Hybrid Cloud Unlocking z/OS to Anywhere

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IBM

Business Challenge

According to Gartner

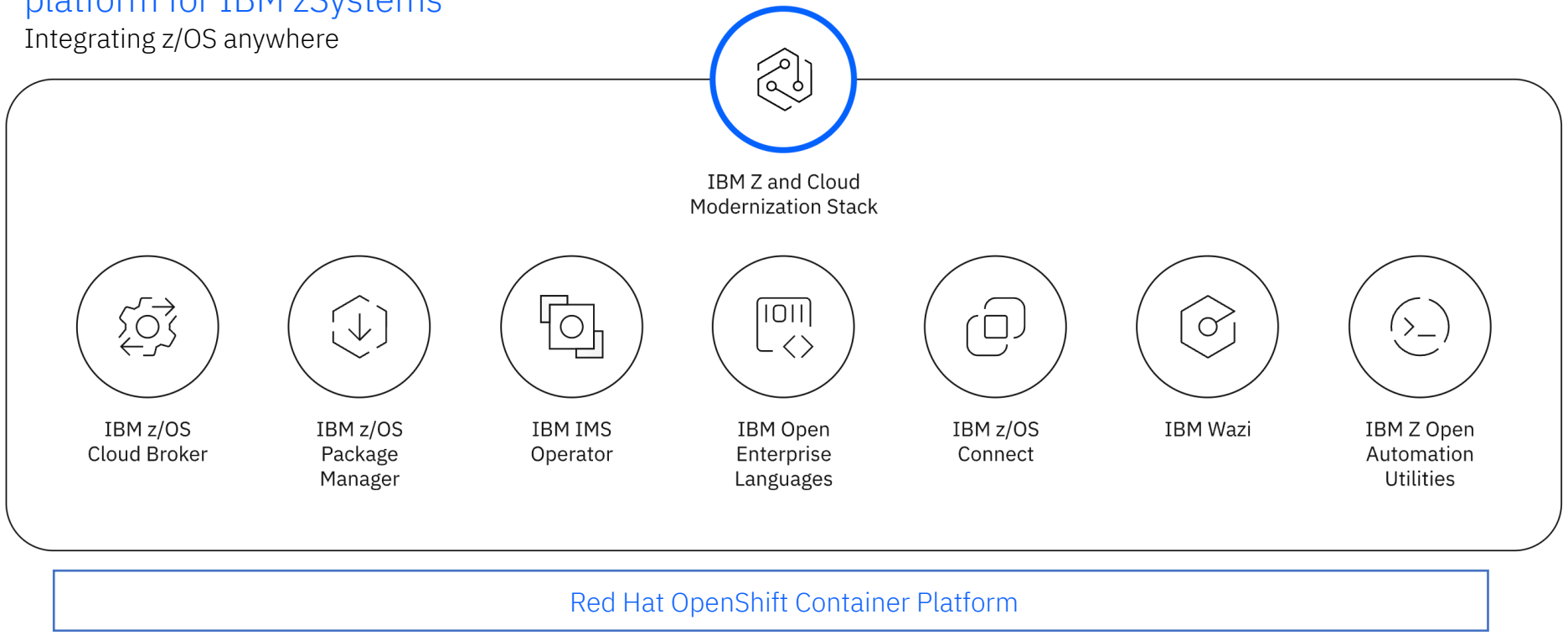
Application leaders responsible for a strategy to build a digital business platform should:

Source: Gartner, Use Continuous Modernization to Build Digital Platforms From Legacy Applications, Stefan Van Der Zijden, Thomas Klinect, Refreshed 11 February 2022, Published 18 January 2018.

IBM Z® and Cloud Modernization Stack

Single, flexible application modernization platform for IBM zSystems

Integrating z/OS anywhere



What Is In the Box:

- **z/OS Connect -** Simple and intuitive containerized z/OS APIs on OpenShift
- **z/OS Cloud Broker -** OpenShift integration of z/OS-based services and resources. Create, modernize, deploy, and manage applications, data, and infrastructure
- **Wazi Sandbox -** A highly flexible, containerized, self-service personal sandbox environment on Red Hat OpenShift
- **Wazi Code -** Provides a common and consistent experience that is familiar to developers. Edit, build, and debug applications through rich z/OS applications
- **Wazi Analyze -** Rapid application analysis to help developers quickly discover the relationships between the components of their z/OS applications
- **z/OS Package Manager -** Deploy and manage software on z/OS systems from Red Hat® OpenShift Container Platform
- **Modern programming languages on z/OS -** Node.js, Python, Go, restricted use C++

Modernize Mainframe Applications for Hybrid Cloud

IBM and AWS

Maximize the value of their investments, and innovate faster, IBM and AWS are collaborating to extend the available application modernization options to enable customers to select the right modernization path for their business.

Pattern #1: Cloud-Native Development for z/OS Applications

Pattern #2: Real-Time Sharing Between z/OS Applications and AWS

Pattern #3: Mainframe Augmentation with New Channels

Pattern #4: Hybrid Storage with AWS Cloud Storage

Pattern #5: Enterprise Automation Across z/OS and AWS

AWS Blog: https://aws.amazon.com/blogs/apn/modernize-mainframe-applications-for-hybrid-cloud-with-ibm-and-aws/

IBM Blog: https://community.ibm.com/community/user/ibmz-and-linuxone/blogs/skyla-loomis/2022/05/09/modernize-for-hybrid-cloud-with-ibm-and-aws

Cloud-native development for z/OS applications

- Accelerate application modernization with the IBM Z and Cloud Modernization Stack, optimized to run on Red Hat OpenShift deployed on AWS.
- Modify existing COBOL, PL1, Java, or Assembler programs using your IDE of choice, deploy on z/OS.
- Leverage new programming languages including Python, Node.js, and Go that can all run on z/OS.
- Seamlessly integrate with standard enterprise-wide CI/CD toolchains, such as Git and Jenkins.
- Additionally, use AWS CodePipeline that can span AWS services and z/OS environments.
- Self-service access to z/OS dev/test environments (Wazi Sandbox) on Amazon EC2.

IBM Z and Cloud Modernization Stack – Dev/Test on AWS, deploy on z/OS

Simple access to applications and data	Agile enterprise DevOps	Standardized IT Automation
Secure API creation and integration in minutes	*Cloud native development with industry standard open tools*	*Reduce need for specialized skills and empower developers*

IBM Z and Cloud Modernization Stack

Pay only for the capabilities you use

Optimized for Red Hat® OpenShift®

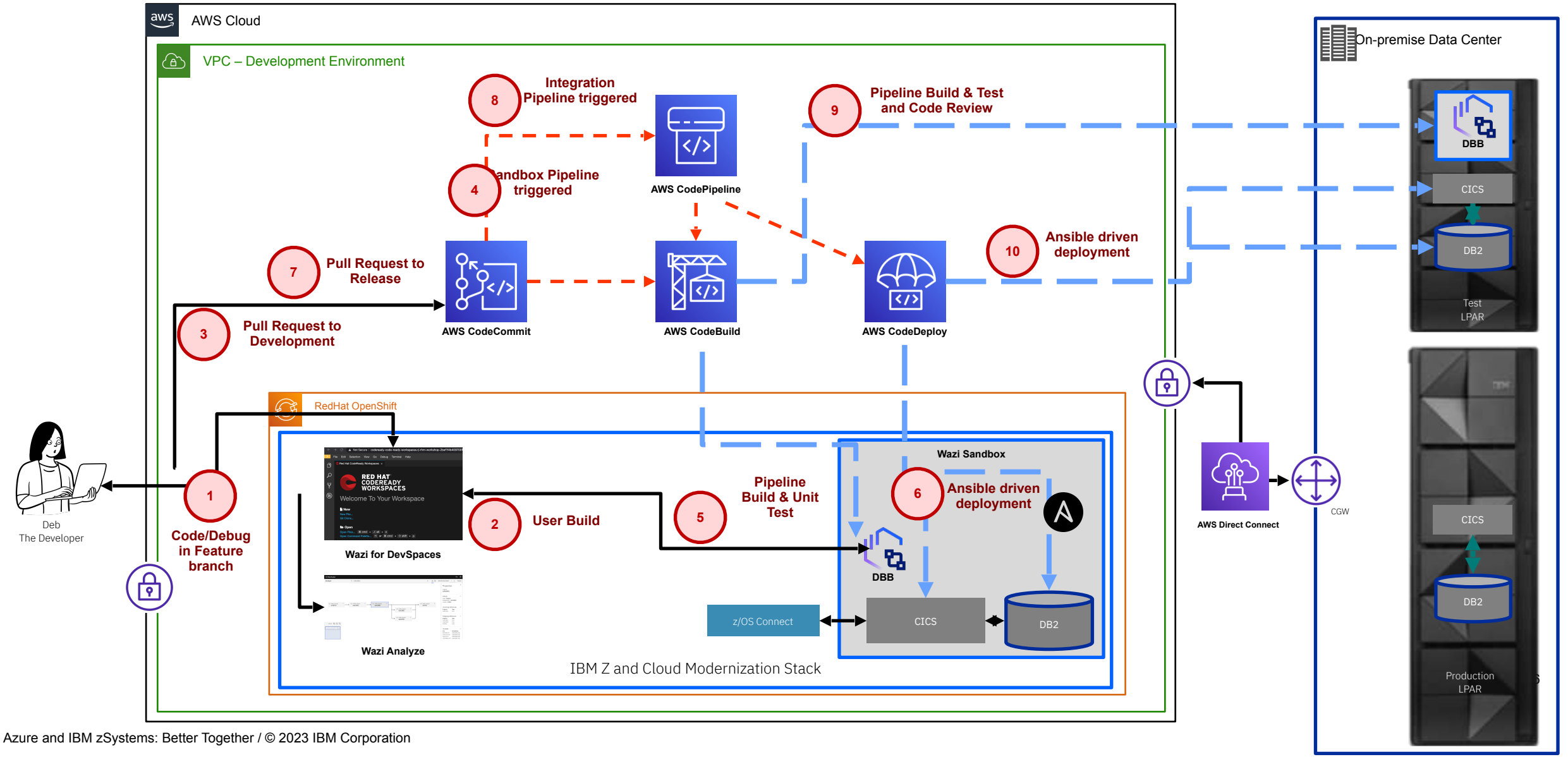
Red Hat OpenShift Service on AWS (ROSA)

Amazon EC2

AWS Blog:https://aws.amazon.com/blogs/apn/bring-your-mainframe-application-development-into-your-enterprise-aws-code-pipelines/

IBM Blog:https://community.ibm.com/community/user/ibmz-and-linuxone/blogs/jacqui-jax-shawley1/2022/11/22/bring-your-mainframe-application-development-into

Example reference architecture



Modernize Mainframe Applications for Hybrid Cloud

IBM and Azure

Increase agility, maximize the value of their investments, and accelerate innovation, IBM and Microsoft are collaborating to extend the available application modernization options to enable customers to select the right path for their business

Pattern #1: Azure DevOps for z/OS applications

Pattern #2: Simplify access from Digital Channels.

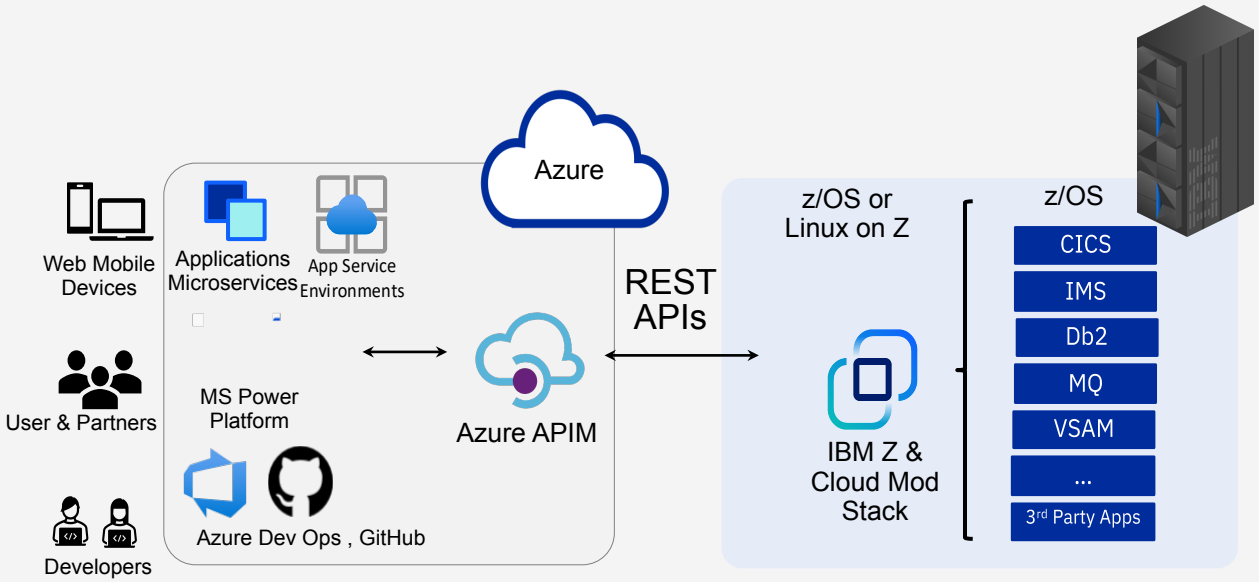
Pattern #3: Share near real-time information between z/OS applications and Azure

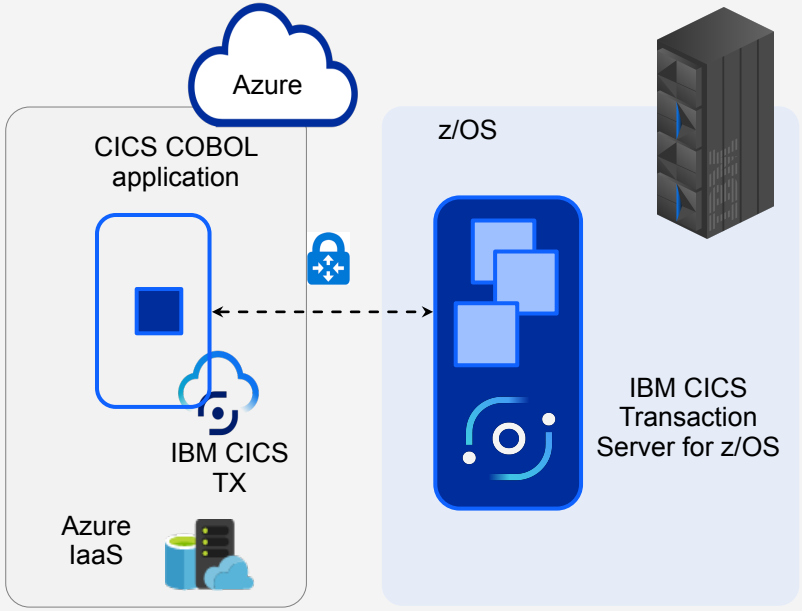
Pattern #4: IT Automation across IBM zSystems and Azure

https://techcommunity.microsoft.com/t5/azure-migration-and/accelerate-mainframe-application-modernization-with-ibm-and/ba-p/3691322

Simplify access from Digital Channels

- Provide secure access to mainframe applications and data through industry-standard APIs using the Open API specification
- Built new APIs in minutes with the IBM low-code API solution, IBM Z & Cloud Modernization Stack
- Provide seamless integration with enterprise API management solutions like Azure APIM
- For new channels, in-country processing, and hybrid cloud deployments to complement CICS on z/OS, IBM offers CICS TX that can run on Azure
  - NOT a replacement for CICS on z/OS
  - Scale and performance limitations





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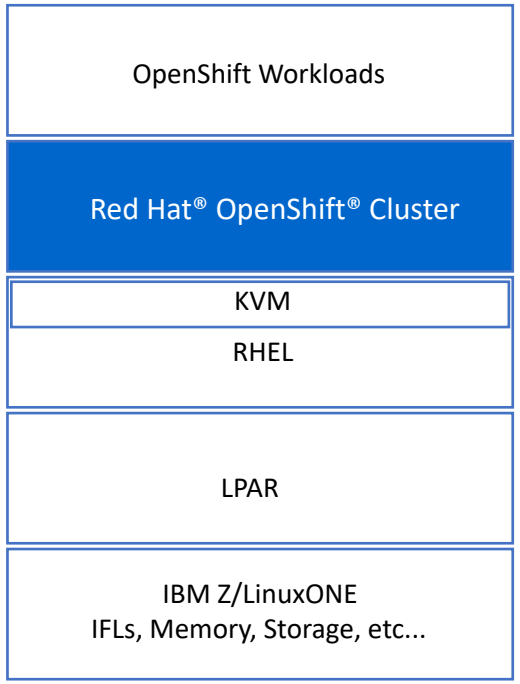
IBM Z and LinuxONE Platforms Capabilities for OpenShift

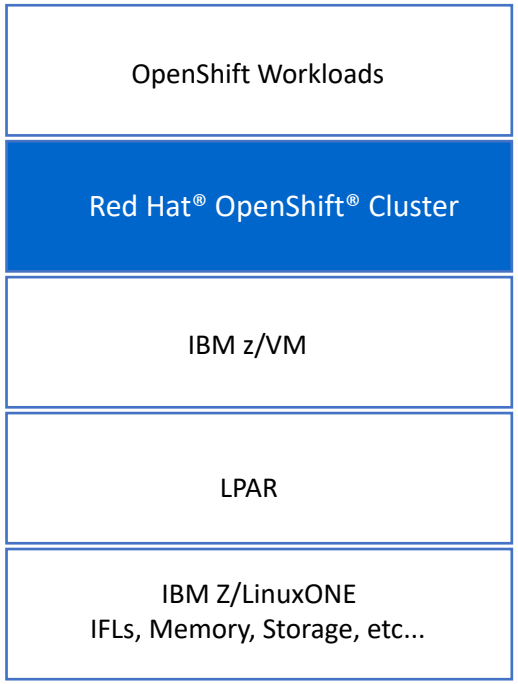
- High levels of security (e.g., Crypto Express card plugin), compliance, and platform uptime
- Ultra low latency for integration/modernization of co-located OCP based IBM Cloud Paks and existing data and apps
- Highly scalable and elastic server, allowing the increase in resource capacity within the same server
- Reduced corporate carbon footprint and energy usage
- Potential cost savings without sacrificing on performance, security, reliability, or openness

More information about IBM zSystems / IBM LinuxONE and Red Hat OpenShift : https://www.ibm.com/downloads/cas/1NAM7DPM , https://www.ibm.com/downloads/cas/A2LMYLGN

Deployment types for Red Hat® OpenShift Container Platform on IBM zSystems and IBM® LinuxONE

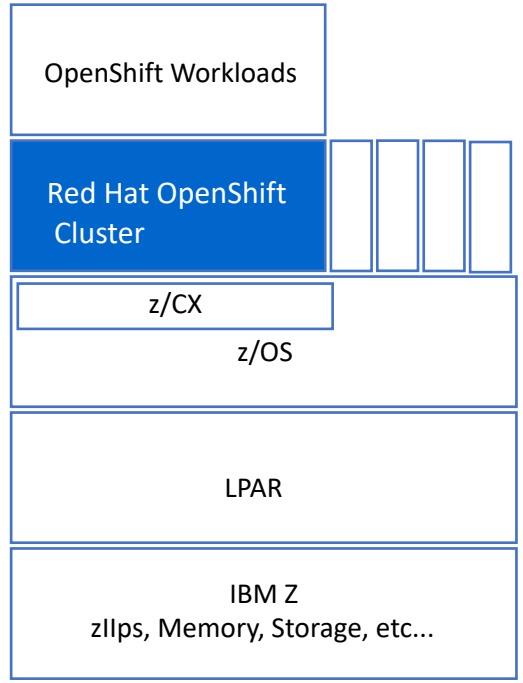


* Kernel-based Virtual Machine (KVM) is an open source virtualization technology built into Linux®. Specifically, KVM lets you turn Linux into a hypervisor that allows a host machine to run multiple, isolated virtual environments called guests or virtual machines (VMs).



** The z/VM® hypervisor is designed to help extend the value of mainframe technology across the enterprise by integrating applications and data while providing exceptional levels of availability, security, and operational ease.

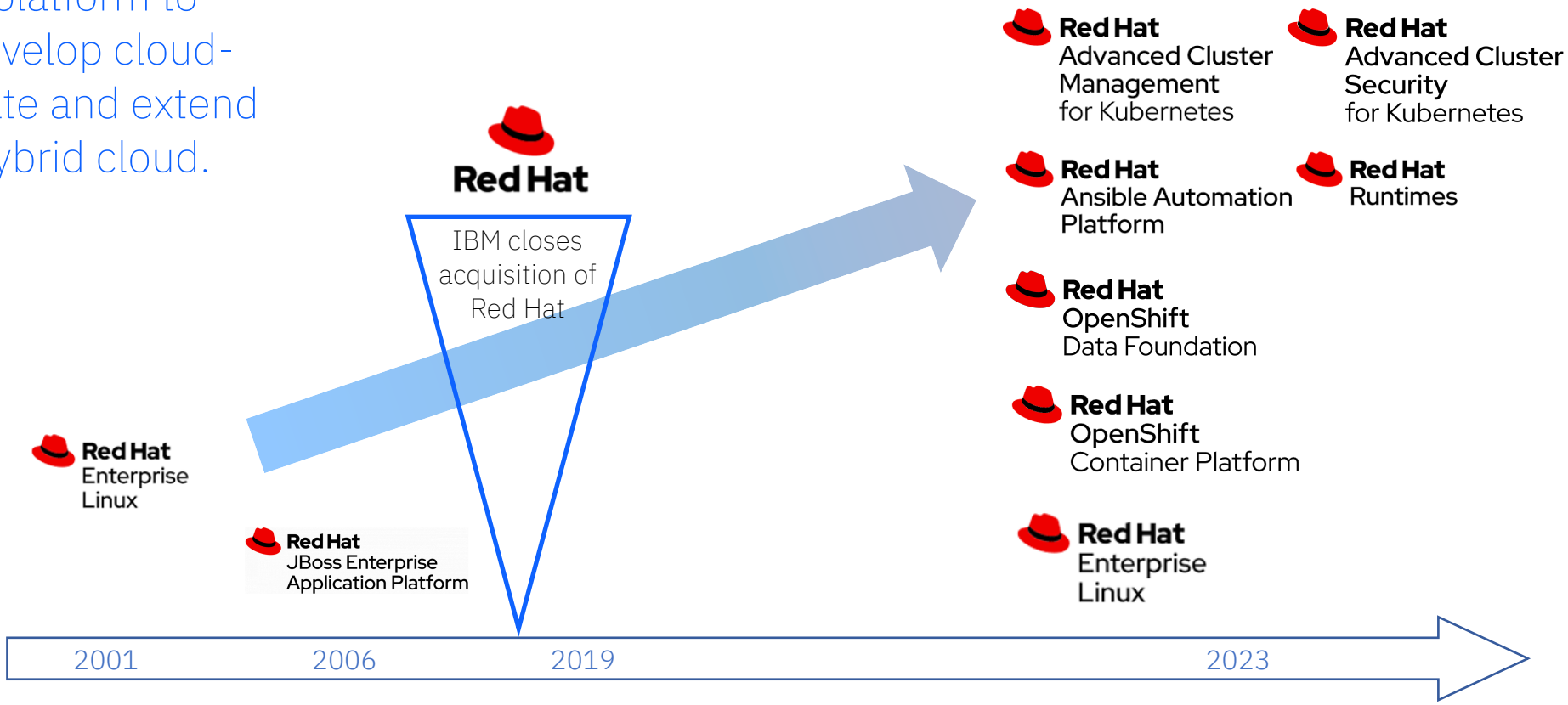
z/VM virtualization technology is designed to allow the capability to run hundreds to thousands of Linux® servers on a single mainframe running with other System z® operating systems, such as z/OS®, or as a large-scale Linux-only enterprise server solution.



For more information on OpenShift architecture on IBM Z and LinuxONE: https://www.ibm.com/docs/en/linux-on-systems?topic=architecture-platform

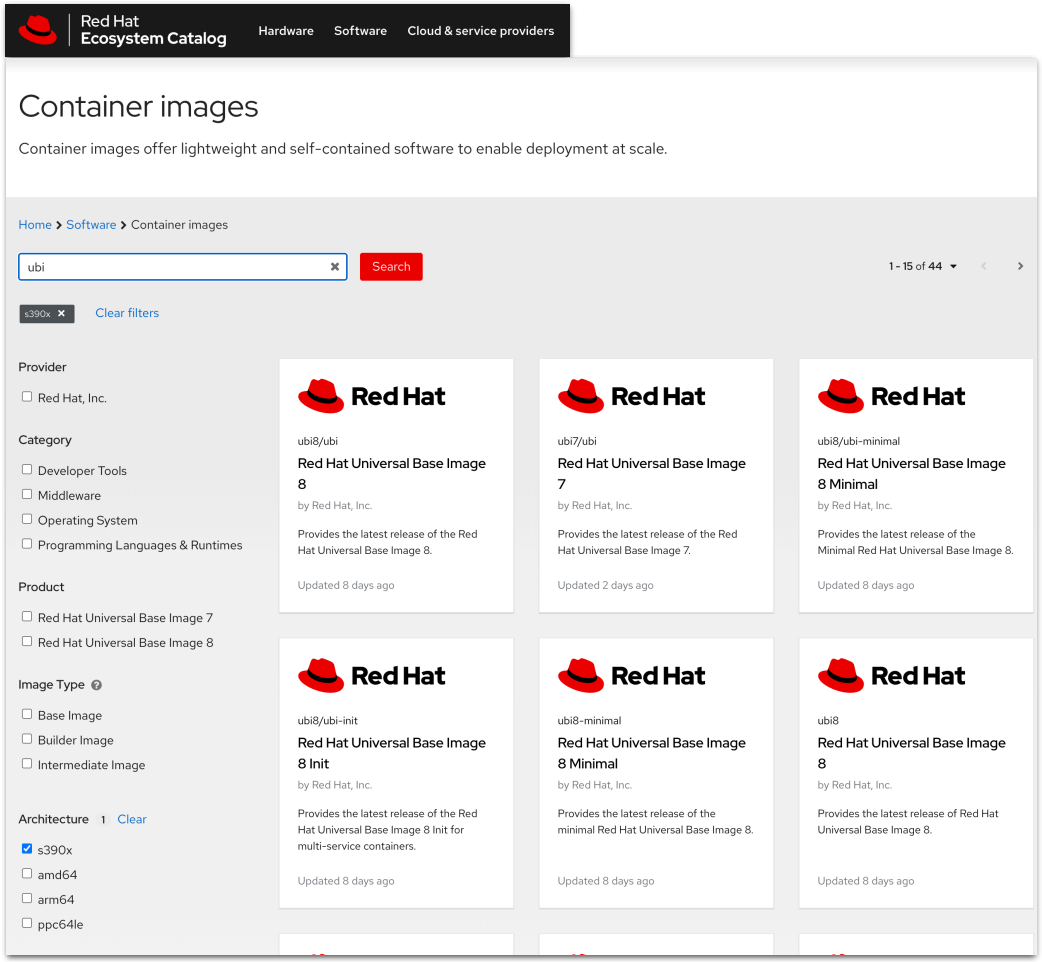
Most IBM ®LinuxONE solutions includes Red Hat

Red Hat provides operating system, middleware, container platform to modernize apps and develop cloud-native apps that integrate and extend workloads across the hybrid cloud.

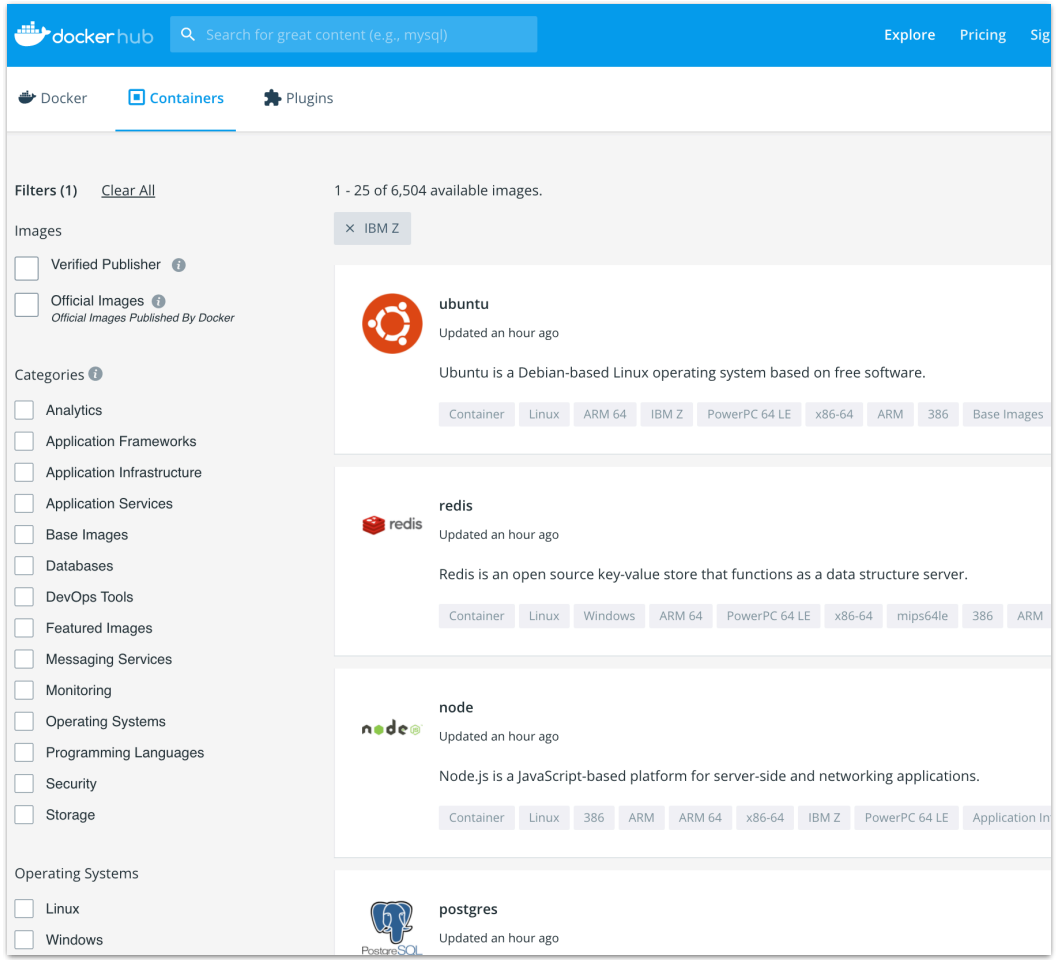


Container images availability for IBM Z and LinuxONE

Red Hat Container Catalog provides 800+ s390x container images

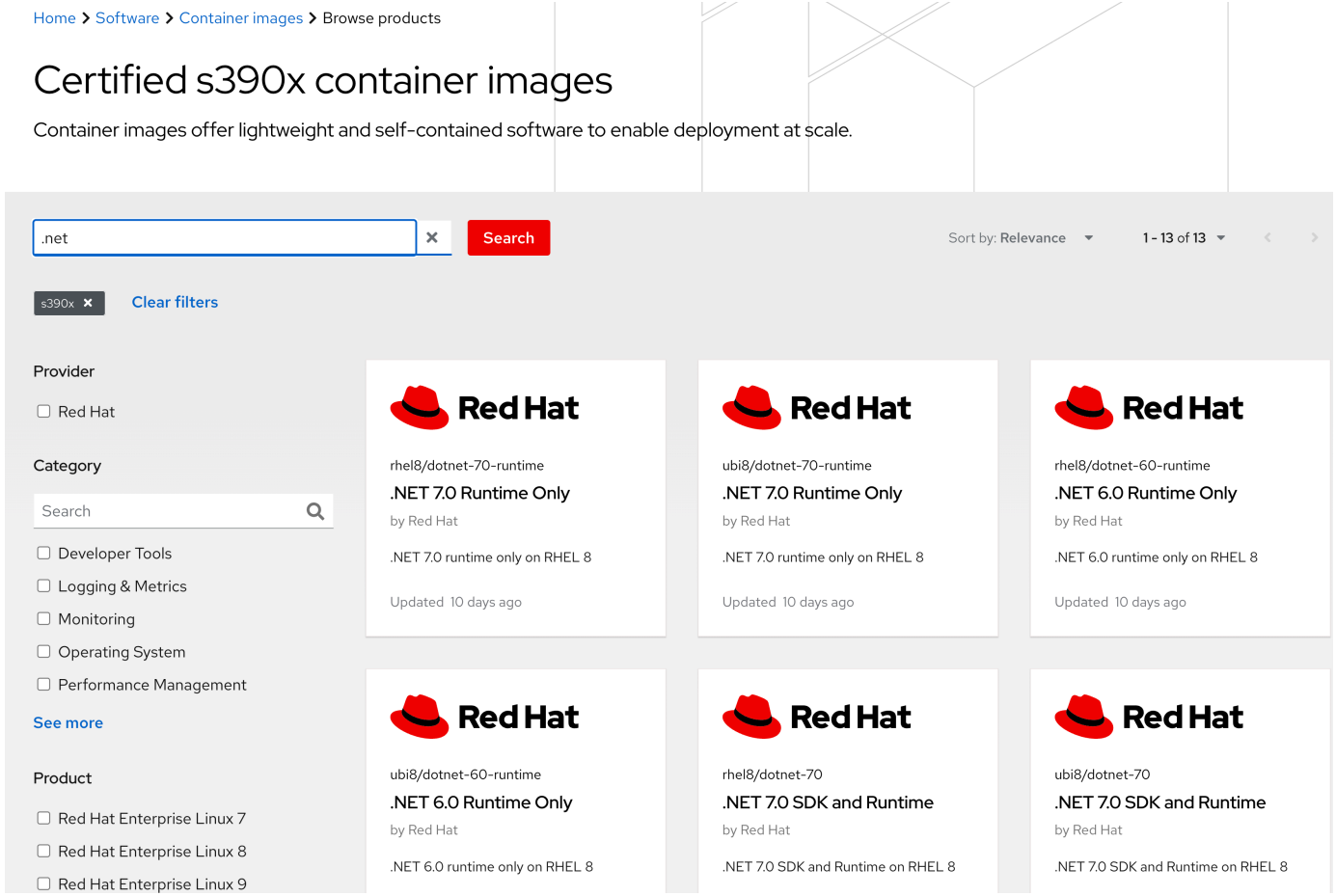


Dockerhub provides more than 6 thousand+ container images for s390x



https://www.linkedin.com/pulse/red-hat-container-catalog-access-270-images-s390x-from-filipe-miranda/

.NET on IBM Linux on Z and IBM LinuxONE



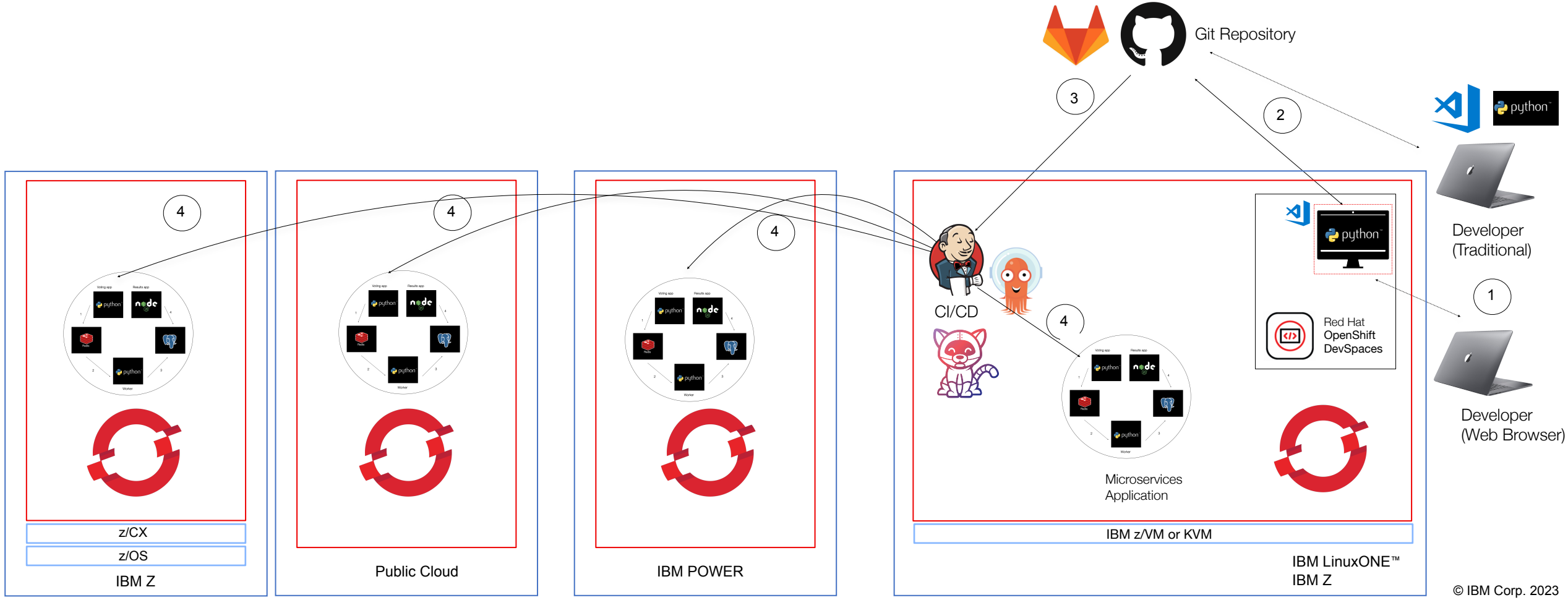
.NET

Great Article from Elizabeth K. Joseph on .NET on IBM Z

More Information on .NET on IBM Z and LinuxONE

Red Hat OpenShift
Container Platform Flexibility Across Hybrid Cloud

Study Case DevOps CI/CD



Use Cases

Modernization

Adopt cloud native to achieve consistency across the enterprise and grow benefit of containerized workloads

Colocation

Co-locate containerized workloads with z/OS and Linux based data to achieve lower response time and meet enterprise SLA

Platform capabilities

Benefit from high efficiency, high scalability, resiliency, out of the box availability, cryptography hardware*, low latency, and high throughput

Integration

Integration and automation of z/OS and Linux based workloads with hybrid cloud on IBM zSystems and IBM LinuxONE

AI and Data

Leverage AI to extract insights and gain trusted, actionable results and move applications close to the data for better throughput and performance

Hyperledger fabric

Hyperledger fabric, the de facto standard for enterprise blockchain platforms, deployed on-premises on IBM zSystems and IBM LinuxONE

More information on IBM zSystems application modernization patterns: https://www.ibm.com/cloud/architecture/architectures/application-modernization-mainframe/patterns/
* https://www.ibm.com/support/pages/kubernetes-device-plug-ibm-crypto-express-cex-cards-installation-and-user-guide

European Bank

Modernize with data virtualization
Replicate once, use many

Business needs

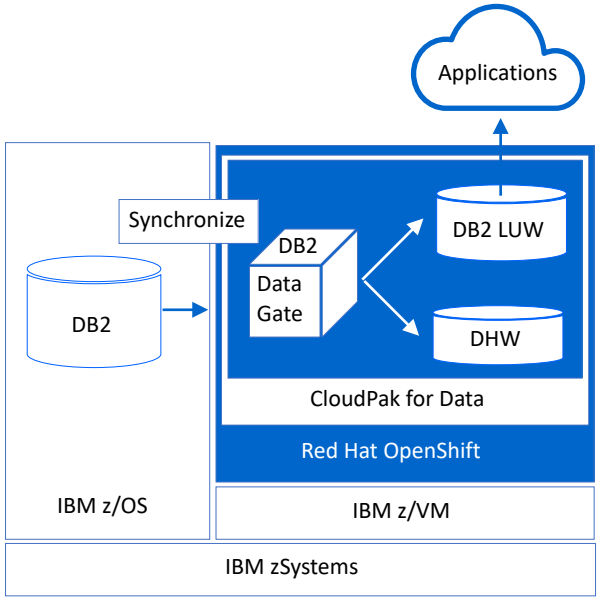
- Compliance with EU regulations – data serving to the Fast Payments app within regulated timeframe
- Optimize data analytics process
- Reduce costs and time associated with data offload

Business benefits

- IBM zSystems always serves the data to the Fast Payments application in a public cloud, even the cloud is experiencing an outage
- Replication of Db2 on z/OS read-only data once with a low-latency / high-throughput
- Analytics transactions are processed for faster results and optimized deployment

Solution

Red Hat OpenShift and IBM Cloud Pak for Data – Data Gate technology
Cloud Pak for Data – Data Warehouse



European Bank

Modernization from large monolithic to an agile configuration

Business needs

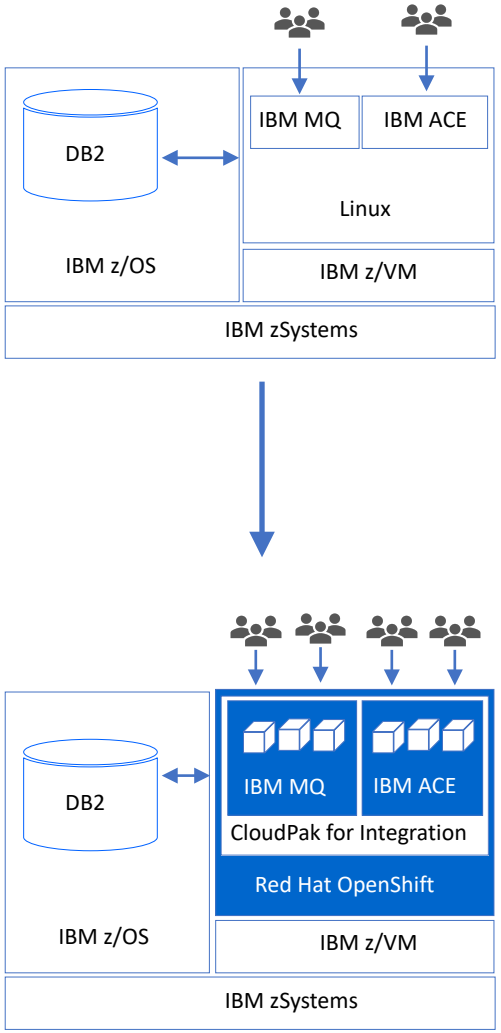
- Improve agility
- Minimize risk of monolithic integration broker and MQ
- Modernize to containerized microservices
- Benefit from reliability and scalability of zSystems

Business benefits

- Agile development and production rollout of various microservices
- Pipeline technology enables to be more responsive to business needs
- Leverage zSystems's scalability, reliability, and lower TCO

Solution

Red Hat OpenShift running 'IBM Cloud Pak for Integration'



US Healthcare

Modernization from large monolithic to a flexible microservices configuration

Business Requirements

As part of their digital transformation effort to take advantage of the cloud-native microservices architecture, a solid foundation that is multi-cloud and multi-architecture was needed.

The existing applications were already running on Linux on Z for TCO, resiliency and scalability and QoS but in a monolithic application running on IBM Websphere.

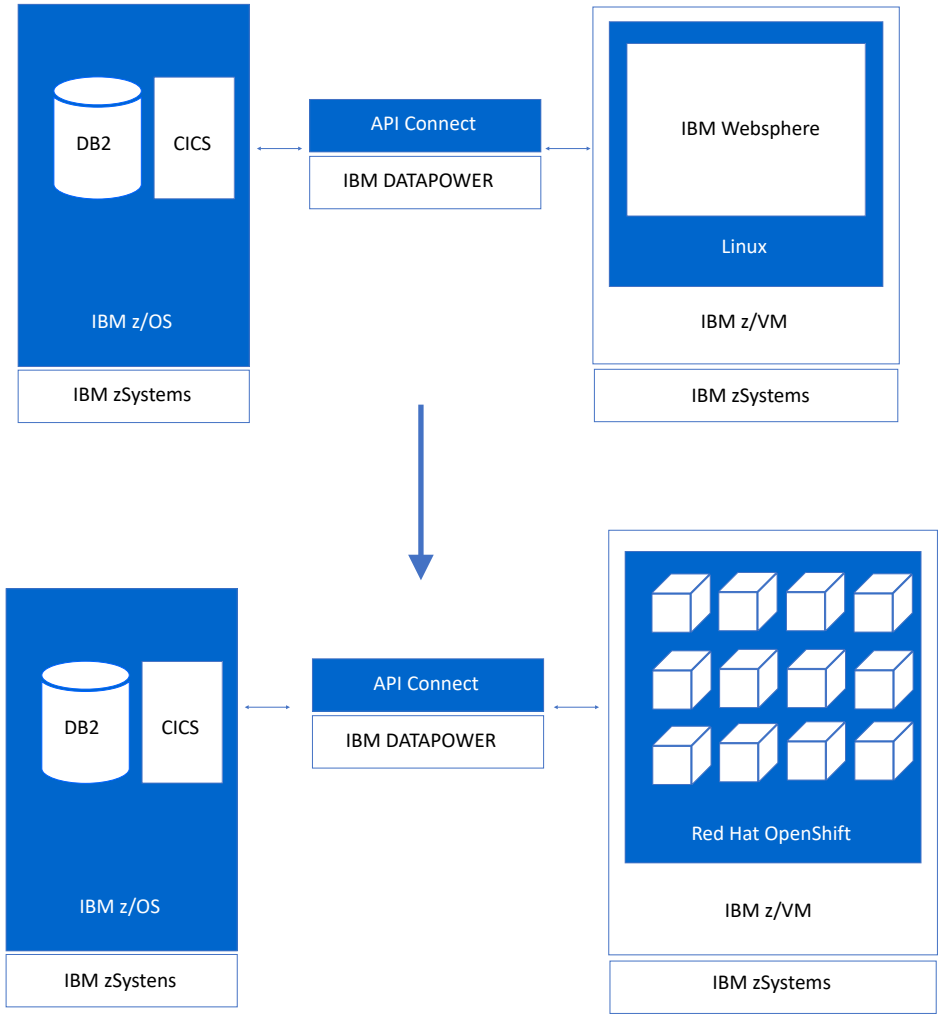
Standardization of automation was a big requirement as well to prevent human error and provide more consistency when building and maintaining their environments.

Solution Benefits

Red Hat OpenShift Container Platform provided the framework for application developers to refactor their applications using an agile methodology leveraging microservices as well as the flexibility for the infrastructure teams to provide new features and capabilities to the platform as needed.

The IBM LinuxONE was chosen for the OpenShift workloads because it provides resiliency, scalability, security and cost effectiveness, while OpenShift provides an abstraction layer that allows developers to build applications on any platform and deploy on LinuxONE. This allows the customer to have flexibility where to develop, and where to deploy their applications, regardless of the cloud deployment model or hardware architecture.

The automation requirements were filled by Red Hat Ansible automation.



Large client

Modernization and Integration with z/OS

Business needs

- modernize its native z/OS ecosystem and integrate the mainframe’s ecosystem to incorporate a hybrid cloud and DevOps strategy to speed up its internal and external business processes
- Emphasis on extending and expanding its z/OS applications using open-source software and microservices managed by an enterprise Kubernetes platformBusiness benefits

Business Benefits

- OpenShift on zCX offered a great option to extend its private cloud and deploy its business applications, leveraging the concept of hybrid cloud
- z/OS ecosystem modernization using corporate cloud native applications, as well as integration with corporate DevOps framework
- Benefits of mainframe’s quality of service, security, availability and reliability known in z/OS environments is now available and running on open-source and cloud-native applications

Solution

IBM zCX Foundation for Red Hat OpenShift