

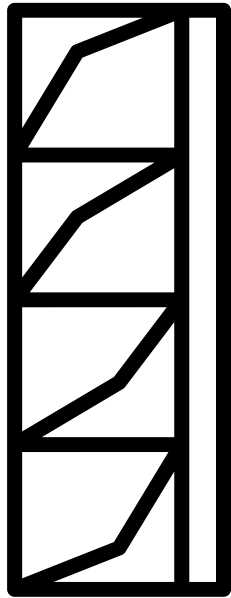
# Red Hat OpenShift Overview and New Capabilities

Wilhelm Mild  
IBM Executive IT Architect  
IBM R & D Lab Germany  
[wilhelm.mild@de.ibm.com](mailto:wilhelm.mild@de.ibm.com)



---

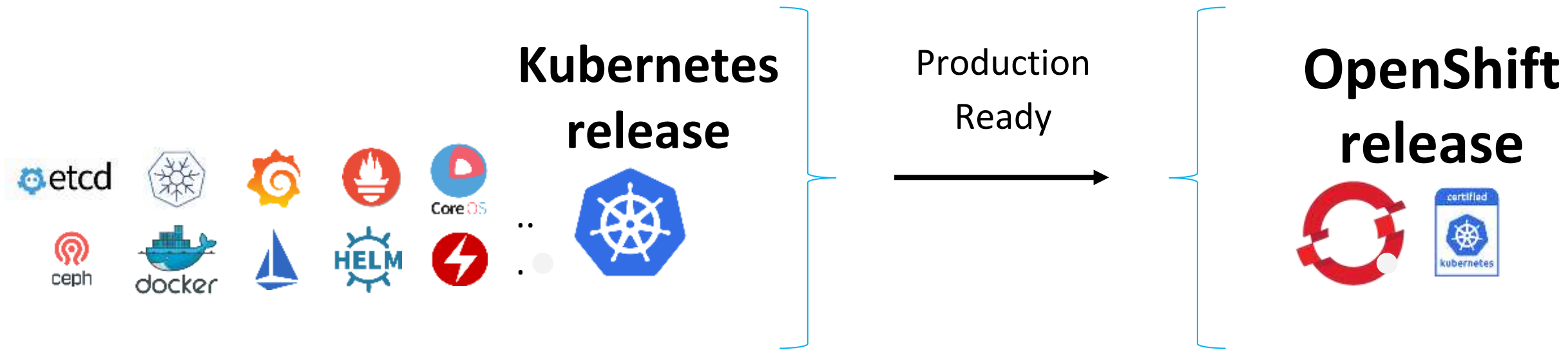
# When to think about Containers & Red Hat OpenShift on IBM zSystems & LinuxONE



*“I need my cloud in my data center!”*

- **Modernize existing applications**, build Microservices and Containers
  - **Integrate** traditional applications **with Cloud services** (private or public)
  - **Enable a cloud-based delivery model**
  - **Develop once** for all platforms
  - **Deploy** apps where they fit best
  - **Enable auto scalability** of workloads
  - **Enable continuous operation** / high availability **per design**
  - **Consolidate workloads** to fewer servers
  - **Co-locate core services with private cloud services**
  - **Extend security** from traditional to cloud services ( crypto, txn security)
  - **Leverage AI and Open Source** technologies on IBM zSystems
-

# Red Hat OpenShift is trusted enterprise Kubernetes



- Hundreds of defect and performance fixes
- 200+ validated integrations
- Certified container ecosystem
- Over 9-years enterprise life-cycle management
- Red Hat is one of the leading Kubernetes contributor since day 1

# Kubernetes (K8S) – container orchestration

defines itself in a cluster format for HA per design



cluster

**Kubernetes Master/Control Nodes**

Kubernetes Master/Control Node 2

Kubernetes Master/Control Node 3

**Worker/Compute Node1**

pod1



pod2



**Worker/Compute Node2**

pod1



pod2

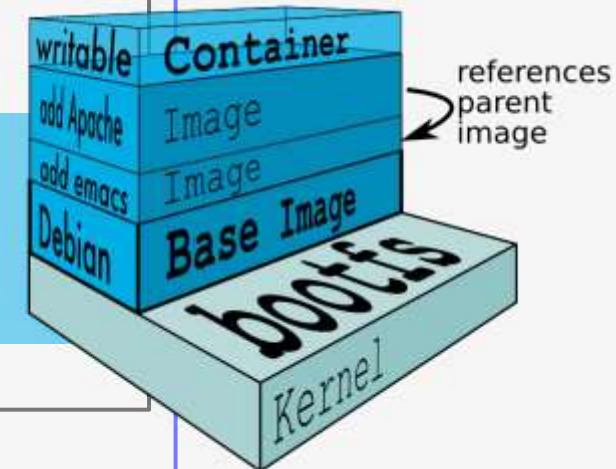


**Worker/Compute Node3**

pod1

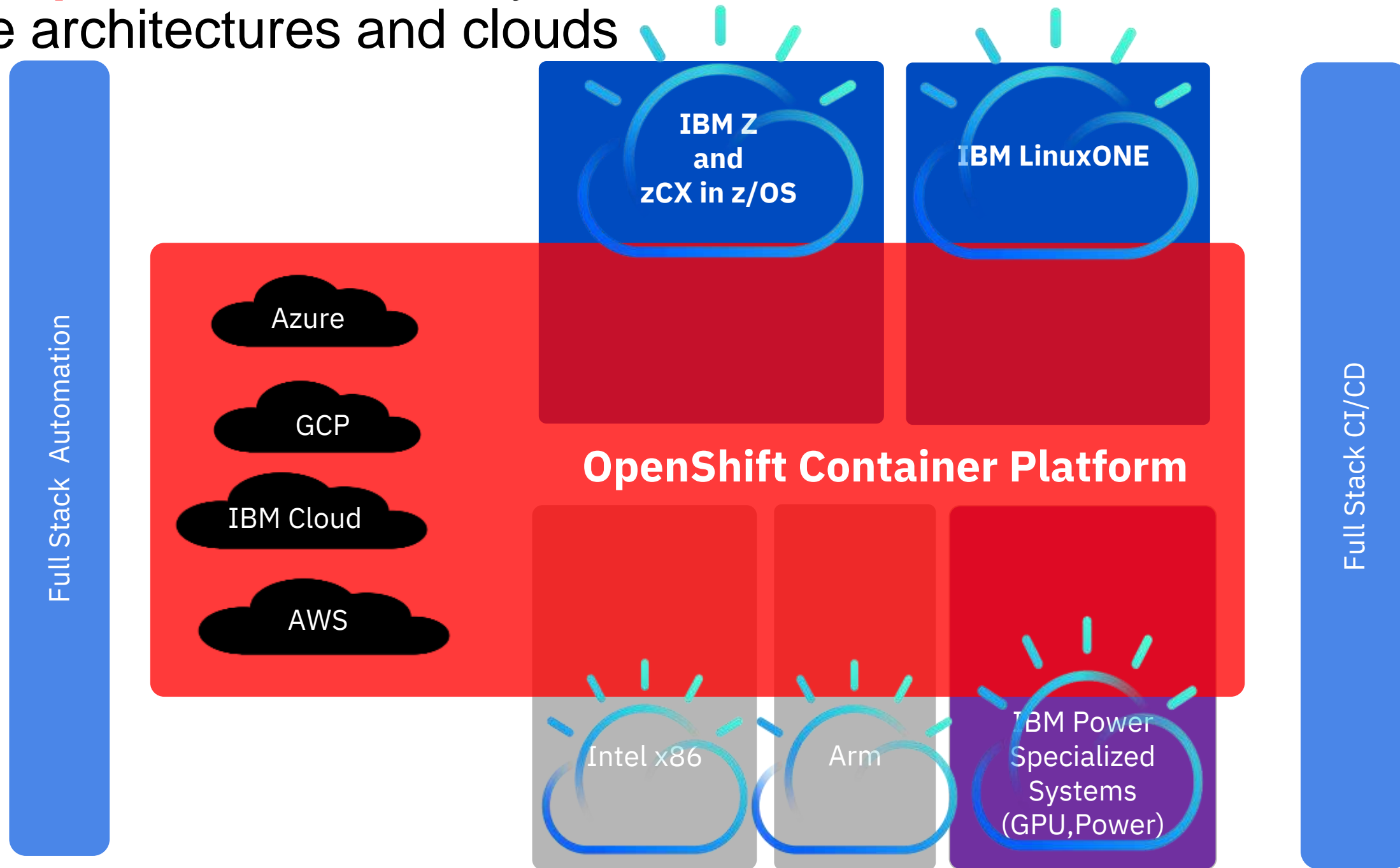


pod3



**Kubernetes is not running container – it orchestrates them**

# Red Hat OpenShift - the only Container Platform across different hardware architectures and clouds



# Red Hat OpenShift Container Platform (RHOCP)

to Build, Deploy, Manage Containerized, Cloud Native Apps that can Run Anywhere

Red Hat OpenShift

- The enterprise Kubernetes Platform
- Runs on IBM zSystems, IBM Power, x86 and public clouds
- Is THE platform for Life cycle management of containerized applications
- Has capabilities for extensions to manage traditional VMs with IBM CP4MCM

Self Service Portal

Build Automation

Deployment Automation

Application Lifecycle Mgt

Service Catalog

Language runtimes, databases, m/w ...



**RED HAT**  
OPENSSHIFT

Kubernetes  
Container Orchestration

CoreOS /  
Red Hat Enterprise Linux

Container Runtime



Physical



Virtual



Private



Public

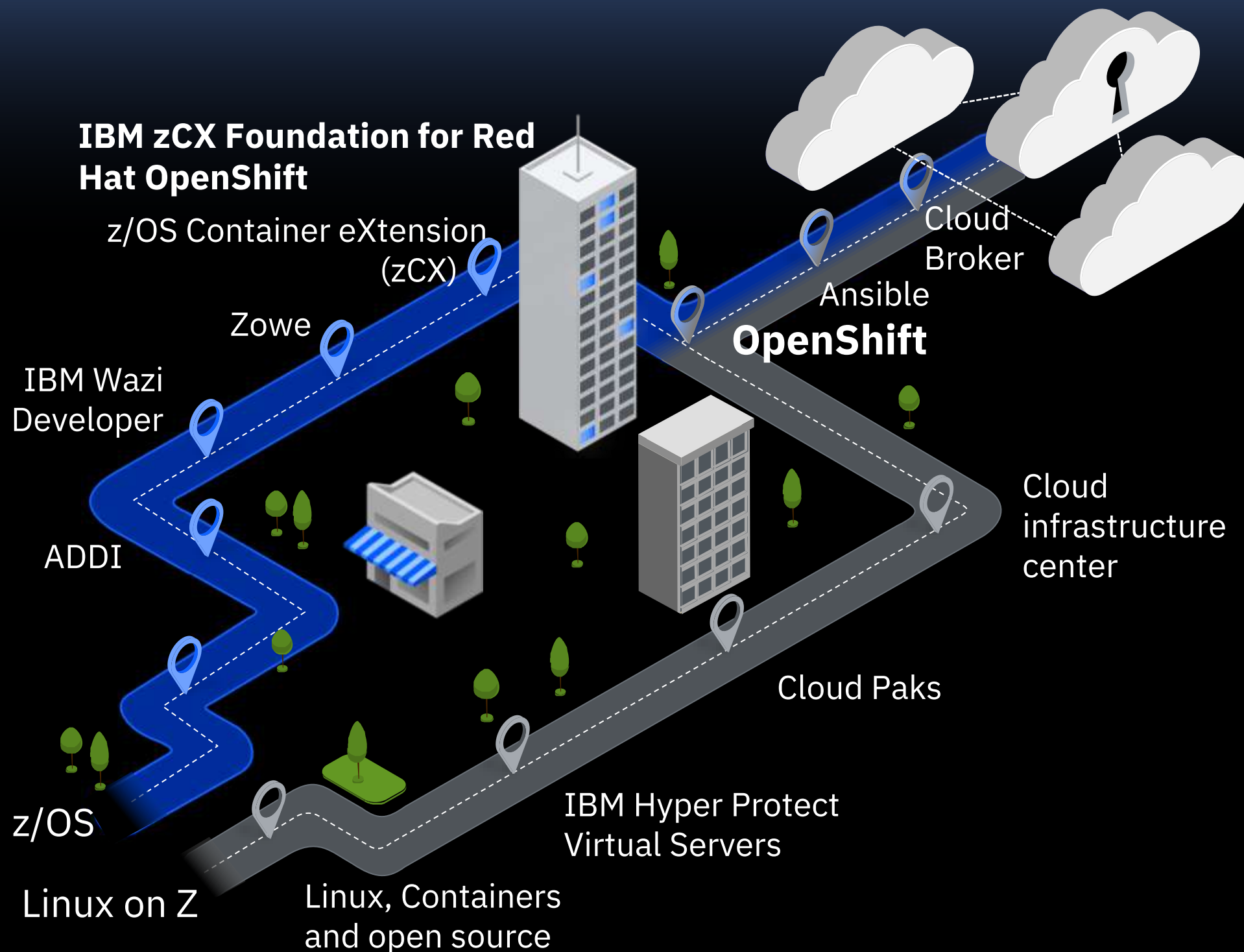
# IBM zSystems: Roadmap to hybrid cloud

Innovate with agility

Create better  
experiences

Fuel business  
growth

Build competitive  
advantage

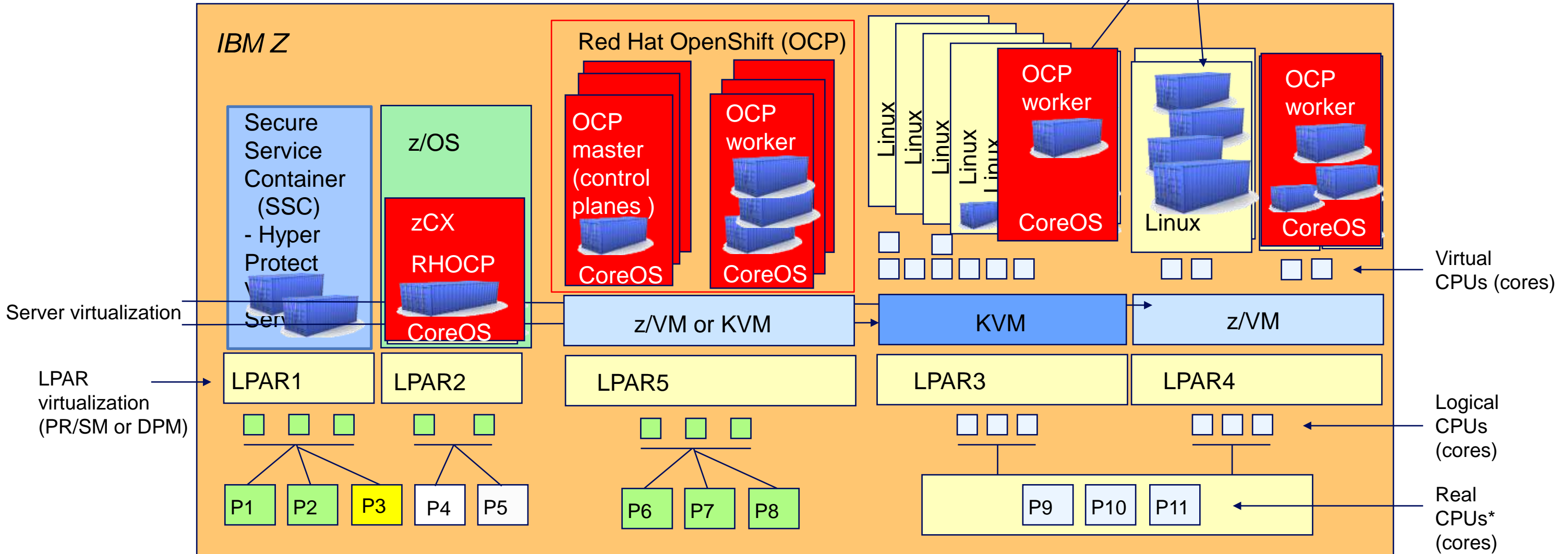


# IBM Z Virtualization and Container options

Server virtualization. There are typically dozens or hundreds of Linux servers in a LPAR virtualized using z/VM or KVM or SSC.

Red Hat OpenShift is an Enterprise grade Kubernetes environment. It can be installed in a z/VM or KVM env.

Application isolation. There are typically thousands of Containers in Linux on IBM zSystems.



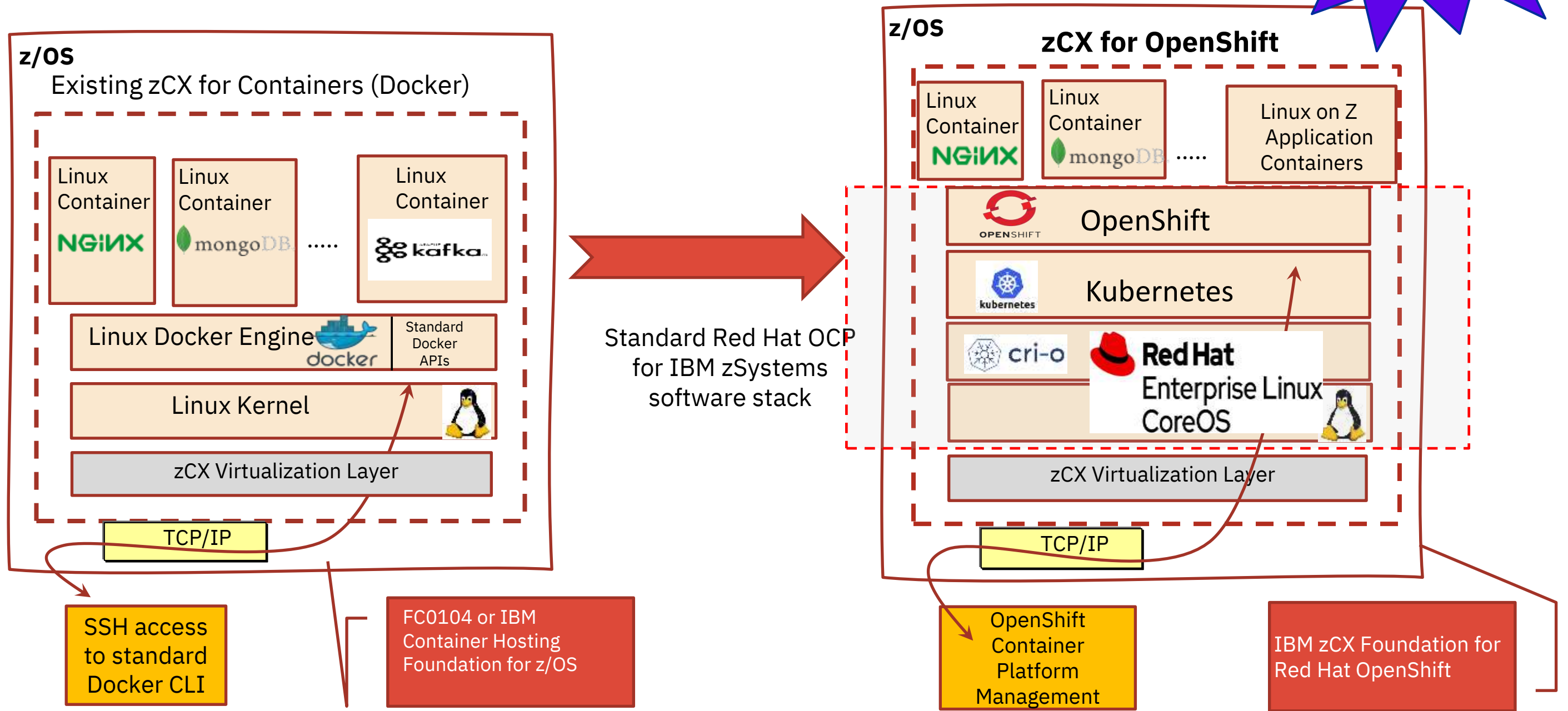
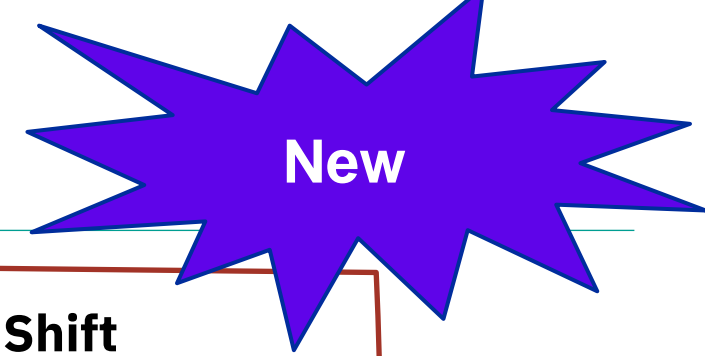
P1 – P11 are Central Processor Units (CPU -> core) or Integrated Facility for Linux (IFL) Processors (IFL -> core) or ZIIP cores in z/OS

\* - One shared Pool of cores per System only

Note: - LPARs can be managed by traditional PR/SM in IBM Z and additional with Dynamic Partition Manager (DPM) in LinuxONE



# IBM zCX for Containers and zCX for Red Hat OpenShift



# z/OS Container Extensions – a virtual container environment

New

**Pre-packaged OpenShift Environment** provided by IBM

- Includes full stack OpenShift (CoreOS + K8S + Openshift components)
- Supported directly by IBM
- Can include clustering and registry capabilities
- Competitive price/performance (Exploits zIIPs)

**Application developers can deploy software using OpenShift interface**

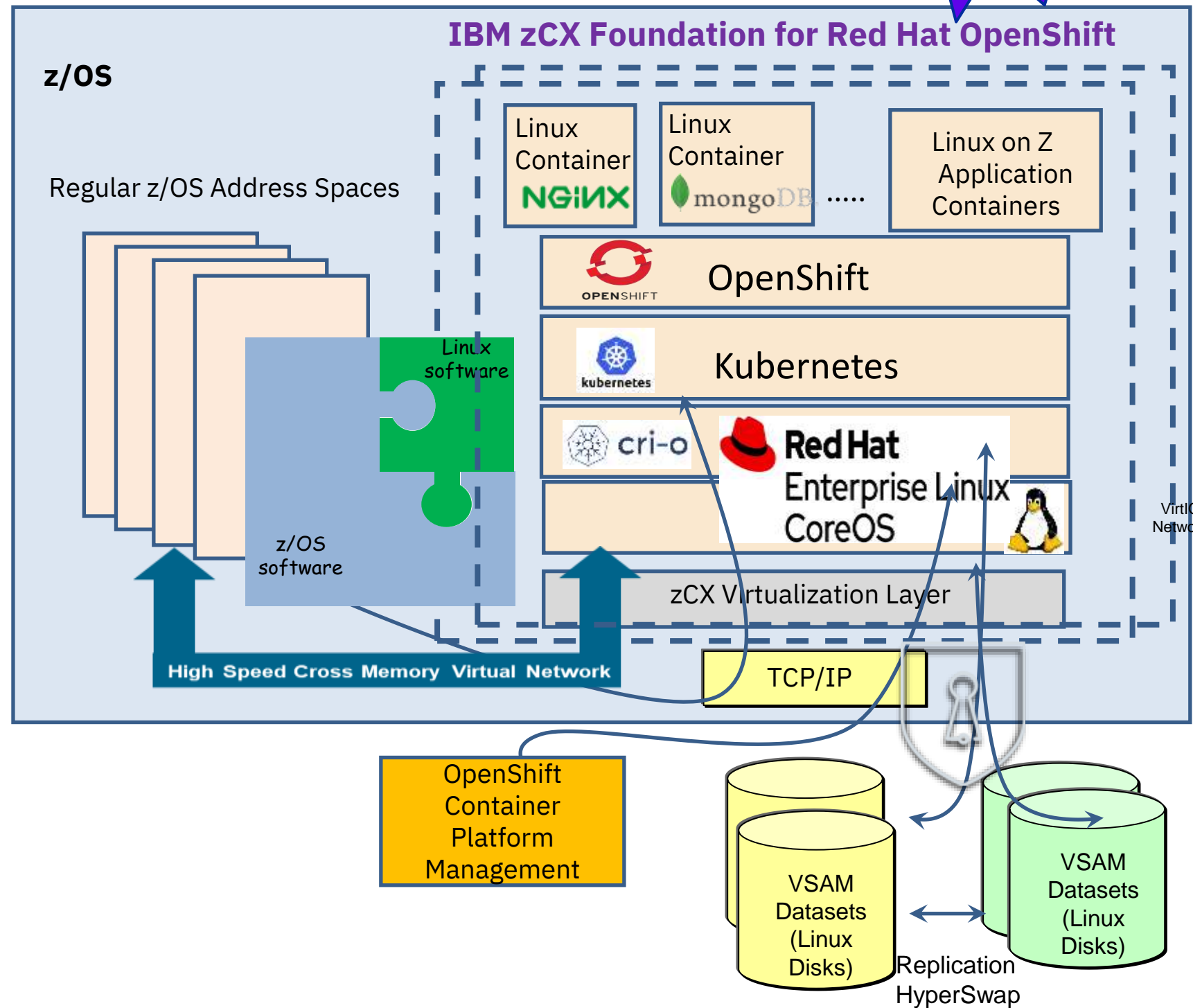
- Any software available as a Container image (s390x) - growing ecosystem
- Any home-grown Linux on Z container images
- Using standard interfaces

**Access into underlying environment via RHOCP APIs**

- No root access
- Administrative tasks via RHOCP and z/OS
- Secure virtual network - SAMEHOST

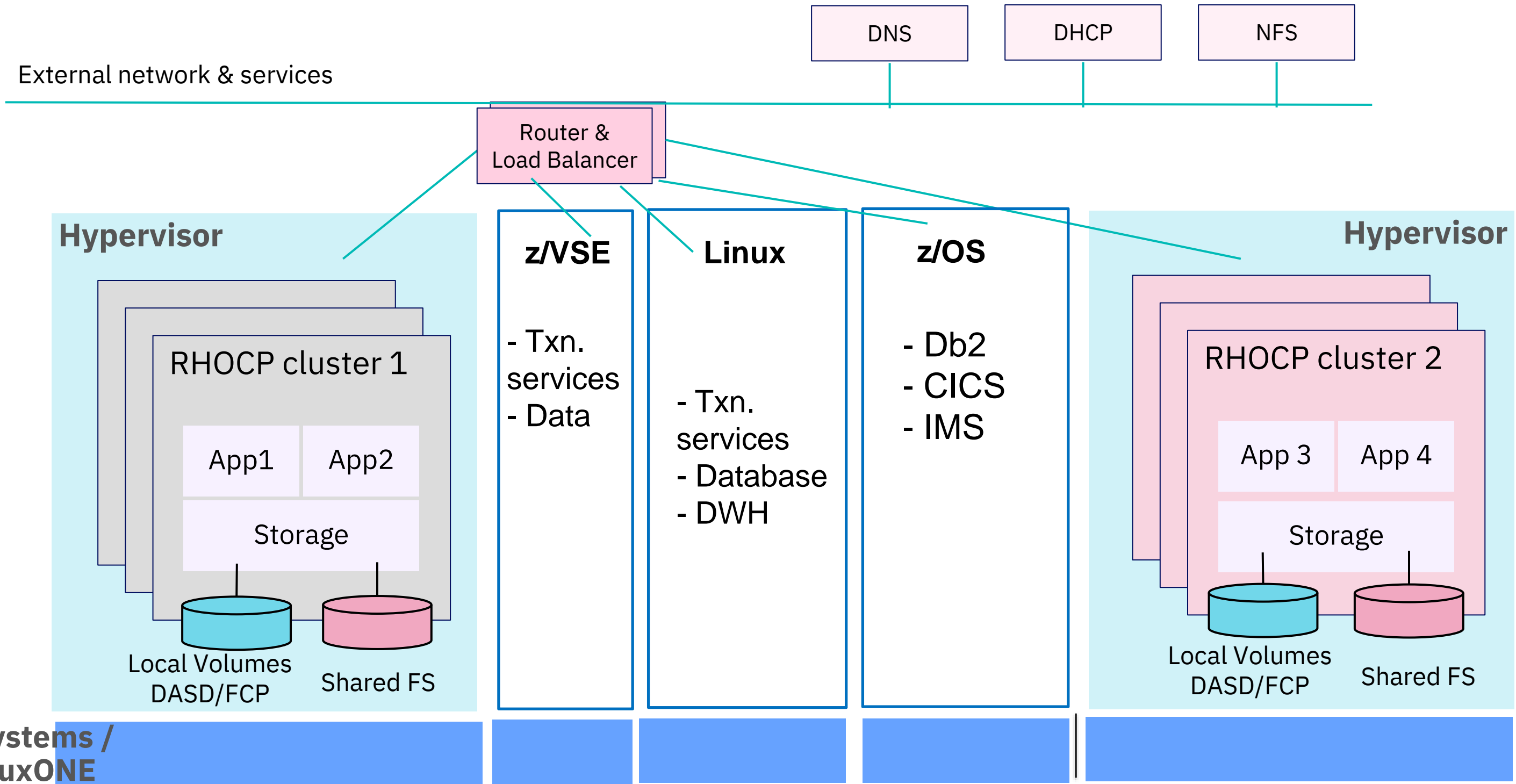
Also provides IBM and ISVs a means of delivering solutions into this environment

- Requires packaging of software as Container images

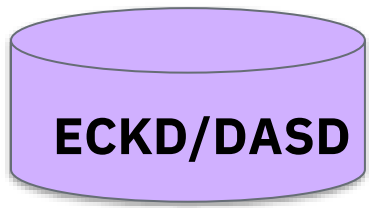
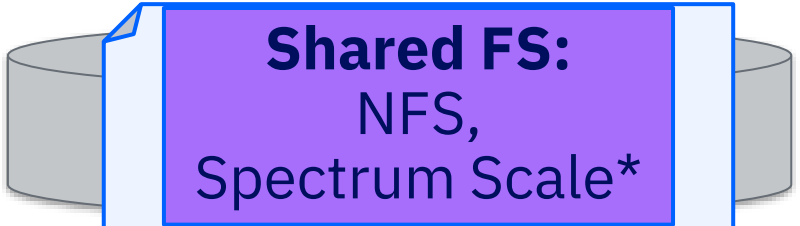
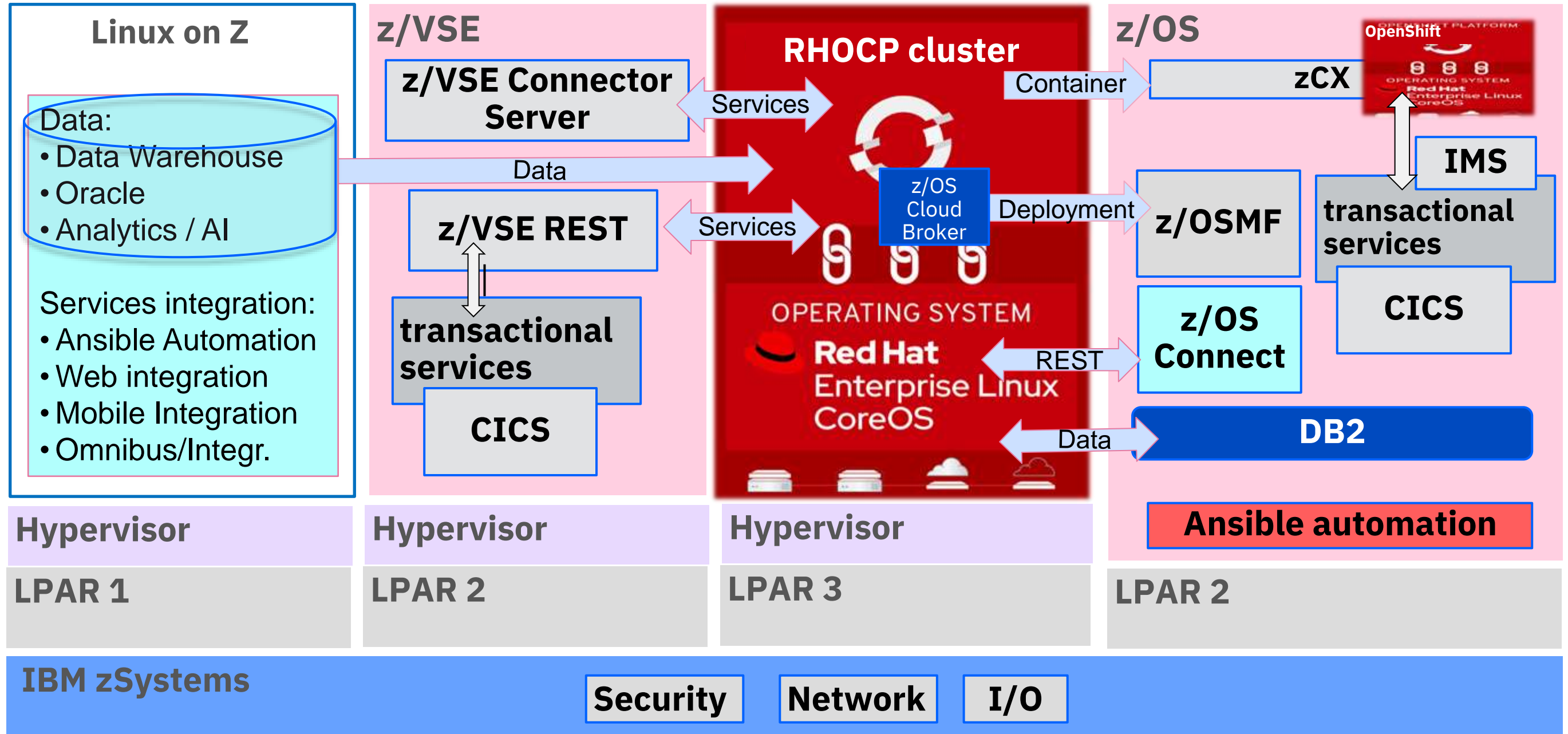


# Why RHOCP on IBM zSystems – cause of operational capabilities for hybrid

**THE platform for Hybrid workload and multiple RHOCP environments on the same HW machine**



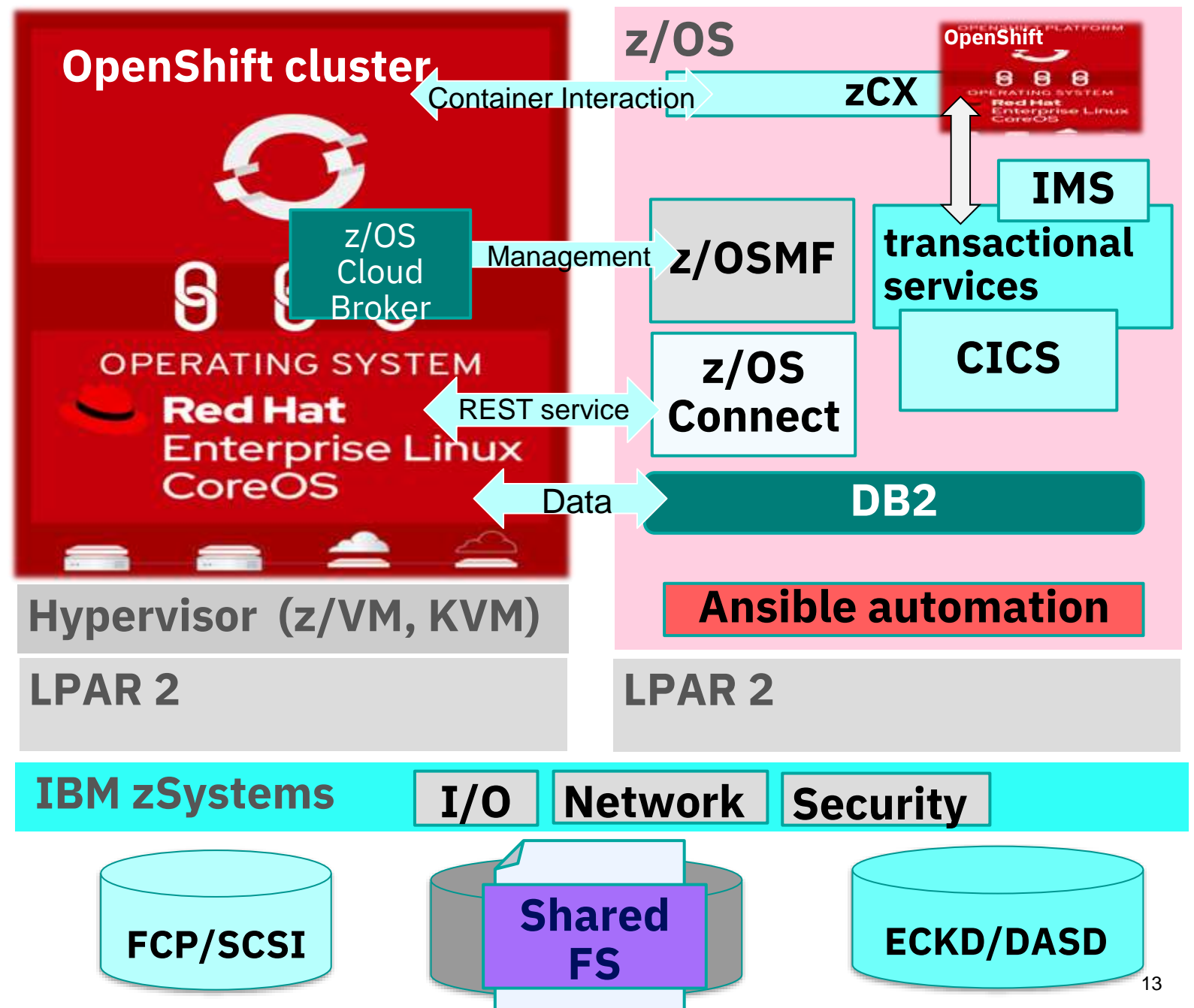
# Capabilities Overview: Red Hat OpenShift Container Platform on IBM zSystems



# Use Cases for Red Hat OpenShift in colocation with z/OS

## RHOCP co-location to z/OS major use cases:

- **Unpredicted scalable workload** in RHOCP accesses z/OS services & data
- RHOCP logic **access to DB2 z/OS**
- **RHOCP to provision z/OS subsystems**, using [z/OS Cloud Broker](#)
- **Development environment** integrates via x86 RHOCP with [z/OS Wazi](#)
- **RHOCP interacts with z/OS services** in CICS / IMS or via zCX with containerized applications and Open Source technology
- **Batch workload** executed in RHOCP with z/OS data access



# Cross Platform OpenShift Application Deployment Consistency

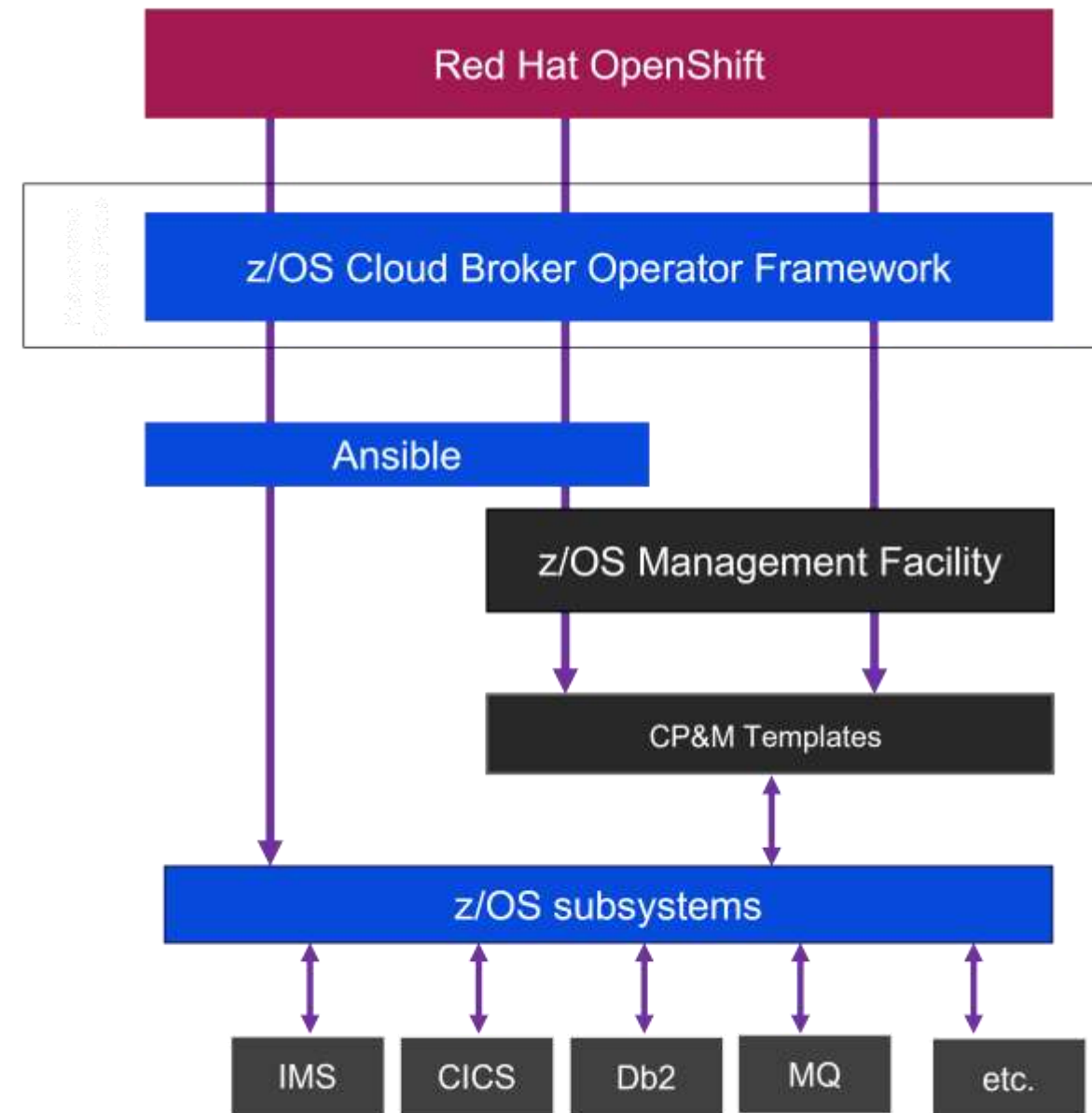
## z/OS Cloud Broker

IBM z/OS Cloud Broker  
Integration of IBM z/OS into OpenShift Container Platform through self-service deployment and access to z/OS resources



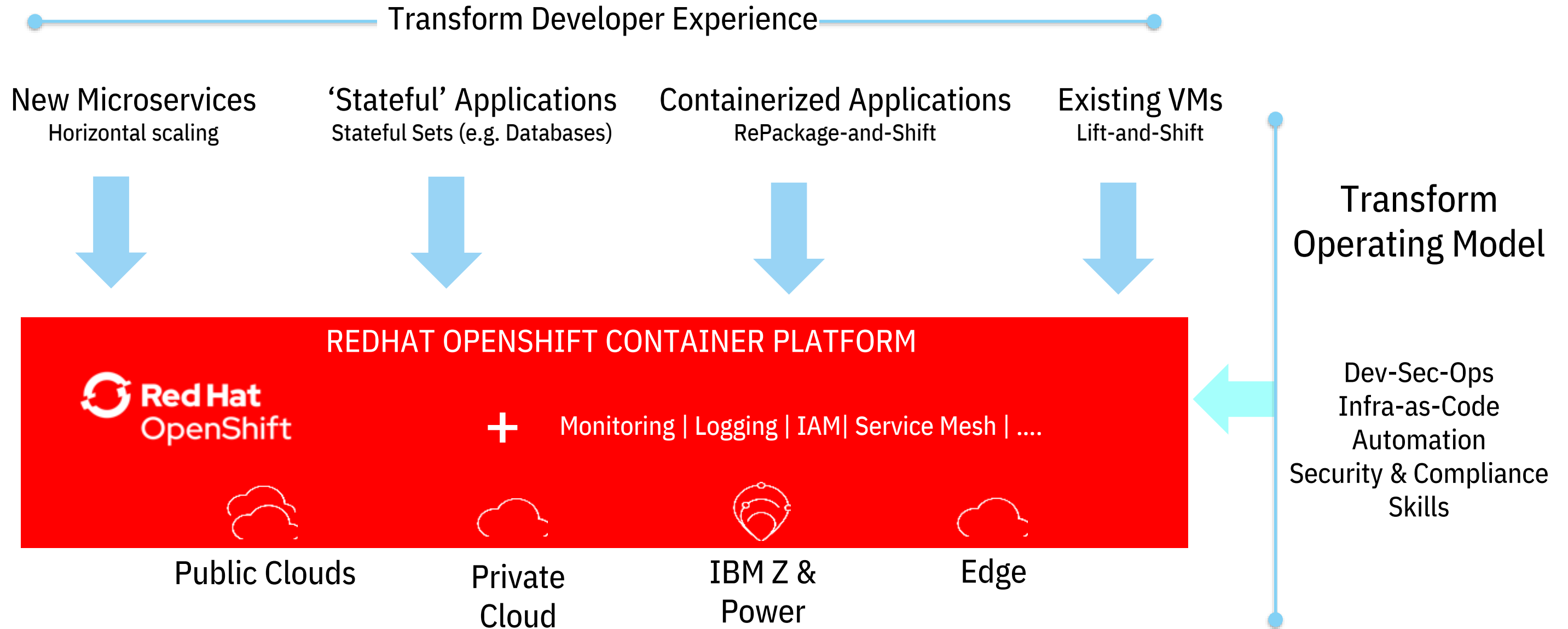
IBM z/OS Cloud Broker V2 (Future)  
z/OS integration into OpenShift powered by an Ansible Engine

- Integrating 'Day 2' management and operations using Ansible interacting with existing z/OS solutions
- Seamlessly evolve to configuration management, orchestration, and application deployment using the Red Hat Ansible Certified Content for IBM Z



Instances

# Red Hat OpenShift supports a wide range of application types in a single platform with a consistent developer & ops experience



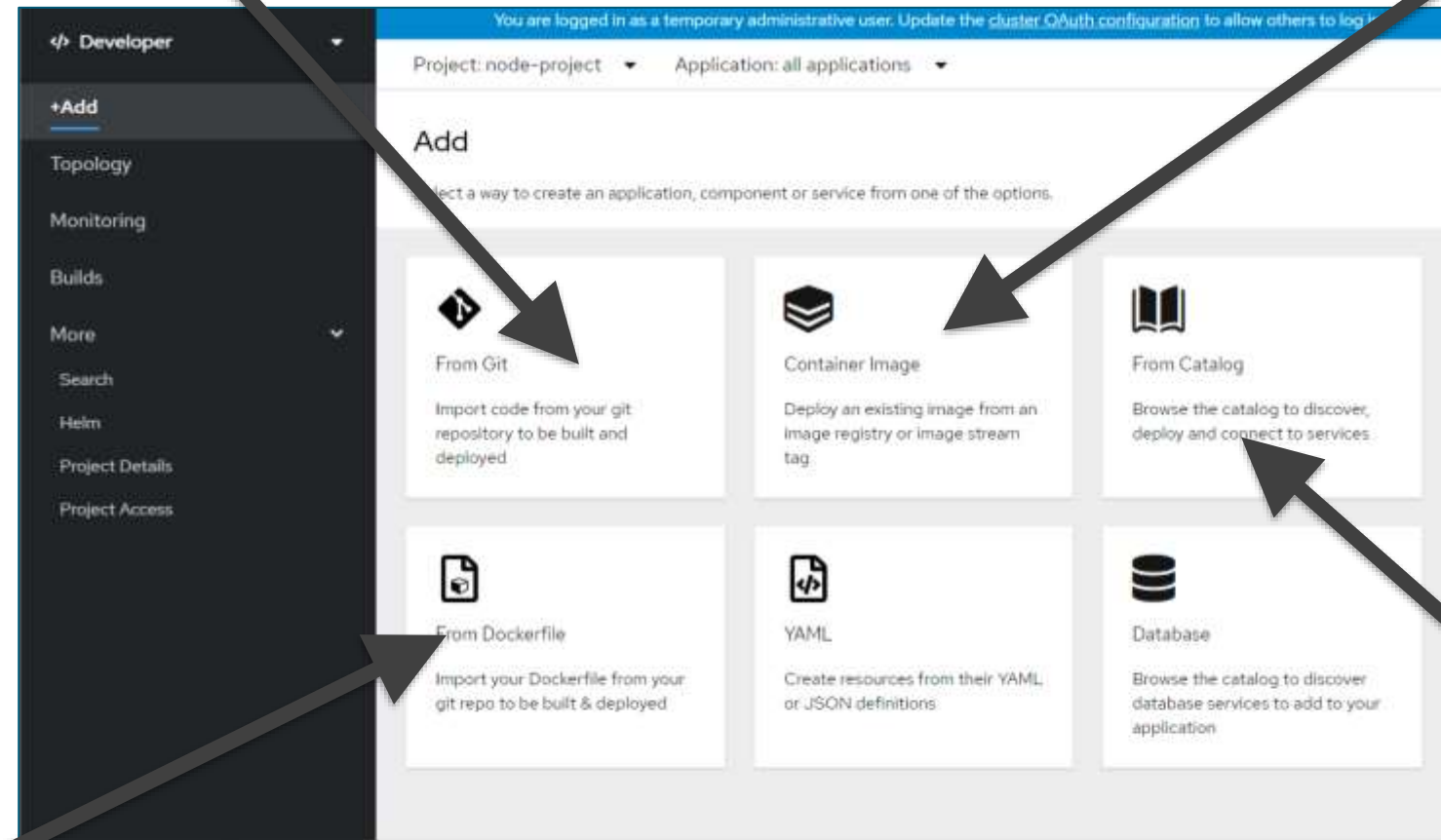
# Container application build with Red Hat OpenShift Container Platform on IBM zSystems & IBM LinuxONE

From source code (in code repo)

i.e. GitHub

From custom container image (in image repo)

i.e. IBM Registry, DockerHub



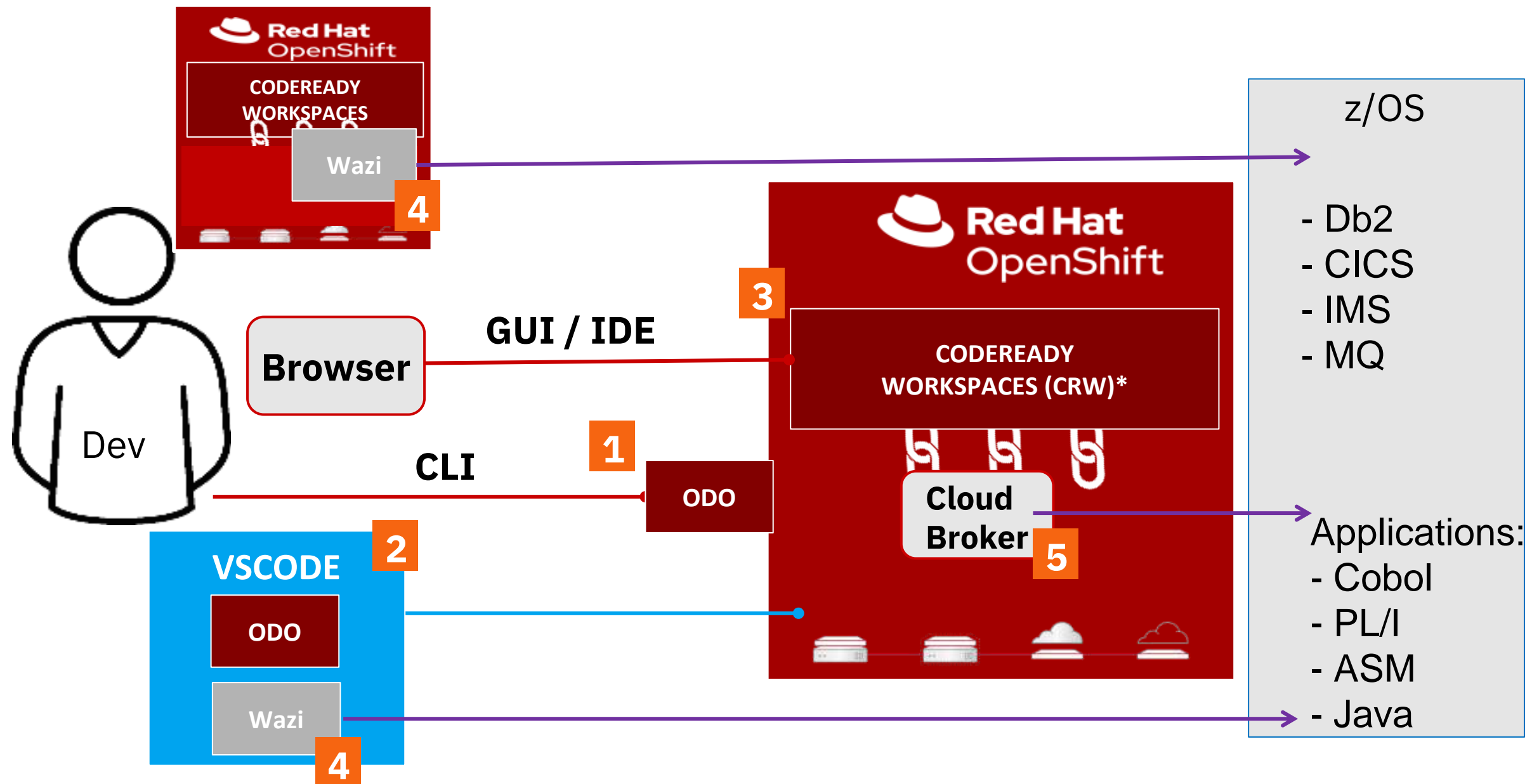
From a Dockerfile



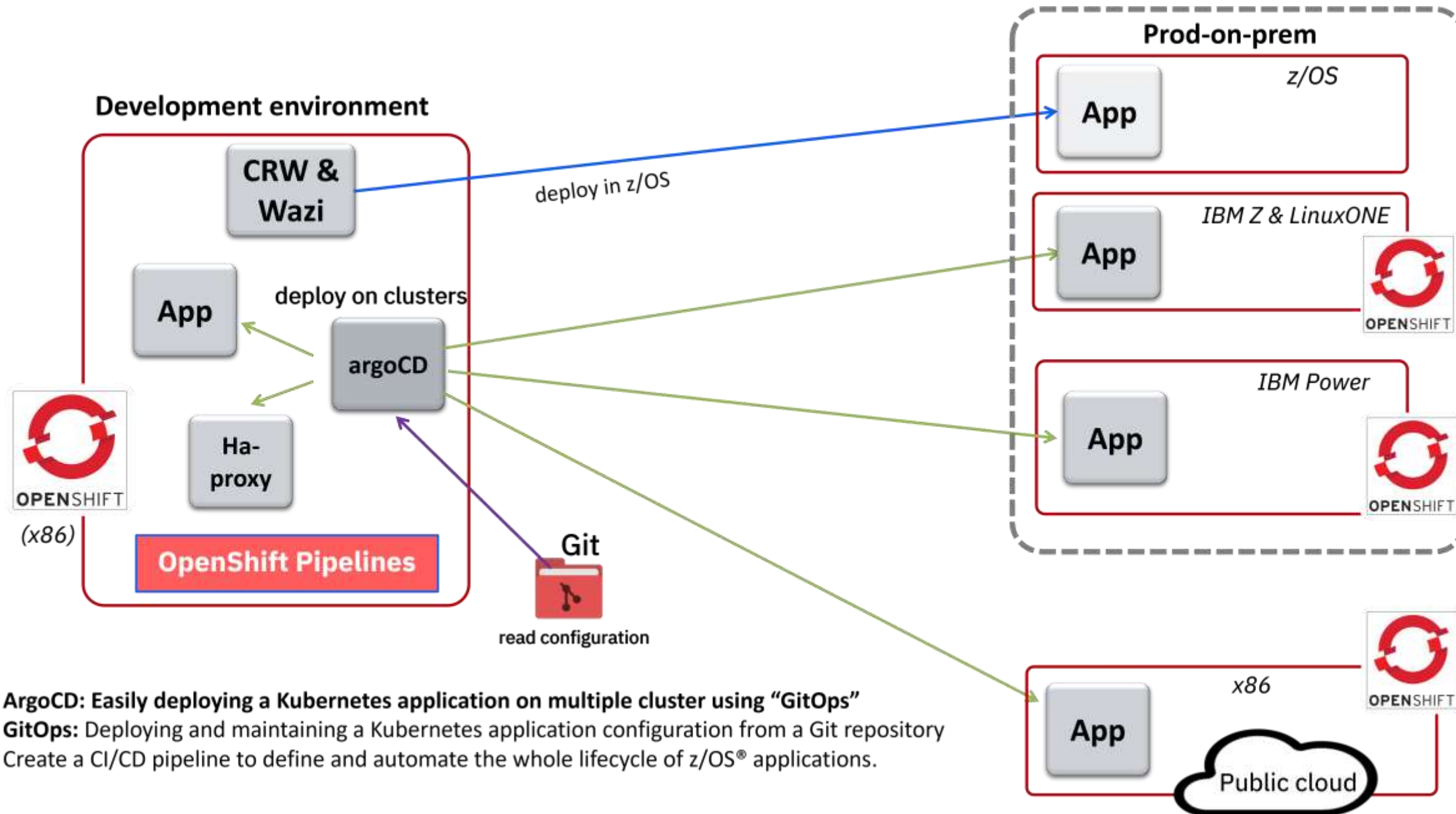
From OCP catalog



# Cloud-native development tools in Red Hat OpenShift for IBM zSystems & LinuxONE

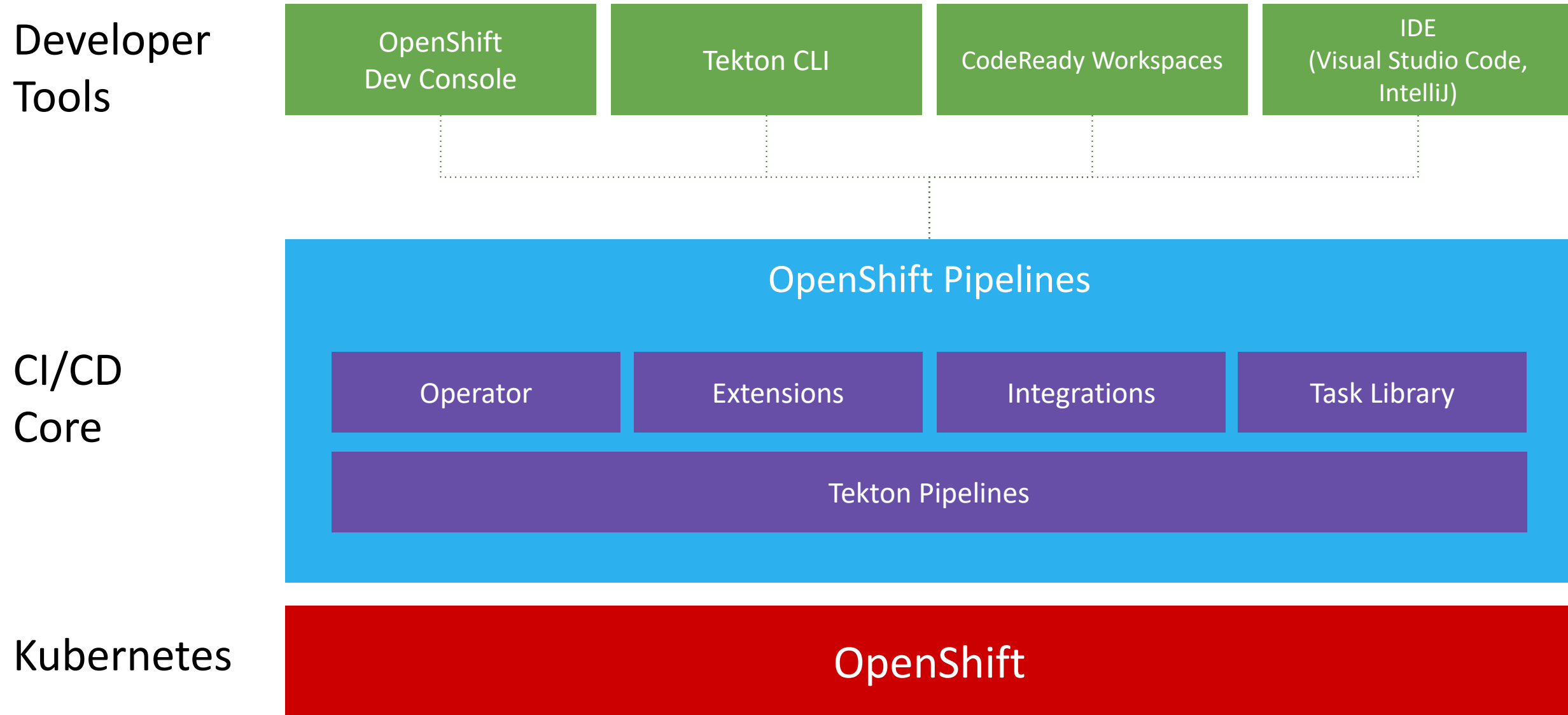


# Cross Platform OpenShift Application Deployment Consistency

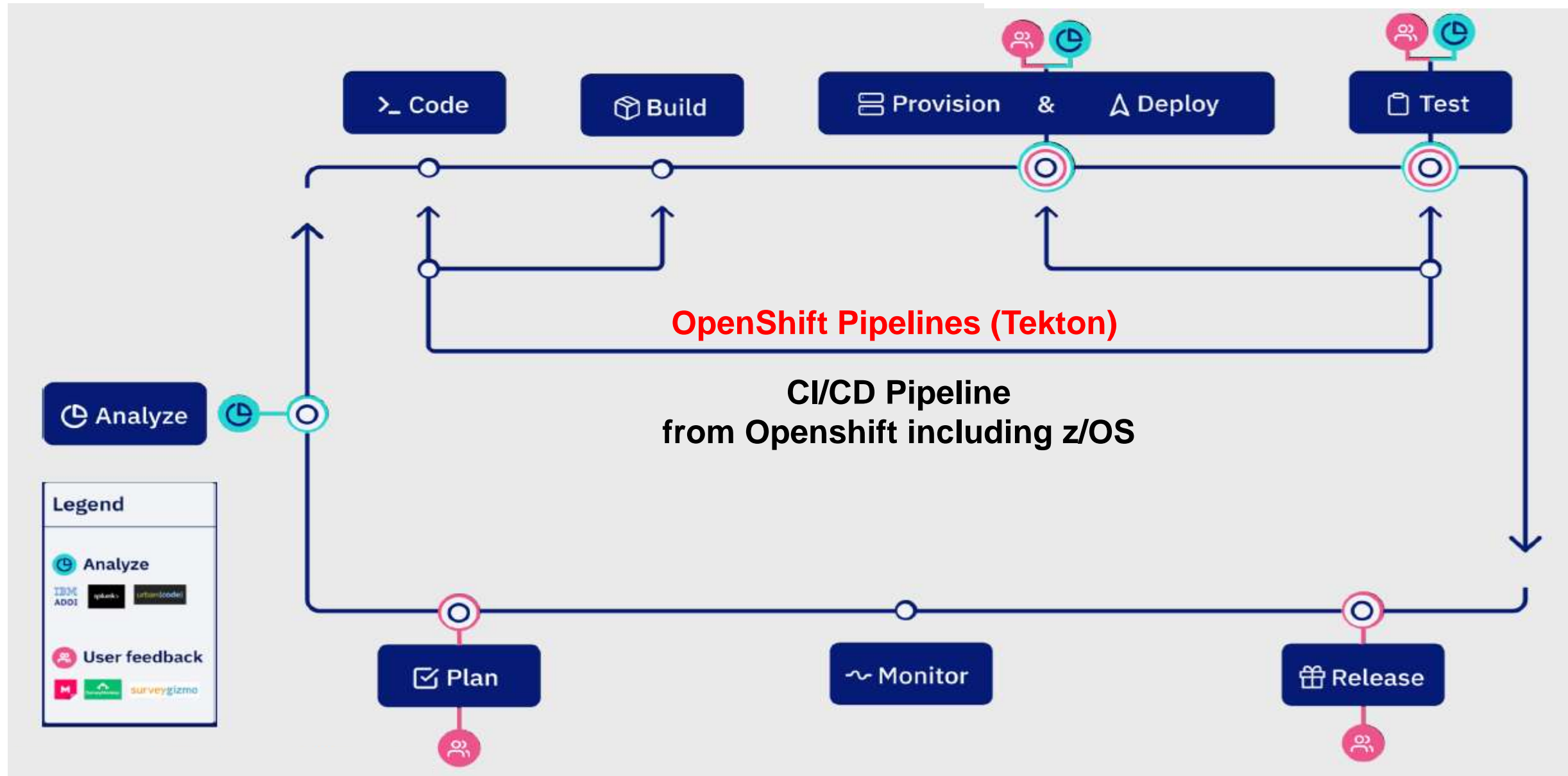


- **ArgoCD:** Easily deploying a Kubernetes application on multiple cluster using "GitOps"
- **GitOps:** Deploying and maintaining a Kubernetes application configuration from a Git repository
- Create a CI/CD pipeline to define and automate the whole lifecycle of z/OS® applications.

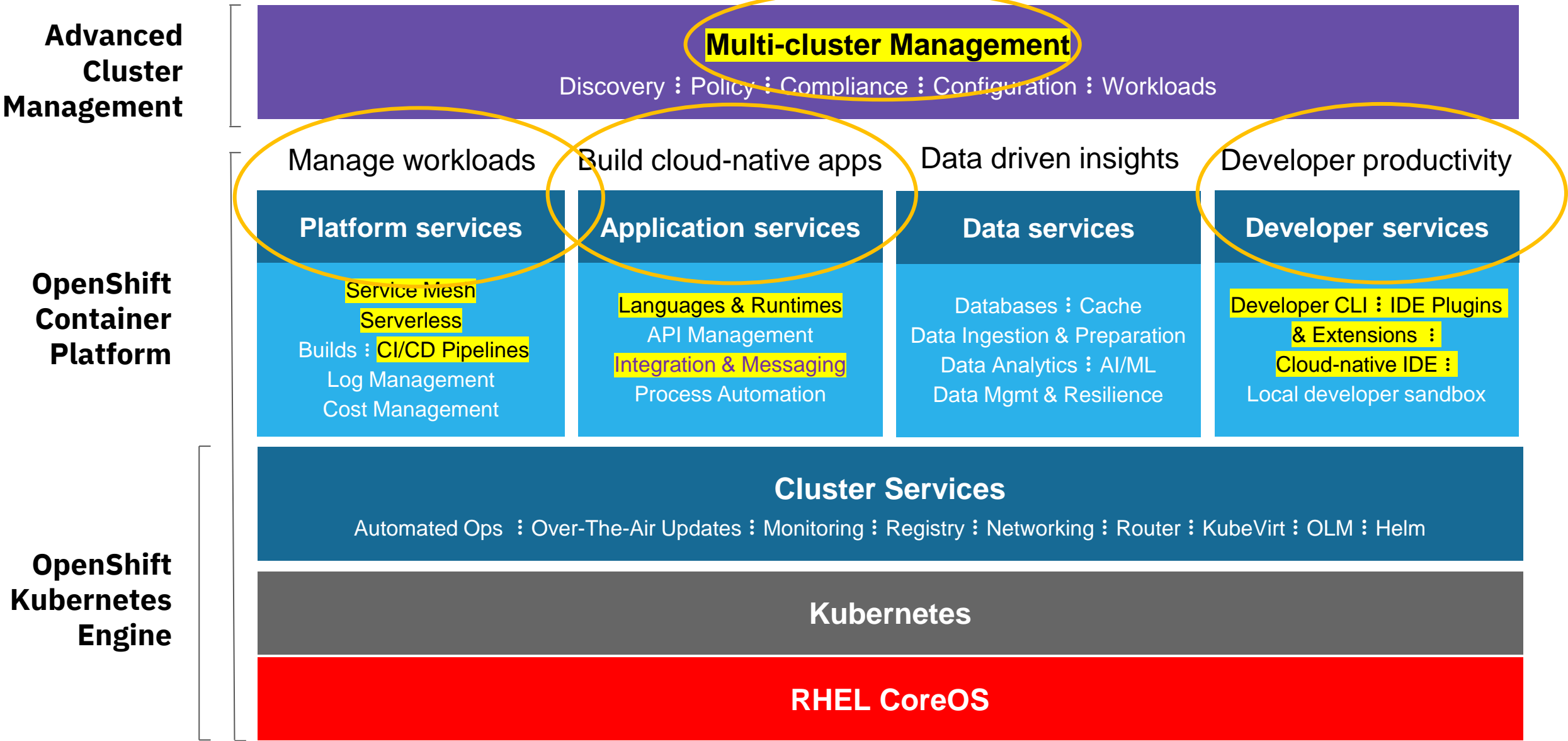
# OpenShift Pipelines: Architecture



# What makes up DevOps and CI/CD



# Red Hat OpenShift Container Platform and Add-ons



# The news about OpenShift 4.10 on IBM zSystems



## IBM zCX Foundation for Red Hat OpenShift

- Run Openshift in z/OS zCX
- Container in zCX managed by OpenShift

## Openshift Security

- Container based access to Crypto Express (CEX)
- IP-Sec support inter Node comm.
- Multus – multi networks per Node
- Horizontal Pod Autoscaler (HPA)
- Vertical Pod Autoscaler (VPA)

## Compliance verification

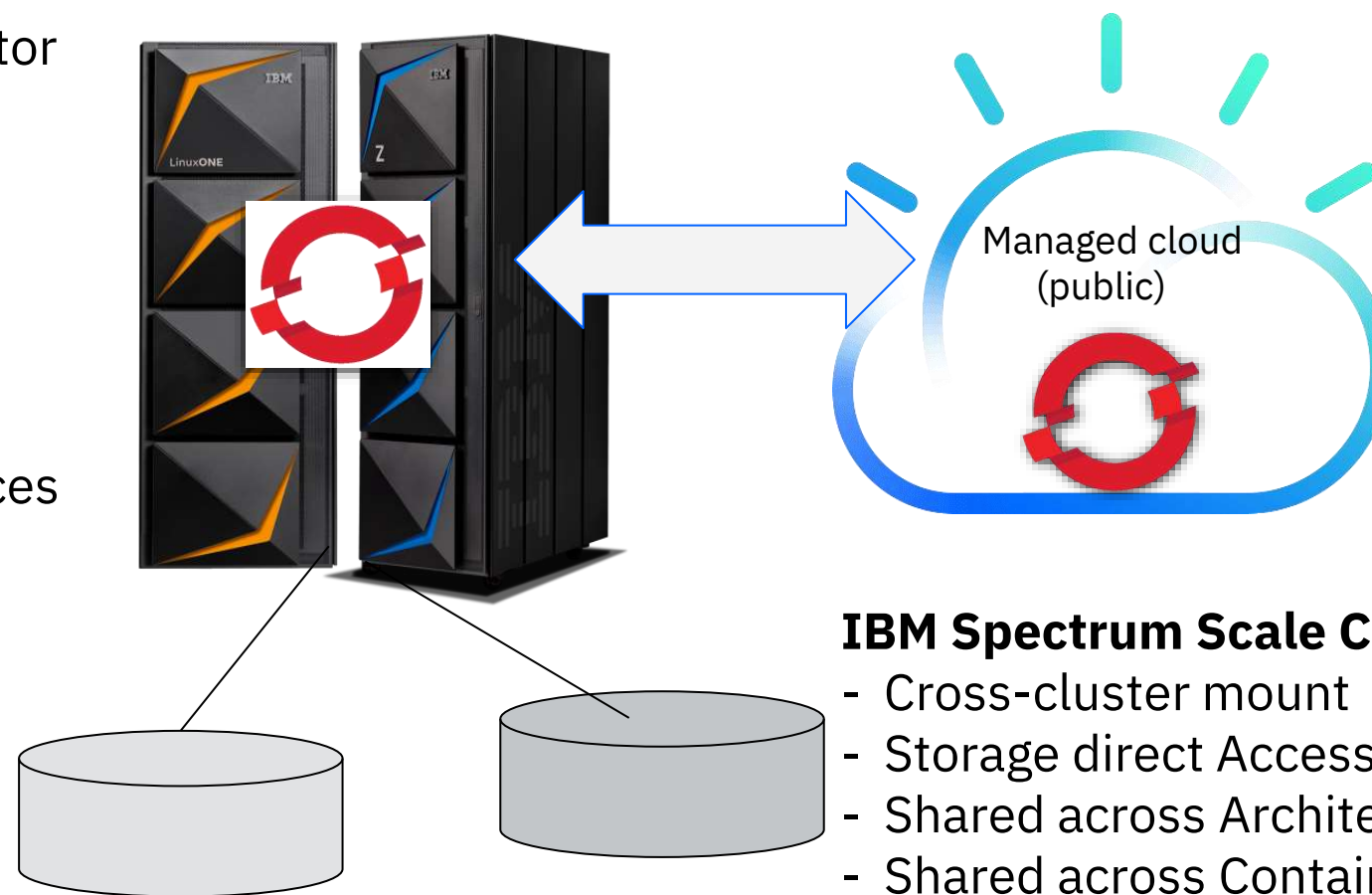
- Via new Compliance operator

## OpenShift Add-Ons

- Runtimes
- Serverless
- ServiceMesh
- Code Ready Workspaces
- AMQ Streams

## OpenShift Data Foundation

- a) Internal Mode
- b) External Mode on x86
- zSystems encryption



## Hybrid Cloud integration

- OpenShift the bridge for Dev.
- OpenShift with ArgoCD  
multi Architecture deployment
- OpenShift Advance Cluster Manager  
consistent management
- OpenShift data gravity

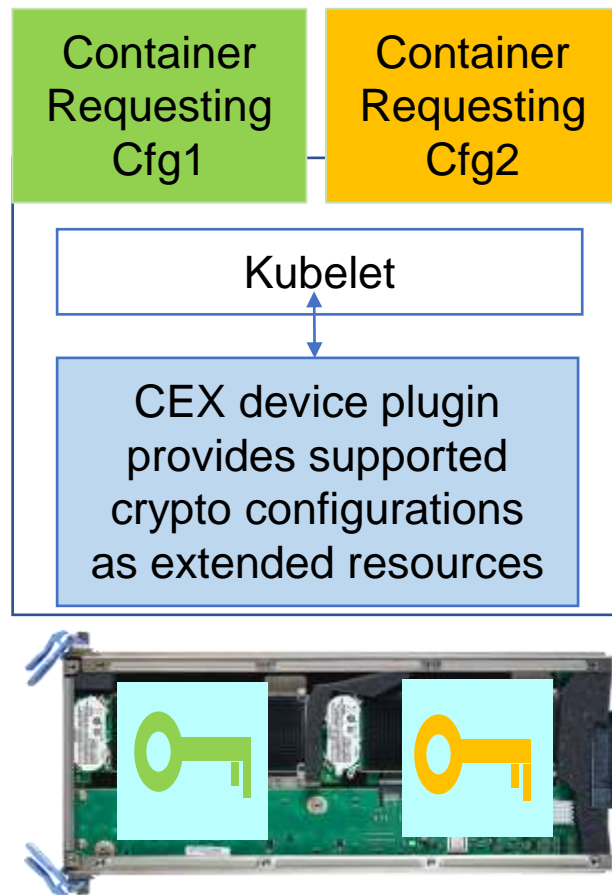
## IBM Spectrum Scale Container Native Storage Access (CNSA)

- Cross-cluster mount
- Storage direct Access
- Shared across Architectures
- Shared across Container and non-container workloads

# Industry leading security with IBM zSystems & LinuxONE

## **NEW:** IBM Crypto Express support for container workloads on Red Hat OpenShift

Red Hat OpenShift Compute Node



- **Kubernetes device plug-in for IBM Crypto Express (CEX) cards**
- *Enables OpenShift containers to take advantage of crypto resources on IBM Crypto Express adapters*
  - Implemented as container running on each compute node
  - Detects CEX resources available on each compute node
  - Assigns the CEX resource to the container
  - Frees resources after container termination
- Supported by Red Hat via typical support for a Red Hat certified container
- Available since Dec 2021 via Red Hat certified container without charge:  
<https://catalog.redhat.com/software/containers/ibm/ibm-cex-device-plugin-cm/61b1c724f90e846f0ebdb112>
- IBM Documentation: [www.ibm.com/support/pages/kubernetes-device-plug-ibm-crypto-express-cex-cards-installation-and-user-guide](http://www.ibm.com/support/pages/kubernetes-device-plug-ibm-crypto-express-cex-cards-installation-and-user-guide)
- Webcast “RHOC P meets IBM Crypto Express”:  
<https://www.ibm.com/support/pages/node/6351445>

# ***Modernize with and on IBM zSystems & LinuxONE***

---

## **NEW:** .NET 6.0 on IBM Z and LinuxONE

### ▪ **.NET 6.0**

▪ *Whether you are working in C#, F#, or Visual Basic, your code will run natively on any compatible operating system.*

- Enable migration of existing applications to OpenShift on IBM zSystems
- Take advantage of platform benefits such as performance, z/OS co-location, security, and resiliency

▪ .NET supported on both Red Hat Enterprise Linux and Red Hat OpenShift Container for IBM zSystems & LinuxONE

- .NET 6.0 is included in the AppStream repository for Red Hat Enterprise Linux 8 Update 5
- Use the ubi8/dotnet-60-runtime image to run pre-compiled applications inside containers

### Further Reading

- Blog: <https://community.ibm.com/community/user/ibmz-and-linuxone/blogs/elizabeth-k-joseph1/2021/11/10/net-6-comes-to-ibm-z-and-linuxone>
- Getting started: [https://access.redhat.com/documentation/en-us/net/6.0/html-single/getting\\_started\\_with\\_dotnet\\_on\\_rhel\\_8/index](https://access.redhat.com/documentation/en-us/net/6.0/html-single/getting_started_with_dotnet_on_rhel_8/index)



ubi8/dotnet-60

**.NET 6.0 SDK and Runtime**

by Red Hat, Inc.

.NET 6.0 SDK and Runtime on RHEL 8

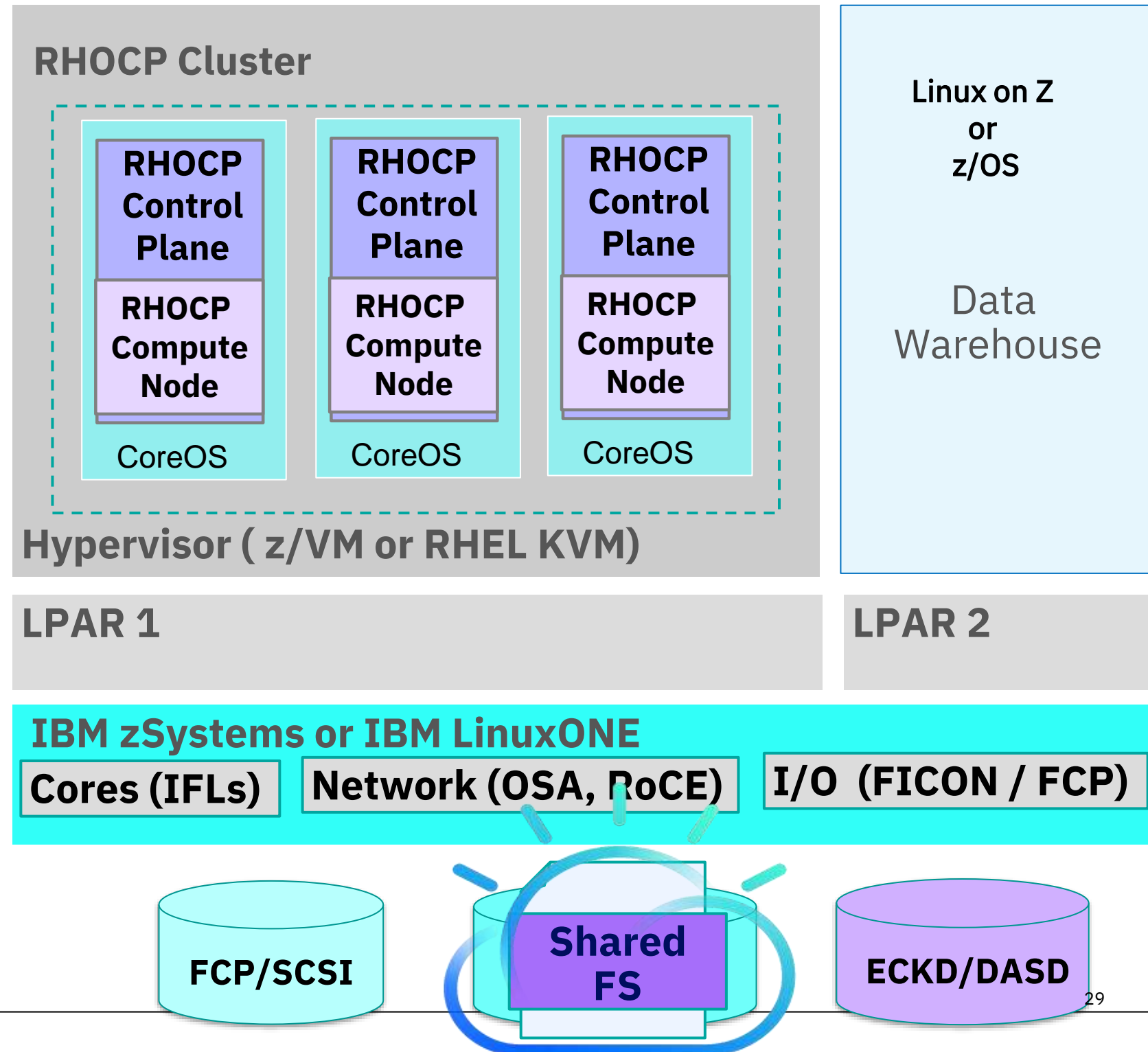
Updated 12 hours ago



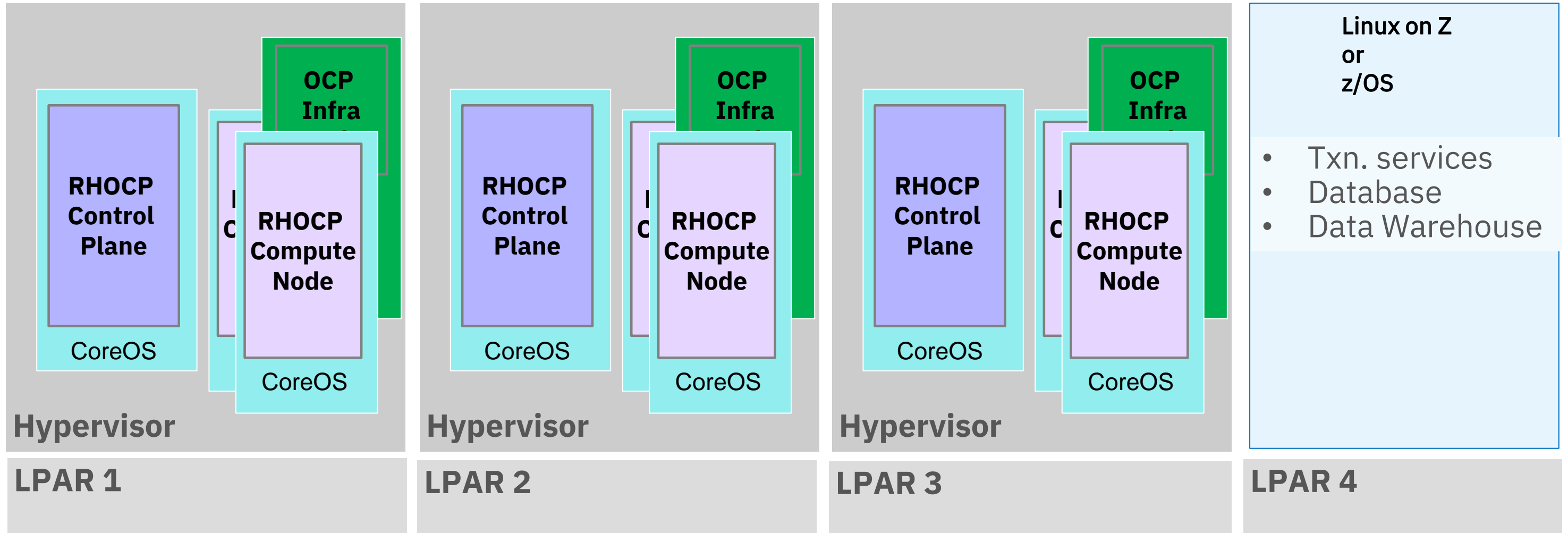
# Minimum Installation Scenario of RHOCP on IBM zSystems

## 'Three Node' cluster from RHOCP 4.8

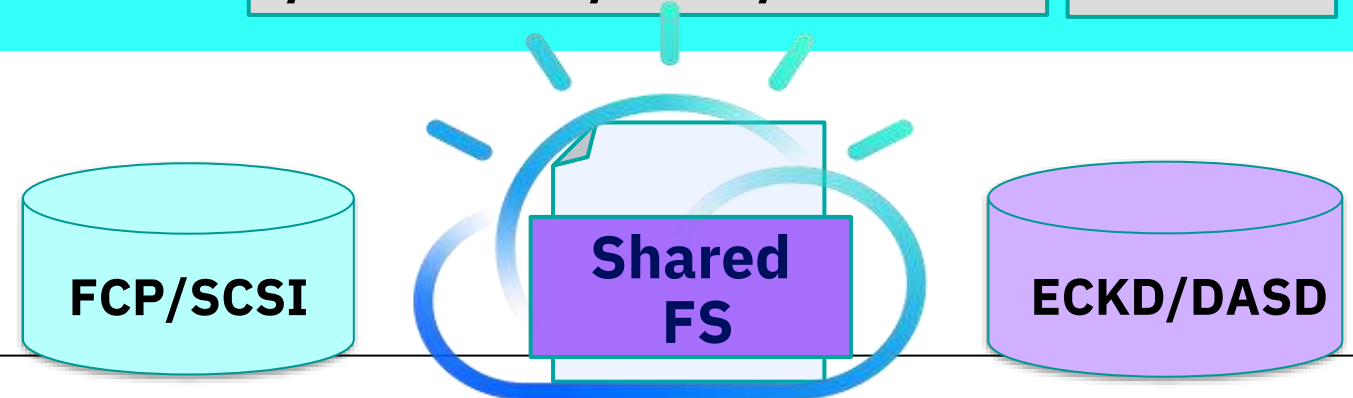
- converged Control Plane nodes and Compute Nodes



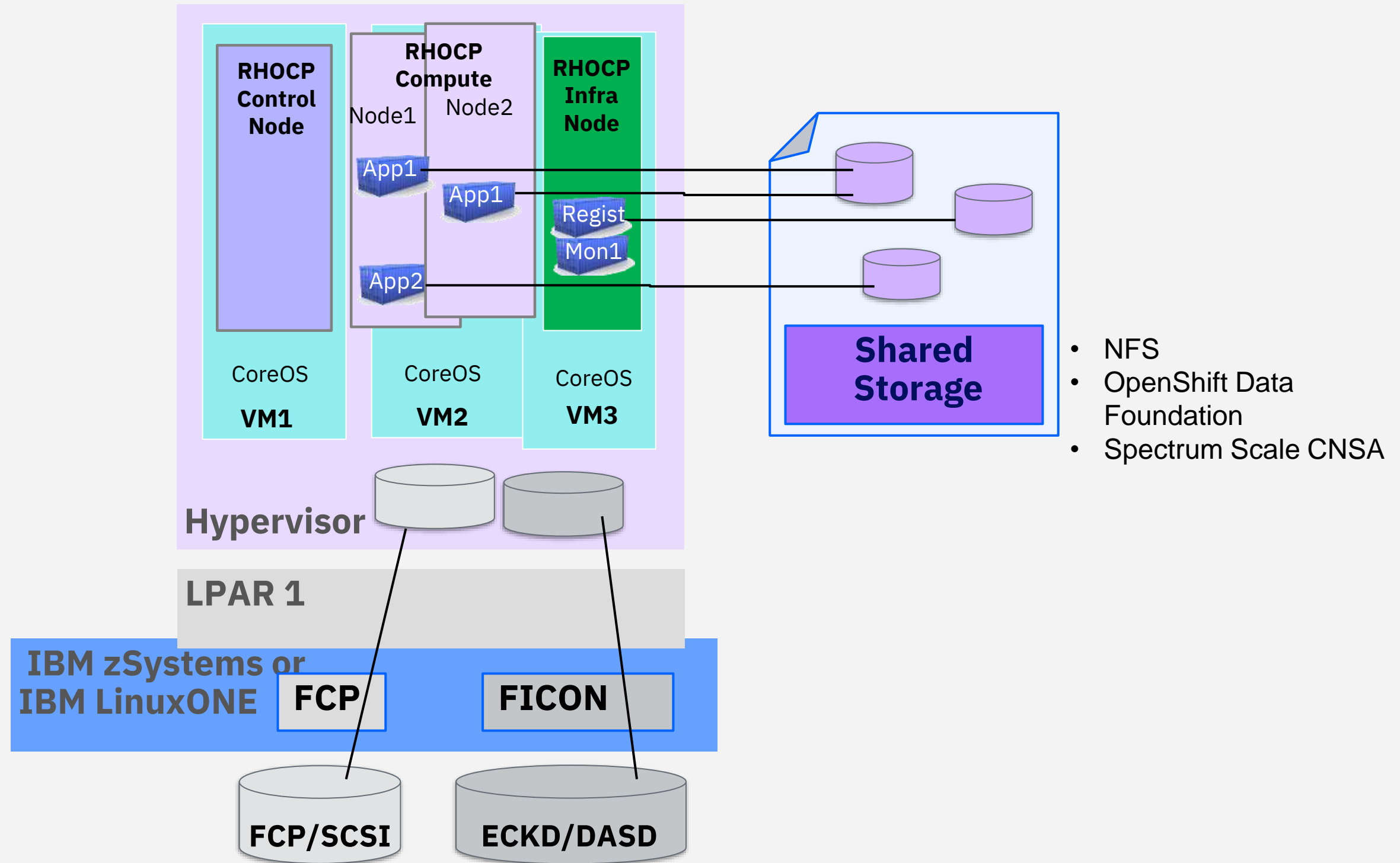
# RHOCP cluster production like Overview diagram



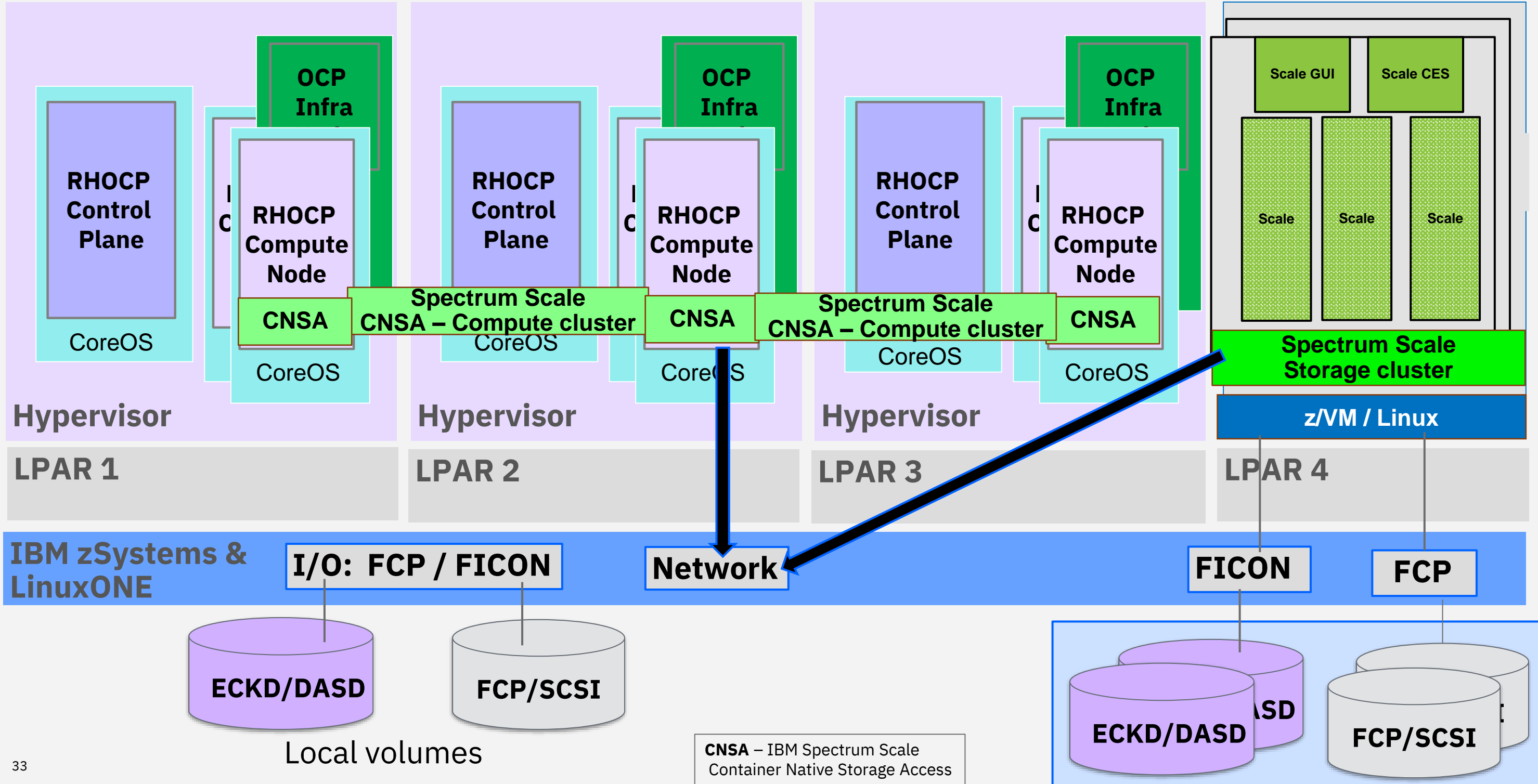
**IBM zSystems & IBM LinuxONE**      **I/O: FICON / FCP / iSCSI**      **Network**



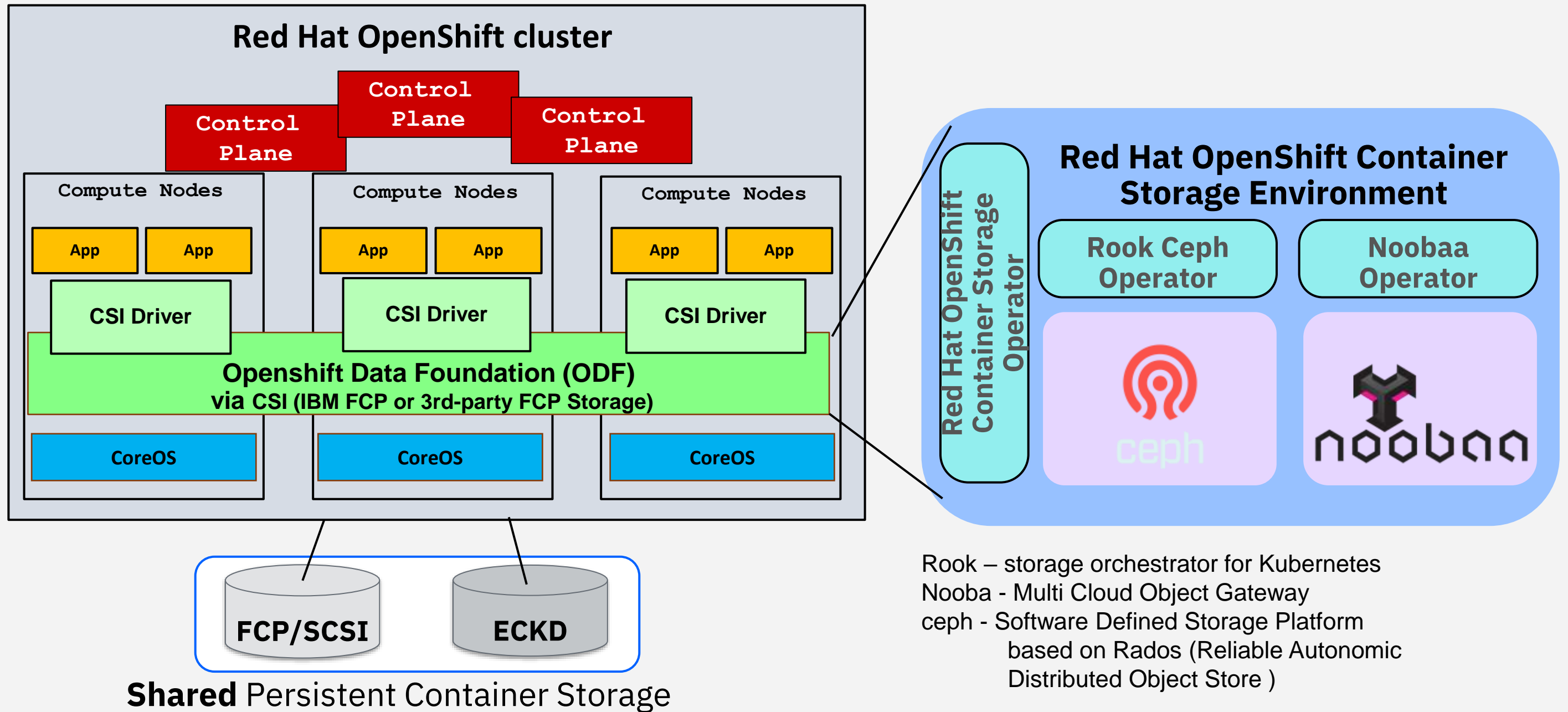
# 'Hypervisor' & 'Container' Storage with RHOCP on IBM zSystems



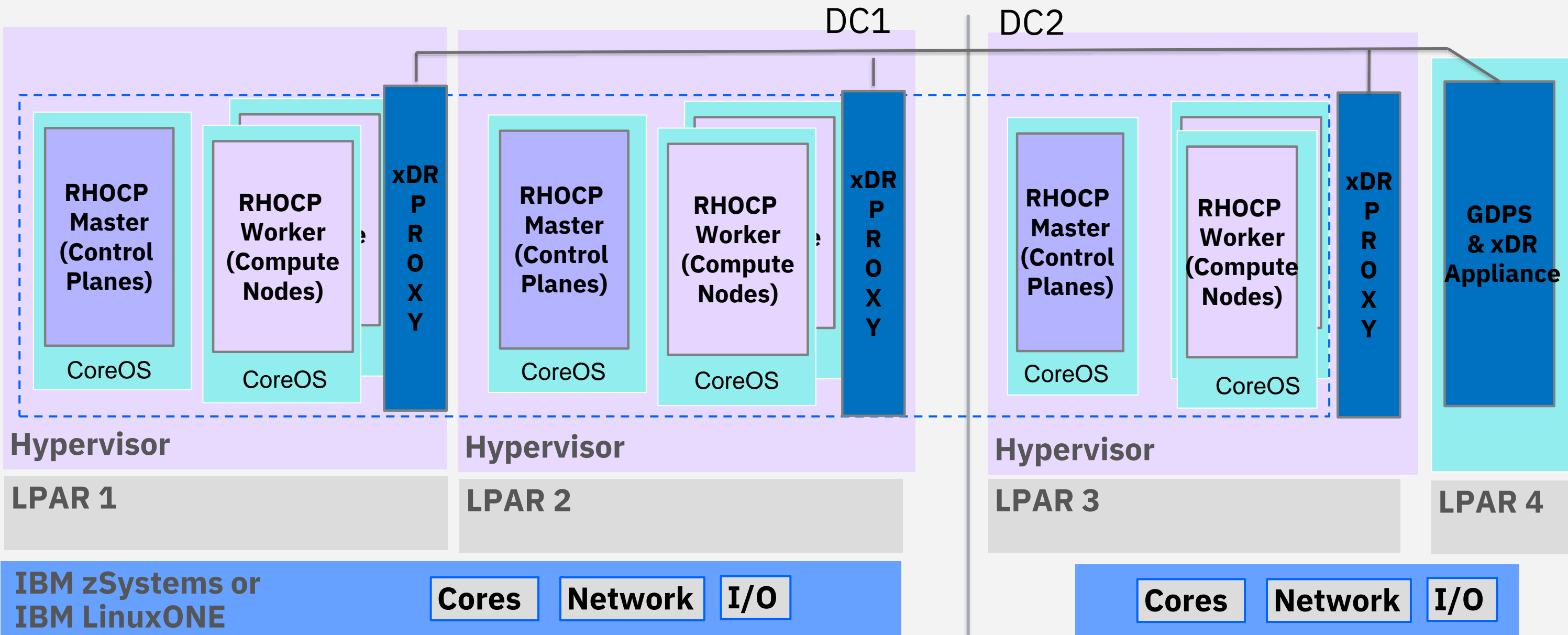
# RHOCP cluster with Spectrum Scale CNSA - **NEW** operator install



# Red Hat OpenShift Data Foundation (RHODF) (Former OpenShift Container Storage - RHOCS) – internal and external mode

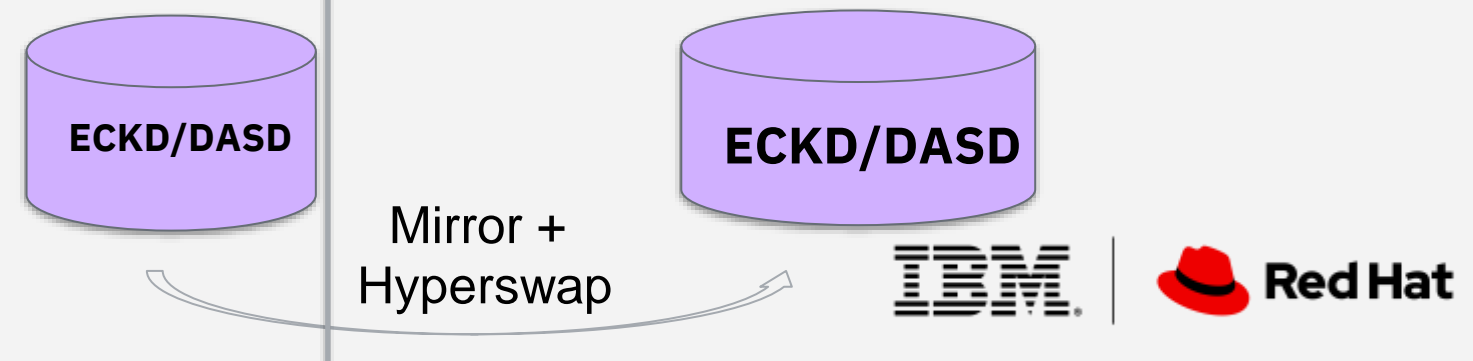


# Case /w GDPS: RHOCP single Cluster in 2 sites with 1+1 CEC (HW machine) + GDPS+xDR



## Case /w GDPS + xDR driven HA/DR

- RHOCP is able to be integrated in a GDPS+xDR scenario
  - Each z/VM needs a Linux guest with xDR proxy installed
  - GDPS+xDR can restart nodes – not Pods
  - GDPS+xDR can Hiperswap – function only avail. /w ECKD

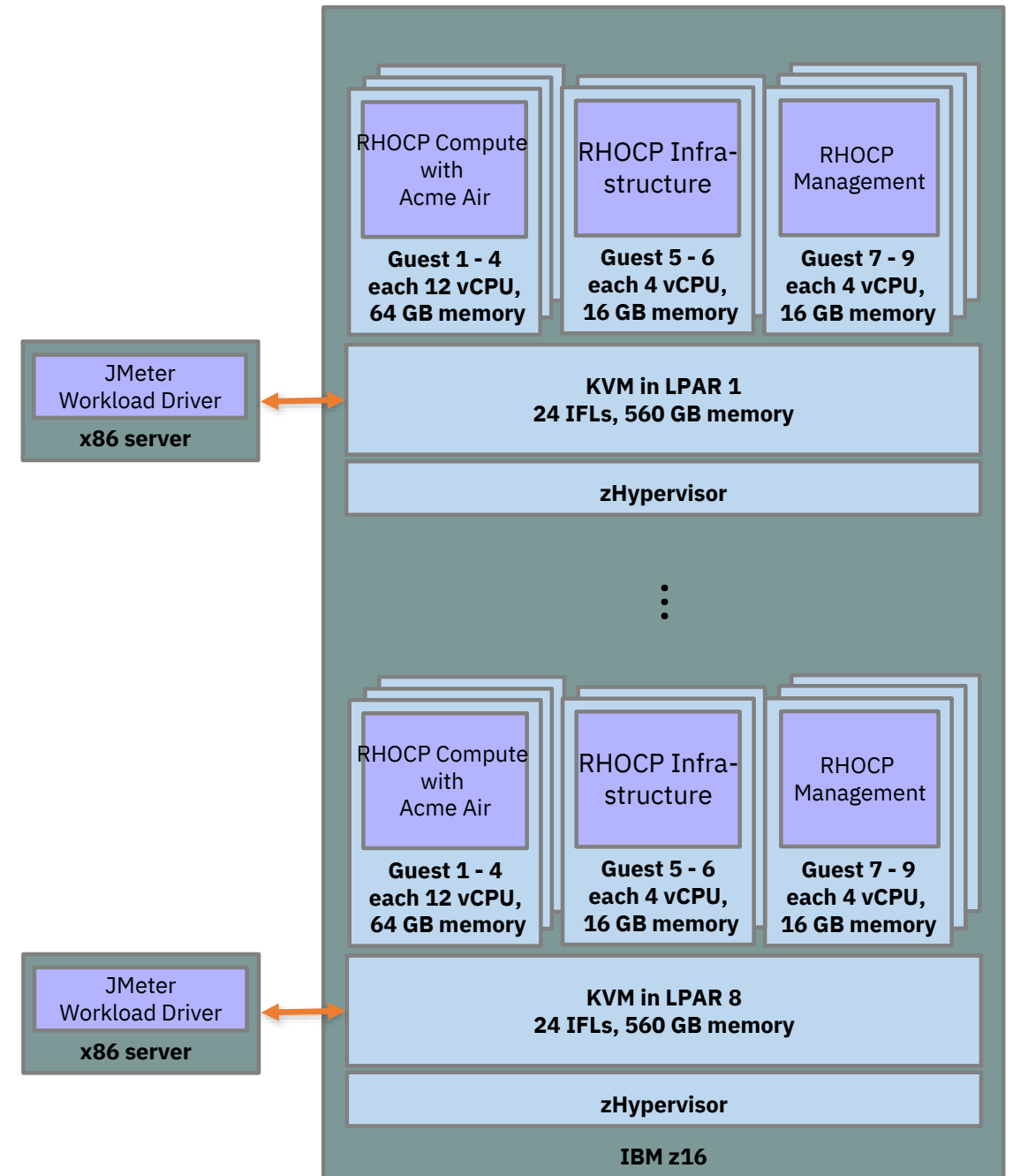


# Performance Proof Points

Maximum number of HTTPS transactions with complex microservices on IBM z16

With IBM z16, execute up to **20 billion HTTPS transactions per day** with OLTP microservice applications running on RedHat OpenShift Container Platform

**DISCLAIMER:** Performance result is extrapolated from IBM internal tests running in an IBM z16 LPAR with 24 dedicated IFLs, 560 GB memory and DASD storage the Acme Air microservice benchmark (<https://github.com/blueperf/acmeair-main-service-java>) on Red Hat OpenShift Container Platform (RHOCP) 4.9 using RHEL 8.4 KVM. On 4 RHOCP Compute nodes 4 Acme Air instances were running in parallel, each driven remotely from JMeter 5.2.1 with 384 parallel users. The KVM guests with RHOCP Compute nodes were configured with 12 vCPUs and 64 GB memory each. The KVM guests with RHOCP Management nodes and RHOCP Infrastructure nodes were configured with 4 vCPUs and 16 GB memory each. Results may vary.

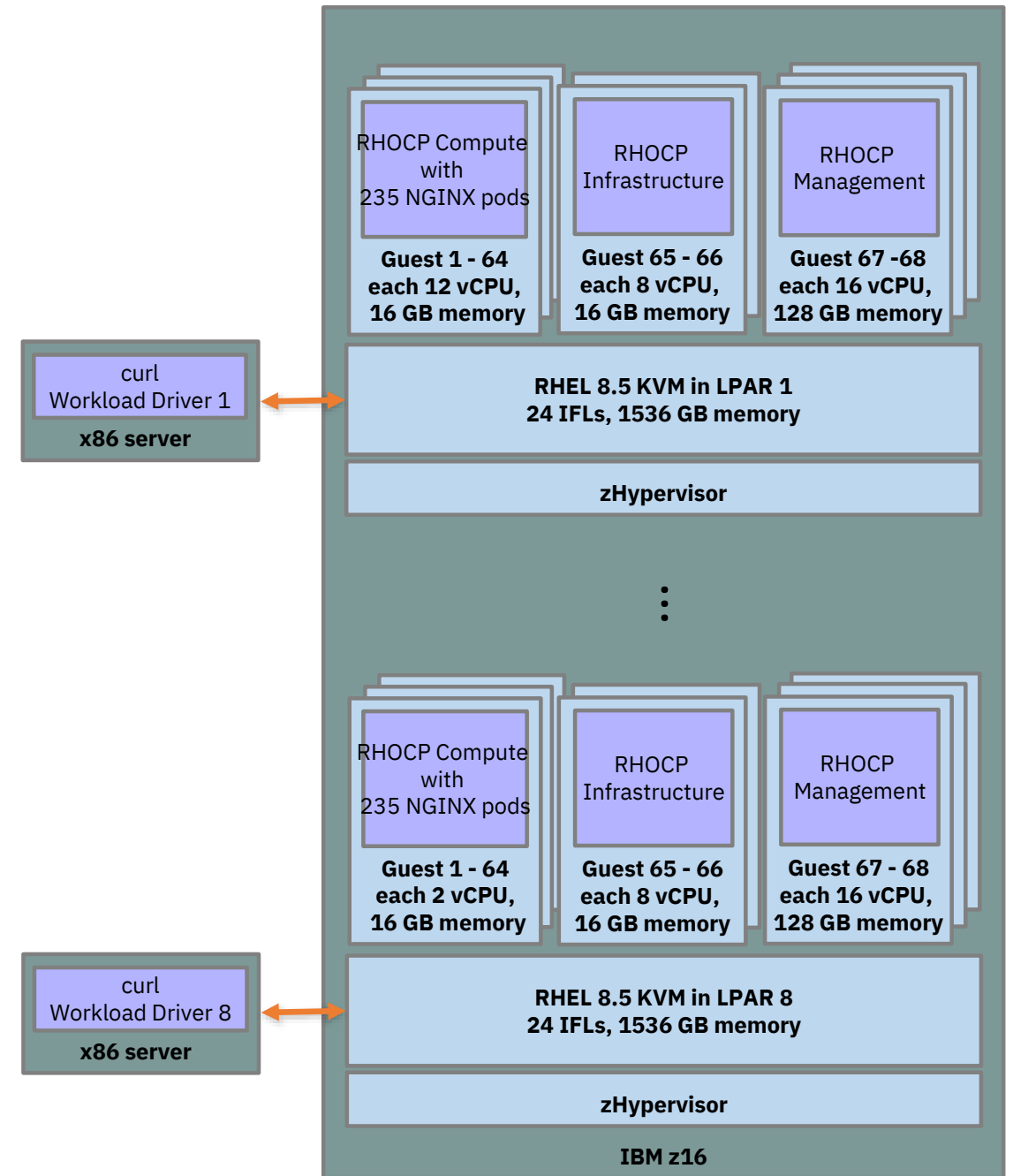


# Performance Proof Points

## Scale-out Red Hat OpenShift Container Platform Compute Nodes and NGINX Pods on IBM z16

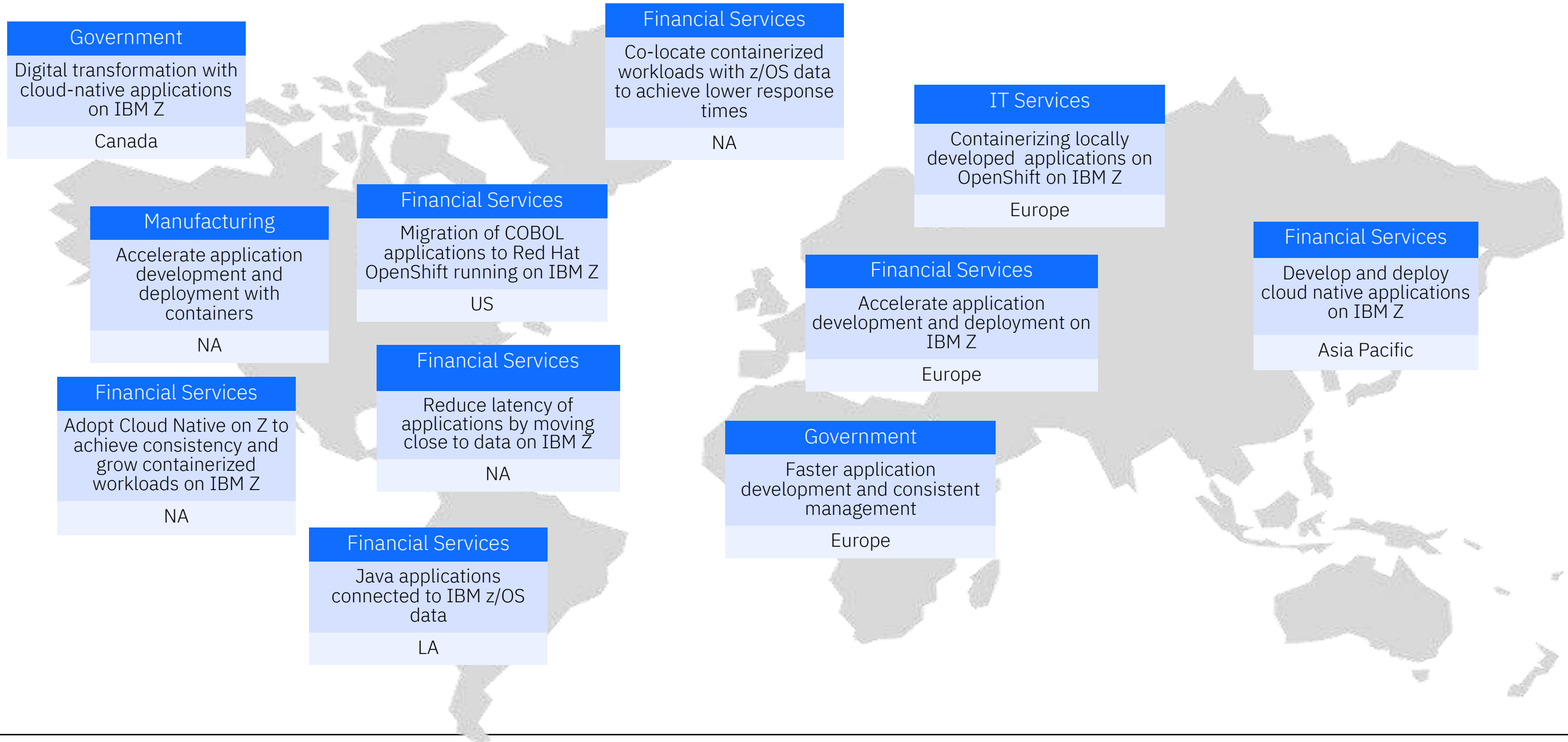
On IBM z16, scale-out to **512** Red Hat OpenShift Container Platform Compute Nodes and deploy up to **100.000** NGINX pods

**DISCLAIMER:** Performance result is extrapolated from IBM internal tests running in an IBM z16 LPAR with 24 dedicated IFLs, 1536 GB memory and FS9200 storage NGINX pods on Red Hat OpenShift Container Platform (RHOCP) 4.10 running on a RHEL 8.5 KVM host. 64 RHOCP Compute nodes with 230 NGINX pods were running in parallel. The KVM guests with RHOCP Compute nodes were configured with 2 vCPUs and 16 GB memory each. The KVM guests with RHOCP Management nodes were configured with 16 vCPUs and 128 GB memory each. Results may vary.





# Real worldwide momentum for **Red Hat OpenShift** on IBM zSystems & Cloud Paks



# Adoption patterns for Red Hat OpenShift on IBM zSystems & LinuxONE



## Co-location

Co-locate containerized workloads with 'system-of-record' data to achieve low response time and meet enterprise SLA

## Modernization

Adapt cloud native CI/CD tooling to achieve consistency and grow containerized workloads

## Cost optimization

Benefit based on streamlined infrastructure, energy, space, operational efficiency, etc.

## Platform capabilities

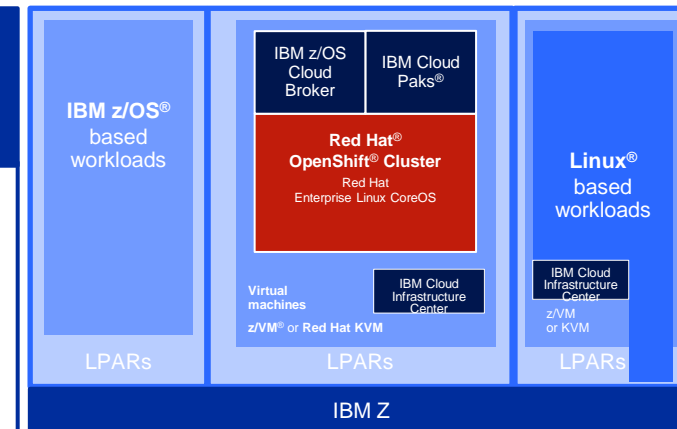
High throughput per core, low latency, high scalability, out of the box availability and resiliency

## AI and Data

Leverage AI to extract critical operational insights for business transformation and achieve agility

## Blockchain

IBM Blockchain Platform deployed on-premises on IBM zSystems



# Use cases for OpenShift on IBM zSystems & LinuxONE

- Enterprise scale Private Cloud-in-a-Box
  - Instant capacity on-demand with
  - Scale-up / out in a single footprint
  - Extreme consolidation and high security
- Hybrid Cloud App & data gravity
  - Hybrid Apps. with transactional interconnection
  - Self scaling environment for orders / public docs
  - Protect IoT devices with secured tokens (Crypto Express)
  - Co-location for latency sensitive access to core data (Db2 z/OS or Oracle)
- Consistency Across Multi-Architecture Development
  - Same developer experience across hybrid Multicloud
  - Same tooling
  - Integration in existing tools
- Consistent Operational Experience
  - Single pane of glass with RH Advanced Cluster Manager (ACM)
  - Global managed Life cycle



# Adoption Patterns with IBM Q for OpenShift on IBM zSystems & LinuxONE

- Quantum safe security integration
  - **digital signatures** validation like mortgage/credit card approvals
  - **document signing** for Financial Institutions that require decades of retention and validity (e.g mortgages could be 30+ years)
  - **algorithms used for digital signatures** will be invalid (in approx 10-15 years) due to quantum computing. The goal is to dual sign electronic documents so that existing mechanisms can continue to be used, and PQC (**post-quantum cryptography**) can be used where available.
  - **IBM zSystems algorithms** like Dilithium & Kyber (key encapsulation) can be used for this and signing can be done on existing systems using p12 certs with PKCS11 (via IBM's Enterprise PKCS11 driver) with the HSM backend on a z16 with a CEX8 card. It can be done with z15 & CEX7 too but that only supports 1 Dilithium algorithm, there's newer ones out there only supported on CEX8



# How did customers start with Openshift on IBM zSystems

## A major Bank

- Lack of fast development and deployments led to a VHE and then to many projects because of reliability and security inheritance of Linux on zSystems

## Public sector customer

- Big need for an Internal secure communication platform
  - Overnight developed Chatbot – with RHOCP CRW

## Insurance customer

- Starting with a game to be ported as educational action
  - The success was followed by the adoption of zCX in a wider scope and integrates with z/OS data and services

## Retail

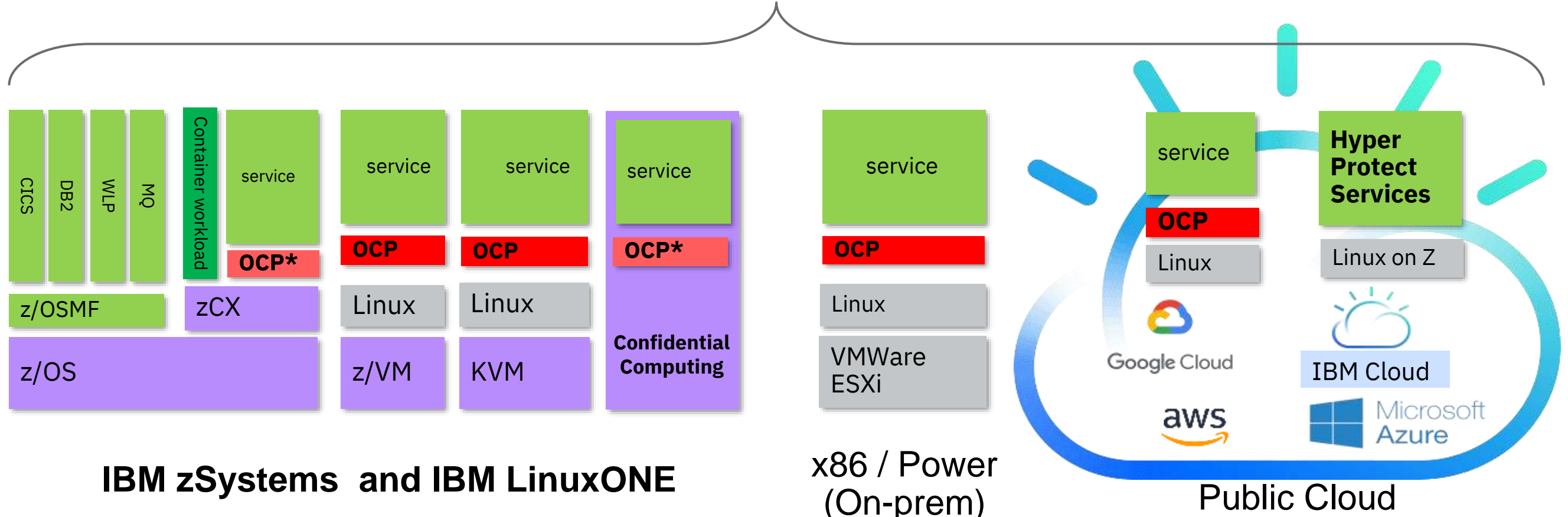
- The need to integrate with public cloud services - a major application developed in cloud was rehosted co-located and increased the txn. throughput by more than 40X



# Outlook: The Hybrid Multicloud Vision with OpenShift



**Advanced Cluster Management (RHACM)**  
 for multi cloud solutions and App. Life cycle  
 - [Can manage Kubernetes and OpenShift cluster](#)



\* Roadmap item

*\* All statements regarding IBM's future direction and intent are subject to change or withdrawal without notice and represent goals and objectives only.*

# Hybrid Cloud Differentiation with Red Hat OpenShift & IBM zSystems & LinuxONE

## Benefits on Z

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

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

Highest levels of **Security and Compliance**



## Adoption Patterns

Enterprise scale **Private Cloud-in-a-Box**  
2.4M containers-per-box

**Digital Transformation and Modernization for z/OS**  
7x shorter batch windows  
5x better transaction response times

**Extreme Consolidation** and  
scalable **Data Serving**  
75% lower Op-Ex

**99.99999%**  
*system availability*

**4:1 better data-center footprint** **2:1**  
*lower power envelope*

**3.8x better Java throughput,**  
**24x faster Java Garbage Collection**

**Enterprise** grade. **Open** by design. **Secured** by IBM zSystems.



# Red Hat catalog with container images for IBM zSystems & LinuxONE

<https://catalog.redhat.com/software/containers/search?p=1&architecture=s390x>

The screenshot displays the Red Hat Ecosystem Catalog interface for container images. The top navigation bar includes the Red Hat logo and links for Hardware, Software, and Cloud & service providers. The main heading is "Container images" with a subtext: "Container images offer lightweight and self-contained software to enable deployment at scale." Below this is a search bar with the text "Search container images" and a red "Search" button. A filter for "s390x" is active, with a "Clear filters" link. The left sidebar contains filters for Architecture (s390x, amd64, arm64, ppc64le) and Category (API Management, Application Delivery, Application Development, Application Server, Automation). The main content area shows a grid of six container image cards, each with the Red Hat logo, name, description, and update time.

Architecture	Category	Image Name	Description	Updated
s390x	Operating System	Red Hat Enterprise Linux 7	Provides the latest release of Red Hat Enterprise Linux 7 in a fully featured and supported base image.	Updated 5 days ago
s390x	Application	redhat-openjdk-18/openjdk18-openshift Java Applications	OpenJDK 8 image for Java Applications	Updated 5 days ago
s390x	Application	rhel7/etcd Etcd	A highly-available key value store for shared configuration	Updated 5 days ago
s390x	Operating System	rhel7-atomic RHEL Atomic Base Image	Provides the latest release of Red Hat Enterprise Linux 7 in a fully supported	
s390x	Application	rhscv/httpd-24-rhel7 Apache httpd 2.4	Platform for running Apache httpd 2.4 or building httpd-based application	
s390x	Application	rhscv/s2i-base-rhel7 s2i base	Base image with essential libraries and tools used as a base for builder images	



# IBM zSystems and LinuxONE Container Registry



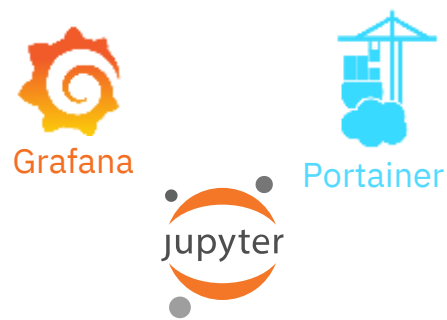
foundational distros\*



languages



registries, scanners



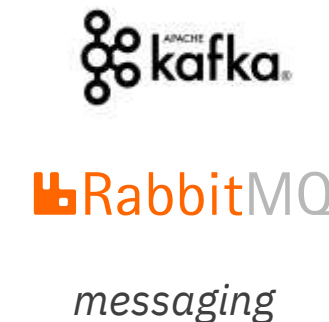
dashboards, UIs



shell, utilities



CI/CD infrastructure



messaging



\* Red Hat base image available at Red Hat Marketplace

Many images, multiple versions, chosen based on customer input



databases/datastores



web serving



Elastic stack

## Top 10 Containers

- Kafka
- Development-workspace
- Elasticsearch
- Logstash
- Ubuntu
- Grafana
- OpenJDK
- Alpine
- Portainer
- Tensorflow

## Images in the pipeline



Official interface made available end of October, 2021

<https://ibm.biz/BdfAdW>

# Docker-Hub containerized software for Linux on IBM Z & IBM LinuxONE

<https://hub.docker.com/search?q=HTTPd&type=image&architecture=s390x>

The search provides public container images that have been built for Linux with version of Linux on Z and LinuxONE

The screenshot shows the Docker Hub search results for container images. The search bar contains the text "Search for great content (e.g., mysql)". The navigation menu includes "Docker EE", "Docker CE", "Containers", and "Plugins". The left sidebar shows filters for "Operating Systems" (Linux, Windows) and "Architectures" (ARM, ARM 64, IBM POWER, IBM Z, PowerPC 64 LE, x86, x86-64). The "IBM Z" architecture is selected. The main content area displays three search results:

- node**: Official image, updated 2 minutes ago. Description: "Node.js is a JavaScript-based platform for server-side and networking applications." Architecture tags: Container, Linux, ARM 64, PowerPC 64 LE, ARM, IBM Z, x86-64, 386, Application Infrastructure. Downloads: 10M+, Stars: 8.9K.
- mongo**: Official image, updated 2 minutes ago. Description: "MongoDB document databases provide high availability and easy scalability." Architecture tags: Container, Windows, Linux, x86-64, ARM 64, IBM Z, Databases. Downloads: 10M+, Stars: 7.0K.
- nginx**: Official image, updated 3 minutes ago. Description: "Official build of Nginx." Downloads: 10M+, Stars: 10K+.

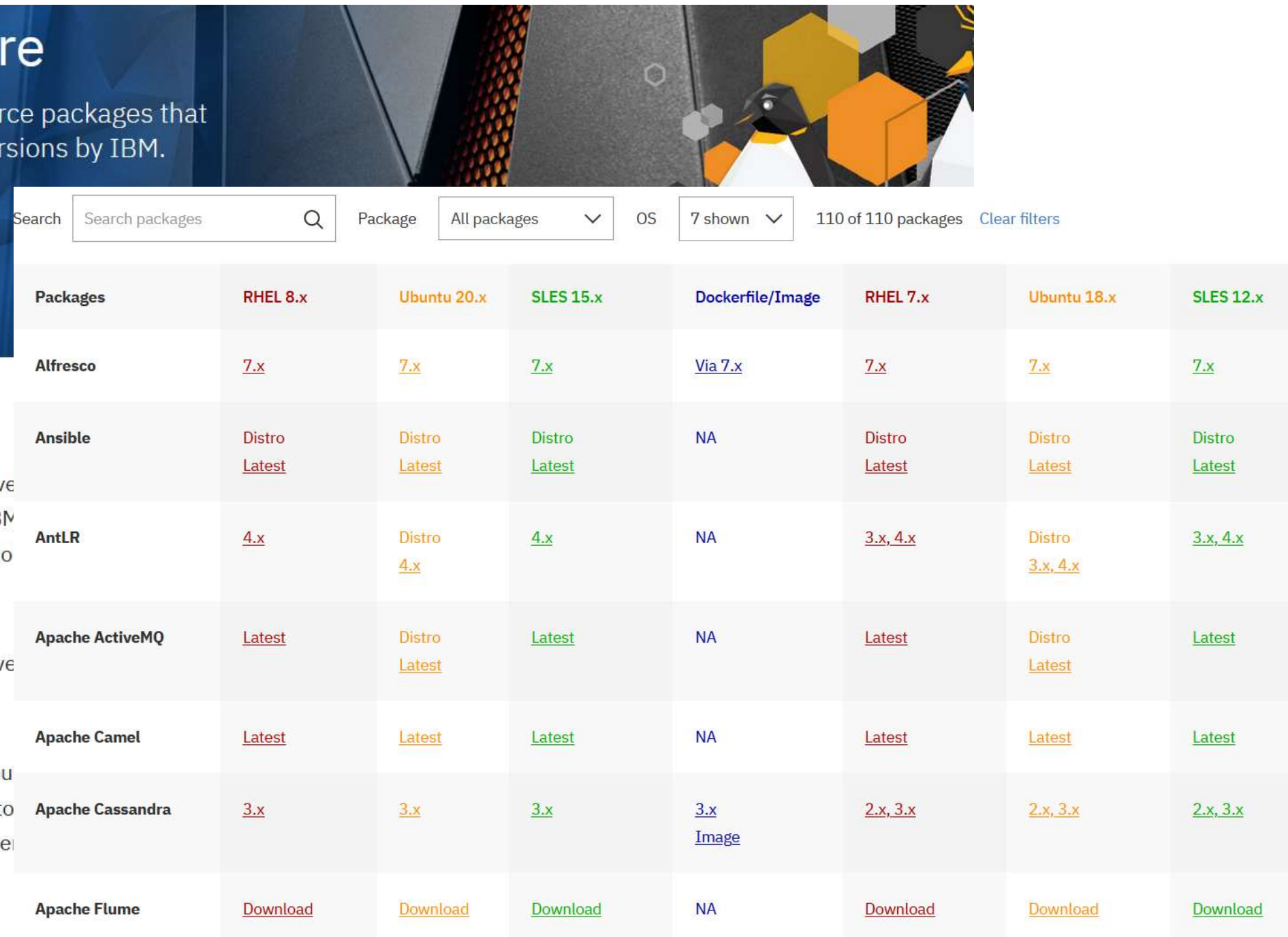
# Open-source containerized Software for Linux on IBM zSystems & IBM LinuxONE

<https://www.ibm.com/community/z/open-source-software/>

## Validated Open Source Software

The table below provides up-to-date information on open source packages that have been ported and/or validated on corresponding distro versions by IBM.

Log in or Sign up



The screenshot shows a web interface for "Validated Open Source Software". It includes a search bar, a dropdown for "Package" (set to "All packages"), and a dropdown for "OS" (set to "7 shown"). Below the search bar is a table with 8 columns: Packages, RHEL 8.x, Ubuntu 20.x, SLES 15.x, Dockerfile/Image, RHEL 7.x, Ubuntu 18.x, and SLES 12.x. The table lists several packages including Alfresco, Ansible, AntLR, Apache ActiveMQ, Apache Camel, Apache Cassandra, and Apache Flume. Each cell in the table contains either a version number, a link to a distro version, or "NA".

Packages	RHEL 8.x	Ubuntu 20.x	SLES 15.x	Dockerfile/Image	RHEL 7.x	Ubuntu 18.x	SLES 12.x
Alfresco	<a href="#">7.x</a>	<a href="#">7.x</a>	<a href="#">7.x</a>	<a href="#">Via 7.x</a>	<a href="#">7.x</a>	<a href="#">7.x</a>	<a href="#">7.x</a>
Ansible	<a href="#">Distro Latest</a>	<a href="#">Distro Latest</a>	<a href="#">Distro Latest</a>	NA	<a href="#">Distro Latest</a>	<a href="#">Distro Latest</a>	<a href="#">Distro Latest</a>
AntLR	<a href="#">4.x</a>	<a href="#">Distro 4.x</a>	<a href="#">4.x</a>	NA	<a href="#">3.x, 4.x</a>	<a href="#">Distro 3.x, 4.x</a>	<a href="#">3.x, 4.x</a>
Apache ActiveMQ	<a href="#">Latest</a>	<a href="#">Distro Latest</a>	<a href="#">Latest</a>	NA	<a href="#">Latest</a>	<a href="#">Distro Latest</a>	<a href="#">Latest</a>
Apache Camel	<a href="#">Latest</a>	<a href="#">Latest</a>	<a href="#">Latest</a>	NA	<a href="#">Latest</a>	<a href="#">Latest</a>	<a href="#">Latest</a>
Apache Cassandra	<a href="#">3.x</a>	<a href="#">3.x</a>	<a href="#">3.x</a>	<a href="#">3.x Image</a>	<a href="#">2.x, 3.x</a>	<a href="#">2.x, 3.x</a>	<a href="#">2.x, 3.x</a>
Apache Flume	<a href="#">Download</a>	<a href="#">Download</a>	<a href="#">Download</a>	NA	<a href="#">Download</a>	<a href="#">Download</a>	<a href="#">Download</a>

### What is in the table?

The table provides up-to-date information on open source packages that have links to packaged binaries and/or document for building them on Linux on IBM packages. Binaries/Docker images once made available by community, are no

### How up-to-date is it?

As we continue to port/test new packages, this table will be updated whenever

### What if a package I'm interested in is not in the table?

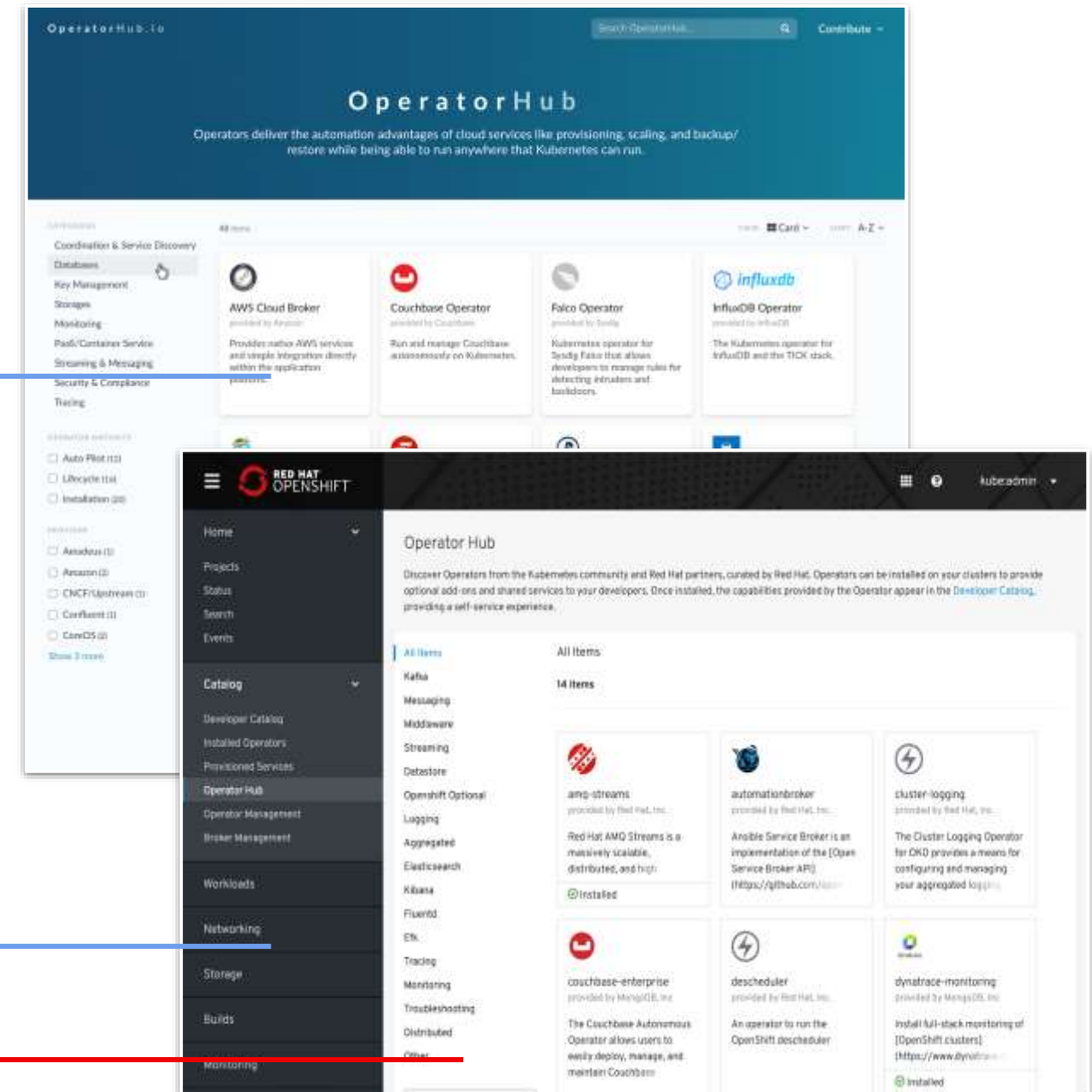
Please submit request via email or [in our group](#). We will prioritize based on but them work out of box, especially those written in languages that don't need to not in this table doesn't necessarily mean it doesn't work on the platform, the

# OperatorHub and certified Operators -> **NEW** certification process

An Operator is a method of packaging, deploying and managing a Kubernetes-native / RHOCP application.

- [OperatorHub.io](https://operatorhub.io) launched by Red Hat, AWS, Microsoft, and Google as operator registry
- OpenShift Operator Certification for RHOCP
- OperatorHub integrated into RHOCP

- **New certification process:**
  - <https://connect.redhat.com/en/partner-with-us/red-hat-openshift-certification>
  - <https://github.com/redhat-openshift-ecosystem/openshift-preflight>

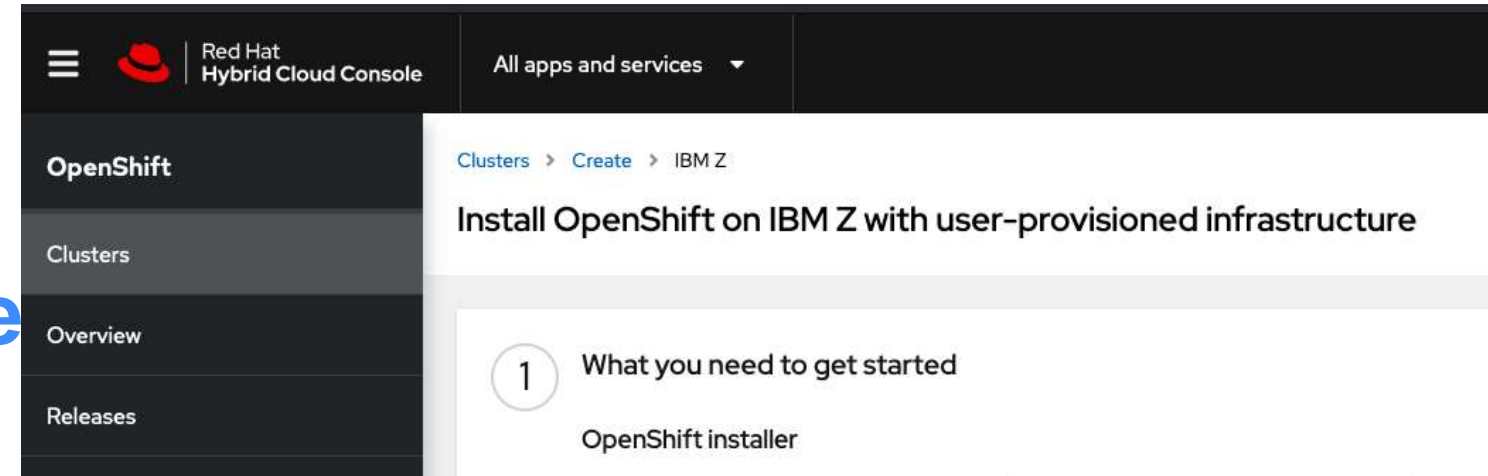


COMMUNITY OPERATORS

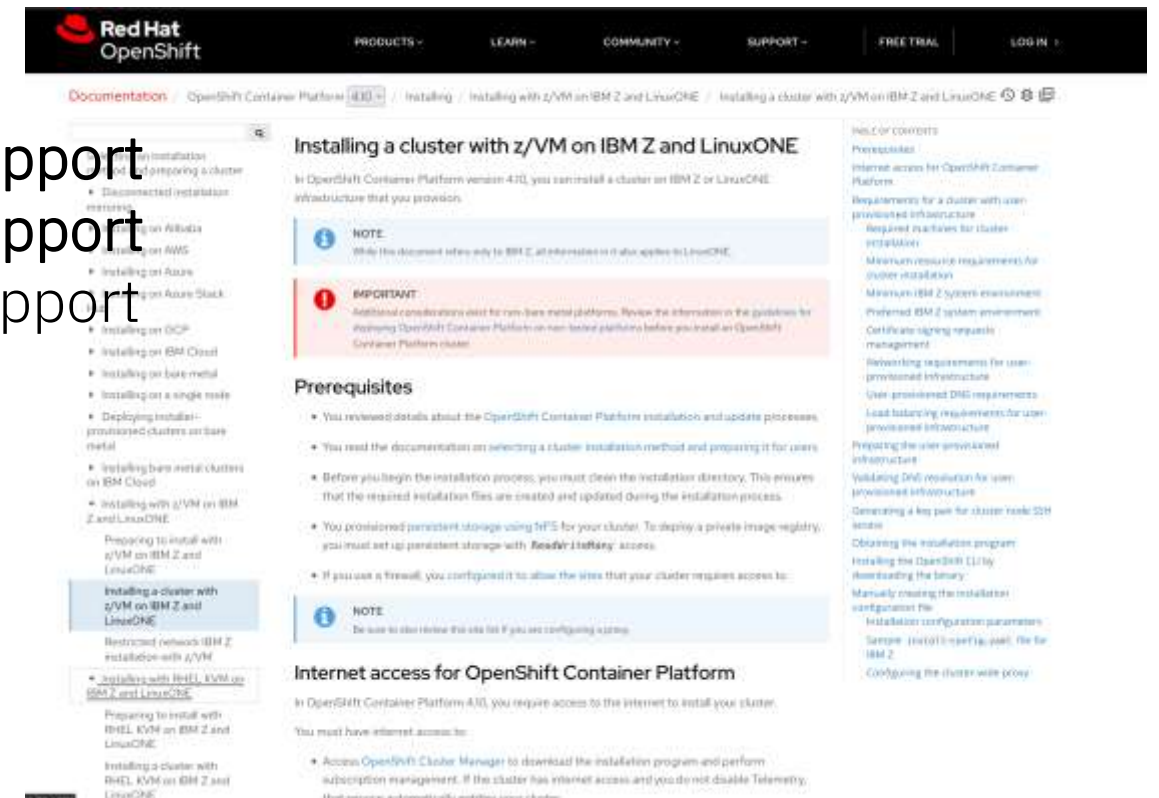
OPENSIFT CERTIFIED OPERATORS

# Where can you download RHOCP?

try.openshift.com  
console.redhat.com/openshift/create



RHOCP 4.10	on Z was released on 03/10/22 – Full Support
RHOCP 4.9	on Z was released on 10/18/21 – Full Support
RHOCP 4.8	on Z was released on 07/27/21 – Maintenance Support
RHOCP 4.7	on Z was released on 02/24/21 – Maintenance Support
RHOCP 4.6 EUS	on Z was released on 10/27/20 – Maintenance Support

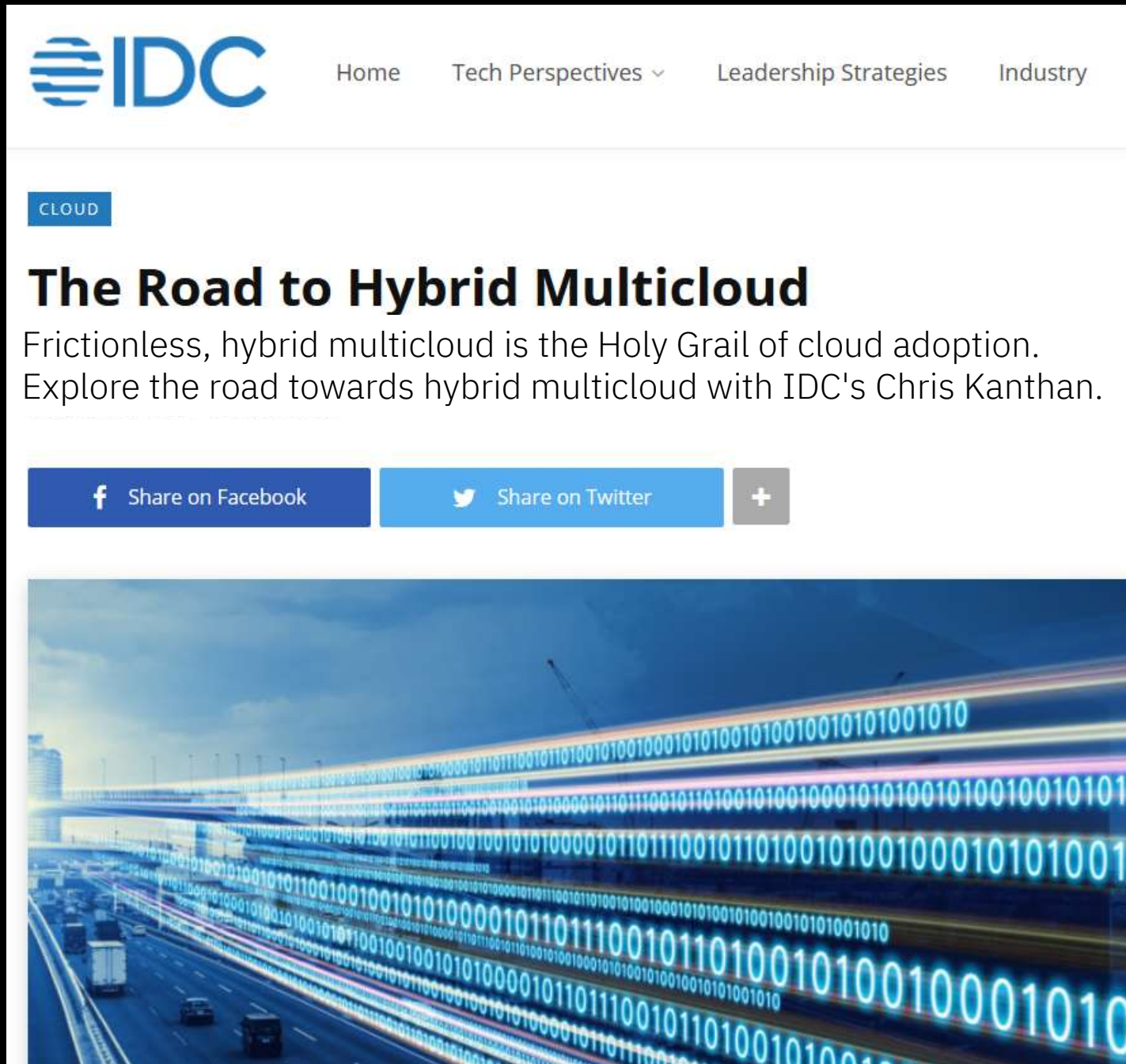


[https://docs.openshift.com/container-platform/latest/installing/installing\\_ibm\\_z/installing-ibm-z.html](https://docs.openshift.com/container-platform/latest/installing/installing_ibm_z/installing-ibm-z.html)  
[https://docs.openshift.com/container-platform/4.10/release\\_notes/ocp-4-10-release-notes.html](https://docs.openshift.com/container-platform/4.10/release_notes/ocp-4-10-release-notes.html)

# Useful links for Linux and RH OpenShift on IBM Z & LinuxONE

- **Technical Linux on zSystems customer webinars:** <http://ibm.biz/LinuxonZandLinuxONEwebcasts>
- **[IBM Knowledge Center](#) for Linux on Z and LinuxONE**
- [Blog: Linux and Mainframe](#)
- [News and tips for running Linux on IBM Z and LinuxONE](#)
- [OpenShift on IBM Z](#)
- **The Reference Architecture:** <https://lnkd.in/dpdpz8V>
- The Reference Architecture for [IBM Spectrum Scale Container Native Storage Access \(CNSA\)](#)
- The Reference Architecture for [Red Hat OpenShift Data Foundation](#)
- Blog: <https://www.openshift.com/blog/installing-ocp-in-a-mainframe-z-series>
- **[Virtualization on IBM Z & LinuxONE](#)**
- [z/VM resources](#)
- [KVM on Z](#) blog
- **[Containers on IBM Z](#)**
- **Trusted IBM Container Image Registry -Sign up now:** <https://ibm.biz/zregeap>
- IBM Z container blog: [Linux on Z and Containers](#)
- zCX, Containers in z/OS : <https://www.ibm.com/support/z-content-solutions/container-extensions/>

# IDC - The Road to Hybrid Multicloud



The screenshot shows the top portion of a web page. At the top left is the IDC logo, followed by navigation links: Home, Tech Perspectives, Leadership Strategies, and Industry. Below the navigation is a blue bar with the word 'CLOUD' in white. The main heading is 'The Road to Hybrid Multicloud' in bold black text. Below the heading is a sub-headline: 'Frictionless, hybrid multicloud is the Holy Grail of cloud adoption. Explore the road towards hybrid multicloud with IDC's Chris Kanthan.' Underneath the sub-headline are three social sharing buttons: 'Share on Facebook', 'Share on Twitter', and a plus sign for more options. At the bottom of the screenshot is a large image showing a highway with cars, overlaid with glowing blue binary code (0s and 1s) that appears to be flowing across the road.

Cloud adoption is not a destination. It is a journey with tremendous rewards for those who are willing to face daunting challenges on [this path of digital transformation](#).

The **Holy Grail** in cloud computing is a **frictionless, hybrid multicloud** that provides consistent experience and unified management across multiple public clouds, private clouds, and even traditional infrastructure.

While such an idealistic state may never be attainable, enterprises need to continuously move towards this goal in small but deliberate steps. The infographic in this blog post presents a roadmap for the hybrid cloud journey, which involves three phases – single cloud, multiple clouds, and hybrid multicloud.

<https://blogs.idc.com/2020/08/21/the-road-to-hybrid-multicloud/>



# Take the next step

Learn more about **Red Hat OpenShift** on IBM Z and LinuxONE

- Watch the video, [What is OpenShift?](#)
- Read [blogs](#)
- Visit the [Red Hat OpenShift](#) website
- Check out the [Reference Architecture](#)
- Read the [OpenShift Container Platform release notes](#)
- Contact the [IBM Acceleration Team](#)

Learn more about **IBM Cloud Pak** solutions and the **IBM z/OS Cloud Broker**

- Visit the [IBM Cloud Pak Solutions website](#)
- Watch the video, [IBM Cloud Paks Explained](#)
- Download the [IBM Cloud Paks white paper](#)
- Visit the [IBM z/OS Cloud Broker website](#)



# Questions?





*IBM Deutschland Research  
& Development GmbH  
Schönaicher Strasse 220  
71032 Böblingen, Germany*

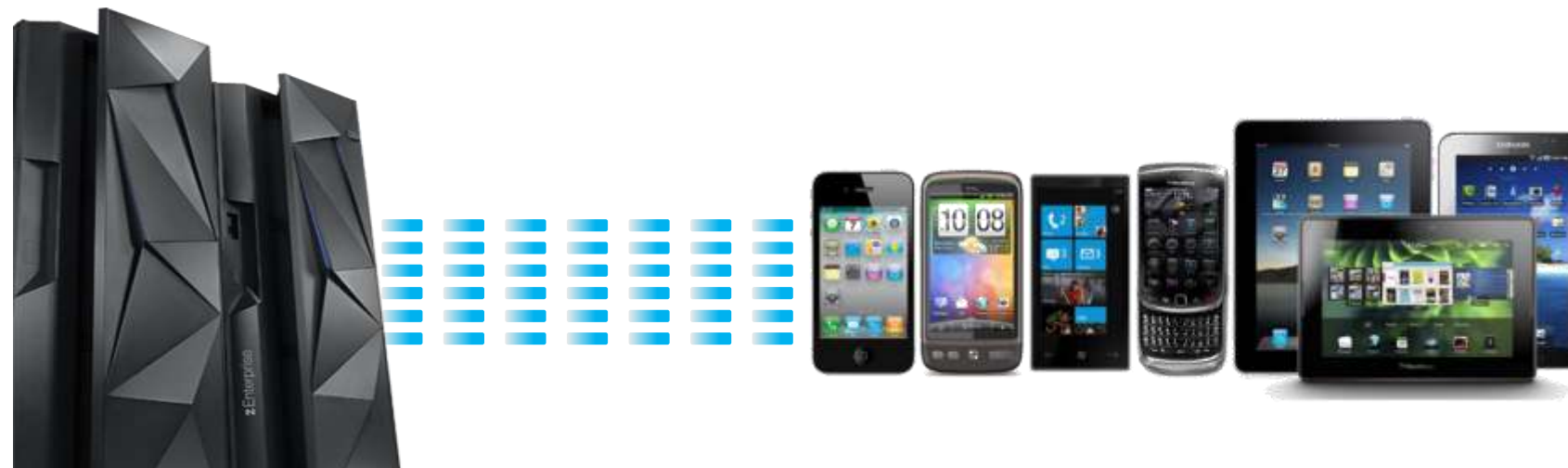
*Office: +49 (0)7031-16-3796  
wilhelm.mild@de.ibm.com*

**Wilhelm Mild**  
*IBM Executive IT Architect*



IT Architecture  
Chief/Lead IT Architect

Distinguished Architect



# Trademarks

The following are trademarks of the International Business Machines Corporation in the United States and/or other countries.

BLU Acceleration*	IBM Z*	MQ*	WebSphere*	Z14	z/VM*
CICS*	InfoSphere	Spectrum Scale	XIV*	z/OS*	z/VSE*
Db2*	LinuxONE	Storwize*	z13*	z Systems*	
IBM*	Maximo*	System Storage*	z13s*		
IBM (logo)*	MobileFirst	Tivoli*			

\* Registered trademarks of IBM Corporation

Adobe, the Adobe logo, PostScript, and the PostScript logo are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States, and/or other countries.

IT Infrastructure Library is a Registered Trade Mark of AXELOS Limited.

ITIL is a Registered Trade Mark of AXELOS Limited.

Linear Tape-Open, LTO, the LTO Logo, Ultrium, and the Ultrium logo are trademarks of HP, IBM Corp. and Quantum in the U.S. and other countries.

Intel, Intel logo, Intel Inside, Intel Inside logo, Intel Centrino, Intel Centrino logo, Celeron, Intel Xeon, Intel SpeedStep, Itanium, and Pentium are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

Linux is a registered trademark of Linus Torvalds in the United States, other countries, or both.

Microsoft, Windows, Windows NT, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.

Java and all Java-based trademarks and logos are trademarks or registered trademarks of Oracle and/or its affiliates.

Cell Broadband Engine is a trademark of Sony Computer Entertainment, Inc. in the United States, other countries, or both and is used under license therefrom.

UNIX is a registered trademark of The Open Group in the United States and other countries.

VMware, the VMware logo, VMware Cloud Foundation, VMware Cloud Foundation Service, VMware vCenter Server, and VMware vSphere are registered trademarks or trademarks of VMware, Inc. or its subsidiaries in the United States and/or other jurisdictions.

Other product and service names might be trademarks of IBM or other companies.

## Notes:

Performance is in Internal Throughput Rate (ITR) ratio based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput that any user will experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput improvements equivalent to the performance ratios stated here.

IBM hardware products are manufactured from new parts, or new and serviceable used parts. Regardless, our warranty terms apply.

All customer examples cited or described in this presentation are presented as illustrations of the manner in which some customers have used IBM products and the results they may have achieved. Actual environmental costs and performance characteristics will vary depending on individual customer configurations and conditions.

This publication was produced in the United States. IBM may not offer the products, services or features discussed in this document in other countries, and the information may be subject to change without notice. Consult your local IBM business contact for information on the product or services available in your area.

All statements regarding IBM's future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

Information about non-IBM products is obtained from the manufacturers of those products or their published announcements. IBM has not tested those products and cannot confirm the performance, compatibility, or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

Prices subject to change without notice. Contact your IBM representative or Business Partner for the most current pricing in your geography.

This information provides only general descriptions of the types and portions of workloads that are eligible for execution on Specialty Engines (e.g, zIIPs, zAAPs, and IFLs) ("SEs"). IBM authorizes customers to use IBM SE only to execute the processing of Eligible Workloads of specific Programs expressly authorized by IBM as specified in the "Authorized Use Table for IBM Machines" provided at [www.ibm.com/systems/support/machine\\_warranties/machine\\_code/aut.html](http://www.ibm.com/systems/support/machine_warranties/machine_code/aut.html) ("AUT"). No other workload processing is authorized for execution on an SE. IBM offers SE at a lower price than General Processors/Central Processors because customers are authorized to use SEs only to process certain types and/or amounts of workloads as specified by IBM in the AUT.

# Notices and disclaimers

- © 2019 International Business Machines Corporation. No part of this document may be reproduced or transmitted in any form without written permission from IBM.
- **U.S. Government Users Restricted Rights – use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM.**
- Information in these presentations (including information relating to products that have not yet been announced by IBM) has been reviewed for accuracy as of the date of initial publication and could include unintentional technical or typographical errors. IBM shall have no responsibility to update this information. **This document is distributed “as is” without any warranty, either express or implied. In no event, shall IBM be liable for any damage arising from the use of this information, including but not limited to, loss of data, business interruption, loss of profit or loss of opportunity.** IBM products and services are warranted per the terms and conditions of the agreements under which they are provided.
- IBM products are manufactured from new parts or new and used parts. In some cases, a product may not be new and may have been previously installed. Regardless, our warranty terms apply.”
- **Any statements regarding IBM's future direction, intent or product plans are subject to change or withdrawal without notice.**
- Performance data contained herein was generally obtained in a controlled, isolated environments. Customer examples are presented as illustrations of how those
- customers have used IBM products and the results they may have achieved. Actual performance, cost, savings or other results in other operating environments may vary.
- References in this document to IBM products, programs, or services does not imply that IBM intends to make such products, programs or services available in all countries in which IBM operates or does business.
- Workshops, sessions and associated materials may have been prepared by independent session speakers, and do not necessarily reflect the views of IBM. All materials and discussions are provided for informational purposes only, and are neither intended to, nor shall constitute legal or other guidance or advice to any individual participant or their specific situation.
- It is the customer’s responsibility to insure its own compliance with legal requirements and to obtain advice of competent legal counsel as to the identification and interpretation of any relevant laws and regulatory requirements that may affect the customer’s business and any actions the customer may need to take to comply with such laws. IBM does not provide legal advice or represent or warrant that its services or products will ensure that the customer follows any law.

# Notices and disclaimers continued

- Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products about this publication and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products. IBM does not warrant the quality of any third-party products, or the ability of any such third-party products to interoperate with IBM's products. **IBM expressly disclaims all warranties, expressed or implied, including but not limited to, the implied warranties of merchantability and fitness for a purpose.**
- The provision of the information contained herein is not intended to, and does not, grant any right or license under any IBM patents, copyrights, trademarks or other intellectual property right.
- IBM, the IBM logo, ibm.com and [names of other referenced IBM products and services used in the presentation] are trademarks of International Business Machines Corporation, registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the Web at "Copyright and trademark information" at: [www.ibm.com/legal/copytrade.shtml](http://www.ibm.com/legal/copytrade.shtml)