Got OpenShift Container Storage? Now What?
How to backup, upgrade, scale, and monitor your storage

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Workshop Agenda

- Primer on OpenShift Container Storage (GlusterFS based)
- Primer on OpenShift Container Storage 4.x (Rook-ceph based)
- OpenShift Container Storage Backup & Recovery (now and future)
- Lab Overview
STORAGE FOR THE OPEN HYBRID CLOUD

OPENSHIFT CONTAINER STORAGE
COMPLETE DATA PORTABILITY
For OpenShift Across the Hybrid Cloud

HYBRID CLOUD OBJECT STORAGE
MOST SCALABLE DATA PLATFORM
For Data Analytics, AI/ML, and emerging workloads

HYPERCONVERGENCE
ELASTIC INFRA ACROSS THE DATA CENTER AND EDGE
Built to enable flexibility, scale, and ease of use
OpenShift Container Storage (OCS) 3.x with Openshift Container Platform 3.x
A PRIMER ON CONTAINER STORAGE

In short: GlusterFS in pods, orchestrated by OpenShift + REST API
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WHY IS THIS A GOOD IDEA?

- **Scalable**
  (1000 PVs/cluster)

- **Highly-available**
  (across cloud AZs)

- **Automated**
  (Dynamic Provisioning)

- **Integrated**
  (Installs with/runs on OpenShift)

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#redhat #rhsummit
OCS DOCUMENTATION, KCS, BLOGS

- OCS 3.11 Deployment Guide
- OCS 3.11 Operations Guide
- KB articles
  - How to run transaction workload on file backed PV
  - OCP 3.10 inventory file changes for CNS 3.9
- Blogs
  - OCP 3.10 with CNS 3.9
  - OCP 3.10 with OCS 3.10
  - OCP 3.11 with OCS 3.11
  - OCS Volume Management
  - Metro OCP Stretch Cluster
OpenShift Container Storage (OCS) 4.x with OpenShift Container Platform 4.x
OCS 4.x AVAILABILITY

- OCS is expected to be available in the same timeframe as OpenShift Container Platform 4.2.
- It will be based on Rook.io, Ceph, and NooBaa (Multi-cloud Gateway).
- OCS will support Ceph RBD (RWO), CephFS (RWX), and have a S3 capability for Object workloads.
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WHAT IS ROOK?

- Operator for Kubernetes/OpenShift that manages storage
- Extends Kubernetes with custom types and controllers
- Automates deployment, bootstrapping, configuration, provisioning, scaling, upgrading, monitoring, and resource management
- Open Source (Apache 2.0)
- Upstream project hosted by the Cloud-Native Computing Foundation (CNCF)
ROOK ARCHITECTURE

New Objects:
- Storage Clusters
- Storage Pools
- Object Store
- File Store

Objects:
- Deployments
- DaemonSets
- Pods
- Services
- StorageClass / PVC
- ClusterRole
- Namespace

kubectl

Kubernetes API

Rook Operators

Client Pods
- (RBD/CephFS Clients)

Management

Attach/Mount

Daemons

Rook Agent (flex)

Ceph CSI Driver

Kubelet

Ceph

RBD/CephFS Clients

Client Pods
OPERATOR PATTERN

● Automates management
● Codifies domain expertise to deploy and manage an application
  ○ Automates actions a human would normally do
● Control loop that reconciles user’s desired state and the actual system state
  ○ Observe - discover current actual state of cluster
  ○ Analyze - determine differences from desired state
  ○ Act - perform operations to drive actual towards desired
ROOK OPERATOR

- Automates configuration of all Ceph daemons
  - Monitor (MON): Create mons and ensure they are in quorum
  - Object Storage Device (OSD): Provision devices with ceph-volume and start daemons
  - RADOS Gateway (RGW): Create the object store and start the RGW daemons
  - Metadata Server (MDS): Create the POSIX compliant CephFS and start the MDS daemon
CEPH ON OPENSHEIFT WITH ROOK

Rook Architecture
ROOK RESOURCES

- [https://rook.io](https://rook.io)
- Try out the Rook v1.0 release!
- Contribute to Rook: [https://github.com/rook/rook](https://github.com/rook/rook)
- Slack - [https://rook-io.slack.com](https://rook-io.slack.com)
- Twitter - @rook_io
- Forums - [https://groups.google.com/forum/#!forum/#!/forum/rook-dev](https://groups.google.com/forum/#!forum/#!/forum/rook-dev)
- Community Meetings
OCS 3.x Backup and Recovery
OCS BACKUP AND RECOVER

- Snapshot capability in OpenShift Container Platform (OCP) is in tech preview at present and not integrated with OCS.
- GlusterFS, the underlying technology behind OCS, does have a mature snapshot capability.
- OCP PVC to PV mapping is required to identify which backups belong to which application.
- Using OCS custom volume naming the GlusterFS volume name will include the OCP namespace or project as well as the PVC name.
- Thereby making it possible to map the volume to a particular workload
  - Blog: How to Backup and Recover Red Hat OpenShift Container Storage
Custom volume naming requires a change to the StorageClass definition as shown below.

```yaml
# oc get sc glusterfs-storage -o yaml
apiVersion: storage.k8s.io/v1
kind: StorageClass
metadata:
  name: glusterfs-storage
parameters:
  resturl: http://heketi-storage-app-storage.apps.ocpgluster.com
  restuser: admin
  secretNamespace: app-storage
  secretName: heketi-storage-admin-secret
  volumeprefix: gf
provisioner: kubernetes.io/glusterfs
reclaimPolicy: Delete

1 Custom volume name support: `<volumeprefixstring>_<namespace>_<claimname>_UUID`
```
OCS BACKUP AND RECOVER

- Need to have a ‘bastion host’ that can be used for executing the scripts, mounting GlusterFS snapshot volumes, and a place to install the agent if using backup and restore software.
- The github repository, `rhocs-backup`, contains two scripts, `rhocs-pre-backup.sh` and `rhocs-post-backup.sh`, have been tested with Commvault Complete™ Backup and Recovery Software.

```bash
sudo ./rhocs-pre-backup.sh /<path_to_file>/converged_vars.ini
```

Followed by this script to unmount the snapshot volumes and to remove the snapshot volumes from the RHOCs Heketi database and GlusterFS converged cluster

```bash
sudo ./rhocs-post-backup.sh /<path_to_file>/converged_vars.ini
```
COMMVAULT BACKUP PROCESS

- Configure subclient using CommCell or Admin Console.
  - Input path to rhocs-pre-backup.sh and rhocs-post-backup.sh
COMMVAULT BACKUP PROCESS

- Configure subclient Backup Schedule and start Backup operation.
COMMVAULT RESTORE PROCESS

- Identify data to be recovered from Backup and where to restore.
OCS 4.x BACKUP AND RECOVER

- Will use snapshot capability available with Kubernetes 1.14 Container Storage Interface (CSI).
- CSI is a standard for exposing arbitrary block and file storage systems to containerized workloads.
- Rook will have CSI driver for Ceph when OCS 4.x is released in Fall 2019.
- There are new OCP resource types for doing volume snapshots.
  - VolumeSnapshotClass: Just like StorageClass provides a way for administrators to describe the “classes” of storage they offer when provisioning a volume, VolumeSnapshotClass provides a way to describe the “classes” of storage when provisioning a volume snapshot.
  - VolumeSnapshot: Used to dynamically provision snapshot using SnapShotClass. Also used to create a new volume from a snapshot.
- More information for the Rook Ceph CSI driver can be found at this [link](#).
Got OpenShift Container Storage? Help us shape the Red Hat OpenShift storage experience.

Visit the User Experience Design team in the Feedback Zone.

Ecosystem Expo
Exhibit Hall A

Activity Title
Get early insights into OCS and influence its direction

Contact Name
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OpenShift with OCS and Rook Lab
Lab Details

- One OpenShift Cluster for each Student
  - 3 Storage Nodes
  - 3 Additional Storage Nodes to be added
- Explore OpenShift Container Storage 3.11
- Explore Prometheus Monitoring for Storage
- Install Rook
  - Deploy Rook Operator
  - Deploy a Ceph Cluster
  - Extend the Ceph Cluster with additional disks
- Upgrade Ceph to the next major release
FIND US AT RED HAT SUMMIT

- At the Storage lockers
- At the Red Hat booth
- At one of Storage dedicated sessions (red.ht/storageatsummit)
- At the Community Happy Hour (Tues 6:30, Harpoon Brewery)
- At the Hybrid Cloud Party (Wed, 7:30, “Committee” restaurant)

Red Hat OpenShift Container Storage
red.ht/videos-RHOCs

Red Hat data analytics infrastructure solution
red.ht/videos-RHDAIS

Red Hat Hyperconverged Infrastructure
red.ht/videos-RHHI
DISCOVERY SESSION THEATER

TUESDAY

7:45 - 8:30 PM - 4 ways to jump start an open source & agile automation culture

WEDNESDAY

10:15-11:00 AM - Day-in-the-Life: Designing Software for Open Innovation Labs

11:15-12:00 PM - How Volkswagen used microservices & automation to develop self-service solutions

12:15-1:00 PM - Container adoption at scale: Metrics-driven framework and other lessons learned

3:15-4:00 PM - The road to RHEL 8: Best practices for optimizing your operating system

4:15-5:00 PM - Adoptando RHEL 8: Las mejores practicas para optimizar tu Sistema Operativo

5:15-6:00 PM - A DevOps survival guide: Small changes lead to big results

6:15-7 PM - Digital Nudge: How automation, machine learning, A.I., and more shape our digital decisions

THURSDAY

10:45-11:30 AM - OpenShift DevSecOps: Making your enterprise more secure for tomorrow, today

11:45-12:30 PM - To the Edge and Beyond: Network Automation for Telecommunications

12:45-1:30 PM - People first, digital second: Using open principles to drive transformation at Heritage Bank

1:45-2:30 PM - Monoliths in OpenShift: Application onboarding strategies for containers
THANK YOU

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