Red Hat OpenShift Container Storage 4.8

Recovering a Metro-DR stretch cluster

Disaster recovery tasks for cluster and storage administrators

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Abstract

This document explains how to recover from a metro disaster in Red Hat OpenShift Container Storage. This is a technology preview feature and is available only for deployments using local storage devices. Technology Preview features are not supported with Red Hat production service level agreements (SLAs) and might not be functionally complete. Red Hat does not recommend using them in production. These features provide early access to upcoming product features, enabling customers to test functionality and provide feedback during the development process.

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MAKING OPEN SOURCE MORE INCLUSIVE

Red Hat is committed to replacing problematic language in our code, documentation, and web properties. We are beginning with these four terms: master, slave, blacklist, and whitelist. Because of the enormity of this endeavor, these changes will be implemented gradually over several upcoming releases. For more details, see our CTO Chris Wright's message.

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CHAPTER 1. OVERVIEW

Given the Metro disaster recovery stretch cluster is to provide resiliency in the face of a complete or partial site outage, it is important to understand the different methods of recovery for applications and their storage.

How the application is architected will determine how soon it can be available again on the active zone.

Depending on the site outage, there can be different methods of recovery for applications and their storage. The recovery time depends on the application architecture. The different methods of recovery are as follows:

- Recovery for zone-aware HA applications with RWX storage
- Recovery for HA applications with RWX storage
- Recovery for applications with RWO storage
- Recovery for StatefulSet pods

CHAPTER 2. UNDERSTANDING ZONE FAILURE

For purposes of this section, we will consider a zone failure to be a failure where all OpenShift Container Platform nodes, masters and workers, in a zone are no longer communicating with the resources in the second data zone (e.g., nodes powered down). If communication between data zones is partially still working (intermittent down/up), steps should be taken by cluster, storage, network admins to sever the communication path between the data zones for recovery to succeed.

CHAPTER 3. RECOVERY FOR ZONE-AWARE HA APPLICATIONS WITH RWX STORAGE

Applications that are deployed with **topologyKey: topology.kubernetes.io/zone**, have one or more replicas scheduled in each data zone, and are using shared storage (i.e., RWX cephfs volume) will recover on the active zone within 30-60 seconds for new connections. The short pause is for **HAProxy** to refresh connections if a router pod is now offline in the failed data zone.

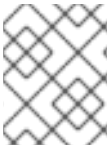
An example of this type of application is detailed in the Install Zone Aware Sample Application section.

NOTE

When you install the Sample Application, test the failure of a data zone by powering off the OpenShift Container Platform nodes (at least the nodes with OpenShift Container storage devices) to validate that your file-uploader application is available and that new files can be uploaded.

CHAPTER 4. RECOVERY FOR HA APPLICATIONS WITH RWX STORAGE

Applications that are using **topologyKey: kubernetes.io/hostname** or no topology configuration whatsoever, have no protection against all of the application replicas being in the same zone.



NOTE

This can happen even with *podAntiAffinity* and **topologyKey: kubernetes.io/hostname** in the **Pod** spec because this anti-affinity rule is host-based and not zone-based.

If this happens and all replicas are located in the zone that fails, the application using RWX storage will take 6-8 minutes to recover on the active zone. This pause is for the OpenShift Container Platform nodes in the failed zone to become **NotReady** (60 seconds) and then for the default pod eviction timeout to expire (300 seconds).

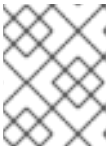
CHAPTER 5. RECOVERING APPLICATIONS WITH RWO STORAGE

Applications that use RWO storage (ReadWriteOnce) have a known behavior described in this Kubernetes issue. Because of this issue, if there is a data zone failure any application pods in that zone mounting RWO volumes (for example: **cephrbd** based volumes) are stuck with **Terminating** status after 6-8 minutes and will not be recreated on the active zone without manual intervention.

Check the OpenShift Container Platform nodes with a status of **NotReady**. It may have an issue that prevents them from communicating with the OpenShift control plane. They may still be performing IO operations against persistent volumes in-spite of this communication issue.

If two pods are concurrently writing to the same RWO volume, there is a risk of data corruption. Some measure must be taken to ensure that processes on the **NotReady** node are terminated or blocked until they can be terminated.

- Using an out of band management system to power off a node, with confirmation, would be an example of ensuring process termination.
- Withdrawing a network route that is used by nodes at a failed site to communicate with storage would be another solution.



NOTE

Before restoring service to the failed zone or nodes, there must be confirmation that all pods with persistent volumes have terminated successfully.

To get the **Terminating** pods to recreate on the active zone, you can either force delete the pod or delete the finalizer on the associated PV. Once one of these two actions are completed, the application pod should recreate on the active zone and successfully mount its RWO storage.

Force delete the pod

Force deletions do not wait for confirmation from the kubelet that the Pod has been terminated.

```
$ oc delete pod <PODNAME> --grace-period=0 --force --namespace <NAMESPACE>
```

<PODNAME>

Is the name of the pod

<NAMESPACE>

Is the project namespace

Deleting the finalizer on the associated PV

Find the associated PV for the Persistent Volume Claim (PVC) that is mounted by the **Terminating** pod and delete the finalizer using the **oc patch** command.

```
$ oc patch -n openshift-storage pv/<PV_NAME> -p '{"metadata":{"finalizers":[]}}' --type=merge
```

<PV_NAME>

Is the name of the PV
An easy way to find the associated PV is to describe the Terminating pod. If you see a multi-attach warning, it should have the PV names in the warning (for example, pvc-0595a8d2-683f-443b-aee0-6e547f5f5a7c).

```
$ oc describe pod <PODNAME> --namespace <NAMESPACE>
```

<PODNAME>

Is the name of the pod

<NAMESPACE>

Is the project namespace

Example output:

```
[...]
Events:
  Type     Reason                  Age   From                     Message
  ----     ------                  ----  ----                     -------
  Normal   Scheduled               4m5s  default-scheduler        Successfully assigned openshift-
storage/noobaa-db-pg-0 to perf1-mz8bt-worker-d2hdm
  Warning  FailedAttachVolume      4m5s  attachdetach-controller  Multi-Attach error for volume
"pvc-0595a8d2-683f-443b-aee0-6e547f5f5a7c" Volume is already exclusively attached to one
node and can't be attached to another
```

CHAPTER 6. RECOVERY FOR STATEFULSET PODS

Pods that are part of a stateful set have a similar issue as Pods mounting RWO volumes. Reference Kubernetes resource StatefulSet considerations for more information.

To get the Pods part of a StatefulSet to recreate on the active zone after 6-8 minutes, the Pod needs to be force deleted with the same requirements (i.e., OpenShift Container Platform node powered off or communication severed) as Pods with RWO volumes.