



# OpenShift Backup / Restore / Disaster recovery

Optional subheading

Alfred Bach  
PSA EMEA

Presenter's Name  
Title

# Introduction

Optional subheading

## ephemeral adjective

ephem·er·al | \ i-'fem-rəl ⓘ, -'fēm-; -'fe-mə-, -'fē- ⓘ \

### Definition of *ephemeral* (Entry 1 of 2)

- 1 : lasting a very short time  
*// ephemeral pleasures*
- 2 : lasting one day only  
*// an ephemeral fever*

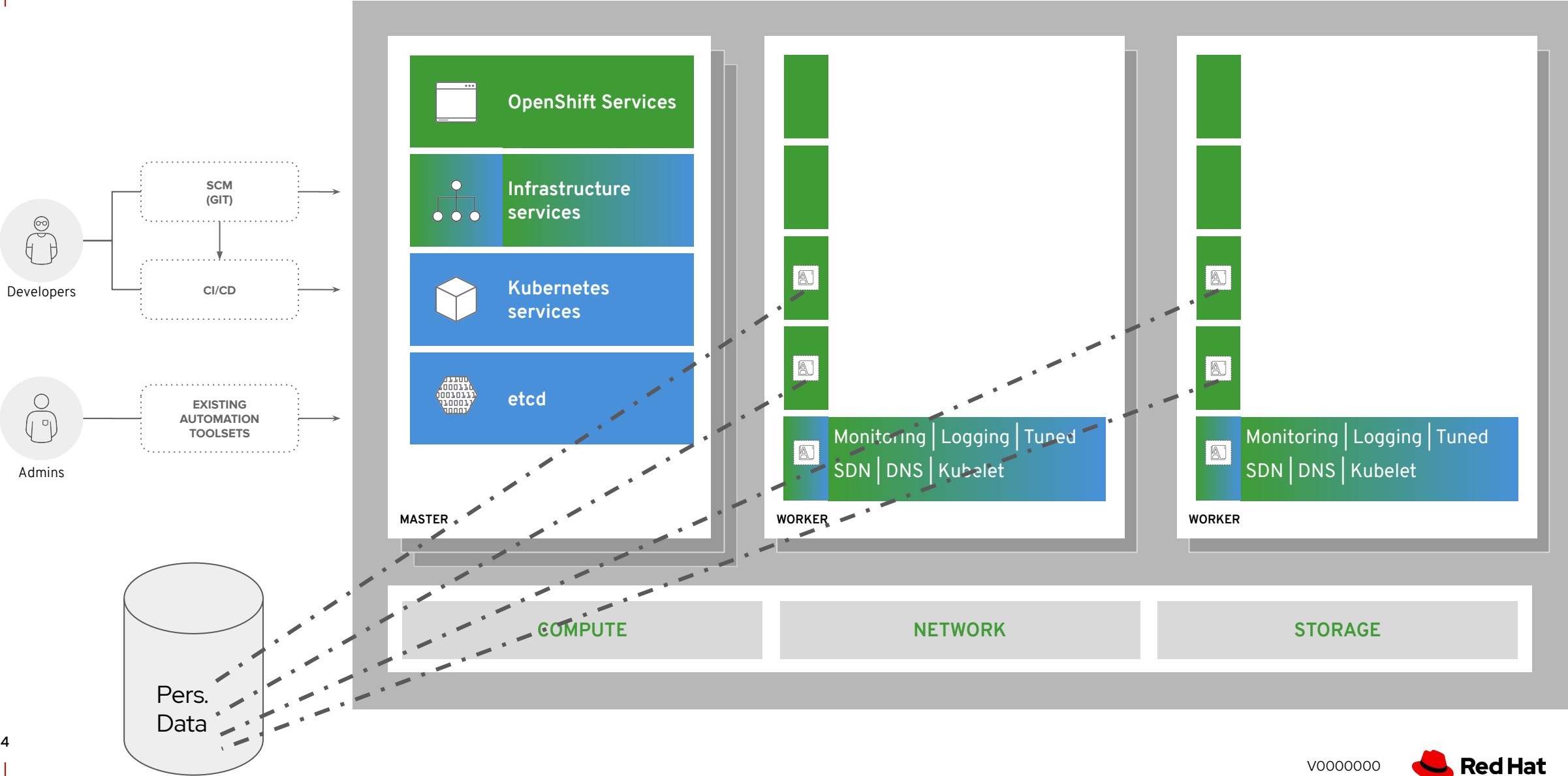
OpenShift provides a lot of container resilience. If a Pod dies and was created through one of the higher level resources (ReplicaSet, Deployment, StatefulSet, etc), OpenShift will recreate it.

However, there are some circumstances where you want to preserve the cluster configuration and restore it in the case of a problem.

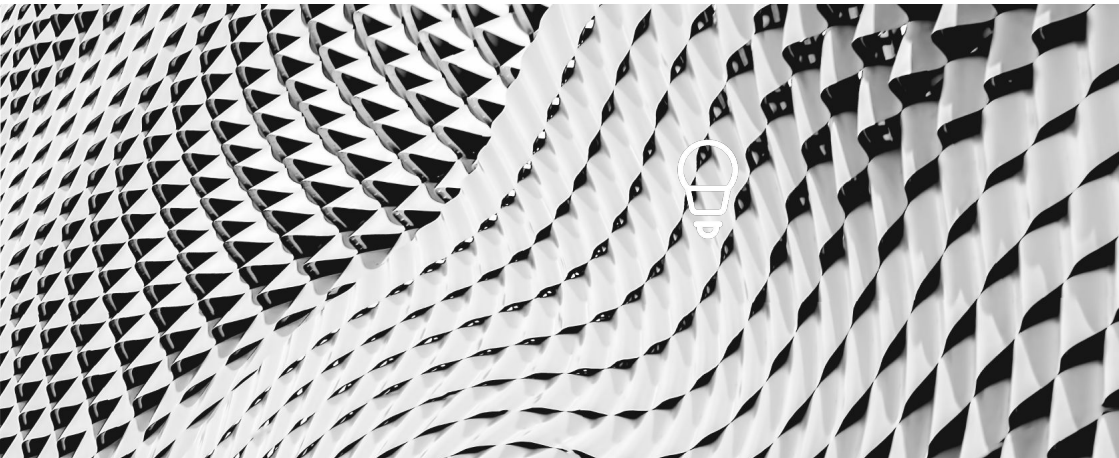
# Control Plane and Data Plane

From the OpenShift and Kubernetes perspective, there is a clear definition of the Control Plane, but, when it comes to the Data Plane, it is loosely defined and its definition is normally based on the context it is being used. To avoid confusion, this is the way we use the terms here:

- **OpenShift Control Plane** : The *OCP Control Plane* is comprised of the Kubernetes Control Plane<sup>1</sup> (Kubernetes Master<sup>2</sup> and the *kubelet* process in each node). For the purpose of this book, we are considering the OpenShift consoles, logging, metrics, and cluster monitoring services as part of this plane.
- **OpenShift Data Plane**: The term *OCP Data Plane*, even when not officially defined in the OKD and OCP documentation, is normally used to describe the traffic forwarding plane of the SDN layer.



# OpenShift backup and restore



# Etcd key-value store backup

The etcd backup procedure can be performed on any etcd node, and consists of the following steps:

- 1 Stop the etcd service: `systemctl stop etcd`
- 2 Create an etcd backup: `etcdctl backup --data-dir /var/lib/etcd --backup-dir ~/etcd.back`
- 3 Copy the etcd `db` file: `cp /var/lib/etcd/member/snap/db ~/etcd/member/snap/db`
- 4 Start the etcd service: `systemctl start etcd`

The etcd key-value store recovery procedure is performed on etcd nodes and consists of the following steps:

- 1 Create a single node cluster
- 2 Restore data to `/var/lib/etcd/`, from backup, while etcd is not running
- 3 Restore `/etc/etcd/etcd.conf`, from backup
- 4 Restart etcd
- 5 Add new nodes to the etcd cluster

# Open Shift nodes

There is no specific need to save any data on an OpenShift node, since there is no stateful data; you can easily reinstall all of the nodes one by one, or while reinstalling the OpenShift cluster.

## Persistent storage

In many cases, OpenShift pod persistent data can be saved and restored with the `oc rsync` command, but it is not the most reliable and efficient method. Persistent storage backup procedures are very different for every storage type, and must be considered separately.

# Backup Methodes





portworx<sup>®</sup>  
by Pure Storage<sup>®</sup>

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## PX Backup

Easily  
backup and  
restore all  
your  
Kubernetes  
applications

← PX-Central / PX-Backup

All clusters ▾

	NAME	CLUSTER	NAMESPACE	VOLUMES	RESOURCES	
IN PROGRESS (10)	backup-mar-19-2020-13-29-01	aks-cluster	example-namespace	3 of 6	41 of 82	
	restore-mar-20-2020-19-24-28	aks-cluster	production-srv1	3 of 6	41 of 82	
	backup-mar-17-2020-12-51-34	aks-cluster	dev-srv2	3 of 6	41 of 82	
FAILED (3)	first-restore-name	aks-cluster	ns-wordpress	3	41	
	second-backup-name	cluster-two	production-srv1	5	89	
	restore-name-three	third-cluster-name	dev-srv2	2	24	
SUCCESSFUL (6)	first-restore-name	aks-cluster	ns-wordpress	3	41	
	second-backup-name	cluster-two	production-srv1	7	89	
	restore-name-three	third-cluster-name	dev-srv2	9	24	

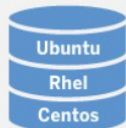


## MACHINE DEFINED CONTROL PLANE

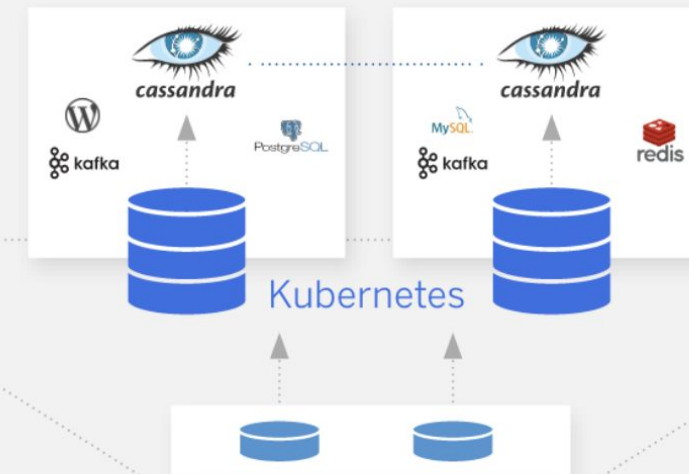
App runs on single machine  
Focus is on machine provisioning and lifecycle management  
Driven by a VM, Storage, and Network Admin

VMWARE/Cloud

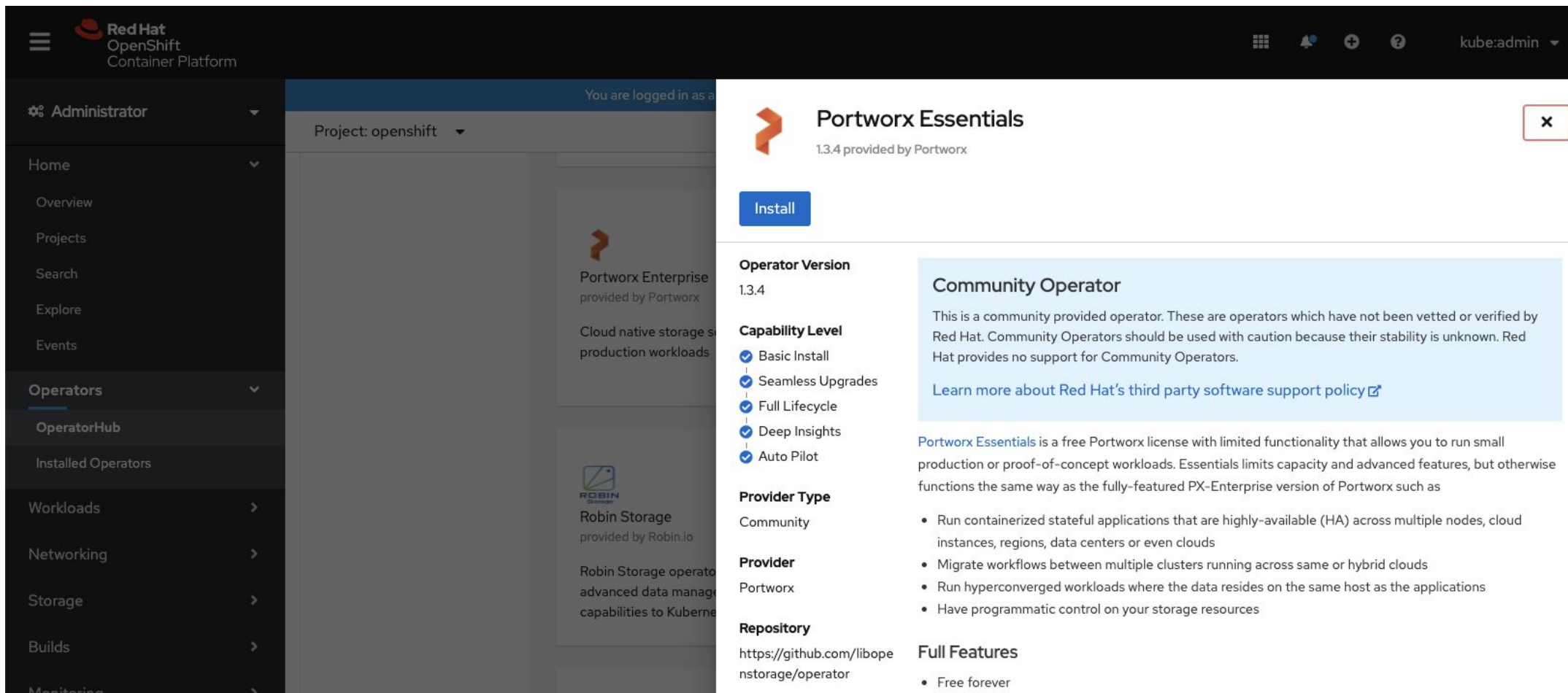
LUNS



## APP DEFINED CONTROL PLANE



App runs across multiple machines  
Focus is on app aware infrastructure provisioning and lifecycle  
Driven by end user (application owner)



The screenshot shows the Red Hat OpenShift Container Platform interface. The left sidebar contains navigation links: Administrator, Home, Overview, Projects, Search, Explore, Events, Operators (selected), OperatorHub, Installed Operators, Workloads, Networking, Storage, Builds, and Monitoring. The main content area displays the Portworx Essentials operator page. The operator is version 1.3.4, provided by Portworx. It is a Community Operator, which means it has not been vetted or verified by Red Hat. The page lists the operator's capabilities: Basic Install, Seamless Upgrades, Full Lifecycle, Deep Insights, and Auto Pilot. It also shows the provider type as Community and the repository as https://github.com/libopenstorage/operator. The full features list includes: Run containerized stateful applications that are highly-available (HA) across multiple nodes, cloud instances, regions, data centers or even clouds; Migrate workflows between multiple clusters running across same or hybrid clouds; Run hyperconverged workloads where the data resides on the same host as the applications; and Have programmatic control on your storage resources.

**Portworx Essentials**  
1.3.4 provided by Portworx

[Install](#)

**Operator Version**  
1.3.4

**Capability Level**

- ✓ Basic Install
- ✓ Seamless Upgrades
- ✓ Full Lifecycle
- ✓ Deep Insights
- ✓ Auto Pilot

**Provider Type**  
Community

**Provider**  
Portworx

**Repository**  
<https://github.com/libopenstorage/operator>

**Community Operator**

This is a community provided operator. These are operators which have not been vetted or verified by Red Hat. Community Operators should be used with caution because their stability is unknown. Red Hat provides no support for Community Operators.

[Learn more about Red Hat's third party software support policy](#)

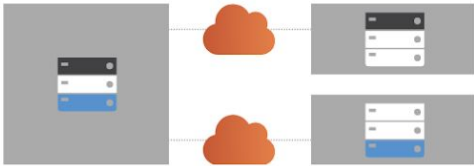
**Portworx Essentials** is a free Portworx license with limited functionality that allows you to run small production or proof-of-concept workloads. Essentials limits capacity and advanced features, but otherwise functions the same way as the fully-featured PX-Enterprise version of Portworx such as

- Run containerized stateful applications that are highly-available (HA) across multiple nodes, cloud instances, regions, data centers or even clouds
- Migrate workflows between multiple clusters running across same or hybrid clouds
- Run hyperconverged workloads where the data resides on the same host as the applications
- Have programmatic control on your storage resources

**Full Features**

- Free forever

## Use Cases



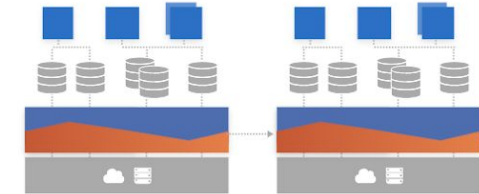
### Backup

Backup entire Kubernetes applications, including data, app configuration, and Kubernetes objects across clouds.



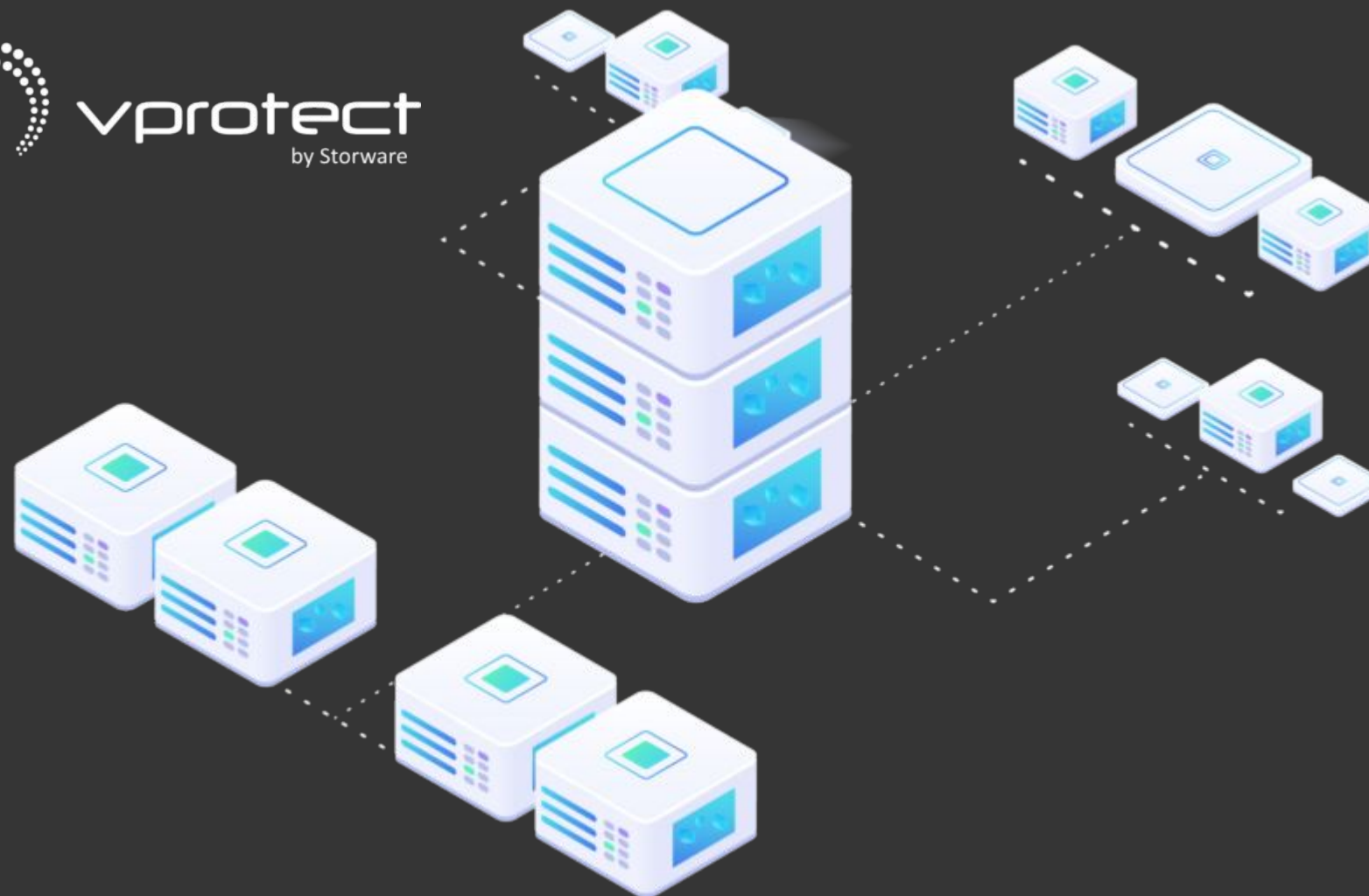
### Restore

Restore any Kubernetes application to any Kubernetes cluster in the cloud or on-prem.



### Migrate

Move a single Kubernetes application or an entire namespace between clusters in a single data center or between environments.



**Red Hat OpenShift Container Platform**

You are logged in as a

Project: openshift

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**StorageOS**  
provided by StorageOS

Cloud-native, persistent storage for containers.

**vProtect Operator**  
provided by Storware

Storware vProtect is a backup solution for virtual environments. It facilitates backup and recovery of virtual machines and containers.

**Zadara Operator**  
provided by Zadara

**vProtect Operator**  
0.0.1 provided by Storware

**Install**

**Operator Version**  
0.0.1

**Capability Level**

- ☒ Basic Install
- ☐ Seamless Upgrades
- ☐ Full Lifecycle
- ☐ Deep Insights
- ☐ Auto Pilot

**Provider Type**  
Certified

**Provider**  
Storware

**Repository**  
N/A

**Container Image**

The operator allows you to deploy:

- MariaDB
- vProtect Server
- vProtect Node in one go.

The operator can monitor to see if the components are present. If they're not, the operator will install the MariaDB, vProtect Server and vProtect Node correctly without any user interaction!

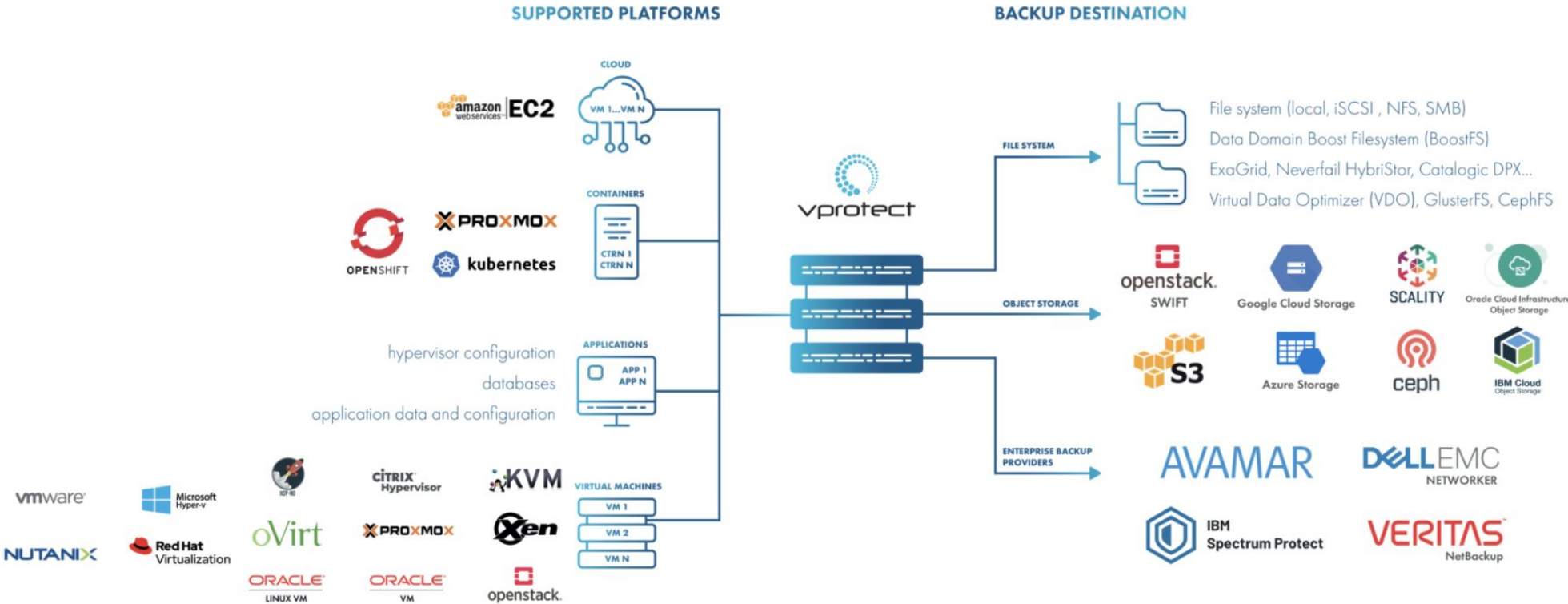
All you have to do is install the operator and create an instance of MariaDB, vProtect Server and vProtect Node by creating a custom resource of type VProtectDBServerNode.

**How to get the Application Images from registry?**

- First Login to redhat catalogue webpage using your credentials.
- Search for the Operator.
- Click on the Operator.
- There is a description that redirects you (upon clicking) to page that explains how to create service accounts.
- Create a Service Account. Refer page : <https://access.redhat.com/terms-based-registry/#/accounts>
- Once a service account is created , you can click on it and then navigate to tab Openshift Secret to get the yaml file for your ImagePullSecret.



# vProtect 3.9 architecture





### Disaster Recovery

Reduces time to recovery in case of infrastructure loss, data corruption, and/or service outages.



### Data Migration

Enables cluster portability by easily migrating Kubernetes resources from one cluster to another.



### Data Protection

Offers key data protection features such as scheduled backups, retention schedules, and pre or post-backup hooks for custom actions.

Velero is an open source tool to safely backup and restore, perform disaster recovery, and migrate Kubernetes cluster resources and persistent volumes.



## Features



### Back up Clusters

Backup your Kubernetes resources and volumes for an entire cluster, or part of a cluster by using namespaces or label selectors.

### Schedule Backups

Set schedules to automatically kickoff backups at recurring intervals.



### Backup Hooks

Configure pre and post-backup hooks to perform custom operations before and after Velero backups.

# OpenShift Snapshot

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Getting  
Started with  
Volume  
Snapshots in  
OpenShift 4

V0000000

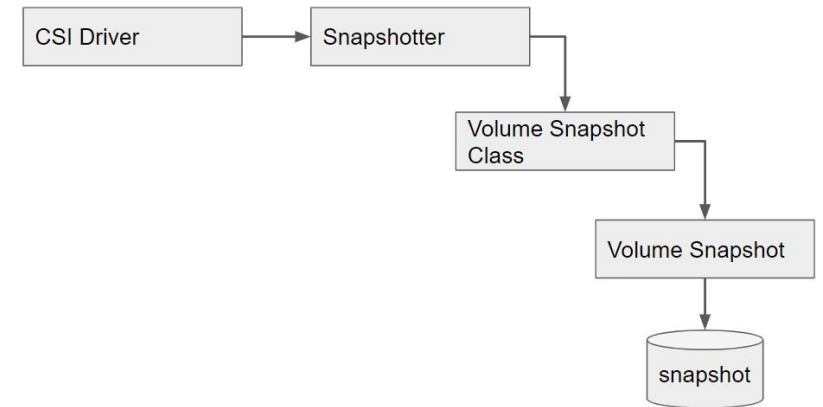


## Overview

Volume snapshots are the ability to create snapshots of persistent volumes in kubernetes using the container storage interface (csi) driver. The csi driver allows storage solutions to integrate into kubernetes and expose their technologies. Snapshots of course, have been and are a key technology when discussing data workloads because they enable backup/restore seamlessly, on-demand and in a split second. Even though volume snapshots are in the alpha stage, several storage providers already have integrations, including one that is very interesting, Ceph RDB.

## How it Works

The CSI driver allows for a snapshotter to be implemented. The snapshotter runs as a side-car container and watches the kubernetes API for snapshot related events from the CSI driver. In order to create a volume snapshot a volume snapshot class must exist. This is similar to the storage class but defines the snapshotter and access to the appropriate CSI driver. Once a volume snapshot class exists a volume snapshot can be created for a given persistent volume claim (pvc). The volume snapshot will then trigger the snapshot operation on the storage device, in this case Ceph RBD. The volume snapshot allows the snapshotter to provide metadata about the snapshot contents to the end-user.



Red Hat

OpenShift

Container Platform

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Project: openshift ▼

Cloud native storage s

production workloads




Robin Storage

provided by Robin.io

Robin Storage operato

advanced data manage

capabilities to Kuberne




StorageOS

provided by StorageOS,

Cloud-native, persiste

for containers.



SnapScheduler

1.1.1 provided by Backube

Install

Operator Version

1.1.1

Capability Level

☒ Basic Install

☒ Seamless Upgrades

☒ Full Lifecycle

☐ Deep Insights

☐ Auto Pilot

Provider Type

Community

Provider

Backube

Repository

https://github.com/backu  
be/snapscheduler

Community Operator

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About this operator

The SnapScheduler operator takes snapshots of CSI-based PersistentVolumes according to a configurable Cron-like schedule. The schedules include configurable retention policies for snapshots as well as selectors to limit the volumes that are snapshotted. An example schedule could be:

*Snapshot all volumes in a namespace daily at midnight, retaining the most recent 7 snapshots for each volume.*

Multiple schedules can be combined to provide more elaborate protection schemes. For example, a given volume (or collection of volumes) could be protected with:

- 6 hourly snapshots
- 7 daily snapshots

# RED HAT® OPENSIFT

Container Storage

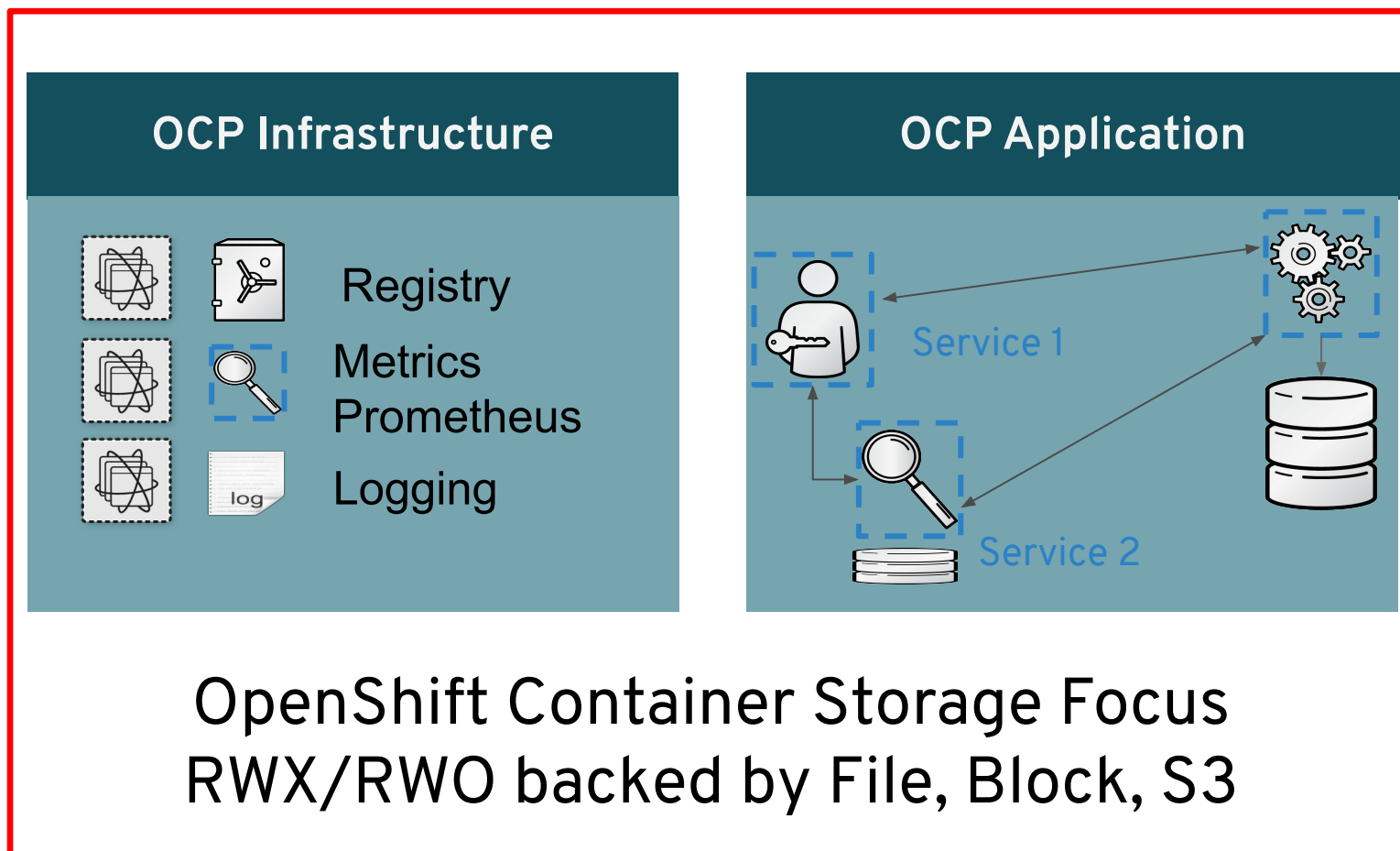
Dynamic, shared,  
and highly available  
storage for  
OpenShift  
applications

# What is OpenShift Container Storage ?

## Highly scalable, production-grade persistent storage

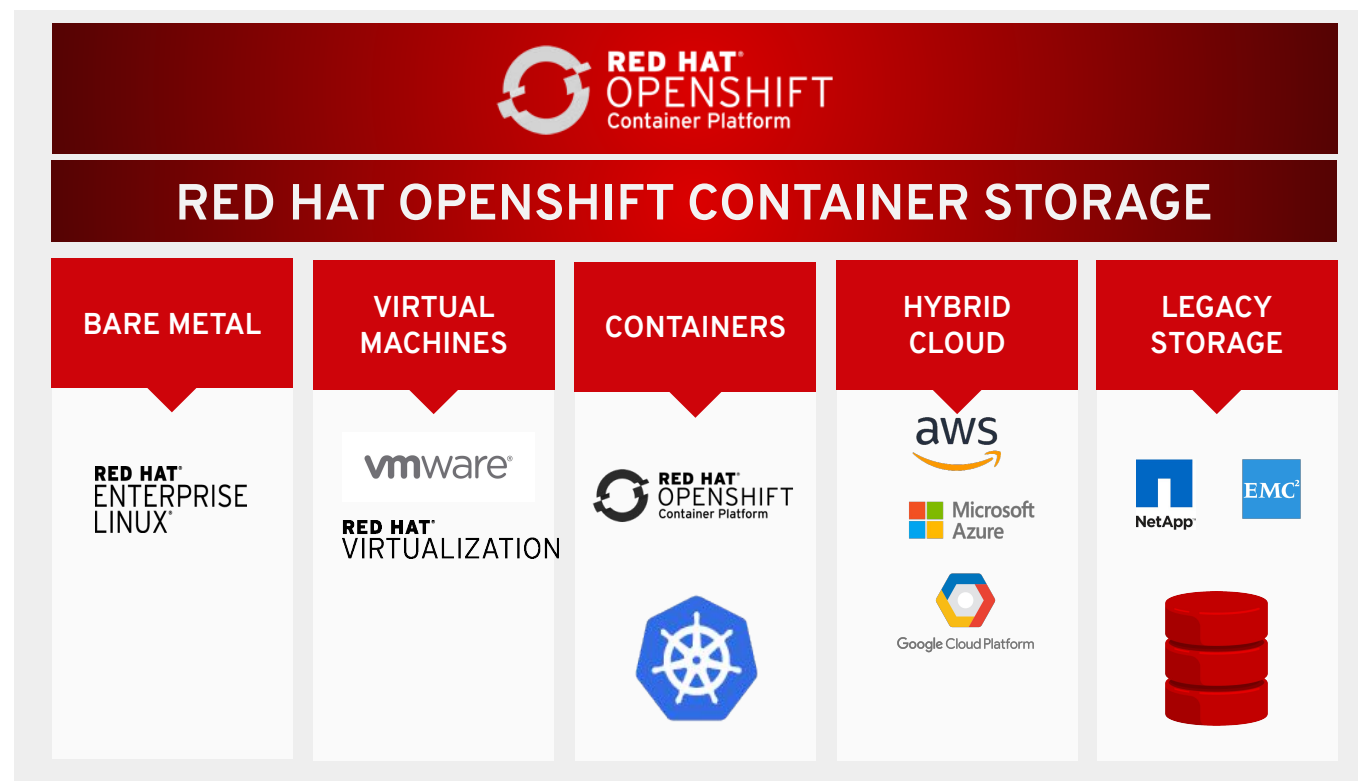
- For **stateful applications** running in Red Hat® OpenShift
- Optimized for Red Hat **OpenShift Infrastructure services**
- Developed, released and deployed in synch with Red Hat OpenShift
- Supported via a single contract with Red Hat OpenShift
- Complete persistent storage fabric across hybrid cloud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

# Why do you need Persistent Storage?





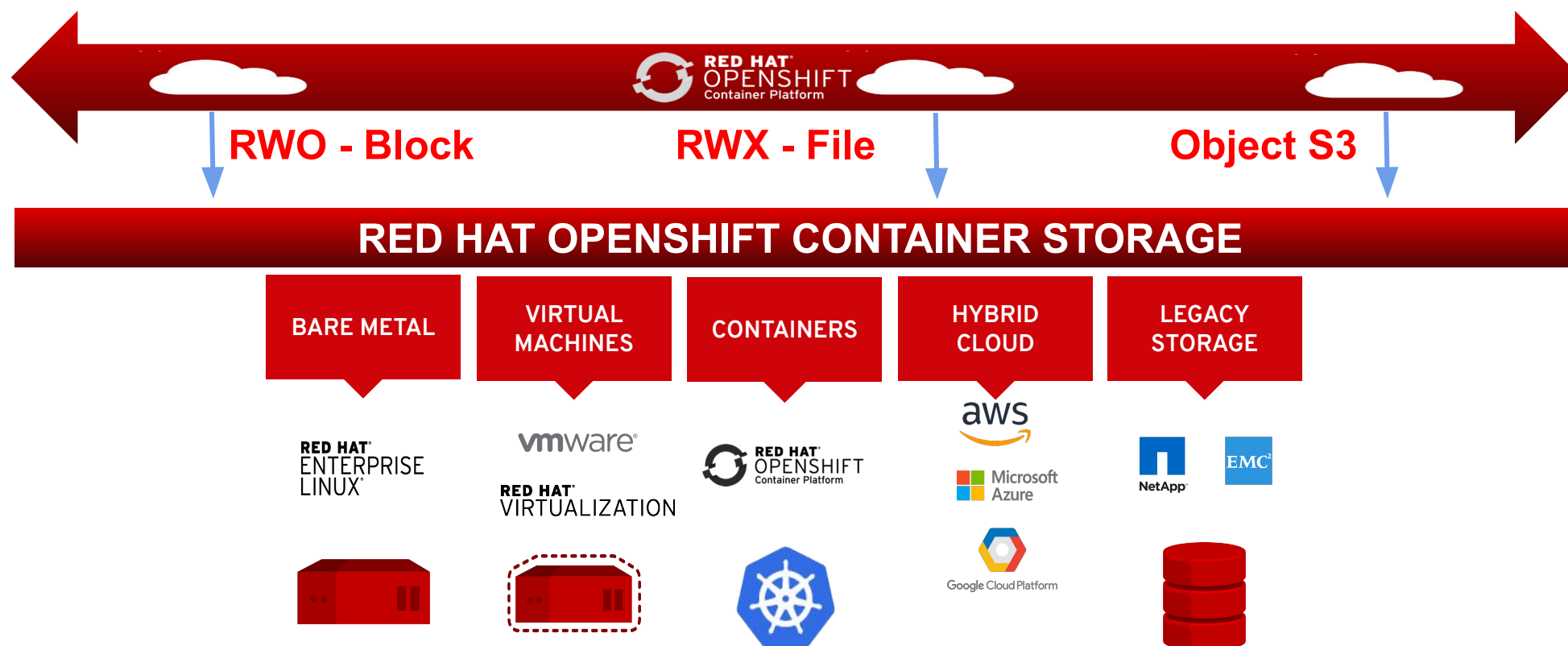
# Consistent storage management, and operations



ANY CLOUD. ANY APP. NO LOCK IN


Future Proof against cloud or infrastructure lock-in

# Complete Storage for Container Platform




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

# Focus Areas



**EASE OF USE  
DAY 1 & DAY 2**

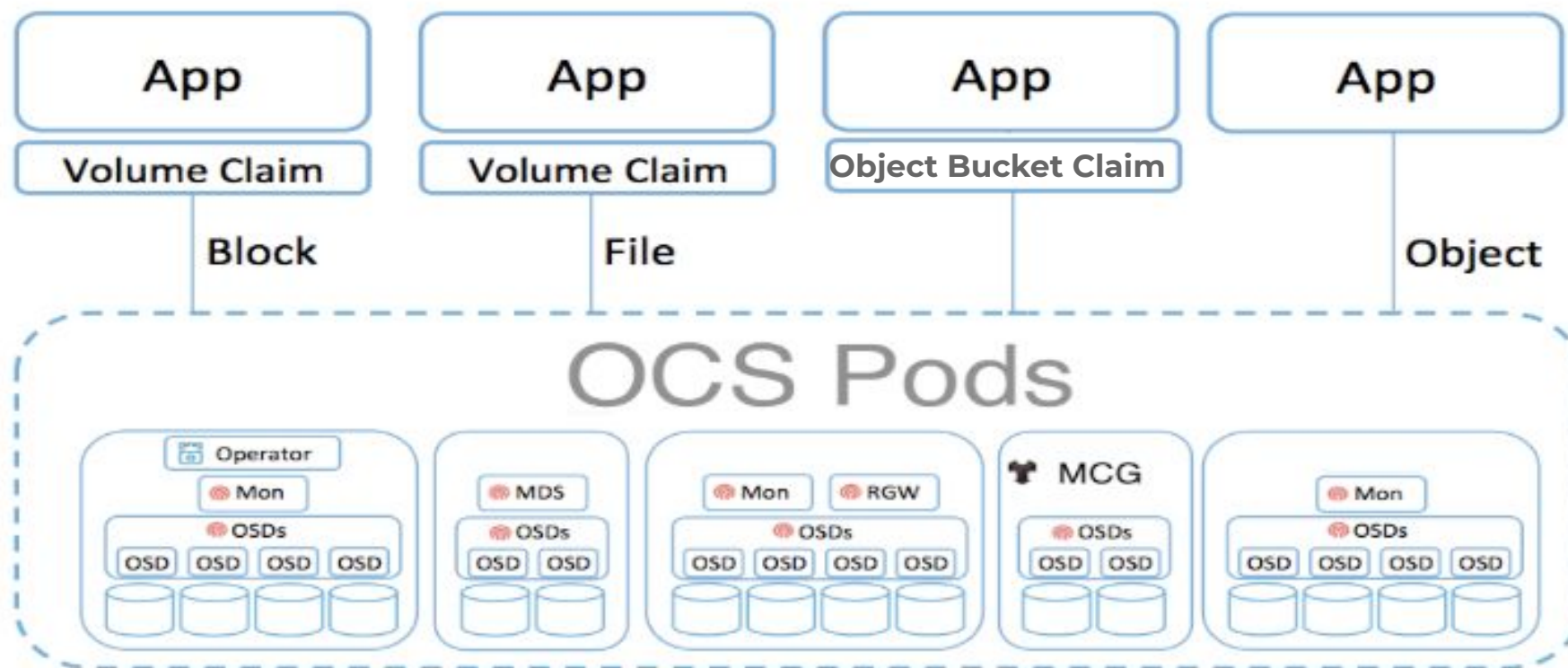


**HYBRID CLOUD  
& DATA SERVICES**



**STORAGE  
ENHANCEMENTS**

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



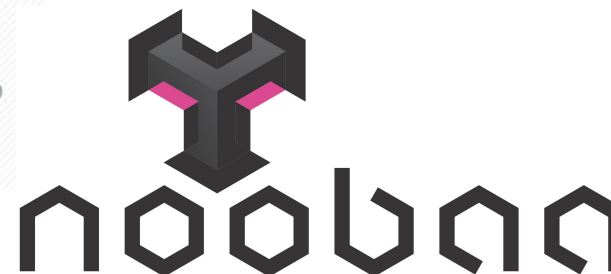
# OCP 4 with OCS 4 - Technology Stack



**Easy & Automated  
Management with  
Operators**



**Highly Resilient &  
Scalable Storage  
System**



**Multi-Cloud & Hybrid  
Object Storage**

# Thank you

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