



# IBM Cloud Paks & Red Hat OpenShift Container Platform on IBM Z & LinuxONE

All workshop materials can be found here:

<https://mmondics.github.io/ocp-cloudpak-workshop/>

## Schedule for the day

### Presentation

- Overview of OpenShift
- Overview of IBM Cloud Paks



### Short Break



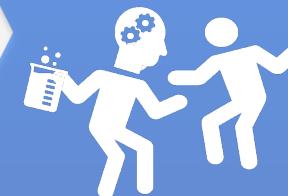
### Presentation

- OpenShift on Z technical deep dive



### Lab exercises

- Self-paced
- Non-sequential



End

4:00 PM Eastern

Start 10:00 AM Eastern

# IBM Cloud Paks & Red Hat OpenShift Container Platform on IBM Z & LinuxONE

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IBM Washington Systems Center



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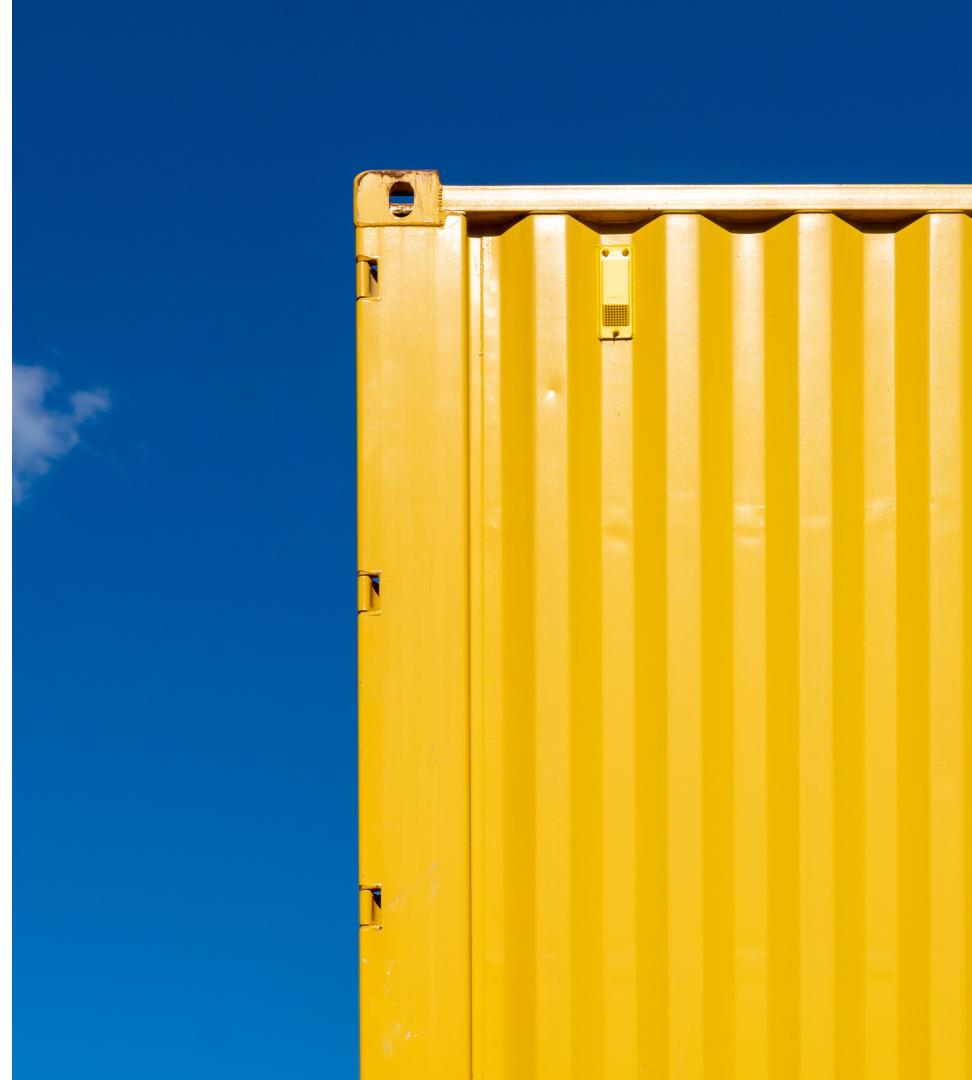
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## Wrap Up

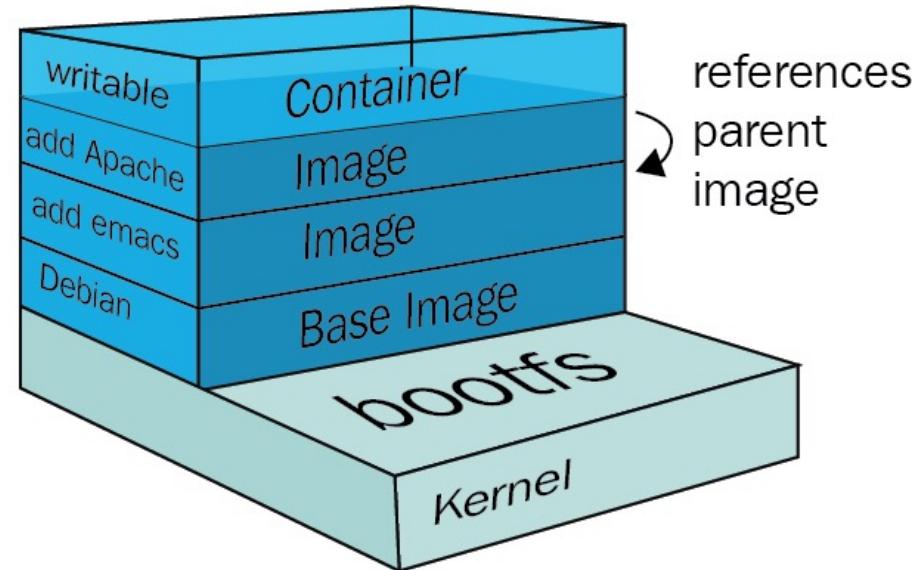
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# Containers



# Container Terminology

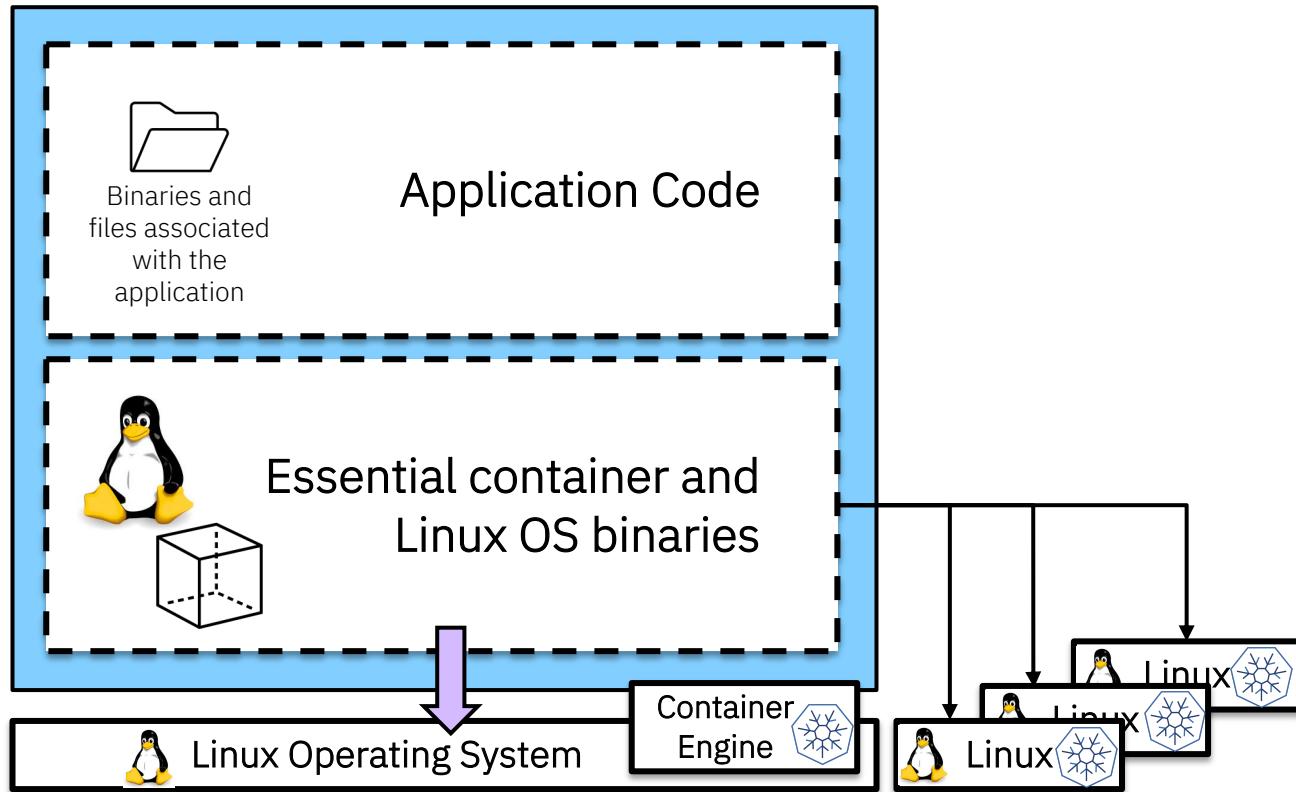
- Container: a standard unit of software that packages up code and all its dependencies, so the application runs quickly and reliably from one computing environment to another
- Container image: a lightweight, standalone, executable package of software that includes everything needed to run an application
- Container engine takes a container image and turns it into a container (i.e. a running process)



# Containerization Overview

Containerization is not a mystical concept.

- Start with the application and associated files
- Add essential container and Linux files and binaries
- Build a container image with provided tooling
- Run image on systems where container runtime exists

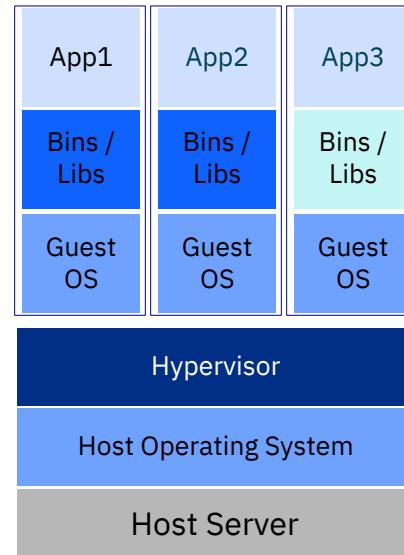


# Containers vs. VMs

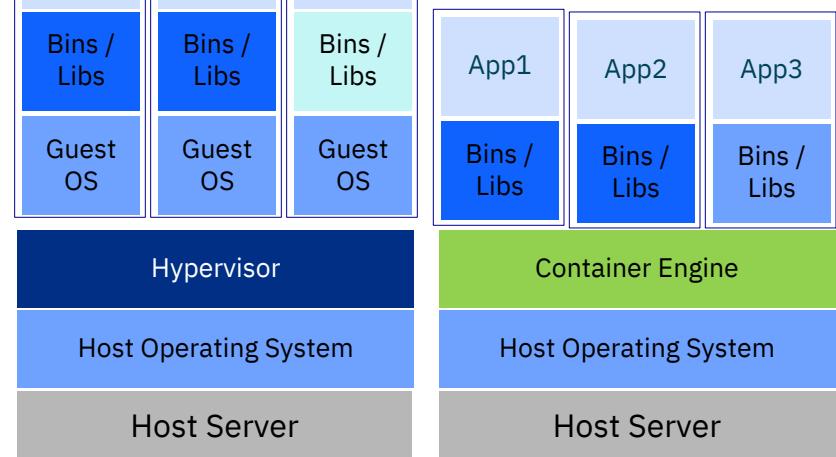
Unlike virtual machines, containers don't virtualize the entire operating system or any underlying hardware.

- Portability
- Build Once, Deploy Anywhere
- Performance
- Resource Isolation
- Management Cost
- Layered Image Architecture
- Great for DevOps and Microservices

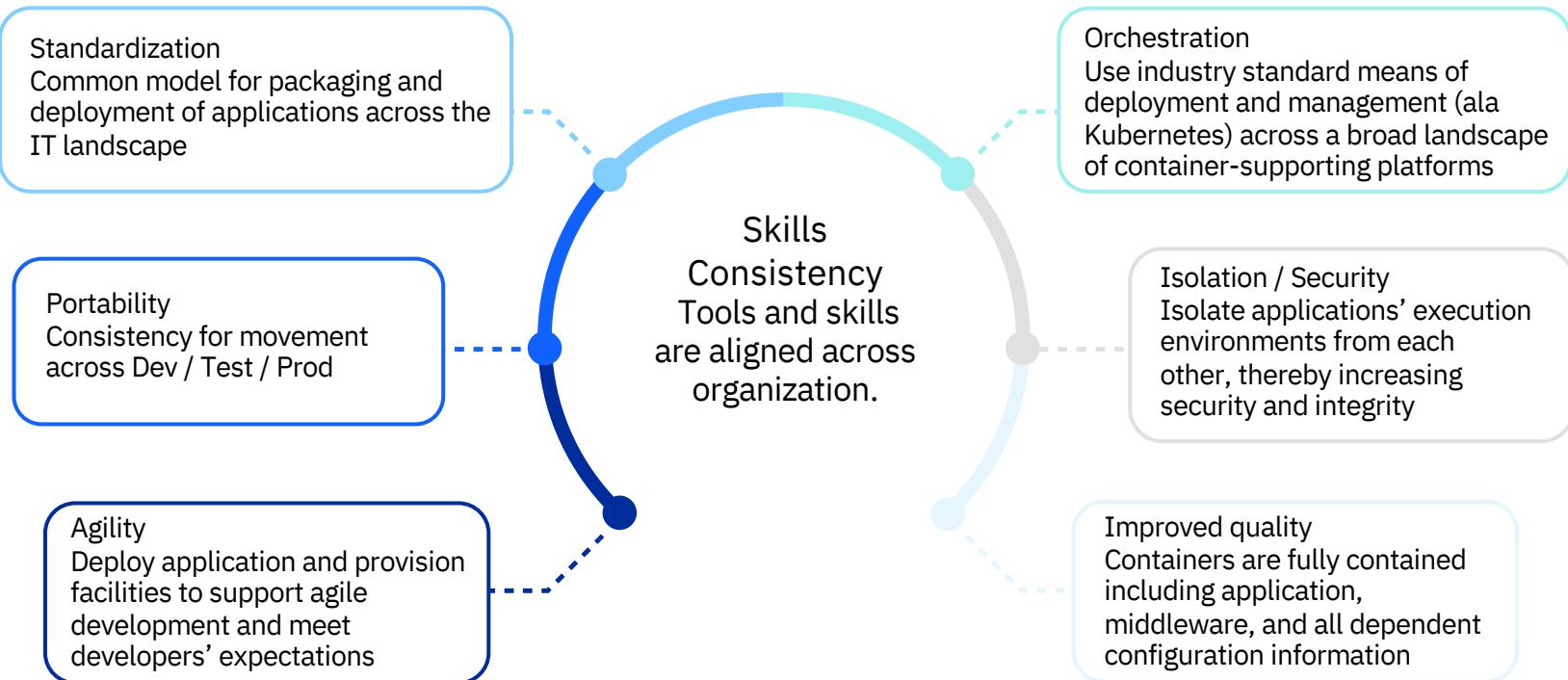
Virtual Machines



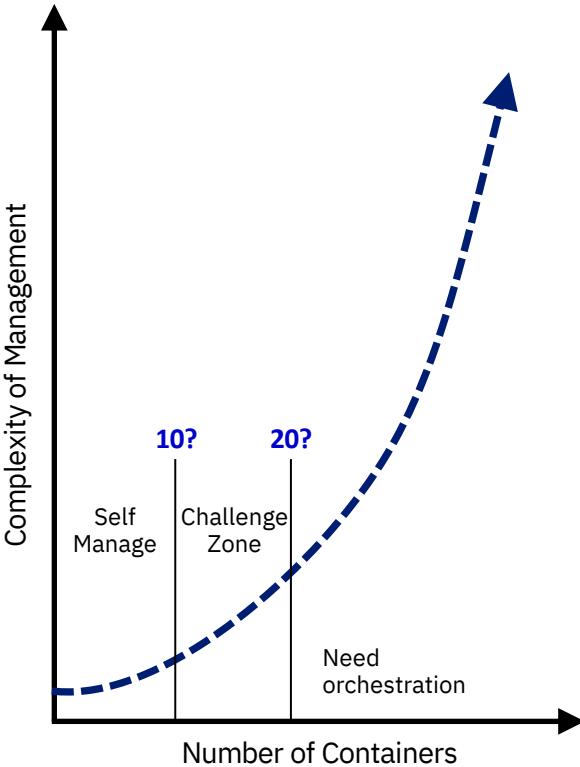
Containers



# Benefits of Containers



# Too much of a good thing?



- A few containers can be managed manually.
- Beyond a point, orchestration is required.
- Kubernetes is the industry leader for orchestration.
- Kubernetes provides:
  - Scheduling of containers to runtimes
  - Monitoring state of containers
  - Restarting failed containers
  - Scaling containers up or down
  - Request load balancing
  - Storage orchestration, plus other functions

# Kubernetes

Although container images and the containers that run from them are the primary building blocks for modern application development, to run them at scale requires a reliable and flexible distribution system. Kubernetes is the defacto standard for orchestrating containers.

Kubernetes is an open source container orchestration engine for automating deployment, scaling, and management of containerized applications.



# What is Kubernetes?

A Container Orchestrator designed to automate container deployment, scaling, and management

- Developed by Google in 2014
- Used by Google to manage billions of containers per week running their services

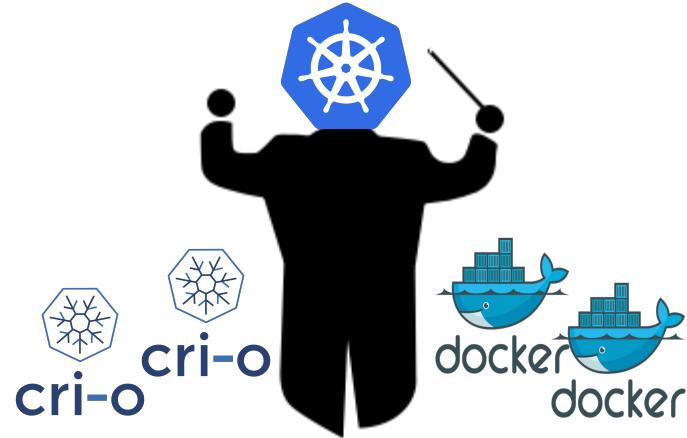
Seed technology of the Cloud Native Computing Foundation (CNCF)



First production grade version (1.0) released July 2015

~Quarterly release since 1.2.0 in March 2016

Latest 1.2.3 released in January 2022



# THE Kubernetes platform for IBM Z and LinuxONE

IBM is adopting the Red Hat OpenShift Container Platform 4 on Linux on IBM Z and IBM LinuxONE.

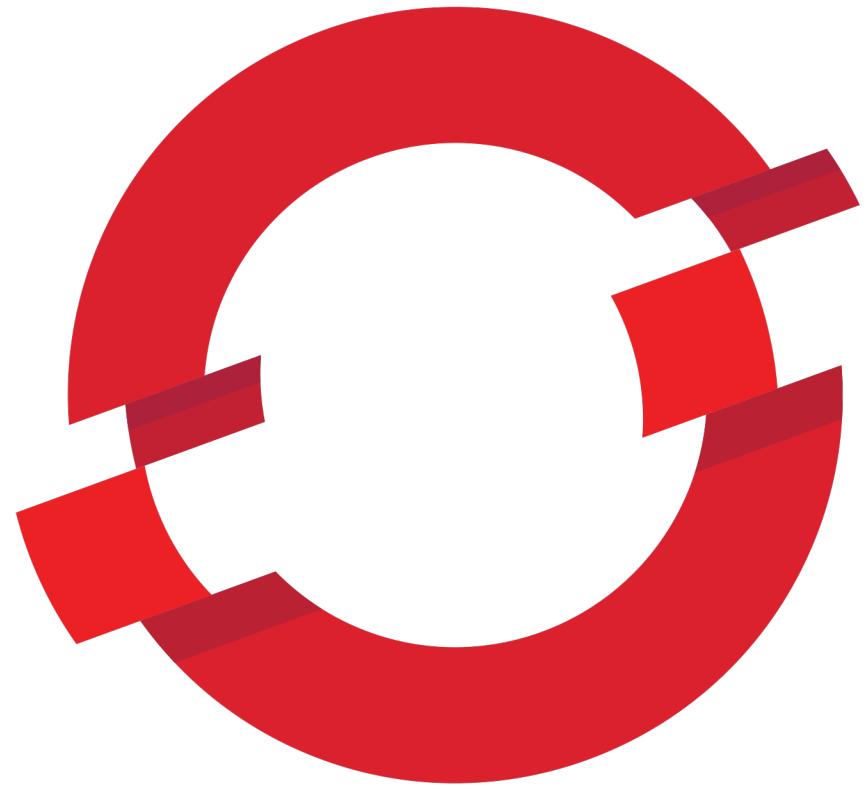
This offering will accelerate the transformation to greater portability and agility through integrated tooling and a feature-rich ecosystem for cloud native development on Linux on IBM Z and LinuxONE offerings.



IBM also intends to deliver IBM Cloud Pak offerings to Linux on IBM Z and LinuxONE offerings. These offerings will accelerate the rich IBM software ecosystem that is necessary for enterprise clients to adopt hybrid multi deployment.

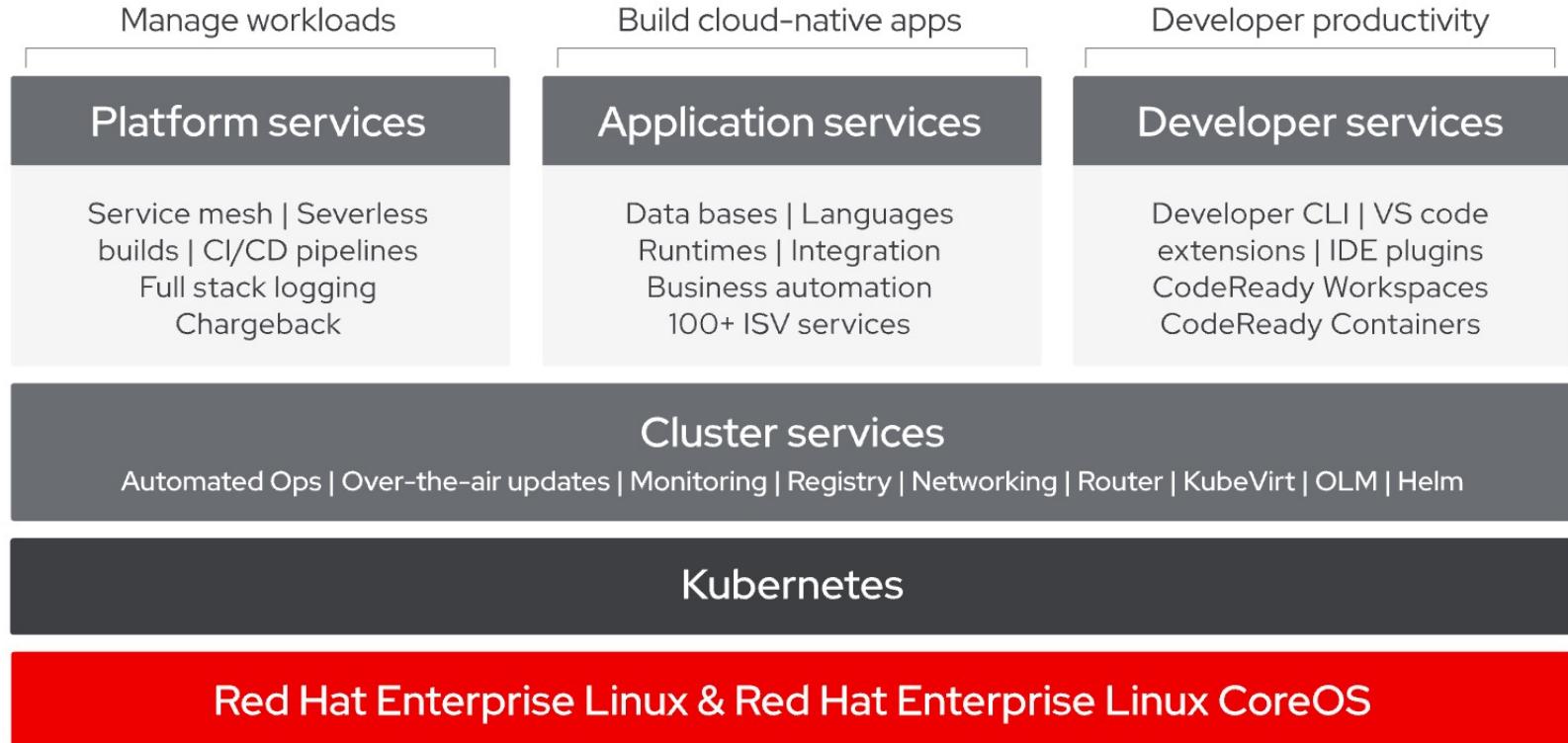
These offerings, combined with the IBM premier enterprise platforms, IBM Z and LinuxONE, will reinforce and further strengthen the IBM focus on hybrid cloud to unlock business value and drive growth for clients by providing a secure and open hybrid, multicloud platform.

# OpenShift Container Platform



# OPENSIFT

# OpenShift Container Platform (OCP) Overview

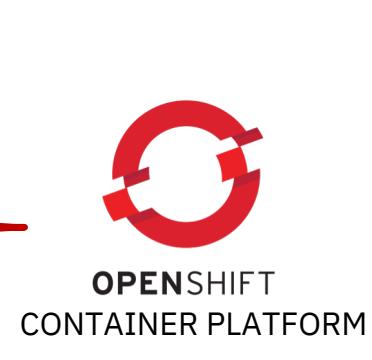


# Under the Hood



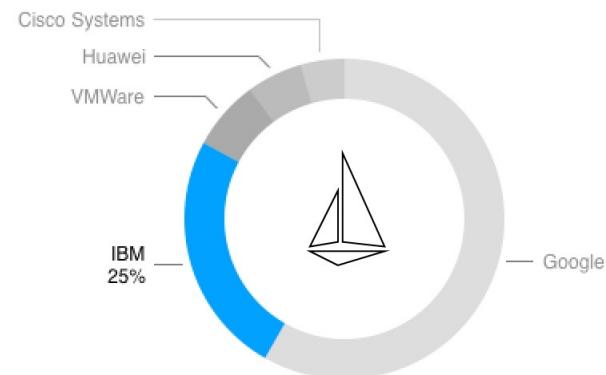
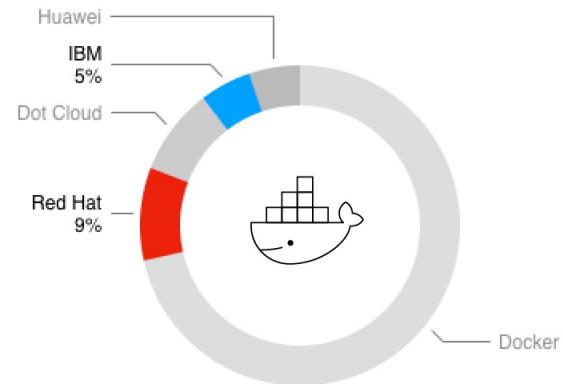
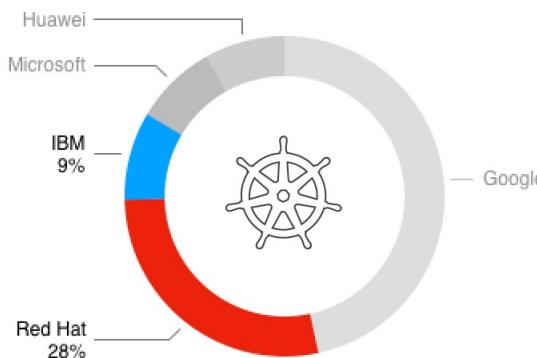
# okd

- OKD – Upstream Open Source Software
- Integrate additional OSS projects
- 100+ Integrations
- Validated OSS Innovation
- Partner Integration Platform



# IBM and Red Hat Open Source Contributors

IBM and Red Hat contributions to Kubernetes,  
Docker, and Istio projects (top 5 orgs apart  
from independent developers).



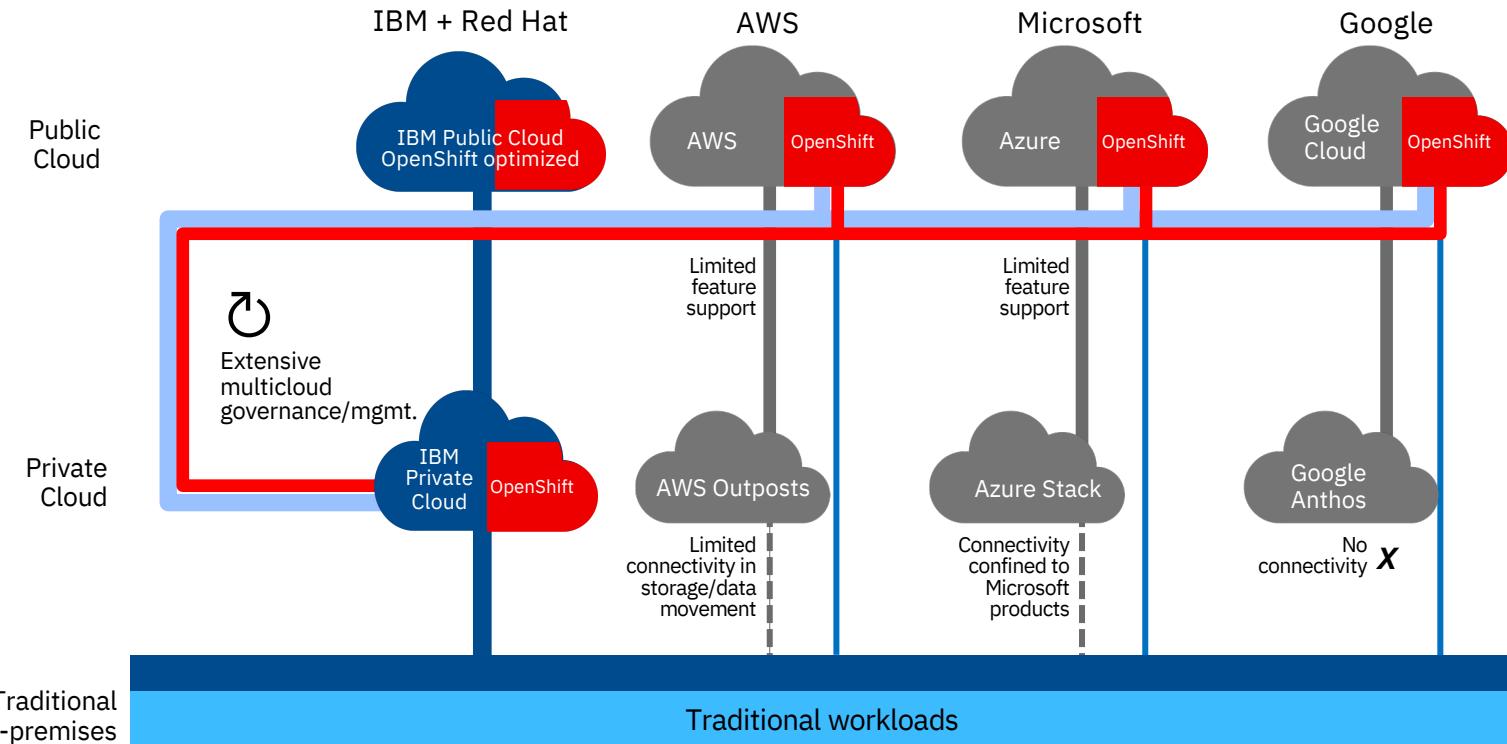
Containerd Companies statistics (Contributions, Range: Last decade), bots excluded		
Rank ^	Company	Number
	All	83559
1	Docker Inc.	17866
2	NTT Corporation	12393
3	International Business Machines Corporation	8558
4	Google LLC	5677
5	Amazon	5098
6	Apple Inc.	4687
7	Alibaba.com	3985
8	Microsoft Corporation	2642
9	Independent	1673
10	LumApps	1475
11	Datadog	1363
12	VMware Inc.	1335
13	CNCF	900
14	Red Hat Inc.	617
15	Tesla Inc .	540
16	Intel Corporation	490
17	ZTE Corporation	459
18	Wargaming	446
19	SUSE LLC	437
20	Pentalog	400

Source: [official CNCF DevStats](#)

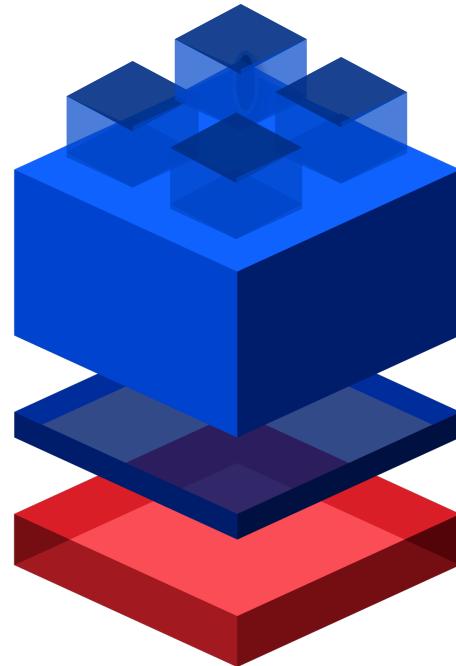
Kubernetes Companies statistics (Contributions, Range: Last decade), bots excluded		
Rank ^	Company	Number
	All	3164848
1	Google LLC	1001658
2	Red Hat Inc.	383142
3	VMware Inc.	254268
4	Independent	105684
5	Microsoft Corporation	96257
6	International Business Machines Corporation	93478
7	Huawei Technologies Co. Ltd	47615
8	The Scale Factory Limited	27356
9	Intel Corporation	26200
10	Kubermatic GmbH	21385
11	CNCF	21232
12	NEC Corporation	20662
13	Amazon	20334
14	Fujitsu Limited	18753
15	SUSE LLC	16880
16	Weaveworks Inc.	16699
17	DaoCloud Network Technology Co. Ltd.	15364
18	ZTE Corporation	13363
19	Samsung SDS	13113
20	Hyper.sh	13025

Source: [official CNCF DevStats](#)

# True Hybrid Multicloud



# IBM Cloud Paks



# The IBM hybrid cloud software approach : Cloud Paks

AI-Powered solutions  
for specific use cases  
and problem domains

Software and AI applications

Containerized Software

Cloud Paks

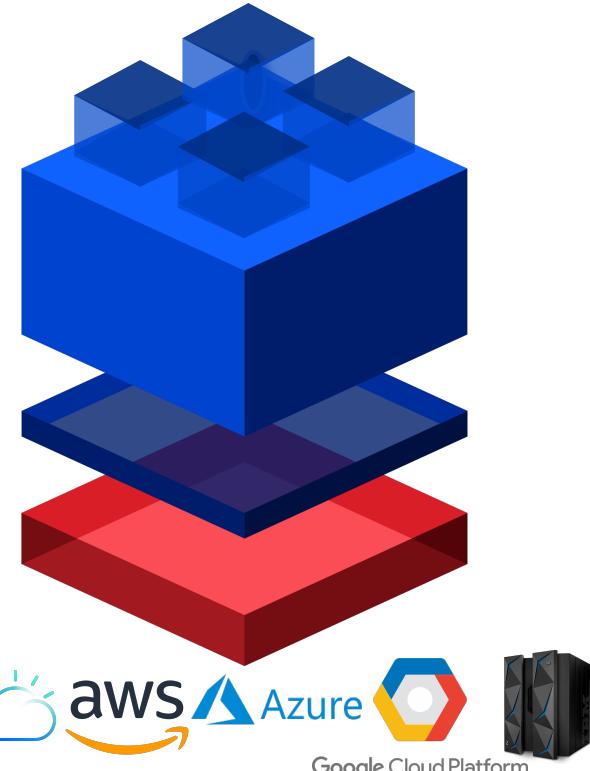
Foundational services  
Consistency and shared  
capabilities

Foundational Services

Enterprise grade  
container platform



Red Hat  
OpenShift Hybrid cloud platform



# IBM Cloud Paks: AI-powered hybrid cloud software

Containerized software, foundational services and Red Hat OpenShift

## IBM Cloud Pak for Data

Unify and simplify the collection, organization and analysis of data

- Transactional and analytical databases
- Data virtualization, governance, privacy
- Data integration/ETL
- AutoAI and Visual Data Science
- Model Risk Management, fairness and explainability

## IBM Cloud Pak for Business Automation

Automate business operations to achieve better performance

- Workflow and decisions
- Content services
- Operational intelligence

## IBM Cloud Pak for Watson AIOps

Automate IT operations to deliver actionable insights

- Application impact avoidance
- Hybrid application management
- Observability

## IBM Cloud Pak for Integration

Automate application and data flows to improve client experiences

- Application integration
- API management
- Messaging and events

## IBM Cloud Pak for Network Automation

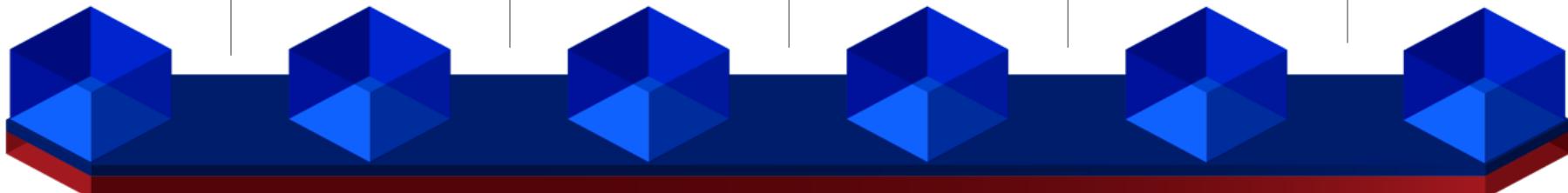
Automate networks to deliver zero-touch operations

- Intent-driven orchestration
- Closed-loop operations
- Network optimization

## IBM Cloud Pak for Security

Generate deeper insights into threats, orchestrate actions and automate responses

- Threat intelligence
- Federated search
- Security information and event management
- Data activity monitoring



# More container-based solutions running on OpenShift on IBM Z

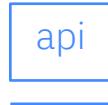
# IBM Z and Cloud Modernization Stack



## Application analysis

Reduce risk of application changes

- Visual insights of application dependencies
- Rapid analysis of application changes
- Analysis of COBOL, PL/I, Java™, and Assembler



## Create and deploy APIs

Secure access to applications and data

- Agile development of OpenAPI 3 APIs in minutes
- Secure and scale business critical APIs
- Seamless integration with enterprise API Management



## Cloud native development

Increase speed and agility for greater productivity

- Common cloud development experience across enterprise
- Choice of languages including Python, Node.js, Go and Java
- Integration with standard, enterprise-wide CI/CD pipeline



## Standardized IT automation for z/OS®

Reduce need for specialized skills, empower developers

- Automated z/OS software management
- Personal z/OS sandbox on Red Hat OpenShift
- Self-serve access to z/OS environments for dev/test



Optimized for Red Hat® OpenShift®

# z/OS Connect



Unlock the value of  
your IBM Z  
subsystems with  
truly RESTful APIs

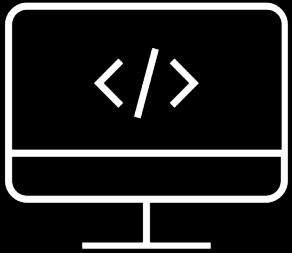
Create consumable  
APIs in minutes to  
make Z applications  
and data central to  
your hybrid cloud  
strategy.

Call APIs from Z  
applications to  
enhance them with  
the power of cloud  
native functions.



# z/OS Connect Components

- z/OS Connect Server container
- z/OS Connect Designer container



z/OS Connect Designer

- OpenAPI 3 support
- API-first functional mapping
- Powerful new web-based user interface



z/OS Connect Server

- Role based security
- Server and its operators enable development teams to independently deploy and scale API integrations
- Near real time statistics to tooling such as Prometheus.

# IBM Wazi Developer

Cloud native development experience for z/OS



Wazi Code



Wazi Sandbox



Wazi Analyze



Optimized for Red Hat OpenShift  
Portable across any cloud

Built on Red Hat CodeReady Workspaces

Certified by IBM and Red Hat

- Bring Your Own IDE

IDE: Integrated Development Environment

Options based on:

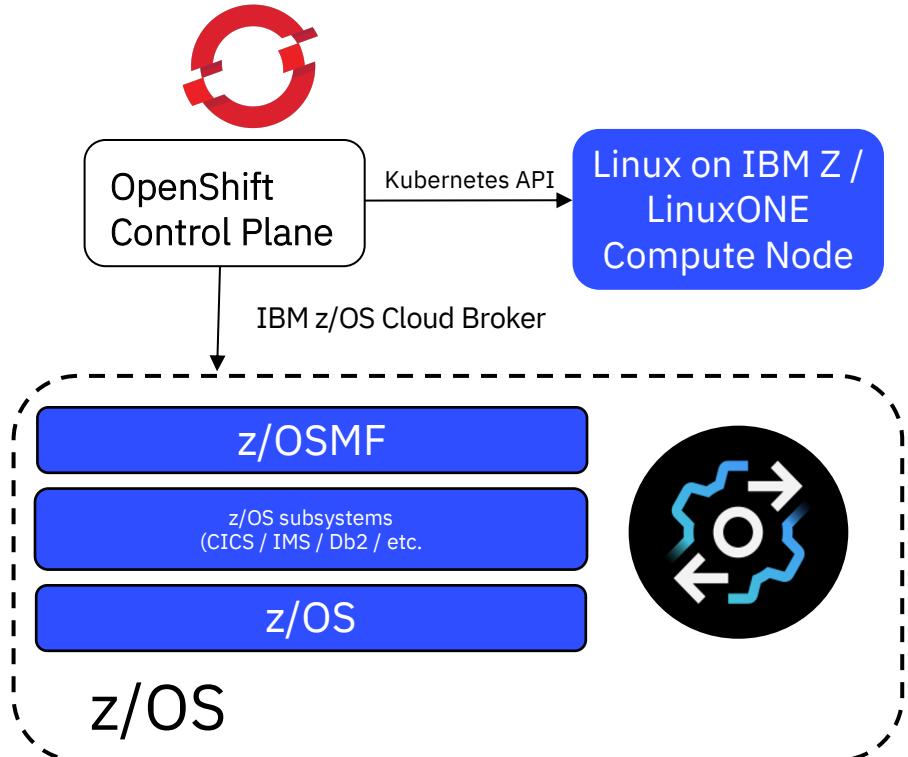
Microsoft®  
Visual Studio Code™

Red Hat  
CodeReady Workspaces

Eclipse ®

- Rich language support: COBOL, REXX, PL/I, Assembler
- Self-service, containerized and personal z/OS sandbox without requiring Z hardware: Runs on Red Hat OpenShift on x86
- Containerized analysis tool with a graphical, web-based user interface: Discover and analyze relationships between z/OS application components
- No vendor lock-in: Integration with opensource tools across the Continuous Integration / Continuous Delivery (CI/CD) pipeline
- Standardized, true parallel development across the enterprise: Edit, debug, build in a familiar environment, move changes to next phase of the pipeline, deploy into native z/OS running on IBM Z

# z/OS Cloud Broker



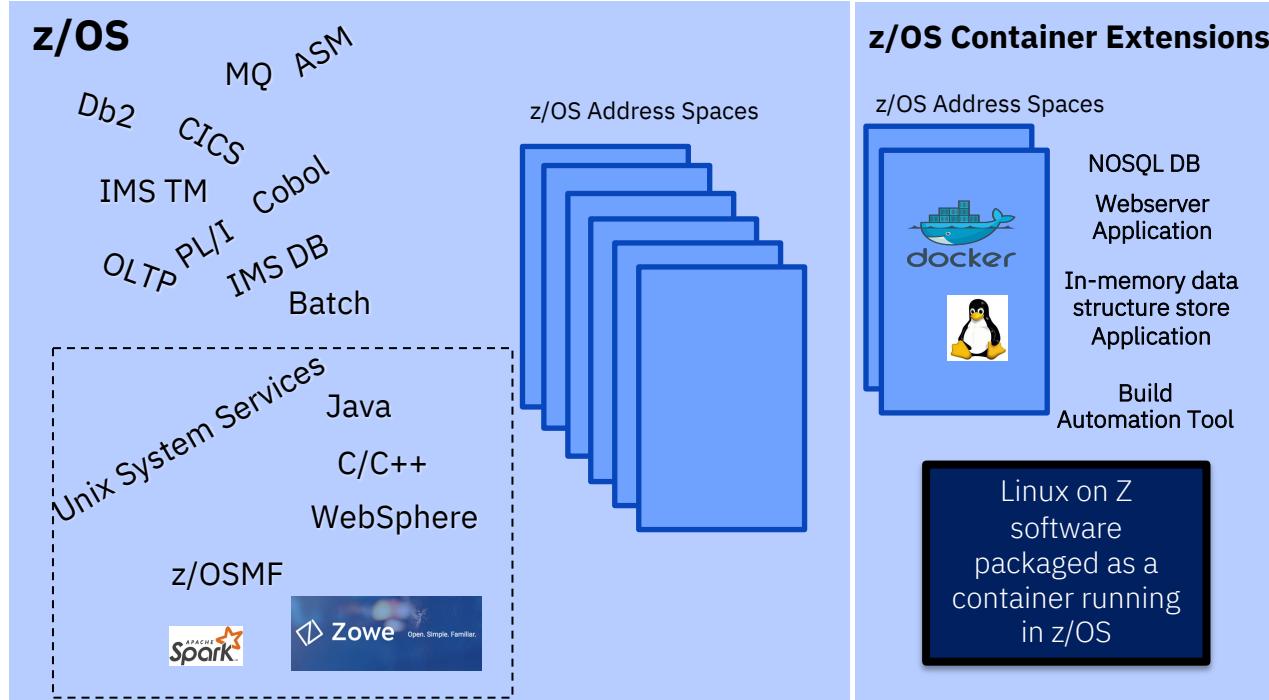
z/OS Cloud Broker is technology that gives users the ability to access and deploy z/OS resources and services on OpenShift for a seamless and universal cloud development experience.

**DevOps** Providing access to IBM Z resources to all flavors of application developers leveraging open standards and tools. i.e. common cloud marketplace.

**Service Provider** Centralization and automation of IBM Z operations to provide Z resources to agencies or clients in a self-service model.

**Multi-Cloud Service Integration** Providing a unified experience for IBM Z cloud services across private cloud and public cloud.

# z/OS Container Extensions



Traditional  
z/OS

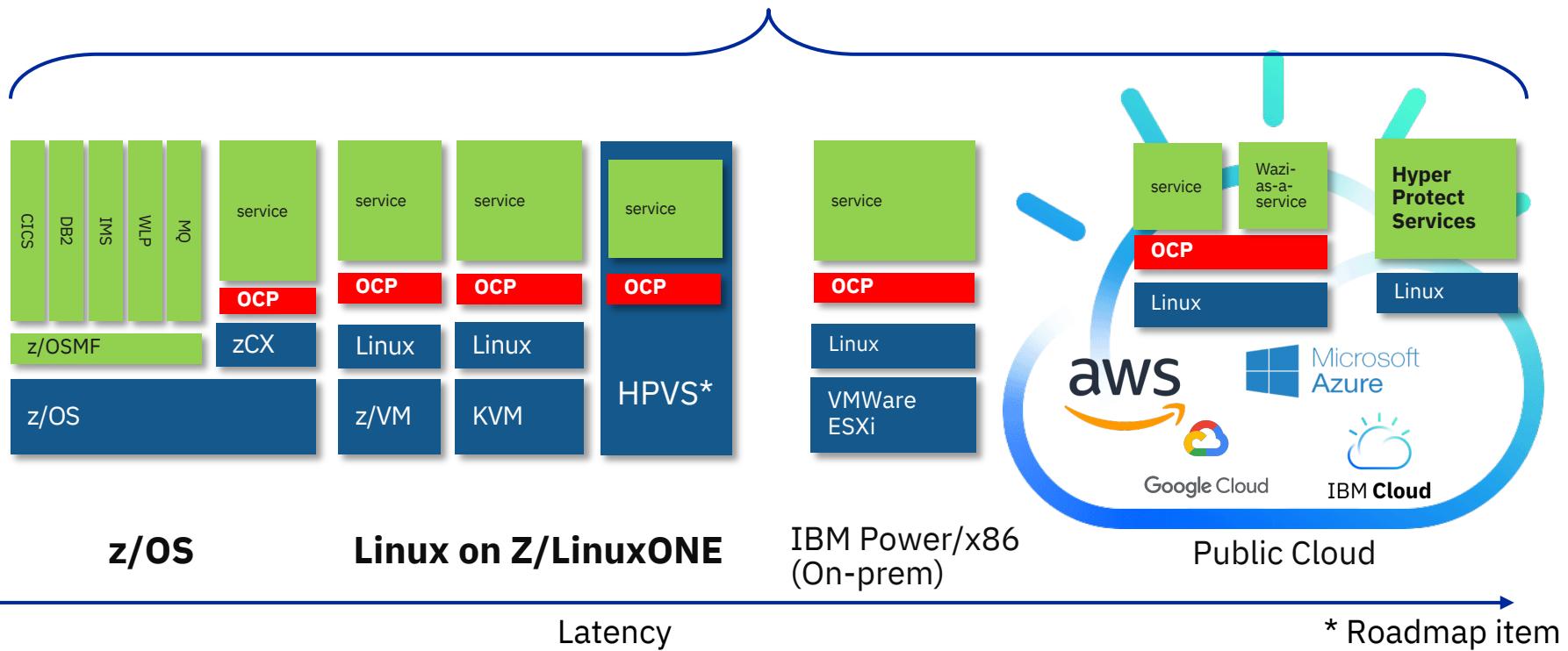


Unix  
Systems  
Services



z/OS  
Container  
Extensions

# The Hybrid Multicloud Vision with IBM Z and LinuxONE

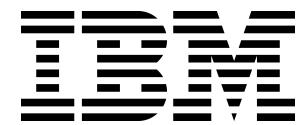


# Thank you

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—  
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# Backup

# IBM Cloud Paks: AI-powered hybrid cloud software

Speed industry and intelligent workflow deployments

Extend and customize with use cases and persona specific capabilities

Simplify experiences with seamless integration of related capabilities

Deploy anywhere as-a-service from the data center to the edge with enterprise QoS

IBM Industry Accelerators



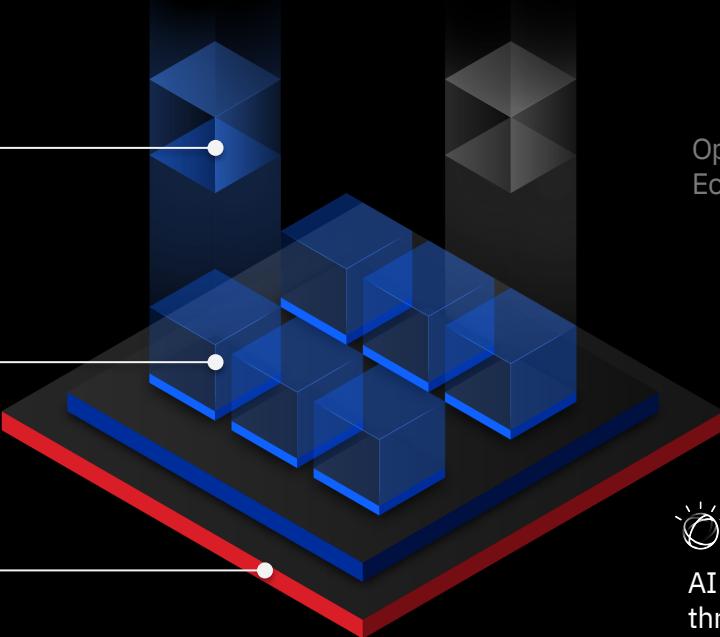
IBM Software

IBM Cloud Paks

Red Hat OpenShift

IBM Cloud Satellite

Open Ecosystem



AI for business throughout



# IBM Cloud Pak for Data

## Modernize and Run Applications Anywhere

### Standalone IBM Offerings

Db2 Standard and Advanced

Informix

DataStage

Information Server

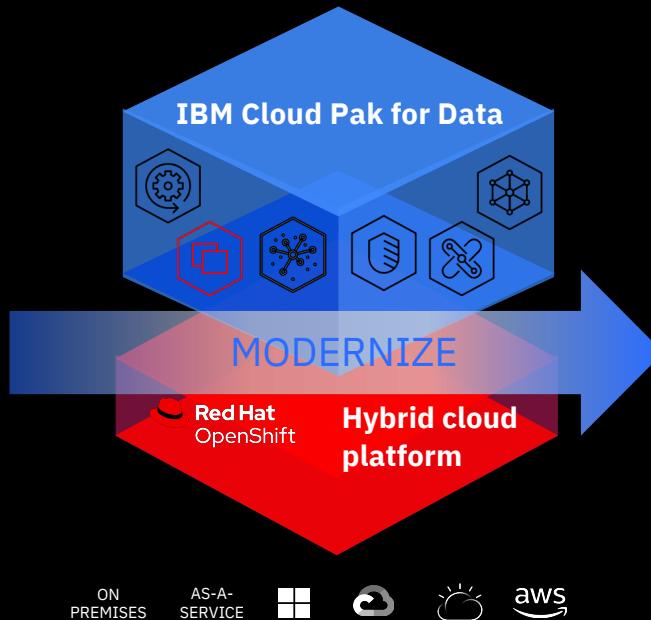
SPSS, Decision Optimization

Cognos Analytics

Planning Analytics

Master Data Management

OpenPages



**50%**

productivity improvement  
in the data lifecycle

**40x**

greater speed of trusted  
data to business users

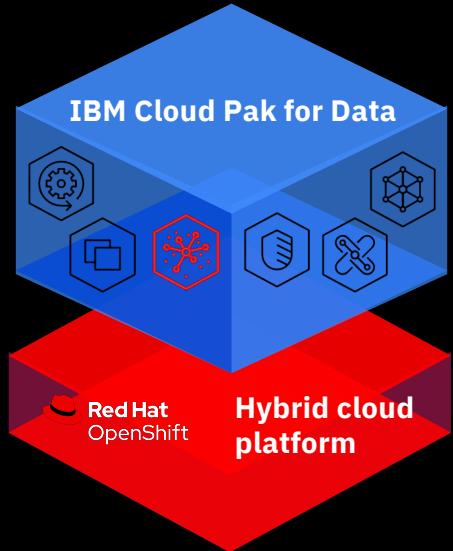
### Business Value of Upgrading

1. Modernize and refactor existing applications to containers on Red Hat OpenShift
2. Reduction in Application Management costs with 65% to 85% improvement in application management efficiency
3. Migrate to Cloud at your own pace, as workloads are ready
4. Protect your Investment with the flexibility and entitlement to run existing applications
5. Flexible licensing with incentives for existing customers of standalone products through the Modernization Upgrade Program

### IBM Cloud Pak for Data Benefits

- Unified platform experience simplifies data delivery, improves end user self-service and reduces IT support
- Modular, open source, and best of breed platform supports the ever-changing business environment
- Single platform solution supports all clouds and tools, reducing data and technology lock-in and dependencies
- Upgrade at your own pace with IBM Cloud Pak for Data while keeping existing Standalone entitlements

# IBM Cloud Pak for Data



	Capability	Available Standalone	Included in Cloud Pak for Data
Cartridges – Available Standalone and in Cloud Pak for Data	Db2 (Standard and Advanced Editions) DataStage Information Server Master Data Management SPSS Modeler / Decision Optimization Planning Analytics Third Party: CockroachDB, MongoDB, Palantir	Watson API Kit Watson Assistant Watson Discovery Financial Crimes Insights OpenPages Cognos Analytics Informix	✓
Unique IBM Cloud Pak for Data Components	Data Virtualization Knowledge Accelerators (for Healthcare, Energy & Utilities, Financial Services, and Insurance industries) Watson Knowledge Catalog (includes IGC, IA, InstaScan, etc.) Watson Machine Learning (including WML-A) Watson Studio Master Data Connect Analytics Engine for Apache Spark IBM Streams Data Privacy	PostgresSQL Catalog of 31 separate Industry Accelerators ( <a href="#">catalog here</a> ) Netezza Performance Server / Db2 Warehouse Regulatory Accelerator Watson OpenScale Open Data for Industries Data Management Console Cognos Dashboards (CDE) Db2 BigSQL	✓
Unique IBM Cloud Pak Licensing/Packaging benefits	RH OpenShift (Kubernetes) included in Cloud Pak for Data	Modernization Upgrade benefits from Standalone products to Cartridges	✓

# IBM Cloud Pak for Business Automation

Automate all your business operations

Up to  
**80%**

reduction in manual  
processes

## Standalone Offerings

WDG RPA

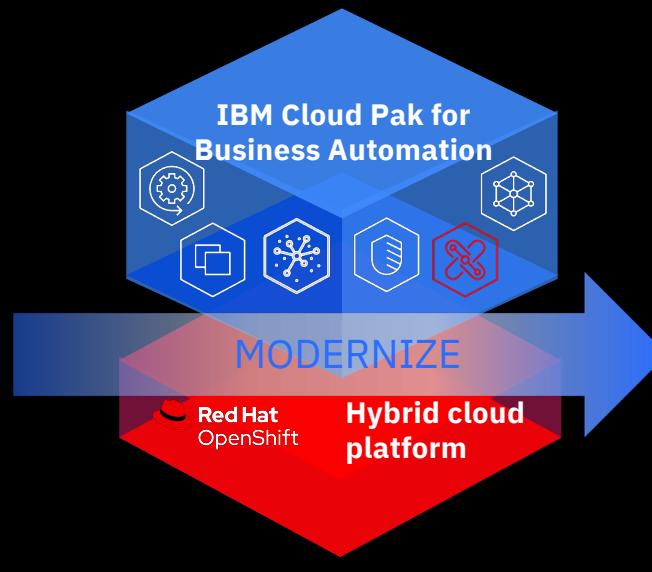
ODM

BPM/Case Manager/BAW

FileNet

Datacap

IER/ICC



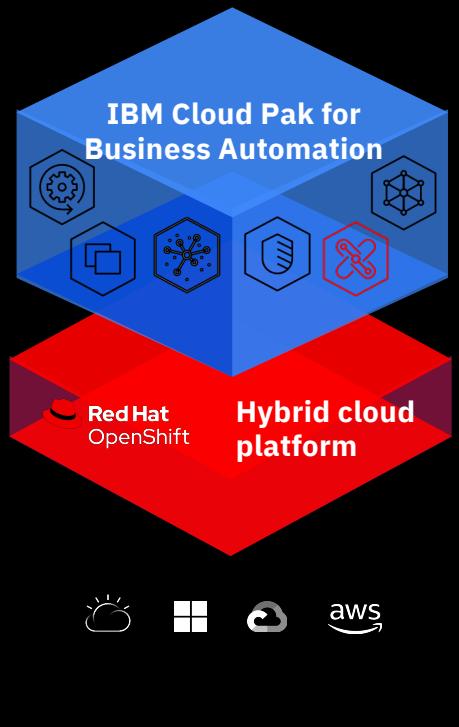
## Business Value of Upgrading

1. **Increase employee productivity** by automating repetitive and mundane human tasks
2. **Reduce Costs** by leveraging AI to streamline processes and minimize business risk
3. **Increase revenue** by delivering customized and automated client experiences at scale
4. Modernize automation applications using containers to support multi cloud deployments
5. Flexible licensing: Mix and match capabilities on demand

## **IBM Cloud Pak Benefits**

- Access to New Value-Added Offerings and Containerized IBM Middleware
- Access to Industry-Leading Red Hat Cloud Platform & Solutions
- License Flexibility
- Cloud Friendly Metrics: Virtual Processor Core (VPC) and MVS metrics
- Full Stack Certification including Open Source support

# IBM Cloud Pak for Business Automation



	Capability	Available Standalone	Included in Cloud Pak for Automation
Standalone Components	IBM WDG Automation	✓	✓
	IBM Business Automation Workflow	✓	✓
	IBM Operational Decision Manager	✓	✓
	IBM FileNet Content Manager	✓	✓
	IBM Datacap	✓	✓
	IBM Enterprise Records	✓	✓
	IBM Content Collector	✓	✓
Unique IBM Cloud Pak Components	IBM Business Automation Content Analyzer		✓
	IBM Decision Services		✓
	IBM Business Automation Insights		✓
	IBM Workstream Services		✓
	IBM Application Designer		✓
	IBM Business Automation Studio		✓
	IBM Business Automation Navigator		✓
	Event Streams to support Business Automation Insights		✓
	Red Hat OpenShift (Kubernetes) included in Cloud Pak		✓
	Unique IBM Cloud Pak Capabilities		✓
Unique IBM Cloud Pak Licensing/Packaging Benefits	Common Services		✓
	License Flexibility to Move between Above Capabilities/Components i		✓

# IT Ops / Management Needs

- Manage the volume of incidents and identify insights on how to fix critical issues quickly
- Minimize the risk of security breaches and non-compliance issues
- Manage complex application environments and an explosion of heterogeneous IT data
- Track and manage across multiple cloud and hybrid environments

***IBM Cloud Pak for MCM is being transitioned and consolidated into IBM Cloud Pak for Watson AIOps. Learn more:***

# IBM Capabilities

**Cost & Asset Management**  
Drive total control and automation of IT operations and provisioning

**Application & Infrastructure Monitoring**  
Define applications to drive business continuity and application resiliency

**Governance & Risk Management**  
Enforce and manage security and compliance criteria at scale

**Event Management & Remediation**  
Automate management of incidents and events that are associated with resources and applications



# IBM Cloud Pak for Watson AIOps

## Automate IT Operations

**\$420K**

saved by reducing  
per outage cost

### Standalone Offerings

Watson AIOps

IBM Operations Analytics  
Predictive Insights

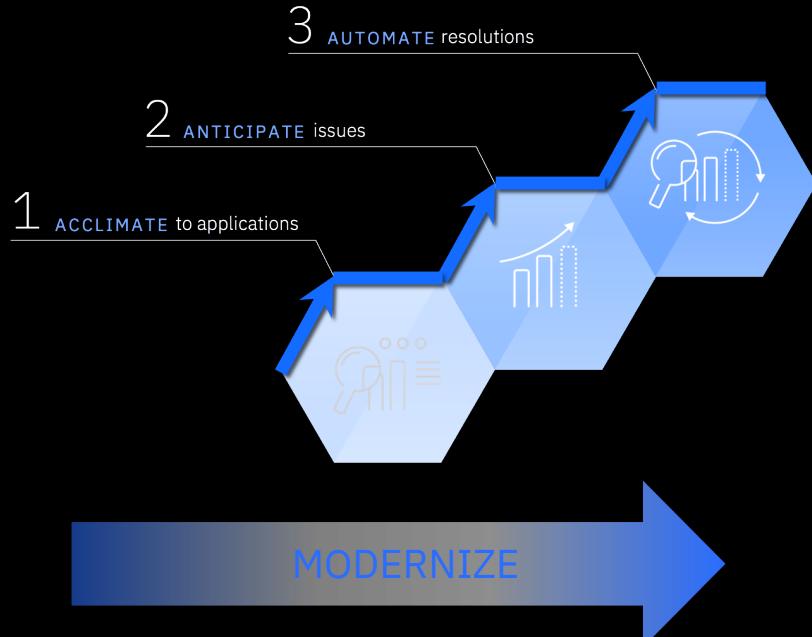
IBM Netcool Operations Insight  
Operations Management  
IBM Netcool Operations Insight  
Connection

IBM Netcool/OMNIbus  
IBM Netcool/Impact

IBM Netcool Operations Insight Agile  
Service Manager

IBM Netcool Operations Insight Network  
Management  
IBM Netcool Operations Insight  
Performance Management

### PATH TO AUTOMATION



### Business Value of Upgrading

#### Ladder to Automation

1. **ACCLIMATE to applications:** Understand business applications and what "good looks like" across the entire application lifecycle from DevOps to IT Ops to Cost Optimization
2. **ANTICIPATE issues**: Increase application availability and reduce security risks by detecting vulnerabilities and predicting operational & compliance issues before they occur
3. **AUTOMATE resolutions:** Reduce costs and invest more in new projects by automatically remediating incidents, decreasing troubleshooting time, and reducing time spent on auditing processes

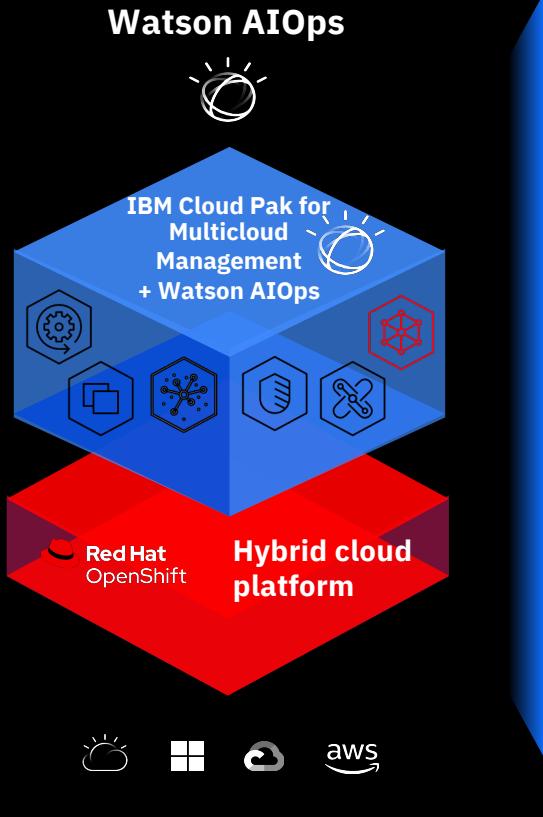
50%

REDUCTION OF  
MAINTENANCE COSTS

25%

INCREASE IN TIME  
AVAILABLE TO NEW  
PROJECTS

# IBM Cloud Pak for Watson AIOps



	Capability	Available Standalone	Included in Watson AIOps
Unique Watson AIOps Components	Watson AIOps: The AI Model		✓
	IBM Operations Analytics Predictive Insights	✓	✓
	IBM Netcool Operations Insight Operations Management	✓	✓
	IBM Netcool Operations Insight Connection		
	IBM Netcool/OMNIbus		✓
	IBM Netcool/Impact		
	IBM Netcool Operations Insight Agile Service Manager		✓
	IBM Netcool Operations Insight Network Management		✓
	IBM Netcool Operations Insight Performance Management		
Watson AIOps add-on			
Unique Watson AIOps Licensing/Packaging Benefits	Price Reduction for Netcool (avg 20% for NOI & 50% NOM)		✓
	ASM included for free in the event & AI		✓
	Flexible and pay for what you use : AI; Metrics and Events ratios		✓
	Adopt at your own pace (licensing and technically)		✓

# IBM Cloud Pak for Integration

Integrate Anything, Anywhere

**3x**

faster to integrate  
and 1/3 of the cost

## Standalone Offerings

MQ & MQ Advanced

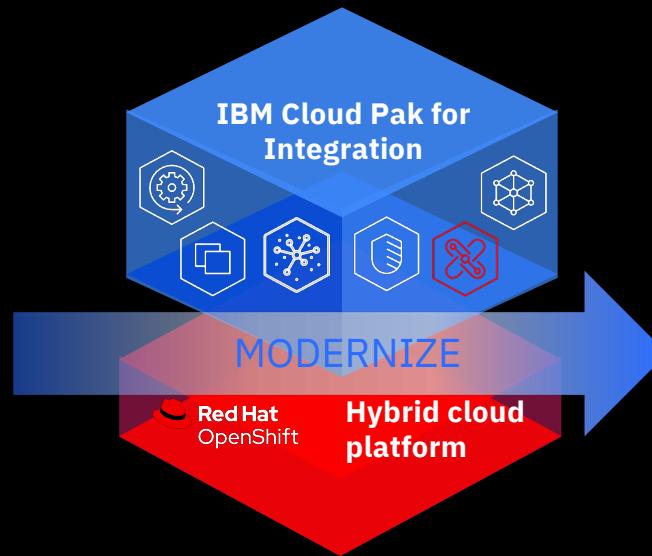
App Connect Enterprise

API Connect

DataPower Virtual

Aspera

Event Streams (Kafka)



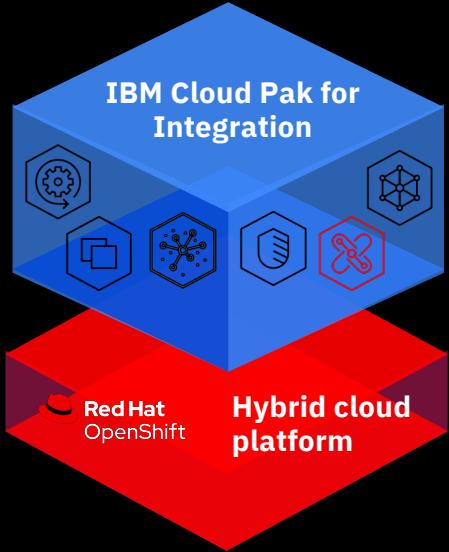
## Business Value of Upgrading

1. Create integrations 3x faster at 1/3 lower cost
2. Most comprehensive integration platform on the market, fully interoperable with stand-alone
3. Increased productivity and governance from Cloud Pak exclusive features: Share and re-use integration assets, unified UX and identity, end to end tracing and monitoring
4. Modernized integration architecture built on Containers and Deployable Anywhere
5. Flexible licensing: Mix and match capabilities on demand

## **IBM Cloud Pak Benefits**

- Access to New Value-Added Offerings and Containerized IBM Middleware
- Access to Industry-Leading Red Hat Cloud Platform & Solutions
- License Flexibility
- Cloud Friendly Metrics: Virtual Processor Core (VPC) metric
- Full Stack Certification including Open Source support

# IBM Cloud Pak for Integration



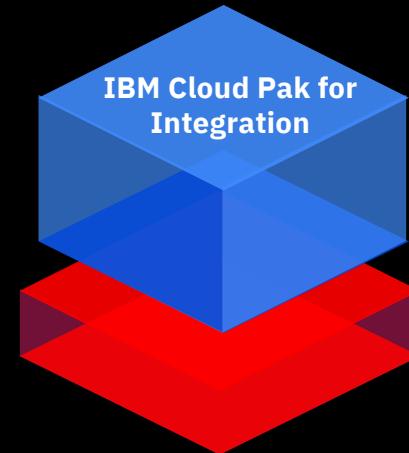
	Capability	Available Standalone	Included in Cloud Pak for Integration
Standalone Components	App Connect	✓	✓
	API Connect	✓	✓
	MQ, MQ Advanced	✓	✓
	DataPower	✓	✓
	Aspera	✓	✓
	Transformation Advisor	✓	✓
Unique IBM Cloud Pak Capabilities	Navigator		✓
	Asset Repository		✓
	Operations Dashboard		✓
	AI Powered Mapping Assist		✓
Unique IBM Cloud Pak Licensing/Packaging Benefits	Moving from PVU to VPC and gain between 40%-70% in additional entitlement		✓
	Availability of non-production parts delivers additional value of 25%-50% when trading in Standalone entitlement to Cloud Pak entitlement		✓
	Embedded OpenShift entitlement included in license		✓
	License Flexibility to Move between Above Capabilities/Components including container-based sub-capacity License Service		✓



# Drive secure and timely access to data and applications

Utilizing a modern, agile approach to integration

- Speed integration development with templates, pre-built connectors and low-code tools
- Reduce the cost of integration by unlocking the value of existing data
- Increase operational agility with a common repository, auto-scaling and self-healing



*Integrates complex sets of modern and legacy data*



*Releases features in 1/3 the previous time to delivery*



*Creates self-service, API-driven business models*

# IBM Cloud Pak for Integration



Client and Partner Applications

## Unified User Experience



### API Lifecycle

- API Connect



### Application & Data Integration

- App Connect



### Enterprise Messaging

- MQ



### Events

- Event Streams



### High Speed Transfer

- Aspera



### Governance



### Integration Security

- DataPower

IBM containerized software



Container platform and operational services



IBM  
public cloud

AWS

Microsoft  
Azure

Google  
Cloud

Private  
Cloud

IBM Z  
IBM LinuxOne  
IBM Power Systems  
IBM Storage

Endpoints



# Integration Needs

- Create and manage APIs
- Respond to events in real-time
- Access data in a fast, secure and reusable way
- Accelerate delivery
- Build and deploy new, re-usable integrations in minutes
- Reduce cost and increase reuse and interoperability
- Secure your business while delivering new engaging services
- Protect transaction integrity
- Balance workload demands to optimize resiliency and scalability

# IBM Capabilities



**API Lifecycle Management**  
Unlock business data and assets as APIs

**Application Integration**  
Connect your cloud and on-prem applications

**Enterprise Messaging**  
Deliver messages reliably with enterprise-grade messaging

**Event Streaming**  
Deliver real-time Kafka event interaction

**High Speed Data Transfer**  
Drive fast & secure data transport across any cloud

**Secure Gateway**  
Control access to vital resources wherever they are

# IBM Cloud Pak for Security

Gain complete insights and unify workflows

## Standalone Offerings

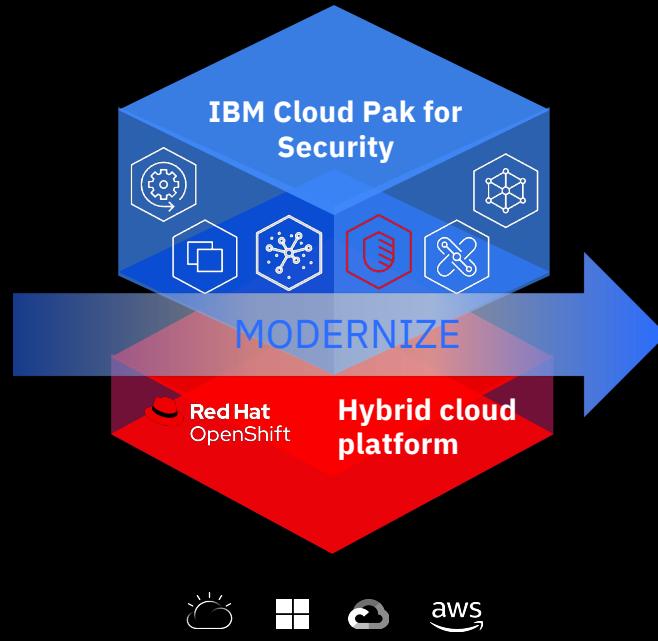
IBM Security QRadar SIEM

IBM Security QRadar Flows

IBM Security QRadar Data Store

IBM Security SOAR

IBM Security SOAR with Privacy



## **IBM Cloud Pak Benefits**

- Access to New Value-Added Offerings and Containerized IBM Middleware
- Access to Industry-Leading Red Hat Cloud Platform & Solutions
- License Flexibility
- Cloud Friendly Metrics: Managed Virtual Server (MVS) & RVU metrics
- Full Stack Certification including Open Source support

600+

validated integrations to reduce risk and MTTD

51%

increase in ability to detect attacks

60x

improvement in investigation time

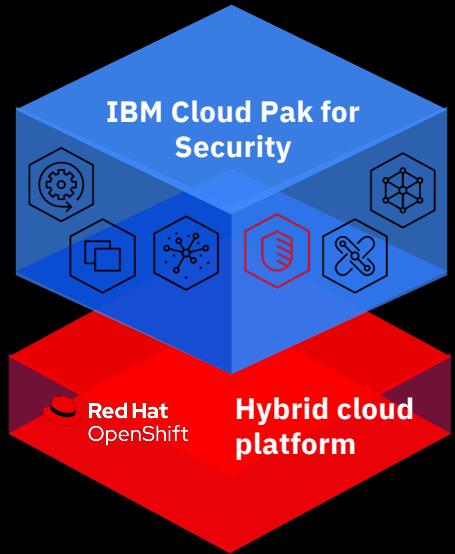
8x

increase in speed to respond to security incidents

## Business Value of Upgrading

1. Non-data volume-based pricing with unlimited data, users and actions
2. Unified/streamlined workflow and insights against existing and future security tooling
3. License Flexibility to Move between Capabilities/Components with unlimited data consumption
4. Migrate from Stand alone offerings to Cloud Pak capabilities at your own pace
5. Deploy on premise or in the cloud
6. Realize the value of a cloud native architecture with improved resiliency and scalability

# IBM Cloud Pak for Security



	Capability	Available Standalone	Included in Cloud Pak for Security	Included in Guardium Insights for Cloud Pak for Security
Available Standalone and Included in Cloud Pak for Security	IBM Security QRadar SIEM	✓	✓	
	IBM Security QRadar Flows	✓	✓	
	IBM Security QRadar Data Store	✓	✓	
	IBM Security SOAR	✓	✓	
	IBM Security SOAR with Privacy	✓	✓	
Unique IBM Cloud Pak Components	IBM Security Threat Intelligence Insights		✓	
	IBM Security Data Explorer		✓	✓ * Restricted Use
	IBM Security Advanced Threat Feed*		✓	* Optional Add On
	IBM Security Guardium Insights			✓
	Red Hat OpenShift (Kubernetes) included in Cloud Pak		✓	✓
Unique Cloud Pak Capabilities	Red Hat Runtimes		✓	✓
	Common services		✓	✓
Unique IBM Cloud Pak Licensing/Packaging Benefits	License Flexibility to Move between Above Capabilities/Components		✓	
	Unlimited data ingestion		✓	

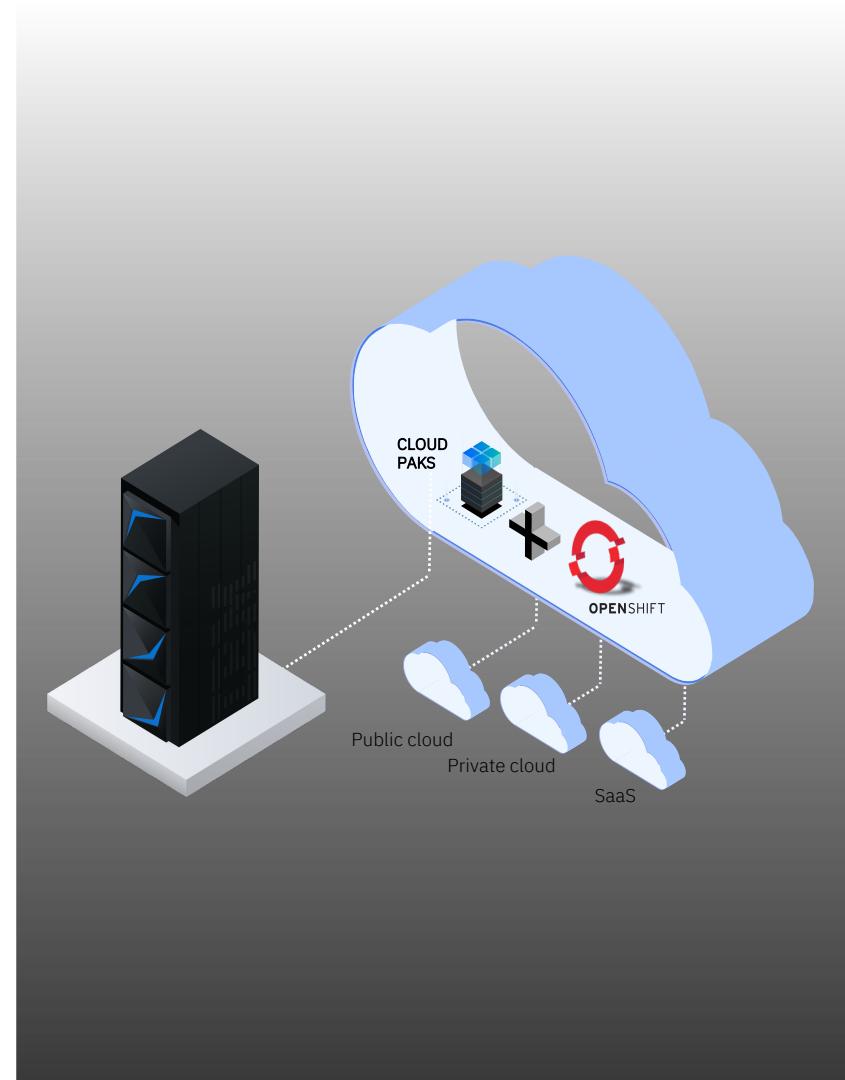
# IBM Z Cloud and Modernization Stack

# Benefits of the Stack

Significantly expand your talent pool

Bring an enterprise-wide DevOps practice

Easily access IBM Z data without moving off-platform



# Accelerate application modernization and IT automation on IBM Z

Simple access to  
applications and data

*Secure API creation and  
integration in minutes*

Agile enterprise  
DevOps

*Cloud native development with  
industry standard open tools*

Standardized  
IT Automation

Reduce need for specialized skills  
and empower developers

## IBM Z and Cloud Modernization Stack



Choice of Integrated Development Environment(IDE)s to enable developers, no vendor lock-down

<p><b>Wazi Developer for VS Code</b> <i>IDE on your desktop</i></p>	<p>Built on <i>Z Open Editor</i></p>	<ul style="list-style-type: none"><li>• IBM Z Open Editor is a no charge Microsoft <sup>®</sup> VS Code <sup>™</sup> extension</li><li>• Available for download in the VS Code marketplace</li><li>• Edit your files directly from z/OS with z/OSMF or RSE API</li></ul> <p><small>z/OSMF: z/OS Management Facility RSE: IBM Remote System Explorer</small></p>
<p><b>Wazi Developer for Workspaces</b> <i>In-browser OpenShift native workspace</i></p>	<p>Built on <i>Red Hat CodeReady Workspaces</i>  Based on open source tool called Eclipse Che, makes Kubernetes development accessible</p>	<ul style="list-style-type: none"><li>• CodeReady Workspaces is included in Red Hat OpenShift <sup>™</sup> and is available in the OpenShift Operator Hub</li><li>• Includes support for Microsoft VS Code<sup>™</sup> extensions</li><li>• Developers only need a web browser to code, build, test</li><li>• Run code updates in an OpenShift container without needing to manage a Kubernetes cluster</li></ul>
<p><b>Wazi Developer for Eclipse</b> <i>On-premise Eclipse-based IDE</i></p>	<p>Works with the <i>Eclipse <sup>®</sup> framework</i></p>	<ul style="list-style-type: none"><li>• Provides the familiarity and features of other Eclipse-based editors</li></ul>



# Wazi Code Features

Essential developer capabilities that include edit, build, and debug

## Wazi Developer for VS Code

- Editors support COBOL, JCL, REXX, HLASM, and PL/I

## Wazi Developer for Workspaces

- Integration with any flavor of Git for Source Code Management (SCM )
- Intelligent build capability with IBM Dependency Based Build
- Integrated debugger to facilitate debugging through IBM z/OS Debugger
- Integrations that enable work with z/OS resources such as MVS™ and UNIX files and JES jobs

## Wazi Developer for Eclipse



# Wazi Sandbox

Containerized, personal sandbox running on Red Hat OpenShift on x86 hardware

Sandbox runs the real z/OS and improves development infrastructure availability and flexibility	<p>Includes the Extended Application Developers Controlled Distribution (ADCD) package</p> <ul style="list-style-type: none"><li>• ADCD is customized bundle of z/OS and related products such as CICS ®, Db2 ®, IMS, z/OS and JES2</li><li>• Not an IBM program product and is not supported as a product</li><li>• Extended ADCD includes additional software, applies maintenance to existing software products</li></ul>
Use any on-premise or cloud-based x86 Red Hat OpenShift ™ environment	<ul style="list-style-type: none"><li>• In the OpenShift UI, simply run the IBM Wazi Sandbox operator</li><li>• Once the sandbox is up and running, open your preferred development environment and connect to the sandbox to edit, debug, build, and test your code</li></ul>



# Wazi Analyze

Containerized analysis tool with a graphical, web-based user interface to discover and analyze relationships between z/OS application components

Graphical visualization in a web-based user interface	<ul style="list-style-type: none"><li>• Fast application analysis in a web-user interface</li><li>• Understand relationships between COBOL, PL/1 and Assembler application components to analyze the impact of changes</li><li>• Graph or table view of the program call structure and of the relationships between programs and copybooks in an application</li></ul>
Containerized tool	<ul style="list-style-type: none"><li>• Runs in Docker environment locally on a developer workstation or remotely on a server</li></ul>

# Storage Suite Starter for IBM Cloud Paks

Introduced with IBM Cloud Pak for Integration in December 2020

Software-defined storage for IBM Cloud Pak deployments



Simplify IBM Cloud Pak deployments by including Storage and documentation so customers are ready for production

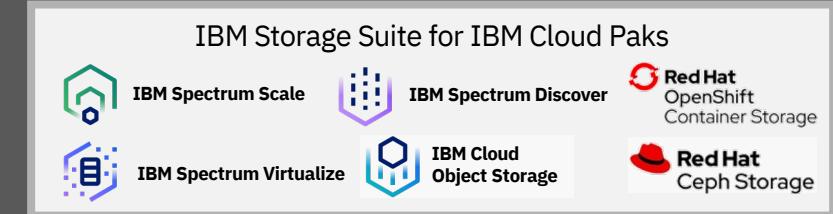


Strengthen IBM's positioning as a one-stop-shop, offering end-to-end solution from IBM Cloud Paks to Storage



Position the full Storage Suite for IBM Cloud Paks as the preferred and validated storage option in upsell opportunities

IBM Cloud Pak for Integration    IBM Cloud Pak for Data    IBM Cloud Pak for Bus Auto    IBM Cloud Pak for WAIOps + MCM    IBM Cloud Pak for Network Auto    IBM Cloud Pak for Security



## What's included?

- Included free-of-charge software-defined storage for IBM Cloud Pak deployments
  - Up to 36TB (12TB usable) of Red Hat OpenShift Container Storage
  - Up to 12TB of IBM Spectrum Scale, IBM Spectrum Virtualize for Public Cloud, and/or IBM Spectrum Discover
    - Note that IBM Cloud Object Storage and Red Hat Ceph Storage are NOT included
  - Fully supported by IBM in production environments (Level 1 and Level 2)
  - Time limit 36-months for new and existing customers