



How to build your complete Red Hat OpenShift environment on IBM Z

Wilhelm Mild
IBM Executive IT Architect
IBM R & D Lab Germany

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How to Build Your Complete Red Hat OpenShift Environment on IBM Z

Panelists:

- **Wilhelm Mild**, IBM Executive IT Architect, Integration Architectures for Container, Mobile on IBM Z and LinuxONE - IBM Systems
- **Elton DeSouza**, Chief Architect, Cloud Native Client Success on z at IBM, IBM Systems
- **Kavita Sehgal**, Program Director for Hybrid Cloud on IBM Z & LinuxONE Lead, IBM Systems
- **Narjisse Zaki**, Linux on Z & LinuxONE Architect - IBM Systems
- **Brett Webb**, Program Director for LinuxONE WW Sales Enablement - IBM Systems

Q&A can be in English, Spanish, French and German

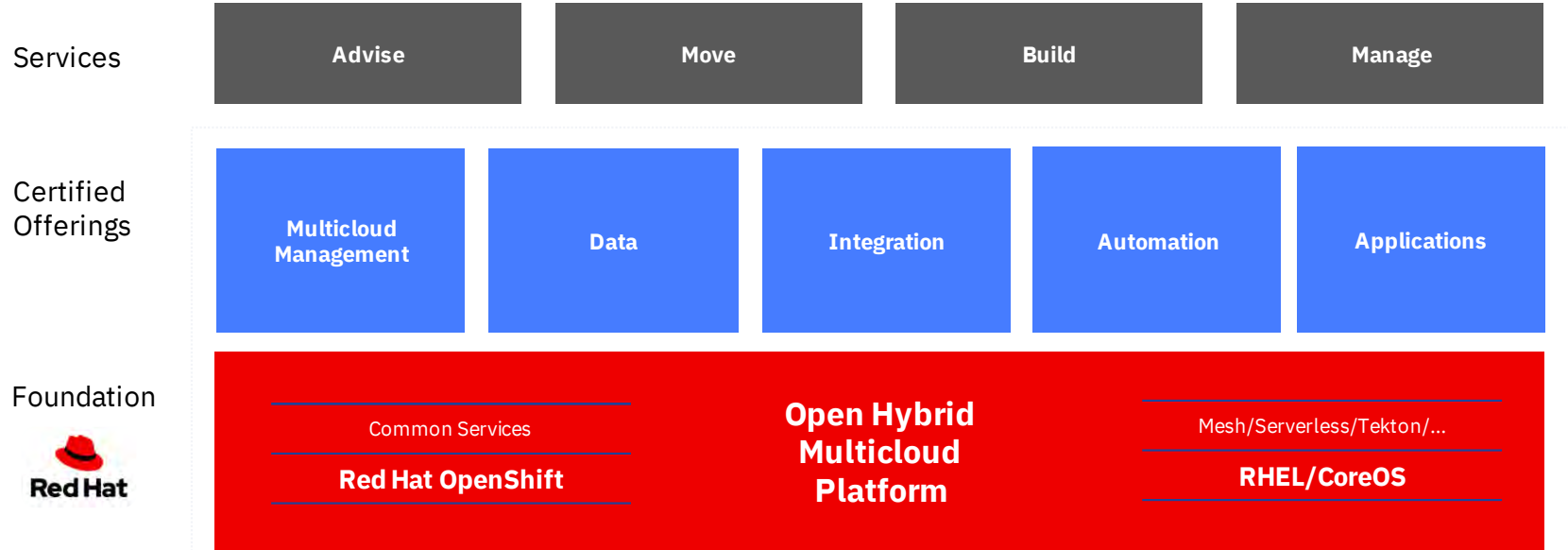
Agenda

- **What is Red Hat OpenShift**
- Red Hat OpenShift on IBM Z and LinuxONE Overview
- Planning for an environment on IBM Z & LinuxONE
- The IBM Cloud Paks
- Installation & setup guidance

Open Hybrid Cloud is the future



IBM® Hybrid Multicloud Strategy



Infrastructure

IBM Z®
IBM LinuxONE™

IBM Power Systems™

IBM cloud™

AWS™
Azure™
Google Cloud™

Red Hat OpenShift is a leader in The Forrester New Wave™: Enterprise Container Platform Software Suites

Reference quotes from the analyst report

“OpenShift supports both public cloud and on-premises environments in a dynamic and automated fashion.”

“Red Hat has great synergy across its product ecosystem.”

Analysts Link

[Forrester Red Hat OpenShift analyst reports](#)



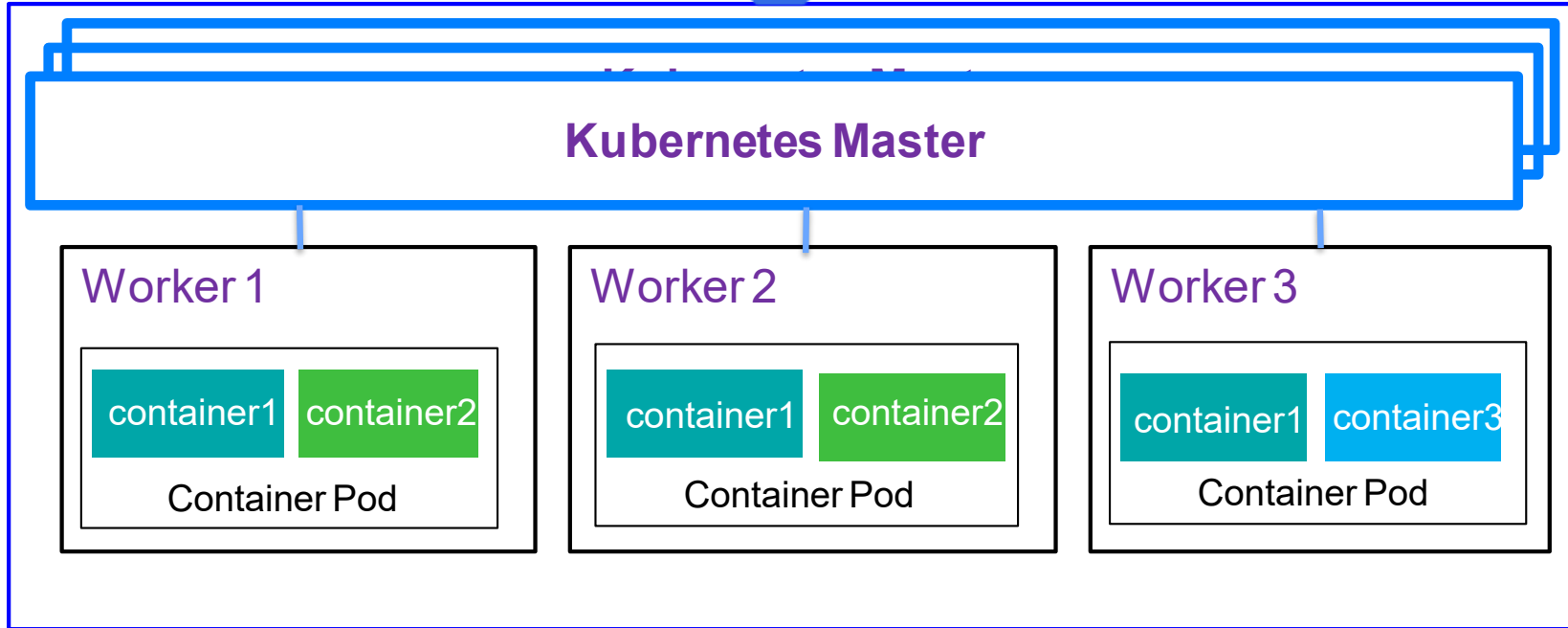
What is Red Hat OpenShift about

- An enterprise Kubernetes platform for container workloads
- Enables seamless Kubernetes deployments on any cloud or on-premises environments
- Integrated and automated installation, from infrastructure to OS and application services
- Seamless platform and application updates
- Auto-scaling of resources and services
- Ability to run enterprise workloads with enterprise CI/CD services, across multiple deployments

Kubernetes (K8S) – defines itself in a cluster format

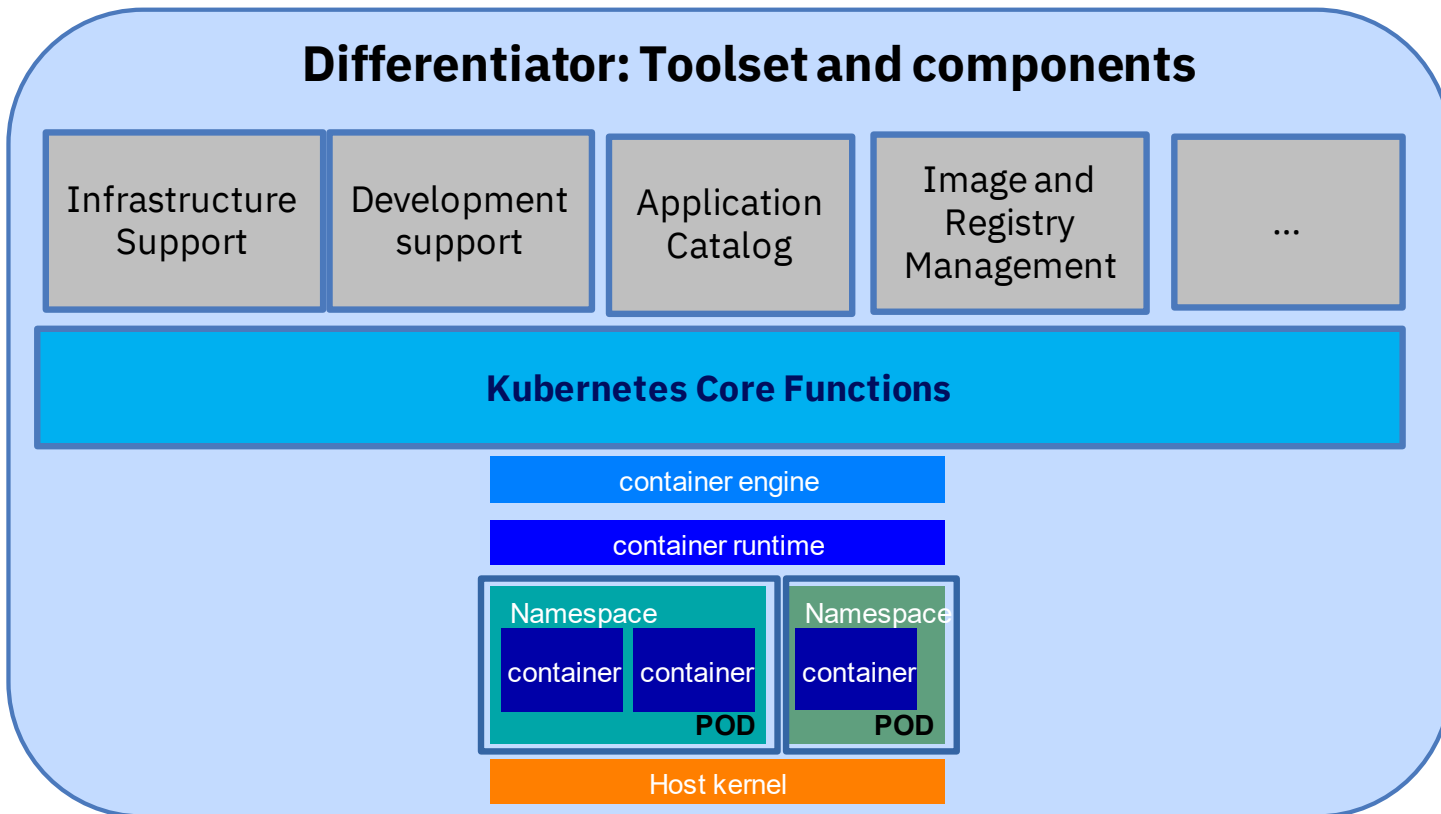


K8S cluster



- **Kubernetes orchestrates Containers; it is not running them**
- **Smallest entity is a pod, which can contain one or more containers**

Kubernetes APIs are used in all orchestration products (e.g. Red Hat OpenShift, Cloud Foundry, Rancher, IBM Cloud Private)

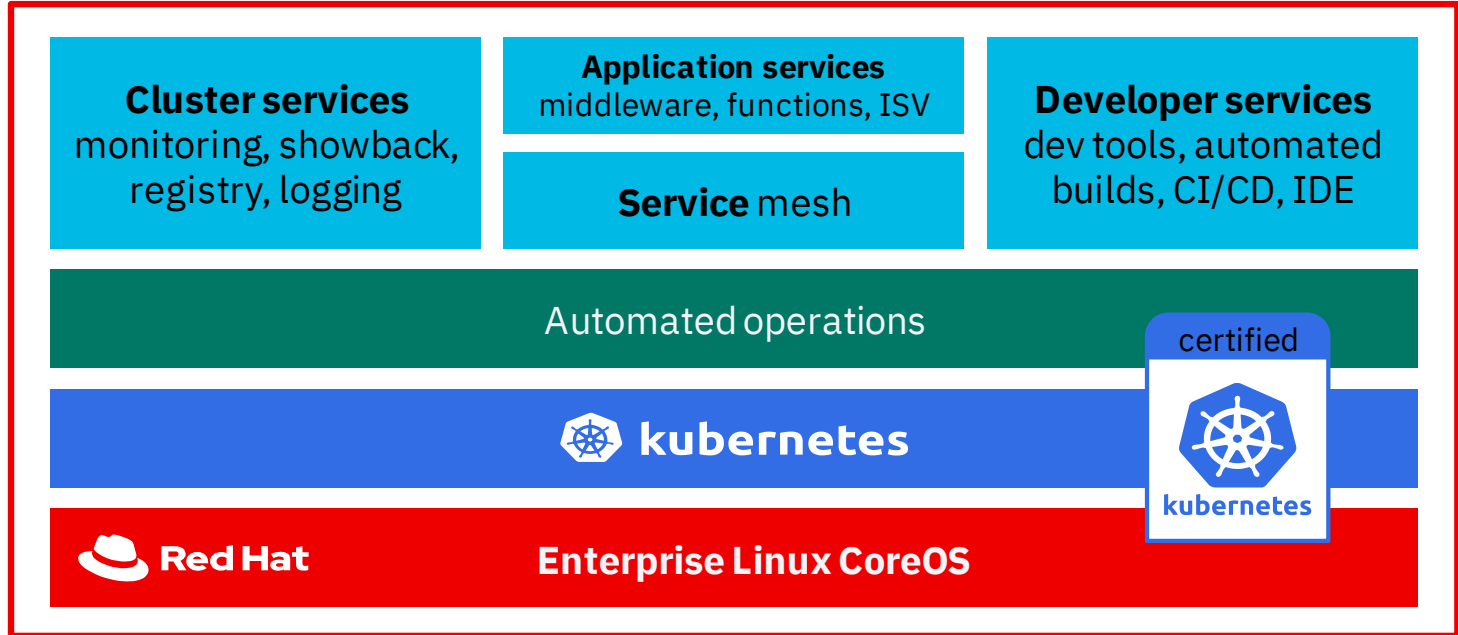


Red Hat OpenShift V4 Overview

Best IT ops experience

CaaS↔PaaS | FaaS

Best developer experience



Physical



Virtual



Private



Public

Red Hat OpenShift Container change – Docker

Red Hat headed towards a world without Docker

- *cri-o* is only one component (the Kubernetes CRI runtime) of OpenShift
- RHEL will not deliver a Docker engine anymore
- Red Hat replaced it with:
 - *podman* (Docker client compatible CLI)
 - *skopeo* (registry)
 - *buildah* (Docker build)

Container availability on IBM Z

Red Hat

	Docker	podman
RHEL 7.5	1.13	0.9.2
RHEL 7.6	1.13	1.4.4
RHEL 7.7	1.13	1.4.4
RHEL 8	-	1.0.0.2
RHEL 8.1	-	1.4.2

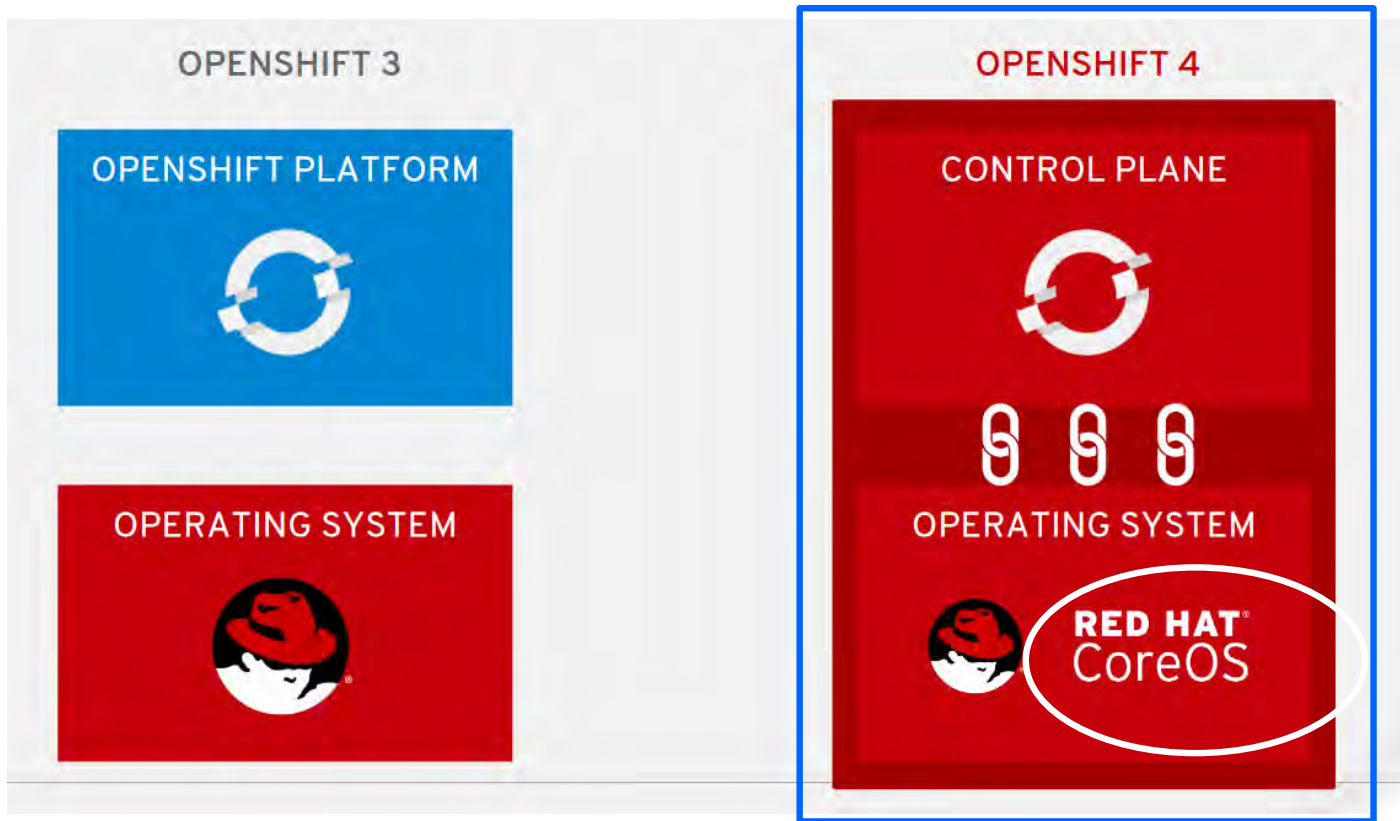
SUSE

	Docker	podman
SLES15	17.09	-
SLES15 SP1	18.09.1	1.0.1

Ubuntu

	Docker	podman
16.04 LTS	18.09.7	-
18.04 LTS	18.09.7	-
20.04 LTS	18.03.8	-

Red Hat OpenShift Version 4 evolution



Introduction to RHEL CoreOS (RHCOS)

Immutable container host based on RHEL 8

- CoreOS is tested and shipped in conjunction with the Red Hat OpenShift platform
- Immutable – can not be changed & no ssh and tightly integrated with Red Hat OpenShift
- Self-managing, over-the-air updates, appliance model – like a container
- Host isolation is enforced via Containers and Security Enhanced Linux (SELinux)

CoreOS is operated as part of the cluster with config for components managed by operators.



30. April 2020

NEW

**Red Hat OpenShift v4.3 for IBM Z and LinuxONE
is available today !**



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Red Hat OpenShift V4 Installation Options

On IBM Z and LinuxONE

OPENSIFT CONTAINER PLATFORM

Full Stack Automated (IPI)

Simplified opinionated “Best Practices” for cluster provisioning

Fully automated installation and updates including host container OS.



Pre-existing Infrastructure (UPI)

Customer managed resources & infrastructure provisioning

Plug into existing DNS and security boundaries



HOSTED OPENSIFT

Red Hat OpenShift on IBM Cloud *

Deploy directly from the IBM Cloud console. An IBM service, master nodes are managed by IBM Cloud engineers.

Azure Red Hat OpenShift **

Deploy directly from the Azure console. A MSFT service, jointly managed by Red Hat and Microsoft Azure engineers.

OpenShift Dedicated **

Get a powerful cluster, fully managed by Red Hat engineers and support; a Red Hat service.

▶ * Based on OCP v4.3 GA slated for March; public beta available now

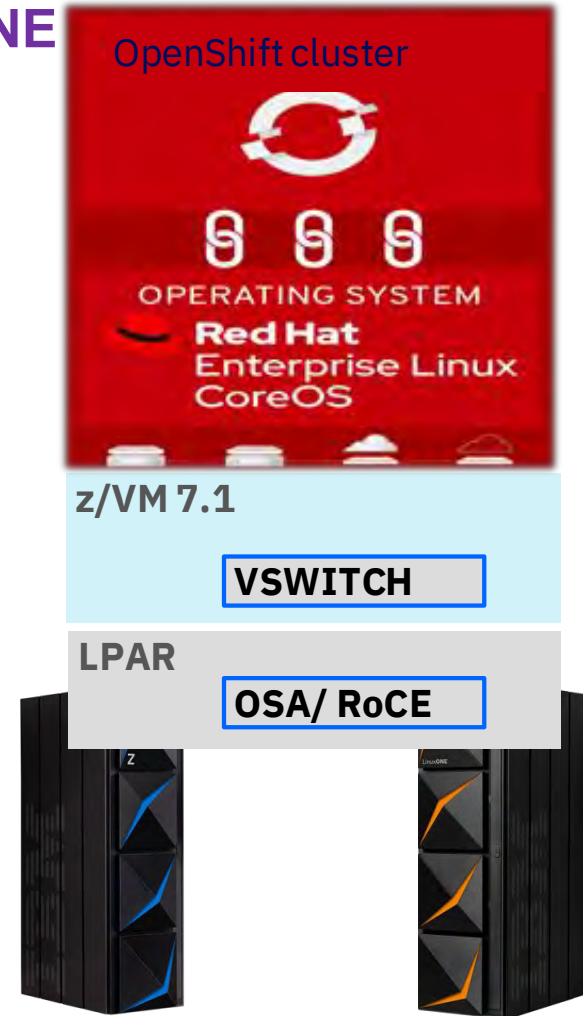
▶ ** Entitlements of OCP obtained through a Cloud Pak purchase are not transferable to these environments

Red Hat OpenShift (OCP) V4 on IBM Z and LinuxONE

- takes advantage of the underlying enterprise capabilities
 - grow to **thousands of Linux guests**
 - and **millions of containers**
- non-disruptively grow, vertical and horizontal scalability
 - including advanced security
 - **confidential Cloud Computing**, including **FIPS 140-2 Level 4** certification

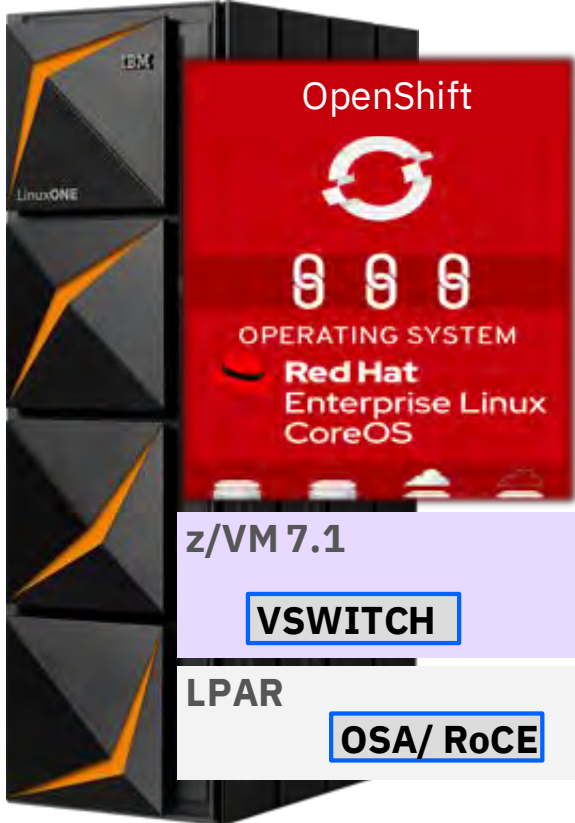
These capabilities were highlighted with the recent announcement of the [IBM z15](#) and [IBM LinuxONE III](#). Running Red Hat OpenShift on IBM Z and LinuxONE also enables cloud native applications to easily integrate with existing data and applications on these platforms, reducing latency by avoiding network delays.

<https://www.ibm.com/blogs/systems/get-ready-for-red-hat-openshift-on-ibm-z-and-linuxone/>



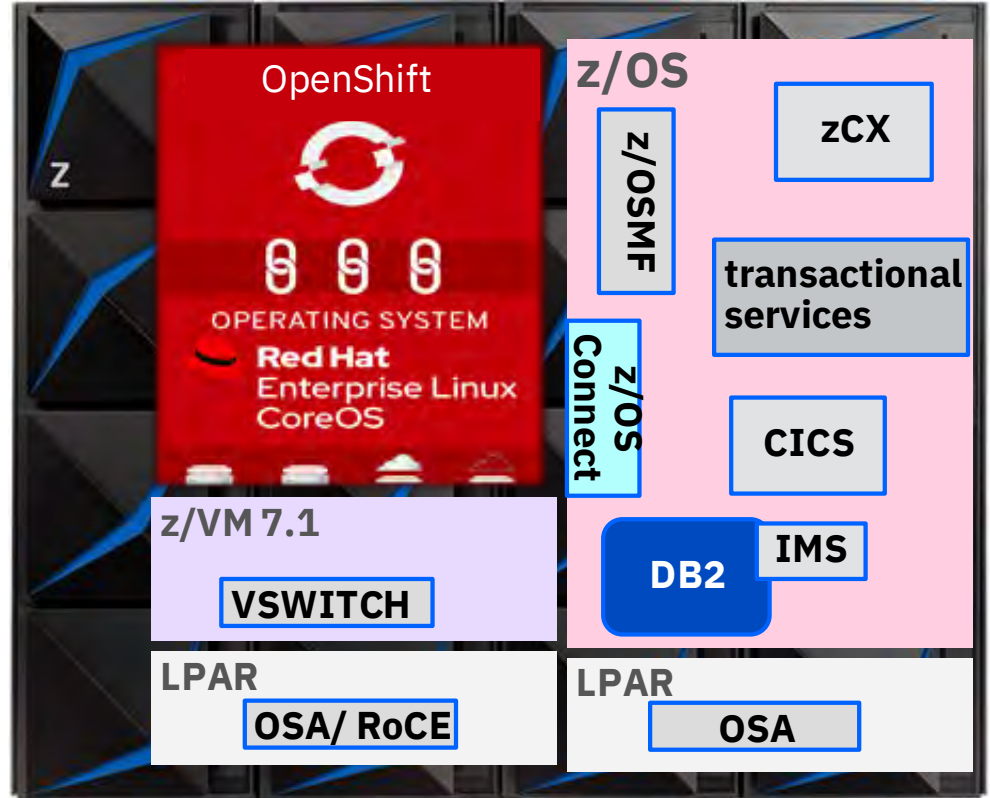
Red Hat OpenShift on LinuxONE or IBM Z collocated with z/OS

IBM LinuxONE



Red Hat OpenShift standalone

IBM Z



Red Hat OpenShift collocated with z/OS

Poll

Which Red Hat OpenShift environment(s) would be most likely implement in your enterprise?

- (A) Red Hat OpenShift standalone**
- (B) Red Hat OpenShift collocated with z/OS**
- (C) Both**

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Minimum OCP cluster Nodes on IBM Z & LinuxONE with z/VM 7.1 (PoC)

The minimum system requirements for an OCP cluster are:

➤ Hardware:

- IBM z13 or later
- any IBM LinuxONE
- 1 LPAR, SMT2 with 3 IFLs, +80GB RAM

➤ Hypervisor

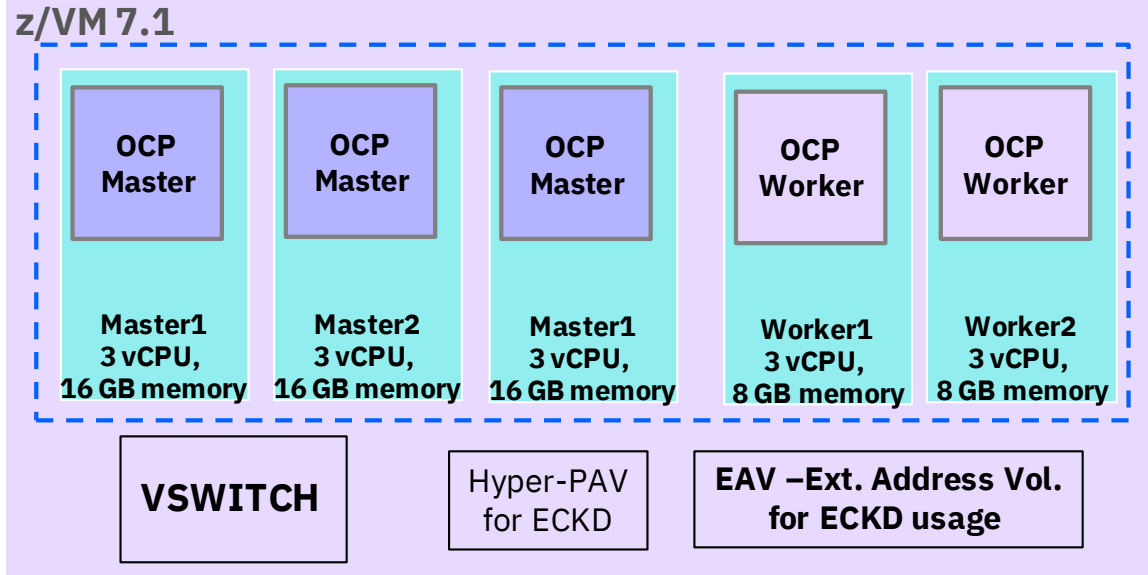
- z/VM Hypervisor 7.1
- EAV Function (HyperPAV recomm.)

➤ Networking options

- OSA, RoCE, z/VM VSWITCH
- 1 Network interface avail. per Node

➤ Storage

- OCP Master, 120 GB each
- OCP Worker, 120 GB workload dep.
- NFS, 150 GB



LPAR (z13,+ / LinuxONE)
3IFLs + SMT2

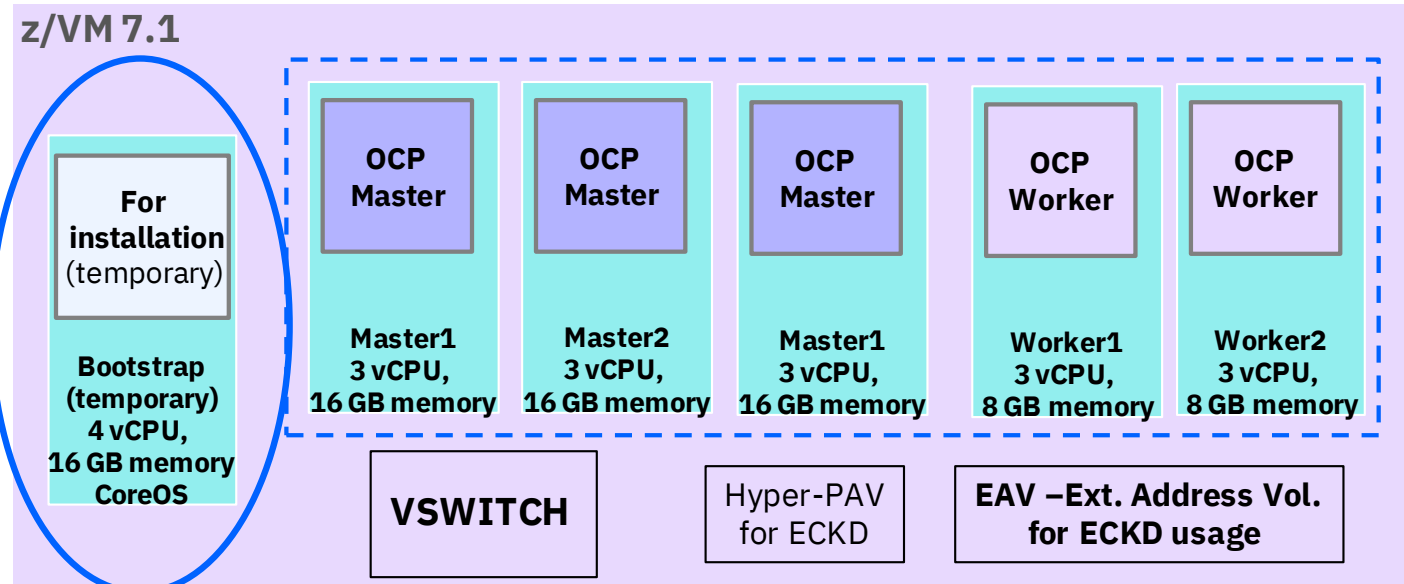
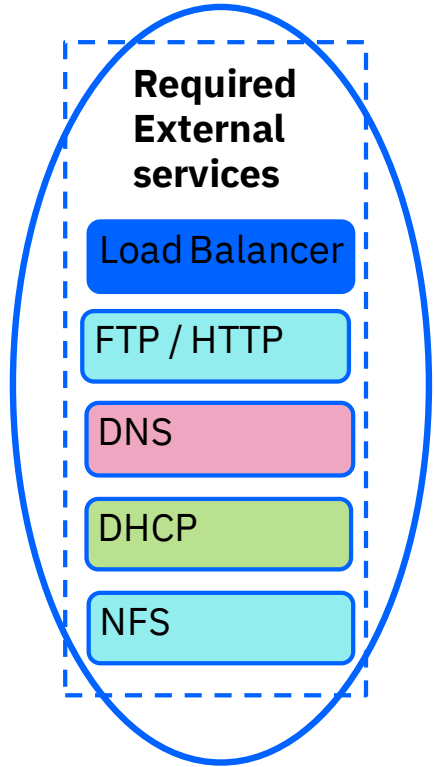
OSA/ RoCE

NFS

FCP/SCSI

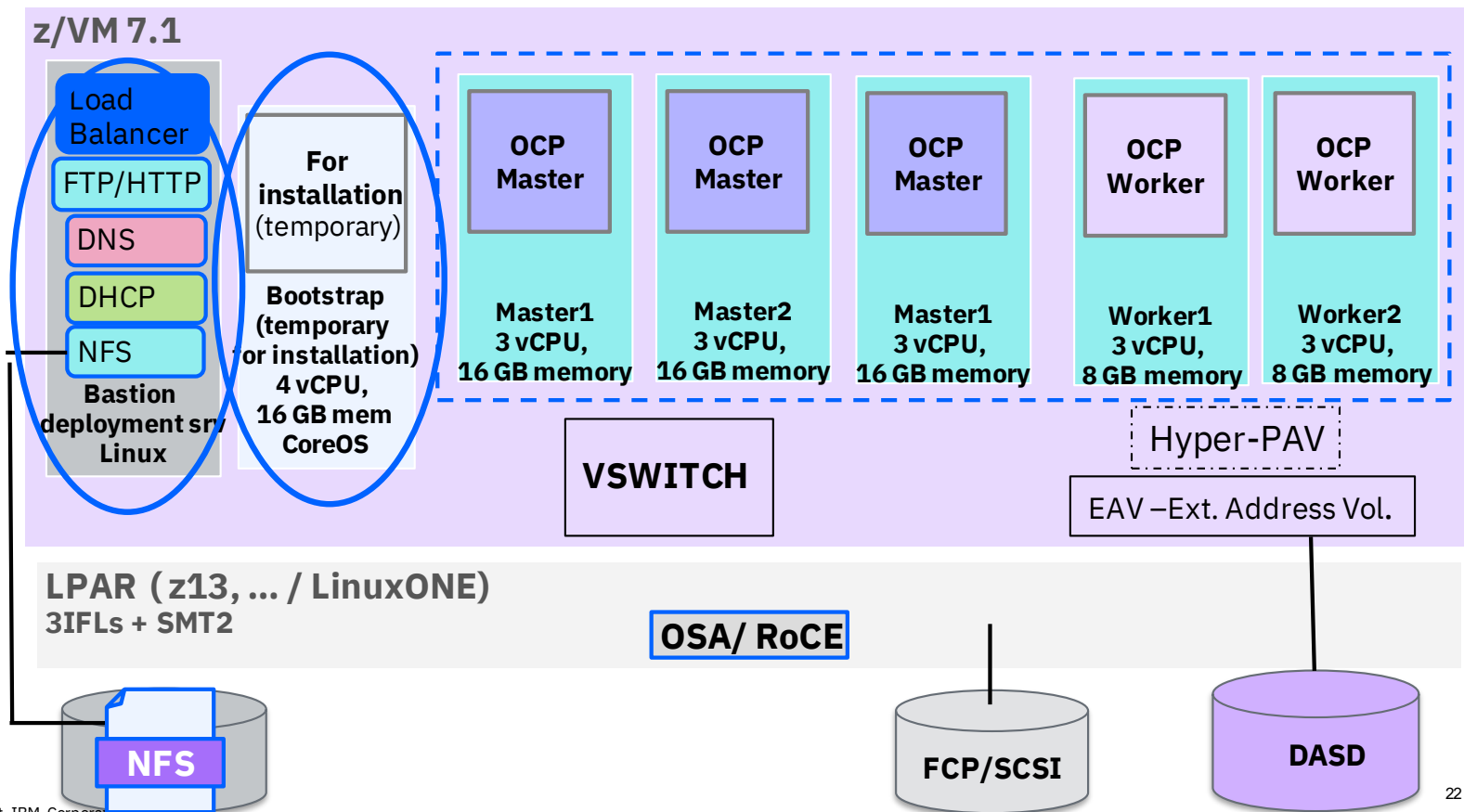
ECKD/DASD

Additional Requirements to Build a OCP V4.3 cluster in z/VM

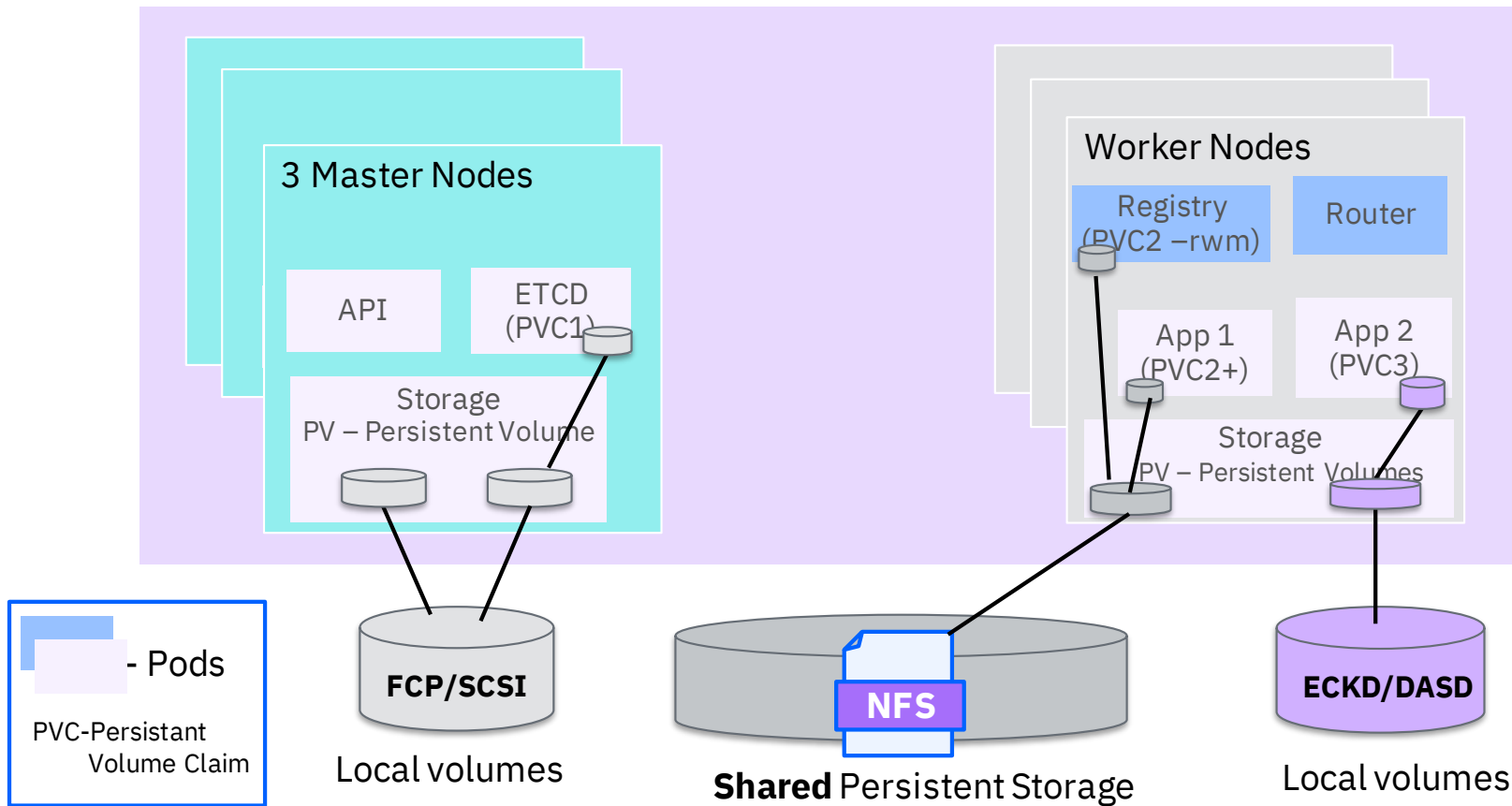


All required Infrastructure components for OCP can be in z/VM guests

- Minimum 3 Master / Control Planes, the number of Worker Nodes can vary, min 2 Worker Nodes

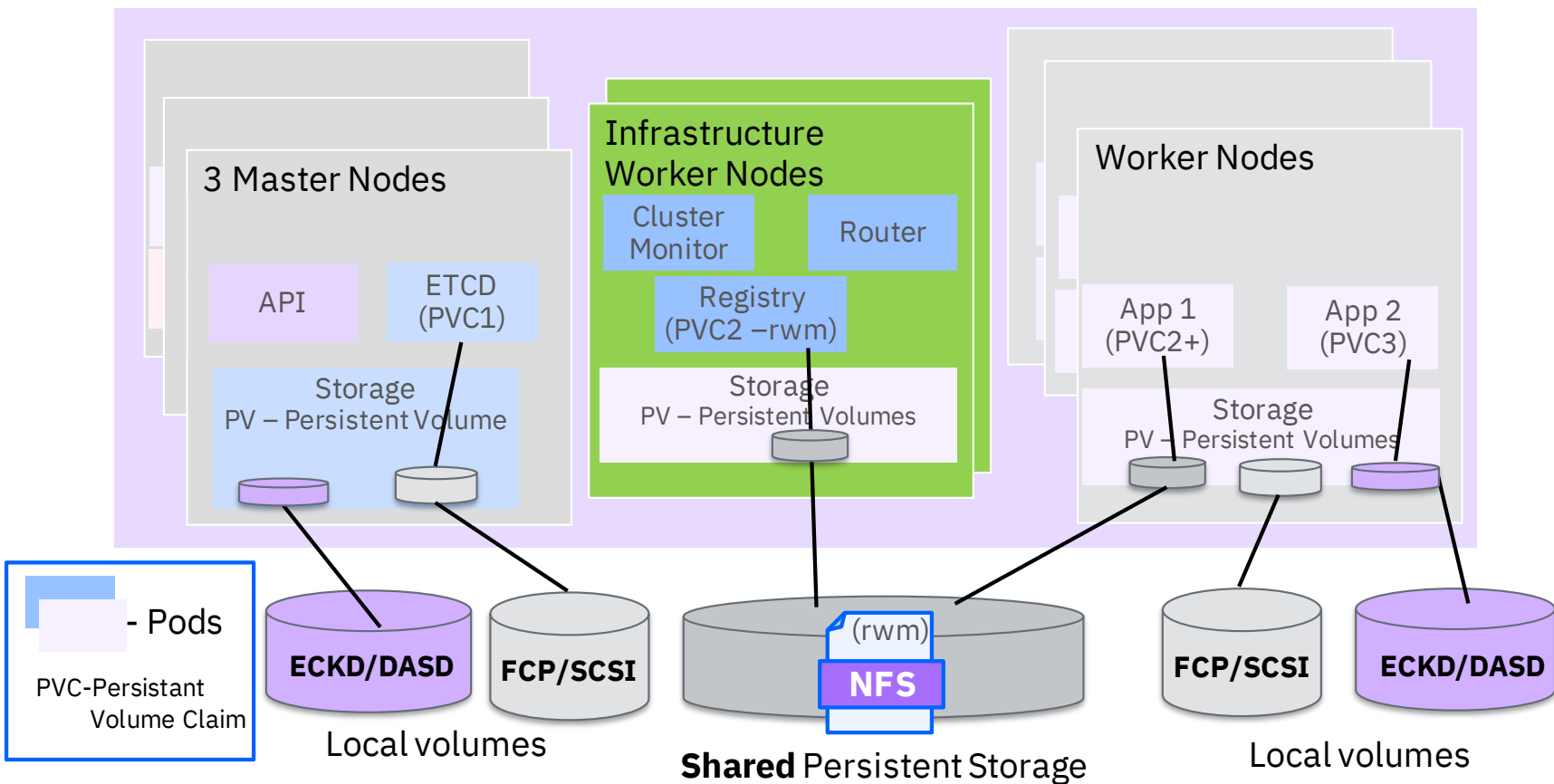


Major Operational Components and Storage options for OCP Nodes



https://docs.openshift.com/container-platform/4.3/storage/persistent_storage/persistent-storage-local.html

Major Operational Components and Persistent Storage options



https://docs.openshift.com/container-platform/4.3/storage/persistent_storage/persistent-storage-local.html

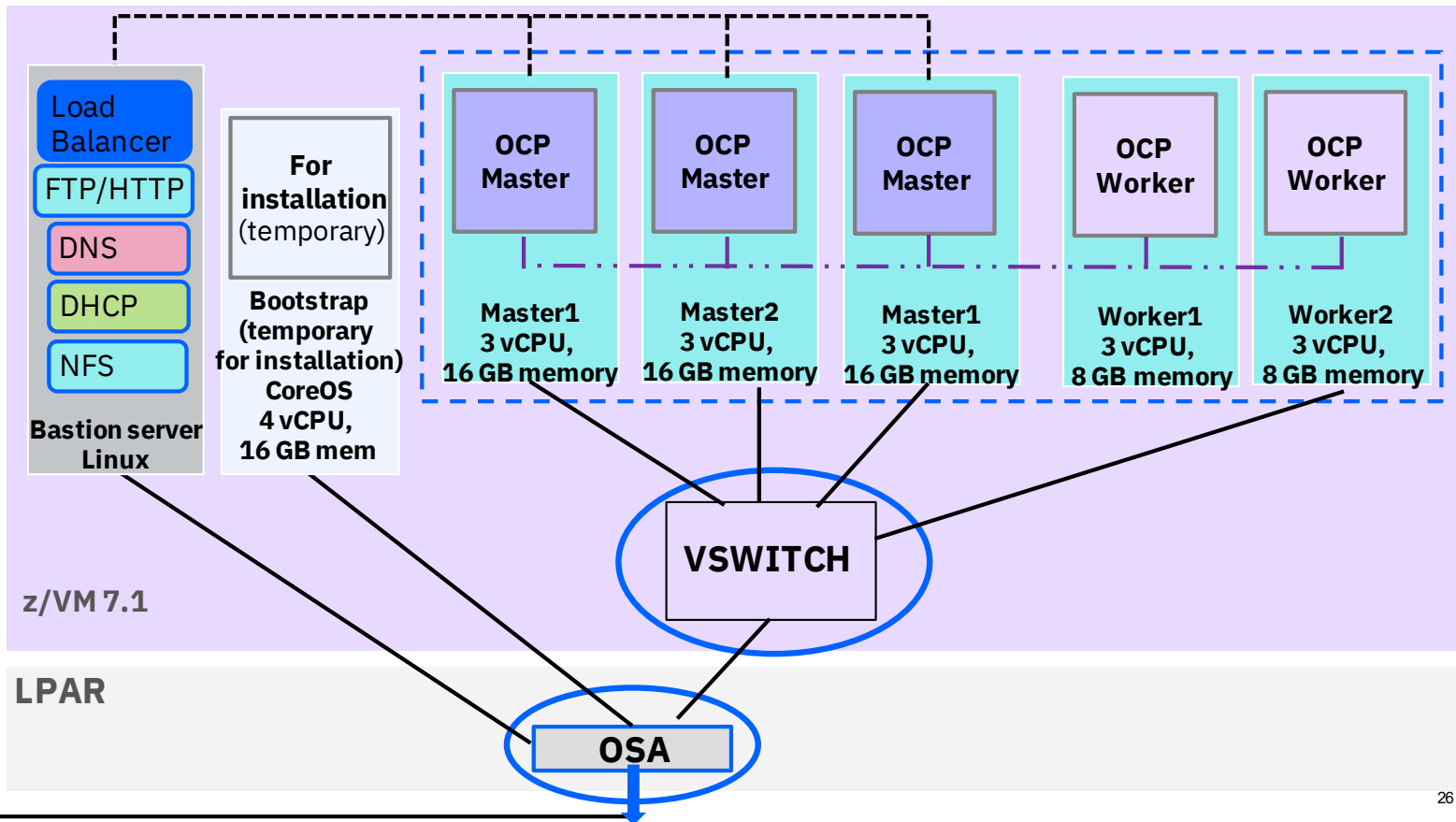
Red Hat OpenShift Infrastructure components on IBM Z and LinuxONE

OpenShift components that fall into the **Infrastructure** categorization include do not require subscription:

- OpenShift control plane services ("masters")
 - Router
 - container image registry
 - cluster metrics collection ("monitoring")
 - cluster aggregated logging
 - service brokers
- Any node running a container / pod / component not described above is considered a 'worker' and must be covered by a subscription.

Network topology options for OCP with z/VM VSWITCH

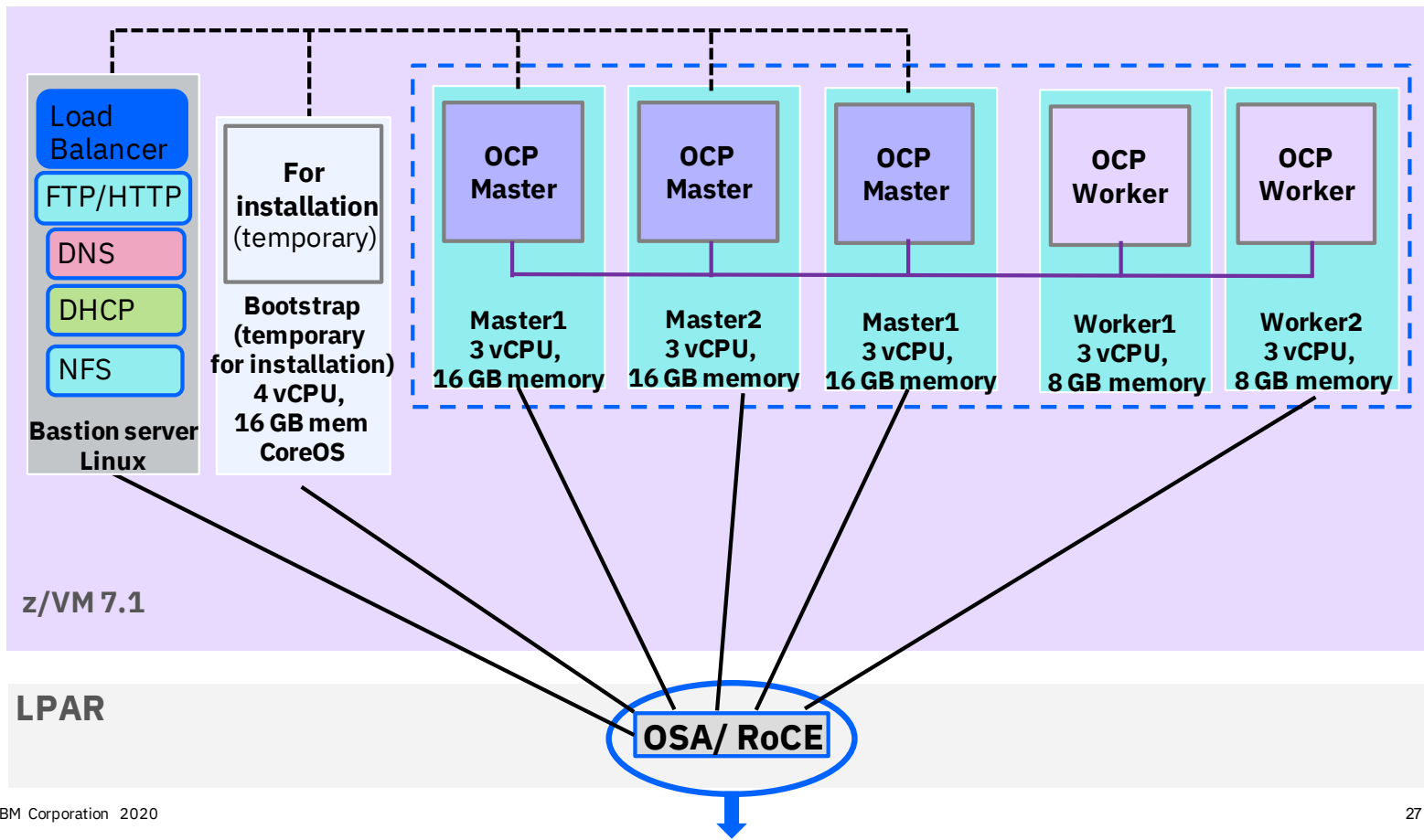
- The OCP cluster requires external network communication



Using z/VM VSWITCH enables easier extension with OCP Nodes

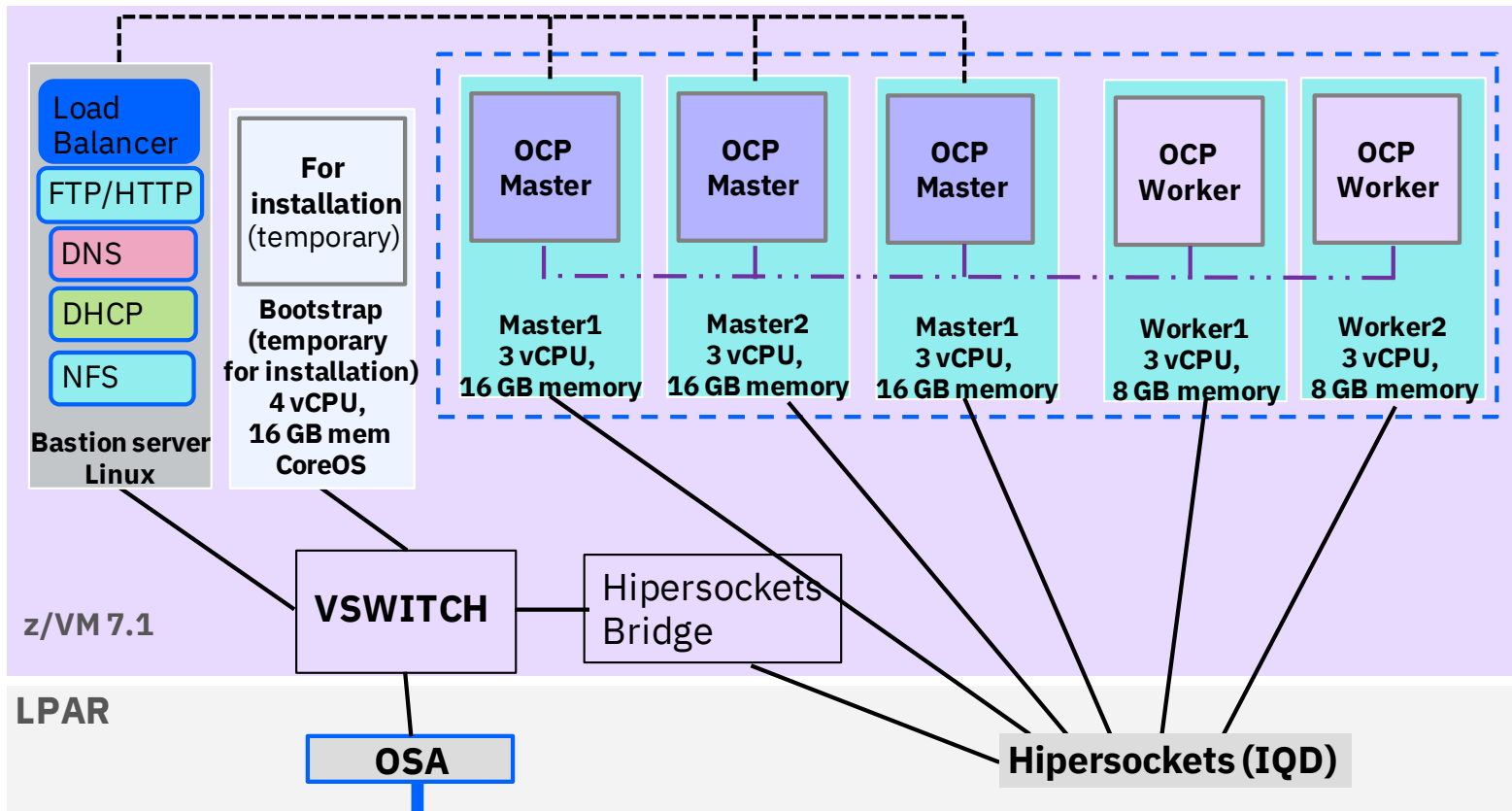
Network topology options for OCP with direct OSA attachment

- The OCP cluster requires external network communication



Network topology options for OCP with z/VM VSWITCH & Hipersockets

- The OCP cluster requires external network communication



Using Hipersockets enables very fast communication in the cluster

OCP on IBM Z & LinuxONE implementation topology planning

A) What is the Use Case

- PoC environment
 - *less resources*
- Productive like env.
 - *SLA based*

B) What are SLAs

- DevOps integration
 - *automation*
 - *shared content*
- Transactional load
 - *performance*
- HA variants
 - *availability*
 - *resiliency*



1. HW topology

- On one HW machine
 - *One cluster / 1LPAR (PoC)*
 - *multiple LPARs*
- Multiple HW machines
 - *in same DC*
 - *across DC*

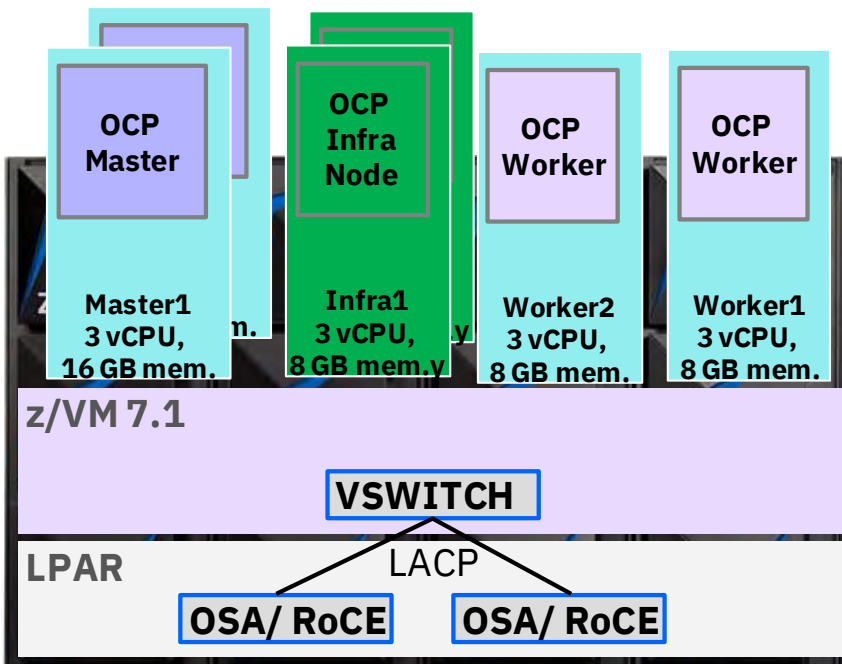
2. Deployment topology

- *OCP Standalone*
- *collocated with z/OS*

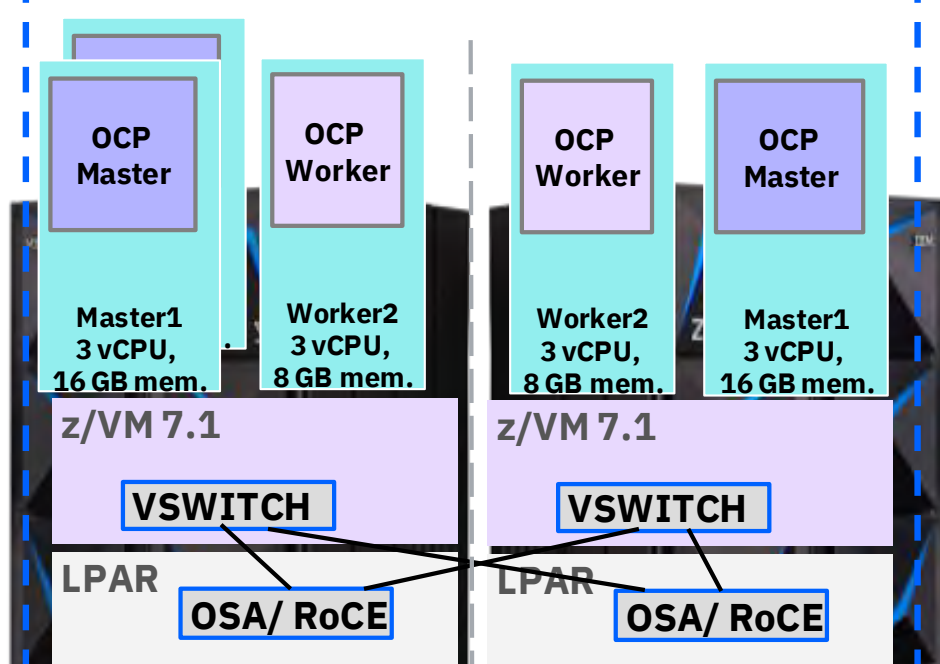
Use Cases: Red Hat OpenShift cluster HA options

Distribute OCP nodes to different z/VM instances on one or more IBM Z / LinuxONE servers to achieve HA and avoid service outages

z/VM Isolation: EAL4+



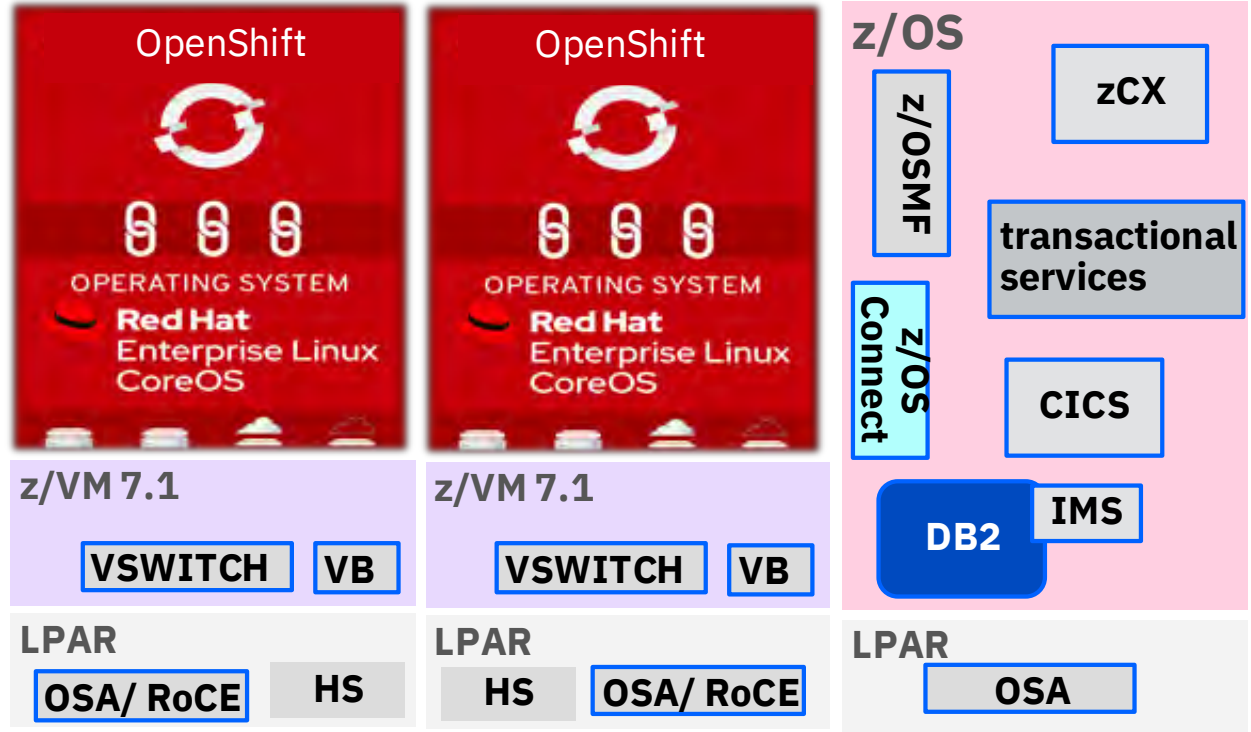
LPAR Isolation: EAL5+



Red Hat OpenShift collocation environment with z/OS

OCP collocation to z/OS major use cases:

- Dynamic workload accesses z/OS services
- OCP logic access to DB2 z/OS
- OCP uses z/OS Cloud Broker to access z/OS resources
- OCP Web environment with z/OS transactional integration
- OCP with Open Source technologies extends z/OS
- Batch workload executed in OCP with z/OS data



Network options:

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

IBM z/OS Cloud Broker

- **Connects z/OS services running on an IBM Z backend to a frontend private cloud platform** providing self-service access and consumption of these services to developers



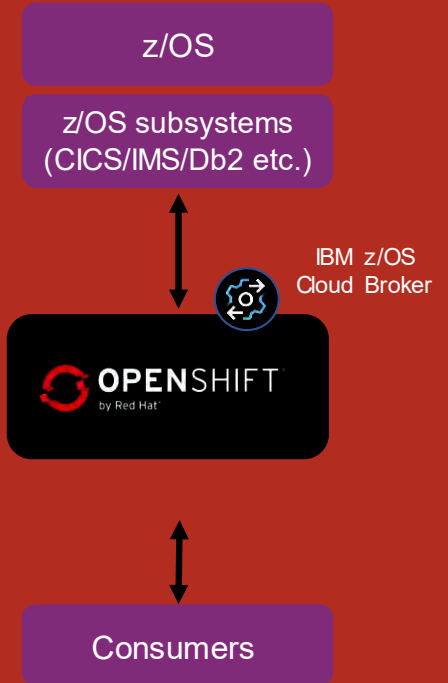
Provides self-service access to managed IBM Z resources to all flavors of application developers



Centralization and automation of IBM Z operations to provide Z resources to agencies or clients in their hybrid cloud



Improve time to value through efficiencies in development and deployment



Configuration summary for a cluster in OpenShift Container Platform on IBM Z & LinuxONE

Bootstrap and Master Nodes (Control Planes)

- 4 vCPUs
- 16+ GB main memory
- 120GB disk storage

Worker Nodes (+ depending on workload)

- 2+ vCPUs (1+ IFLs with SMT2 enabled)
- 8+GB main memory
- 120GB disk storage (workload dependant)

Reference about OCP cluster limits

- https://docs.openshift.com/container-platform/4.2/scalability_and_performance/planning-your-environment-according-to-object-limits.html

Operating System

- A Linux for Bastion deployment server
- RHEL CoreOS only for Master and Bootstrap
- RHEL CoreOS only for Worker Nodes

Persistent Storage / Persistent Volume (PV)

- NFSv4 server with >100GB disk storage
- 100GB for internal registry at minimum

Infrastructure Services (Pre-requisites)

- DHCP server or static IP addresses for OCP Nodes
- DNS server (e.g. BIND, ExternalDNS, dnsmasq)
- Load balancer (e.g. IBM Datapower, F5, NGINX, HAProxy ...)
- Internet connectivity, or AirGap install (new in OCP 4.3)


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IBM Software as Cloud Paks – *Middleware anywhere*







A faster, more secure way to move your core business applications to any cloud through enterprise-ready containerized software solutions

IBM containerized software
 Packaged with Open Source components, pre-integrated with the common operational services, and secure by design



Container platform and operational services
 Logging, monitoring, security, identity access management



- Complete yet simple**
Application, data and AI services, fully modular and easy to consume
- IBM certified**
Full software stack support, and ongoing security, compliance and version compatibility
- Run anywhere**
On-premises, on private and public clouds, and in pre-integrated systems

IBM Cloud Paks for Red Hat OpenShift

Integrated with IBM's public cloud, leveraging RedHat OpenShift

**Cloud Pak for
Applications**

**Cloud Pak
for Data**

**Cloud Pak for
Integration**

**Cloud Pak for
Automation**

**Cloud Pak for
Multicloud
Management**

**Cloud Pak for
Security**



- Enterprise-proven managed Kubernetes service running 14k+ production clusters
- Most secure environment for containerized workloads with built-in container level security, isolation, bare metal support, and broad industry compliance (PCI, HIPPA, etc.)
- Built in load balancing and multi-zone availability for simplified management and resiliency
- Cloud Paks are certified and optimized for On-Prem platforms and IBM's public cloud for accelerating moving your workloads to the cloud

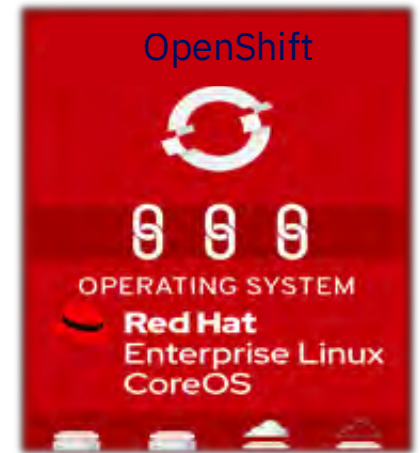
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OpenShift on IBM Z and LinuxONE

Basic installation steps:

- Prepare your z/VM environment (User directories, storage, network)
 - Prepare the CoreOS Bootstrap (temporary) server
 - Setup an FTP or HTTP server to serve installation files
 - Prepare the OCP pre-req. Services: DNS, NFS, Load Balancer, DHCP
 - Download OCP product code from cloud.redhat.com:
 - openshift-installer, RH CoreOS image
 - Run the openshift-installer to define and create ignition files for the OpenShift cluster
 - Save the ignition files on the FTP / HTTP server
 - Copy kernel image, parmfile, coreos-installer image to your z/VM guests
 - Adjust the parmfile for the z/VM guest and specify the ignition file for the bootstrap, master, and worker nodes
 - Punch the installation files into the z/VM virtual readers
 - Boot (IPL from z/VM virtual reader) the CoreOS-installer on each node, to install the bootstrap, master, and worker nodes
- Red Hat Installation documentation:
https://access.redhat.com/documentation/en-us/openshift_container_platform/4.3/html/installing_on_ibm_z/installing-on-ibm-z
- Step by step sample installations and environment setup
<https://www.openshift.com/blog/installing-ocp-in-a-mainframe-z-series>
<https://www.openshift.com/blog/red-hat-openshift-installation-process-experiences-on-ibm-z-linuxone>



z/VM 7.1

VSWITCH

LPAR

OSA/ RoCE



Replay availability!

Wilhelm Mild

IBM Executive IT Architect

wilhelm.mild@de.ibm.com

+49-703-116-3796

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<https://bit.ly/TechUTalks>

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- **The replay, presentation and Q&A transcript will be available on the TechU Talks page within 48 hours.**

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<https://learn.openshift.com/>

Interactive Learning Portal

Our Interactive Learning Scenarios provide you with a pre-configured OpenShift® instance, accessible from your browser without any downloads or configuration. Use it to experiment, learn OpenShift and see how we can help solve real-world problems.

Foundations of
OpenShift

START COURSE

Building
Applications On
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START COURSE

Subsystems,
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Where can you download OCP?

try.openshift.com
cloud.redhat.com

OCP 4.3
GA 30. Apr.
2020



More information

Get a free account on cloud.redhat.com

<https://developer.redhat.com>

Red Hat OCP portal

cloud.redhat.com

Install OCP on IBM Z

https://docs.openshift.com/container-platform/4.2/installing/installing_ibm_z/installing-ibm-z.html

Learn OpenShift

<https://learn.openshift.com>

Ross Mauri's Blog

<http://www.ibm.com/blogs/systems/red-hat-openshift-now-available-ibm-z-linuxone>

IBM Systems Magazine Article

<https://ibmsystemsmag.com/01/2020/cutting-edge-ibm-z-innovations>

IDC Whitepaper

<https://www.ibm.com/it-infrastructure/linuxone/capabilities/linux-containers>

Questions?



Wilhelm Mild
IBM Executive IT Architect

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



IT Architecture
Chief, Lead IT Architect

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



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