



# IBM Cloud Paks & Red Hat OpenShift Container Platform on IBM Z & LinuxONE

All workshop materials can be found here:

<https://mmondics.github.io/ocp-cloudpak-workshop/>

## Schedule for the day

### Presentation

- Overview of OpenShift
- Overview of IBM Cloud Paks



### Short Break



### Presentation

- OpenShift on Z technical deep dive



### Lab exercises

- Self-paced
- Non-sequential



End

4:00 PM Eastern

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# Containers

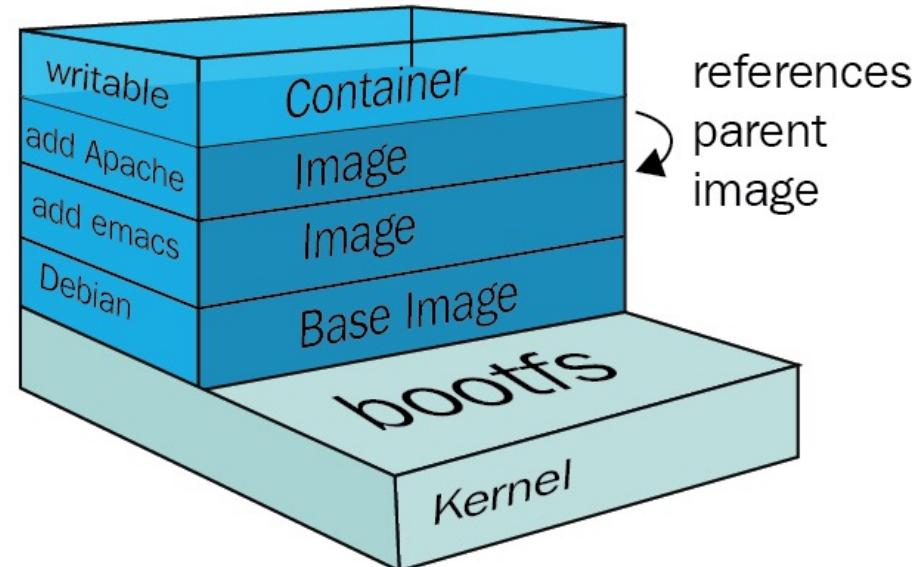


# Containers

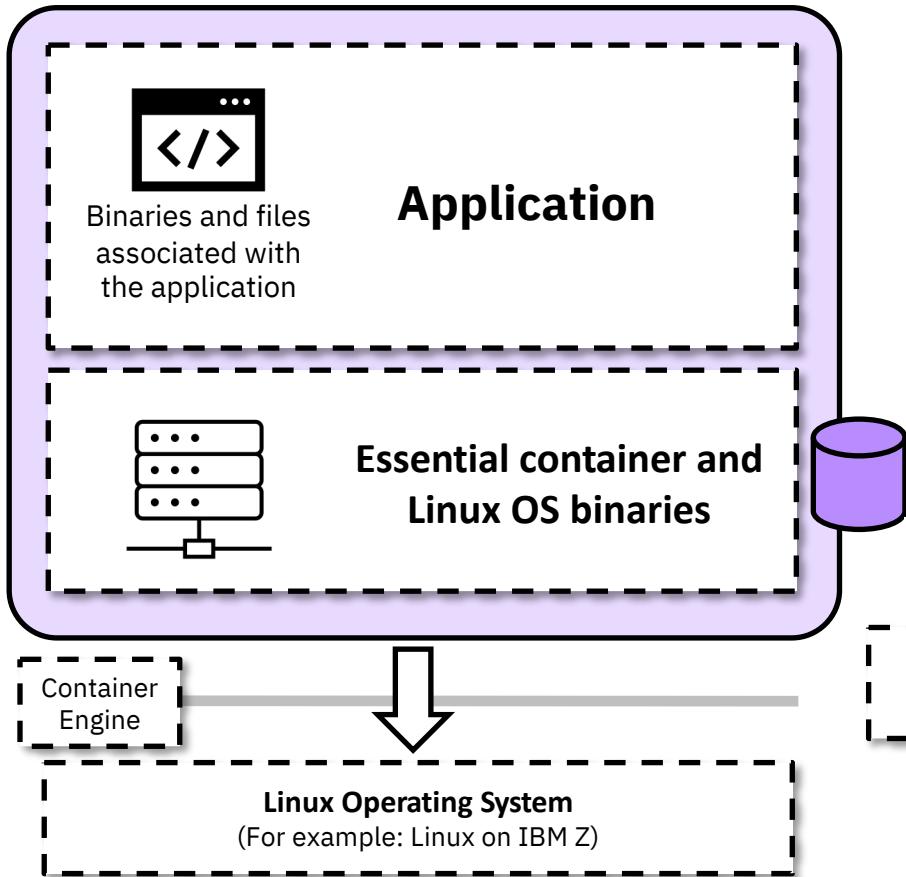
Container: a standard unit of software that packages up code and all its dependencies, so the application runs quickly and reliably from one computing environment to another

Container image: a lightweight, standalone, executable package of software that includes everything needed to run an application

Container engine takes a container image and turns it into a container (i.e. a running processes) `



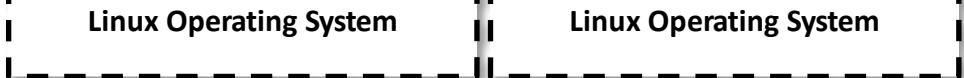
# Overview of Containerization



## The appeal of containerized applications:

- Extremely **lightweight**
- **Isolated** from other containers
- Very fast starts and restarts
- **Portable** across container platforms
- Maps extremely well to "**micro-service**" architectures

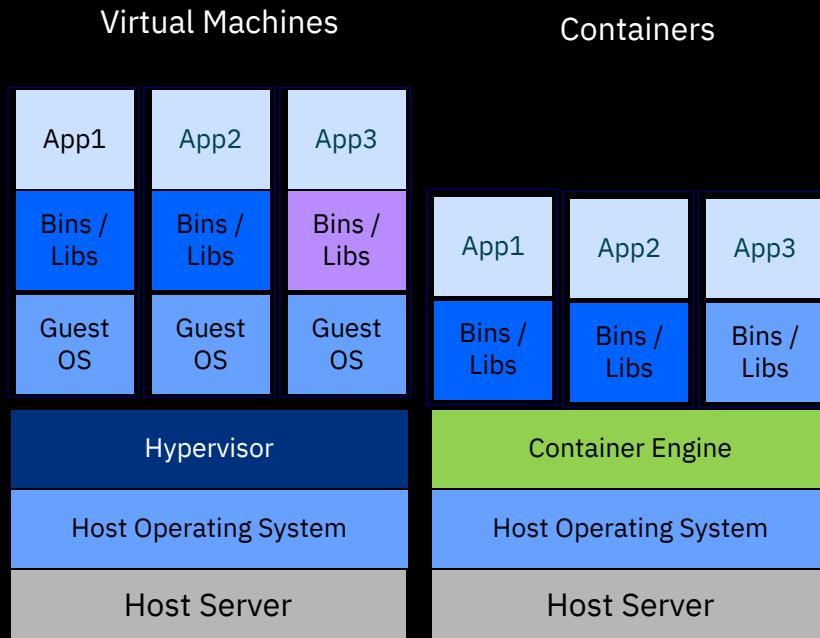
*Capable of being deployed across architectures*



← ----- →

*For example, across production LPARs in a highly-available container architecture*

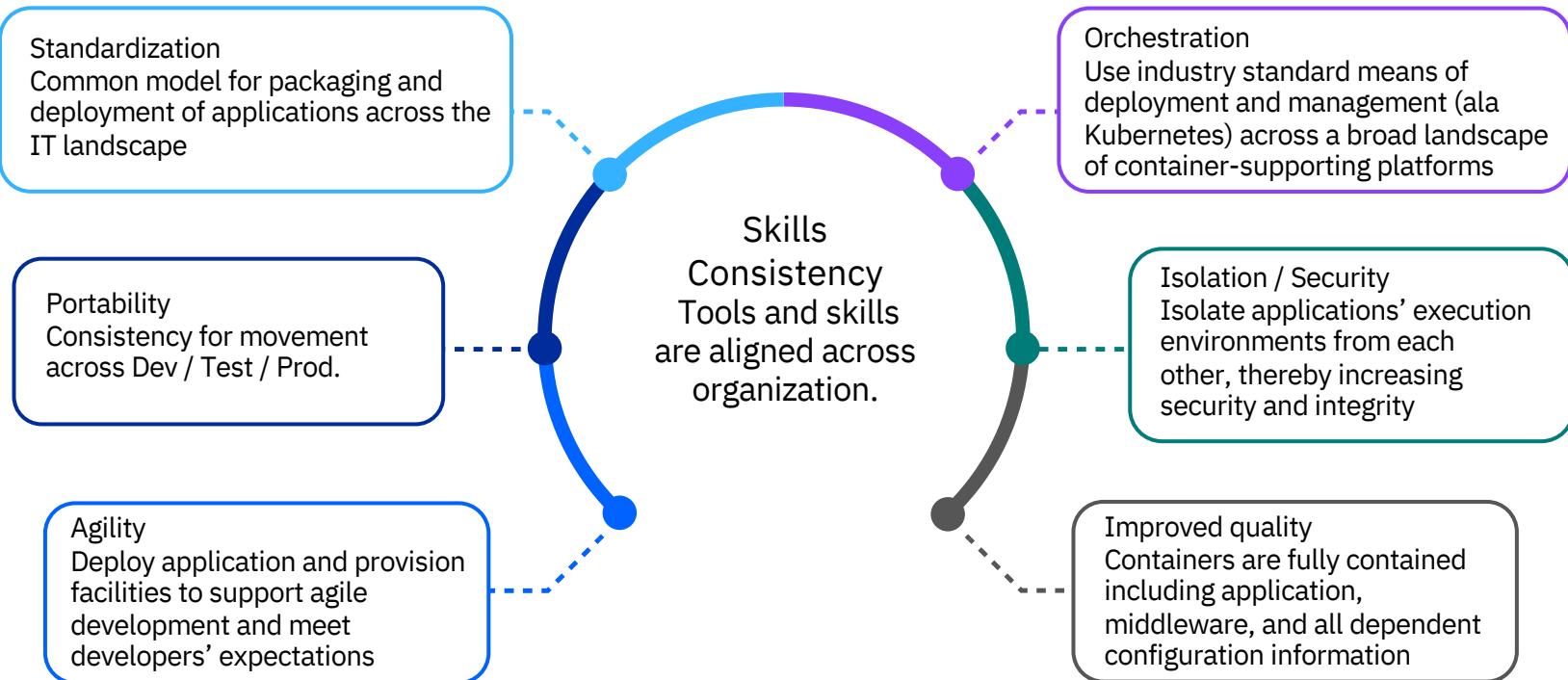
# Containers vs. VMs



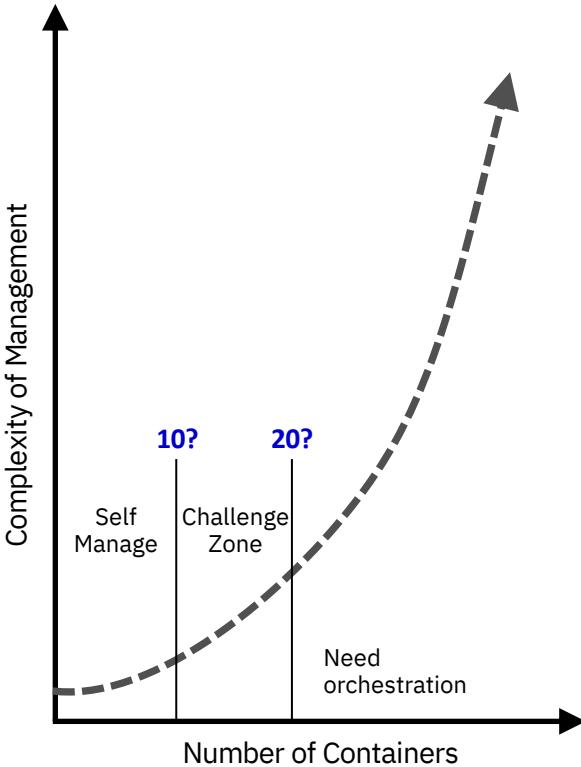
Containers are lighter and provide better performance:

- Portability: VM (Gigabytes) vs. Container (Megabytes), VMs are constrained to Hypervisor and hardware-emulation.
- Layered Image Architecture: Containers are built upon layers and changes can be tracked.
- Performance: Containers can boot and restart in seconds, compared to minutes for virtual machines. And no extra overhead of a hypervisor and guest OS makes containers consume less CPU and memory.
- Resource Isolation: Containers use Linux cgroups to limit the amount of memory and CPU that can be consumed.
- Management cost: Each VM requires a full functional operating system, and then extra management for them.
- Build Once/Run Anywhere: Provides a way to package an application and all its dependencies so that the application can be moved freely between environments – packages are light weight, stand-alone, including code, runtime environment, libraries, etc.
- Great advantage to use containers in DevOps, Batch computing, Lightweight PaaS and Microservices

# Key benefits of containers



# Orchestration – Kubernetes



- A few containers can be managed manually.
- Beyond a point, orchestration is required.
- Kubernetes is the industry leader for orchestration.
- Kubernetes provides:
  - Scheduling of containers to runtimes
  - Monitoring state of containers
  - Restarting failed containers
  - Scaling containers up or down
  - Request load balancing
  - Storage orchestration, plus other functions

# What is Kubernetes?

Although container images and the containers that run from them are the primary building blocks for modern application development, to run them at scale requires a reliable and flexible distribution system. Kubernetes is the defacto standard for orchestrating containers.

Kubernetes is an open source container orchestration engine for automating deployment, scaling, and management of containerized applications.



# What is Kubernetes?

- A Container Orchestration System designed for automated container deployment, scaling, and management
- Developed and designed based Google-grown Borg and Omega systems
  - Founded by Google in 2014
  - Proven to work at Google for over 10 years
  - Google spawns billions of containers per week with these systems
- Seed technology of the [Cloud Native Computing Foundation \(CNCF\)](#)
  - The first project to get donated to the CNCF
  - First production grade 1.0 released in July 2015
  - Quarterly releases since v1.2.0 in March 2016
  - Latest v1.23 was released in January 2022
- <https://kubernetes.io/releases/>



# THE Kubernetes platform for IBM Z and LinuxONE

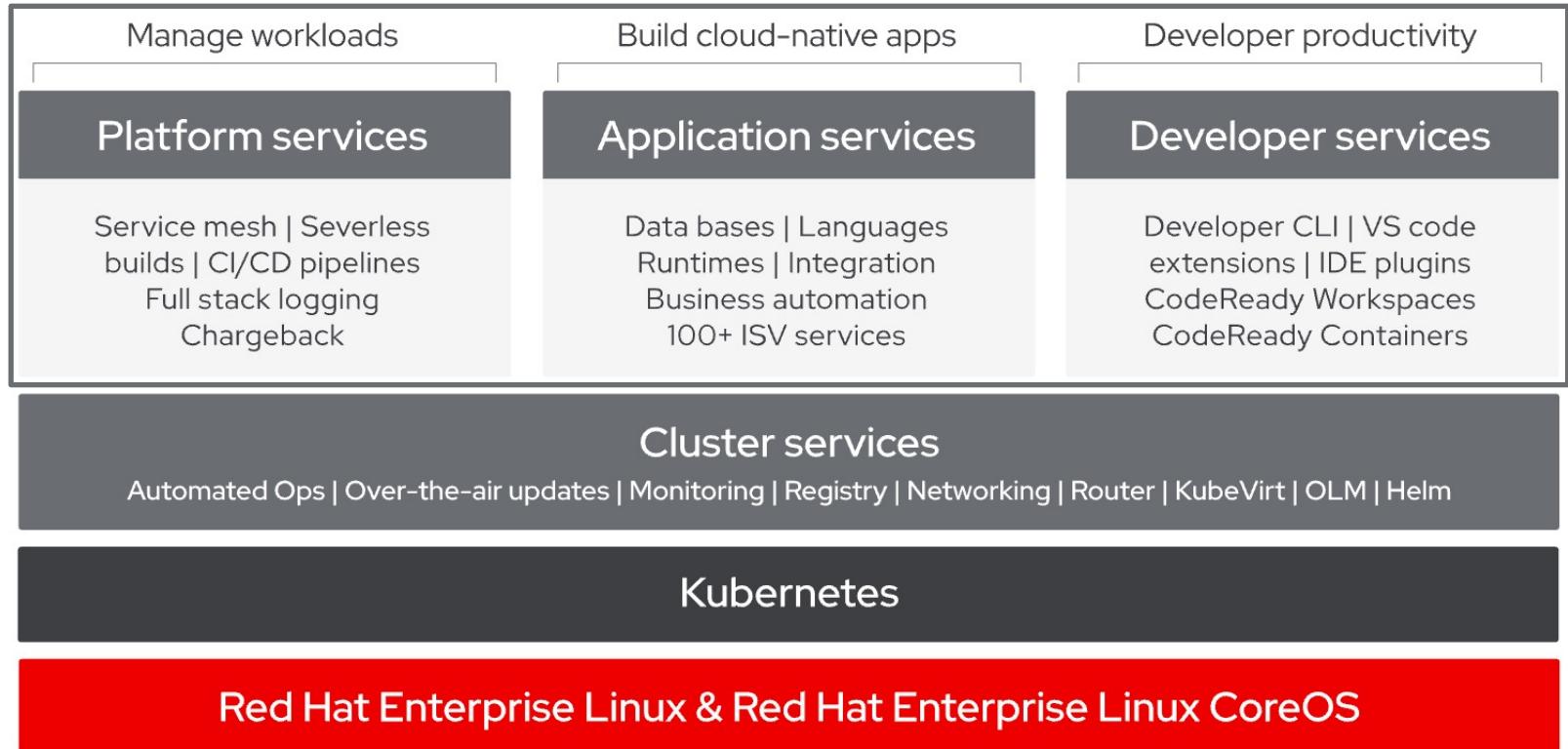


## **IBM is adopting the Red Hat OpenShift Container Platform 4 on Linux on IBM Z and IBM LinuxONE.**

This offering will accelerate the transformation to greater portability and agility through integrated tooling and a feature-rich ecosystem for cloud native development on Linux on IBM Z and LinuxONE offerings.

IBM also intends to deliver IBM Cloud Pak offerings to Linux on IBM Z and LinuxONE offerings. These offerings will accelerate the rich IBM software ecosystem that is necessary for enterprise clients to adopt hybrid multi deployment.

These offerings, combined with the IBM premier enterprise platforms, IBM Z and LinuxONE, will reinforce and further strengthen the IBM focus on hybrid cloud to unlock business value and drive growth for clients by providing a secure and open hybrid, multicloud platform.





# okd

- OKD – Upstream Open Source Software
- Integrate additional OSS projects
- 100+ Integrations
- Validated OSS Innovation
- Partner Integration Platform

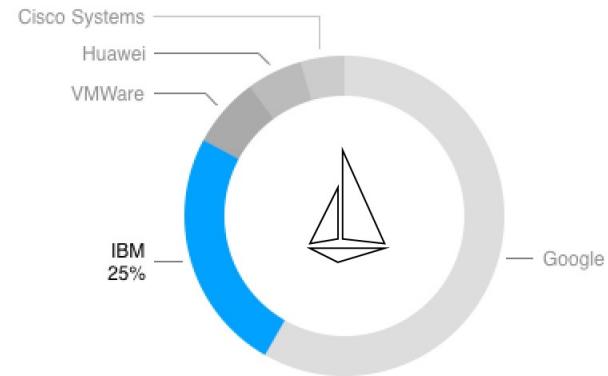
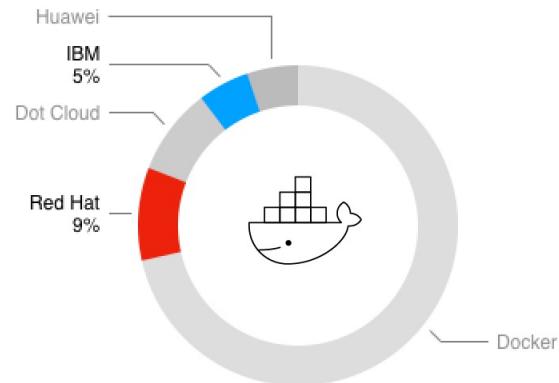
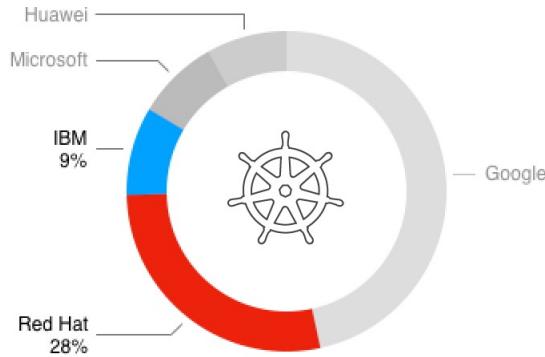


## Under the Hood

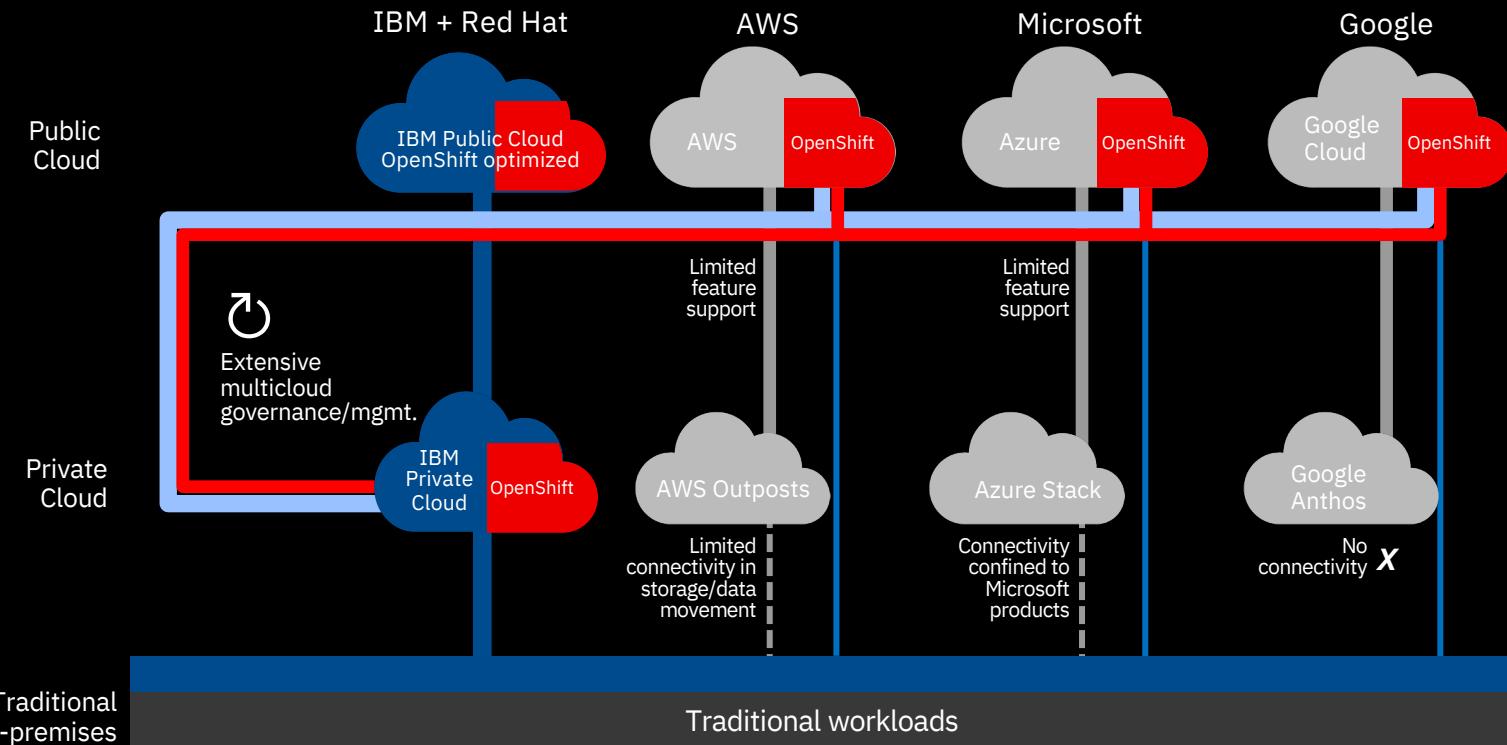


# IBM & Red Hat: Open Source Contributors

**IBM and RedHat contributions to Kubernetes, Docker and Istio projects ( top 5 orgs, apart from independent developers )**



# IBM + Red Hat deliver the industry's only true hybrid multicloud platform



<https://cloud.redhat.com/openshift/install>

Infrastructure provider	Installation options
Bare Metal	Full stack automation and pre-existing infrastructure
IBM Z	Pre-existing infrastructure
Power	Pre-existing infrastructure
Red Hat OpenStack	Full stack automation and pre-existing infrastructure
Red Hat Virtualization	Full stack automation and pre-existing infrastructure
vSphere	Full stack automation and pre-existing infrastructure
Platform agnostic	Full stack automation and pre-existing infrastructure

## OpenShift installer

Download and extract the install program for your operating system and place the file in the directory where you will store the installation configuration files. Note: The OpenShift install program is only available for Linux and macOS at this time.

Linux

[Download installer](#)

Developer Preview [Download pre-release builds](#)

### Pull secret

Download or copy your pull secret. The install program will prompt you for your pull secret during installation.

[Download pull secret](#)

[!\[\]\(a5ce6bf60513915c4be97f191363167f\_img.jpg\) Copy pull secret](#)

### Command line interface

Download the OpenShift command-line tools and add them to your PATH.

Linux

[Download command-line tools](#)

### Red Hat Enterprise Linux CoreOS (RHCOS)

Download RHCOS to create machines for your cluster to use during installation. Download the initramfs, the kernel, and the OS image corresponding to your VM type. [Learn more](#)

[Download RHCOS initramfs](#)

[Download RHCOS kernel](#)

[Download RAW for DASD VM](#)

or

[Download RAW for FCP VM](#)

OpenShift 4.9 - Available on Z



# IBM Cloud Paks

# The IBM hybrid cloud software approach : Cloud Paks

AI-Powered solutions  
for specific use cases  
and problem domains

Software and AI applications

Containerized Software

Cloud Paks

Foundational services  
Consistency and shared  
capabilities

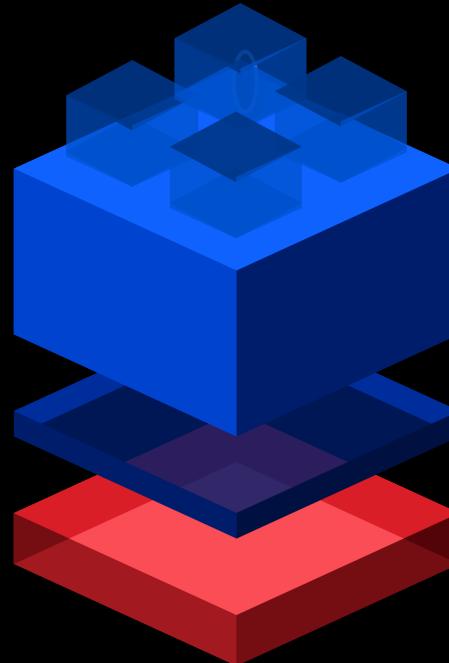
Foundational Services

Enterprise grade  
container platform



Red Hat  
OpenShift

Hybrid cloud platform



# IBM Cloud Paks

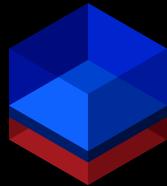
IBM delivers hybrid cloud software that **predict**, **secure**, and **automate** their businesses. They are packaged as **Cloud Paks** that include: Containerized software, foundational services and Red Hat OpenShift.

## Predict



IBM  
Cloud Pak  
for **Data**

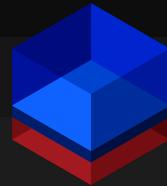
## Secure



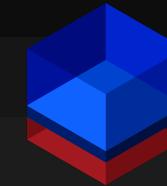
IBM  
Cloud Pak  
for **Security**

## Automate

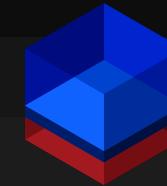
Automation platform



IBM  
Cloud Pak  
for **Business  
Automation**



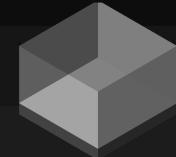
IBM  
Cloud Pak  
for **Watson  
AIOps**



IBM  
Cloud Pak for  
**Integration**



IBM  
Cloud Pak  
for **Network  
Automation**



IBM **WebSphere**  
Hybrid Edition



- Containerized software
- Foundational services
- Red Hat OpenShift

Each client cloud journey has unique use cases, yet all contribute to a holistic end-to-end cloud transformation

## Use Cases for WebSphere Hybrid Edition

- Modernize applications by using insights to appropriately refactor, optimize resources and costs and reduce complexity
- Develop cloud native apps with containers, starting with open source, common services, developer tools of choice and integrated DevOps

## Use Cases for Integration

- Cloud and SaaS integration (e.g. connect Workday to the payroll system)
- Respond to real-time events to optimize customer offers
- Create a secure API portal for clients and partners

## Use Cases for Multicloud AI Operations

- Confidently assess, diagnose and resolve incidents across mission-critical workloads.
- Deliver a secure multicloud deployment, upgrade and management with consistency
- Provide end-to-end operations and security management across hybrid/multicloud

## Use Cases for Data

- Connect all data for self-service analytics
- Operationalize AI with trust and transparency
- Dynamically build and deploy cloud-native data and AI workloads

## Use Cases for Automation

- Improve employee productivity by automating mundane tasks and assisting knowledge work
- Accelerate customer-facing processes and ensure consistent experiences
- Increase visibility by collecting and visualizing operational data to optimize business processes
- Achieve zero-touch network operations

## Use Cases for Security

- Connects to all security data sources for analysis where it resides through the use of open standards and ecosystems
- Supports IBM and third-party tools to search for threat indicators and behaviors across any cloud or on-premises location
- Connects security workflows with a unified interface, allowing faster response to security incidents, orchestrating and automating the incident response process

# Why run OCP on IBM Z or IBM LinuxONE?

# IBM Z and IBM LinuxONE are the best place for IBM Cloud Paks and Red Hat OpenShift

## Ultra Low Latency and Large Volume Data Serving **and** Transaction processing

Scale-out to 2.4 million containers on a single system. Blistering I/O rates approaching 1TB/sec. Industry-leading L2 processor cache sizes. Specialty assist processors to optimize performance and throughput.

## Enterprise class infrastructure – Elastic, Scalable, Available **and** Resilient

Workload scaling that involves an increase in the capacity for resources within the same server either by redirecting resources, increasing priority, unlocking resources etc. without increasing the number of resources.

## Highest levels of Security, Compliance **and** Platform uptime

99.999% uptime for hardware and even higher guarantees for memory/network. There have been zero memory failures in field in the past 4 decades and zero unplanned downtime. Designed to eliminate single points of failure and provide 100% uptime for decades. 50 year mean time to failure.



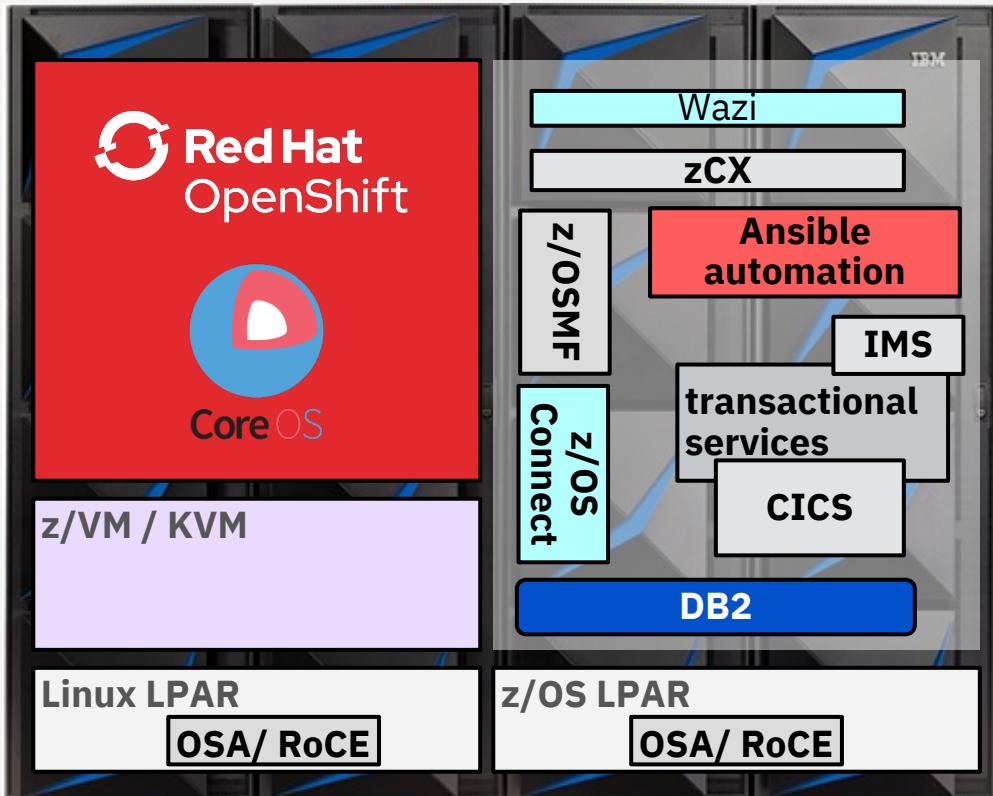
# OpenShift co-location with z/OS

OpenShift co-location with z/OS  
use cases:

- **Extremely low latency** between Linux and z/OS LPARs
- **Access DB2 on z/OS** from OpenShift
- Using z/OS Cloud Broker to **provision z/OS subsystems** from OpenShift
- **Integrate z/OS development** environment with IBM Wazi
- Extend z/OS services with **open source** technologies running on OpenShift
- Execute **batch workloads** in OpenShift that access z/OS data

## Network options:

- Shared OSA or RoCE
- Hipersockets (HS) with VSWITCH Bridge (VB)



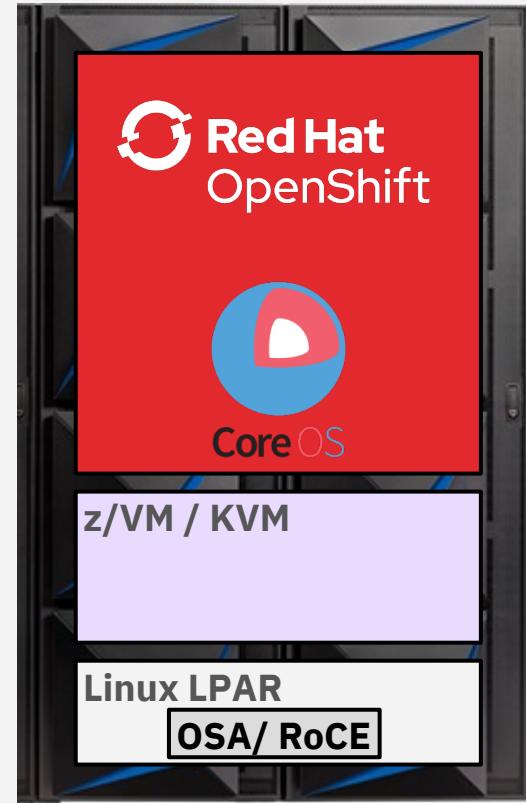
# Enterprise Class Infrastructure

Take advantage of the underlying enterprise capabilities

- grow to [thousands of Linux guests](#)
- and [millions of containers](#)

Grow without disruption. Vertical and horizontal scalability

- Advanced security
- [confidential Cloud Computing](#)  
including [FIPS 140-2 Level 4](#) certification



# Don't forget about TCO!

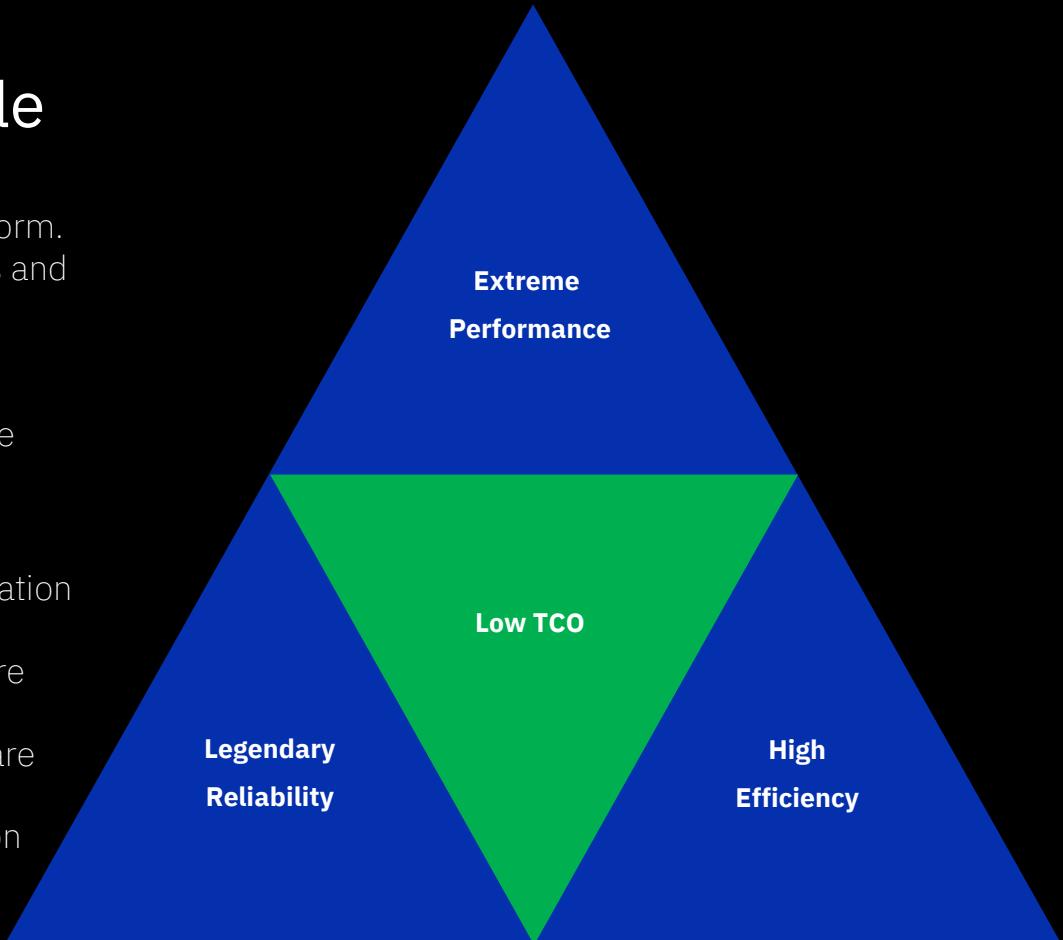
## Unrivaled TCO value at scale

### High Efficiency

Virtualization density unmatched by any other platform. Host hundreds to thousands of Linux virtual servers and share hardware resources, resulting in significant savings, year over year. Decades of efficiency refinements that result in dramatically less power, cooling, and floorspace requirements to process the same workload as other platforms.

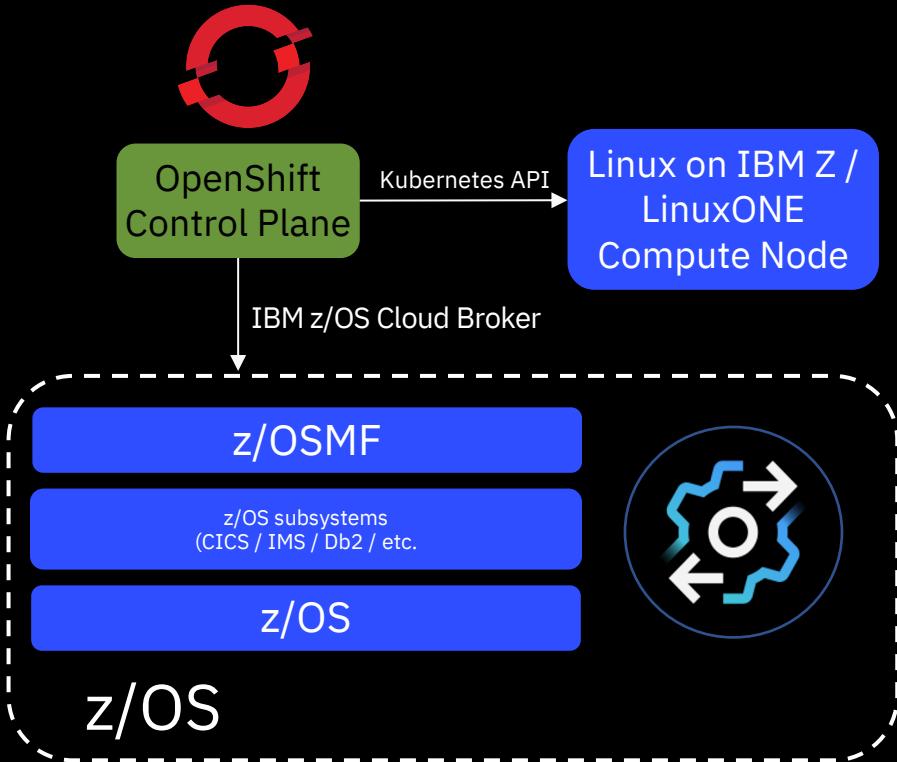
### Low Total Cost of Ownership

Efficient operation all the way up to 95-100% utilization – including processing cores. Network costs are reduced because the network is virtualized. Software licensing are on fewer cores, usually by a large magnitude, resulting in significant savings in software costs, year over year. In many cases, you may see millions of dollars in savings. Problem determination time and effort decreases on this more reliable, virtualized server.



# z/OS Cloud Broker

## Cloud Consumption of z/OS



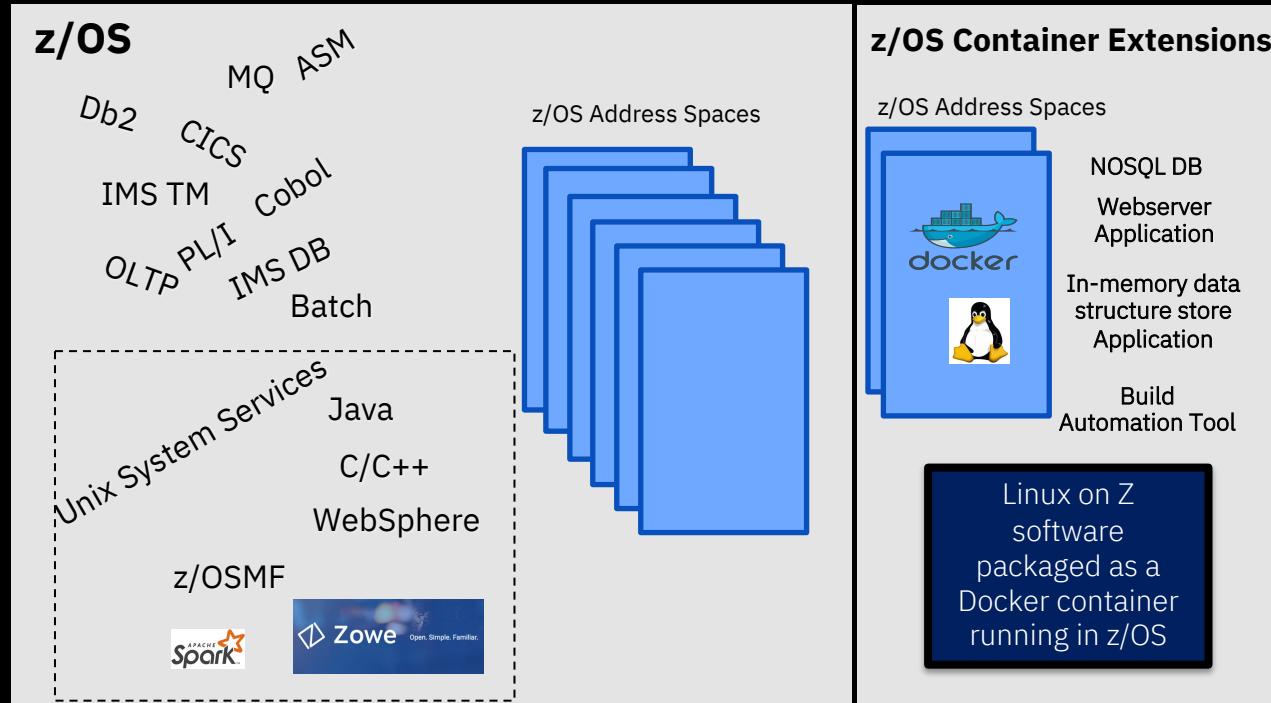
z/OS Cloud Broker is technology that gives users the ability to access and deploy z/OS resources and services on OpenShift for a seamless and universal cloud development experience.

**DevOps** Providing access to IBM Z resources to all flavors of application developers leveraging open standards and tools. i.e. common cloud marketplace.

**Service Provider** Centralization and automation of IBM Z operations to provide Z resources to agencies or clients in a self-service model.

**Multi-Cloud Service Integration** Providing a unified experience for IBM Z cloud services across private cloud and public cloud.

# z/OS Container Extensions

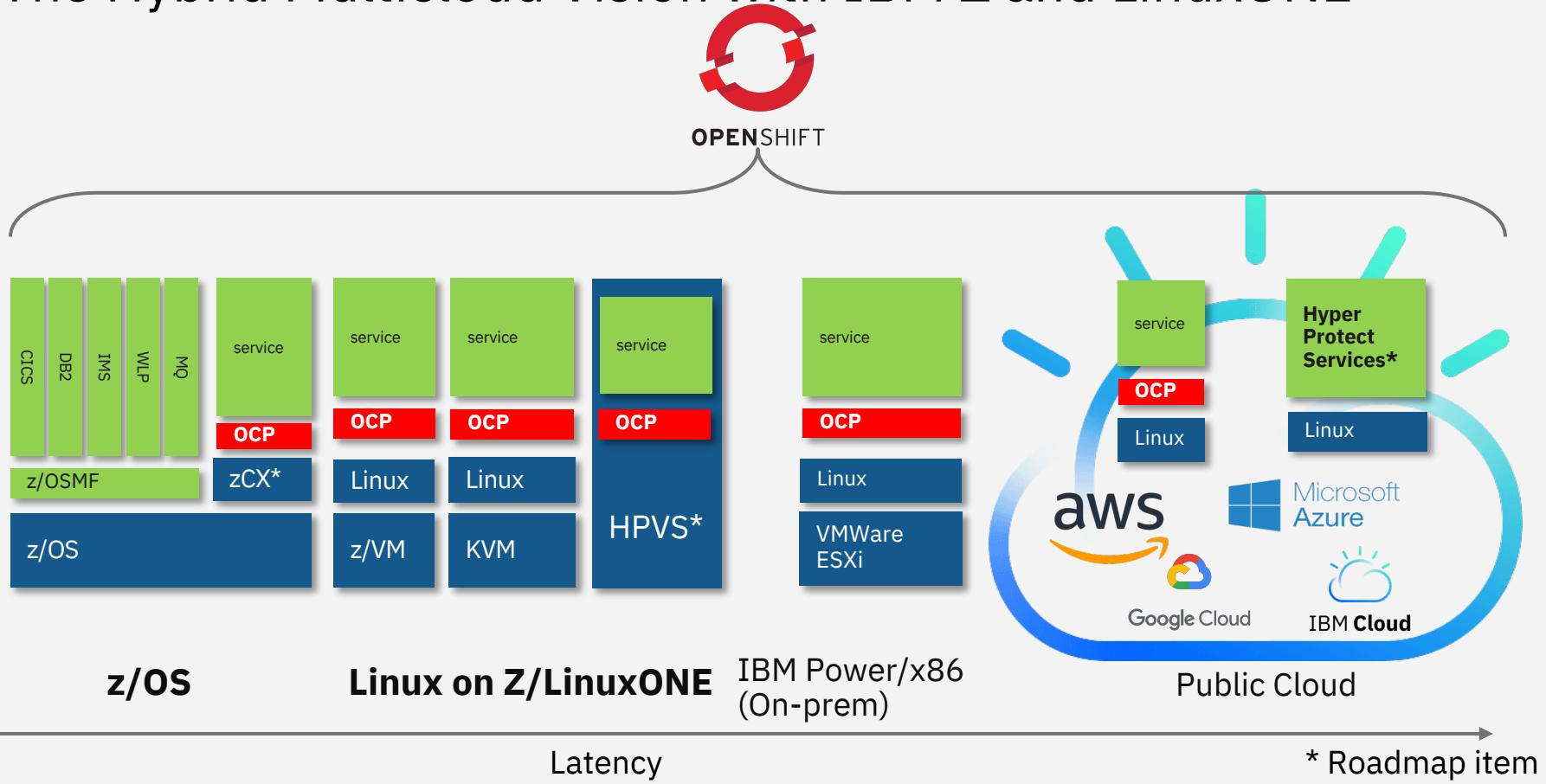


Traditional  
z/OS

Unix  
Systems  
Services

z/OS  
Container  
Extensions

# The Hybrid Multicloud Vision with IBM Z and LinuxONE



# Questions?

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IBM Washington Systems Center (WSC)



