OpenShift **on** IBM Z **and** LinuxONE

Worldwide **Acceleration Team**

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What problems are customers trying to solve?

Customer Expectations Continue to Rise

The empowered customer is increasingly savvy and expects a highly personalized experience, one that is consistent across channels. The cause of this rising expectations is fairly clear and Uber, Amazon, Airbnb, Netflix are the disruptors of their industries.
“Each time a consumer is exposed to an improved digital experience, their expectations are immediately reset to a new higher level.”

SPEED is More Important than Ever

"It's no longer the big beating the small, but the fast beating the slow."
Indeed the challenge for many legacy brands is that they struggle to move as rapidly towards the future that digital disruptors have already staked out.

Digital Transformation means Business Transformation

Enterprises need to recognize that evolving to a true digital value proposition isn't just about digital, but requires in many cases a re-invention of major portions of the business including core technology systems, operating processes and business models
"Digital transformation is a fundamental shift in how a firm delivers value and drives revenue."

How containers can help ?

Infrastructure Efficiency
Containers significantly reduce the overhead on compute resources — particularly memory. This enables far more workloads per physical server since each share a single host OS, meaning only one copy of the kernel and system libraries is running per system.

Greater Scalability
Greater scalability is garnered through the use of container orchestration systems like Kubernetes that can automatically place workloads on the least-used node in a container cluster and dynamically scale the number of container instances up and down in response to changing application usage

Greater Agility in Application Delivery
This increase is a result of the low resource overhead of containers that allows new instances to be deployed in seconds.

DevOps Organizations Creation
Containers facilitate the integration of developers and IT operations into DevOps organizations that can accelerate application testing and delivery.

New Application Creation
Containers combine deployment agility, process automation, and application scalability, allowing developers to rapidly explore and prototype new ideas while encouraging them to design differently. A different approach helps developers take advantage of distributed container systems, along with their dynamic scalability and frictionless startup and shutdown processes.

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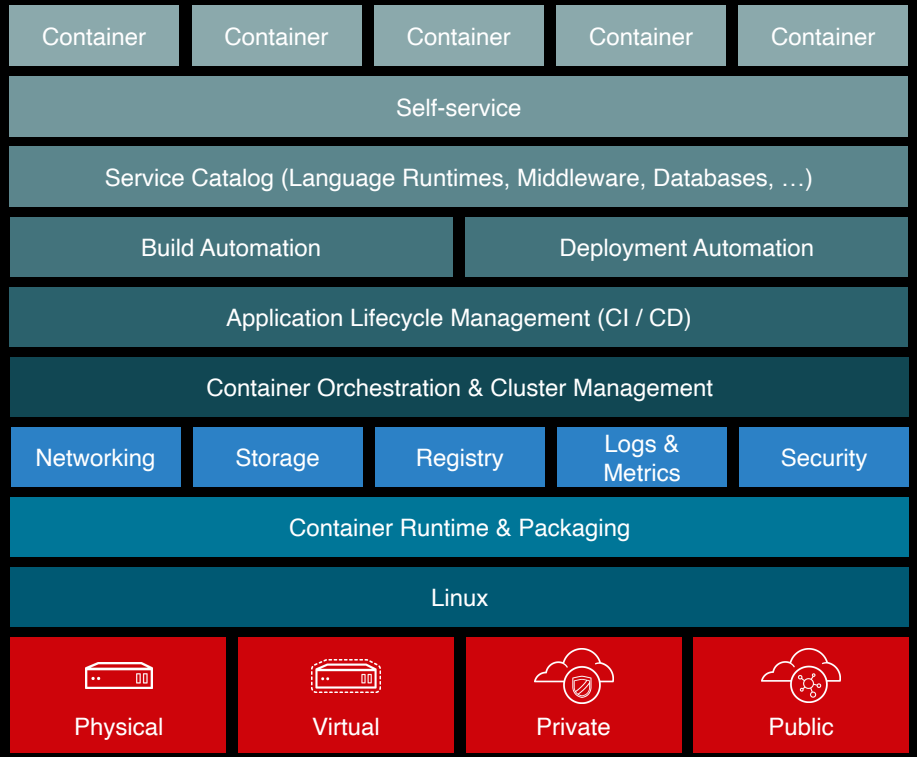
DIY CONTAINER STACK CHALLENGES

Bring your own middleware, data & other services. Build out a service catalog / interface to enable self-service deployment.

Pull Kubernetes or other orchestration (Mesos, Swarm) from rapidly moving upstream & support / maintain yourself. Do all the work required to integrate it into your enterprise IT environment (networking, storage, registry, security, logging, metrics, etc.)



Take existing application build/CI & deployment tools and evolve to add container image build & mgt., continuous deployment, etc.

Pull Docker container runtime from rapidly moving upstream and support, secure and maintain it yourself.

Support and manage your own Linux community distro or build on existing RHEL or 3rd party commercial Linux offerings.

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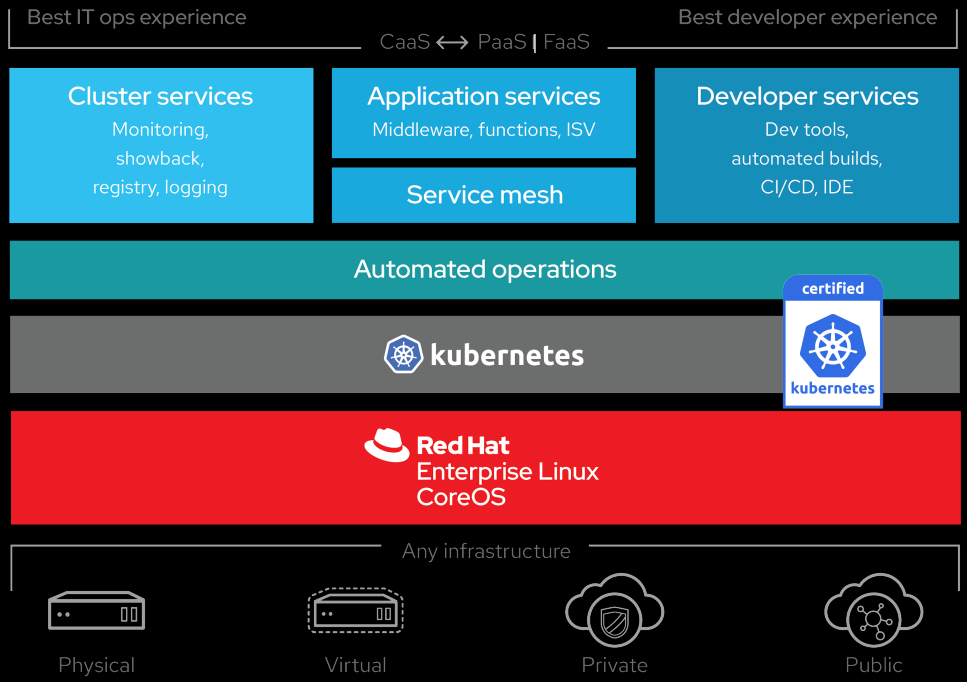
Red Hat Openshift 4



Automated, full-stack installation from the container host to application services

Seamless Kubernetes deployment to any cloud or on-premises environment

Autoscaling of cloud resources

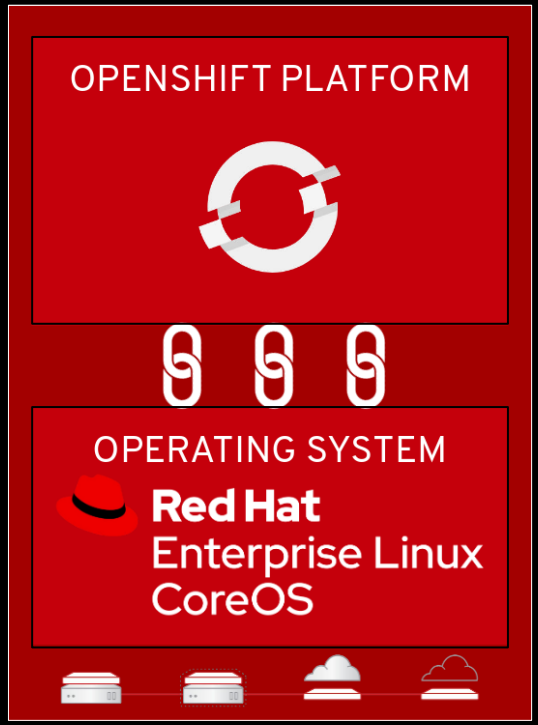
One-click updates for platform, services, and applications

Introduction to RHEL CoreOS (RHCOS)

Immutable container host based on RHEL 8

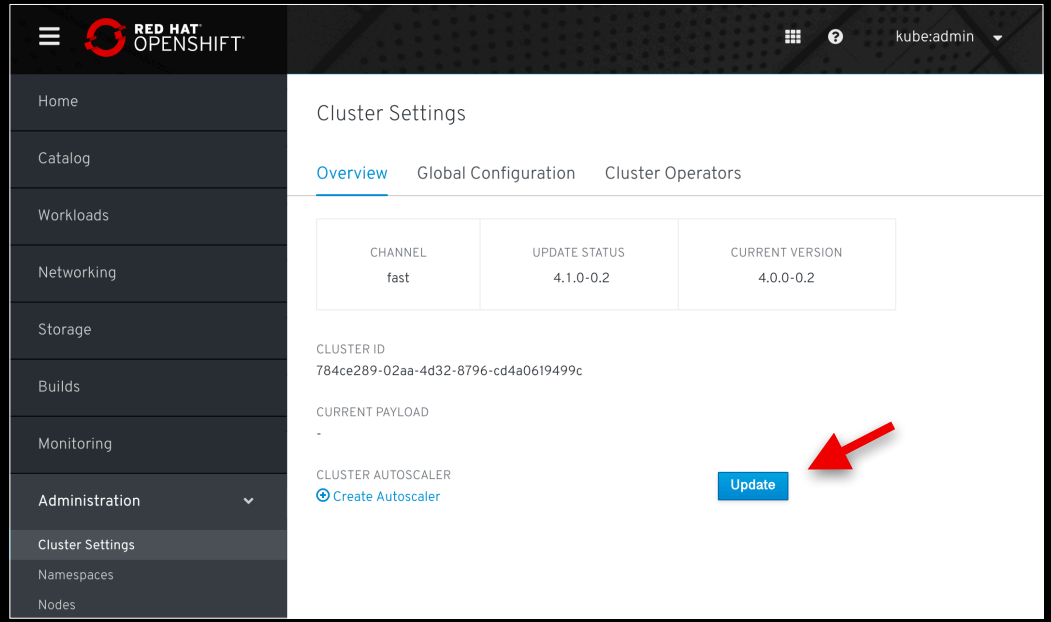
- CoreOS is tested and shipped in conjunction with the OpenShift platform
- Immutable and tightly integrated with OpenShift
- Self-managing, over-the-air updates
- Host isolation is enforced via Containers and Security Enhanced Linux (SELinux)

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



Over the Air (OTA) Updates

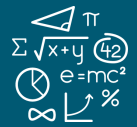
- OpenShift retrieves the list of available updates
- Admin selects the target version
- OpenShift is updated over the air
- Auto-update support



Kubernetes-native day 2 management

OPERATOR
FRAMEWORK

Flexible app architectures



No reinvention of core concepts

Uniform deploy and debug

Truly hybrid

Operators codify operational knowledge and workflows to automate life-cycle management of containerized applications with Kubernetes

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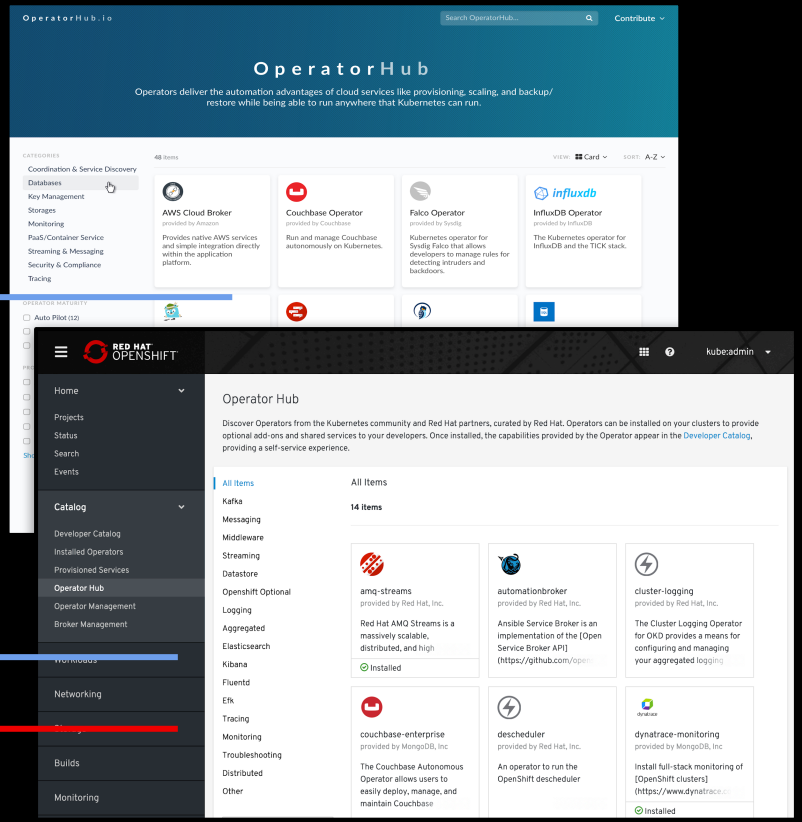
OperatorHub and certified Operators

- OperatorHub.io launched by Red Hat, AWS, Microsoft and Google
- OpenShift Operator Certification
- OperatorHub integrated into OpenShift 4



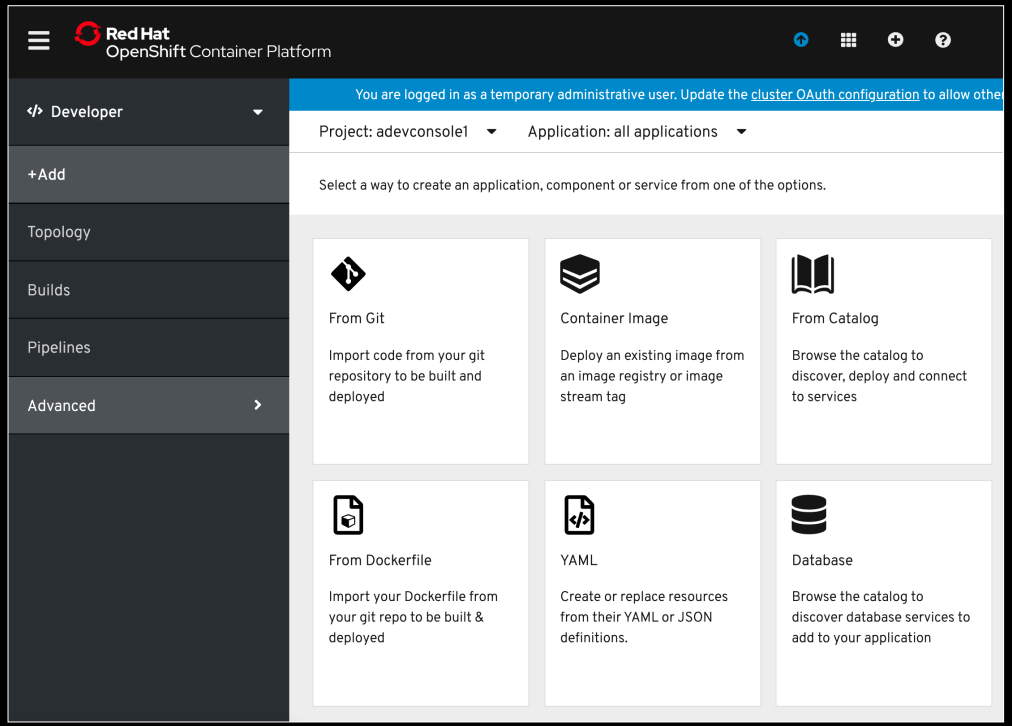
COMMUNITY OPERATORS

OPENSHIFT CERTIFIED OPERATORS

Developer Console: Create Applications

Key Features

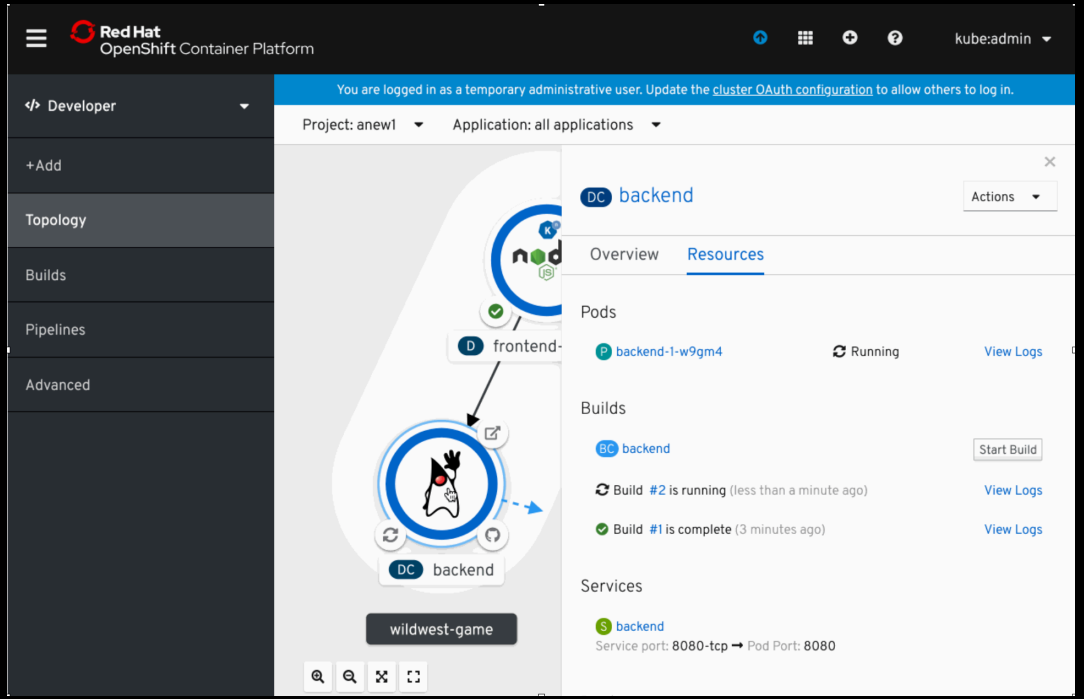
- Import source from Git
- View existing container image
- Edit YAML definition
- Build from Dockerfile
- Explore services catalog
- Deploy database from catalog



Developer Console: Application Topology

Key Features

- View structure and status of app components
- Drill into specific workloads
- Quickly navigate to pod logs
- Manually scale
- Pod donut!
- Access route/URL
- Linked build and source



Developer Console: Application Logs

Key Features

- View structure and status of app components
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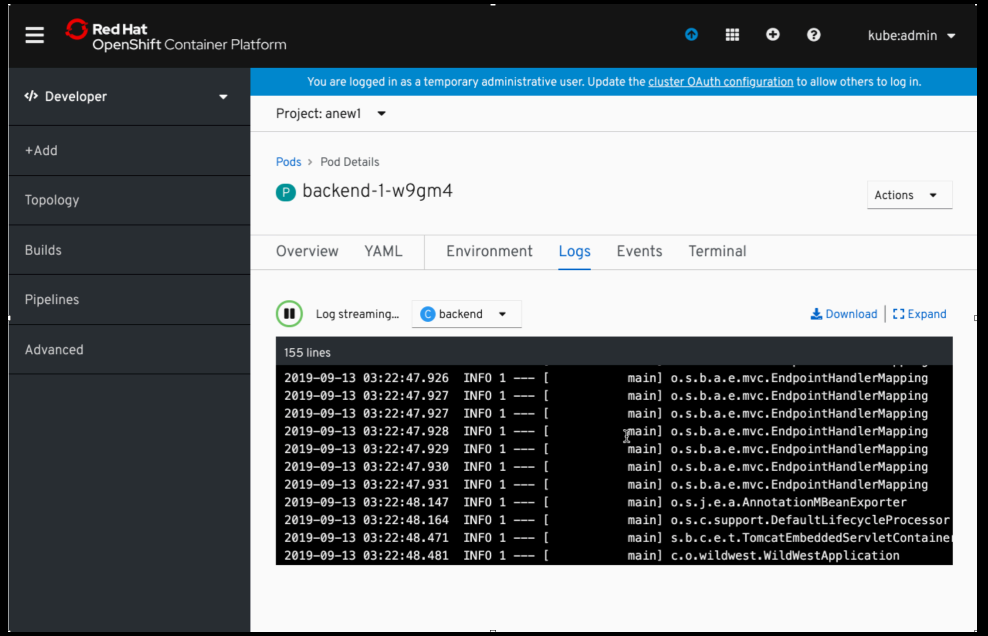

Developer Console: Application Scaling

Key Features

- View structure and status of app components
- Drill into specific workloads
- Quickly navigate to pod logs
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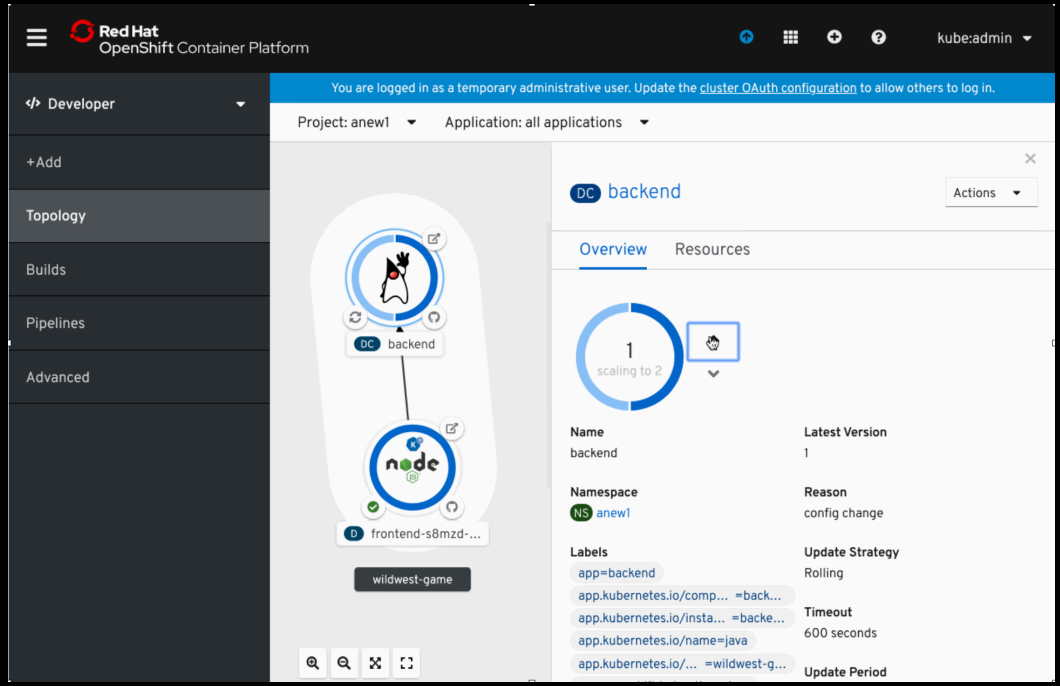
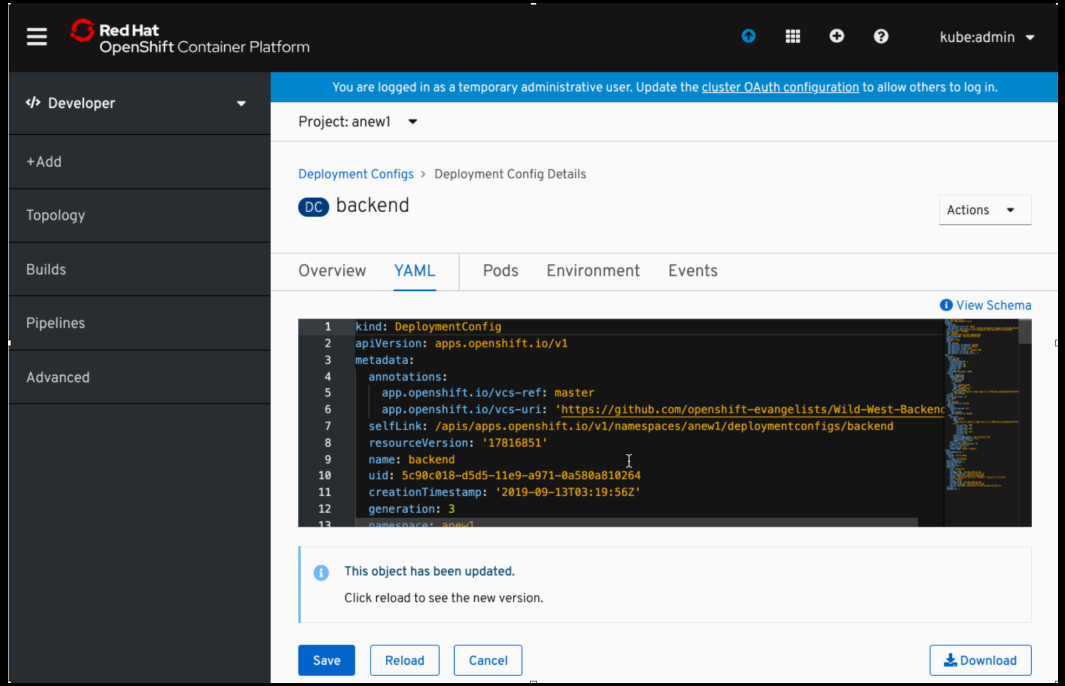
- Access route/URL
- Linked build and source



Developer Console: Application Deployment

Key Features

- View structure and status of app components
- Drill into specific workloads
- Quickly navigate to pod logs
- Manually scale
- Pod donut!
- Access route/URL
- Linked build and source



CONTAINER INFRASTRUCTURE AND MANAGEMENT

	Kubernetes	OpenShift
Multi-host container scheduling	✔	✔
Self-service provisioning	✔	✔
Service discovery	✔	✔
Enterprise Linux operating system		✔
Image registry		✔
Validated storage plugins		✔
Networking and validated networking plugins		✔
Log aggregation and monitoring		✔
Multi-tenancy		✔
Metering and chargeback		✔

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DEVELOPER EXPERIENCE

	Kubernetes	OpenShift
Automated image builds	No developer or application services	✔
CI/CD workflows and pipelines		✔
Certified application services		✔
Certified middleware		✔
Certified databases		✔
200+ certified ISV solutions		✔

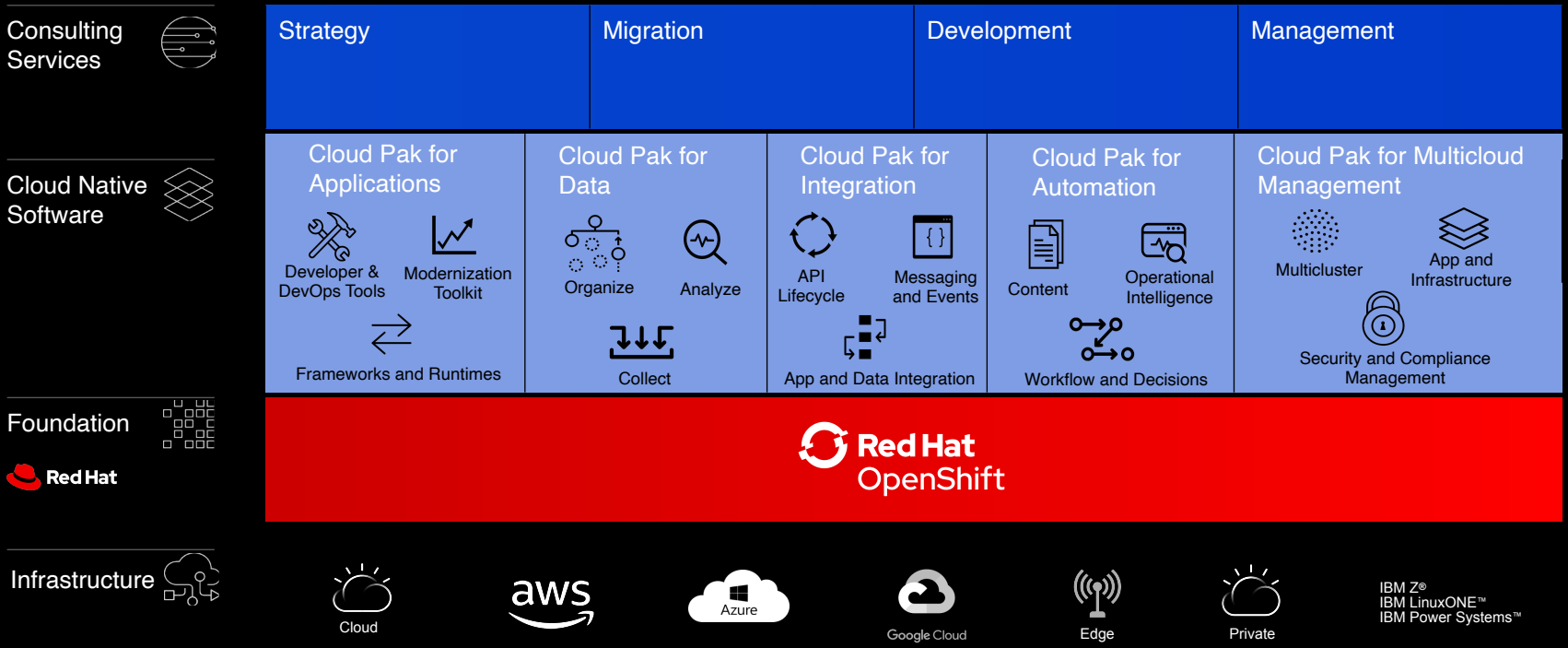
ENTERPRISE SUPPORT AND COMMUNITY

	Kubernetes	OpenShift
Community forums and resources	✔	✔
Zero downtime patching and upgrades		✔
Enterprise 24/7 support		✔
9 year support lifecycle		✔
Security response team		✔

External review: 10 most important differences between OpenShift and Kubernetes

Creating the world's leading hybrid cloud provider

IBM Hybrid Multicloud Strategy



Why IBM Z **and** IBM LinuxONE when Using Containers?

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

Scale-out to 2.4 million containers on a single system

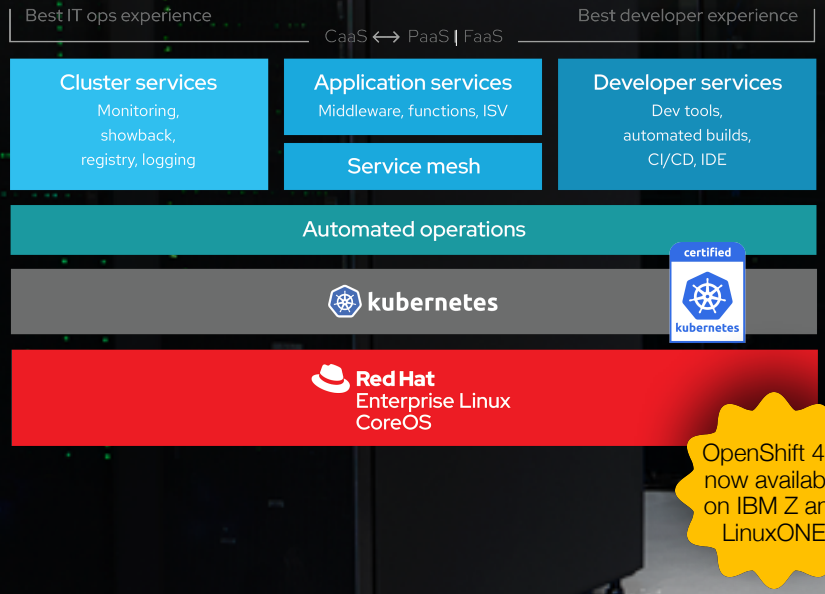
Enterprise class infrastructure – Elastic, Scalable, Available **and** Resilient

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

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

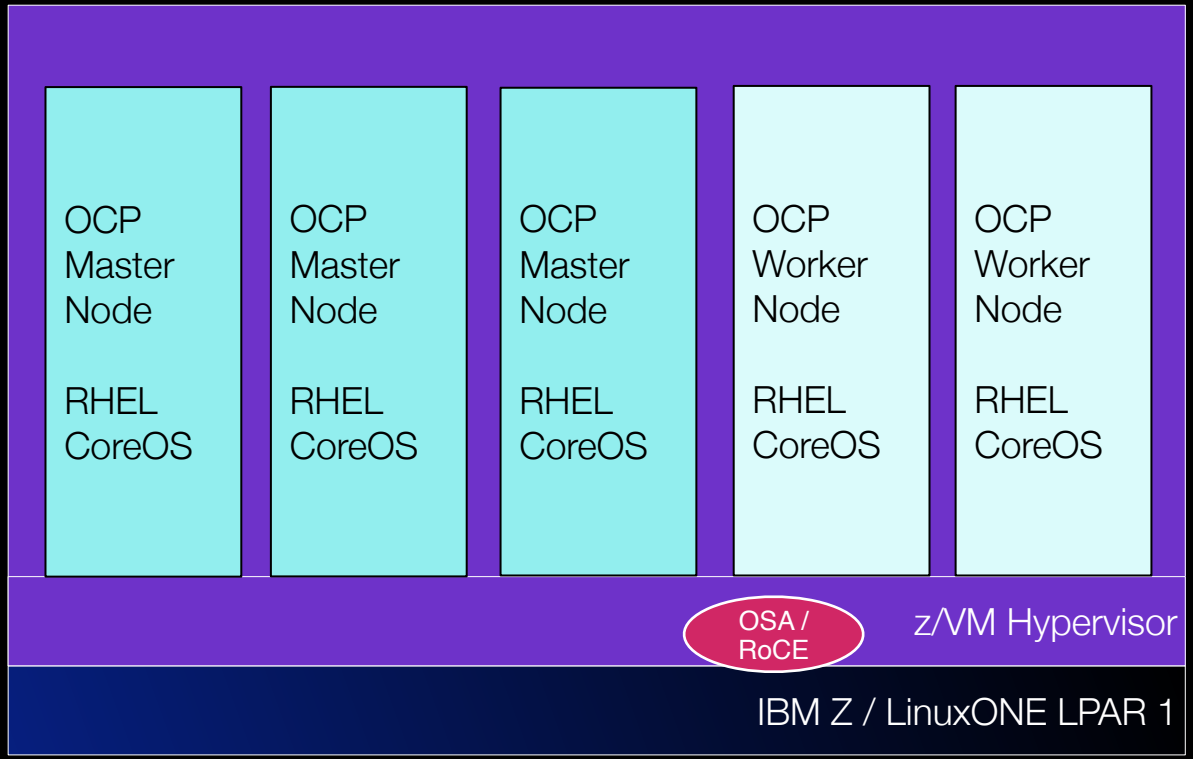
99.999% uptime for hardware and even higher guarantees for memory/network. There have been zero memory failures in field in the past 4 decades and zero unplanned downtime

Red Hat Openshift on IBM Z and LinuxONE



OpenShift 4.4 now available on IBM Z and LinuxONE

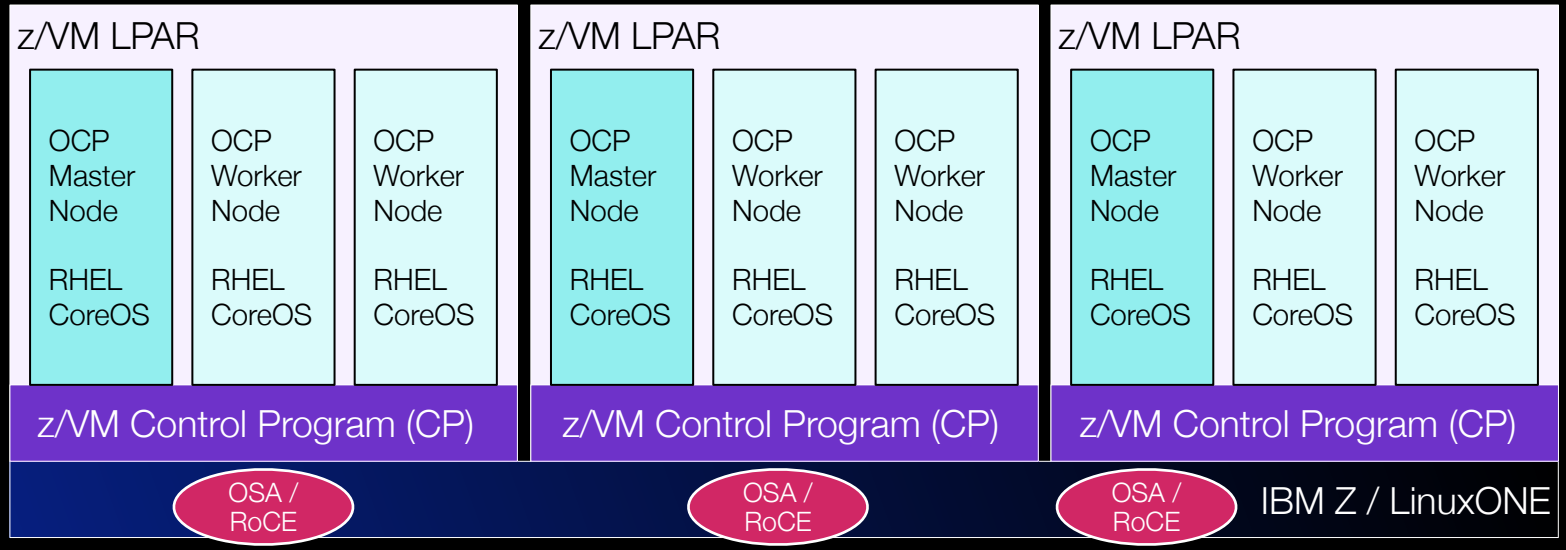
Minimum Configuration Architecture Overview



Red Hat Openshift:

- Minimum configuration
  - 1 LPAR/3 IFLs
  - 1 OSA/RoCE
  - z/VM 7.1 Hypervisor
    - Openshift cluster nodes run on guest virtual machines

Preferred Configuration Architecture Overview



Notes

Distribute OCP master nodes (control planes) to different z/VM instances on one or more IBM Z / LinuxONE servers to achieve High Availability and cover service outages/windows

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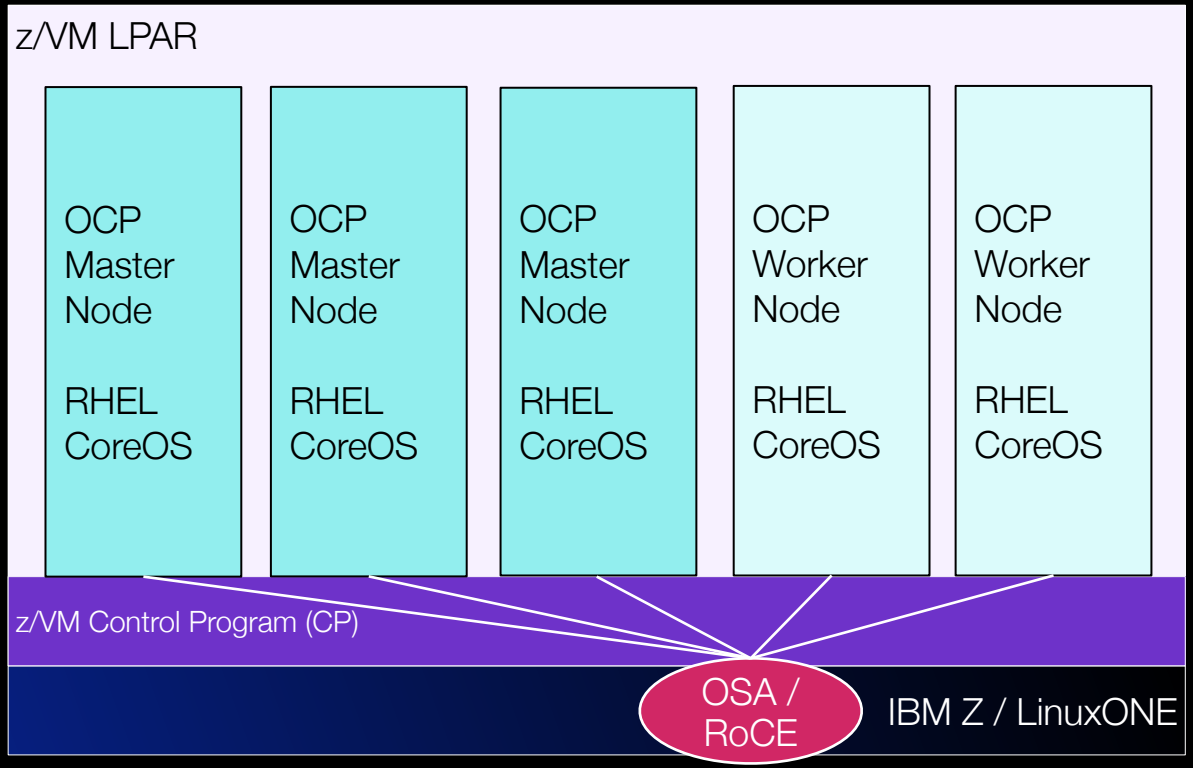
Architecture Overview – Network Option 1



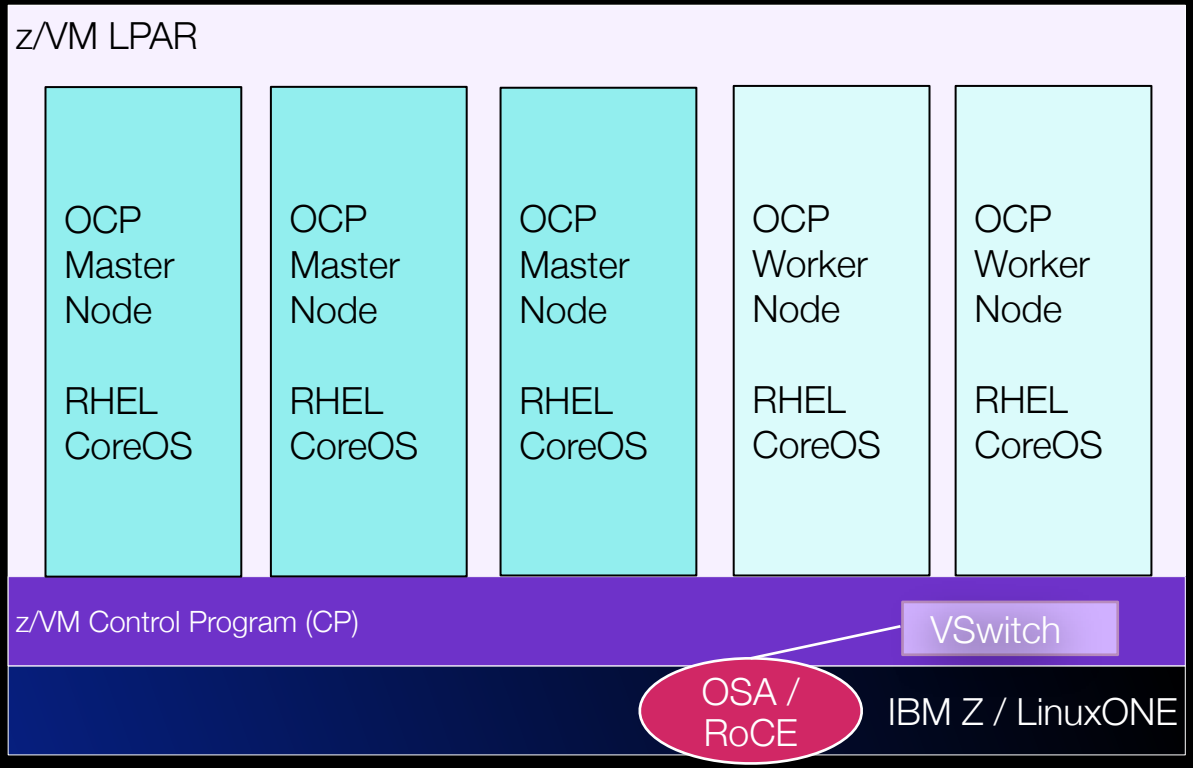
Use single vNIC for z/VM guest virtual machines:

- Direct-attached OSA or RoCE to each guest virtual machine

Openshift uses this 1 vNIC for two networks:

- External communication
- Internal communication – software-defined network for Kubernetes pod communication

Architecture Overview – Network Option 2



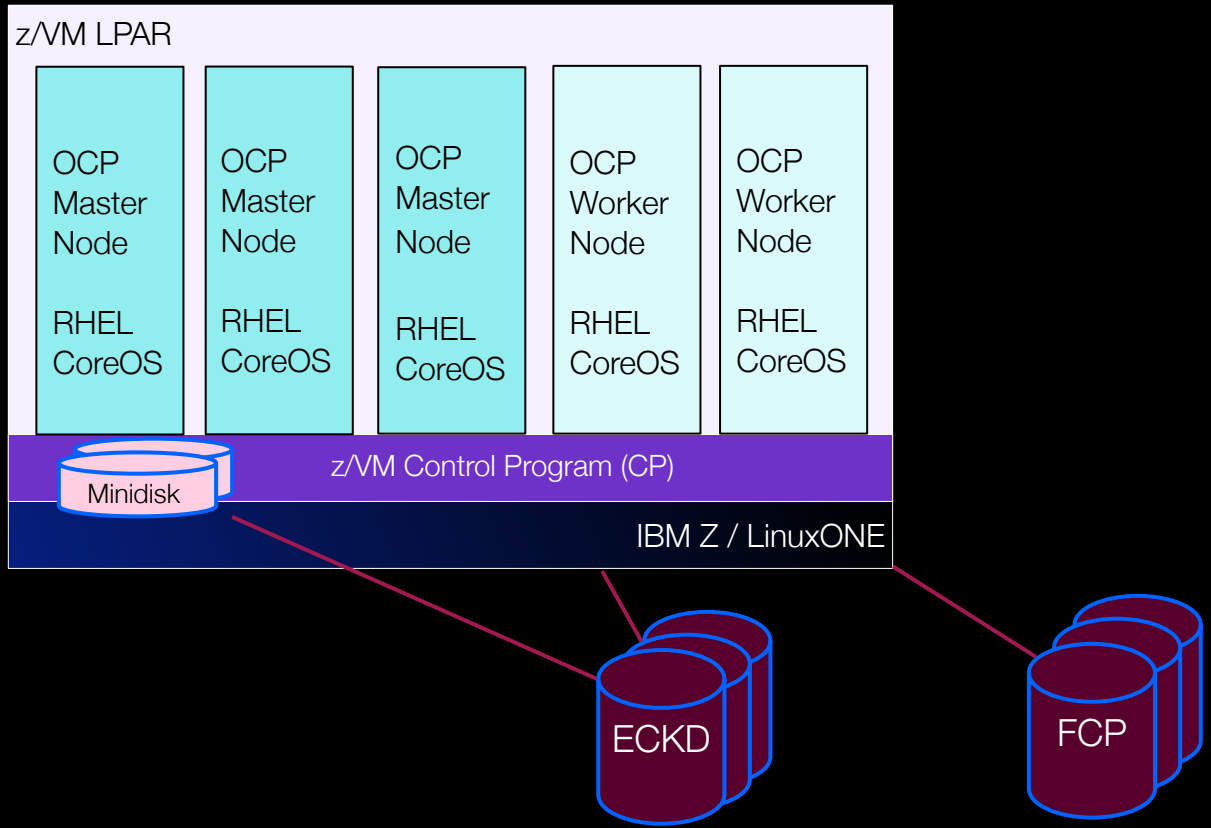
Use single vNIC for z/VM guest virtual machines:

- z/VM VSwitch with OSA (optionally, using link aggregation)

Openshift uses this 1 vNIC for two networks:

- External communication
- Internal communication – software-defined network for Kubernetes pod communication

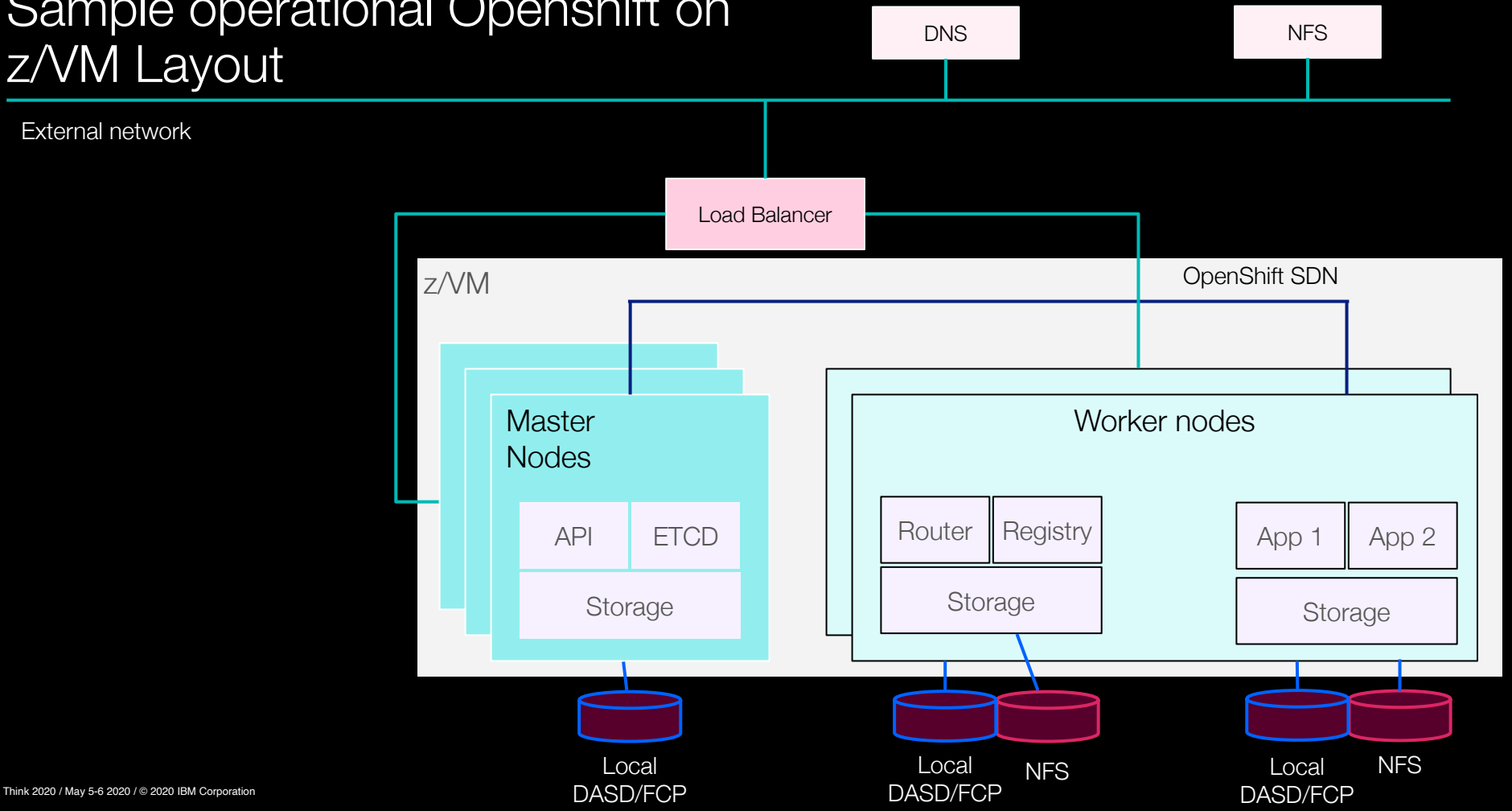
Architecture Overview – Disk Storage Options for Installation



Disk storage considerations

- Minidisks are a z/VM virtual resources and represent smaller chunks on a DASD; Linux sees them as individual disks (DASDs)
- Consider HyperPAV for ECKD storage
- DASDs/FCP devices can be dedicated to a z/VM guest ("pass-through")
- Consider using FCP multipath installations (future)

Sample operational Openshift on z/VM Layout



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Adoption Patterns for Openshift on IBM Z and LinuxONE

- Enterprise scale Private Cloud-in-a-Box

Instant capacity on-demand with scale-up/out in a single footprint for space and power constrained data-centers

- Digital Transformation and Modernization for z/OS
- Extreme consolidation and scalable Data Serving
- Data Gravity

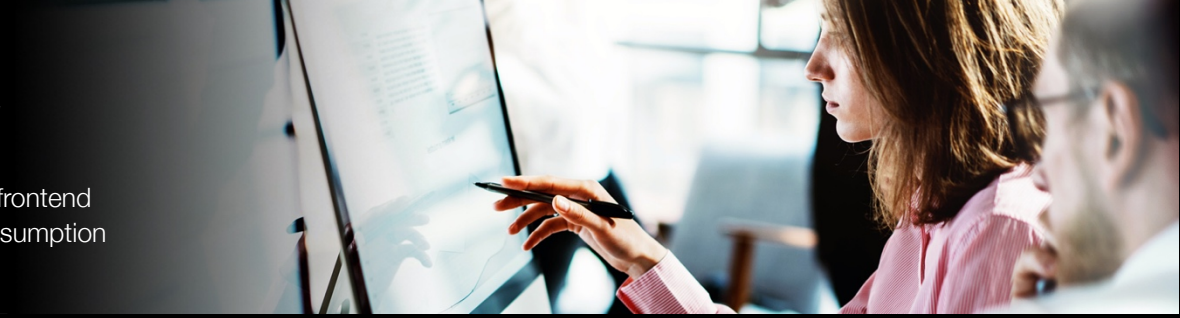
apps connect via ultra-low-latency, ultra-secure and highly resilient network into legacy system-of-record (eg. Service Broker to zOS instances)

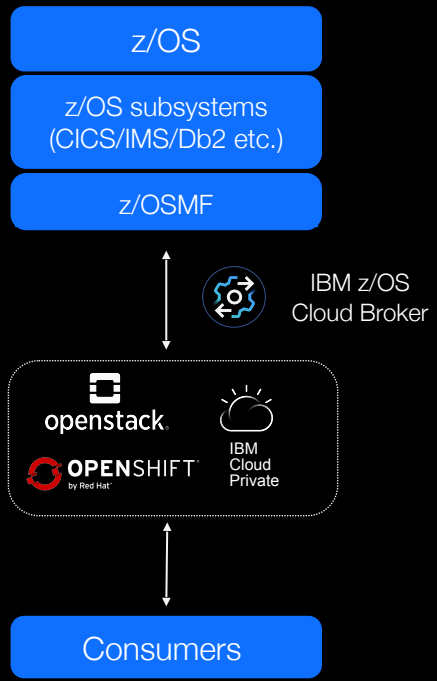
- Consistency Across DevOps Experience
- Workload Modernization and Hybrid Cloud

z/OS Cloud Broker

Integrate z/OS into the hybrid cloud

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





Challenge

Business critical applications running on z/OS are isolated, and installation of any Cloud platform will not integrate my z/OS subsystem within same control planes.

Client Value

- 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

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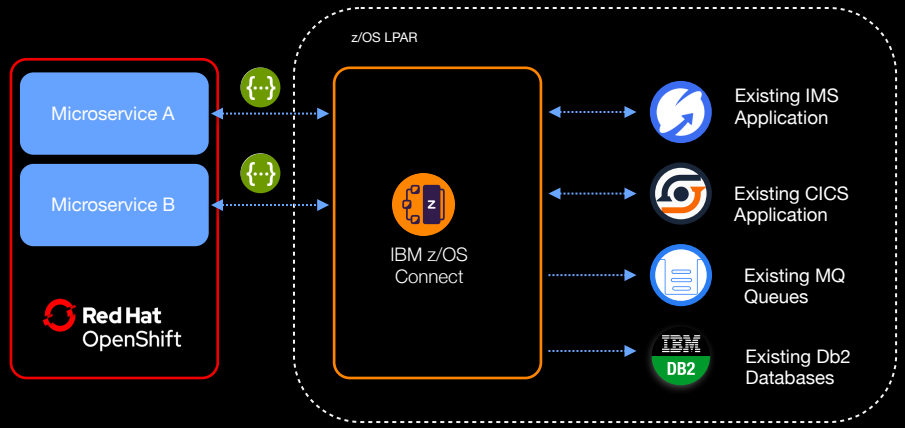
z/OS Connect EE

Truly RESTful APIs to and from the Cloud for IBM Z Services

IBM® z/OS® Connect Enterprise Edition enables you to empower a wide community of developers with a simple and intuitive way to consume data and services hosted on IBM Z®. It provides a single, common way to unleash your existing market-differentiating assets on IBM with RESTful APIs



Client Value

- Speed application development

Empower app developers with critical data and services through RESTful APIs designed to be easily consumable.

- Harness new opportunities

Expose IBM Z assets as APIs without changing your backend applications. Use these APIs to leverage the API economy, creating new opportunities with developers and cultivate new customers.

- Secure and control

Host APIs on one of the world's most trusted platforms with enhanced security through pervasive encryption on IBM z14/15®.

Large International Bank

Accelerate Enterprise Digital Transformation

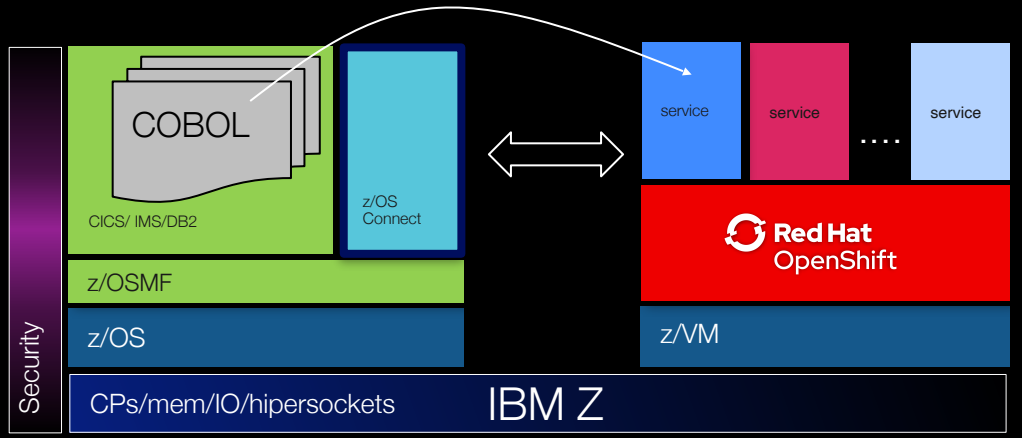
Containerized services running on Openshift on Z co-located on the same hardware with z/OS Db2 data and CICS for low latency, high volume transaction processing – enables incremental modernization of mission-critical systems while maintaining enterprise SLAs.

Up ~10x lower application response time by co-locating applications on Z compared to workloads running on x86.

Modernization and **Digital Transformation**

Modernize and extend legacy assets incrementally while maintaining enterprise SLAs and keeping risk/cost low.

OpenShift Experience with Better SLAs at Lower Cost
Seamless integration of IBM Z with OpenShift DevOps, dev experience, etc
Common cloud control plane across the entire enterprise – including Z



Thank you
Grazie
Merci
Gracias
Obrigado
ありがとう
谢谢
Dankeschön