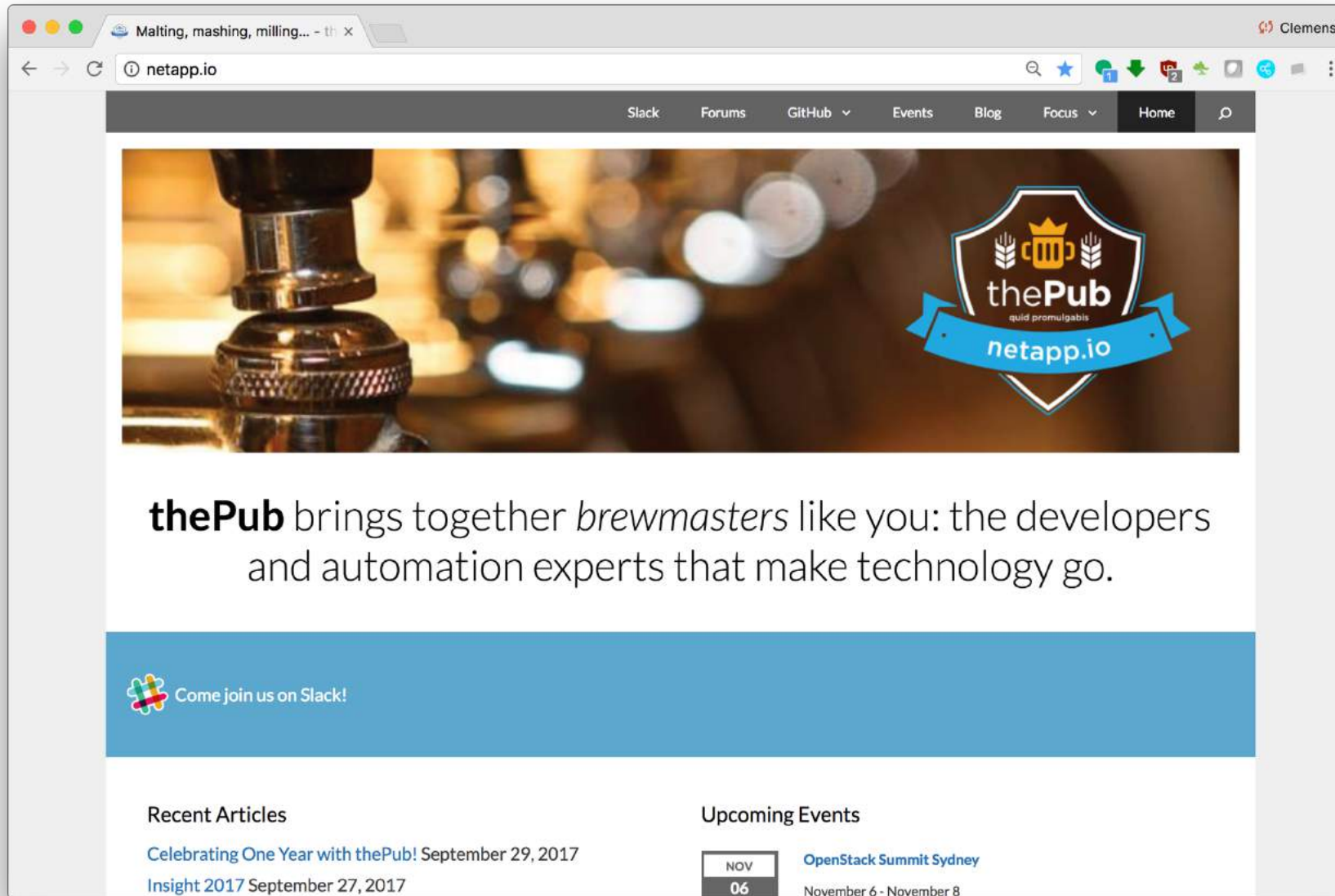


Kapil Arora, NetApp

- Good Summary on Keith Tenzer's Blog (co-authored by NetApp)
  - <https://keithtenzer.com/2017/04/05/storage-for-containers-using-netapp-solidfire-part-vi/>
  - <https://keithtenzer.com/2017/04/05/storage-for-containers-using-netapp-ontap-nas-part-v/>
- MongoDB on Kubernetes
  - <http://netapp.io/2017/04/07/deploy-containerized-mongodb-kubernetes-netapp/>
- OpenShift on NetApp Full Video
  - <https://www.youtube.com/watch?v=WZ3nwl4aILU>
  - Explains and shows failover, provisioning, etc.



https://netapp.io





**NetApp can help running  
stateful legacy and new applications  
on Containers  
More @ [netapp.io](https://netapp.io)**