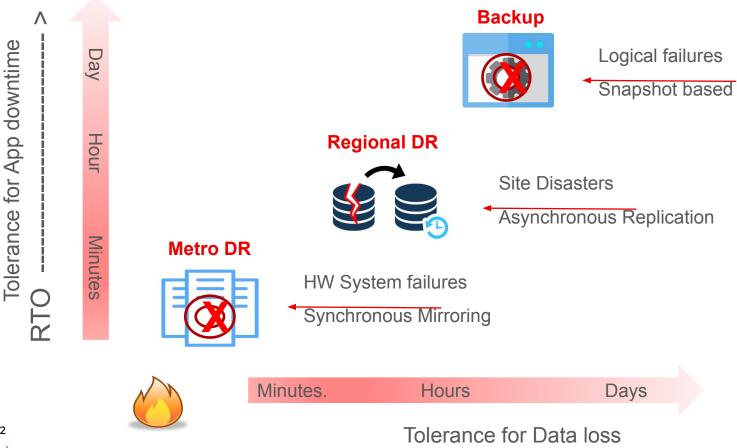


HA-DR for Stateful Applications on OpenShift



Resiliency Solutions for different service level objectives



- Comprehensive protection solutions against wide spectrum of failures
- ▶ Beyond Data Protection --> Full Application protection
- Resiliency built into the platform Available to all stateful and stateless applications on OpenShift
- ► OCP + ODF + ACM integrated stack lends towards Automated and Simplified Application granular protection



OCP Integrated, Full Stack DR Protection

Multi-Site Multi Cluster Manager





RHACM

ODR Hub Operator –
 Orchestrates & Automates
 DR operations across clusters

Platform





 ODR Cluster Operator -Manages and synchronizes cluster meta data and application data

Persistence Layer

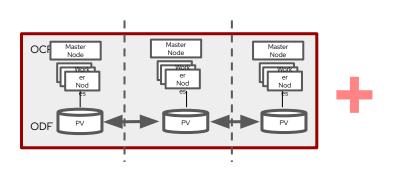


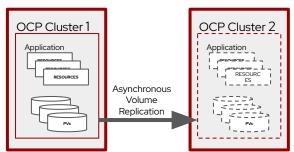
- Asynchronous replication of Application volumes – or-
- Synchronous Mirroring of Application volumes

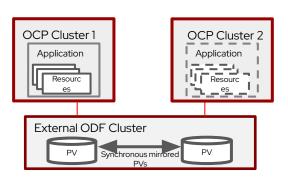
- Easy configuration DR across cluster and sites as part of application deployment
- Automated DR Failover and Failback operations reduces RTO
- Manage and Monitor DR across clusters and Apps
- Same consistent DR operations for both Metro-DR and Regional-DR
- Both Application Data and State is protected and used for Application granular protection
- Consistent Data replication or mirroring or both based on infrastructure and desired protection.



OCP Cluster HA + DR for stateful Applications







Cluster HA

Regional-DR

Metro-DR

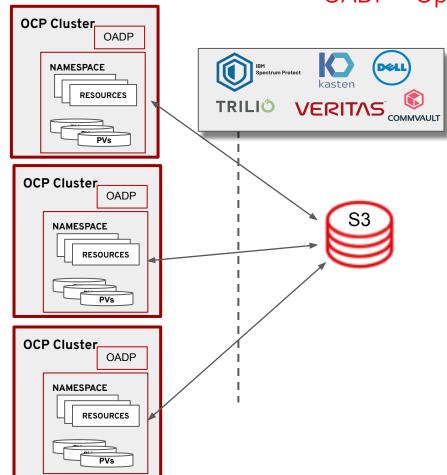
Topology	Single OCP+ODF clusters deployed over multiple AZs in a single region	Multi OCP + ODF clusters spread over multiple regions	Multi OCP clusters + single external ODF stretched cluster deployed over low latency networks
RTO (Downtime)	RTO=0 (Continuous)*	RTO = minutes DR Automation from ACM+ODF reduces RTO	RTO = minutes DR Automation from ACM+ODF reduces RTO
RPO (Data loss exposure)	RPO=0 No Data loss due due to Synchronous mirroring of ODF data	RPO > 0; Usually 5 min or higher Depends upon network bandwidth & change rate	RPO=0 No Data loss due due to Synchronous mirroring of ODF data
Infra Requirements	Multi-AZ supported public clouds (vSphere support in OCP 4.10)	All ODF supported platforms No network latency limits	On-prem only (vSphere, bare metal) <10ms network latency between sites vooooooo

Solution Overview



OpenShift Backup Solution

OADP - OpenShift API for Data Protection



- Application granular, cluster consistent backups with OADP
- OpenShift App backup protection with eco-system of broad
 Backup Partner ISV partners
- Snapshots with CSI interface from ODF ensures backups with open standards

OCP Application Backup – Key Components

3rd party backup Applications

Backup CLI



OADP operator

















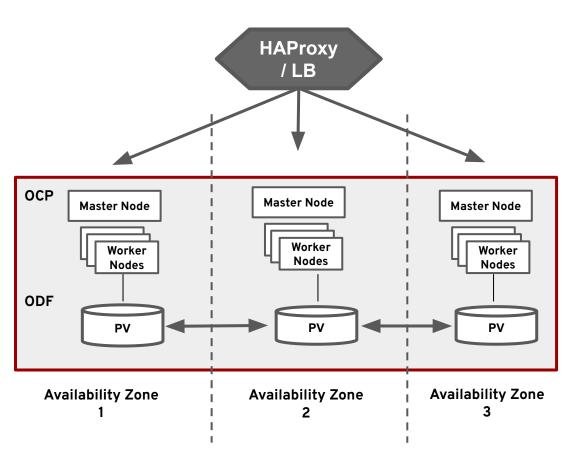
Edge

- Third party backup Applications /native CLI
 - Handles Backup policy management, backup scheduling, retention and restore management and data movement
- OADP OpenShift App Data Protection API
 - Enables namespace or label scoped backups with all ensuing cluster resources and application data (PVs)
 - Ensures OCP version independence and works across storage providers (via pluq-ins)
- ODF PV Snapshots via CSI
 - PV/PVC backups of ODF volumes through standard CSI interfaces
 - Can be used with or without OADP



Application HA

Multi-Zone spanning Cluster for local HA

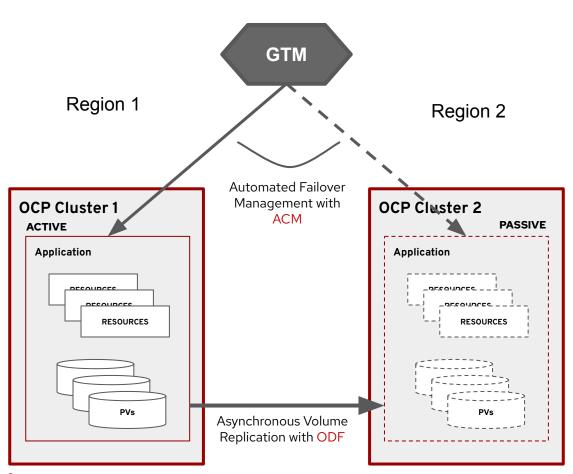


- ► HA for Stateful Applications deployed on cluster that is stretched across Availability Zones within a region
- ► Installer ensures that resources are deployed across all AZs making the cluster resilient against failures of any single AZ
- ODF provides synchronous consistent copies in all AZs ensuring no data loss during zone failures
- ► Suitable for public cloud platforms with Regions supporting 3 or more AZs
 - Can be deployed on-prem when AZs are connected by networks with <10ms latency



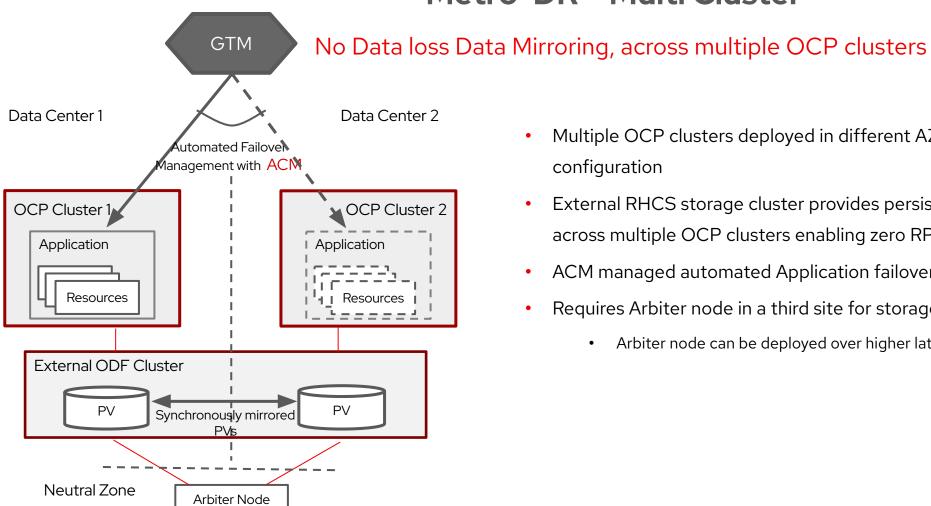
Regional-DR with Failover Automation

Protection against Geographic Scale Disasters



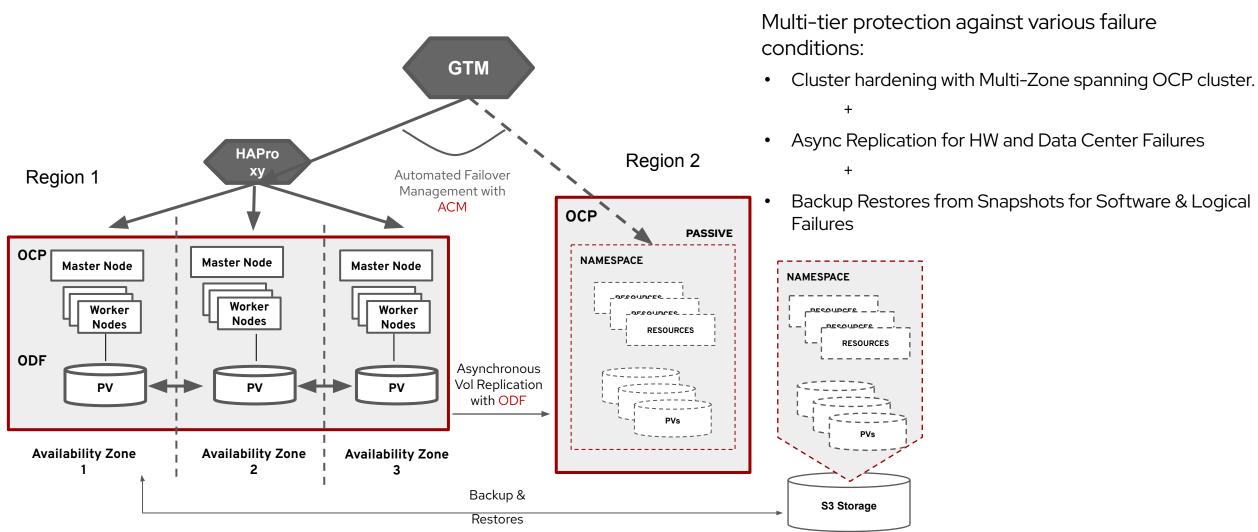
- Asynchronous Volume Replication => low RPO
- ODF enables cross cluster replication of data volumes with replication intervals as low as 1 min
- ODF Storage operators synchronizes both App data PVs and Cluster metadata
- Automated Failover Management => low RTO
 - ACM Multi-Cluster manager enables failover and failback automation at application granularity
- Both clusters remain active with Apps distributed and protected among them

Metro-DR - Multi Cluster



- Multiple OCP clusters deployed in different AZs provide a complete fault isolated configuration
- External RHCS storage cluster provides persistent synchronous mirrored volumes across multiple OCP clusters enabling zero RPO
- ACM managed automated Application failover across clusters reduces RTO
- Requires Arbiter node in a third site for storage cluster
 - Arbiter node can be deployed over higher latency networks provided by public clouds

Comprehensive & Flexible Data Protection for the desired SLO (RPO+RTO)

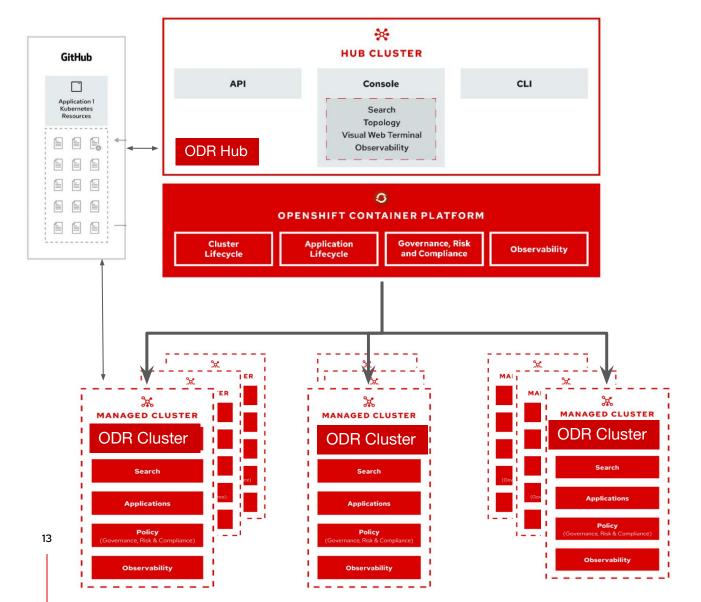


RH-ACM Based DR Automation

DR Automation reduces
RTO

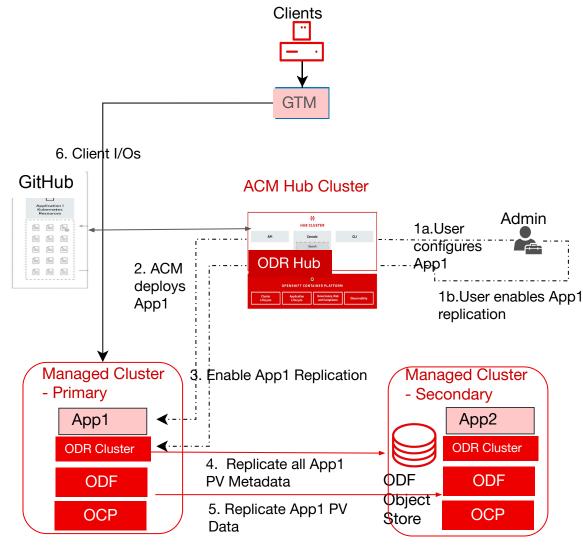


RHACM Managed DR Automation



- ACM provides DR management and monitoring across multiple clusters.
- ACM drives placement of DR enabled applications based on capacity and policy
- DR Orchestration through the centrally managed RH-ACM
 Hub via ODR Hub operator
- ODR Cluster Operator on each managed (workload) cluster manages data replication and synchronization
- ACM Hub cluster is recommended to be placed in a zone neutral to managed clusters

ODF & ACM enables easy DR Configuration

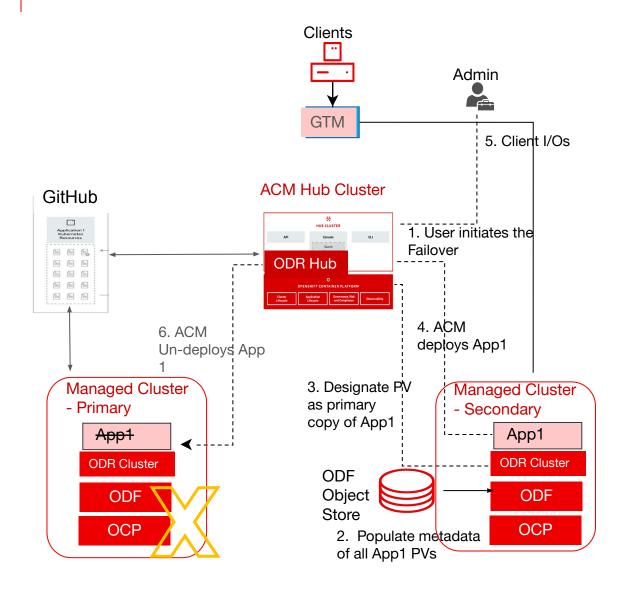


A Centrally deployed ACM Hub managing DR between a pair of Managed clusters deployed at different regions

- Ensures both Application state and Data are replicated and protected
 - Uses ODF Object Store to capture App meta data
- Provide active-active use of both sites, where different applications can be deployed to each site cross replicating to each other
- Flexibility for replica copy to have different storage configuration than primary

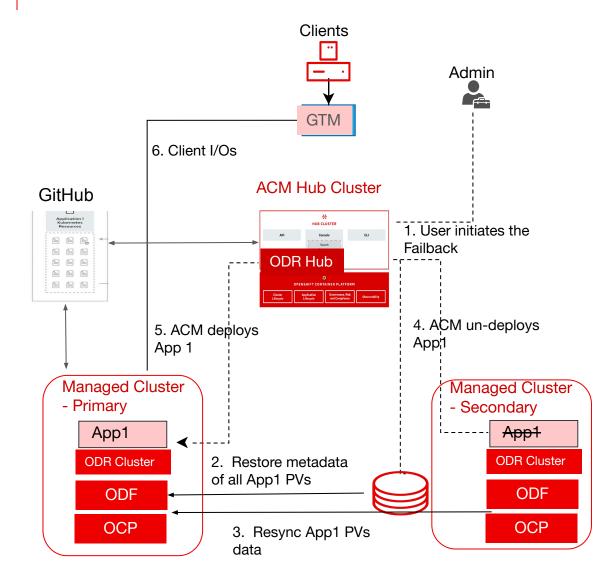


Automated DR Failover reduces RTO



- Failover process automation Increases application availability and reduces user errors
- Application(s) granular Failovers and Policy based prioritized failovers
- Failovers are always user initiated and controlled, eliminates un-intended switch and data loss.
- ODR Hub ensures App metadata is populated before the failover to ensure Apps binds to the right PVs

DR Failback ensures smooth recovery to Primary



- PV Data changes and meta data changes are restored to primary cluster before the fail-back is complete
- Fail-back operations are user initiated and controlled
- Workload migrations across hybrid platforms are also enabled with the same process

OpenShift Resiliency Solution Roadmap

Backup



Regional DR



Metro DR



1H 2022 2H 2022

- RedHat OADP Operator (Feb '22)
- Native OCP DP
- Differentiated from Partner solutions

- Regional DR (GA) May '22
 - Block (RBD) only
 - Simplified Orchestration
 - Resilient ACM Hub

- Metro-DR (GA)
 - Multi-Cluster, ACM Managed

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Alternate DR Solutions

Two Zone Stretch Cluster

HAProxy /LB Availability Zone/Fault Availability Zone/ Fault Domain 1 Domain 2 OCP **Master Node** Master Node Worker Worker Nodes Nodes **ODF ODF** ODF

Availability Zone/

Fault Domain 3

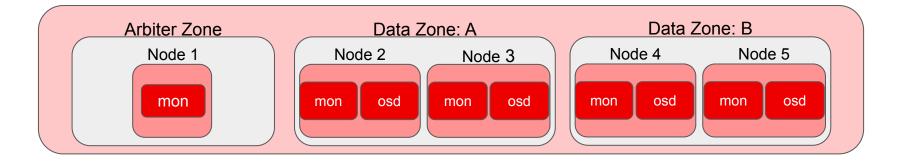
Arbiter Node

RPO – 0 RTO – Mins

No Data loss Data Mirroring, across 2 sites

- Stretch OCP-ODF Cluster across 2 AZs
 - Data replicated across 2 AZ/sites connected by low latency networks
 - Arbiter for Cluster quorum in a neutral AZ/site
 - Minimal resource requirements for Arbiter node contains ODF Mon process and OCP Master node
 - Failure of any node or resource on one AZ triggers automatic redirection of traffic to its cluster pair.

Stretch Cluster Configuration



- Two local copies per data zone for local HA.
 - Requires Replica 4 configuration
- Two Monitors are required for each data zone
 - · A zone is considered down by ODF when all the mons in the zone are unavailable.
- Rook to detect the topology labels of the nodes set by the user and manages ODF resources accordingly

Thank you!

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