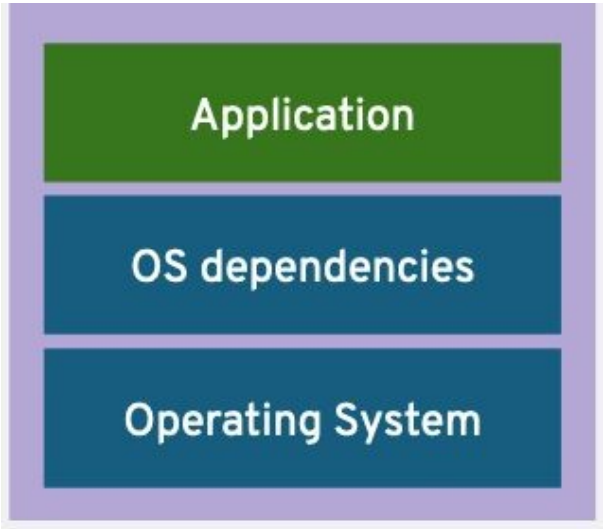
OPENSHIFT STORAGE

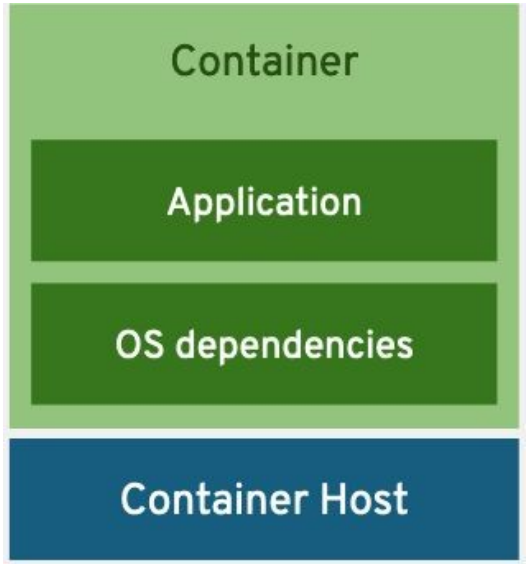
Red Hat

APPLICATION PROPERTIES AND BEHAVIOUR



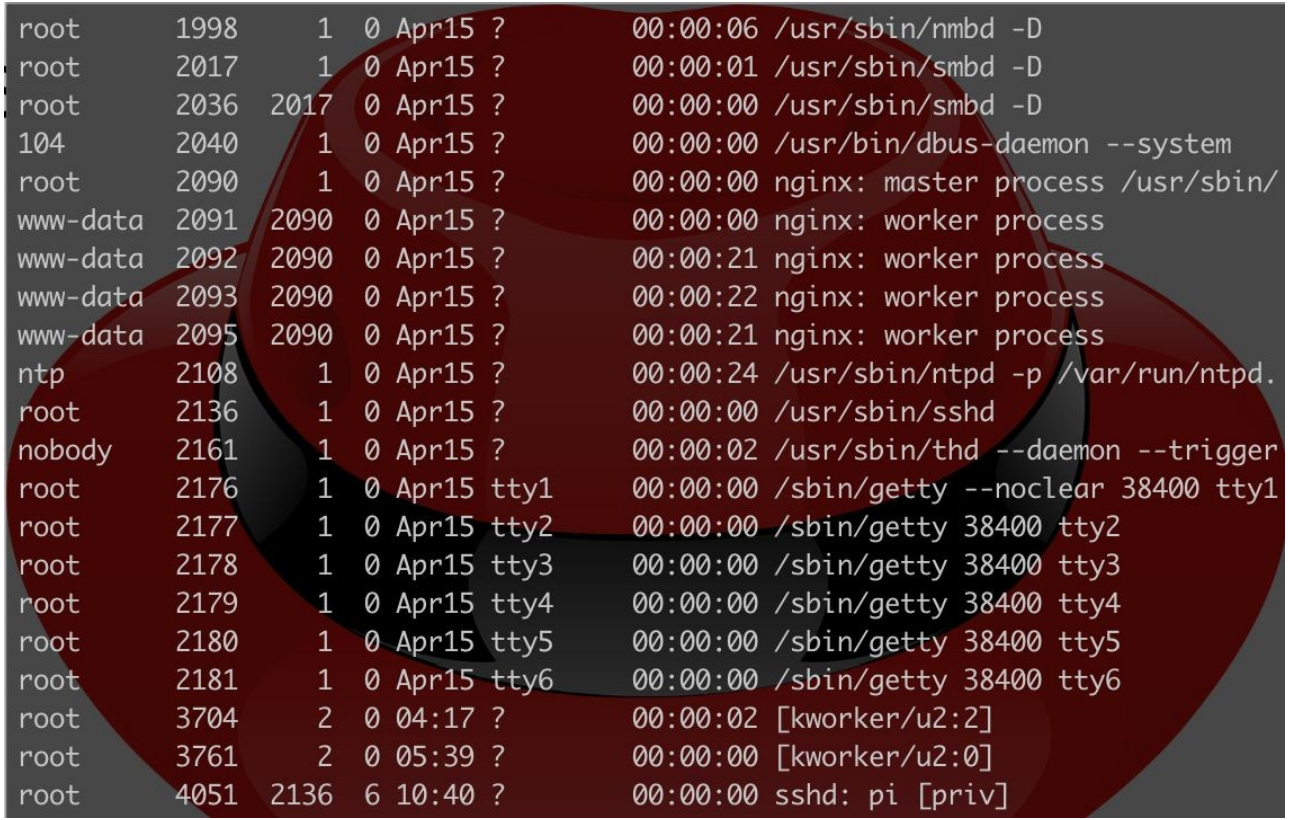
TRADITIONAL APPLICATION

APPLICATION PROPERTIES AND BEHAVIOUR



MODERN APPLICATION

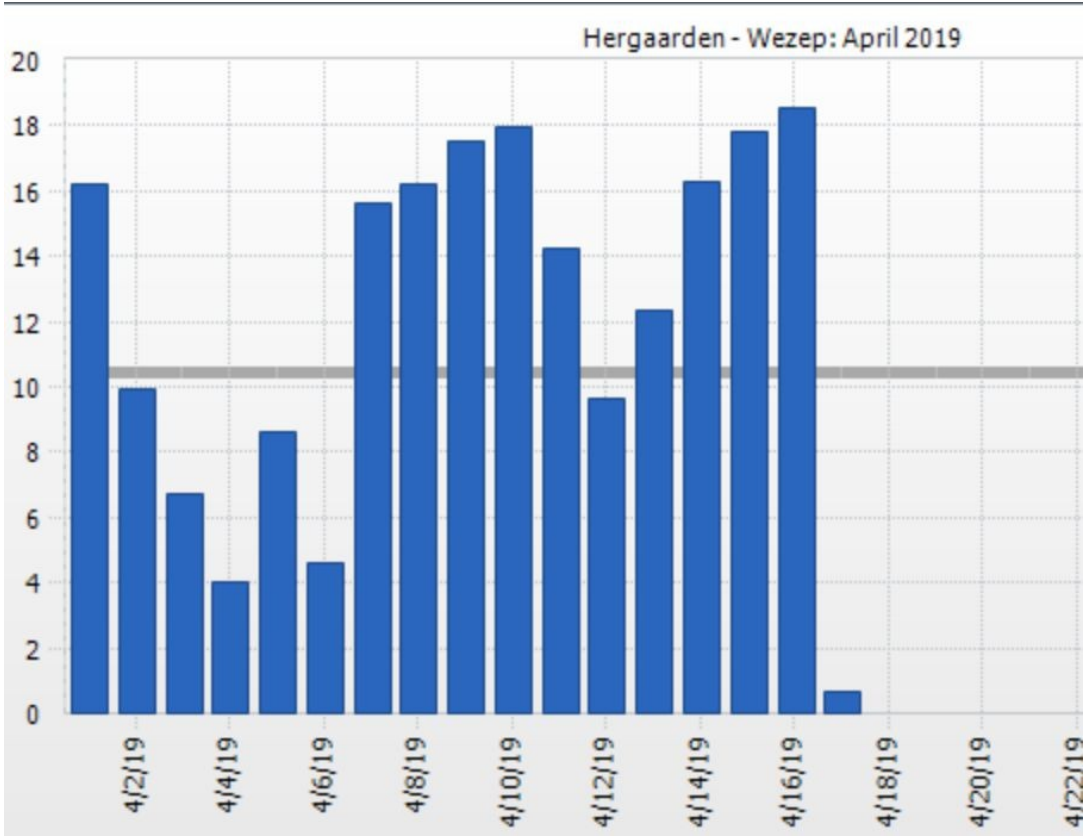
A CONTAINER IS A SYSTEM PROCESS



```
root       1998     1  0 Apr15 ?        00:00:06 /usr/sbin/nmbd -D
root       2017     1  0 Apr15 ?        00:00:01 /usr/sbin/smbd -D
root       2036  2017  0 Apr15 ?        00:00:00 /usr/sbin/smbd -D
104        2040     1  0 Apr15 ?        00:00:00 /usr/bin/dbus-daemon --system
root       2090     1  0 Apr15 ?        00:00:00 nginx: master process /usr/sbin/
www-data   2091  2090  0 Apr15 ?        00:00:00 nginx: worker process
www-data   2092  2090  0 Apr15 ?        00:00:21 nginx: worker process
www-data   2093  2090  0 Apr15 ?        00:00:22 nginx: worker process
www-data   2095  2090  0 Apr15 ?        00:00:21 nginx: worker process
ntp        2108     1  0 Apr15 ?        00:00:24 /usr/sbin/ntpd -p /var/run/ntpd.
root       2136     1  0 Apr15 ?        00:00:00 /usr/sbin/sshd
nobody     2161     1  0 Apr15 ?        00:00:02 /usr/sbin/thd --daemon --trigger
root       2176     1  0 Apr15 tty1     00:00:00 /sbin/getty --noclear 38400 tty1
root       2177     1  0 Apr15 tty2     00:00:00 /sbin/getty 38400 tty2
root       2178     1  0 Apr15 tty3     00:00:00 /sbin/getty 38400 tty3
root       2179     1  0 Apr15 tty4     00:00:00 /sbin/getty 38400 tty4
root       2180     1  0 Apr15 tty5     00:00:00 /sbin/getty 38400 tty5
root       2181     1  0 Apr15 tty6     00:00:00 /sbin/getty 38400 tty6
root       3704     2  0 04:17 ?        00:00:02 [kworker/u2:2]
root       3761     2  0 05:39 ?        00:00:00 [kworker/u2:0]
root       4051  2136  6 10:40 ?        00:00:00 sshd: pi [priv]
```

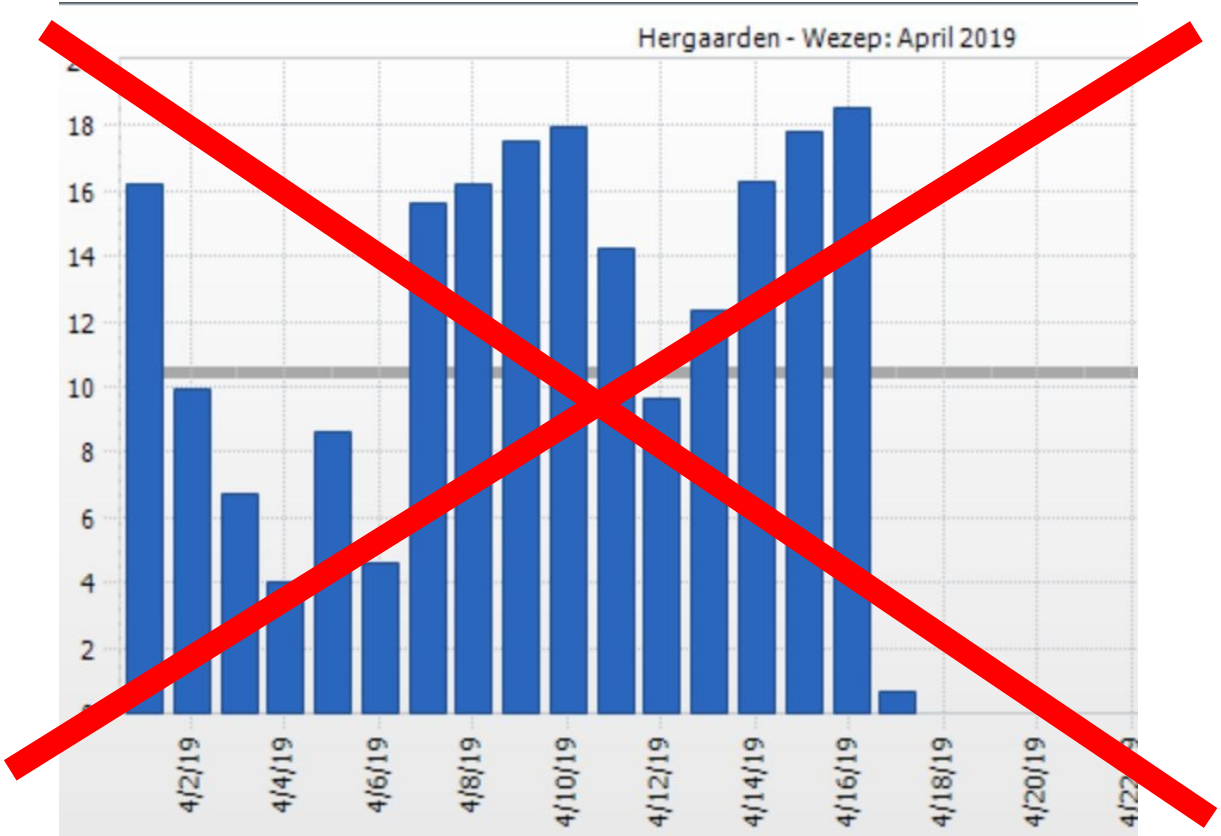
Red Hat

A SYSTEM PROCESS THAT PRODUCES STATE



Red Hat

A STOPPED PROCESS CAUSES LOSS OF THAT STATE

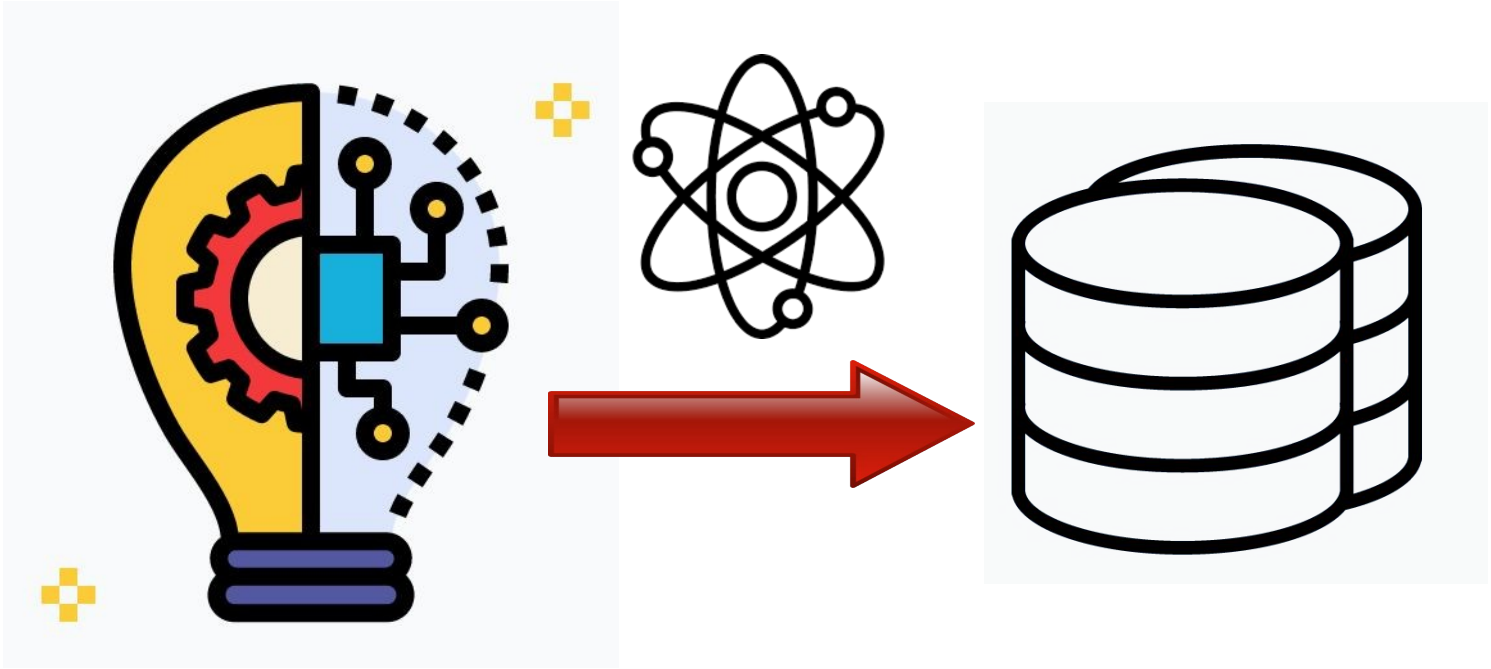


Red Hat

NEED FOR PERSISTENT STORAGE

CONTAINERS NEED STORAGE

Containers are not persistent by default. App data is lost when containers die.



Red Hat

POSSIBLE STORAGE PROVIDERS

- NFS
- GlusterFS
- OpenStack Cinder
- Ceph RBD
- AWS Elastic Block Store (EBS)
- GCE Persistent Disk
- Azure Disk
- Azure File
- FlexVolume
- iSCSI
- Fibre Channel
- VMWare vSphere
- Container Storage Interface (CSI)
- Dynamic Provisioning and Creating Storage Classes

https://docs.openshift.com

Red Hat

STORAGE PROVISIONING IN OPENSHIFT

- **STATIC PROVISIONING**

  Storage Admin creates storage volumes upfront
  OpenShift selects a predefined volume based upon claim, nearest available size
  No automated housekeeping - causing administrative burden
  Error Prone due to increasing complexity and resulting administrative overhead

- **DYNAMIC PROVISIONING**

  OpenShift user requests for storage by persistent volume claim (PVC)
  Storage system does the needful in an automated way
  Delivers the exact requested size and type storage volume
  No administrative overhead and storage admin involvement upfront
  Automated housekeeping, better efficiency

Red Hat

4 BASIC STORAGE NEEDS IN OPENSHIFT

- **REGISTRY STORE**
  Where container base images reside.
  By default not redundant, therefore possible point of failure.

- **PERSISTENT FILE STORAGE FOR CONTAINERS**
  Container application state is held in this persistent file storage

- **PERSISTENT BLOCK STORAGE FOR CONTAINERS**
  Specific storage type for specific workloads the require certain performance
  i.e. Database workloads, Logging where Elastic or equivalents are involved.

- **EPHEMERAL STORAGE**
  Application internal storage, also named EmptyDir.
  Outside scope for container storage

Red Hat

BACKUP SLIDES

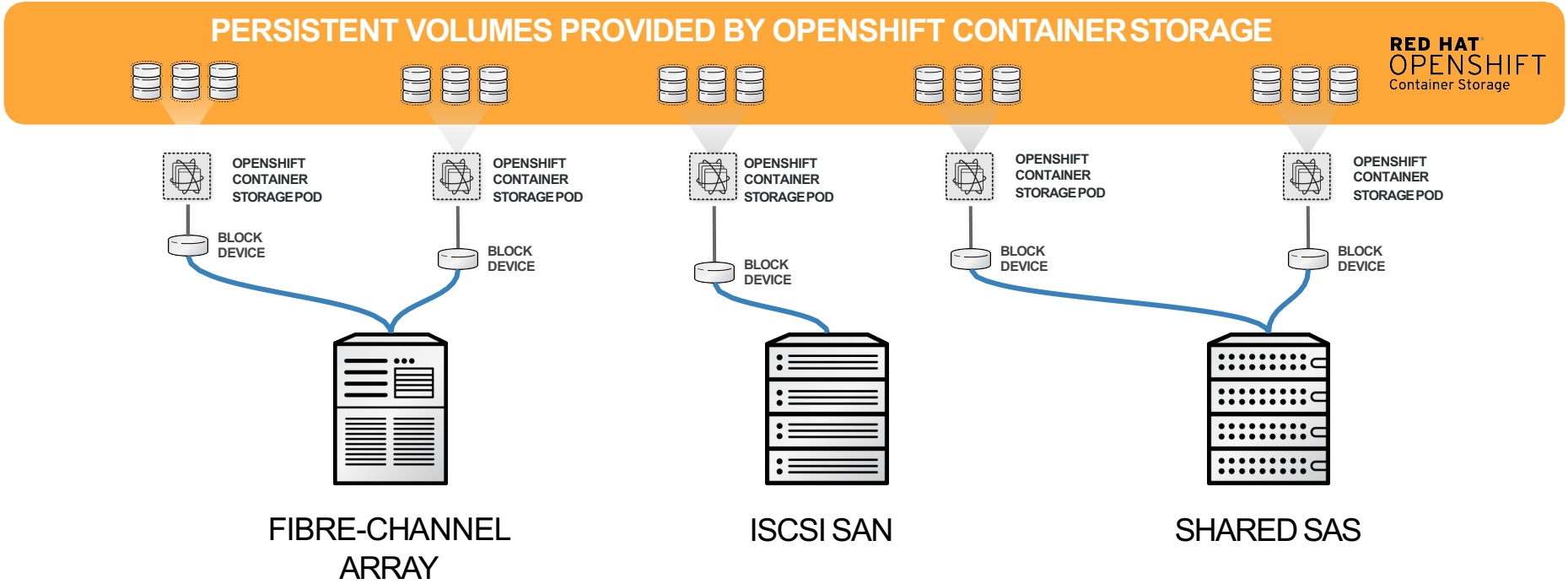
RED HAT SOLUTION: RHOCS

RED HAT OFFERS A FULLY INTEGRATED STORAGE SOLUTION FOR OPENSHIFT

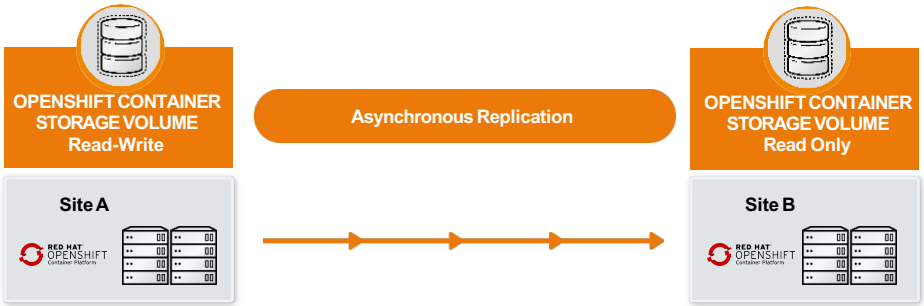
Objection: *“We don’t need your storage, we already have an existing storage solution present”*

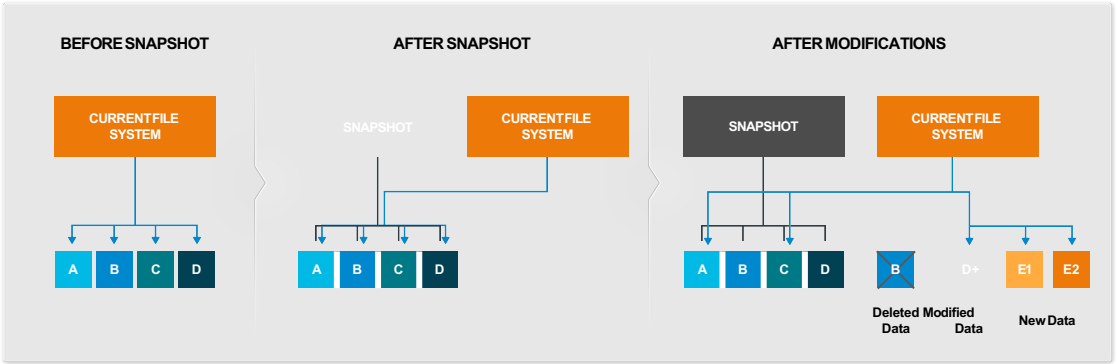
Red Hat

LEVERAGE LEGACY STORAGE...
WITH OPENSHIFT CONTAINER STORAGE CONVERGED MODE



SNAPSHOTS AND GEO-REPLICATION



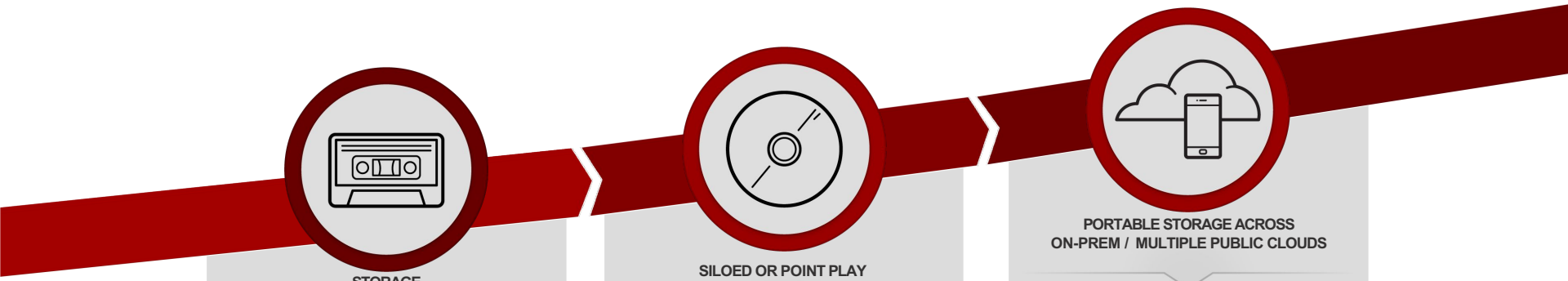


SUMMARY FACTS

- CONTAINERS ARE SYSTEM PROCESSES
- CONTAINER STATES ARE VOLATILE BY DEFAULT
- CONTAINERS THEREFORE NEED PERSISTENT STORAGE
- EXISTING STORAGE ENTITIES CAN BE USED IN CONJUNCTION WITH OPENSHIFT
- EXISTING STORAGE ENTITIES OFTEN JUST ADDRESS ONE SINGLE PART OF THE 4 NEEDS
- PROVISIONING AND HANDLING OF CONTAINER STORAGE BECOMES COMPLEX SOON
- DIFFERENT STORAGE NEEDS IN OPENSHIFT REQUIRE DIFFERENT SOLUTIONS
- RED HAT OFFERS **OCS** - NOT JUST ANOTHER STORAGE SOLUTION - A STORAGE MANAGER
- OCS: VALUE ADD TO THE BUSINESS - NO DIY PLUMBING OF EXISTING THINGS -

Red Hat

STORAGE OPTIONS FOR CONTAINERS



STORAGE ARRAYS AND APPLIANCES

- Scalability and high availability fall short of customer needs
- Vendor lock in and high TCO
- Monolithic appliance model

SILOED OR POINT PLAY STORAGE SOLUTIONS

- No hybrid cloud support
- No unified control plane (K8s)
- Lack of automated or dynamic handling of storage needs

PORTABLE STORAGE ACROSS ON-PREM / MULTIPLE PUBLIC CLOUDS

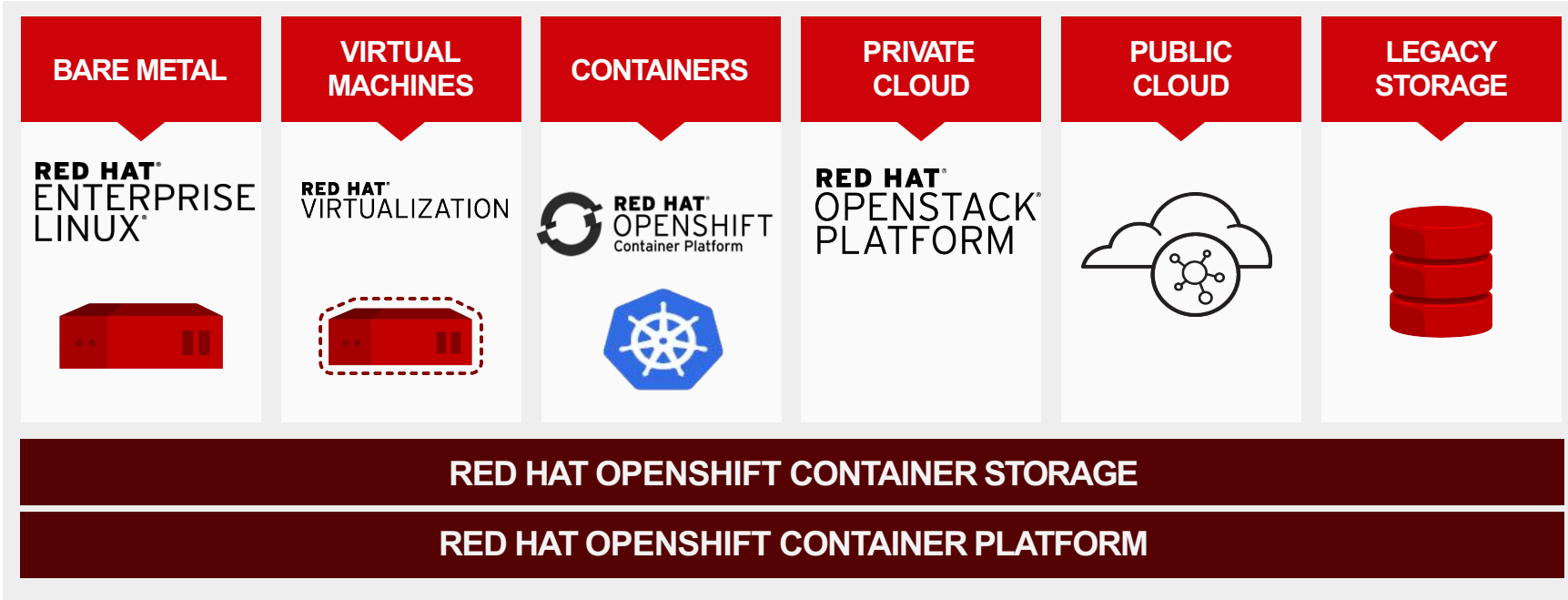
OpenShift Container Storage from Red Hat

- Runs in public clouds
- Single Vendor Support model
- Seamless user experience for developers and DevOps
- Full integration and all automated

Red Hat

Consistent Storage Experience Across Hybrid Cloud

APPLICATION PORTABILITY AND LOWERCOSTS

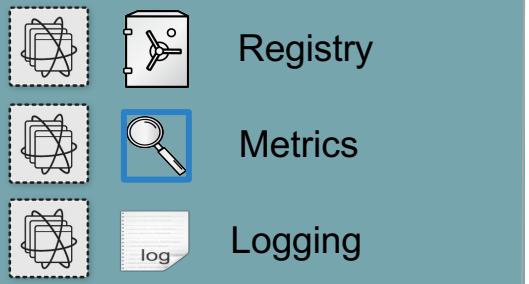


Red Hat

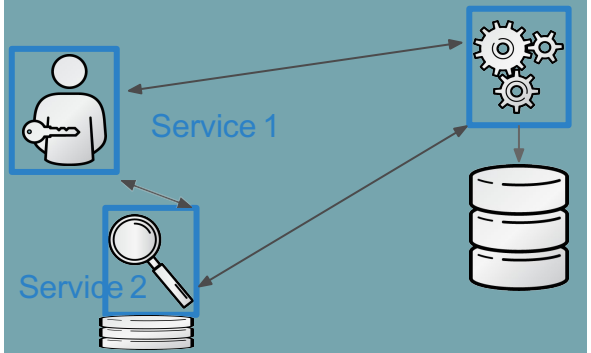

OCS 3
OpenShift Container Storage
Based on GlusterFS technology

OPENSHIFT PLATFORM STORAGE NEEDS

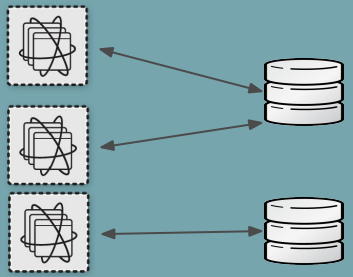
OCP Infrastructure



OCP Application



Local/Ephemeral Storage



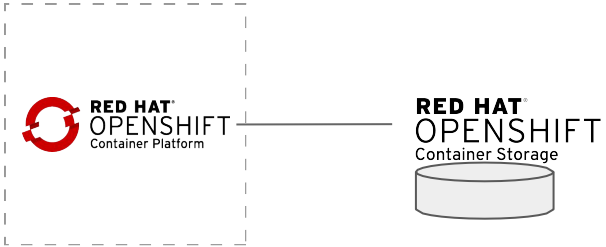
Openshift Container Storage focus

PERSISTENT STORAGE FOR CONTAINERS

VALUE PROPOSITION FOR STORAGE ADMIN VS. DEVOPS

STORAGE FOR CONTAINERS

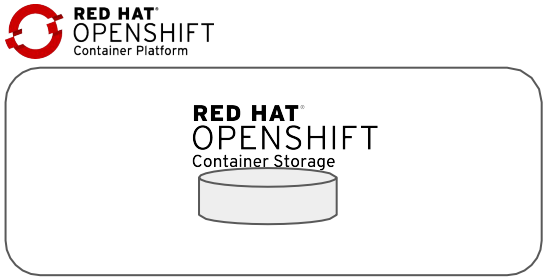
Persona: Storage Admins, Infrastructure Admins



- Leverage existing investment in traditional storage, managed by storage admin
- Attach to stand alone storage

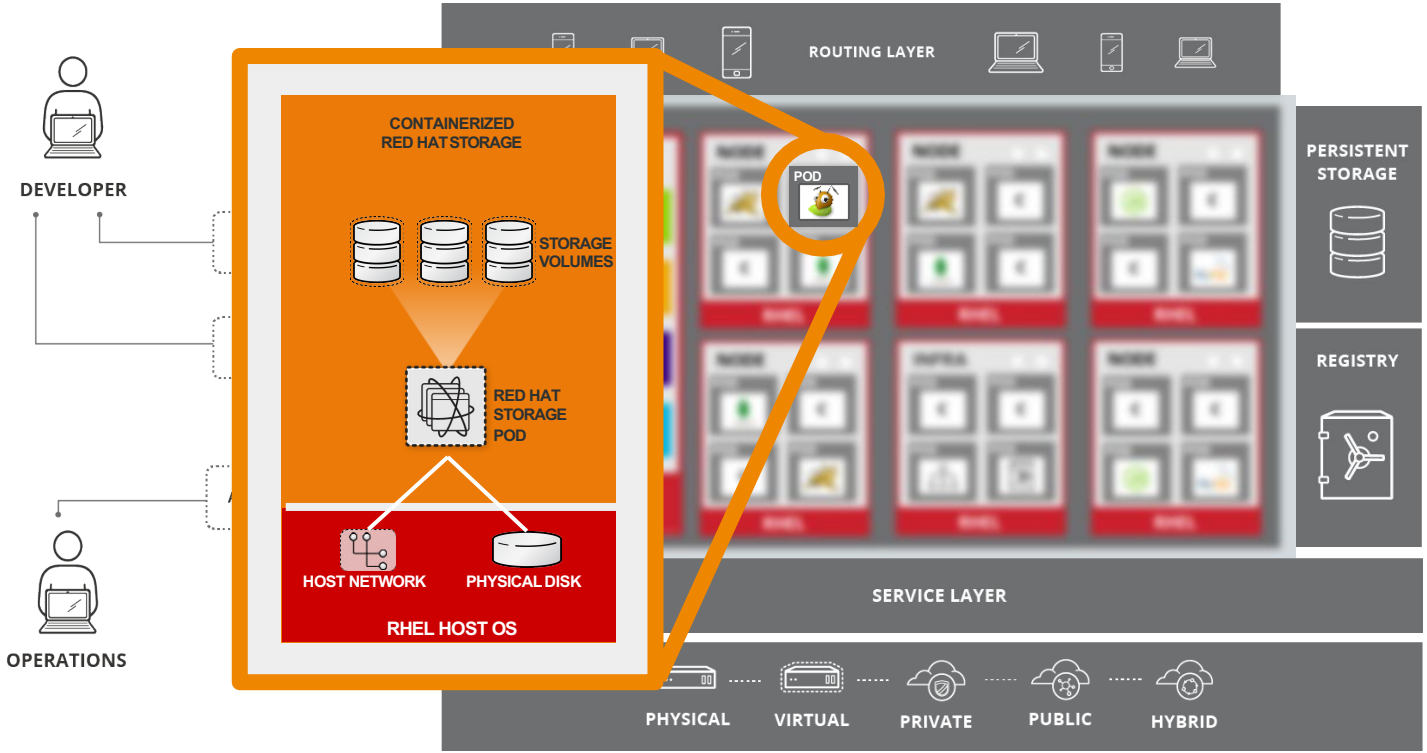
STORAGE IN CONTAINERS

Persona: DevOps, App Architects

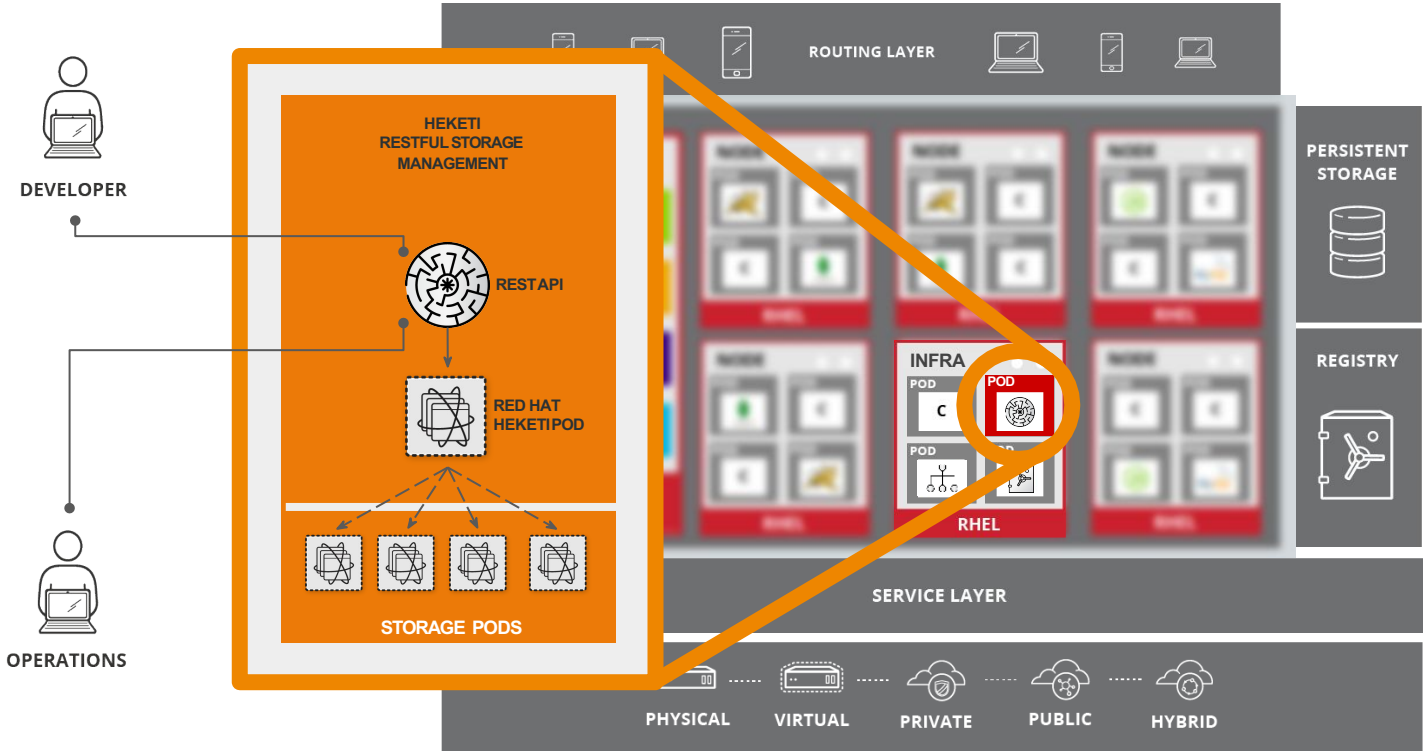


- Highly scalable, enterprise-grade storage, fully integrated into OpenShift Container Platform

OCS Data Plane



OCS Control Plane



OCS product features

More relevant since v3.9

Integration	Features	CNS 3.9	OCS 3.10	OCS 3.11
kubernetes	Support RWX, RWO, ROX	✓	✓	✓
	Dynamic provisioning	✓	✓	✓
	PVC resize (oc edit pvc)	✓	✓	✓
Openshift	Prometheus storage API metrics	☐	✓	✓
	Deploy with OCP ansible playbook	☐	✓	✓
	PVC resize (web-console)	☐	☐	✓
	Storage class volume options	☐	✓	✓
	Infra support registry, metrics, logging	✓	✓	✓
Storage	Block storage with iSCSI support	✓	✓	✓
	File sharing with glusterfs-fuse	✓	✓	✓
	Object with S3/Swift (tech preview)	✓	✓	✓
	Snapshot and geo-replication	✓	✓	✓
	Arbiter volume (replica 2 + metadata)	☐	✓	✓
Infrastructure	Public Azure, AWS, GCP	✓	✓	✓
	Private Openstack	✓	✓	✓
	VIrtualization (VMW, RHV)	✓	✓	✓

OCS 3.11 support

Aligned with the OCP lifecycle support

Life Cycle Phases

Full Support

Full support is provided according to the published Scope of Coverage and Service Level Agreement[5&6]. Likewise, Development Support is provided according to the published Scope of Coverage and Service Level Agreement.

During the Full Support Phase, qualified Critical and Important Security errata advisories (RHSAs) and Urgent and Selected High Priority Bug Fix errata advisories (RHBAs) may be released as they become available, all other available fix and qualified patches may be released via periodic updates. Customers are expected to upgrade their OpenShift environment to the most current supported version. On request, and at Red Hat's discretion, qualified Critical Security errata advisories (RHSAs) and Critical Bug Fix errata advisories (RHBAs) may be made available to non-current minor versions.

Non-current releases within the full support phase which are no longer eligible for maintenance updates of any kind are marked as unmaintained. The following tables outlines the schedule for which minor versions of OpenShift v3 will no longer be eligible for maintenance updates:

v3.X End of Maintenance Schedule

Nov 2018	Jan 2019	Apr 2019	Jul 2019	Oct 2019	Jun 2022
3.0 & 3.1	3.2 & 3.3	3.4 & 3.5	3.6 & 3.7	3.9 & 3.10	3.11

https://access.redhat.com/support/policy/updates/openshift

OCP v4 storage integration requirements

New challenge for storage vendors

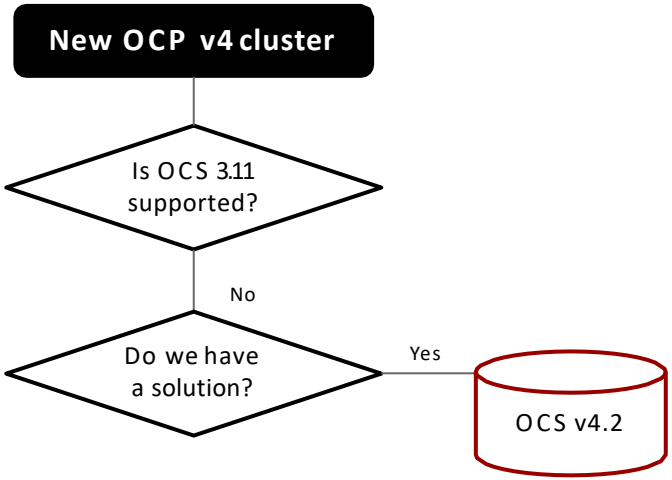
- Operator framework for standard lifecycle management
- New industry standard storage API with CSI (Container Storage Interface) integrated with kubernetes offering:
  - Storage Classes which provide configuration to CSI drivers
  - Ability to encrypt credentials
  - Multiple CSI drivers can co-exist
  - Ensure that one controller service start at a time

CSI plugin components (API calls)

CONTROLLER Service	NODE Service	IDENTITY Service
. CreateVolume . DeleteVolume . ListVolume . ControllerPublishVolume . ControllerUnpublishVolume . ValidateVolumeCapabilities . GetCapacity . CreateSnapshot . DeleteSnapshot . ListSnapshot . ControllerGetCapabilities	. NodeStageVolume . NodeUnstageVolume . NodePublishVolume . NodeUnblishVolume . NodeGetVolumeStats . NodeGetInfo . NodeGetCapabilities	. GetPluginInfo . GetPluginCapabilities . Probe(ProbeRequest)

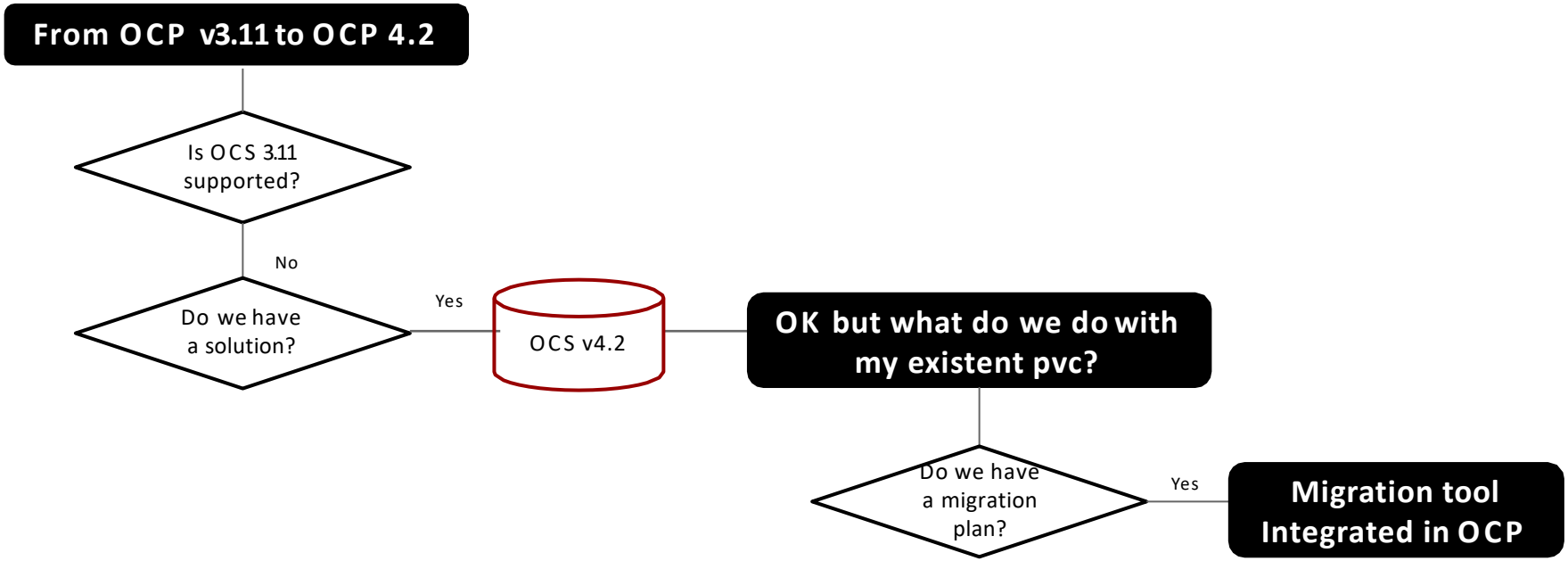
It’s OCS 3.11 ready for OCP 4.2?

Use case for fresh new OCP 4.2 cluster



It's OCS 3.11 ready for OCP 4.2?

Use case for existent OCP 3.11 to OCP 4.2




OCS 4
OpenShift Container Storage

OPENSHIFT OPERATOR FRAMEWORK

- Goal of an Operator: Put operational knowledge into software
- Day-1: Operators implement and automate common installation, configuration
- Day-2: Re-configuration, update, backup, failover, restore
- Kubernetes-native application
  (integrating natively with Kubernetes concepts and APIs)

WHAT CHANGED

- **OPENSHIFT**
  OpenShift transitions from OCP 3 to OCP 4

- **OPENSHIFT CONTAINER STORAGE**
  also transitions from OCS 3 to OCS 4

- **OCS 4** will be based on **ROOK.IO**, which uses **Red Hat Ceph Storage**
  and the recently acquired **NooBaa** technology as the **Red Hat Multi Cloud Gateway**

- **Will OCS 3 work with OCP 4?**
  NO. Migration tooling will be available to facilitate the move to OCS 4.x.

- **MIGRATION PATH**
  There will be a supported migration path offered for OCS 3 to OCS 4

Red Hat

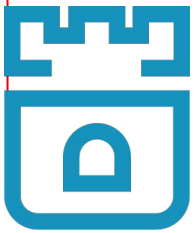
THE OCS 4 TECHNOLOGY STACK

WHY WE MOVE TO CEPH

- **MOTIVATION**

  As cloud-native applications have evolved, we are noticing more customer requests for a native, easy to use S3/object interface
  (apps like registry, chargeback, metering, AI/ML) in addition to traditional persistent volumes (RWX & RWO) on the platform.

  By leveraging Ceph, OCS can now provide a production-grade S3 interface in addition to persistent volumes for stateful applications.



ROOK

- ROOK Project

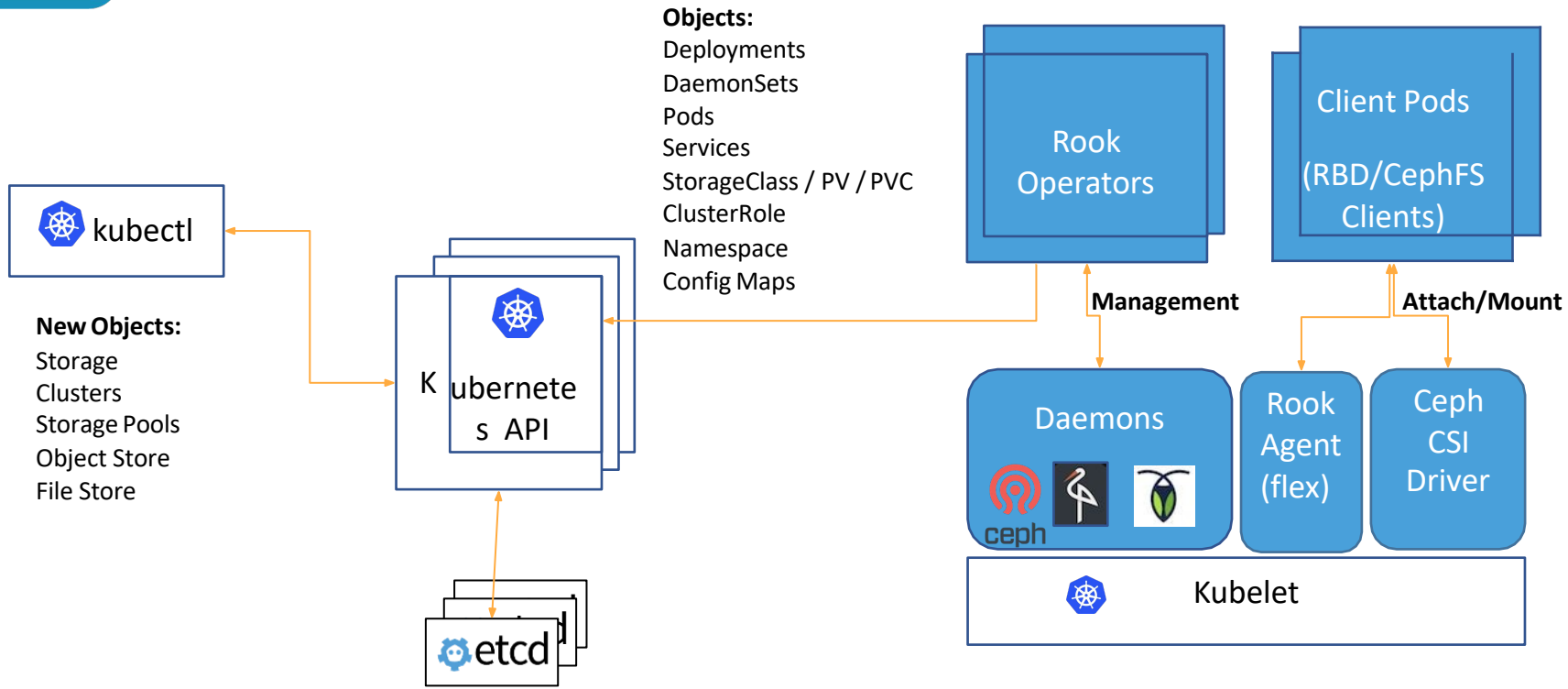
CLOUD-NATIVE STORAGE ORCHESTRATOR
automated deployment and life-cycle management

- Bootstrapping
- Configuration, provisioning, scaling, upgrading, migration, disaster recovery, monitoring, and resource management

https://rook.io

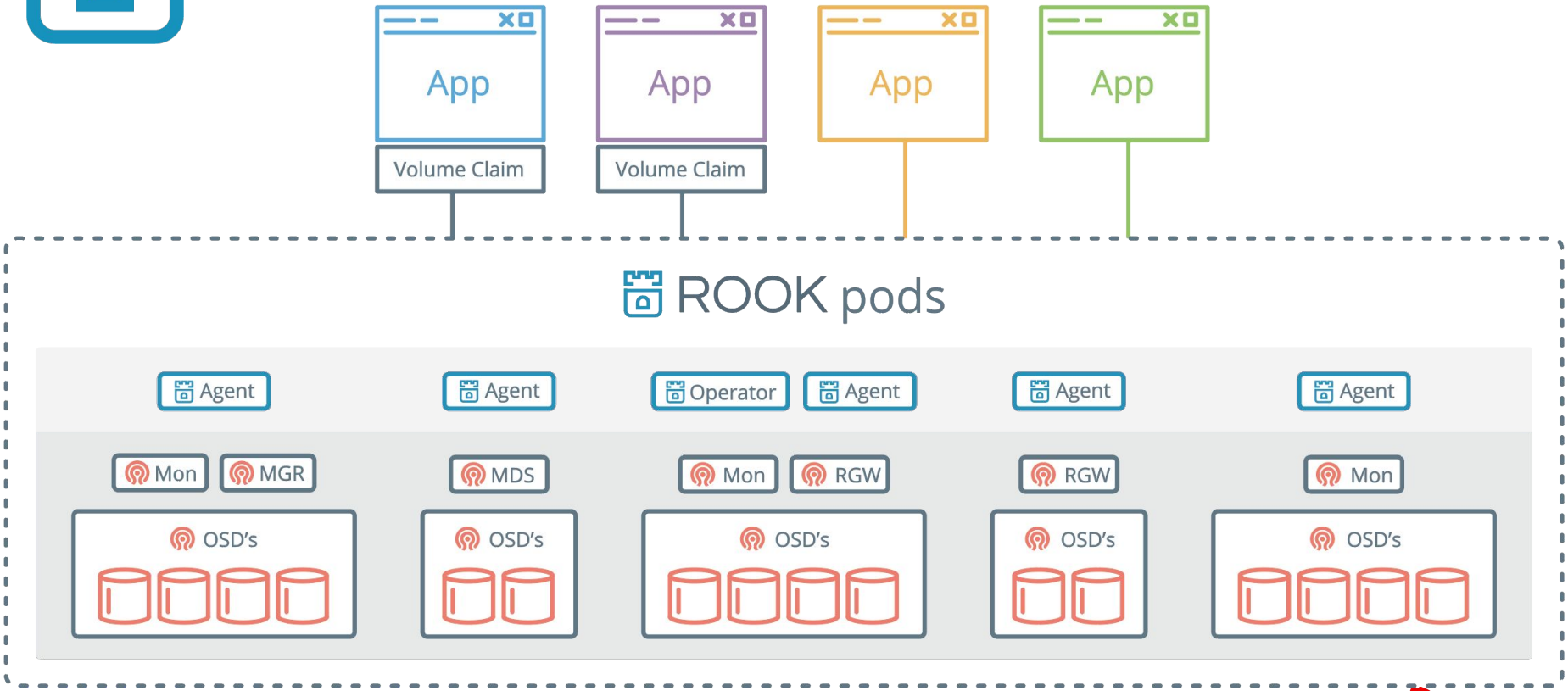
Red Hat

ROOK ARCHITECTURE



Red Hat

CEPH ON OPENSHIFT WITH ROOK



Red Hat

NOOBAA.IO

Red Hat

ABOUT NOOBAA

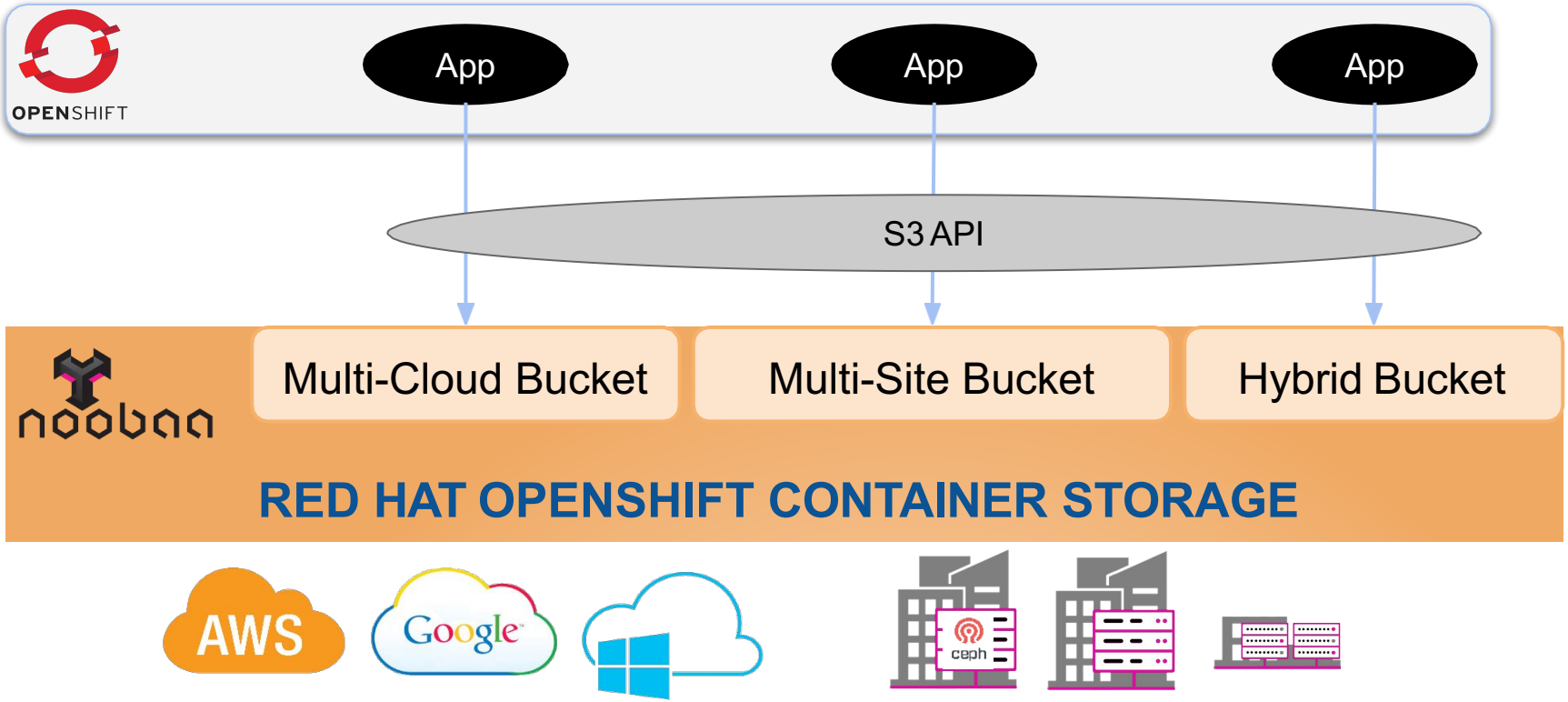
- **OCS MULTI CLOUD GATEWAY (NOOBAA)**
  NooBaa provides a consistent S3 endpoint across different infrastructures (AWS, Azure, GCP, Bare Metal, VMware)

- **OCS MCG FUNCTIONALITY**
  Multi Cloud Object Gateway: Active/Active read/write across different clouds.

- **PRODUCTIZATION**
  productized as RHOCS Multi-Cloud Gateway, starting with OCS 4.2
  (NooBaa, is upstream only, downstream **OCS Multi-Cloud-Gateway**)

Red Hat

MULTI-CLOUD OBJECT GATEWAY



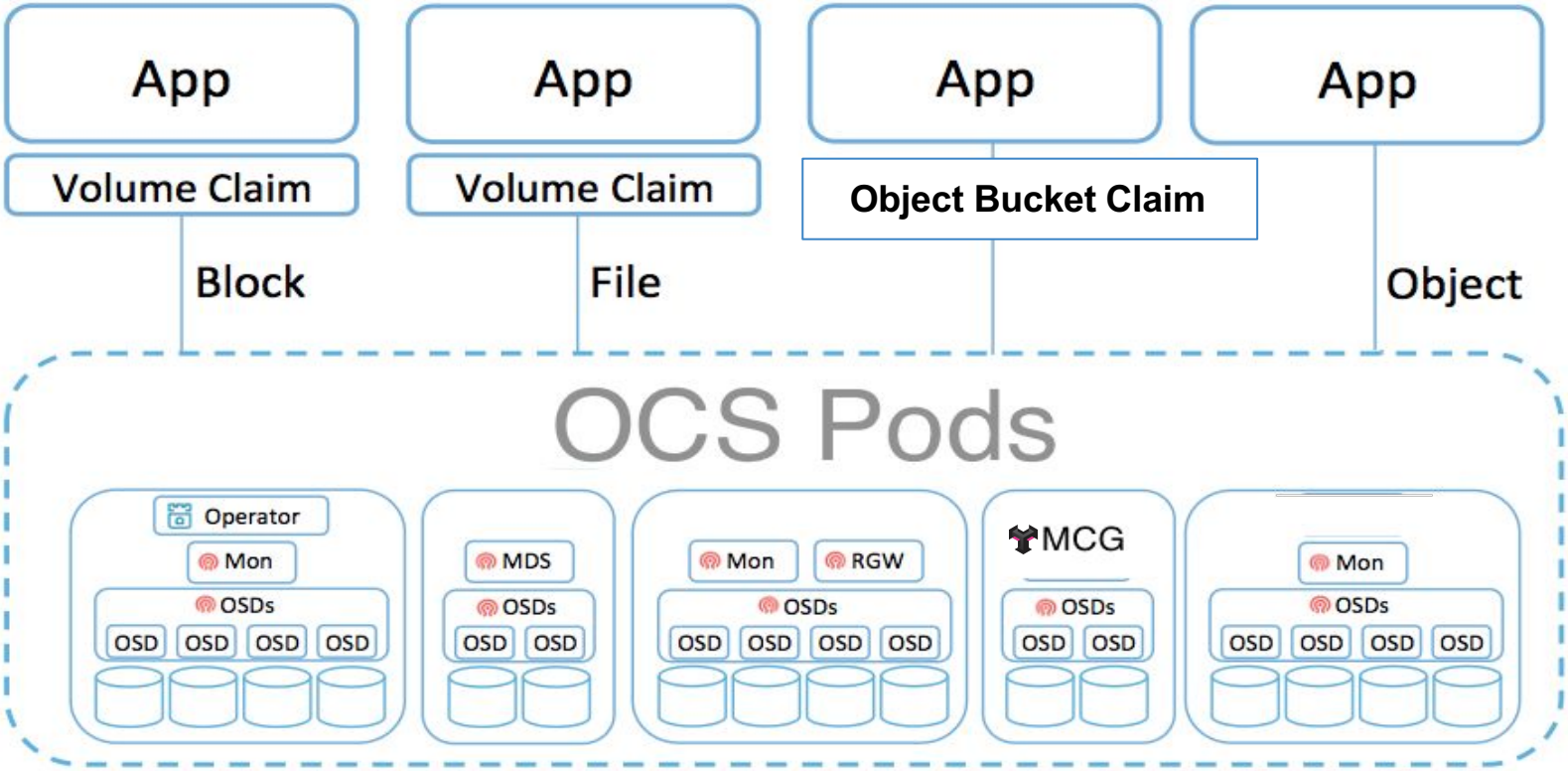
ACTIVE - ACTIVE MULTI CLOUD - READ/WRITE

Red Hat

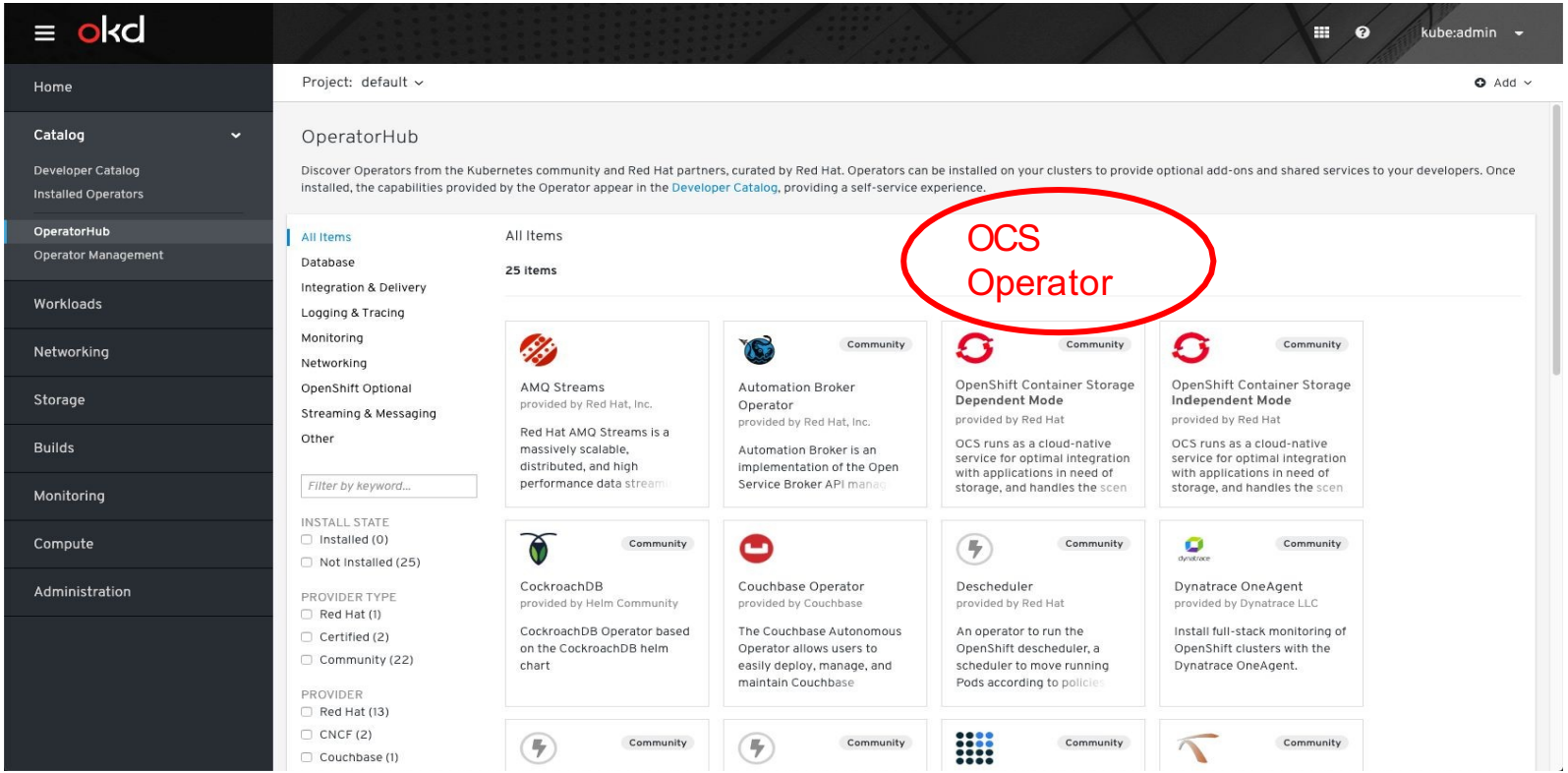

SUMMARIZING
OpenShift Container Storage

OCS 4.x Operator Install, Upgrade, Expansion

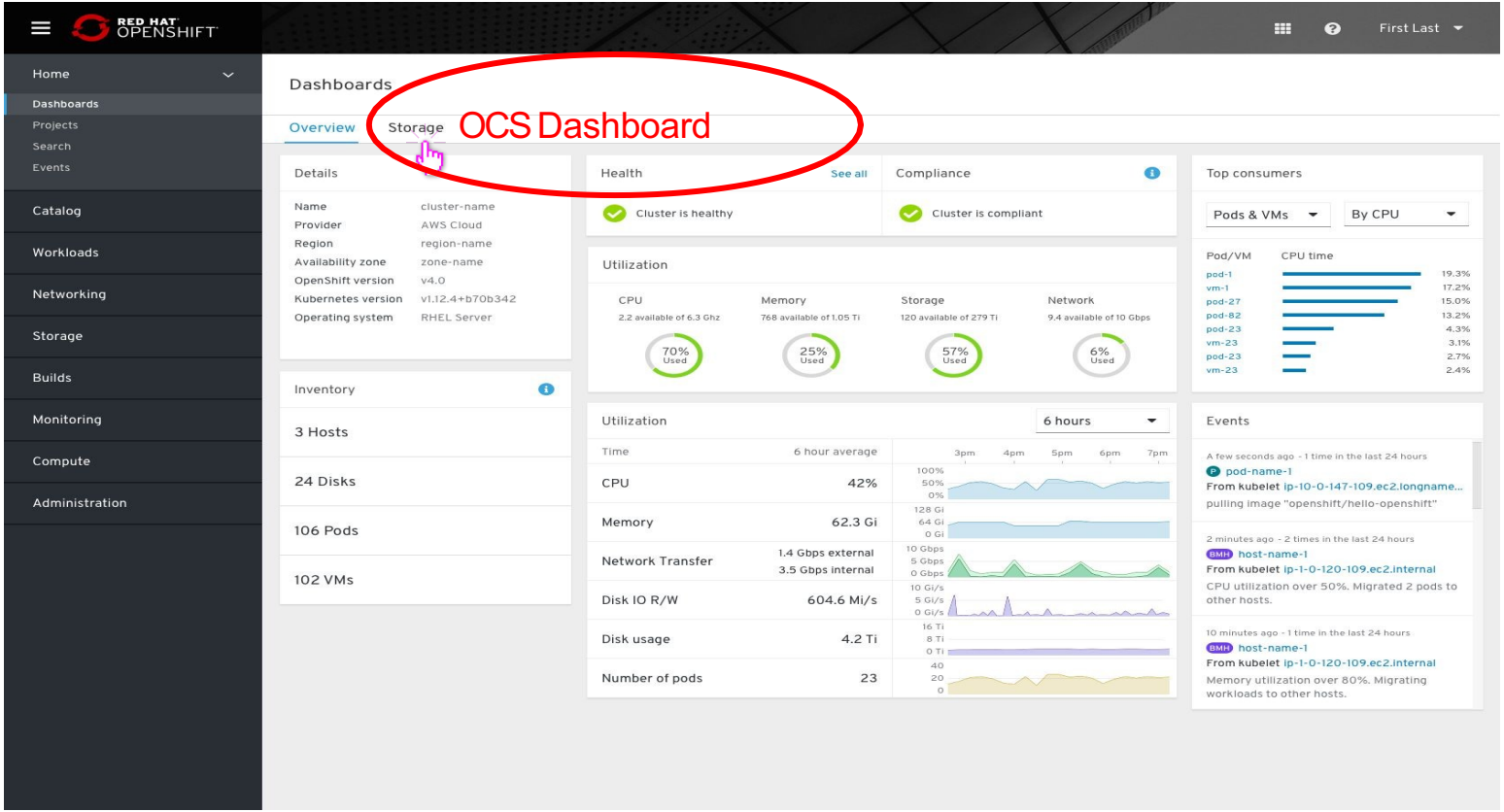
OCS Operator based on Rook.io with Operator Lifecycle Manager (OLM)



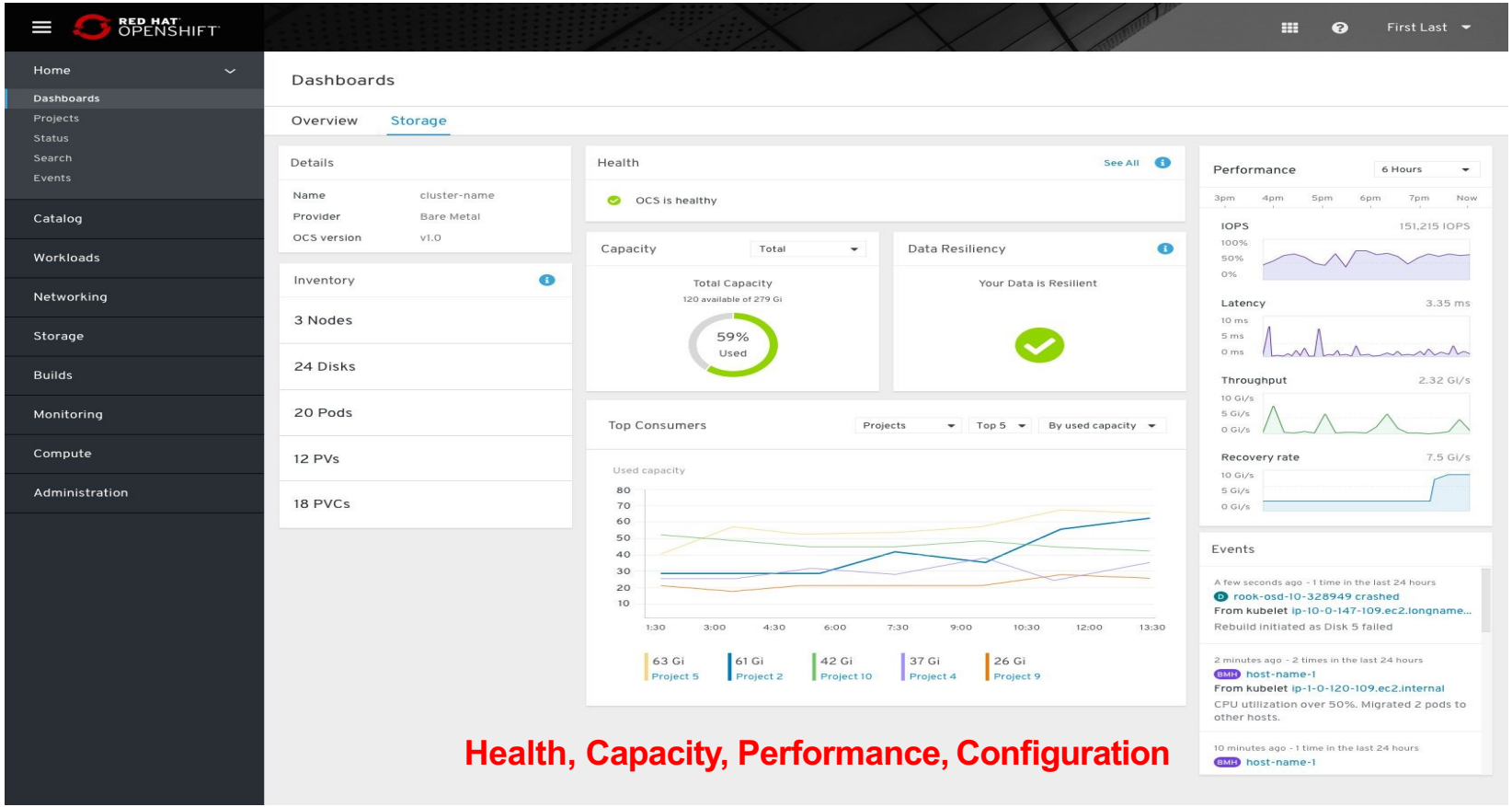
OCS 4.x Operator Driven Install from OperatorHub



INTEGRATED MONITORING AND MANAGEMENT

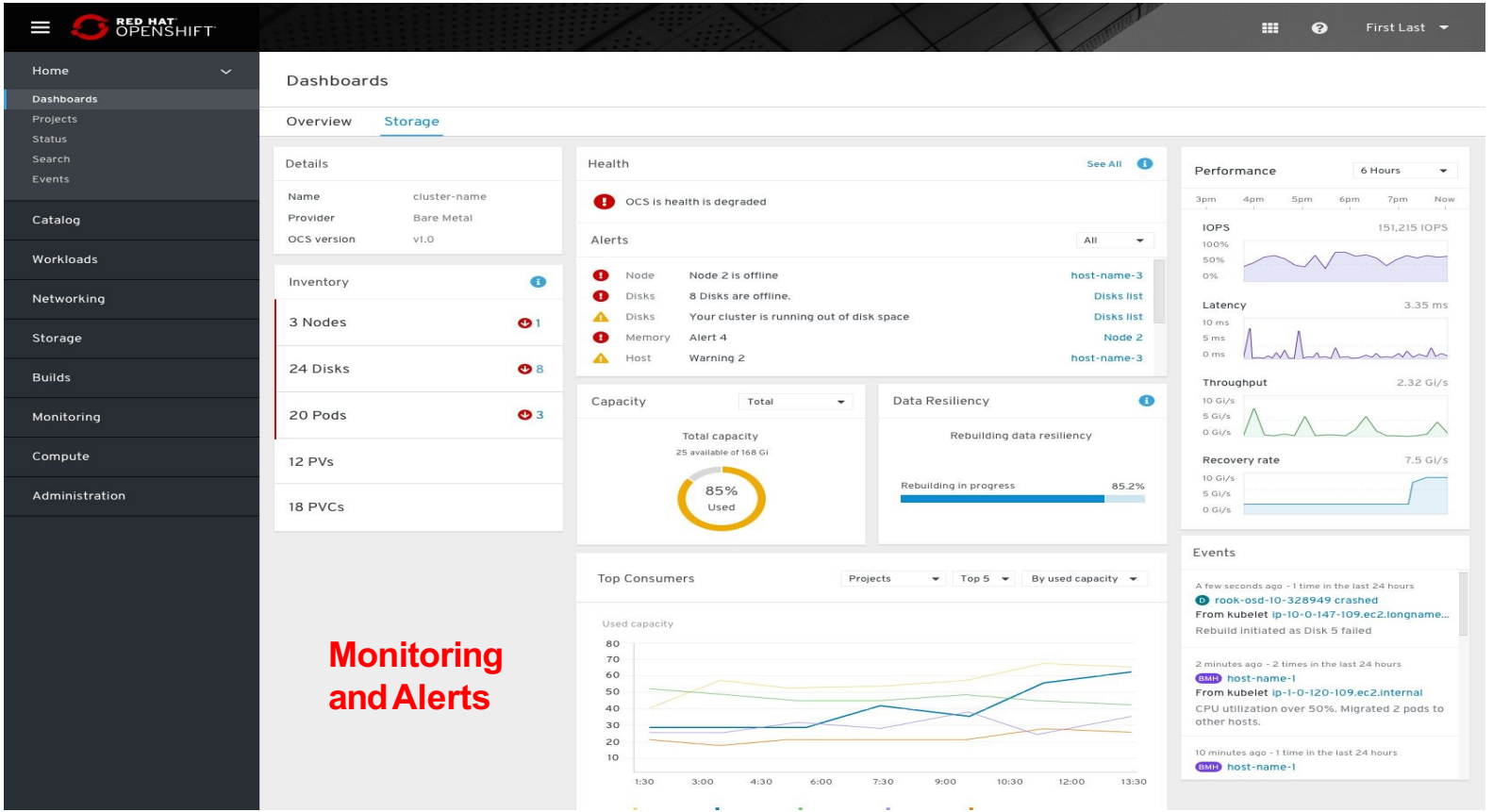


OCS INTEGRATED DASHBOARD



Health, Capacity, Performance, Configuration

OCS INTEGRATED DASHBOARD - ALERTS



Monitoring and Alerts

FUNCTIONALITIES AND SUPPORTABILITY

- **FUNCTIONALITIES**
  - OCS 4.2 has **FILE**, **BLOCK**, and **OBJECT** support
  - OCS 4.2 supports **Prometheus**
  - OCS 4.2 will be **FIPS** compliant

- **SUPPORTABILITIES**
  - **VMWare**
    storage provisioned from VMDKs and RDMs

  - **PUBLIC CLOUD**
    supported in all public cloud environments where OCS 3 is supported today, including AWS (OCS 4.2),
    Azure and Google Cloud (OCS4.3)

Red Hat

ANY CLOUD, ANY APP, ONE STORAGE EXPERIENCE

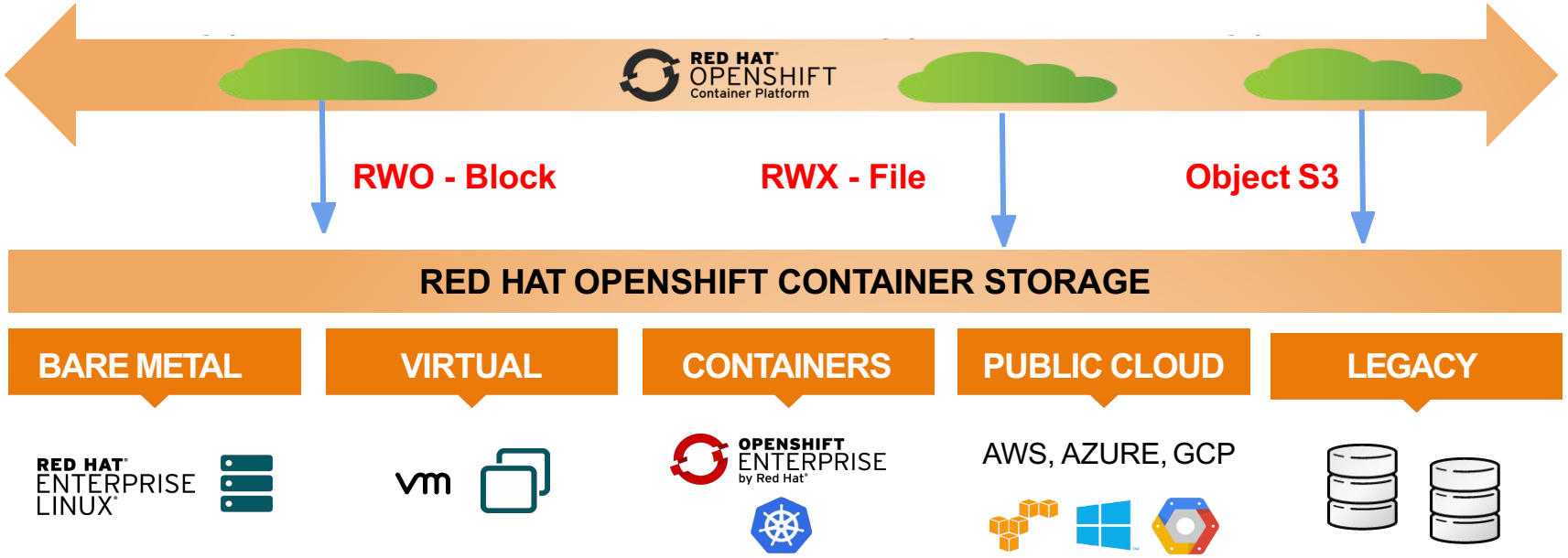
RED HAT OPENSHIFT CONTAINER STORAGE

BARE METAL	VIRTUAL	CONTAINERS	PUBLIC CLOUD	LEGACY
RED HAT ENTERPRISE LINUX	vm	OPENSHIFT ENTERPRISE by Red Hat	AWS, AZURE, GCP	

Consistent consumption, management, operations
Future Proof against cloud or infrastructure lock-in

Red Hat

COMPLETE STORAGE FOR CONTAINER PLATFORM



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

SKU’s

- **NO SKU CHANGES**

  OCS 3.X and OCS 4.x will have the same subscription model;
  there are no plans to change this.

  Please note that customers will still be buying and consuming OCS
  (even though the underlying technology will be different)
  using the same SKUs that we have today
  which will provide access to the new Ceph-related content set.

Red Hat

THE FACTS - SUMMARY

- CONTAINERS ARE SYSTEM PROCESSES AND ARE VOLATILE BY DEFAULT
- CONTAINERS THEREFORE NEED PERSISTENT STORAGE
- **OCP 4** USES **OPERATORS** TO MANAGE THE ENTIRE OCP CLUSTER
- RHOCS NOW CHANGES AND WILL NOW USE **CEPH** AND **NOOBAA** 'UNDER THE HOOD'
- **OCS 4.2** IS PLANNED TO BECOME GENERAL AVAILABLE STARTING AT **OCP 4.2**
- **OCS 4.2** WILL OFFER **FILE, BLOCK** AND **OBJECT** STORAGE
- **SKU** PROPOSITION WILL REMAIN THE SAME

Red Hat

Thank you

Red Hat is the world's leading provider of enterprise open source software solutions.

Award-winning support, training, and consulting services make

Red Hat a trusted adviser to the Fortune 500.


linkedin.com/company/red-hat


youtube.com/user/RedHatVideos


facebook.com/redhatinc


twitter.com/RedHat

Red Hat

REFERENCE HYPERLINKS

OCS Sales Enablement
https://mojo.redhat.com/docs/DOC-1204753

Velero Migration Tooling
https://youtu.be/VvqsKjAvCx4

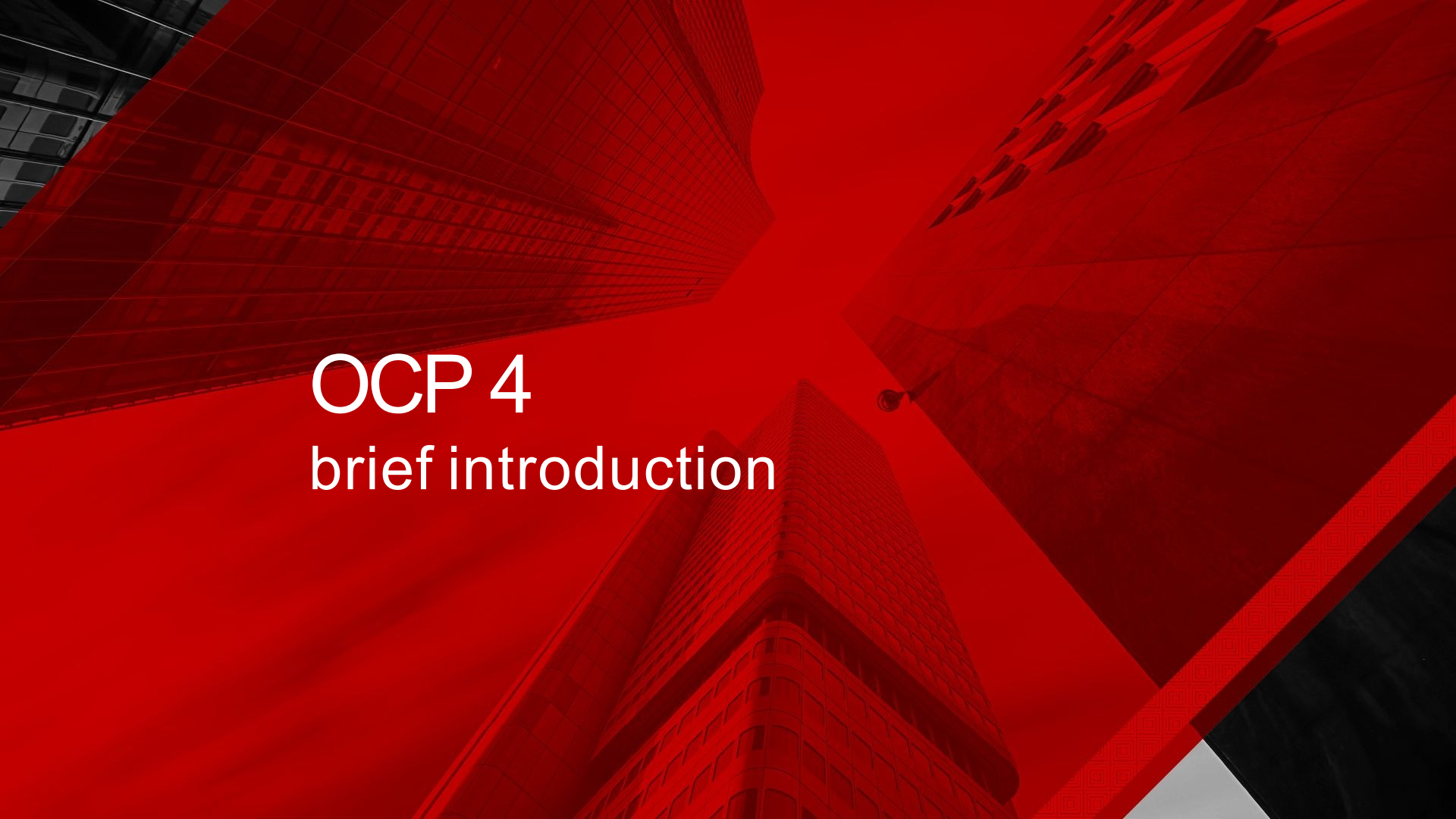
OpenShift Storage for Admins
http://admin-labguides.6923.rh-us-east-1.openshiftapps.com/workshop/ocp-for-admins/lab/environment

Red Hat

AGENDA - Part II

- OCP 4 - BRIEF INTRODUCTION
- INSTALLATION EXPERIENCES: IPI & UPI
- OPERATOR FRAMEWORK
- WHAT HAS CHANGED WITH RHOCS
- COMPONENTS: ROOK, CEPH & NOOBAA
- RED HAT ENTERPRISE SOLUTION
- FUNCTIONALITIES AND SUPPORTABILITY
- THE FACTS - SUMMARY

Red Hat


OCP 4
brief introduction

RED HAT® OPENSHIFT

Developer Preview: try.openshift.com

TRUSTED ENTERPRISE KUBERNETES

- Trusted Host, Content, Platform
- Full Stack Automated Install
- Over the Air Updates & Day 2 Mgt

A CLOUD-LIKE EXPERIENCE, EVERYWHERE

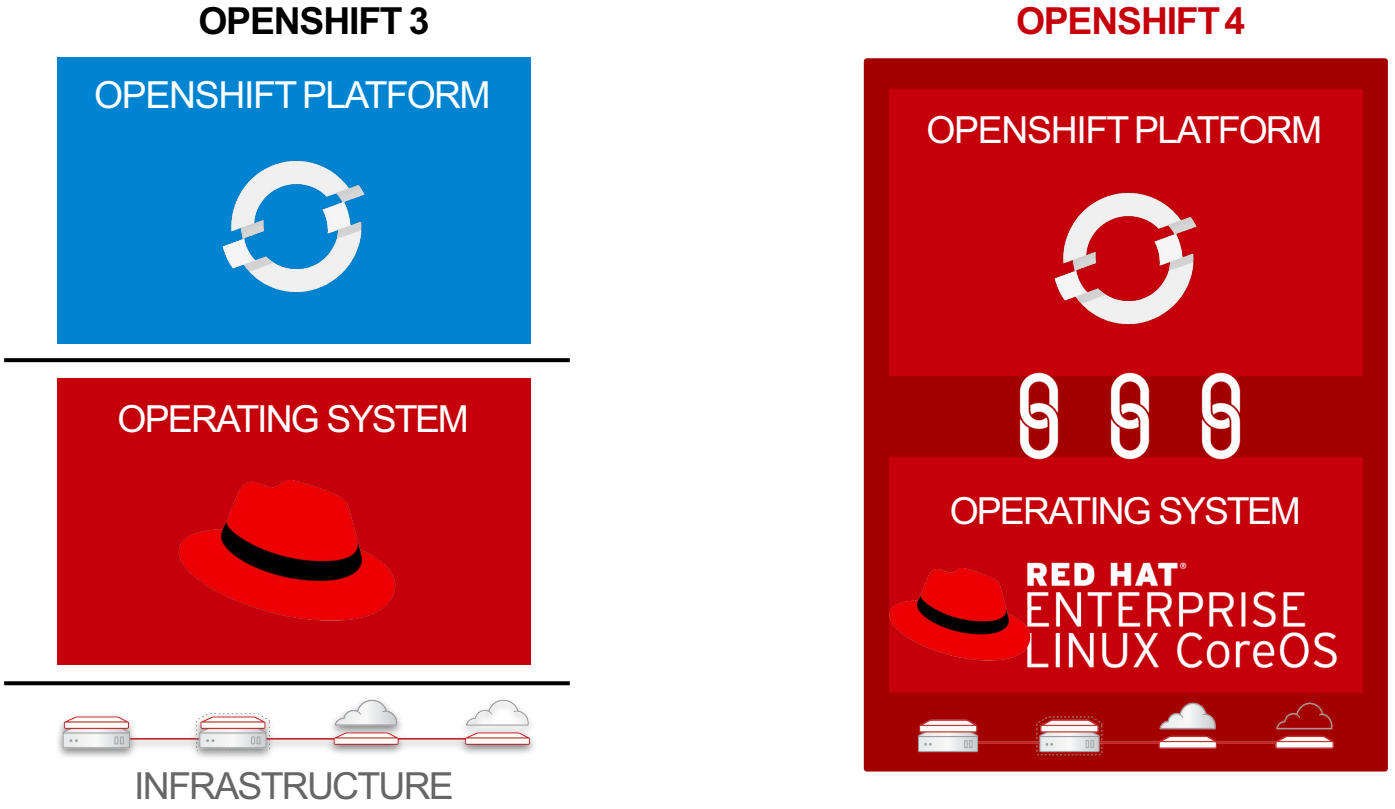
- Hybrid, Multi-Cluster Management
- Operator Framework
- Operator Hub & Certified ISVs

EMPOWERING DEVELOPERS TO INNOVATE

- OpenShift Service Mesh (Istio)
- OpenShift Serverless (Knative)
- CodeReady Workspaces (Che)

Red Hat

FULL STACK AUTOMATED INSTALL + UPGRADE



INSTALLATION EXPERIENCES

OPENSHIFT CONTAINER PLATFORM

FULL STACK AUTOMATED

Simplified opinionated “Best Practices” for cluster provisioning

Fully automated installation and updates including host container OS.

Red Hat Enterprise Linux CoreOS

PRE-EXISTING INFRASTRUCTURE

Customer managed resources & infrastructure provisioning

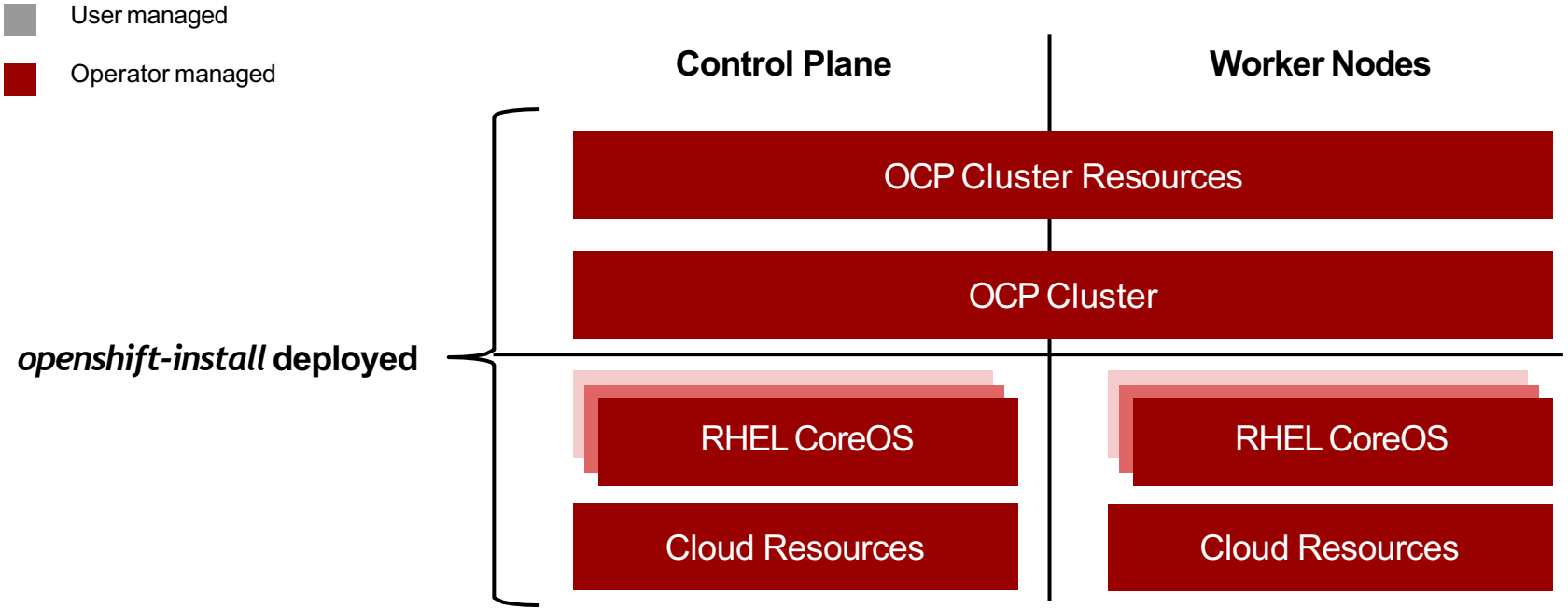
Plug into existing DNS and security boundaries

Red Hat Enterprise Linux CoreOS

Red Hat Enterprise Linux

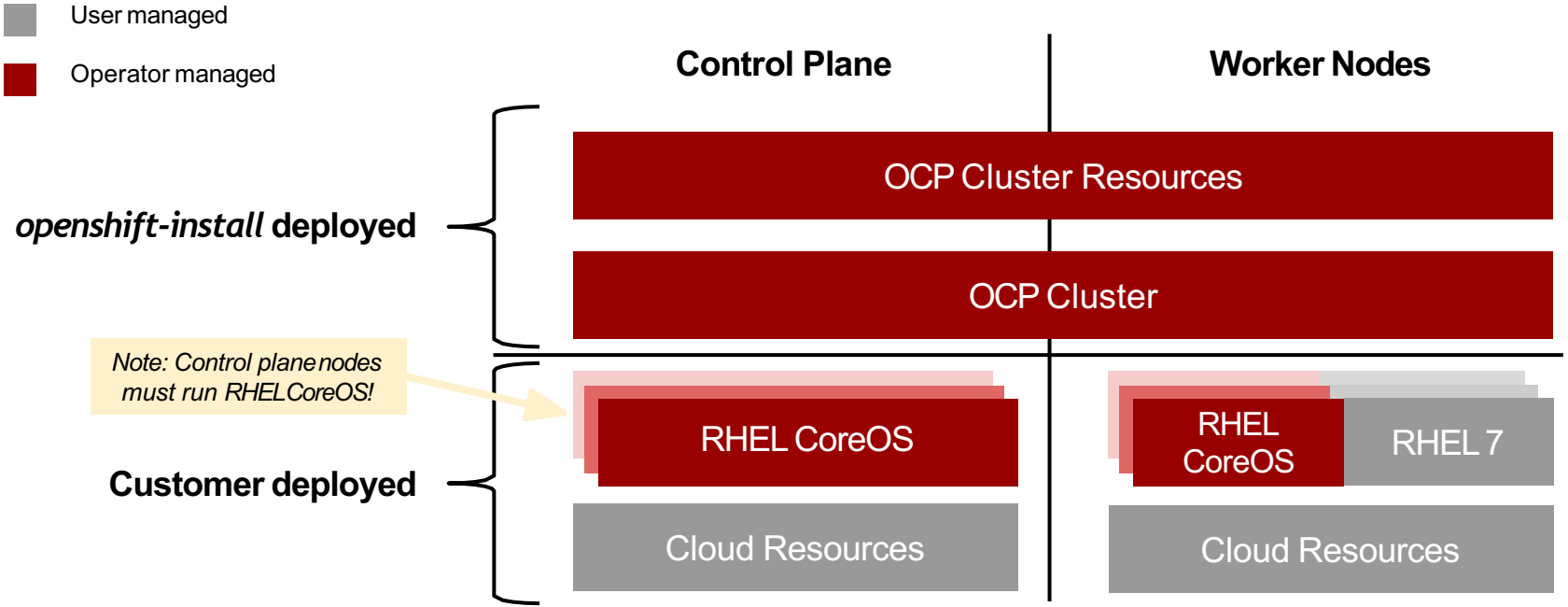
IPI: FULL STACK AUTOMATED DEPLOYMENT

Day 1:openshift-install - Day 2: Operators



UPI: DEPLOYING TO EXISTING INFRASTRUCTURE

Day 1: openshift-install - Day 2: Operators + Customer Managed Infra & Workers



RED HAT ENTERPRISE LINUX

	RED HAT® ENTERPRISE LINUX®	RED HAT® ENTERPRISE LINUX CoreOS
	General Purpose OS	**Immutable container host**
BENEFITS	• 10+ year enterprise life cycle • Industry standard security • High performance on any infrastructure • Customizable and compatible with wide ecosystem of partner solutions	• Self-managing, over-the-air updates • Immutable and tightly integrated with OpenShift • Host isolation is enforced via Containers • Optimized performance on popular infrastructure
WHEN TO USE	When customization and integration with additional solutions is required	When cloud-native, hands-free operations are a top priority

OPENSHIFT OPERATOR FRAMEWORK

Picture source: pexels.com

OPENSHIFT OPERATOR FRAMEWORK

OpenShift 4 uses **OPERATORS** to manage EVERY ASPECT of the cluster.

This includes operators that manage **essential** Kubernetes project components like the api server, scheduler, and controller manager.

Additional operators for components like the cluster-autoscaler, cluster-monitoring, web console, dns, ingress, networking, node-tuning, and authentication are included to provide management of the entire platform.