State of OpenShift Container Storage

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OpenShift Storage Update

Red Hat

OPENSHIFT STORAGE THEMES

Feature Expansion

Continue to work with upstream community to make sure that CSI is a complete spec, enabling all required features (like resize).

Flexibility

Enable storage to be used flexibility, focus on minimising any outages or lengthy operations

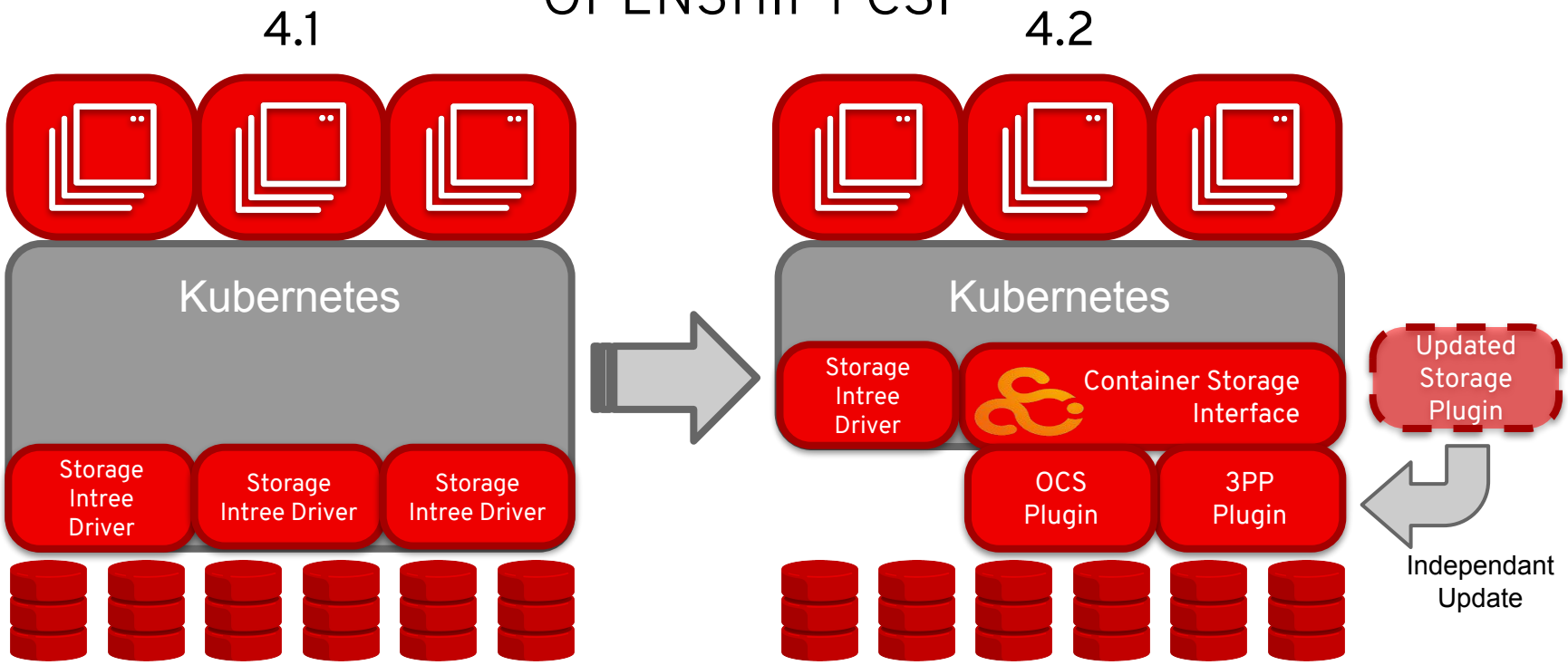
Enabling Choice

Focus on partner certification and enablement. Grow the storage options available on OpenShift by leveraging CSI and Operator Hub. Have OCS as the key OpenShift storage provider.

Observability

Bring in more metrics to allow not just monitoring but event correlation and preemptive actions

OPENSHIFT CSI



CSI: ENABLING OCS AND PARTNERS

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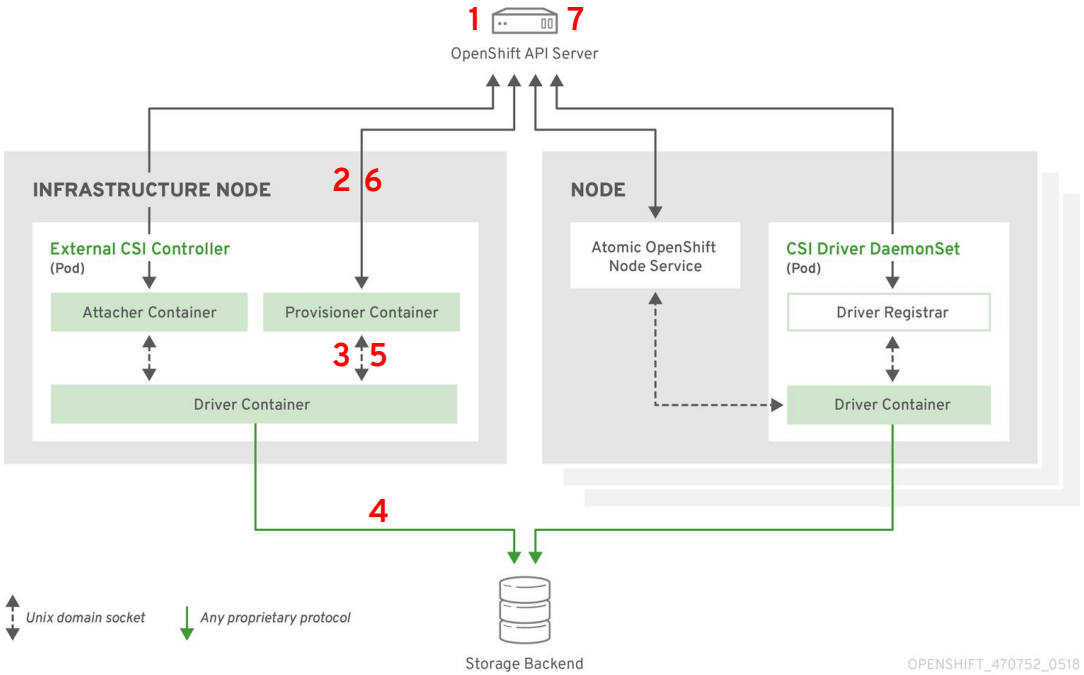
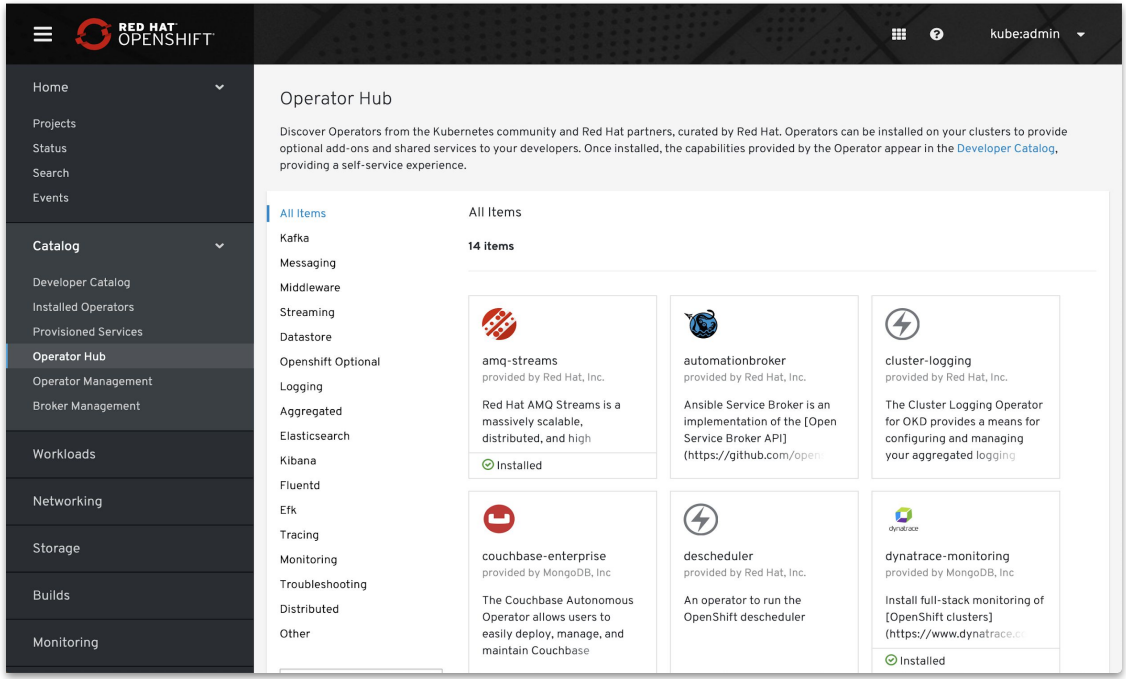
EXAMPLE: DYNAMIC PROVISIONING

1. User creates a PVC (on API server).
2. The external provisioner gets an event that a new PVC was created.
3. The external provisioner initiates CreateVolume call to the CSI driver.
4. The CSI driver talks to storage backend and creates a volume.
5. The CSI driver returns a volume to the external provisioner.
6. The external provisioner creates PV on API server.
7. Kubernetes PV controller finishes the binding (PVC is Bound).



OPERATORS IN OPENSHIFT

Operator Hub - Allows administrators to selectively make operators available from curated sources to users in the cluster.



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4.4 STORAGE DEVICES

Continued improvements

- CSI API work
  - Snapshot/Restore to Tech Preview
  - Clone to Tech Preview
  - Sidecar rebase
- Partner enablement
  - CSI Test Suite now included in 4.4
- Lots of extra focus on upstream work

OCP Supported	
AWS EBS	Fibre Channel
Azure File & Disk	HostPath
GCE PD	Local Volume
VMware vSphere Disk	Raw Block
NFS	iSCSI
Supported via OCS	
File , Block, Raw Block, Object	
Supported via OSP	
Cinder	

OPENSHIFT STORAGE ROADMAP

Near Term (4.4)

- CSI
  - Snapshot Tech Preview
  - Clone Tech Preview
  - Certification suite

Medium Term (4.5)

- CSI API
  - Resize (GA)
  - Cloning (GA)
  - Raw Block (GA)
- CSI Drivers
  - AWS EBS (Tech Preview)
  - Ephemeral aka Inline Volumes (Tech Preview)
- Enhancements
  - Local Storage discovery
  - Recursive permissions

Long Term (4.6+)

- CSI
  - Migration
  - Snapshot/Restore to GA
  - Cloud provider CSI drivers
  - Ephemeral storage GA
- 3rd Party vendor storage
- More customer RFEs
- Storage metrics

RED HAT®
OPENSHIFT
Container Storage

Dynamic, shared, and highly available storage for OpenShift applications

Eran Tamir
Product Management

Red Hat

What is OpenShift Container Storage ?

Highly scalable, production-grade persistent storage

- For **stateful applications** running in Red Hat® OpenShift
- Optimized for Red Hat **OpenShift Infrastructure services**
- Developed, released and deployed in synch with Red Hat OpenShift
- Supported via a single contract with Red Hat OpenShift
- Complete persistent storage fabric across hybrid cloud for OCP

Red Hat OpenShift Container Storage

Options

- Runs in all possible infrastructure environments
- No vendor lock-in: Freedom of choice

Efficiency

- Use of automation to improve efficiency
- Increase utilization of existing storage
- Meets container application's storage needs and protocols

Scalability

- Start small and scale to future needs
- Always balanced and optimized
- Handles petabytes of data

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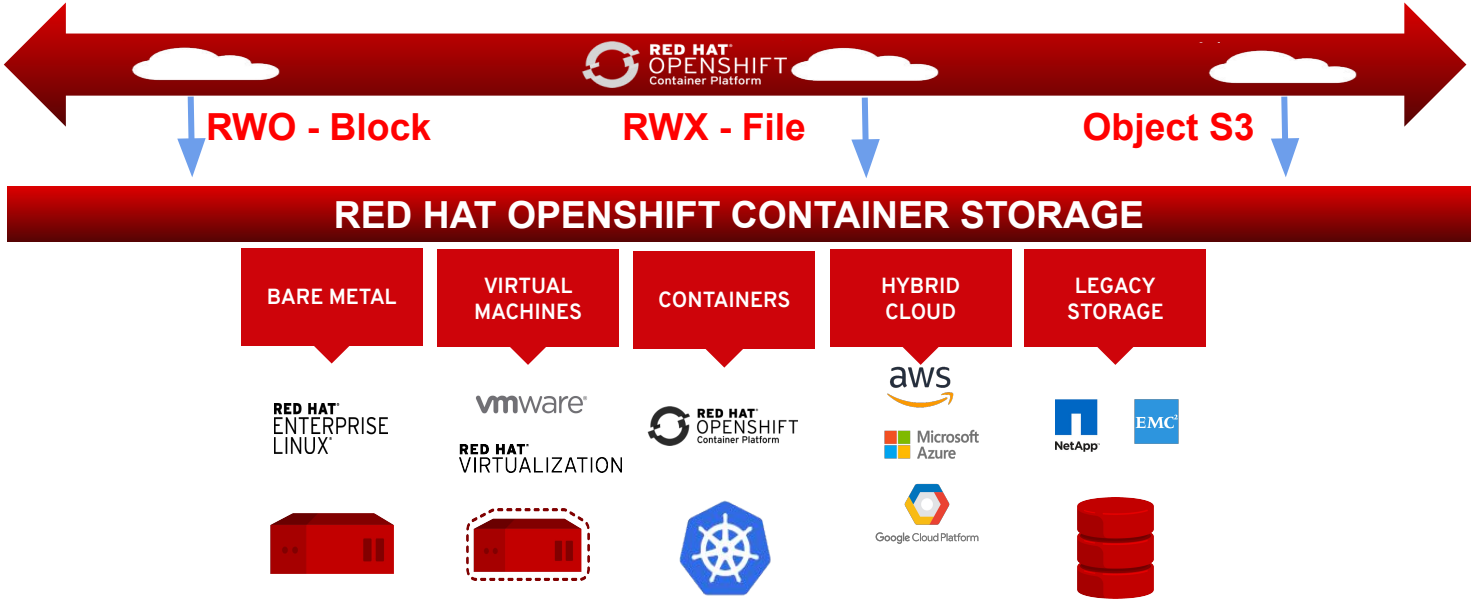
Complete Storage for Container Platform



Provides Storage for All Apps and infrastructure Services in their native interfaces

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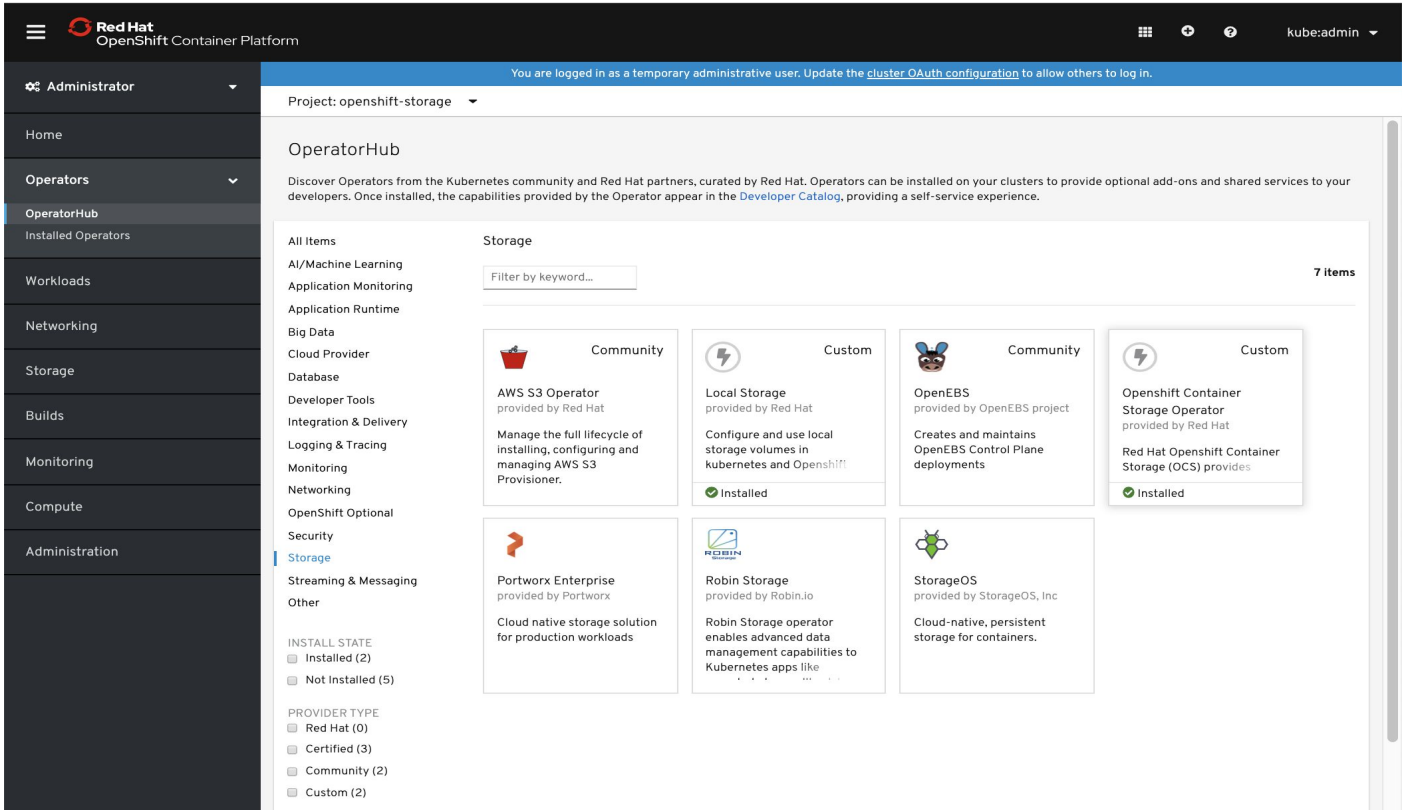
Operator Driven Install from OLM



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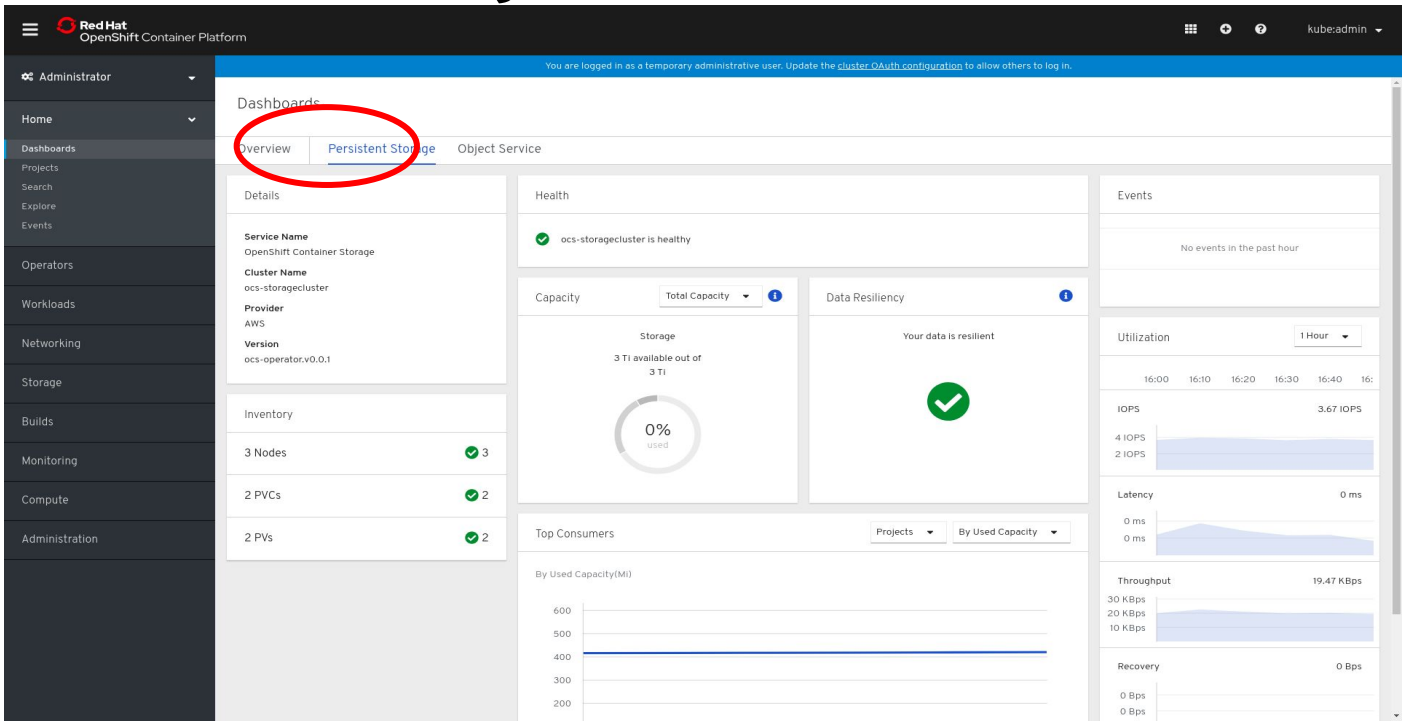
Integrated Dashboard



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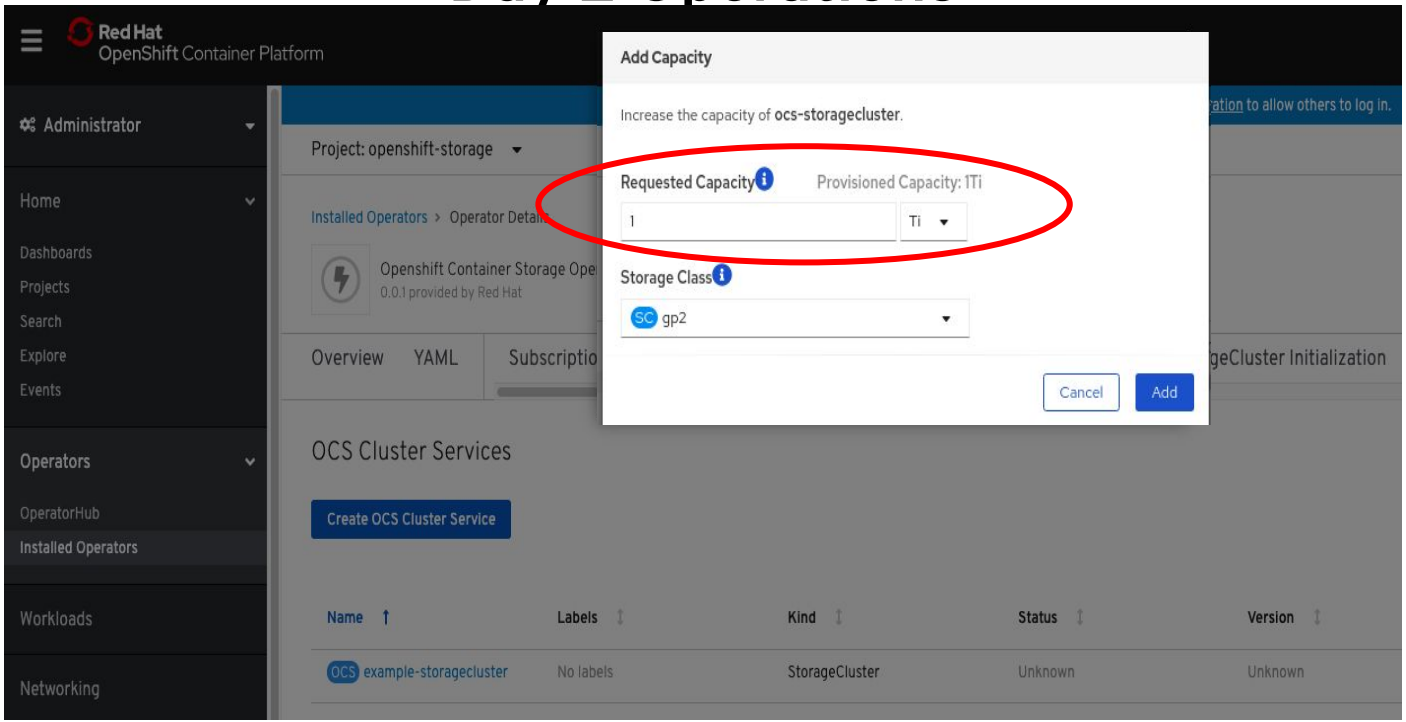
Day 2 Operations



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Hybrid and Data Services

Multi Cloud Object Gateway

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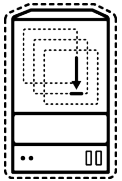
MULTI-CLOUD OBJECT GATEWAY

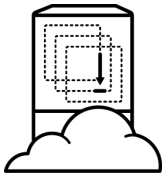
Start lean

A single lightweight pod for basic development and tests



Scale locally

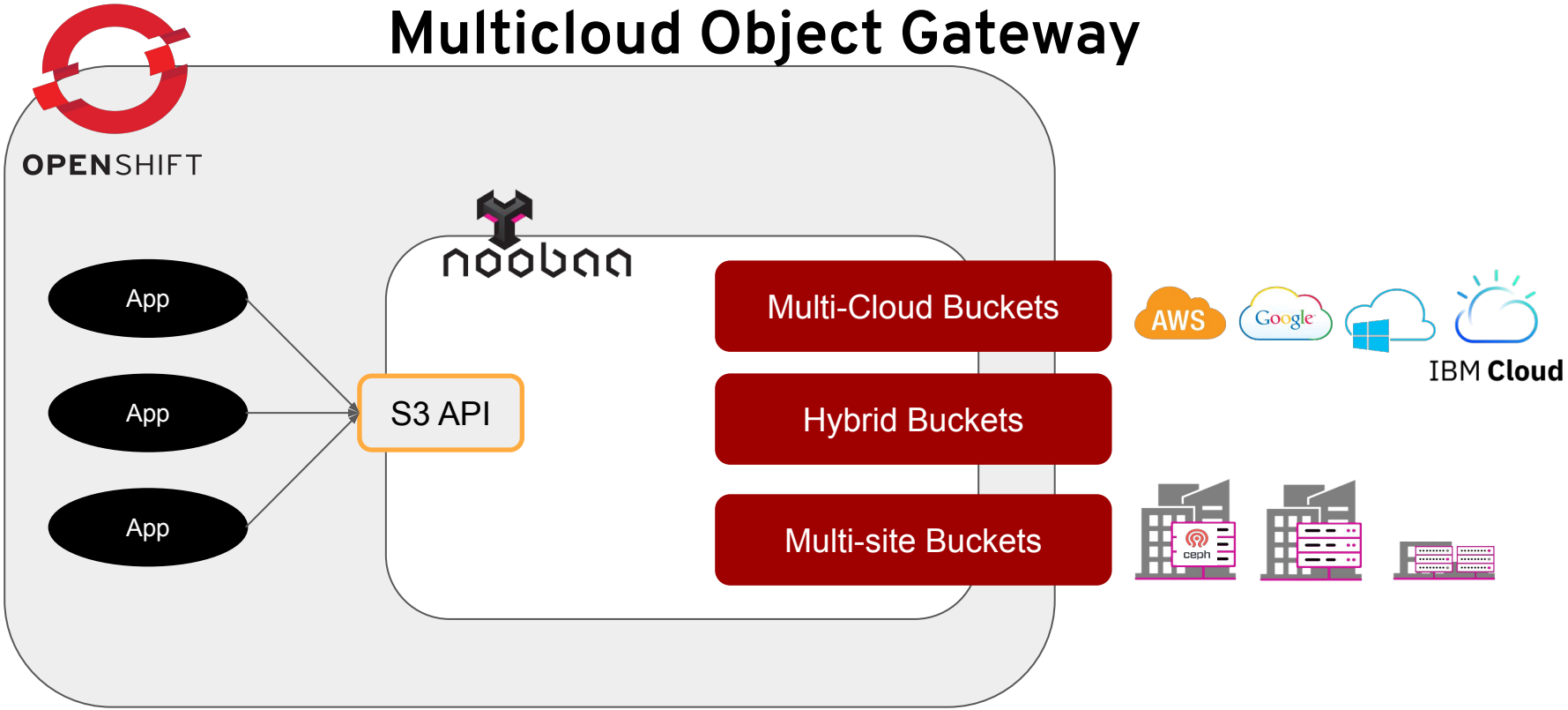
Scale with local volumes or Red Hat Ceph Storage



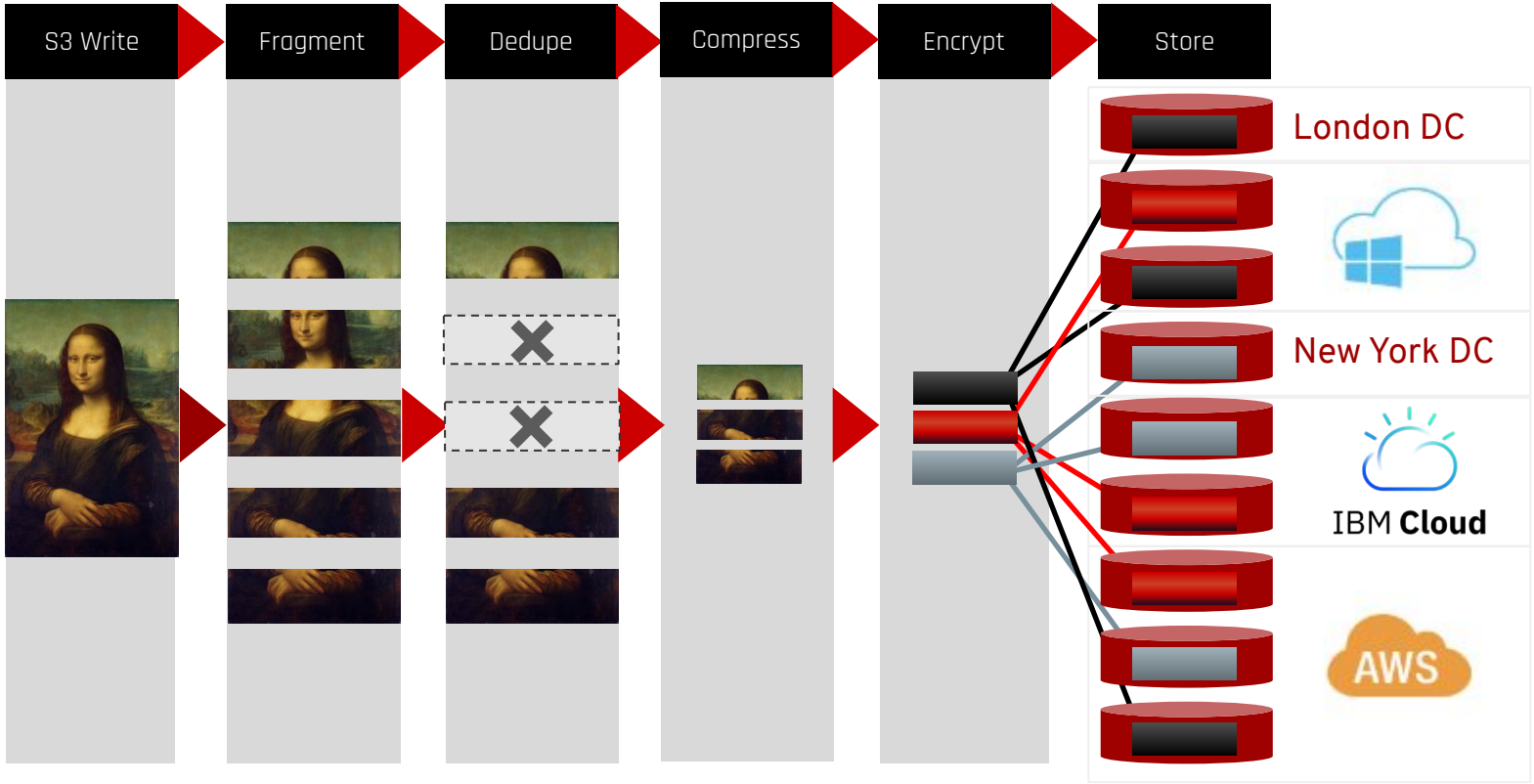
Workload portability

Easily mirror data to other cluster or native cloud storage

Multicloud Object Gateway



EFFICIENCY AND SECURITY BY DEFAULT



Workloads & Technology

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Workloads per Service

Persistent Volume

Block

- Primary for DB and Transactional workloads
- Low latency
- Messaging

Provided by Rook-Ceph

Shared File System

- POSIX-compliant shared file system
- Interface for legacy workloads
- CI/CD Pipelines
- AI/ML Data Aggregation

Provided by Rook-Ceph

Object Service

- Media, AI/ML training data, Archiving, Backup, Health Records
- Great Bandwidth performance
- Object API (S3/Blob)

Provided by Multi-Cloud Object Gateway

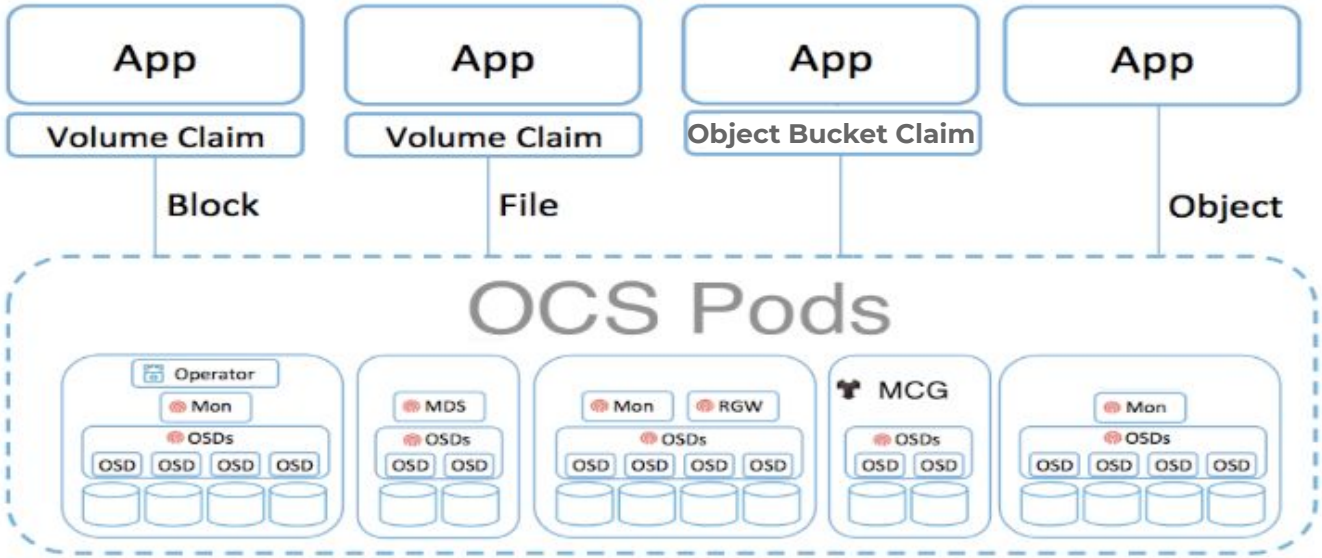
OCP 4 with OCS 4 - Technology Stack

Easy & Automated Management with Operators

Highly Resilient & Scalable Storage System

Multi-Cloud & Hybrid Object Storage

OCS Operator based on Operator SDK with Operator Lifecycle Manager (OLM)



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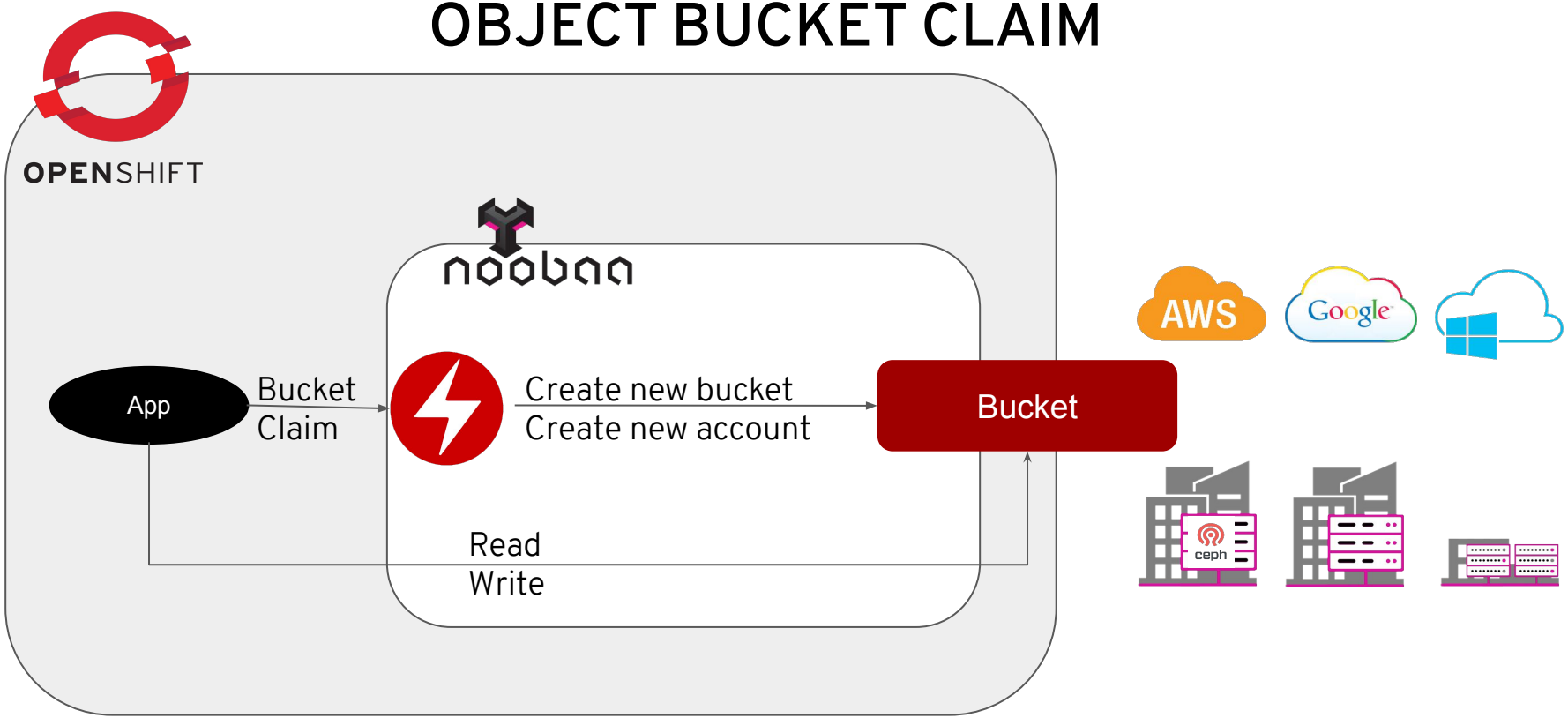
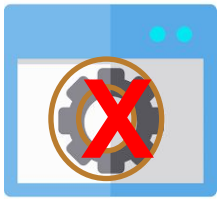
OBJECT BUCKET CLAIM



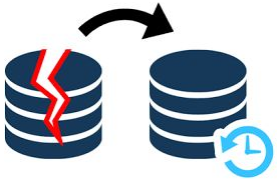
Data Protection

Backup & Disaster Recovery (DR)



Backup Solution

- Protection against Logical failures
  - User errors – accidental deletion, Bad Actors, Application software bugs, Malicious software - virus,
- Restore to the previous point-in-time copy of the data and/or application state
- Based on Snapshots – local and/or remote



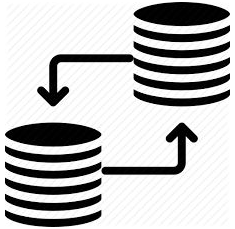
WAN DR Solution

- Protection against Data Center disasters with large blast radius
  - Data Center failures due to power grid or HVAC issues, Geographic scale natural disasters – flooding, earthquakes
- Automated Failover to remote Standby or Hot site with Async Replication

Metro HA-DR Solution

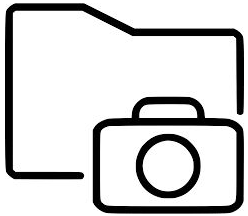
- Protection against HW failures with small blast radius
  - Hardware component, systems or rack level failures
- Automatic Failover across Availability Zones with Sync Mirroring

Building blocks for OCP-OCS Data Protection



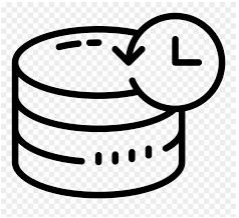
Data Mirroring

Synchronous data copy provides resiliency against HW failures without data loss



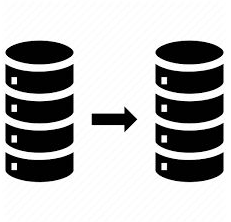
Snapshots

Point-in-Time consistent data copies provides protection against logical failures



Backup

Building upon snapshots, backups enable restoring applications to pre-failure state



Data Replication

Data asynchronously copied to remote sites enable application recovery for data center failures

What next?

OpenShift Container Storage 4 Backlog

Platforms [Alongside effort]

- OpenStack
- Azure
- Google
- IBM Cloud
- RHV
- Alibaba

Multicloud Object Gateway

- Multi-Cluster HA
- Cache mode for edge
- MCM integration for multi-cluster deployment and dashboard
- Namespace policies

Data Protection

- **Backup**
  - Snapshots/Clone/Restore
  - Backup API for 3rd party partners
- **Disaster Recovery** - Manual failover
  - Active/Passive solution with async replication
- **HA Disaster Recovery** - Automatic failover in low latency
  - Stretch cluster with arbiter
  - Multi Cluster - sync replication or volumes

Security

- Encryption at rest and in transit
- KMS integration

Scalability

- Independent mode - Shared, Scalabale Storage
- Support for 10K PVs in 20 nodes

https://www.openshift.com/storage

Thank you

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