Ins and Outs of IBM Storage Red Hat Openshift

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Washington Systems Center – Storage experts cover a variety of technical topics.

Audience: Clients who have or are considering acquiring IBM Storage solutions. Business Partners and IBMers are also welcome.

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2020 Upcoming Webinars:

July 28 – Spectrum Scale Erasure Code Edition
Register Here: https://ibm.biz/BdqaMT

August 20 - Designing a Resilient Storage Network for IBM SVC and Spectrum Virtualize HyperSwap Clusters
Register Here: https://ibm.biz/Bdqb5h

August 25 - Protecting your business with GDPS Logical Corruption Protection (LCP) Manager
Register Here: https://ibm.biz/Bdq8gA

Accelerate with IBM Storage Survey

Please take a moment to share your feedback with our team!

You can access this 5 question survey via Menti.com with code 91 74 40 or

Direct link https://www.menti.com/mkg7a2x6q8

Or

QR Code

It’s a simple fix. Or is it?

Slightly modified Dilbert strip.

Containers, Microservices and Orchestration

Fundamental to your cloud evolution

Improves resource utilization

No more over-provisioning

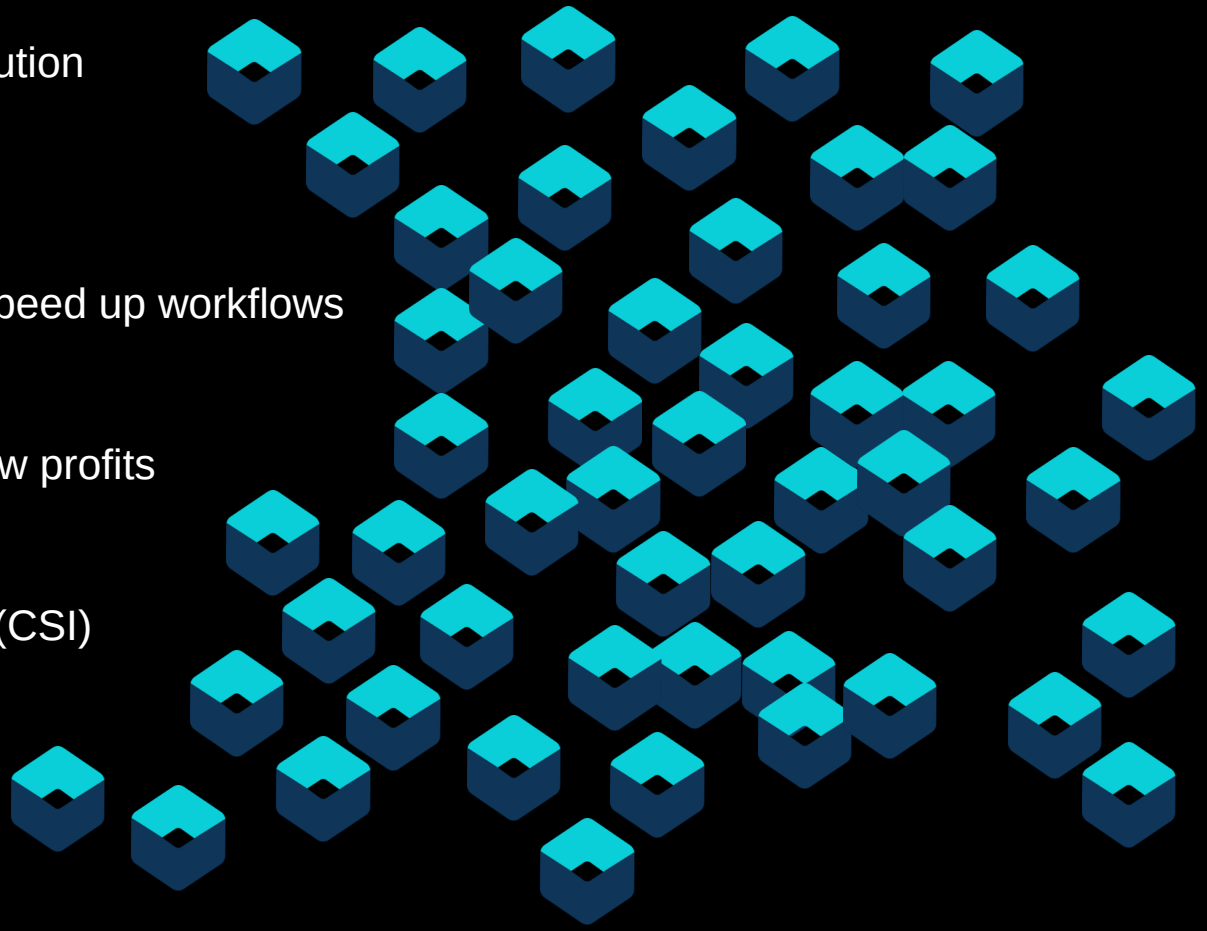
Isolates discrete processes to speed up workflows

Spin up in microseconds

Improves time to market and new profits

Utilize Open Source

- Container Storage Interface (CSI)
- Managed by Kubernetes



Storage challenges were mostly about the numbers.

Now it’s about the data

65% Reduction in infrastructure costs

59% Avoid vendor lock-in

59% Data stored with different vendors in silos across the enterprise

59% Improve latency

Storage connectivity matters

Storage must have a way to connect to the cloud

Speed of adoption matters

NVMe, Storage Class Memory, and Software-Defined Storage

Storage location matters

Data security

Regulatory environments

Performance

Availability

IBM can help you modernize

data resource solutions designed for Red Hat OpenShift and IBM Cloud Paks

People & Process

Delivering the right data resources for any container environment, for any workload when you need it

- Block
- File
- Object

Architecture

Container ready and container native storage based on open source technology

- Red Hat OpenShift
- Container Storage Interface (CSI)
- Kubernetes

Technology

- Multi Parallelism
- Persistent to the core
- Engineered for AI
- Unlimited scalability to meet all workload requirements

Terminology

- **Containers** – standard unit of software that packages up code and all its dependencies – “Docker” or “CRI-O are a “brand” of container
- **Kubernetes – (K8s)** – a container management tool
- **OpenShift – (OCP)** – container application “platform” with full stack automation
- **Kubectl or OC** – CLI used to run commands against a Kubernetes cluster
- **yaml** – a human readable data serialization language – typically used for systems configuration files

Storage Specific Terminology

Ceph – SDS that implements object storage on a distributed computer cluster, and provides interfaces for object-, block- and file-level storage.

CSI – Container Storage Interface – industry standard API to create and use storage services

Non-Persistent Volume (NPV) – no data requires storing / used – ex – Siri application

Persistent Volume (PV) – a storage systems data area where container data is kept – ex – Mongo DB

Persistent Volume Claim (PVC) – a request to a storage system for a place to store data

Agenda

1- What/why Containers

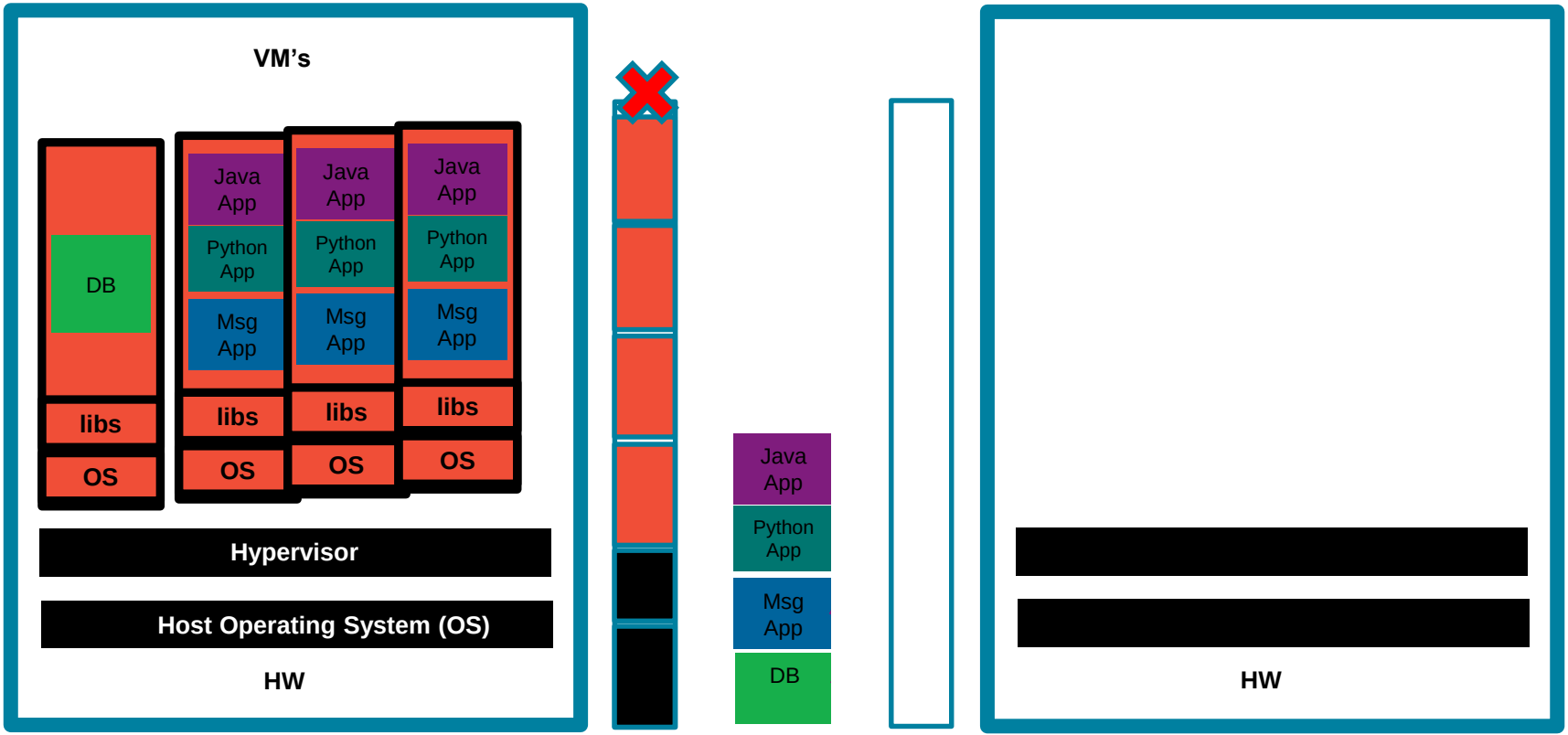
2 - What/why Kubernetes

3 - What/why Openshift

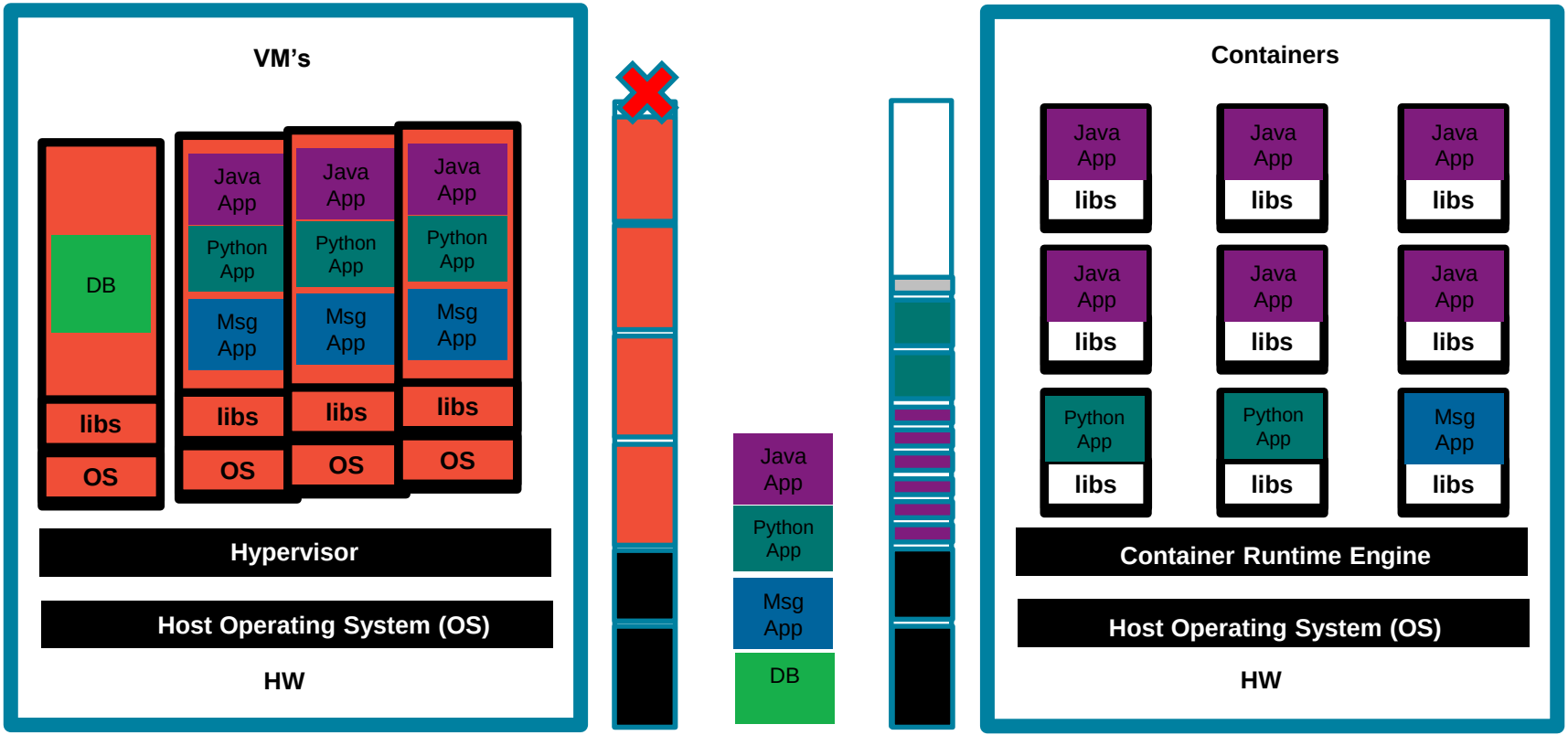
4 - What/why Cloud-paks

5 - How we can help

Containers versus Virtual Machines (VMs)



Containers versus Virtual Machines (VMs)



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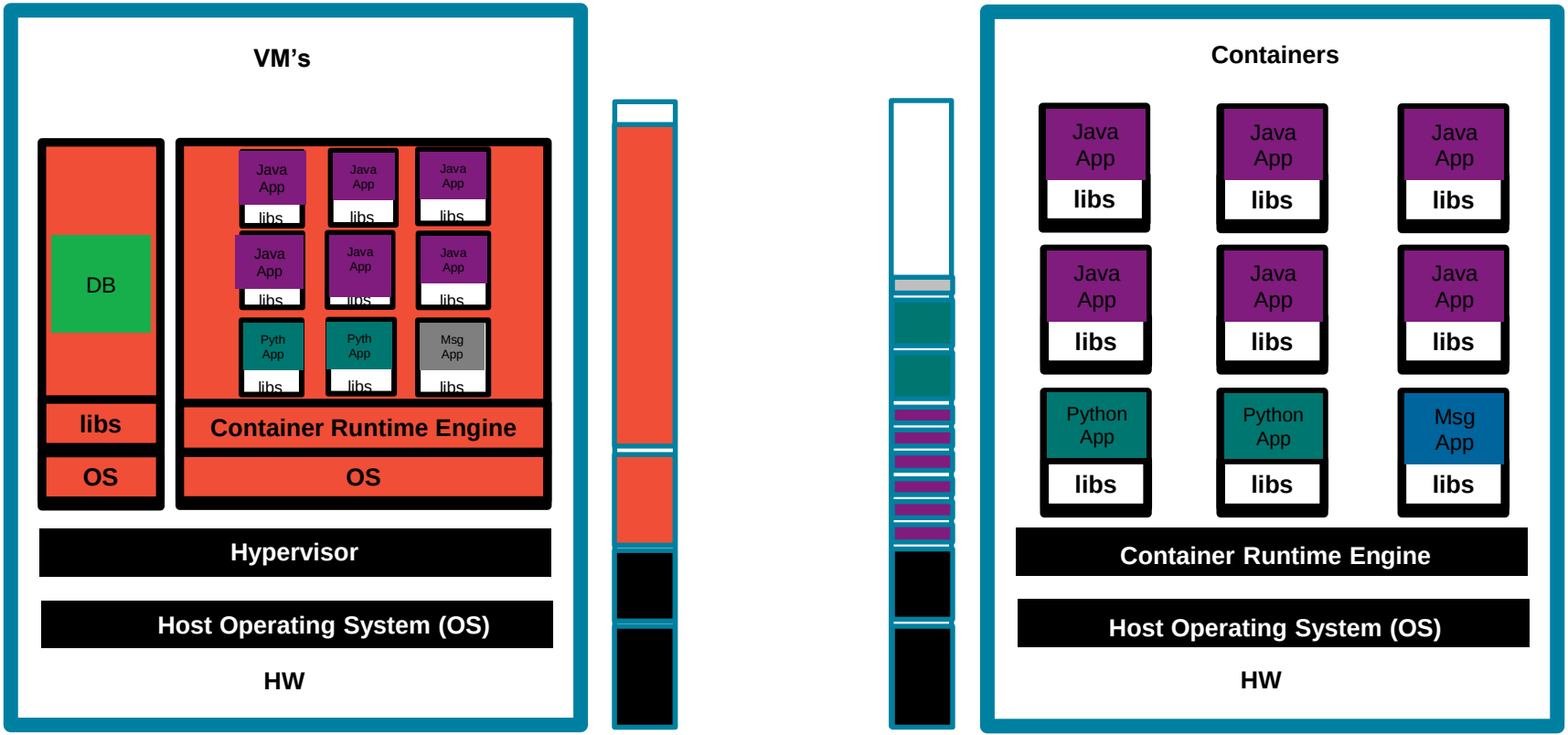
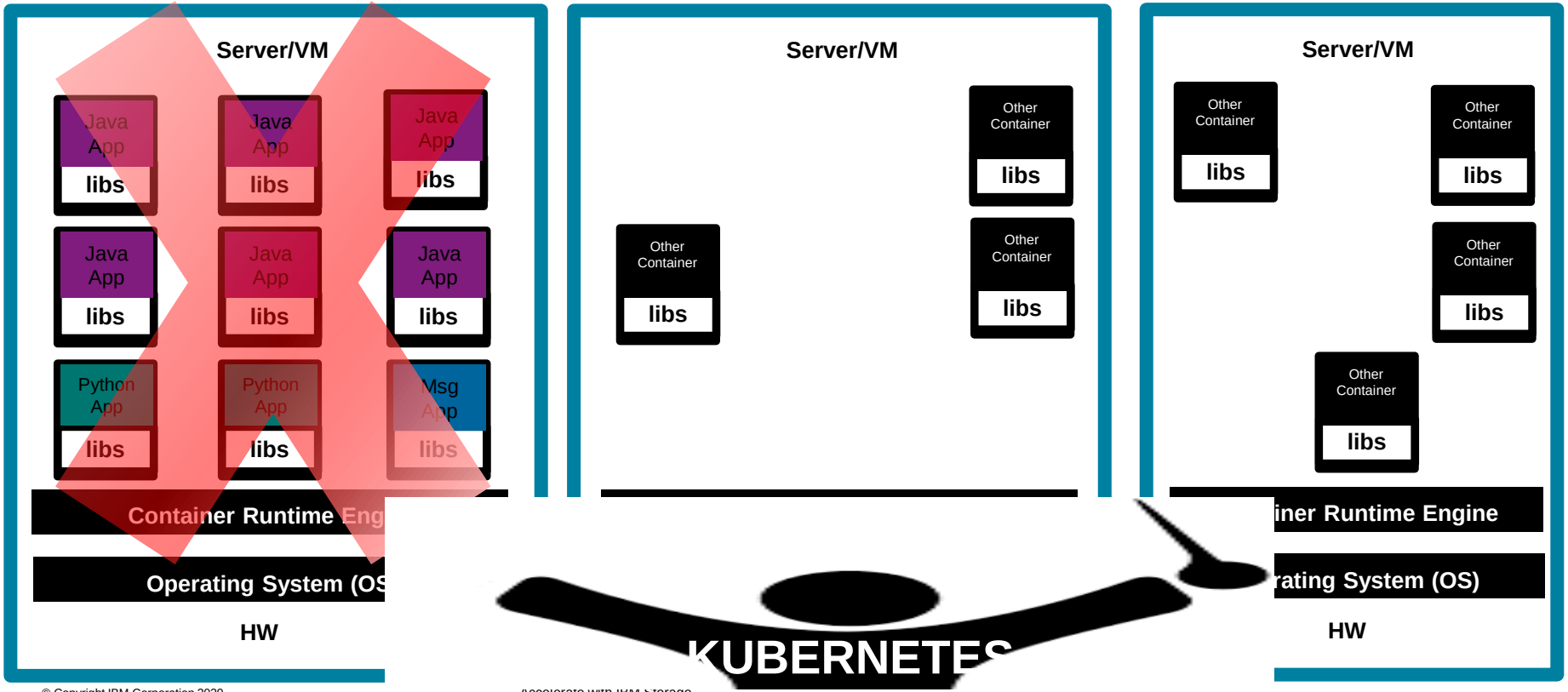


Kubernetes - Container Orchestration



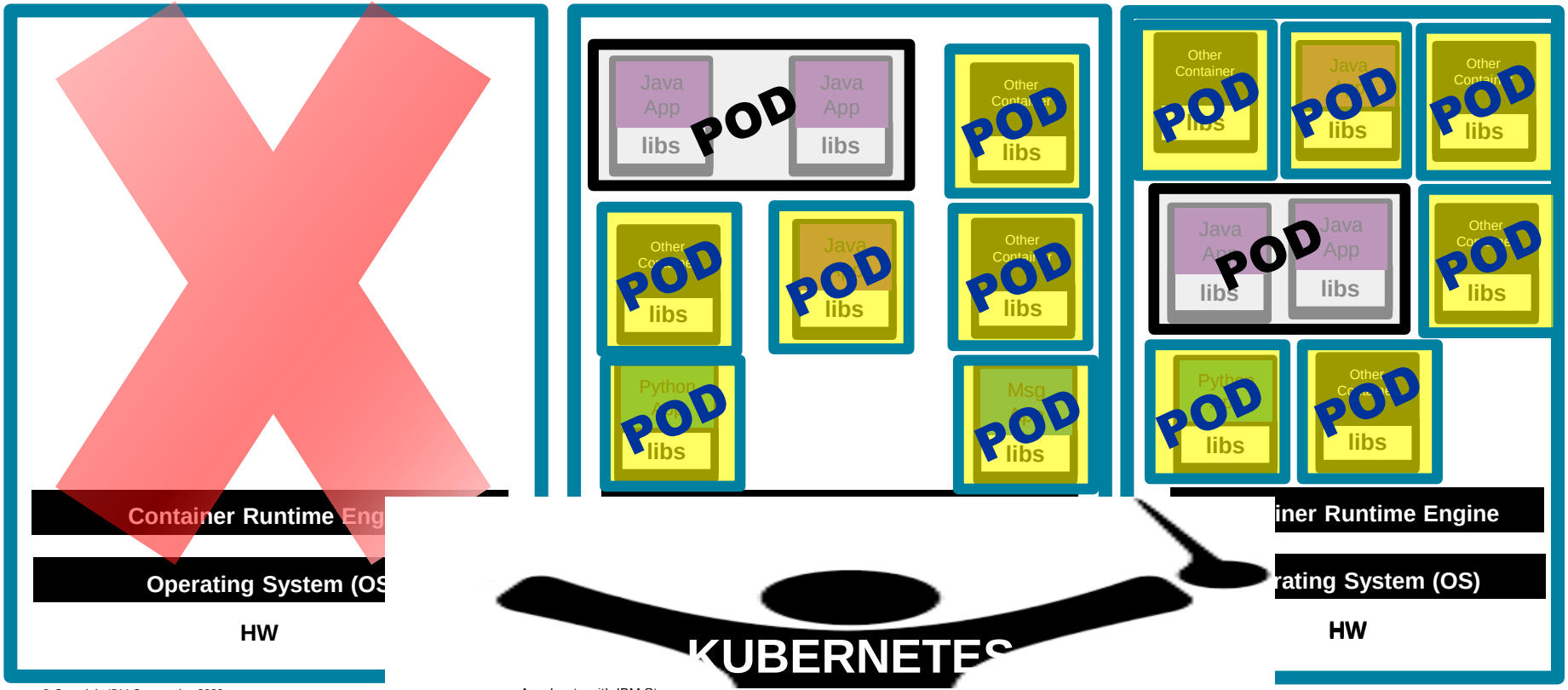
Kubernetes - Conta tration

Kubernetes Terminology 101

“Pods”

1. **Pods** are the **smallest deployable units** of computing that can be created and managed in Kubernetes
2. **Pods** consist of *one or more containers* that are logically connected and deployed together.
3. *Most **pods** are just one container.*

Kubernetes - Container Orchestration



Multicloud world wants “build once, run anywhere”

- ***OpenShift Container Platform enables that***

OpenShift Container Platform 4 Overview

Cluster services
Monitoring, managing, policy, security, Registry, logging

Application services
Middleware, function, ISV

Service mesh

Developer services
Dev tools, Automated builds, CI/CD, IDE

Automated operations for installation, upgrades & life-cycle mgmt for the entire stack

Kubernetes

Red Hat
Enterprise Linux
Enterprise Linux CoreOS (introduced in v4.0)

Any infrastructure

Physical

Virtual

Private

Public

OpenShift Container Platform 4 Overview

RED HAT PORTFOLIO
Optimized for Containers

- RED HAT OPENSHIFT Application Runtimes
- RED HAT JBOSS WEB SERVER
- RED HAT JBOSS ENTERPRISE APPLICATION PLATFORM
- RED HAT DATA GRID
- RED HAT AMQ
- RED HAT FUSE
- RED HAT MOBILE
- RED HAT ANSIBLE Engine
- RED HAT QUAY CONTAINER REGISTRY
- RED HAT DECISION MANAGER
- RED HAT PROCESS AUTOMATION MANAGER
- RED HAT 3SCALE API MANAGEMENT
- RED HAT OPENSHIFT Container Storage

THIRD-PARTY ISV
Red Hat Container Catalog (100s certified)

IBM, Microsoft, SAP, New Relic, Couchbase, Crunchy Enterprise PostgreSQL, Sysdig, F5, Veritas, Zabbix, NetApp, Sonatype, JFrog, dynatrace, nuagenetworks

CLOUD SERVICES
Open Service Broker

amazon web services, Microsoft Azure, Google Cloud

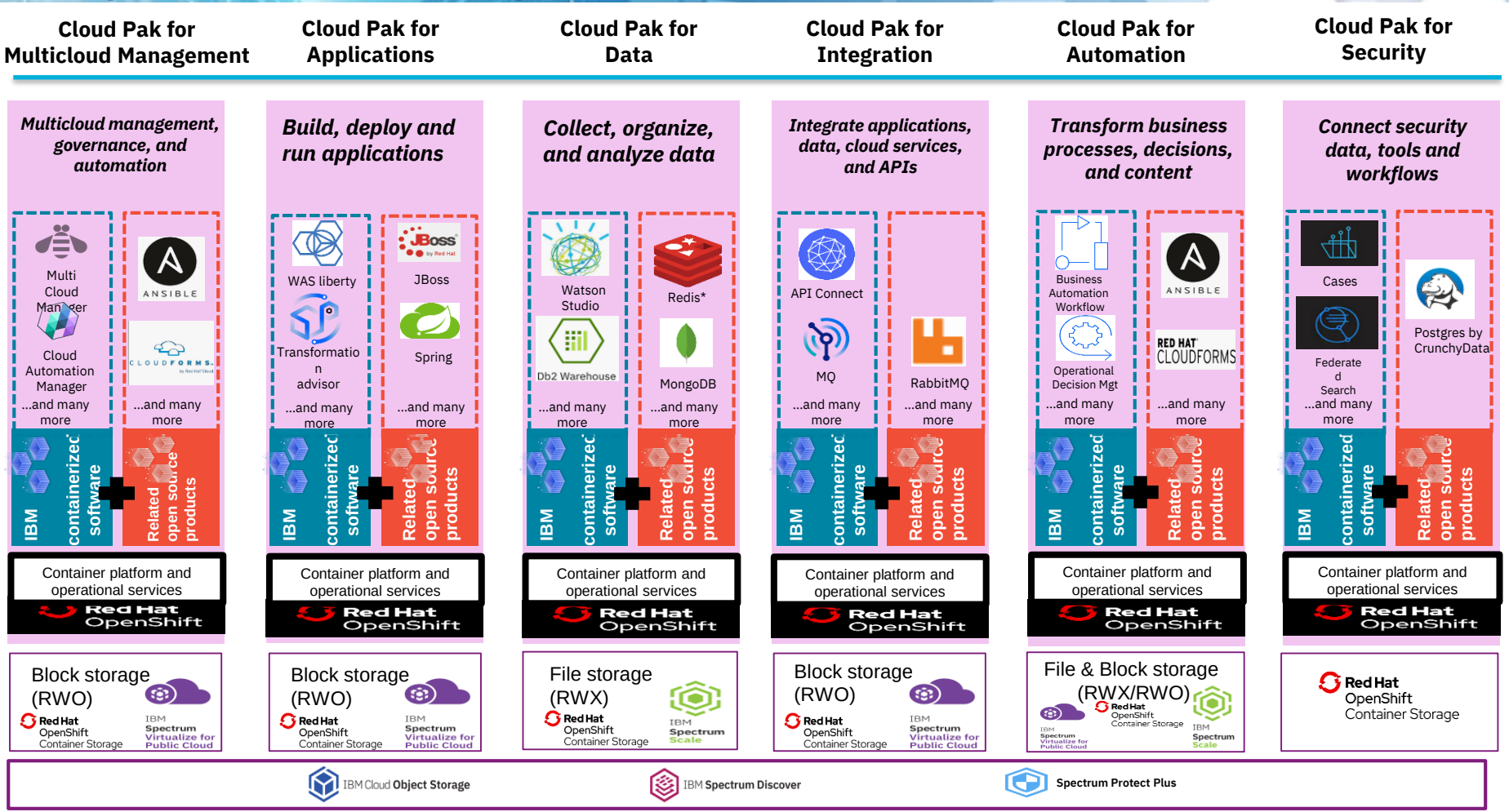
RED HAT® OPENSHIFT

Any infrastructure

Physical | Virtual | Private | Public

What are IBM Cloud Paks?

Washington Systems Center - Storage



Washington Systems Center - Storage

Cloud Pak for Multicloud Management

X86-Now Power-Now

- Multi Cloud Manager
- Cloud Application Management
- Cloud Event Manager
- Cloud Automation Manager
- ANSIBLE
- CLOUDFORMS

Red Hat OpenShift

Cloud Pak for Applications

X86 & Z -Now Power- 2Q20

- Open liberty
- Swift
- WAS liberty
- Spring
- Kabanero Enterprise
- JBoss
- JBoss
- istio
- jenkins
- node.
- Transformation advisor

*UrbanCode Deploy
*Developer Team Orch
*Dev Team Governance

+ Add-on * RHOAR - OpenShift Application

Red Hat OpenShift

Cloud Pak for Data

X86-Now Power 2Q20

- Cloudant
- DB2
- Cognos
- Streams
- MariaDB*
- Redis*
- MongoDB
- etcd

* PostgreSQL
* NetApp Persistent Storage
* Wand Taxonomies and Ontologies
* Knowis for Banking
* Lightbend Reactive Microservices
* Prolifics Prospecting Accelerator

+ Add-on * (including Watson AI,

Red Hat OpenShift

Cloud Pak for Integration

X86-Now Power-3Q20

- App Connect Enterprise
- API Connect
- Event Streams
- MQ
- RabbitMQ
- Aspera
- Integration explorer
- Watson Voice gateway *
- Datapower

+ Add-on *

Red Hat OpenShift

Cloud Pak for Automation

X86-Now Power-2021

- Business Automation Workflow
- Operational Decision Management
- Business Automation Insight
- Business Automation Content Analyzer
- File Connect Manager
- Robotic Process Automation *

+ Add-on *

Red Hat OpenShift

Cloud Pak for Security

X86-Now Power-2021

- Federated Search
- Case Management
- Universal Data Insights
- Security orchestration and Automation
- Development Framework

Red Hat OpenShift

X86 Only — Spectrum Protect Plus for IBM Cloud Paks

*IBM Storage Suite for IBM Cloud Paks

*CoreOS 4Q20

*x86/Power: Supported on OCP 4.2+
*Power: ~June 2020

- IBM Spectrum Scale
- IBM Spectrum Virtualize
- IBM Spectrum Discover — X86 Only
- IBM Cloud Object Storage
- Red Hat OpenShift Container Storage — *X86 only today, *Power: TBD
- Red Hat Ceph Storage

IBM FlashSystem | IBM DS8K | IBM ESS | IBM Cloud Object Storage

*Cloud Pak support for storage products varies based on version and individual products in the Cloud Pak

IBM FlashSystem Family

Storage made simple for hybrid multicloud

Entry Enterprise

FlashSystem 5100

FlashSystem 5000

Midrange Enterprise

FlashSystem 7200

High-End Enterprise

FlashSystem 9200R

FlashSystem 9200

Hybrid Multicloud

IBM **Spectrum** Virtualize for Public Cloud

IBM Spectrum Virtualize Software

IBM Storage Insights (AI-based Monitoring, Predictive Analytics, and Proactive Support)

IBM Systems Flash Storage Offerings Portfolio

IBM Spectrum Virtualize | IBM Spectrum Accelerate | IBM Spectrum Scale | IBM Power Systems

NVMe end-to-end

Storwize V5010E / V5030E

Entry
SAS Hybrid & AFA

Storwize V5100/F

Entry
NVMe Accelerated
Hybrid & AFA Solutions

Storwize V7000

Enterprise for Everyone
NVMe Accelerated
Hybrid & AFA Solutions

FlashSystem 9110 / 9150

Enterprise Class
NVMe accelerated
Multicloud Enabled

FlashSystem A9000

Cloud Service Providers

FlashSystem A9000R

High End Enterprise

IBM Elastic Storage Server

Big Data

Consolidate file & object workloads
Faster data analysis
Global sharing

DS888xF

Business Critical

z/OS / AIX
Power HA
Power i HA

Business critical, deepest integration with z Systems
Superior performance and reliability
Three-site / Four-site replication
DS8888F, DS8886F, DS8884F, DS8882F

99.9999% Availability

Scale-out clustering
Simplified management
Flexible consumption model
Virtualized, flash-optimized, modular storage
Enterprise heterogeneous data services and selectable data reduction

Simplified management
Flexible consumption model
Large Grid scale
Full time data reduction

VersaStack™ Solution by Cisco and IBM

IBM FlashCore™ Technology Optimized

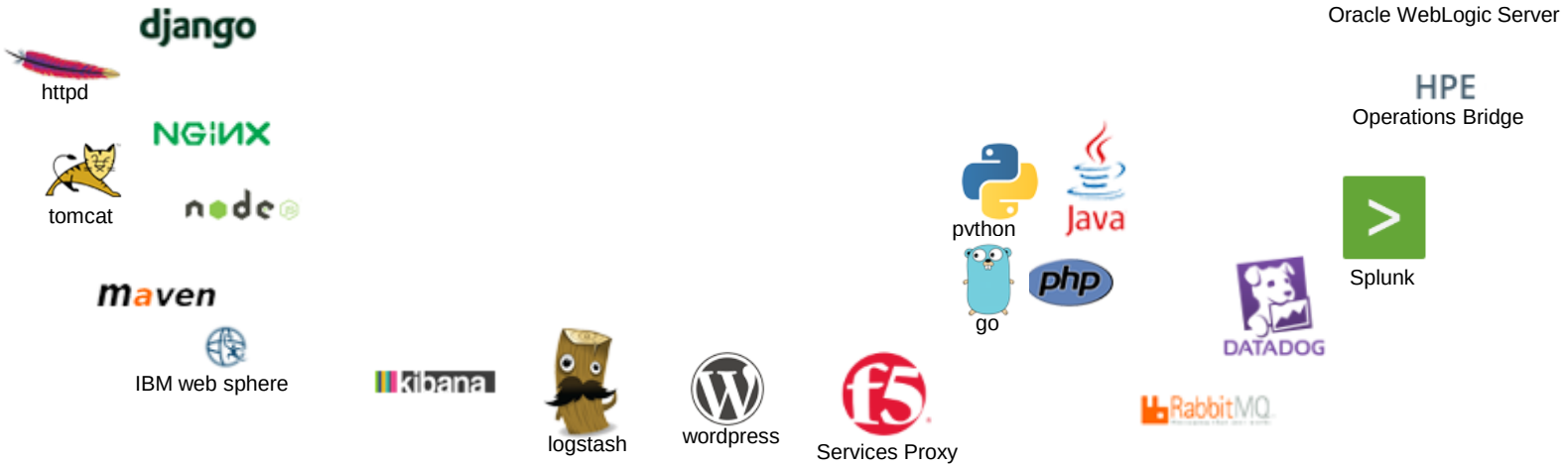
Enhanced data storage functions, economics and flexibility with sophisticated virtualization

NVMe FlashCore Module
Superior endurance & performance
- FIPS 140-2
- Hardware Compression

FlashSystem 900
Application acceleration

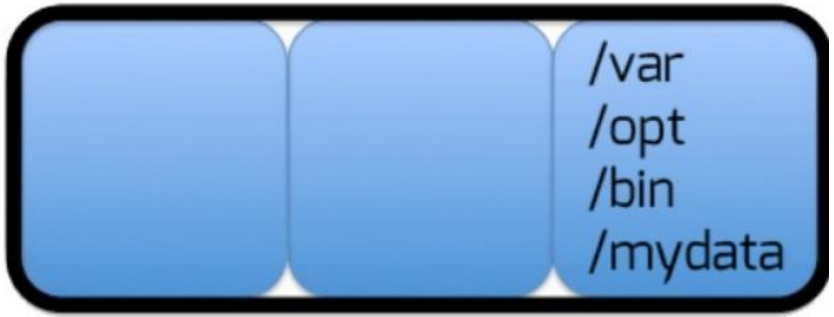
- Extreme performance
- Hardware Compression
- Targeting database acceleration

Why storage for containers?



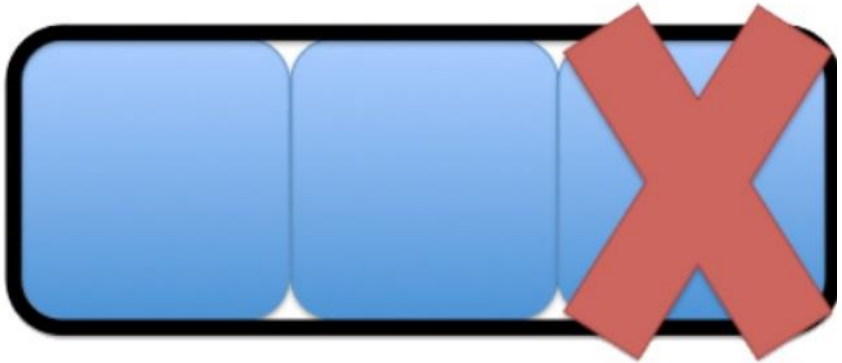
The storage challenge

- When I run a persistent application in a container, where does my data get stored?
  - one container holds the directory and structure of the application



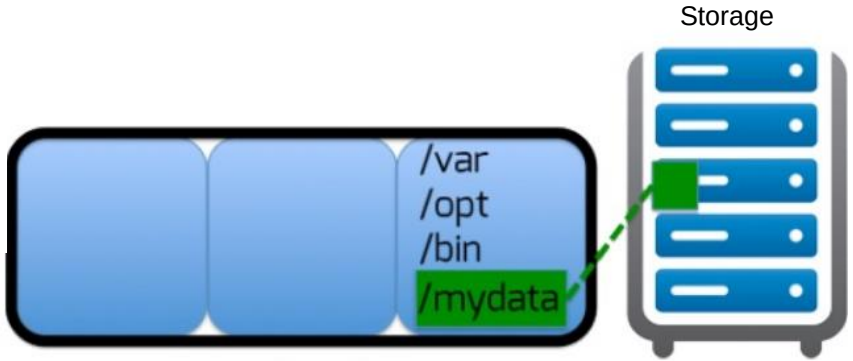
The storage challenge

- lose a container. lose the data.



The storage challenge – the solution

- **Store the data outside of the container!**

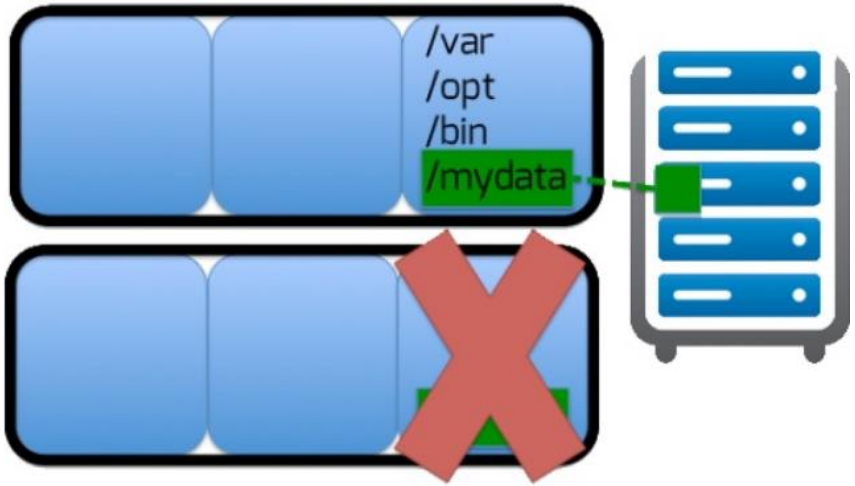


The storage challenge – the solution

- lose the container, data remains in tact on the remote volume

The storage challenge – the solution

- attach the volume to a new container on a different host. persisted state



New definitions of storage for Containers

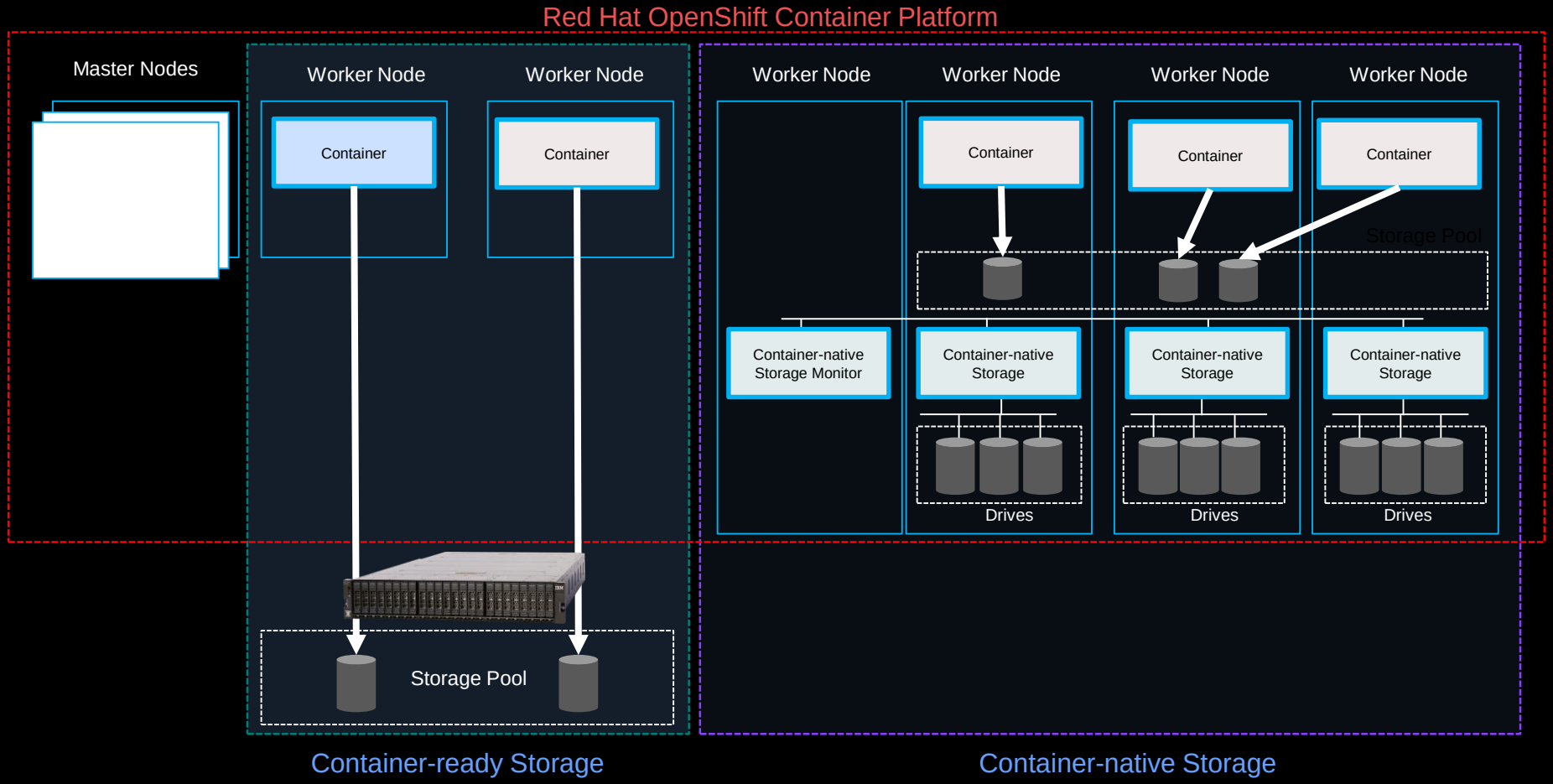
Container-ready Storage

- **Various classes of storage, including:**
  - Storage Area Network (SAN) devices
  - Software Defined Storage (SDS)
  - Network Attached Storage (NAS)
- **Leverage your existing infrastructure, processes, management, and monitoring**
- **Features such as snapshots, clones, and replication can still be used**
- **Offerings include:**
  - IBM Spectrum Virtualize family of products
  - IBM Spectrum Scale
  - IBM Cloud Object Storage

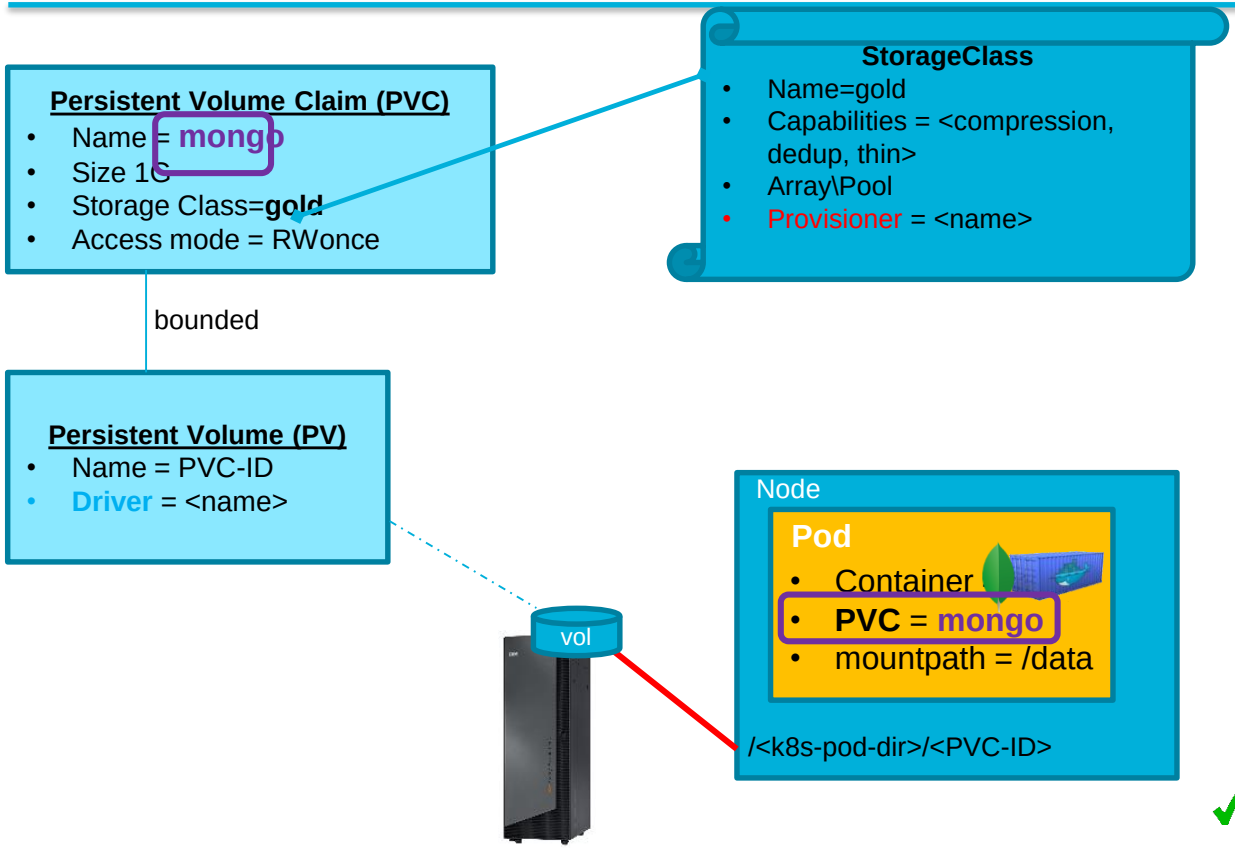
Container-native Storage

- **Storage is deployed inside containers and presented to application containers**
  - Hyper-converged approach to storage & compute for containerized applications
  - Use internal drives or external storage for consumption
  - Management through a single control plane within K8s
- **Depending on protection scheme, can be up to 3 copies of the data stored**
  - Can be based on object, file, block, or other types
  - Generally includes snapshots, clones, and/or replication
- **Offerings include:**
  - Red Hat OpenShift Container Storage (Rook + Ceph + Multi-Cloud Object Gateway)
  - Red Hat GlusterFS

Container-ready and Container-native Storage



Kubernetes Storage Terminology



Storage Class

To achieve dynamic volume creation, the admin must define a k8s **StorageClass** (e.g : gold, silver).

Provision a volume

1. The user create a claim for volume (**PVC).**
2. The "**Provisioner**" (vendor specific) listens to new PVC requests, and dynamically creates the volume on the storage system (if no PV already matched). The **PV** is created.

Create a stateful POD

1. The user creates a **POD** with the new PVC.
2. K8s triggers the "**Driver**" in order to attach the PV to the node.
3. The volume is now mapped and mounted to the node.
4. k8s starts the POD with the PV mounted to /data inside the container.

✓ The statefull container is UP

https://kubernetes.io/docs/concepts/storage/volumes/

Kubernetes Storage Terminology

Persistent Volume Claim (PVC)
- Name = mongo
- Size 1G
- Storage Class=**gold**
- Access mode = RWonce

bounded

Persistent Volume (PV)
- Name = PVC-ID
- Driver = IBM CSI

StorageClass
- Name=gold
- Capabilities = <compression, dedup, thin>
- Array\Pool
- Provisioner = IBM CSI

Secret
Array Credential

IBM Block CSI Driver
- Provisioner =
- Driver = IBM CSI

✓ **Enabling IBM Storage for Kubernetes**

Node

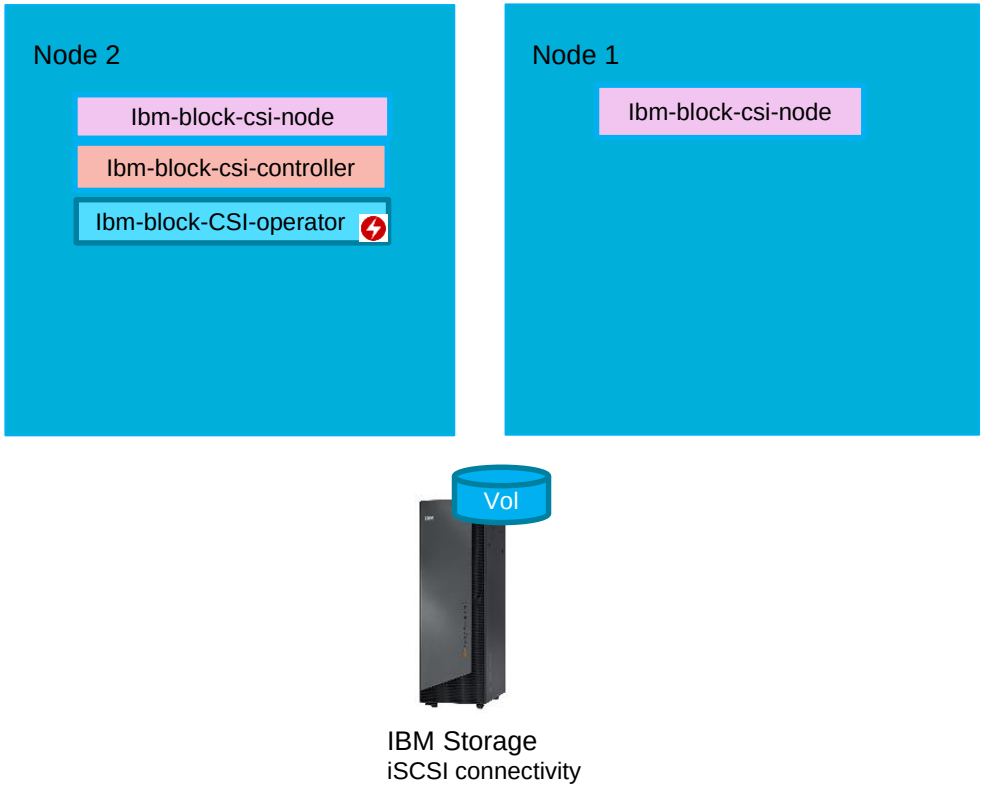
Pod
- Container
- **PVC** = mongo
- mountpath = /data

/<k8s-pod-dir>/<PVC-ID>

vol

IBM Block Storage

New IBM CSI driver – Flow



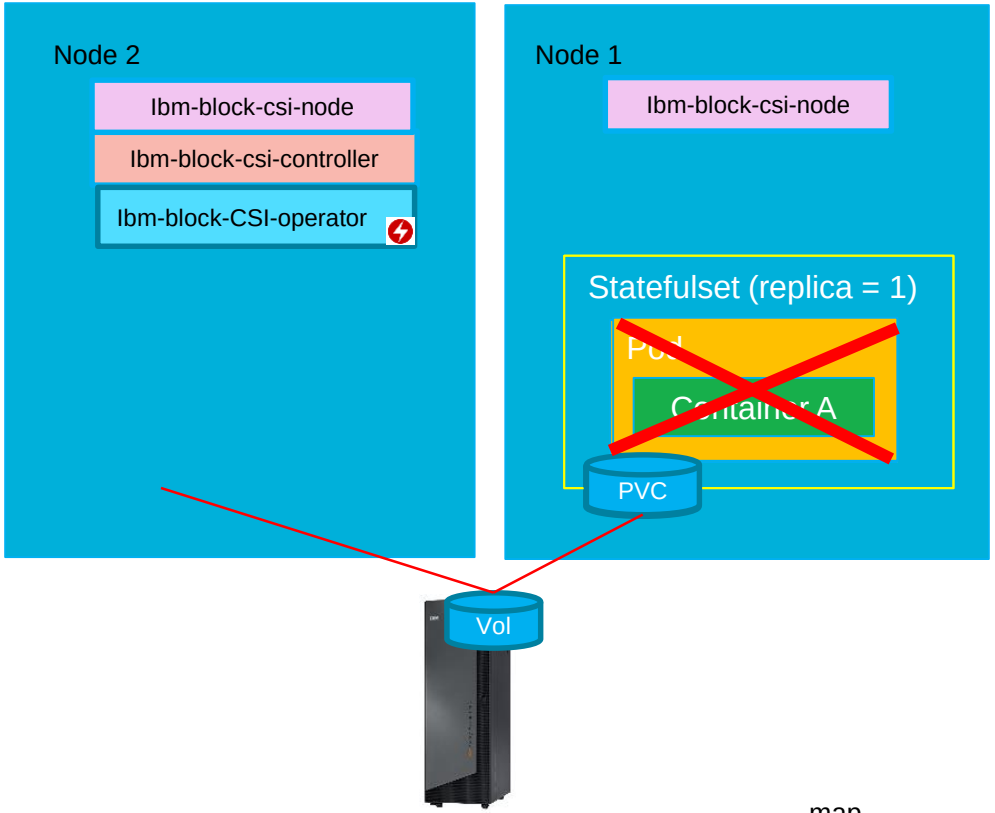
Flow:

1. Prepare nodes(iscsi\multipath\connectivity)
2. Install the driver (from Openshift Console)
3. Create Storage Class
4. Create PVC
5. Create statefulset with PVC + write data

StorageClass
gold

Secret
Array Credential

New IBM CSI driver – Flow



Flow:

1. Prepare nodes(iscsi\multipath\connectivity)
2. Install the driver (from Openshift Console)
3. Create Storage Class
4. Create PVC
5. Create statefulset with PVC + write data
6. Simulate Pod kill (Change POD selector)
7. Statefulset move to node2 with the data!

StorageClass gold

Secret Array Credential

DATA persists ✓

IBM Block CSI Driver

Deploying IBM Block CSI Driver

Let’s see this live –

Demo Time

Container Storage

Developers Love It

Container storage lets developers shave time from development and testing cycles, and gives them control over how storage is delivered. Developers can provision their own storage, autonomously, through a simple interface — the Kubernetes-based orchestration platform. Docking and loading containers adds another layer of efficiency to development, testing, and deployment scenarios. The bottom line is, developers can focus more on code and less on housekeeping.

Admins Love It

Container-based solutions reduce administrative burdens while giving admins more control over their environments. Because developers can request and provision storage themselves, admins no longer need to plant themselves in the middle of development projects. And orchestrators go to town keeping containers in check and running. Although administrators and developers seem to be on two different planets much of the time, container storage unites!

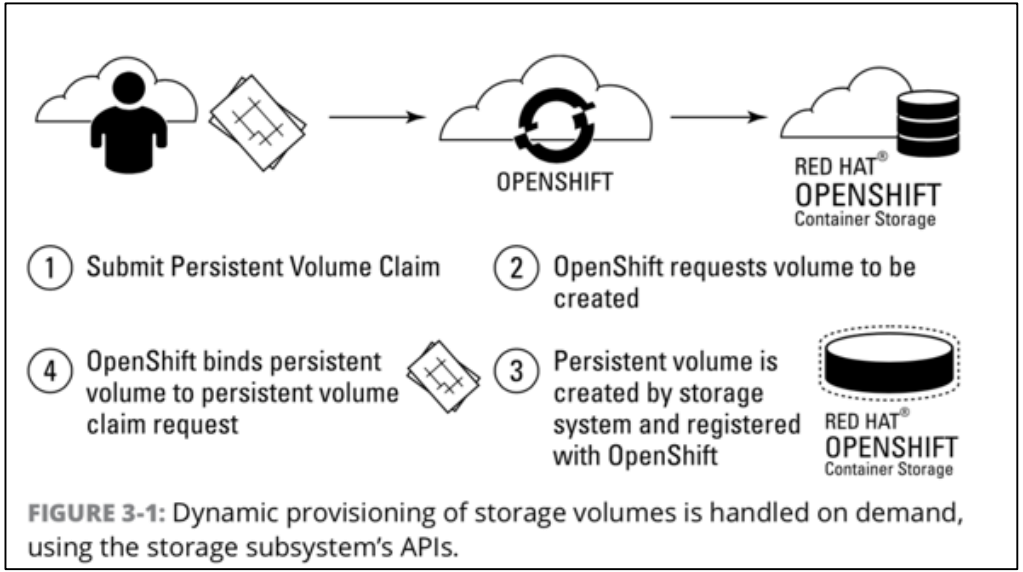
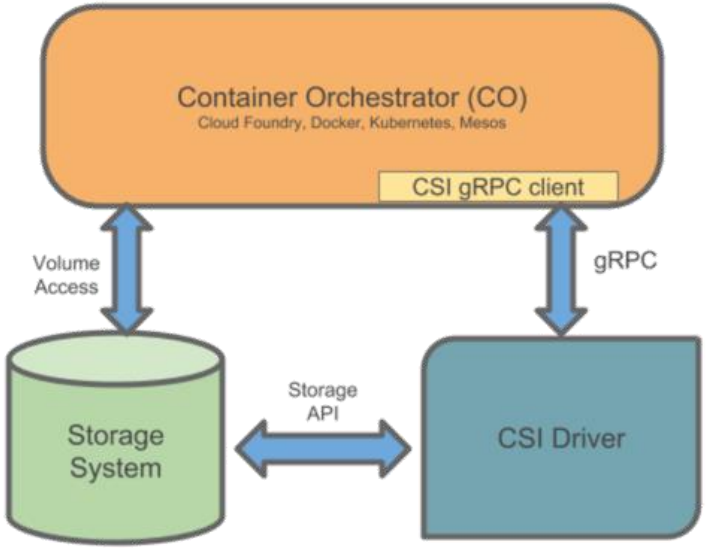


FIGURE 3-1: Dynamic provisioning of storage volumes is handled on demand, using the storage subsystem's APIs.

CONTAINER STORAGE INTERFACE

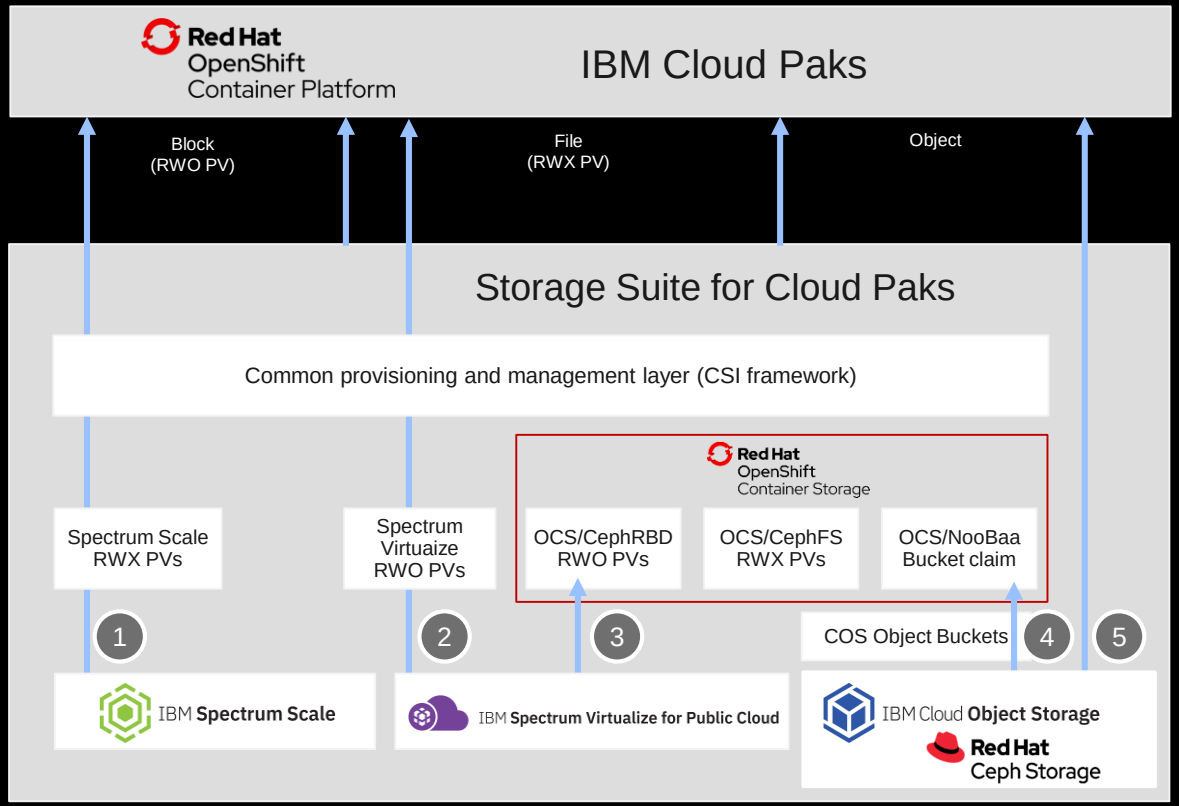


Persistent Volume Storage Classes

Let's see this live, lets review a storage class –
Demo Time

- PersistentVolumeClaims allow a Containerized Application to consume abstract storage resources.
- Containerized applications need PersistentVolumes with unique properties:
  - Performance
    - Flash
    - File
    - Object
  - Data Optimization
    - Compression
    - Deduplication
    - Thin
  - Security - Encryption
- Cluster administrators need to be able to offer a variety of PersistentVolumes that differ in more ways than just size and access modes, without exposing users to the details of how those volumes are implemented.
- For these needs there is the StorageClass resource.

Overview of deployment options for Storage Suite offerings



Spectrum Scale

1. Through the CSI driver

Spectrum Virtualize for Public Cloud

2. Through the CSI driver
3. Under OCS Ceph

Cloud Object Storage

4. Multi-Cloud Object Gateway
5. External object store direct from Cloud Pak

Key features and benefits of Storage Suite for Cloud Paks

A complete yet simple SDS infrastructure foundation

Choose the data resources you need when you need them - block, file or object - and as your needs change deploy new data resources

IBM certified with Kubernetes and Red Hat OpenShift

Ongoing security, compliance and version compatibility

Build new applications with modern process

Helps enterprises transform and move to the cloud by enabling them to build new applications using modern processes

Simple scalable deployments

Organizations can simply deploy data resources, scaling up or down without impact to their business

Quickly deploy persistent data resources as storage classes

Self–service provisioning of persistent storage resources in Kubernetes environments

Speed up container storage provisioning

Supports Container Storage Interface (CSI), simplifying management and reducing costs for containerized storage deployments

Key takeaways

- Hybrid multicloud is happening now
- Containers are gaining momentum
- Without a **solid storage foundation,** projects will fail
- **IBM Storage Suite Cloud Paks** provides that SDS foundation

IBM Spectrum Scale

IBM Cloud Object Storage

IBM Spectrum Discover

IBM Spectrum Virtualize for Public Cloud

Red Hat OpenShift Container Storage

Red Hat Ceph Storage

Offering Management & Sales Subject Matter Expert List

NA Team
Michael Reaney – Business Development Executive
Michelle DePinto – NA Storage Sales Leader
Ann Evans – Sales Enablement

Washington Systems Center
Lloyd Dean – Storage Software Architect/Specialist
Dominic Pruitt – Storage Technical Specialist

Global Team

Shaluka Perara - Business Leader

Megan Grohman – Lead Offering Manager

Frank Lee - Sales Leader

Matt Levan - Technical Offering Manager

Par Hettinga - Sales Enablement

JP Lavigne - Marketing


IBM

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Please take a moment to share your feedback with our team!

You can access this 5 question survey via Menti.com with code 91 74 40 or

Direct link https://www.menti.com/mkg7a2x6q8

Or

QR Code