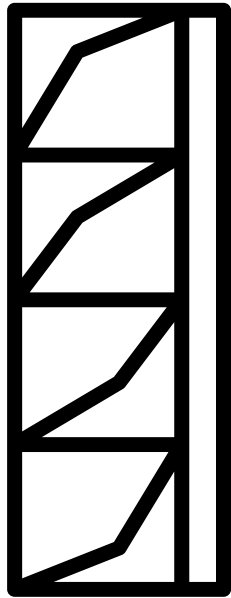


Where to deploy container workload in RH OpenShift on zSystems or in z/OS zCX

Wilhelm Mild
IBM Executive IT Architect
IBM R & D Lab Germany
wilhelm.mild@de.ibm.com



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

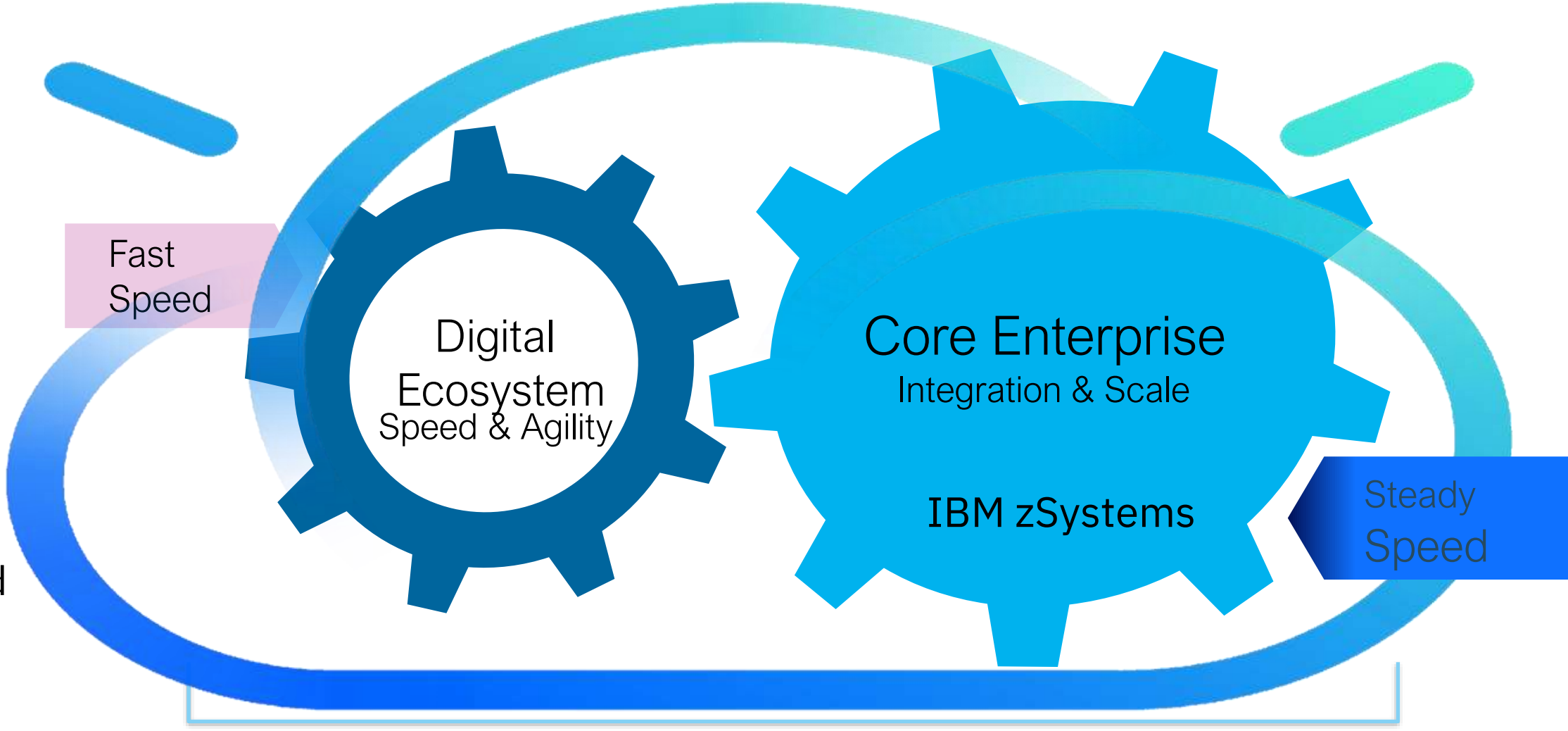


- **Modernize existing applications**, build Microservices and Containers
- **Integrate** traditional applications **with Cloud services** (private or public)
- **Enable a cloud-based delivery model**
- **Develop once** for all platforms
- **Deploy and Run** apps where they fit best
- **Enable auto scalability** 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

“I need my cloud in my data center!”

Hybrid IT services, hybrid Cloud – with self service DevSecOps and CI/CD

- Flexibility**
with Microservices
- Efficiency**
with Containers
- Lifecycle**
increase speed
- DevSecOps**
integration end-2-end
- CI/CD**
Faster deployments



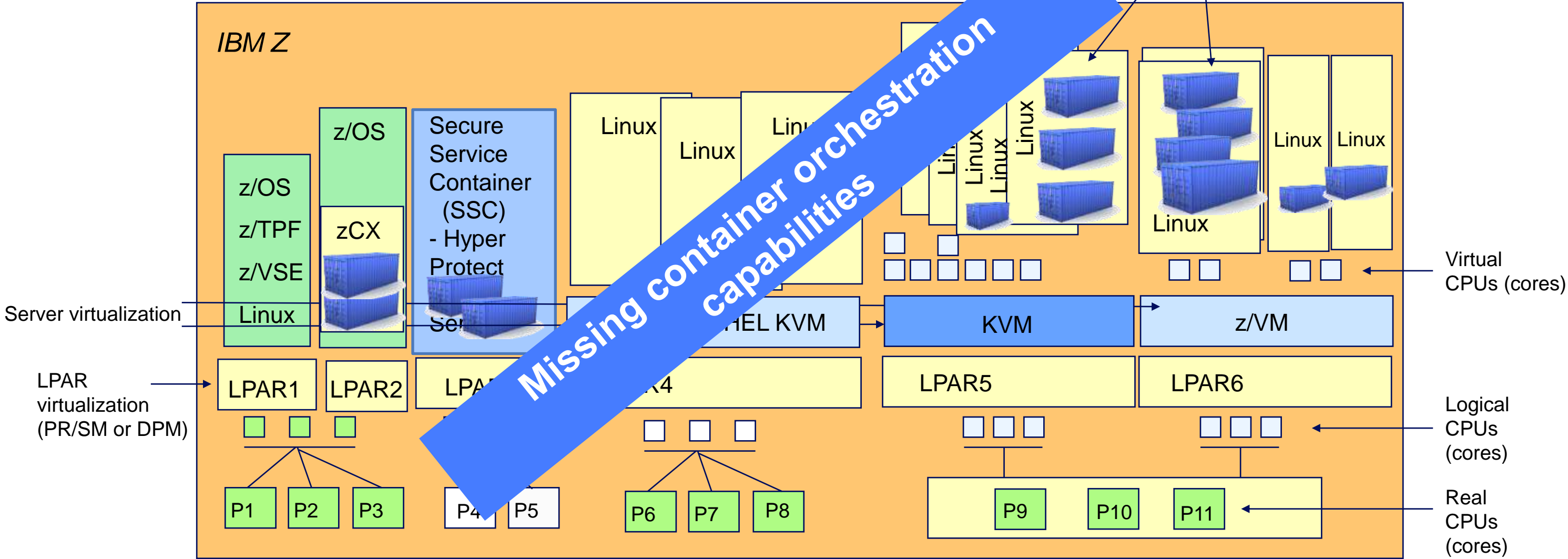
Hybrid service orchestration and traditional transactional & data services orchestrator

The cloud service model with end-to-end orchestration capabilities

IBM zSystems 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.

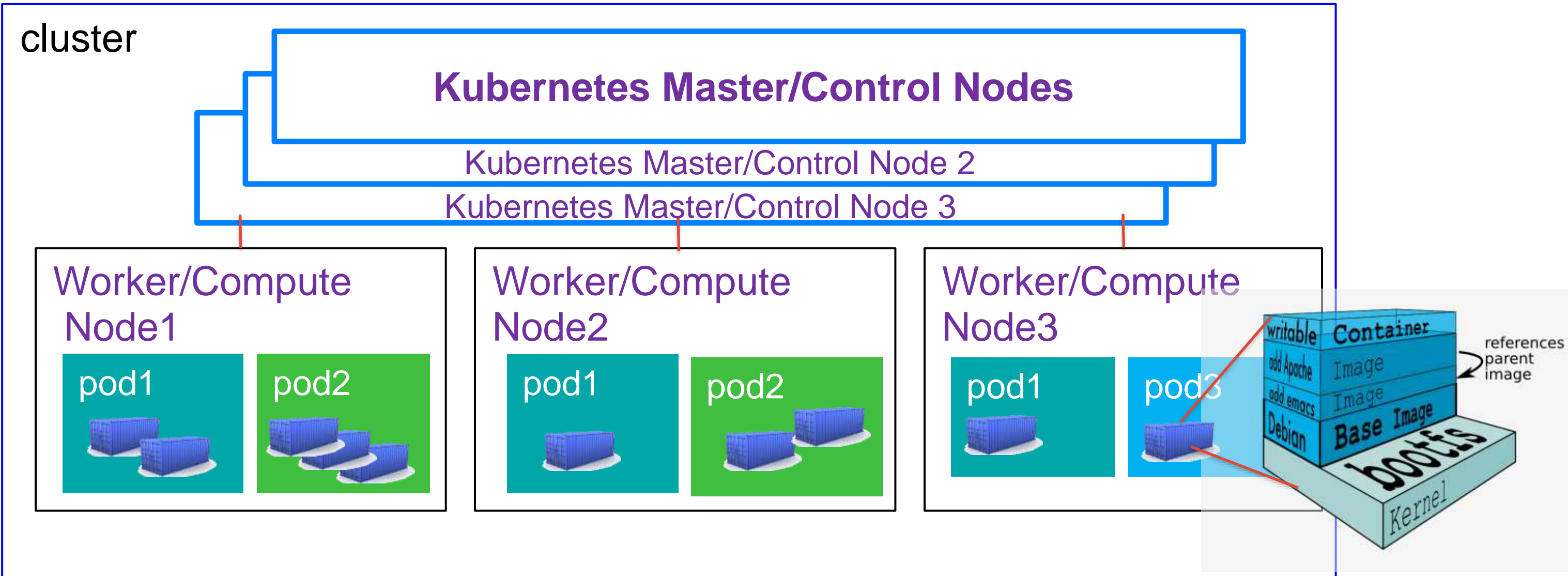
Application isolation. There are typically thousands of Containers in Linux on IBM Z.



P1 – P11 are General Purpose Processor Units (GPU -> core) or Integrated Facility for Linux (IFL) Processors (IFL -> core)
 Note: - LPARs can be managed by traditional PR/SM in IBM Z and additional with Dynamic Partition Manager (DPM) in LinuxONE

Kubernetes (K8S) – container orchestration

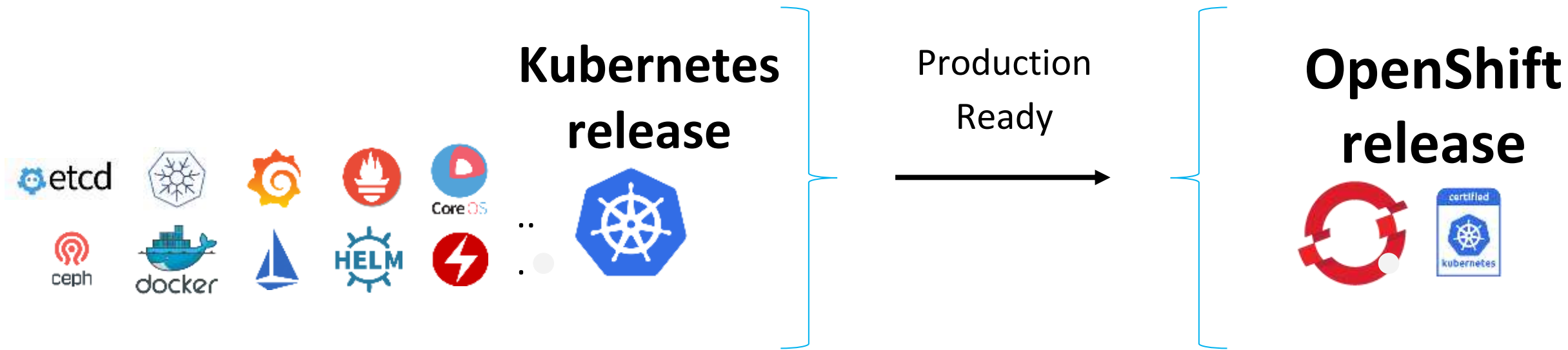
- defines itself in a cluster format for HA per design



Kubernetes is not running container – it orchestrates them

Kubernetes is THE container Orchestration tool

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

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 Clusters on different Architectures with RHACM

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

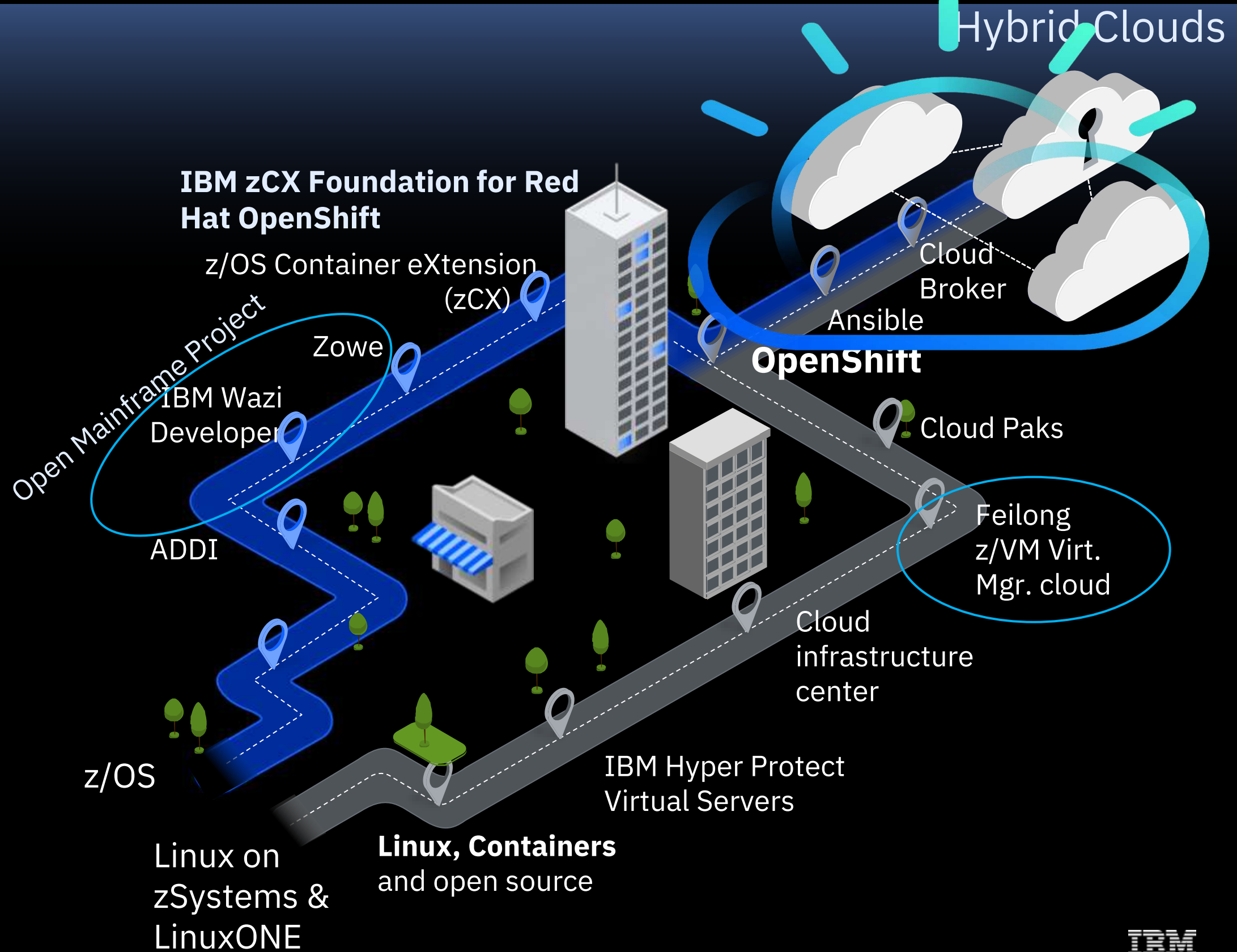
IBM Development Roadmap to hybrid clouds

Innovate with agility

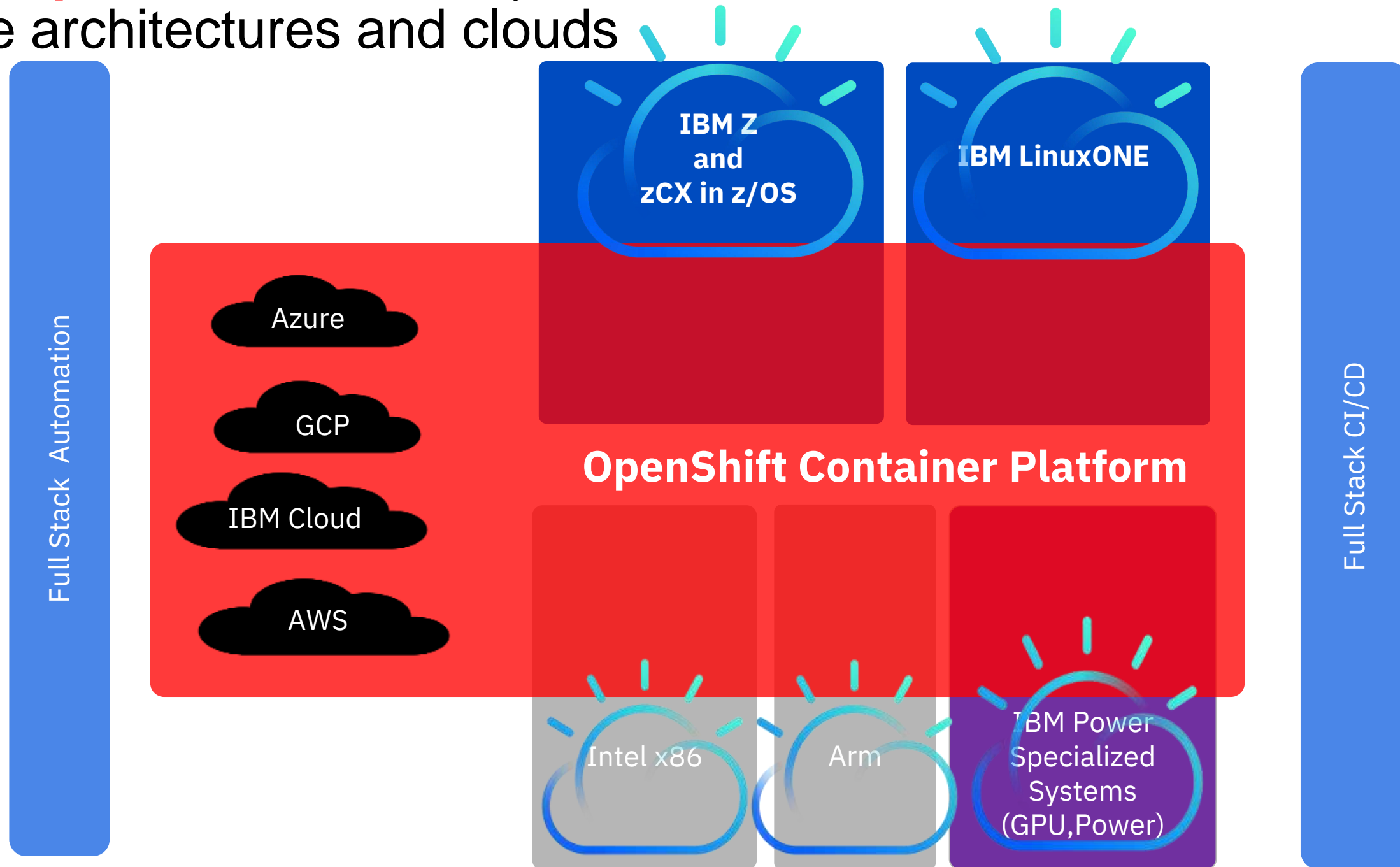
Create better experiences

Fuel business growth

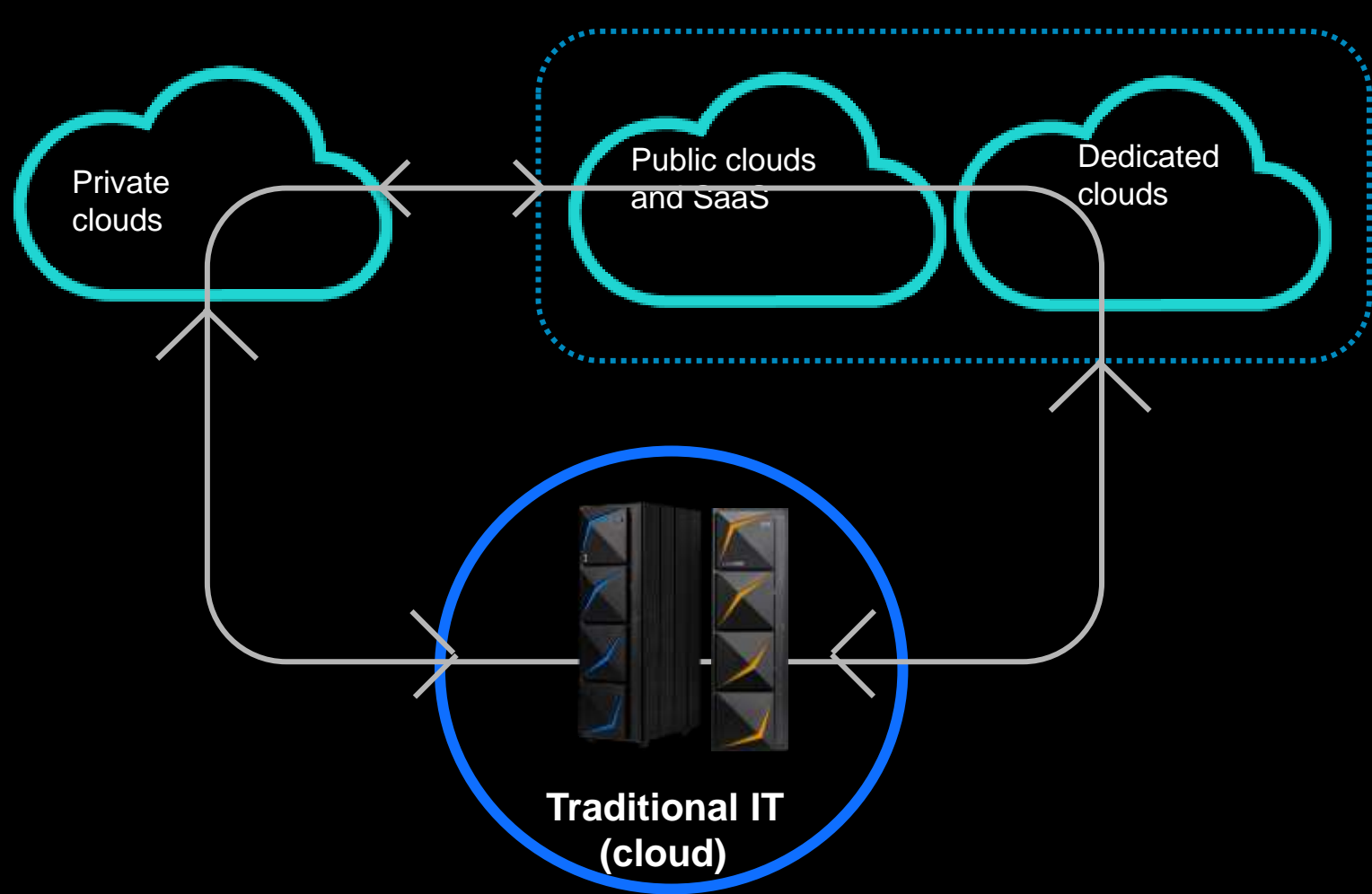
Build competitive advantage



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



Hybrid and Multicloud are the new normal



A real-world look at multicloud

94% Share of enterprises using a mix of cloud models

67% Share of enterprises using more than one public cloud provider



Movement between clouds

73% priority concern



Connectivity between clouds

82% priority concern



Consistency of management

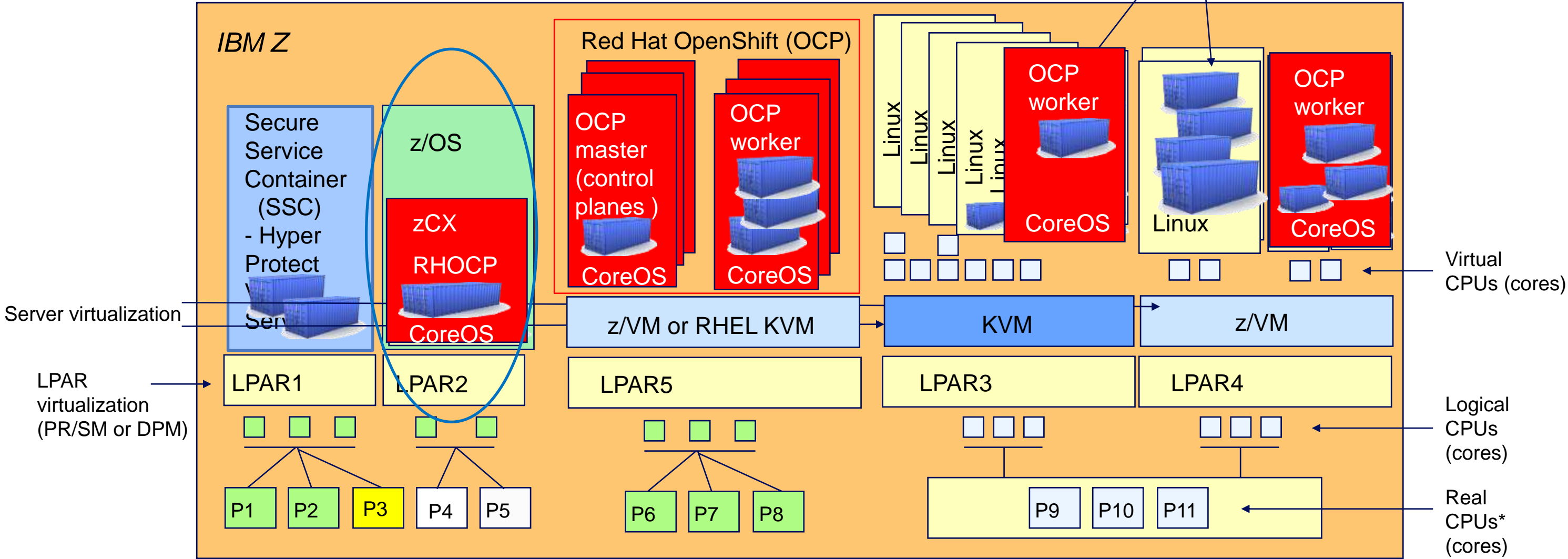
67% priority concern

IBM zSystems 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.

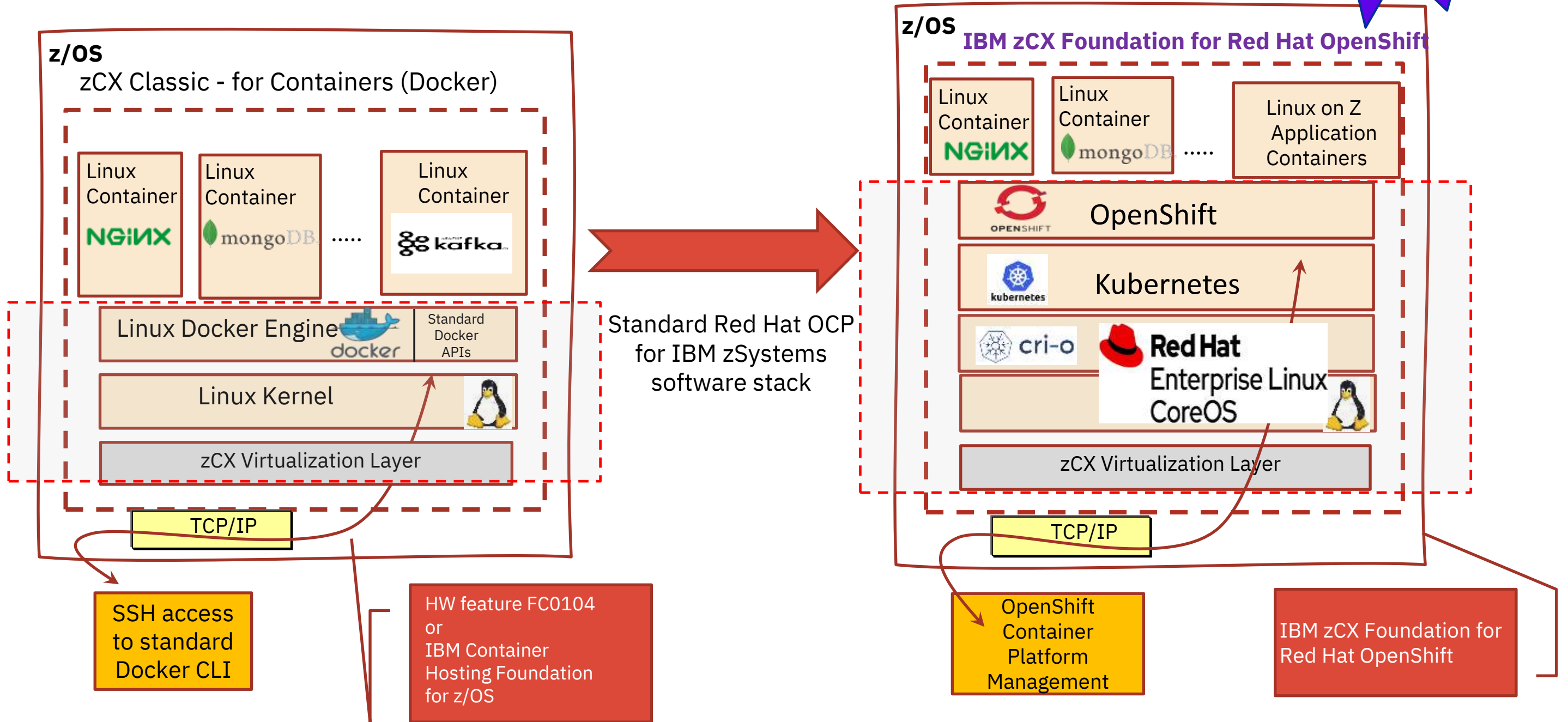
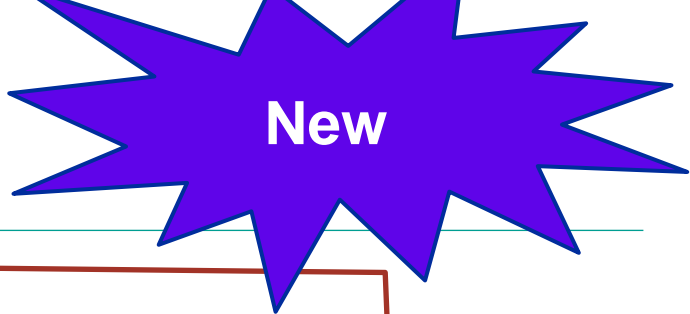


P1 – P11 are Central Processor Units (CPU -> core) or Integrated Facility for Linux (IFL) Processors (IFL -> core) or ZIIP cores in z/OS

* - 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



IBM zCX Foundation for Red Hat OpenShift environment

IBM pre-packaged OpenShift Environment

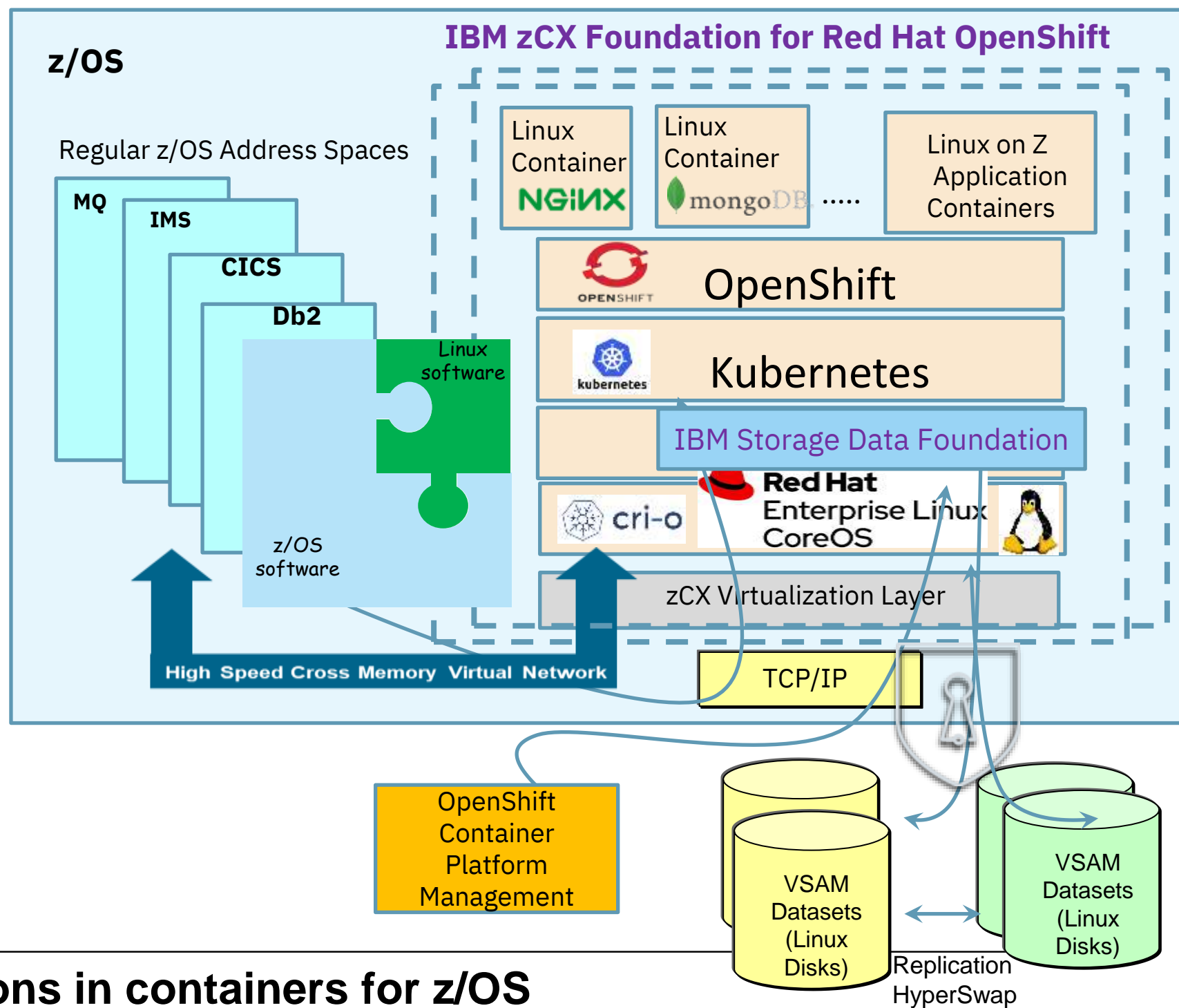
- Includes full stack OpenShift (CoreOS + K8S + Openshift components)
- Supported directly by IBM
- Can include clustering and registry capabilities
- Competitive price/performance (Exploits zIIPs)

Application developers

- can deploy software using OpenShift interface
- Any software available as a Container image (s390x) - continuously growing ecosystem
- Any home-grown Linux on zSystems container images
- Using open standard interfaces

Access to underlying environment via RHOCP APIs

- No root access
- Administrative tasks via RHOCP and z/OS
- Secure virtual network – SAMEHOST
- Requires packaging of software as Container images
- Same code for RH OpenShift in IBM zSystems
- WLM Mgmt – like any other z/OS Address Space

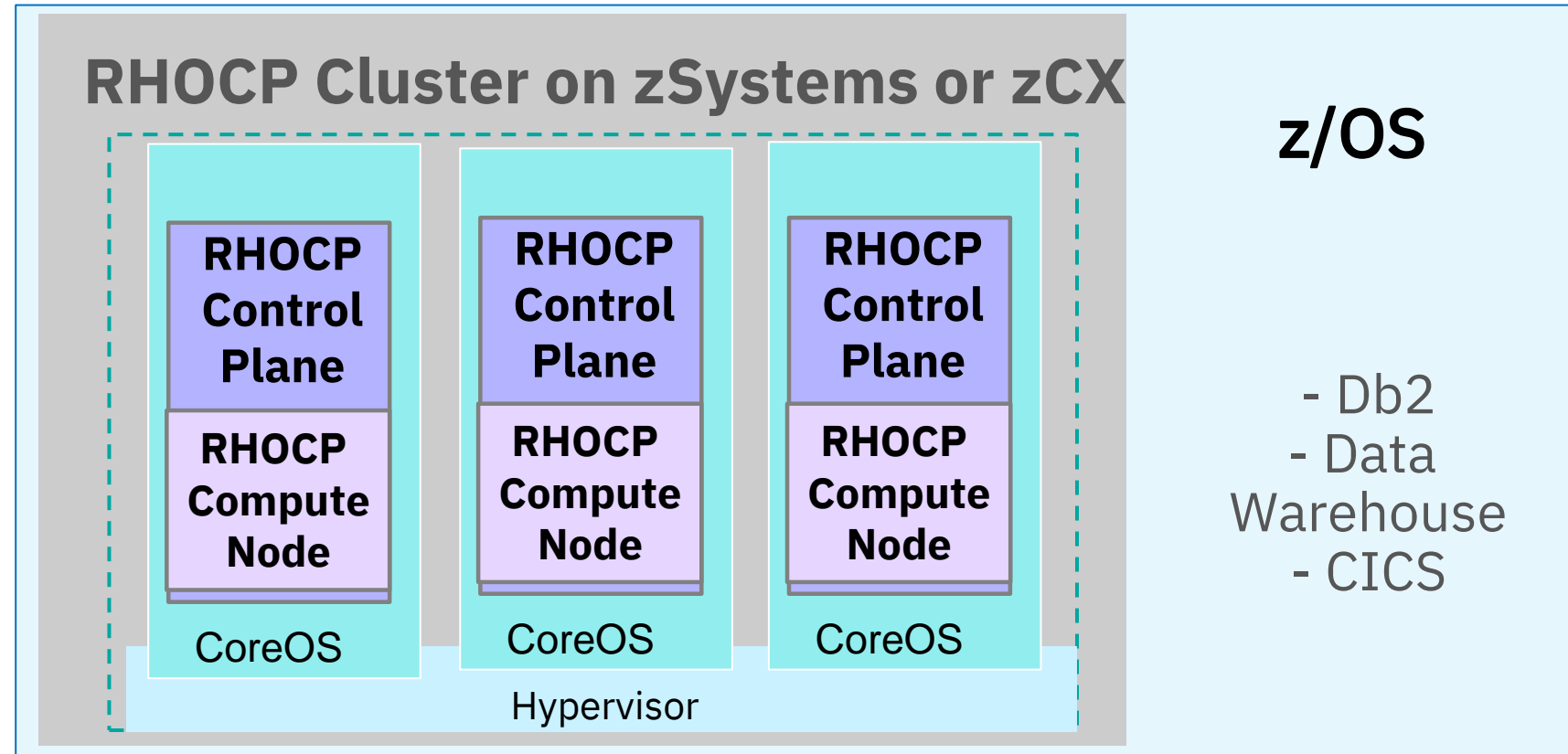


Provides various solution options in containers for z/OS

Minimum Installation Scenario of RHOCP on IBM zSystems or zCX

'Three Node' cluster from RHOCP 4.8

- converged Control Plane nodes and Compute Nodes

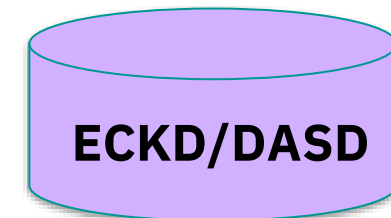
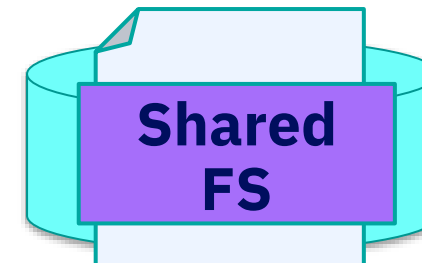
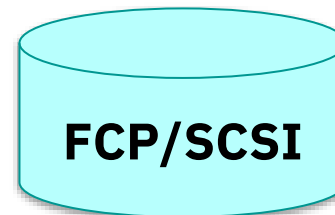


IBM zSystems

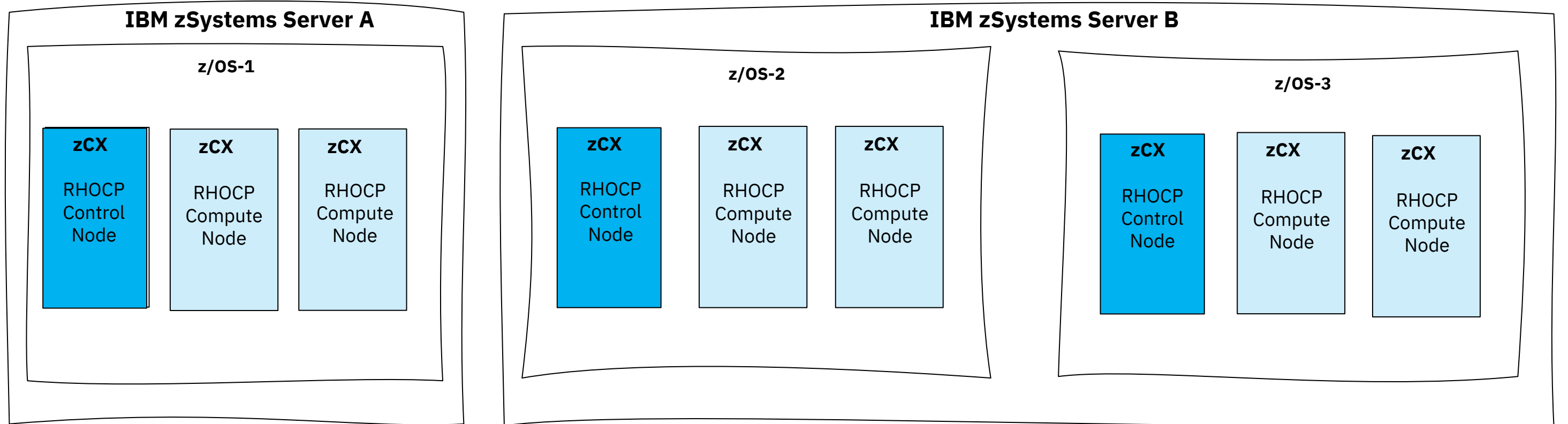
Cores (IFL/ZIIP)

Network (OSA, RoCE)

I/O (FCP/FICON)



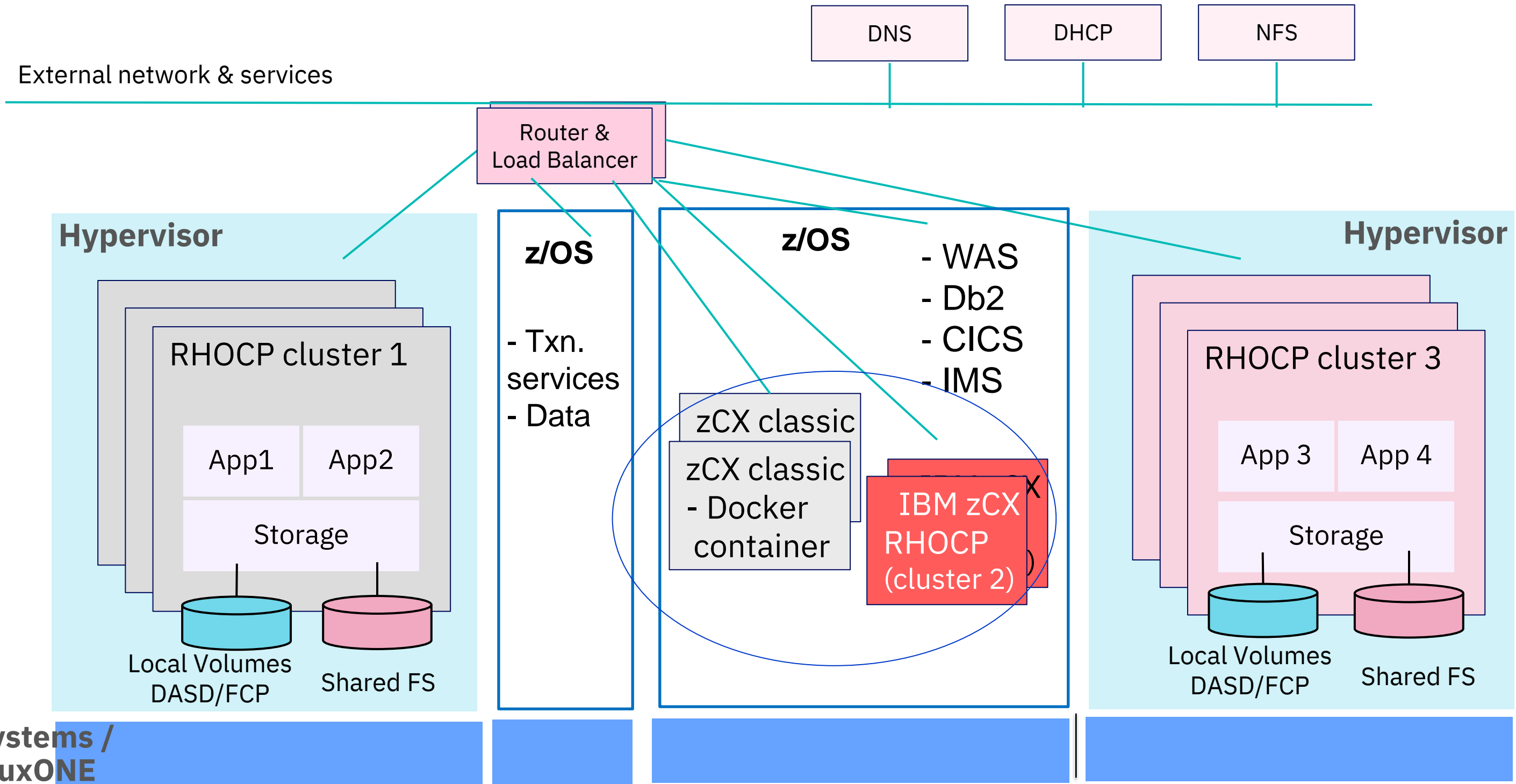
Red Hat OpenShift Cluster deployed as HA on z/OS in zCX



Best Practices for HA Configuration

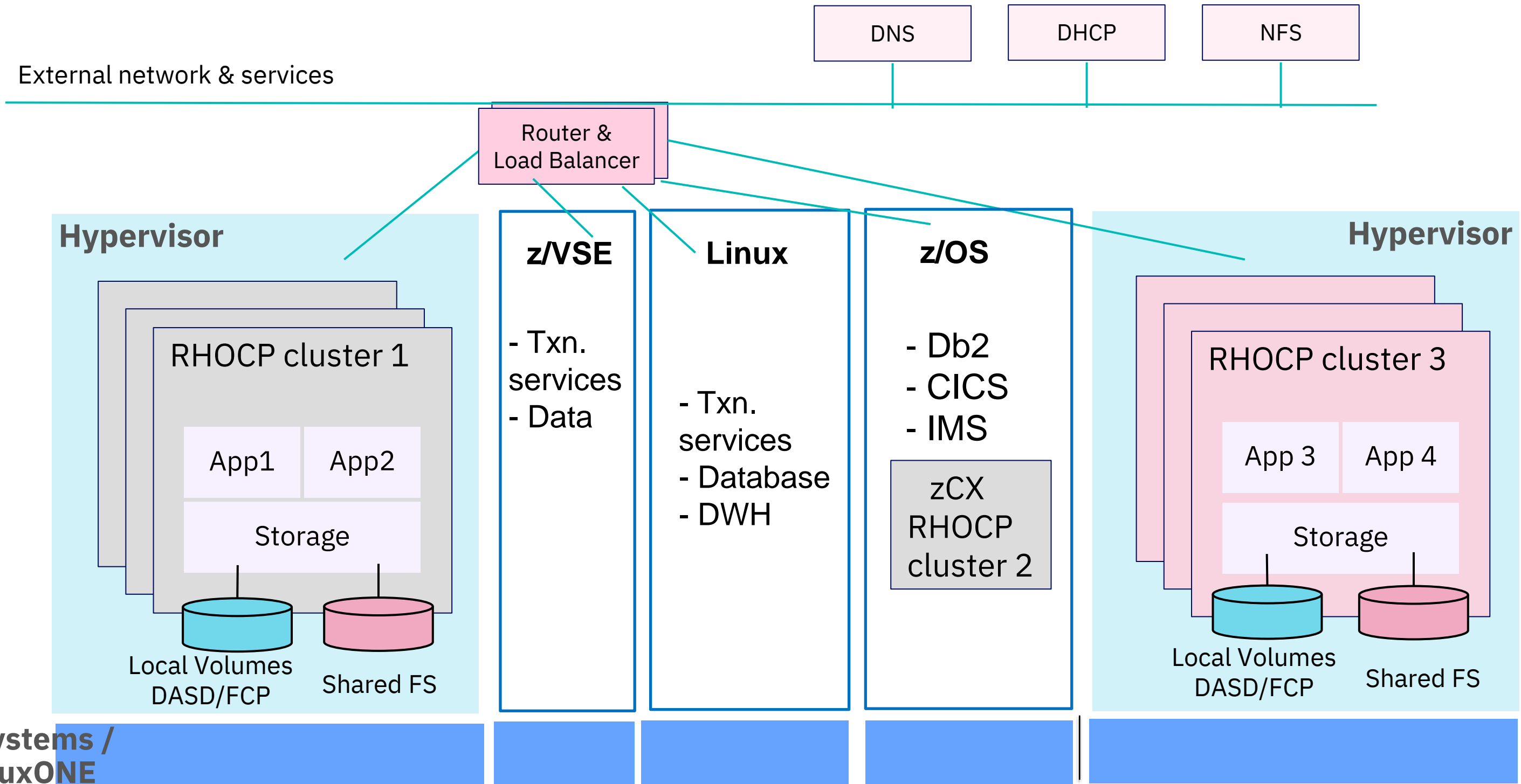
Why RHOCP on IBM zSystems – cause of operational capabilities for hybrid

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

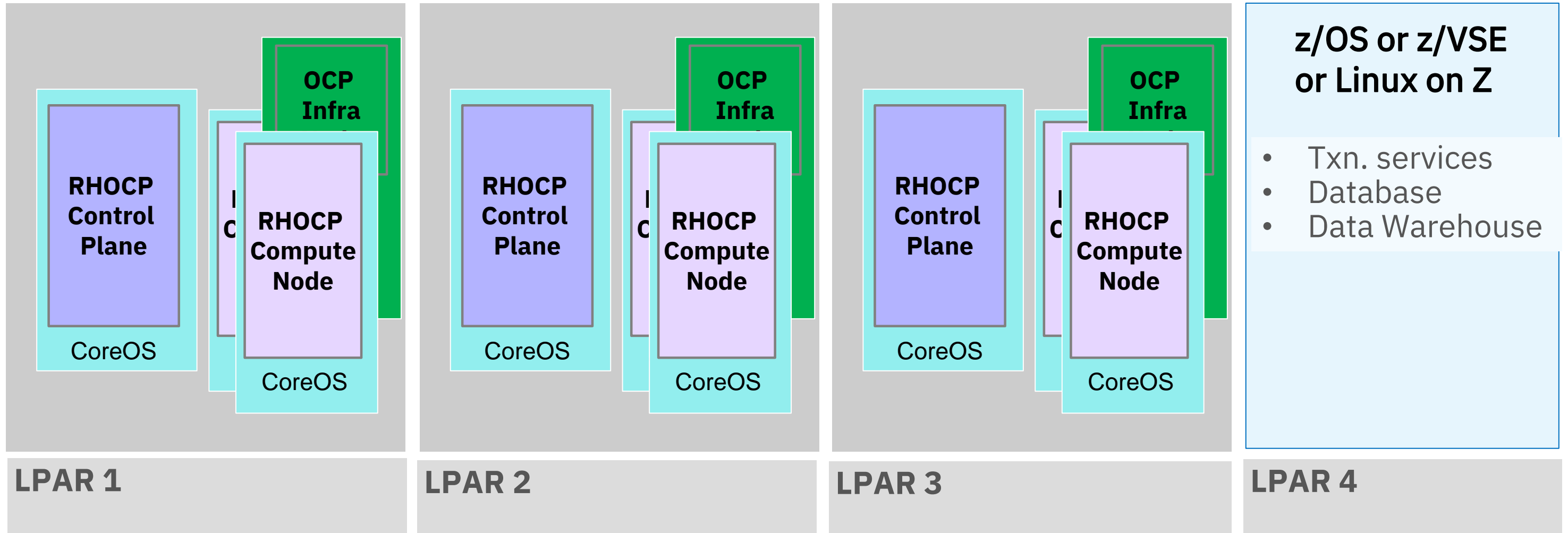


Why RHOCP on IBM zSystems – cause of operational capabilities for hybrid

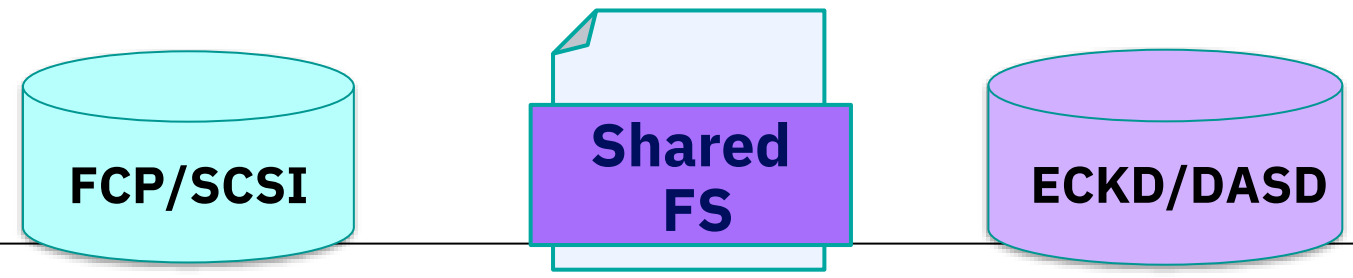
THE platform for Hybrid workload and multiple RHOCP environments on the same HW machine



RHOCP cluster production like Overview diagram



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



Hybrid Cloud solutions with IBM zSystems



5) Enterprise Observability with AI cloud integration



6) Verify Compliance on IBM zSystems



7) Make use of Cloud services in IBM Q

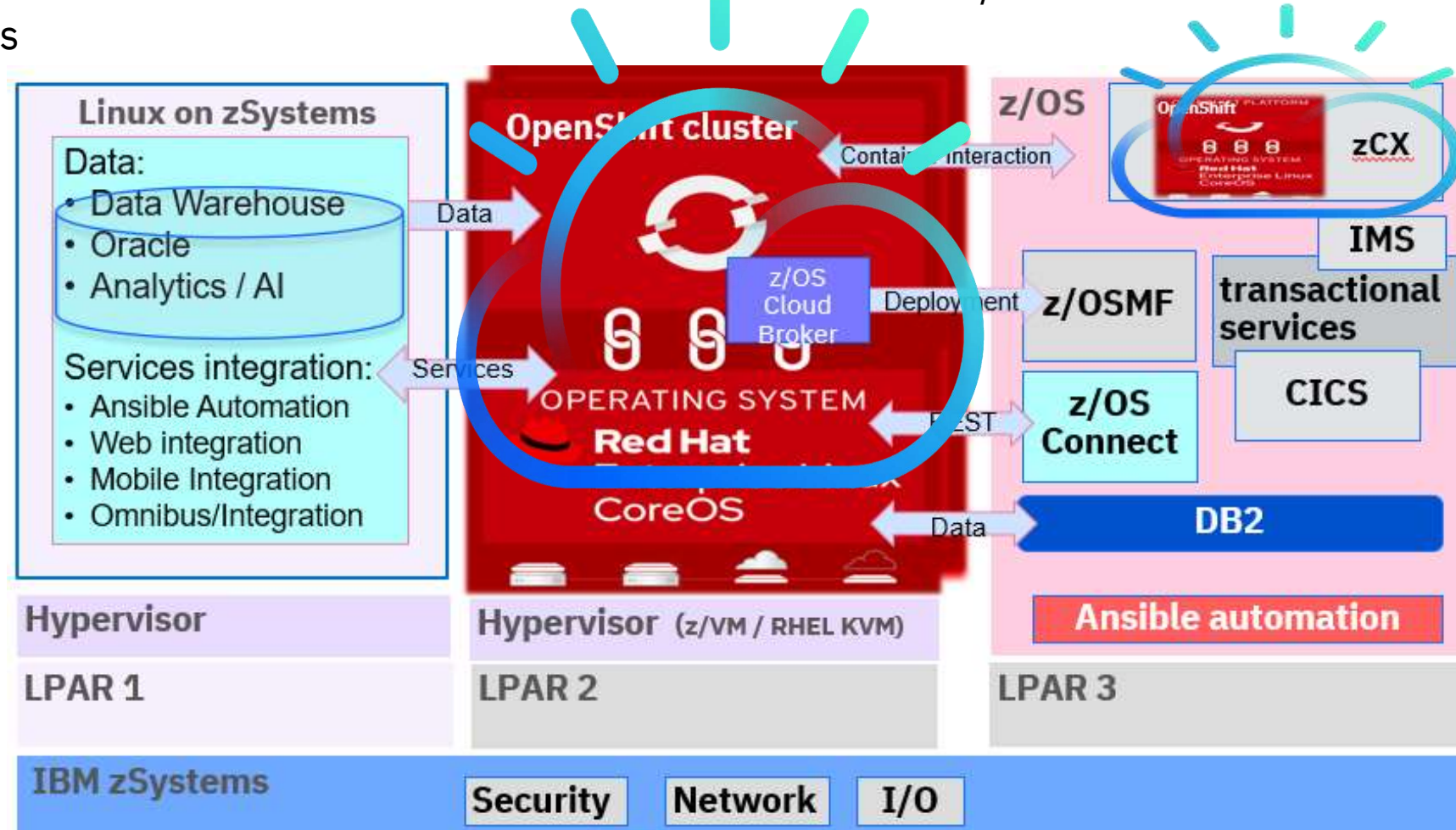


3) RHOCP Cloud extension of data, AI and services from core data and services to off-prem clouds (e.g. R/O data or accumulation of data from different areas for cleansing)

1) On-prem Cloud with integration capabilities to core IBM zSystems & AI

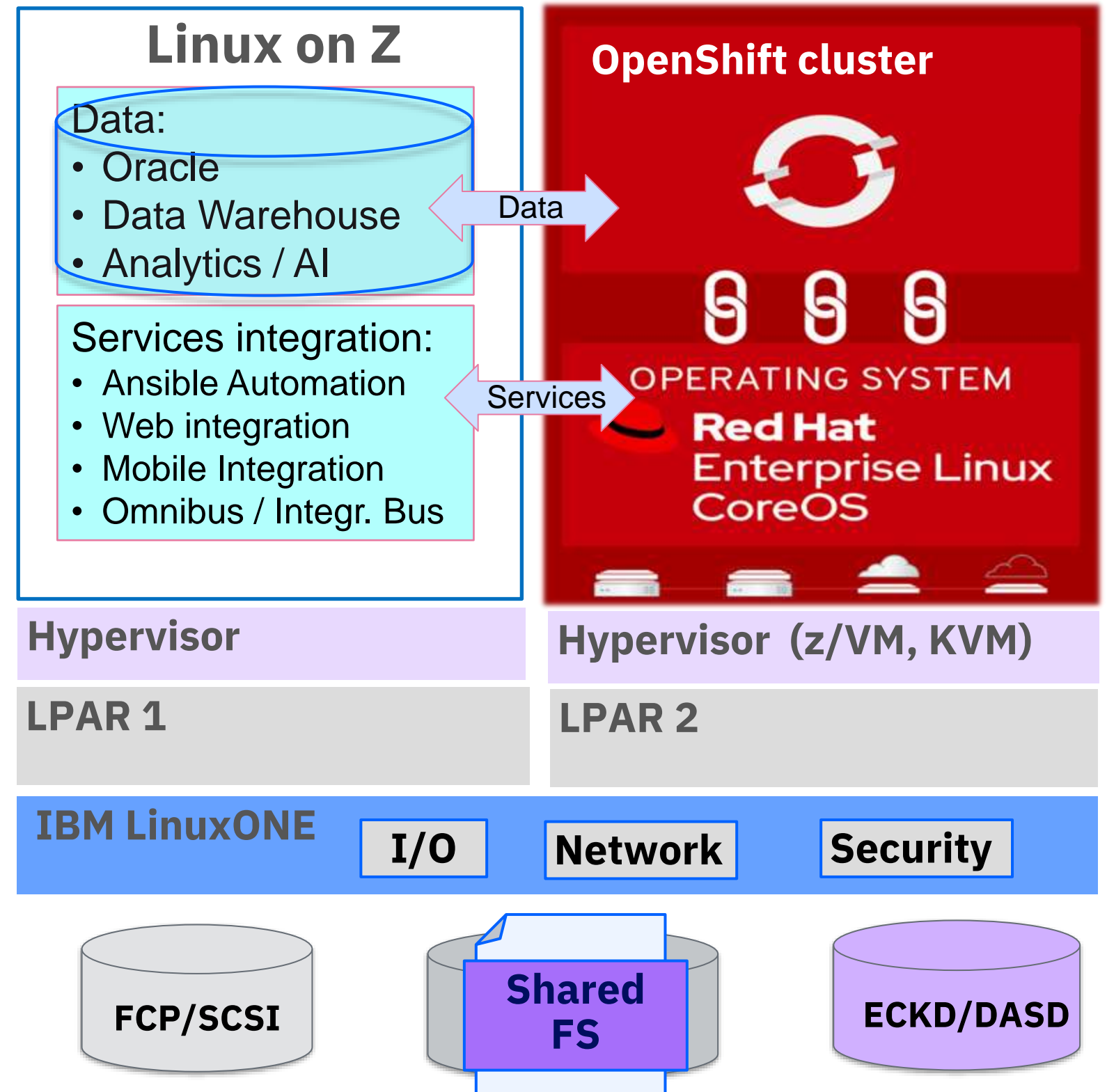
2) Cloud inside z/OS with zCX, next to z/OS data and services

4) Dev / Test in cloud & integration or hybrid cloud solutions (e.g. x86, public)



(1) Use cases for Red Hat OpenShift Container Platform collocated with Linux on IBM Z

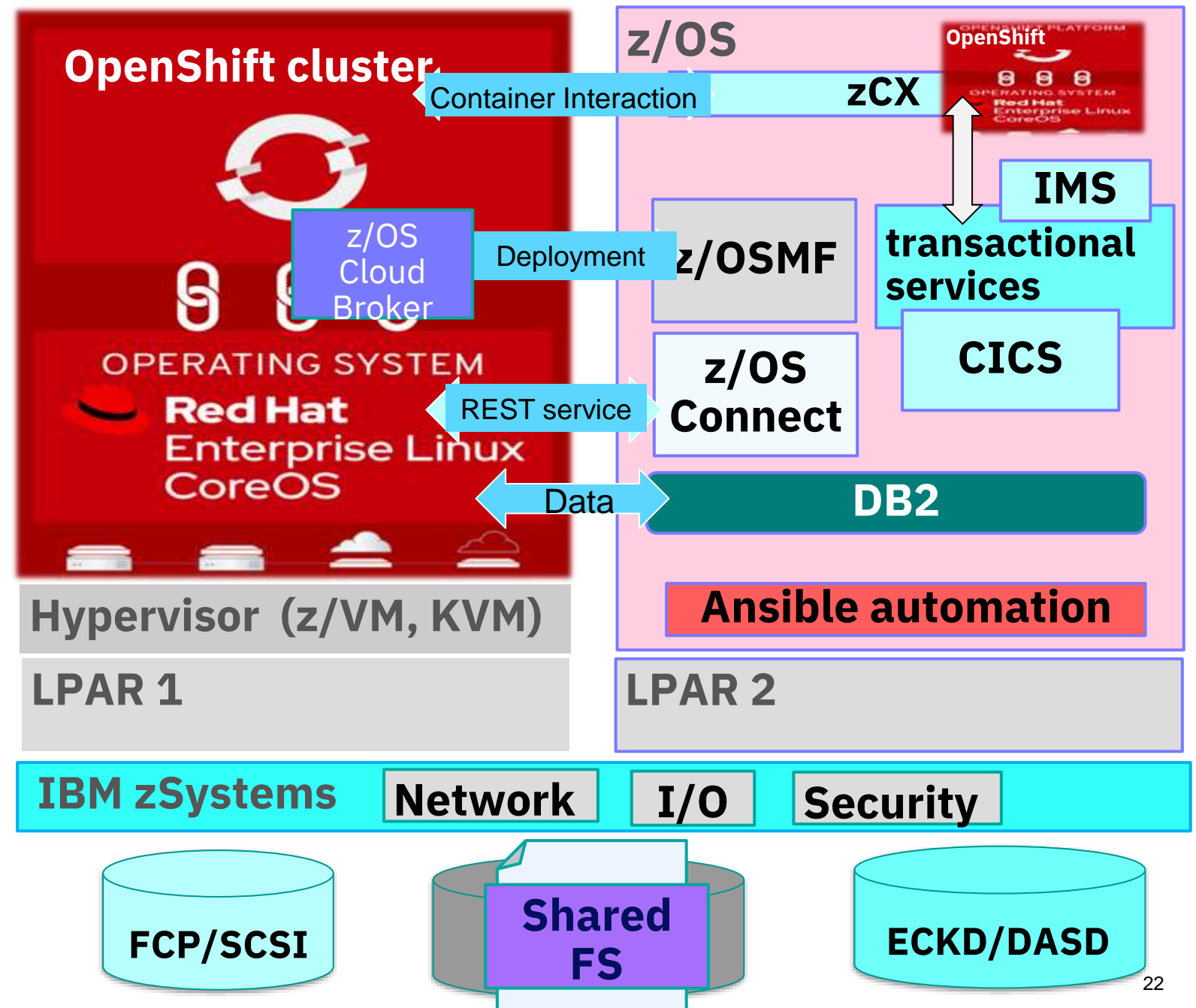
- **RHOCP environment integrates with Linux on Z transactional systems**, bidirectional capabilities (e.g. Temenos T24 for banking)
- **RHOCP workload interacts with enterprise data**, like a Data Lake, Oracle or Db2 Data Warehouse
- **RHOCP implements the Front end for Web or Mobile applications**, for high dynamic workloads, scalability, resource sharing and reliability
- **RHOCP extends Linux on Z Systems of Record** with Open-Source technologies



(1) Use Cases for Red Hat OpenShift in co-location 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

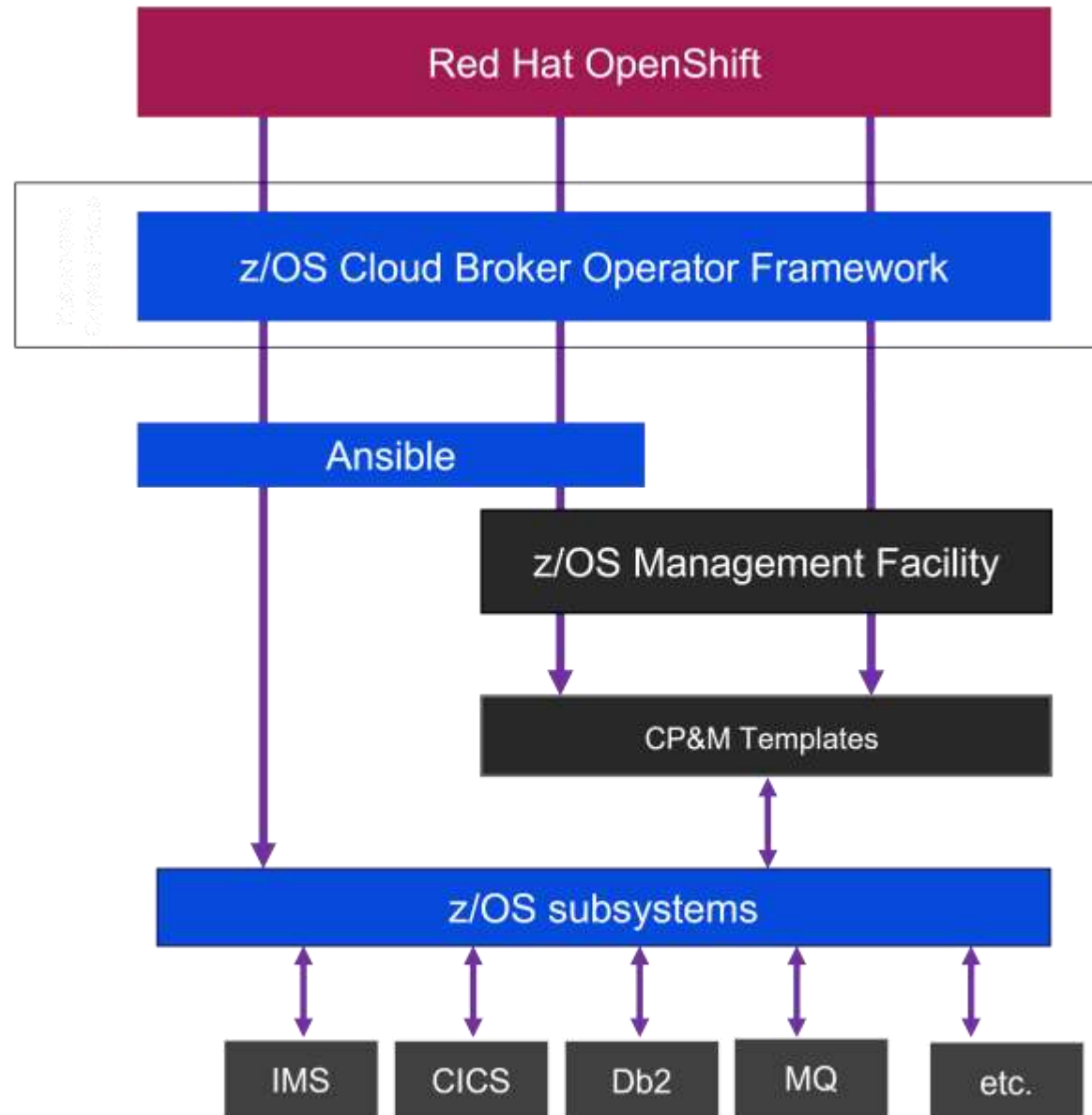
z/OS Cloud Broker

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

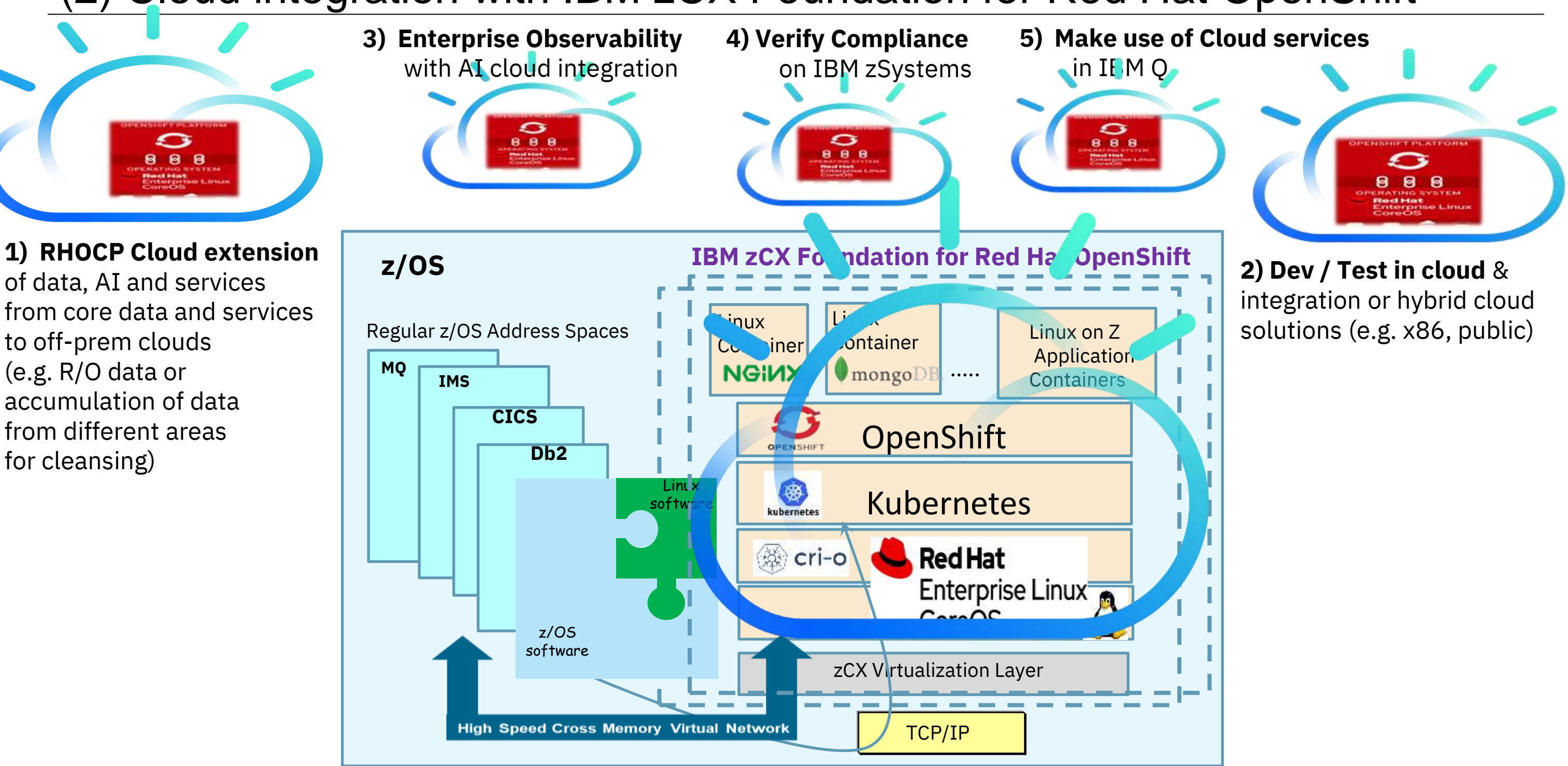


IBM z/OS Cloud Broker V2 (Future)
z/OS integration into OpenShift powered by an Ansible Engine

- 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



(2) Cloud integration with IBM zCX Foundation for Red Hat OpenShift



Provides various solution options in containers for z/OS

(2) Cloud services in zCX

Primary solution categories with IBM zCX Foundation for Red Hat OpenShift

z/OS Software Ecosystem Expansion

Integrated z/OS operational model,
transparently inherit QoS.

Caching-database: Co-locate Non-SQL databases, latest microservices, and analytics frameworks within native z/OS without compromising on performance and security

z/OS Software Exploitation

Integration with mission critical
workloads (CICS, IMS, Db2, etc.,).

Data & Service gravity: Co-locate services with applications and workloads within z/OS to exploit response time critical services and data, gaining accessibility and proximity to key resources

Systems Management

Less burden on Operations and
Dependency Management.

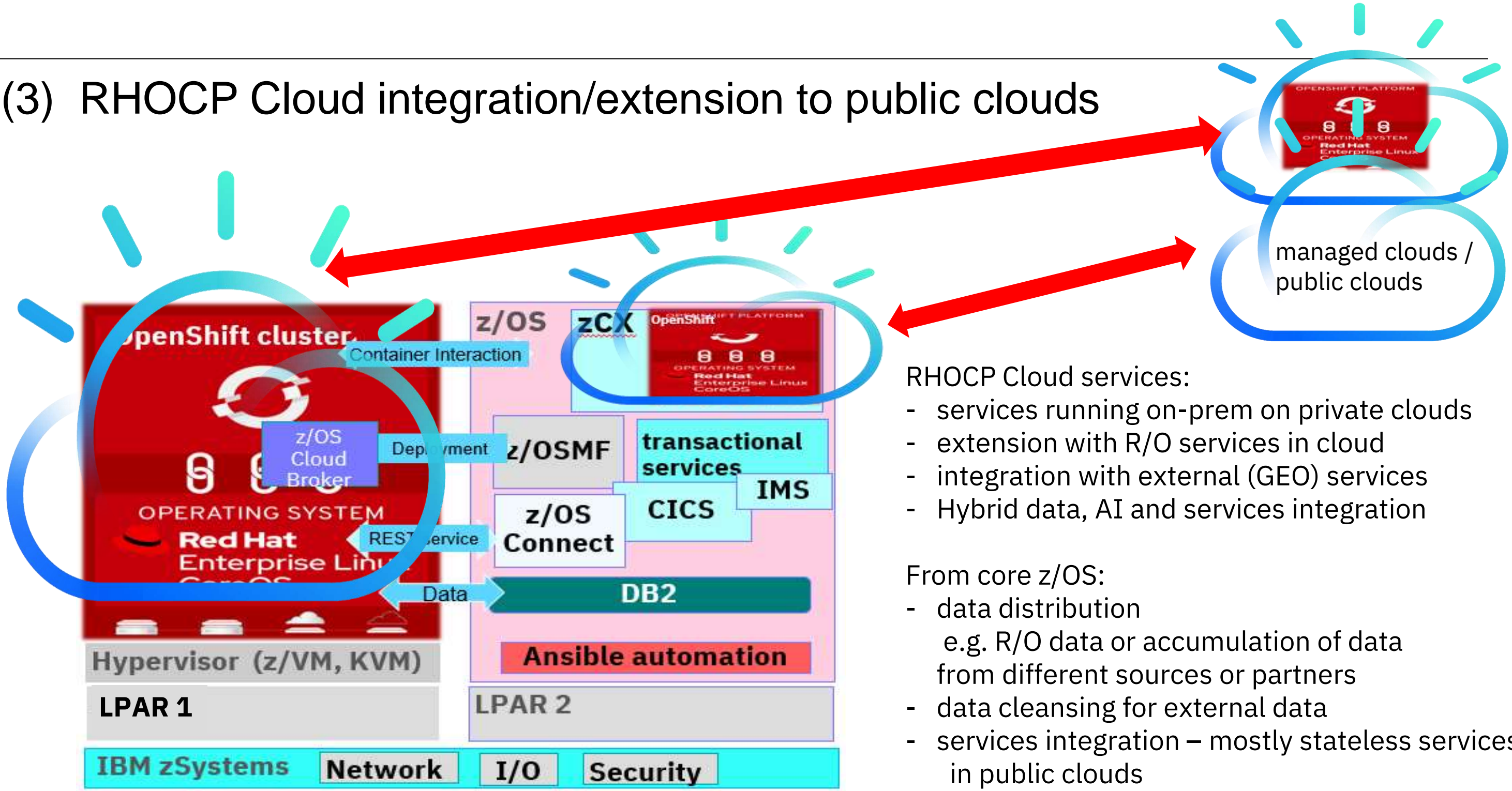
Global Observability: Make use of Open-Source components to centralize operational services and UI portals for system management and observability products

DevSecOps

Attract and exploit new talent,
improve time to market, and provide a
cloud-native experience on z/OS

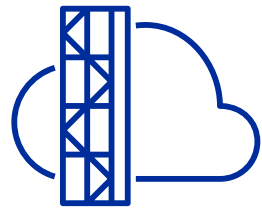
Process integration: Use Open-Source applications and Linux based development tools within the z/OS environment, build centralized deployment and CI/CD pipelines.

(3) RHOCP Cloud integration/extension to public clouds

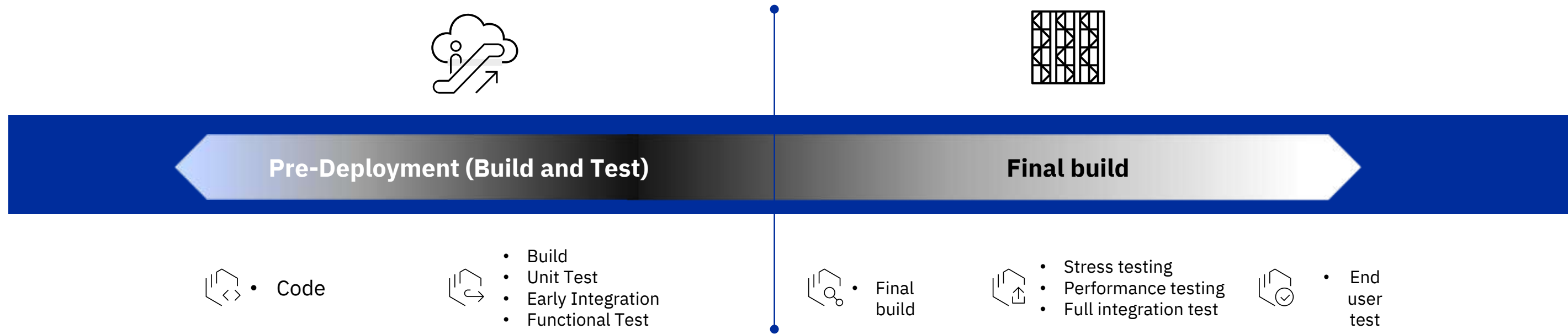


- RHOCP Cloud services:
- services running on-prem on private clouds
 - extension with R/O services in cloud
 - integration with external (GEO) services
 - Hybrid data, AI and services integration
- From core z/OS:
- data distribution
 - e.g. R/O data or accumulation of data from different sources or partners
 - data cleansing for external data
 - services integration – mostly stateless services in public clouds

(4) Cloud native Development using cloud development services



- Red Hat OpenShift in public cloud
- IBM Wazi as a Service - IBM Virtual Dev and Test for z/OS in the cloud



5 Mins*

Deploy and Start a z/OS system in less than 5 Mins

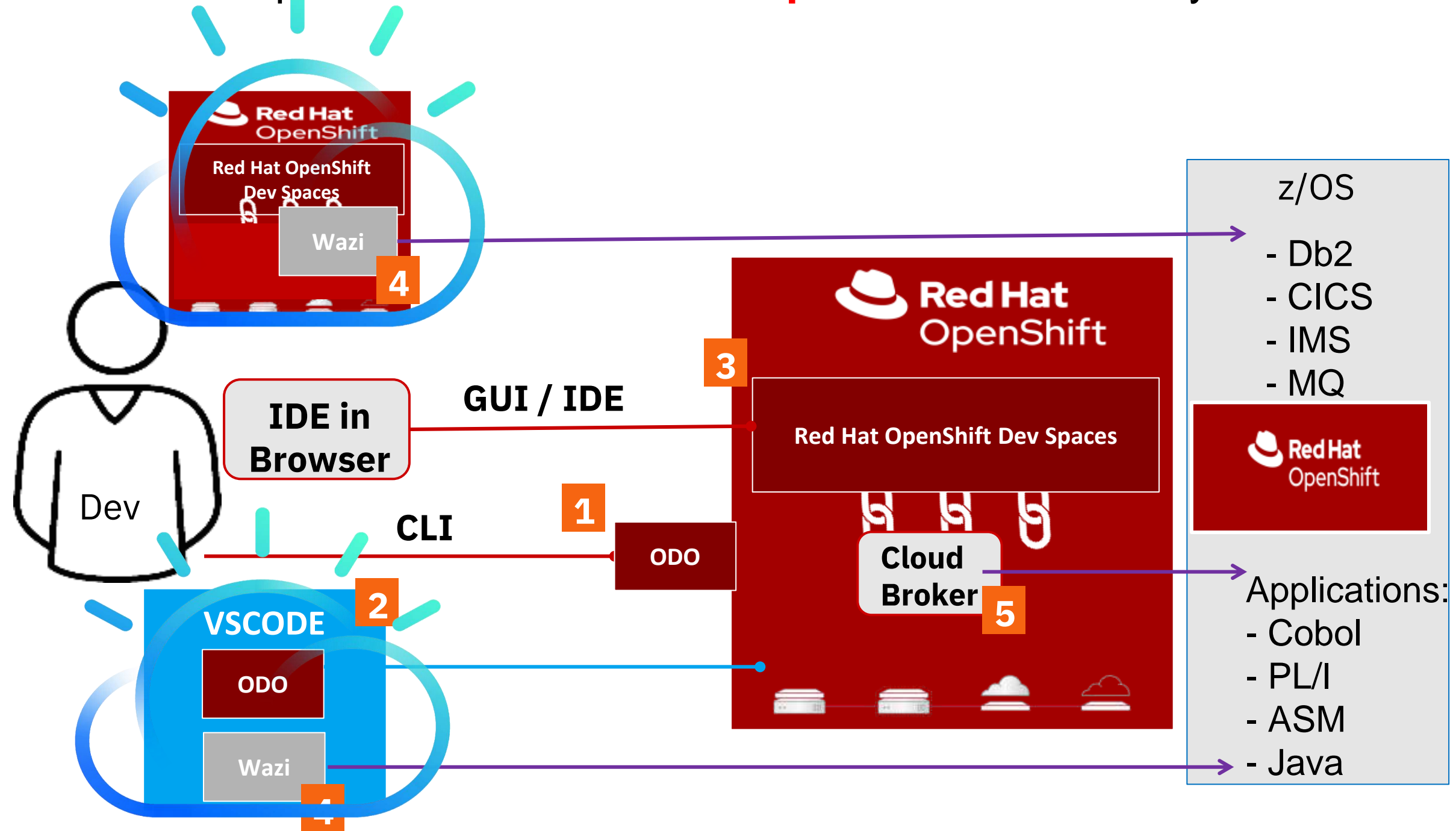
8-15x*

the performance compared to x86 (ZD&T & Sandbox)

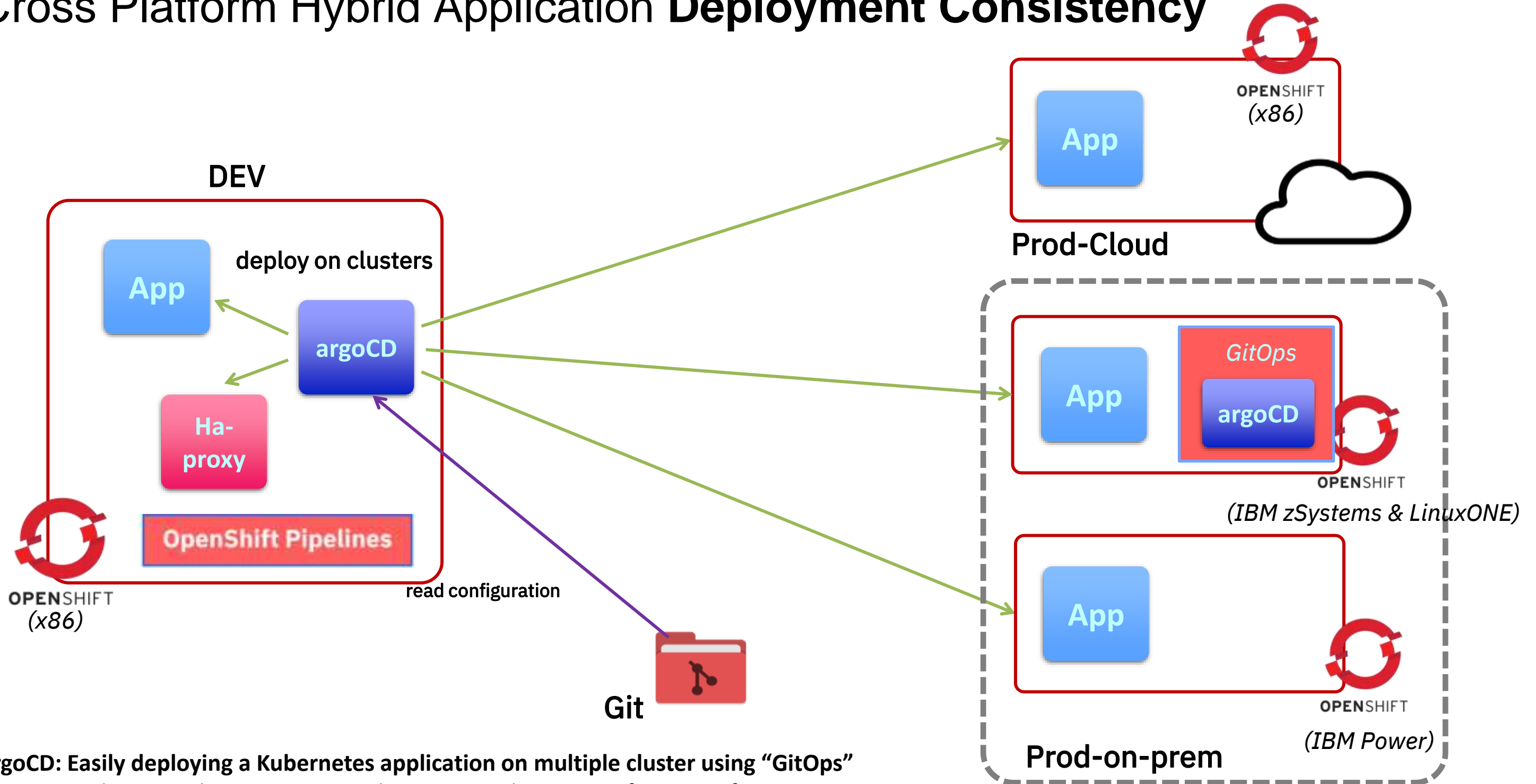
Encrypt

with keys stored in Key Protect or HPCS during VPC VSI creation

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



Cross Platform Hybrid Application Deployment Consistency

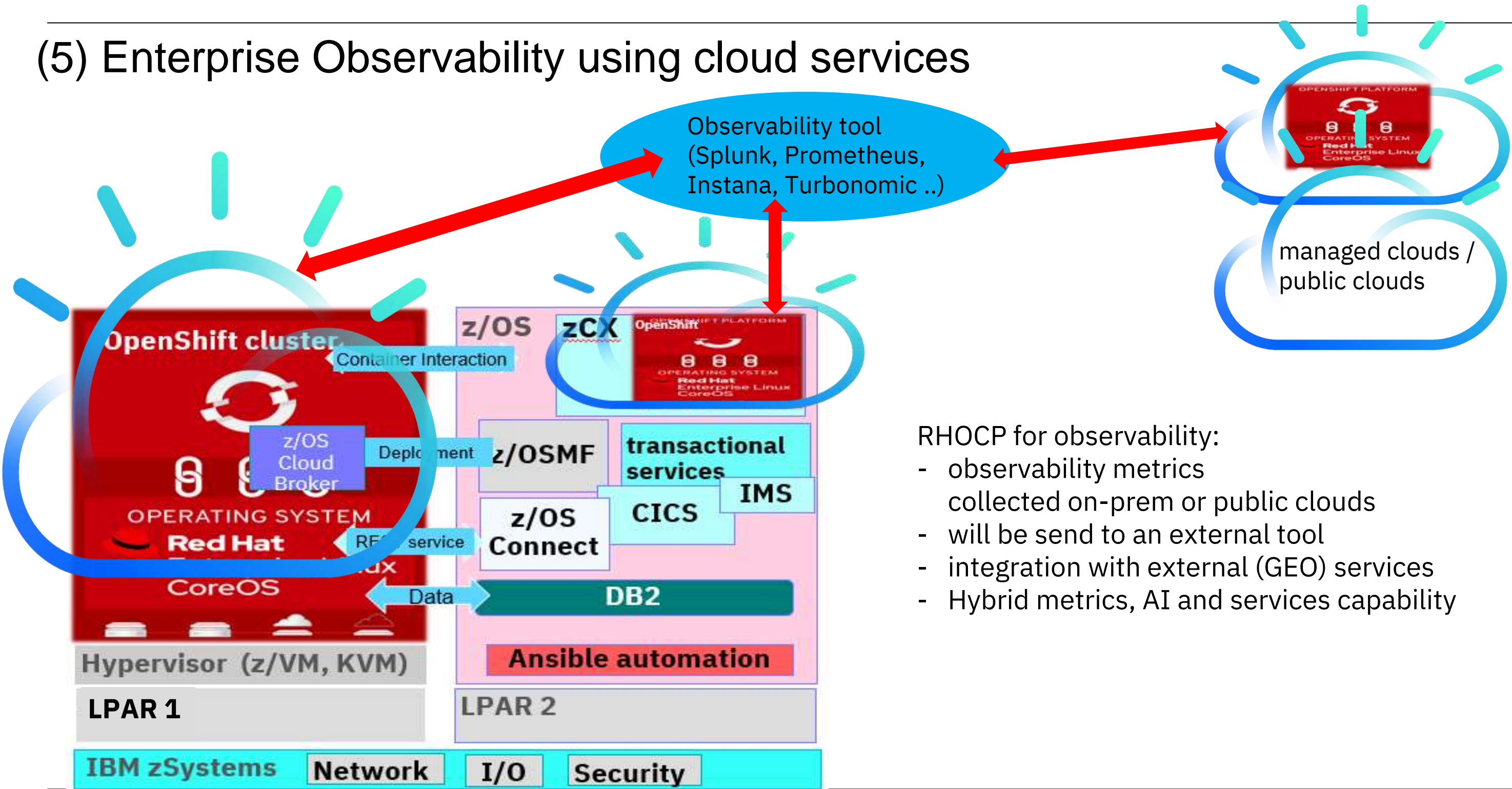


ArgoCD: Easily deploying a Kubernetes application on multiple cluster using "GitOps"

GitOps: Deploying and maintaining a Kubernetes application configuration from a Git repository



(5) Enterprise Observability using cloud services



RHOCP for observability:

- observability metrics collected on-prem or public clouds
- will be send to an external tool
- integration with external (GEO) services
- Hybrid metrics, AI and services capability

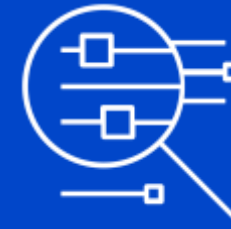
AI-Powered Observability & Automation for the enterprise



Faster decision making

*Full-stack and enterprise
observability*

IBM **Instana**



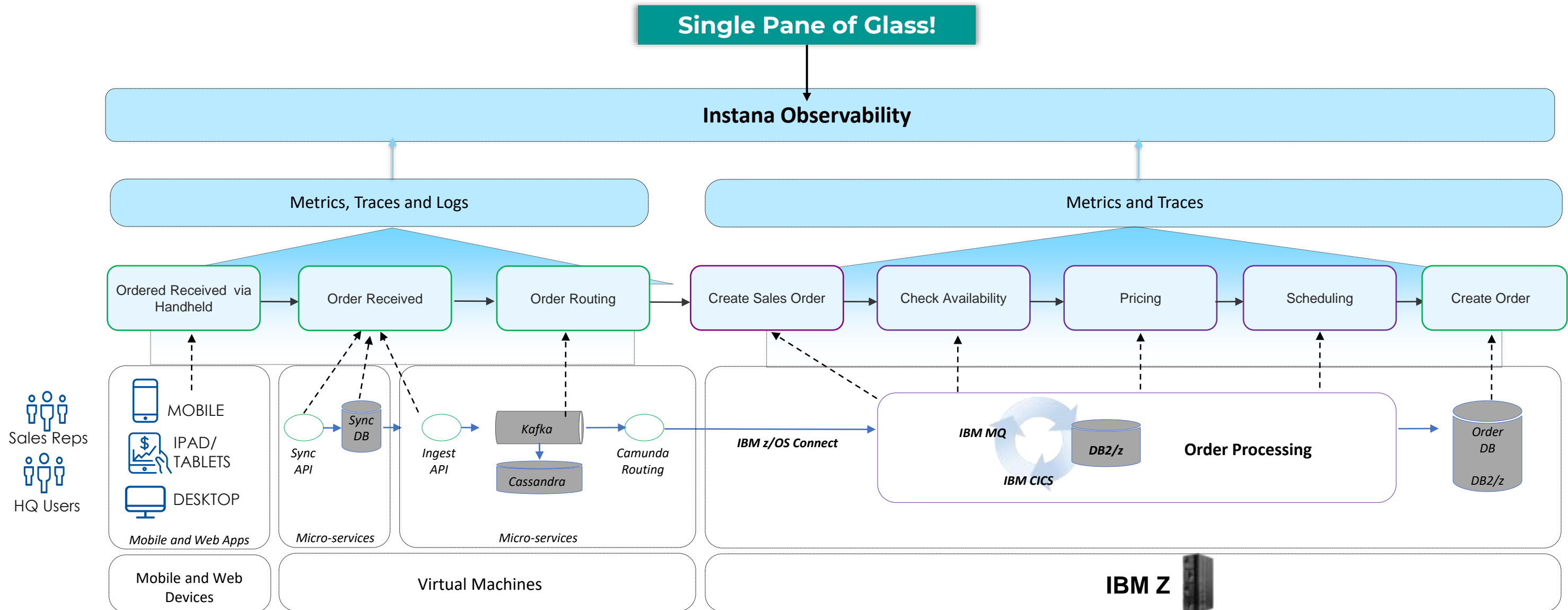
Dynamic cost optimization

*Performance-first
cost optimization*

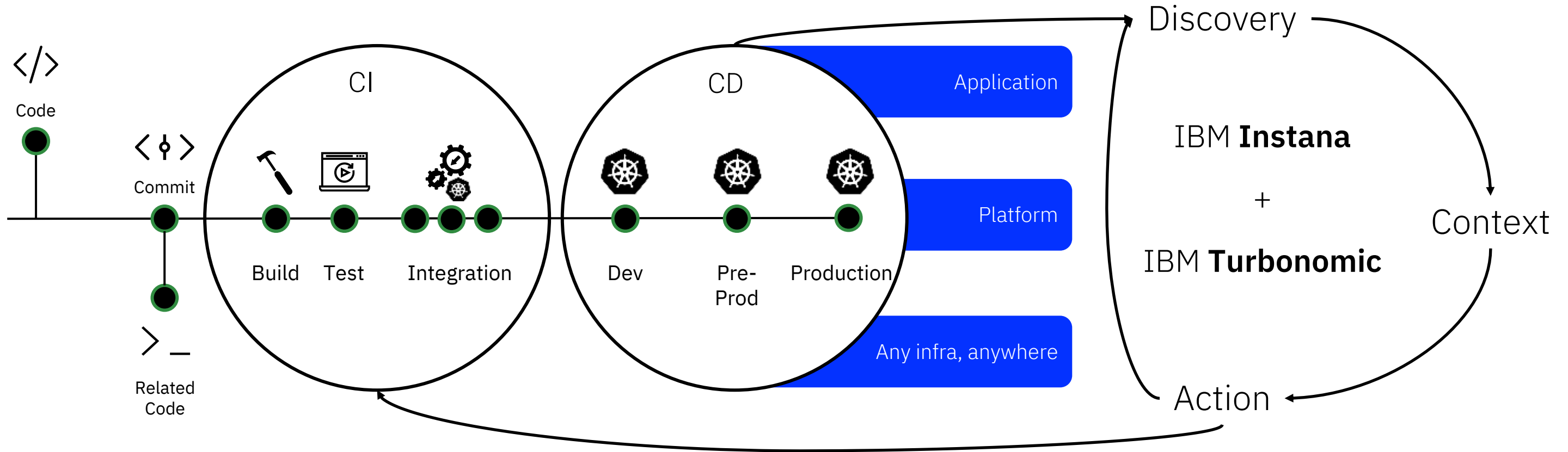
IBM **Turbonomic**

Instana supports observing the **entire Hybrid Application Landscape**

Instana is unmatched when it comes to comprehensive tracing support to consume and analyze every trace, regardless of how it's captured. Instana integrates with major logging tools like Splunk, ELK, and Humio.

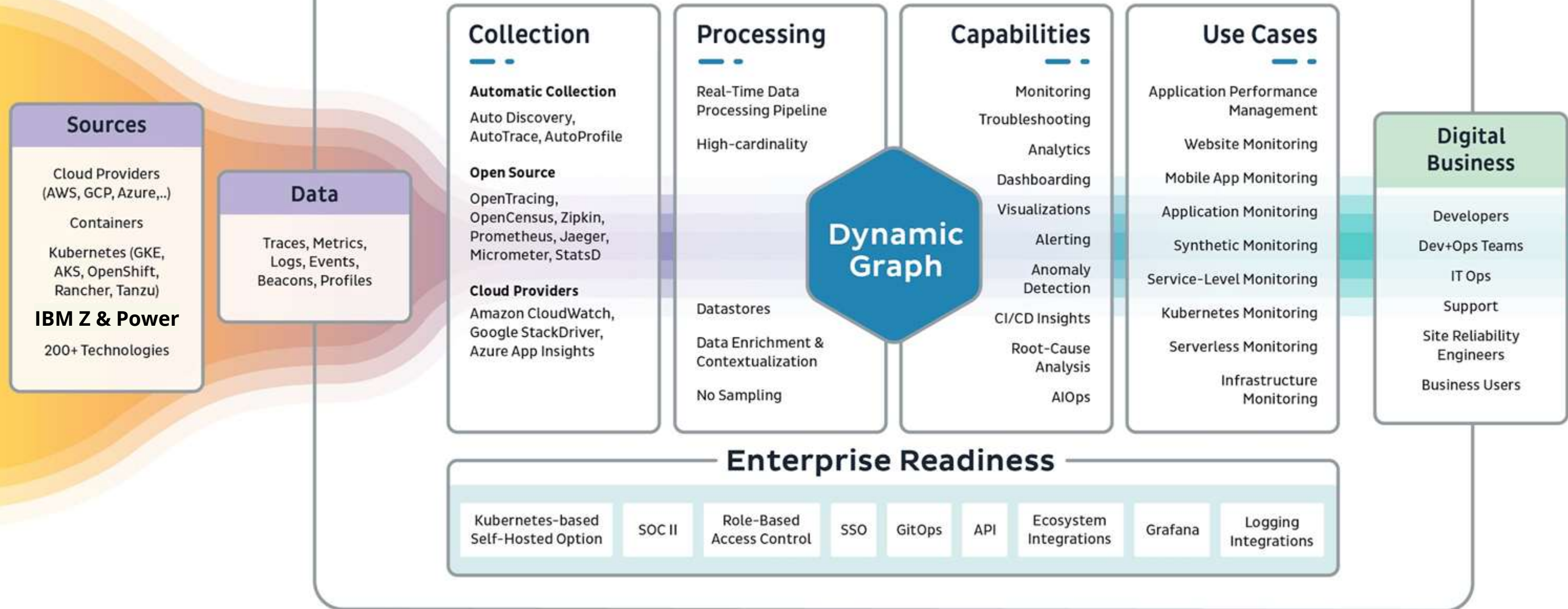


Optimize Across the Application Lifecycle



Continuously assure application health at the lowest cost— **don't make it an afterthought** – build it into your systems and processes to ensure dynamic resourcing across the entire application lifecycle!

Instana Enterprise Observability Platform



100% collection, 1-second granularity with no consumption or user costs

Use cases

Improved Automation to Support Cloud Native Journey

- Automated discovery of tech for full-stack observability
- Automated instrumentation & correlation of services
- Automatic tracing for *every* application/service
- Automatic dependency map creation
- Automated dashboards

Speeding Up Deployment

- Integrating into CI/CD pipelines
- Let the dev know within seconds how their release is performing
- Empowers dev's to become self-sufficient
- Improve developer experience

Correlation of MELT for Observability DIY framework

- Prometheus (metrics)
- Grafana (dashboarding)
- Splunk/ELK (logging)
- Jaeger (tracing)

Reduce APM / Observability Spend

- No data ingestion costs
- All-inclusive pricing
- No hidden fees!

Reduce MTTD + MTTR with Real-time Root Cause Analysis

- Real-time detection of infra & middleware component anomalies
- Real-time detection of app/service latency & error anomalies
- Reduce finger pointing & eliminate the blame game

Simplify Agent Maintenance

- Single agent architecture
- Reduce time spent updating multiple agents
- No app restarts required

SRE Transformation

- SLA/SLI/SLO support
- Custom dashboards
 - By end-user journeys
 - By business transactions
 - By technology
 - By persona

Optimize Infrastructure Resources

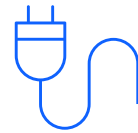
- Reduced # of VM's
- Reduce cloud spend
- Identify memory leak issues

Turbonomic Application Resource Management...



Data Center Efficiency

Automated resource levels



Cloud Workload Optimization

Scale cloud native apps



Cloud Migration Planning

App-driven, optimized planning ensures responsible cloud consumption

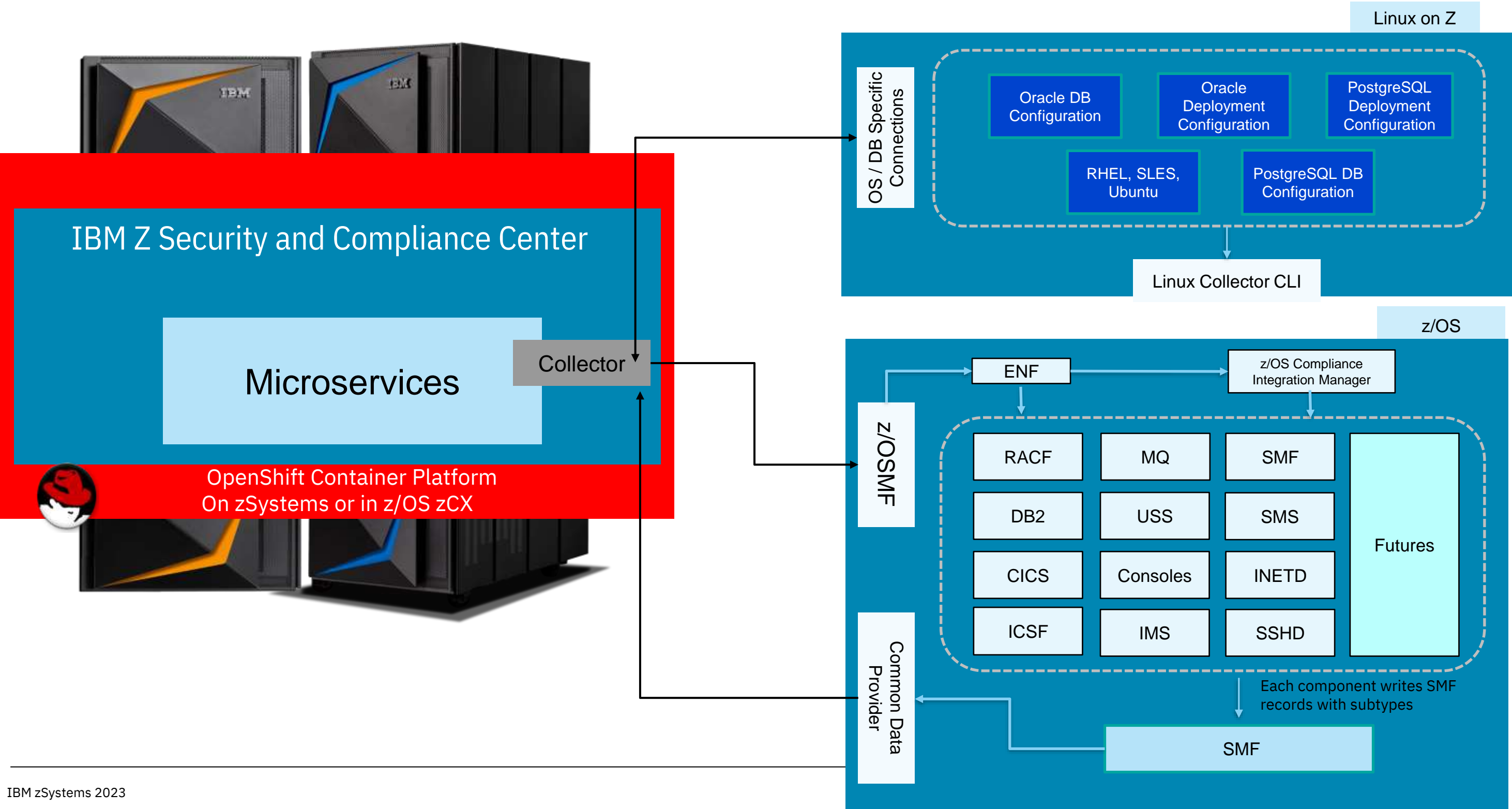


Data Center Performance Optimization

Supported on AWS, GCP, Azure for compute, storage, K8

- Ensures applications running on-premises get exactly the resources they need to perform, materially reducing data center energy consumption
- Scale cloud native apps in the public cloud based on customer experience metrics—assure service level objectives (SLOs), while minimizing cloud footprint and cost.
- Software continuously determines when to scale out (and back) containerized microservices to meet customer or revenue-based SLOs

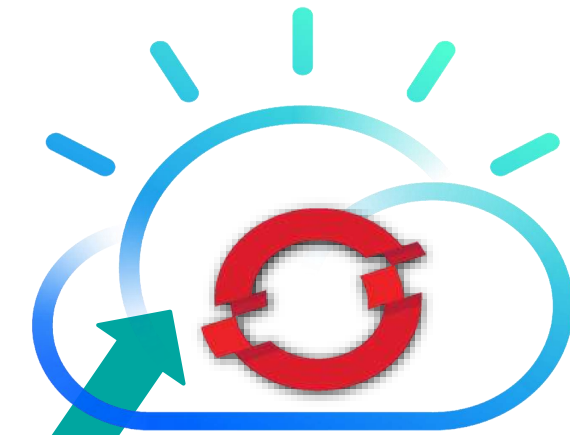
(6) Compliance verification on OpenShift on IBM zSystems or zCX



(7) Extension to Quantum safe algorithms with RH OpenShift

- 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

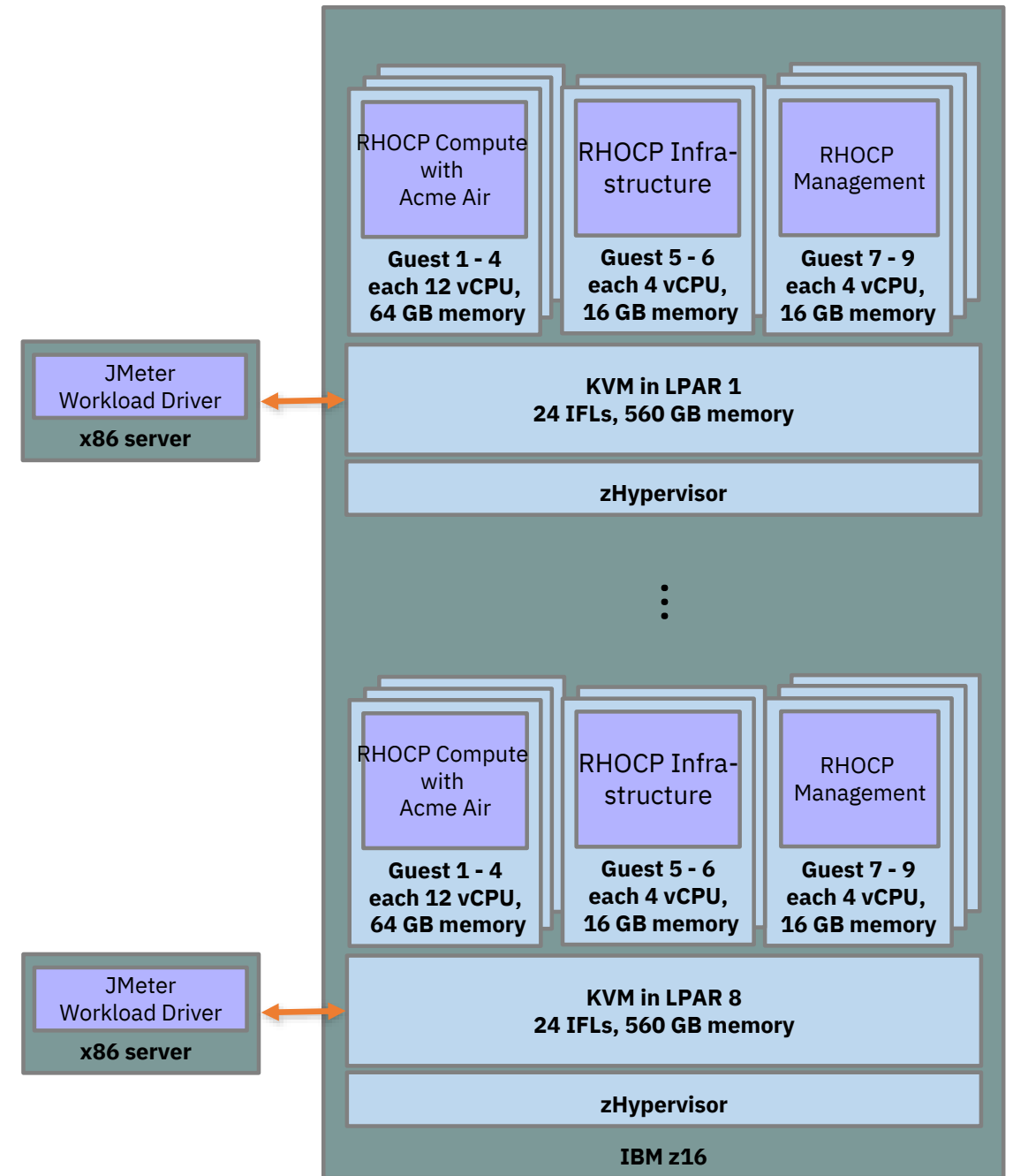


Performance Proof Points

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.

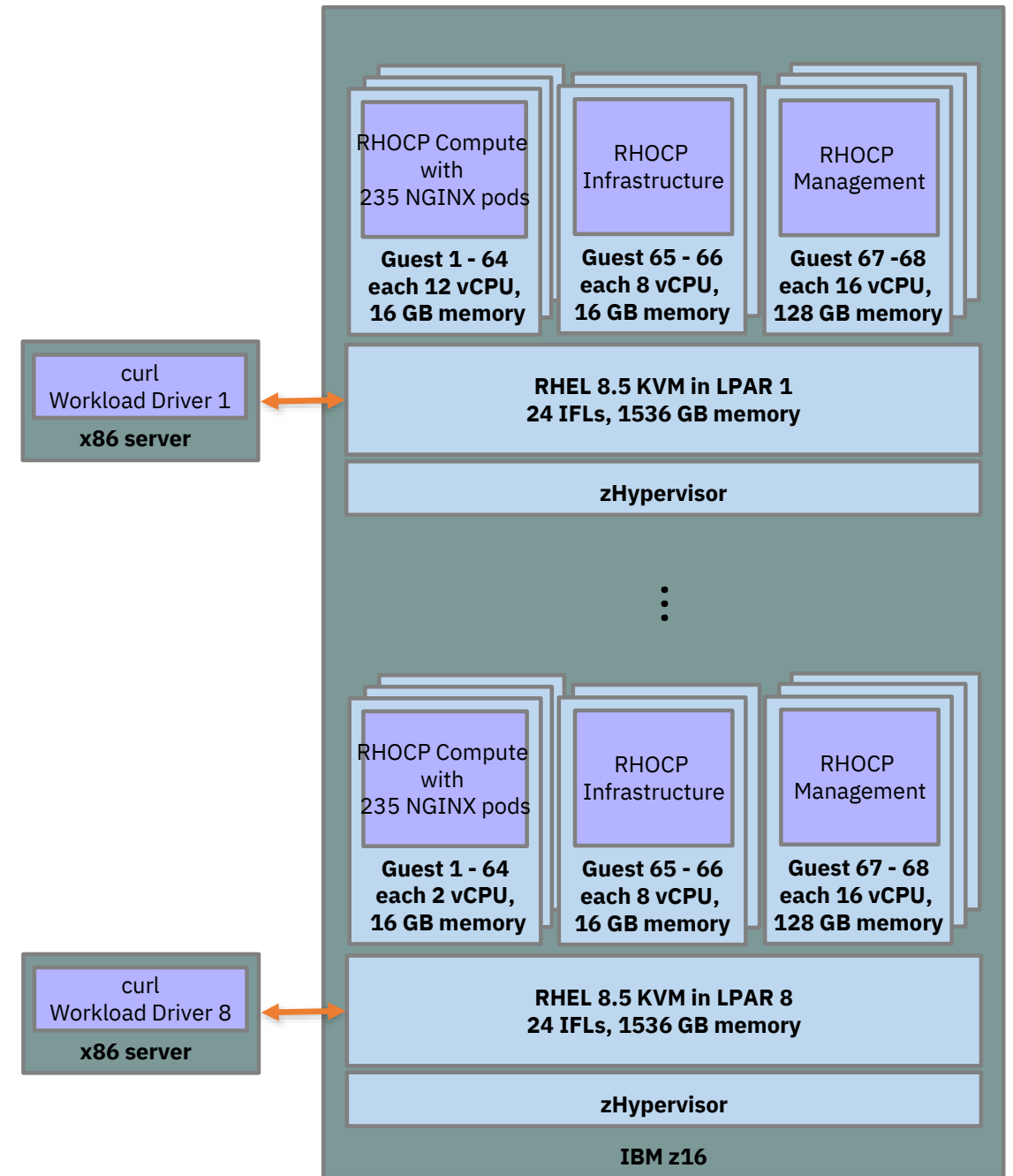


Performance Proof Points

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

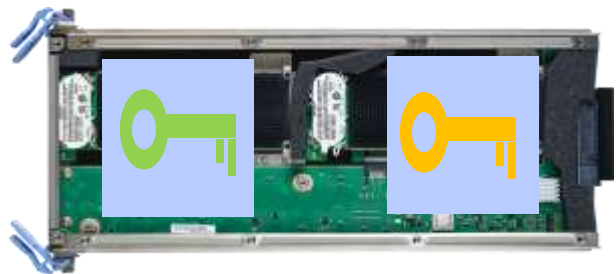
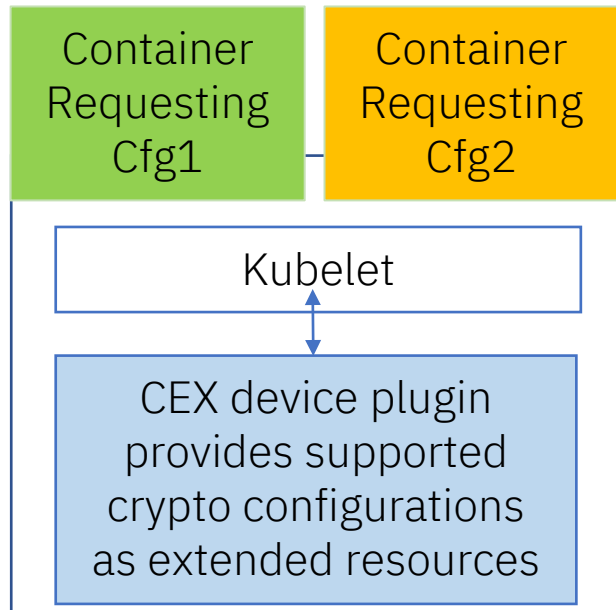
DISCLAIMER: Performance result is extrapolated from IBM internal tests running in an IBM z16 LPAR with 24 dedicated IFLs, 1536 GB memory and FS9200 storage NGINX pods on Red Hat OpenShift Container Platform (RHOCP) 4.10 running on a RHEL 8.5 KVM host. 64 RHOCP Compute nodes with 230 NGINX pods were running 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.



Major Use Case: Secure Assets and objects

IBM Crypto Express direct access from containers on Red Hat OpenShift

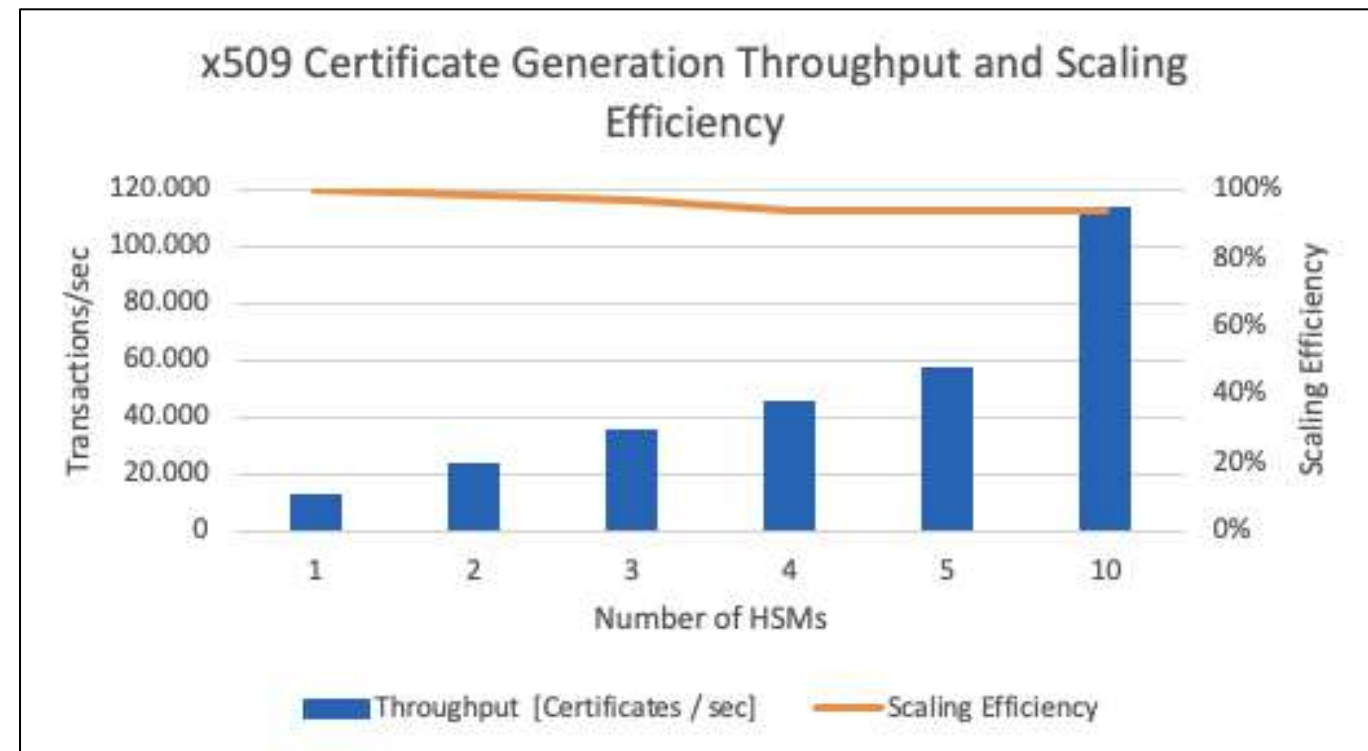
Red Hat OpenShift Compute Node



Scale-up X509 Certificate Generation on IBM LinuxONE Emperor 4 with CEX8S

On a single IBM LinuxONE Emperor 4 drawer, generate up to **100,000 certificates per second** using **protected keys exploiting Crypto Express 8S adapters** when running application pods on Red Hat OpenShift Container Platform

DISCLAIMER: Performance results is extrapolated from an IBM internal study designed to replicate secure certificate generation with Java on Red Hat OpenShift Container Platform (RHOC) 4.10 on IBM LinuxONE Emperor 4 using KVM. 2 microbenchmark pods (Signature RSA 2048 key is protected by AES master key in Crypto Express 8S adapters, certificate signatures are done with SHA-256 for x509 certificates) were run in parallel per compute node each driven locally with 20 parallel threads. IBM LinuxONE Emperor 4 configuration: The RHOC Management and Compute nodes ran on RHEL 8.5 KVM using macVTap in an LPAR with 24 dedicated cores, 256 GB memory, FlashSystem 9200 storage, CEX8S adapters in “2 HSM version” mode, one HSM per compute node. Packages used for benchmark: IBM Semeru Open 11 JDK 11.0.14.1.1 0.30.1-1 using BouncyCastle packages for x509 certificate generation and SunPKCS11 JCE provider connected to Opencryptoki 3.16.0 CCA token for cryptographic operations. Results may vary.



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 Z
- 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 Z & 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



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

You have the choice in running containerized apps

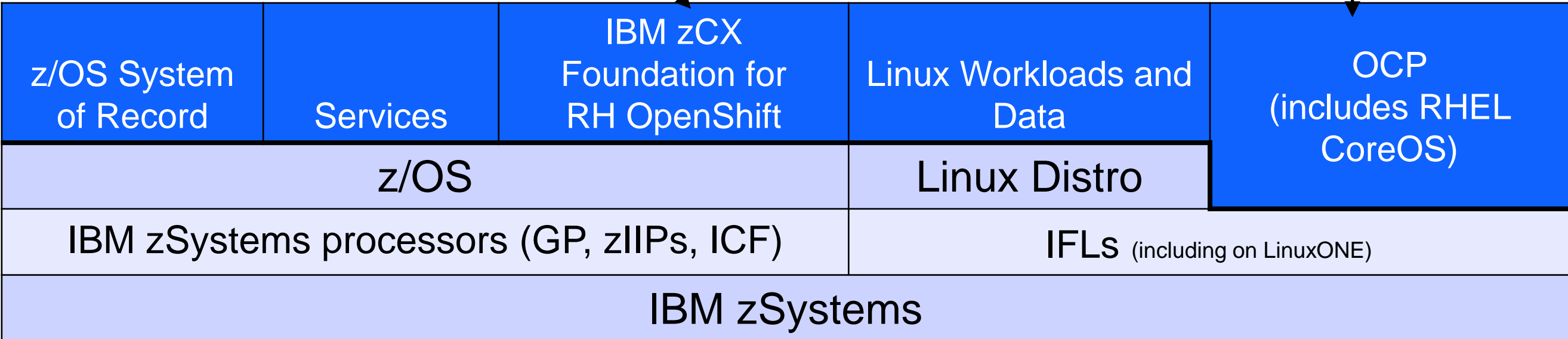
While both IBM z/OS Foundation for OpenShift in zCX and Red Hat OpenShift Container Platform (RHOCP) on IFLs run containerized workloads in a zSystems & LinuxONE environment, they have some differences that need to be understood to position the solution in the right environment.

IBM zCX Foundation for Red Hat OpenShift

- Runs as address spaces in z/OS – taking advantage of z/OS QoS - on either zIIPs* or GPs*
- Includes a complete RH OpenShift with CoreOS kernel but doesn't require a Linux distro, or separately provisioned Linux instance (nor FC0104 or Container Hosting Foundation - which are for zCX Classic only)
- Can be deployed with z/OS 2.4 and newer

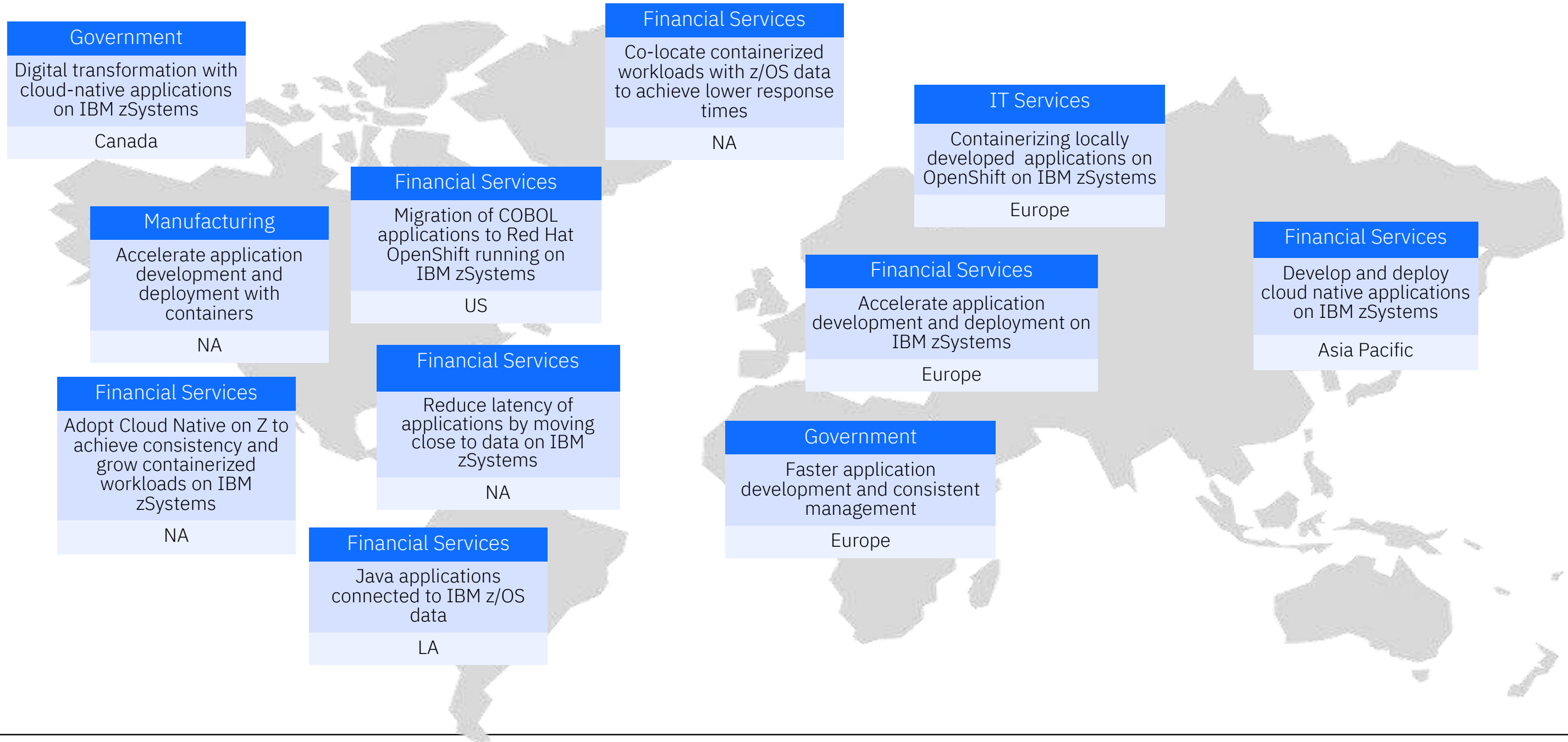
Red Hat OpenShift on zSystems

- Runs on IFLs* and includes RHEL CoreOS taking advantage of IFL unique features
- Deployed in a virtualized environment with z/VM or RHEL KVM as Hypervisor
- Runs alongside (i.e. on IFLs in separate LPARs) with traditional Linux on Z environments which offer choices of Linux distros (ie RHEL, SLES, Ubuntu, etc)



* While OCP and Linux distros can run in GPs, we expect the majority of deployments to be on IFLs or zIIPs

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



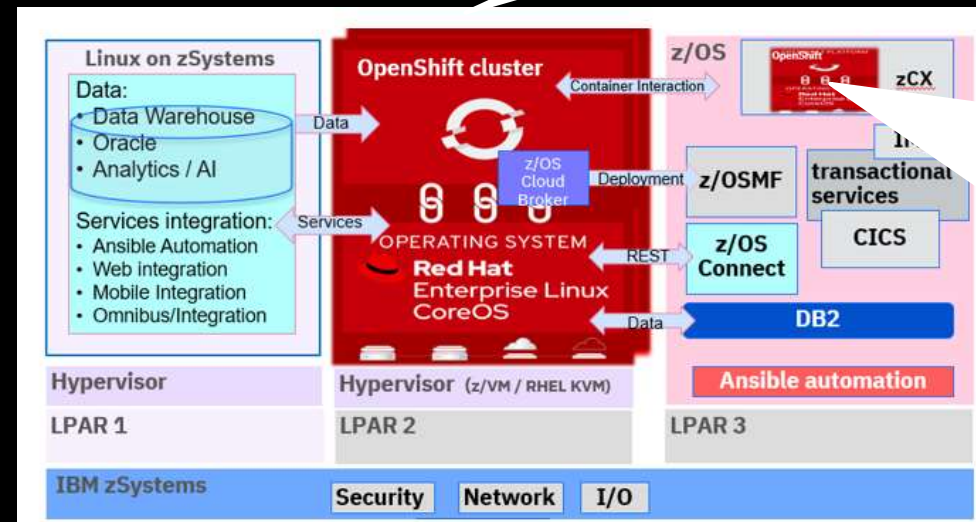
Public Sector service provider (EU)

Cloud services Dev. and AI, & easy change from x86 – to IBM zSystems

Challenge

- Prove of viability of Red Hat OpenShift Container Platform on IBM zSystems as easy development for public services
- Red Hat OpenShift, a solid platform for scalable selected vendor applications and services not designed for zSystems.
- AI enabled verification for Geo changes and real estate

I'm a bot: Which city service can I help with ?



Real Estate Tax calculations, for buildings or ground developments – based on satellite picture analysis & compares with help of ML and AI routines on RH OpenShift & IBM Watson on IBM zSystems



Solution advantage: RHOCP availability and scalability for SaaS

- As door opener was a communication bot for public services that could be replicated and extended with new functions and AI intelligence with guidance for public city services
- A second wow effect was a vendor application that needed more scalability that was turned from x86 to IBM zSystems in 2 weeks and delivered highest reliability, security and robustness.
- The solution was implemented as a converged HA & DR solution with Db2 z/OS as backend data
- The ultimate use case implemented was the requirement for an automatic real estate change control for Taxes and can be replicated to other object change detection. It was implemented using ML scoring in IBM z16 with Telum and AI algorithms for

Large insurance – flexibility proof for IBM zCX Foundation for Red Hat OpenShift on IBM zSystems

Challenge
 Customer needed flexibility for new applications and faster turnaround time for inquiries. It was a steady growth over the past few years, adding more service requirements to meet its business demands.

Based on these requirements, the client ran a Proof of Technology to find the benefits of a Red Hat OpenShift in an IBM z/OS zCX environment on the zSystems platform.

The objective of this work was to verify what benefits exist, related to performance, portability and low latency of RH OpenShift in a zCX environment compared to the distributed x86 environment.

A great Success from different perspectives:

50%

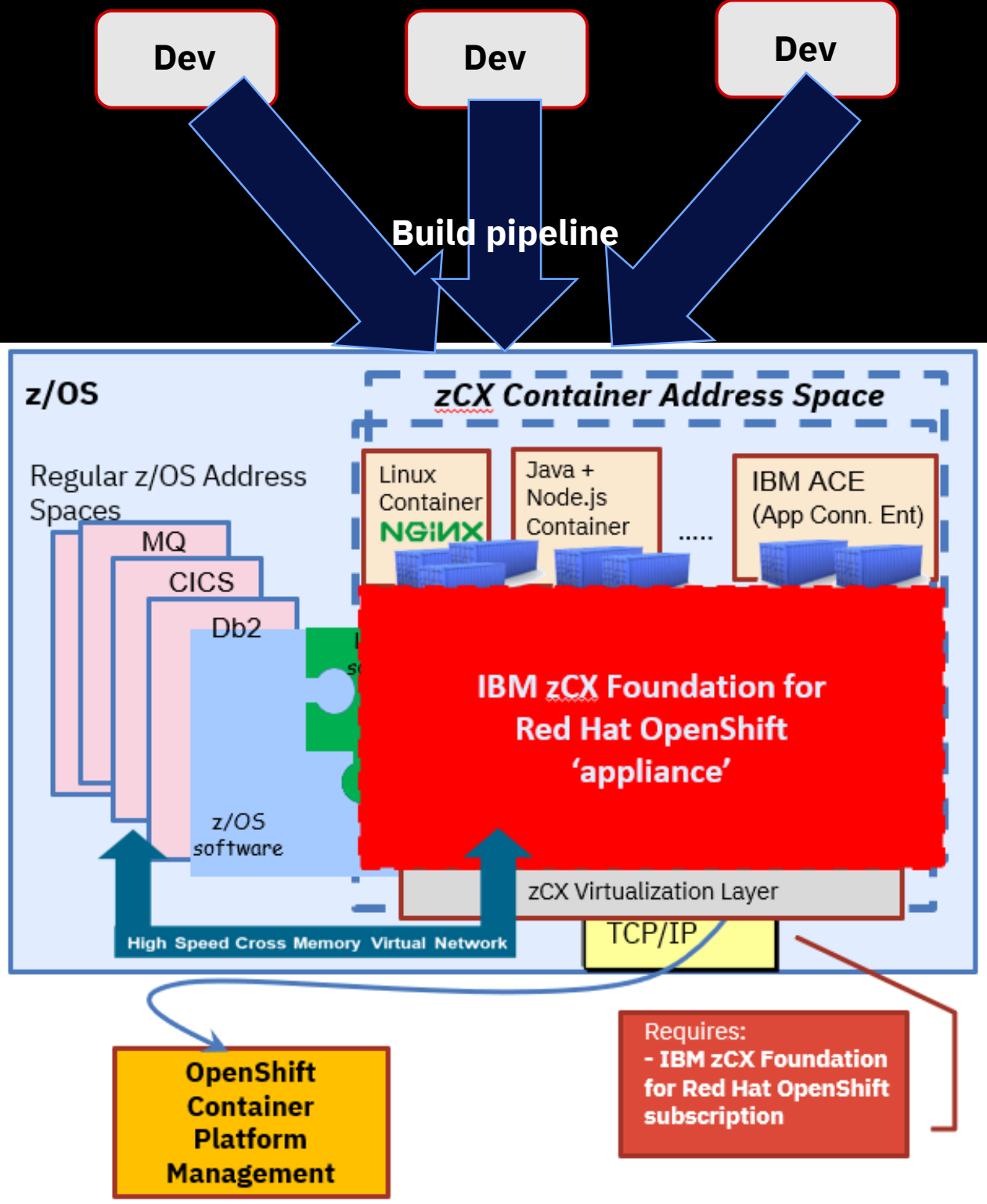
- Shorter response time from Apps with RHOCP zCX vs. x86 to Db2 z/OS

40x

- Faster documents processing in zCX vs same workload on x86.

100%

- Ansible script automated setup, aligned with the x86 procedure.
 - Reused Java & Node.js apps from x86 in zCX environment.



Creating the ultimate hybrid cloud

Client explains, the IBM zSystems and LinuxONE platforms are here to help.



The video player shows a grayscale aerial view of Edinburgh, Scotland, with the text 'Open Source Edinburgh' overlaid in large white font. A play button icon is centered over the text. In the top left corner, there are logos for FINOS and SCOTT LOGIC (with the tagline 'ALTOGETHER SMARTER'). In the top right corner, there is a 'D&I Gold' logo. Below the video frame, the title 'Do not cancel the mainframe!' is displayed in bold black text, followed by the speaker's name 'Reg Wilkinson, Z DevOps Centre of Excellence Lead' and his affiliation 'Lloyds Banking Group'. The video player controls at the bottom include a play button, a progress bar showing '0:00 / 29:13', and icons for volume, closed captions, settings, and full screen.

Adoption patterns for Red Hat OpenShift on IBM zSystems



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

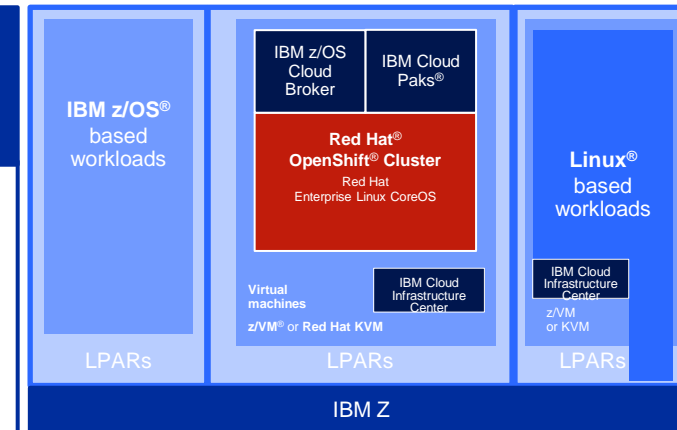
High throughput per core, low latency, high scalability, out of the box availability and resiliency

AI and Data

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

Blockchain

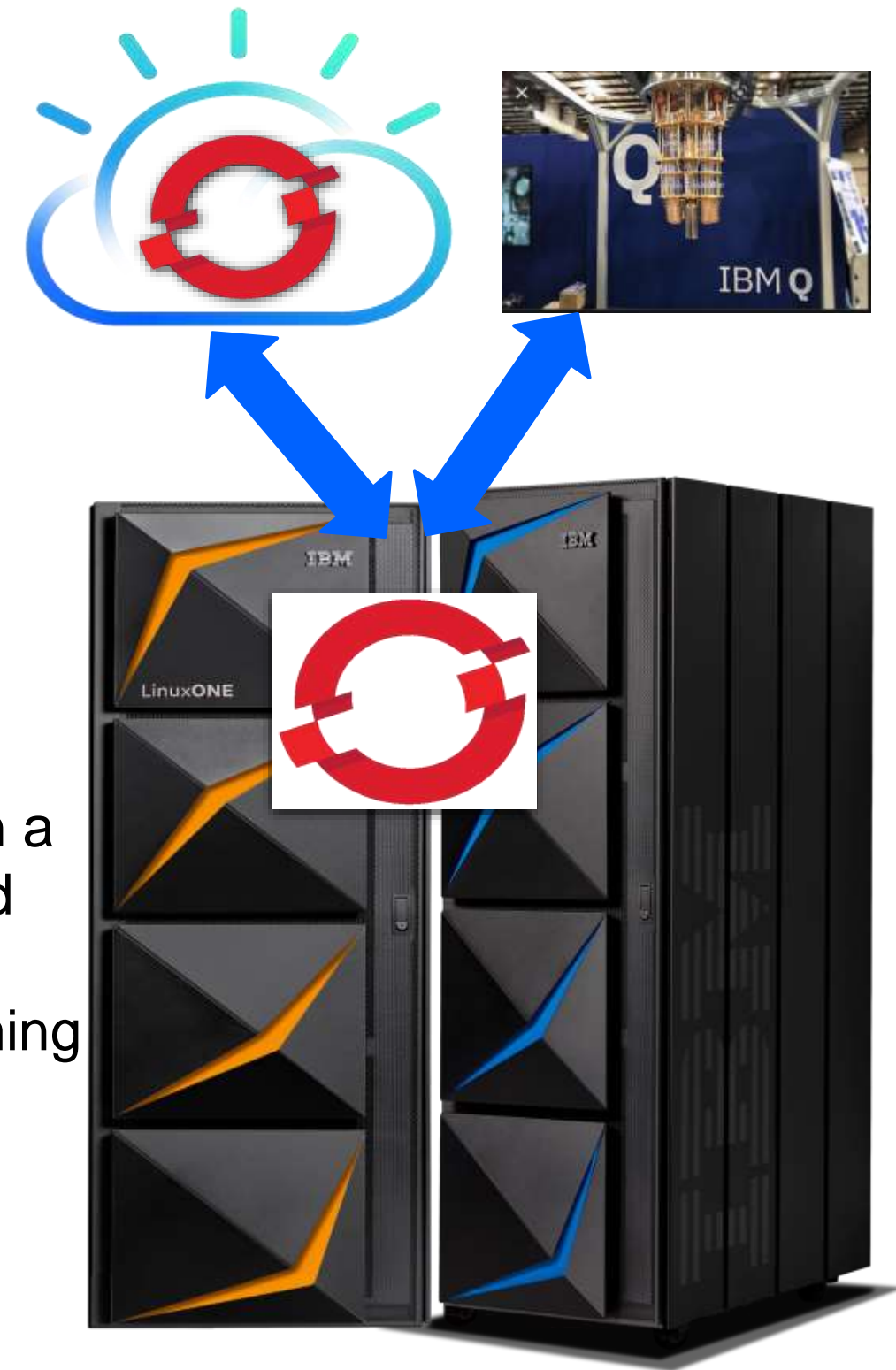
IBM Blockchain Platform deployed on-premises on IBM zSystems



Conclusion: Various Benefits ... **Start Now !**

- **Have applications highly available and scalable** – no service disruption anymore at all – and that by the deployment design
- **Consistent Development per excellence** – without platform consideration
- **Test and Deployment** are automated and supervised
- Management of environments and life cycle is centralized in one pane of glass from all architectures
- **The highest security, resiliency and isolation** come together in a virtualized environment with resource sharing and tenant isolated
- **Scalability is automated** for scaling up and down and is consuming resources only if it is actively used – with OpenShift Serverless
- **Data management** takes care of availability, gravity, consistency and cloud service behavior – even across multiple clouds

Red Hat OpenShift on IBM zSystems can do all that today !



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 the text "Red Hat Ecosystem Catalog", with menu items 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 breadcrumb trail: "Home > Software > Container images". A search bar contains the text "Search container images" and a red "Search" button. To the right of the search bar, it indicates "1 - 15 of 589" results. A filter for "s390x" is active, with a "Clear filters" link. The left sidebar contains filter sections: "Architecture" with a "Clear" link and checkboxes for "s390x" (checked), "amd64", "arm64", and "ppc64le"; "Category" with a search box and checkboxes for "API Management", "Application Delivery", "Application Development", "Application Server", and "Automation"; and "Product" with a search box. The main content area shows six container image cards, each with the Red Hat logo and the following details:

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

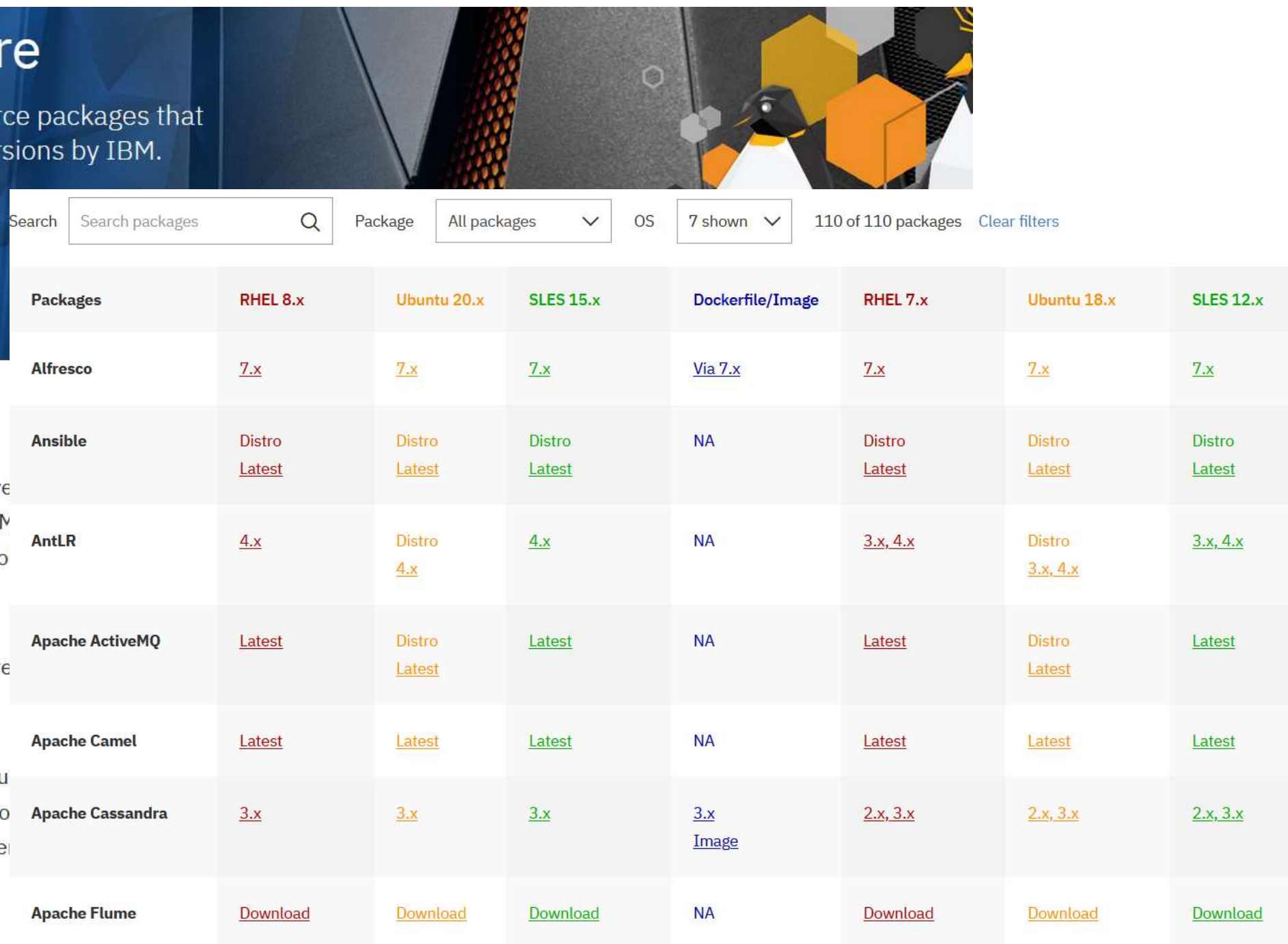
Open-source containerized Software for Linux on IBM zSystems & IBM LinuxONE

<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". At the top, there is a search bar with the text "Search packages" and a magnifying glass icon. To the right of the search bar are dropdown menus for "Package" (set to "All packages"), "OS" (set to "7 shown"), and a count "110 of 110 packages" with a "Clear filters" link. 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 with links to their respective versions or Dockerfiles.

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

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

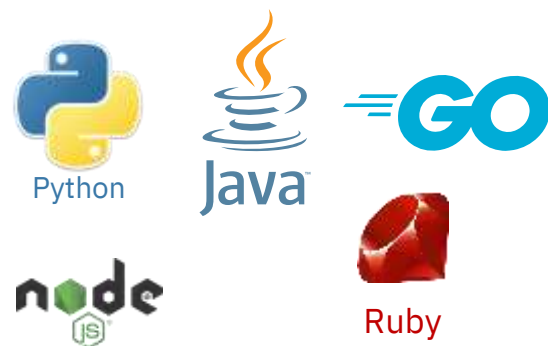
What if a package I'm interested in is not in the table?

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

IBM zSystems and LinuxONE Container Registry



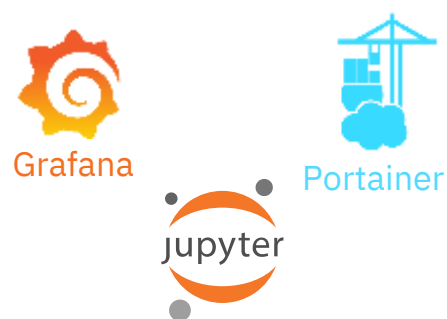
foundational distros*



languages



registries, scanners



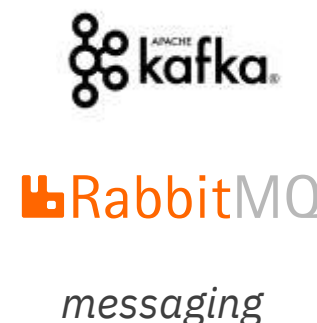
dashboards, UIs



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>

Need access to IBM zSystems / LinuxONE for RHOCP ?

Try the LinuxONE Community Cloud

The IBM LinuxONE Community Cloud provides

- Free access for developers, students, and entrepreneurs
- Virtual servers and services for testing and piloting emerging applications for evaluation purposes
- Fast Start Guides
<https://www.ibm.com/community/z/linuxone-cc/faststart>

Try OpenShift Container Platform on the LinuxONE Community Cloud

<https://www.ibm.com/community/z/linuxone-cc/request-oc>

<https://developer.ibm.com/components/ibm-linuxone/gettingstarted/>

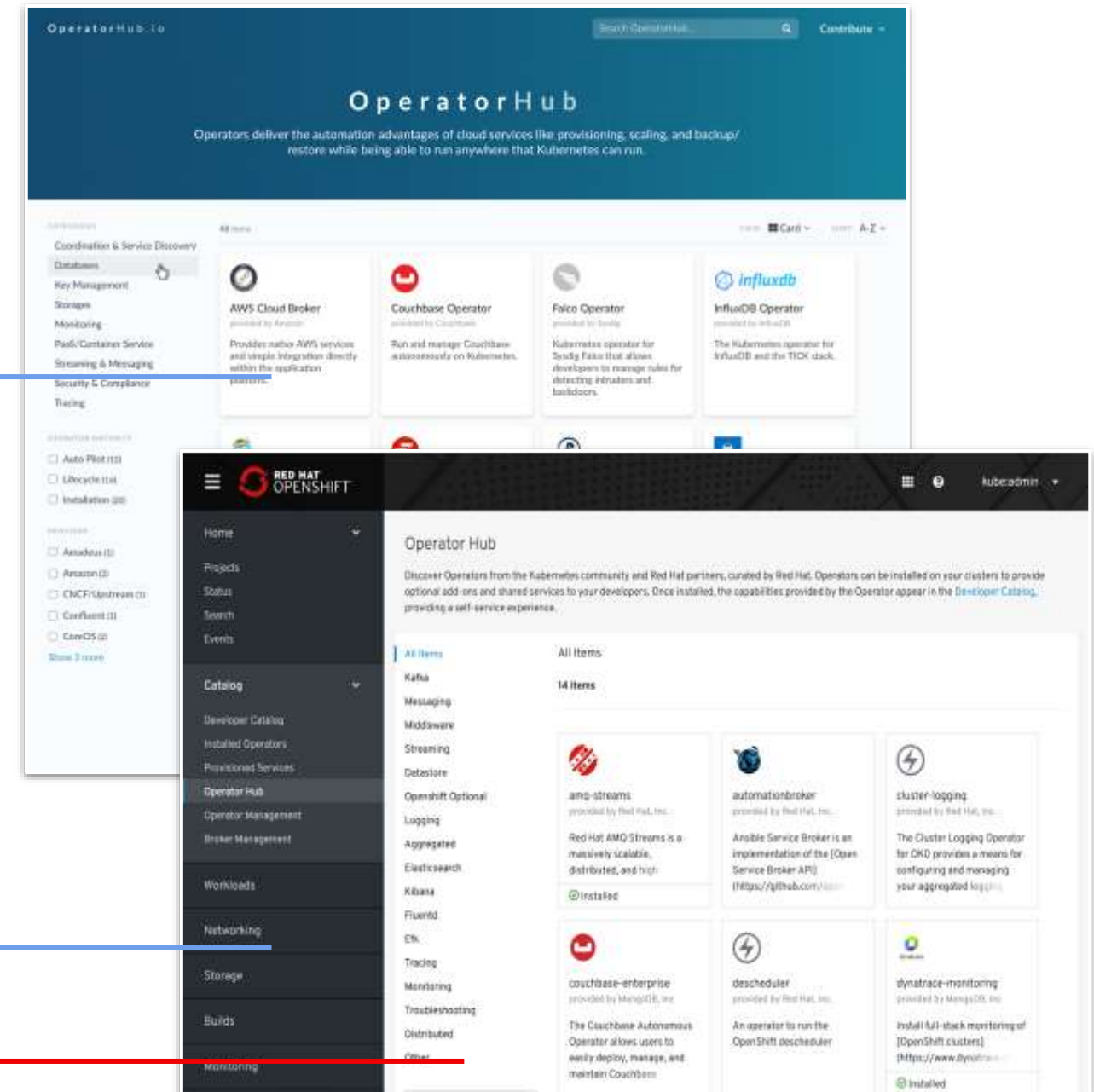


OperatorHub and certified Operators -> **NEW** certification process

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

OPENSHIFT CERTIFIED OPERATORS

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>
Redbook: <https://www.redbooks.ibm.com/redbooks/pdfs/sg248515.pdf>
- 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

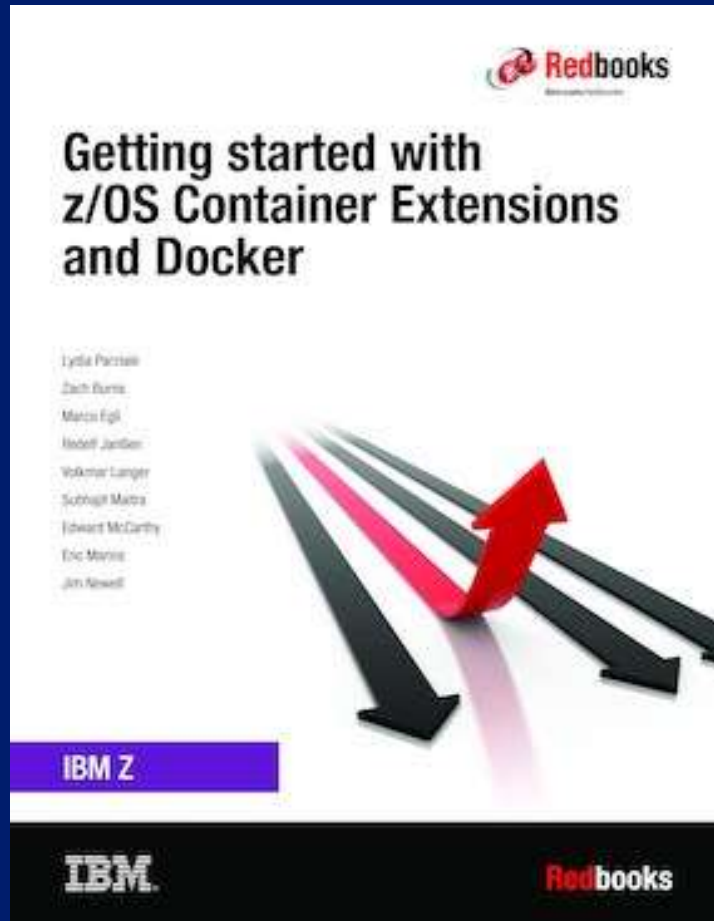
- **[Containers on IBM Z](#)**
- **Trusted IBM Container Image Registry -Sign up now:** <https://ibm.biz/zregeap>
- IBM Z container blog: [Linux on Z and Containers](#)
- zCX, Containers in z/OS : <https://www.ibm.com/support/z-content-solutions/container-extensions/>

zCX Resources

Content Solution Page

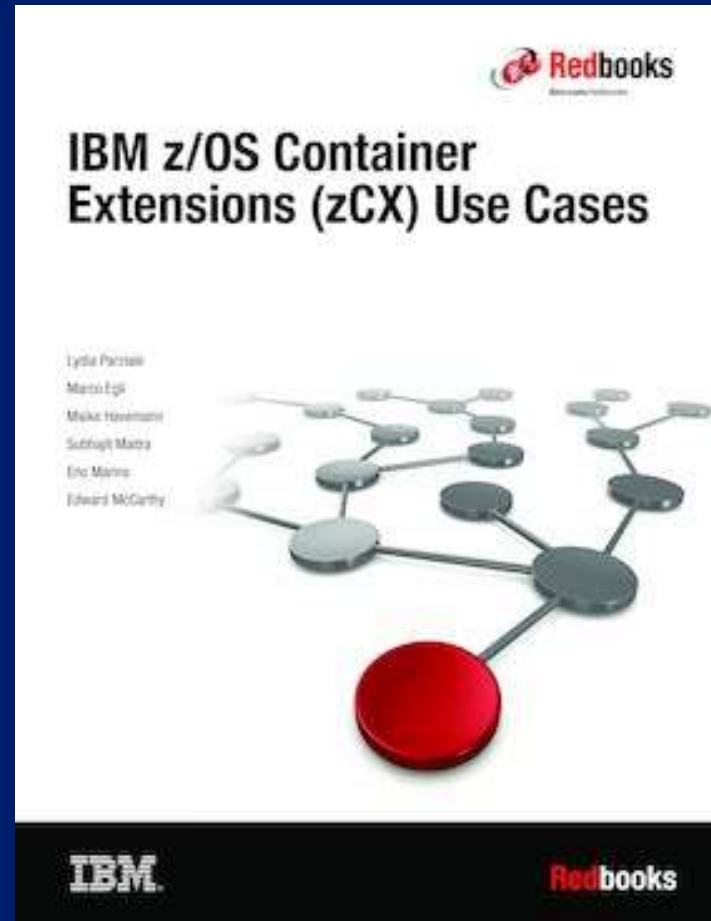
<https://www.ibm.com/support/z-content-solutions/container-extensions/>

Getting Started



IBM Form #: [SG24-8457-00](#)

Use Cases



IBM Form #: [SG24-8471-00](#)



IBM Z and LinuxONE Content Solutions

↓ Introduction

↓ How to get started

The slide features the title 'IBM z/OS® Container Extensions – zCX' in white text on a black background. Below the title, the text 'Resource Planning' is visible. A large white play button icon is centered on the right side. To the right of the play button is a large, stylized white 'Z' graphic. In the bottom left corner, there is a white circle containing the number '1'. The IBM logo is in the bottom right corner. At the very bottom, small text reads 'IBM Z / zCX / September 2019 / © 2019 IBM Corporation'.

Questions?



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