EVOLVING SOLUTIONS

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Unleashing the Power of Hybrid Cloud Integration

AGENDA

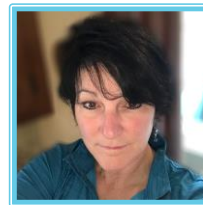**Welcome**   Barbara Call
                                              Senior Director, Content
                                              Strategy, Atlantic Region
                                              IDG

Hybrid Cloud Vision   Michael Downs
                                              Chief Technology Officer
                                              Evolving Solutions

Hybrid Cloud Innovation   Joe Cropper
                                              Master Inventor
                                              IBM Corporation

HYBRID CLOUD VISION

Michael Downs
Chief Technology Officer
Evolving Solutions
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WHO IS EVOLVING SOLUTIONS?

Evolving Solutions is a technology solutions provider that helps clients **modernize** and **automate** their mission-critical applications and infrastructure to support business transformation.

Our business is client-centric consulting and delivery of technical solutions to enable **modern operations** in a hybrid cloud world.

A CONTINUALLY CHANGING AND UNPREDICTABLE WORLD

Organizations must prioritize the ability to rapidly adapt to unforeseen events

- The global events of 2020 and 2021 were unprecedented, but they accelerated the rate of technology and business transformation.

- By 2023, global crises will make 75% of CIOs integral to business decision-making as digital infrastructure becomes the business OS while moving from business continuation to re-conceptualization.[1]

"We are now experiencing a whole new level of uncertainty."

-Jerome Powell, Federal Reserve Chairman

1. IDC FutureScape: Worldwide IT Industry 2021 Predictions

DIGITAL TRANSFORMATION ADDRESSES THE CHALLENGES OF FLEXIBILITY AND ADAPTABILITY

Existing technology trends have accelerated because of these challenges

- Rapid adoption of cloud that was driven by cost is now prioritizing agility

- Cloud native application development creates flexibility by design

Increasing the "digitization" of business process and products facilitates adaptability

- Allows for automation and integration

- As more processes become digital, the ability to analyze them and make data-driven, actionable decisions becomes possible

OPERATIONALIZING THE CLOUD

Processes   **Tools**   **Outcomes**

Connectivity & Access

Monitoring & Observability

Performance

Resilience
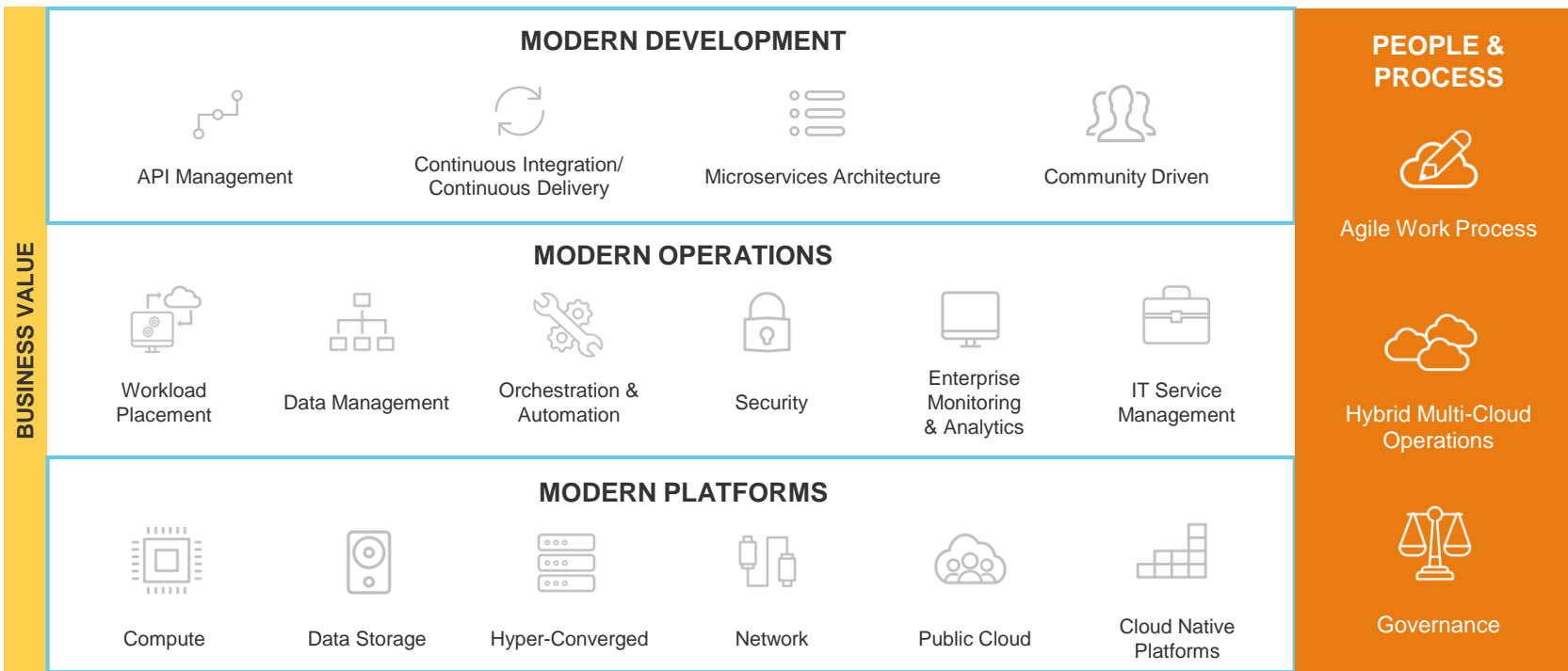
Data Protection

Automation

Cost Optimization

OUR MODERN OPERATIONS PHILOSOPHY

Cloud is not a place. Cloud is a set of disciplines.®

Adopting these disciplines provides the adaptability, resilience and flexibility required for businesses to survive, compete and grow in an unpredictable world.

HYBRID CLOUD VISION FOR BUSINESS TRANSFORMATION

BUSINESS VALUE

MODERN DEVELOPMENT

| API Management | Continuous Integration/ Continuous Delivery | Microservices Architecture | Community Driven |

MODERN OPERATIONS

| Workload Placement | Data Management | Orchestration & Automation | Security | Enterprise Monitoring & Analytics | IT Service Management |

MODERN PLATFORMS

| Compute | Data Storage | Hyper-Converged | Network | Public Cloud | Cloud Native Platforms |

PEOPLE & PROCESS

Agile Work Process

Hybrid Multi-Cloud Operations

Governance

HYBRID CLOUD INNOVATION WITH IBM POWER

JOE CROPPER
*Chief Architect, IBM Power Hybrid Cloud Platform*
IBM Master Inventor
jwcroppe@us.ibm.com

While it's the new normal, hybrid multicloud isn't easy without the right tools…

- Multiple on-prem data centers

- Multiple public cloud providers

- Multiple hardware platforms, hypervisors and clouds–each with different management tools

- Various resources – VMs (LPARs), containers, different operating systems, etc.

How do you manage, observe, optimize, automate and modernize across this diverse hybrid cloud landscape?!?
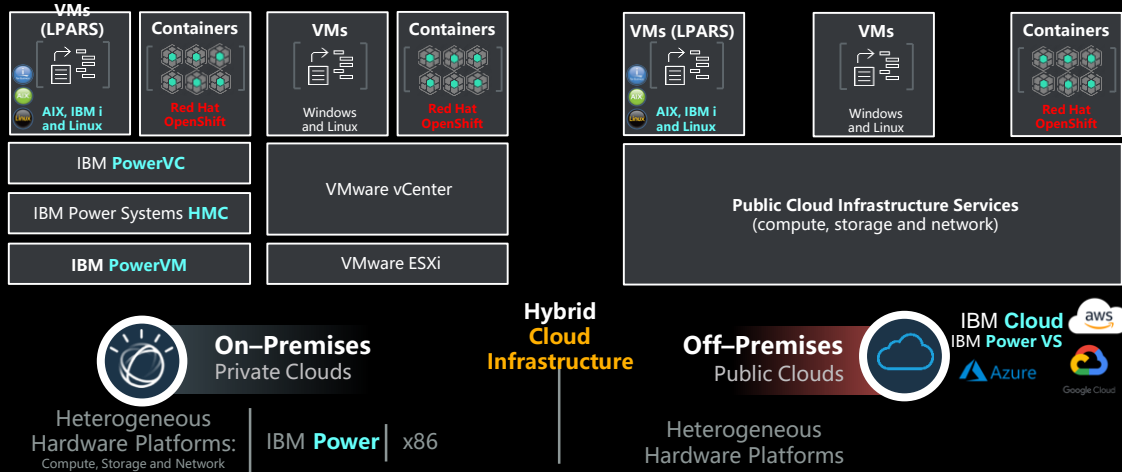
Frictionless hybrid cloud experience with IBM Power

AIX IBMi Linux

Cloud Innovation
Agility, flexibility and automation across private and public Cloud

Application Modernization
Enterprise AI, advanced analytics, containerization, extension via microservices

Resilient, Scalable & Secure
Business continuity through reliability and agility

Modernize existing & develop new cloud-native applications with speed and agility

Modernize existing applications	Build new application services
Extend enterprise apps on AIX, IBM i and Linux with enterprise AI and containers	Open ecosystem for access and use by IT admins and developers with no special skills required

Enabling a Frictionless Hybrid Cloud Experience for Enterprise-class Workloads

Private Cloud	Public Cloud
Dynamic, automated cost management Elastic computing Pay per use Ansible Automation	Power Virtual Server Consistent architecture Seamlessly connect to IBM Cloud Enterprise solutions

IBM | Red Hat

IBM Hybrid Cloud Management
Current Landscape & Client Use Case Categories

Manage & Automate	Observe & Optimize	Modernize
Seamless infrastructure management and automation	*AI-driven Automation with full-stack enterprise observability and dynamic resource + cost optimization*	*Modernize and extend applications through cloud-native services*

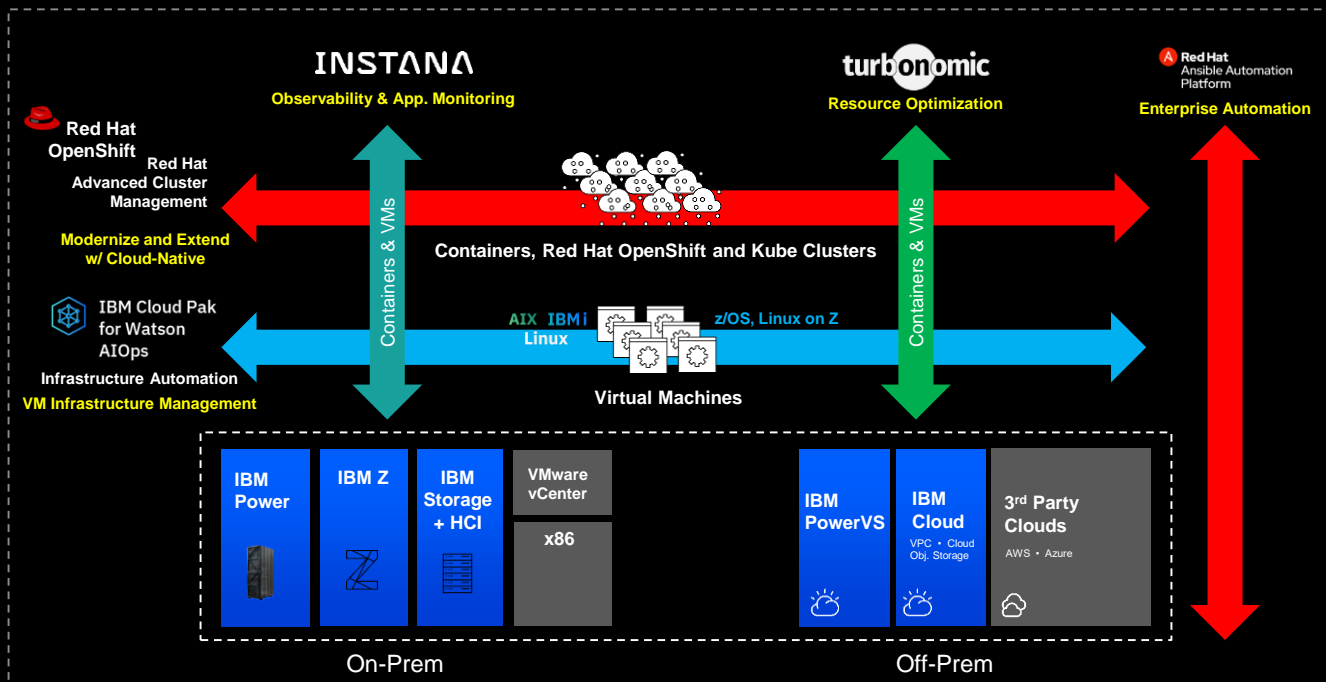| **Market**	Infrastructure Automation	Application Performance Management (APM) tools	Hybrid Cloud Management & Application Modernization
IBM & Red Hat Solutions	IBM Cloud Pak for Watson AIOps **Infrastructure Automation** / Red Hat Ansible Automation Platform	INSTANA an IBM Company / turbonomic an IBM Company	Red Hat OpenShift / Red Hat Advanced Cluster Management for Kubernetes

Enterprise Hybrid Cloud Platform with IBM Power

IBM's Hybrid Cloud Management

AI-driven automation of IT

Faster Decision Making

Full-stack, enterprise observability

Observe

Smarter Resource Allocation

Dynamic resource management and cost optimization

Optimize

Automation

Autonomous problem determination, remediation, avoidance

Automate

INSTANA

an IBM Company

Real-time understanding of environment

turbonomic

an IBM Company

Maximize efficiency, compliance

IBM Cloud Pak for Watson AIOps

Automate IT availability

AI-Powered Automation

Overview of IBM Cloud Pak for Watson AIOps:
Infrastructure Automation

INFRASTRUCTURE MANAGEMENT

- Discover existing and provision new VMs – existing workloads such as Oracle, SAP, etc.
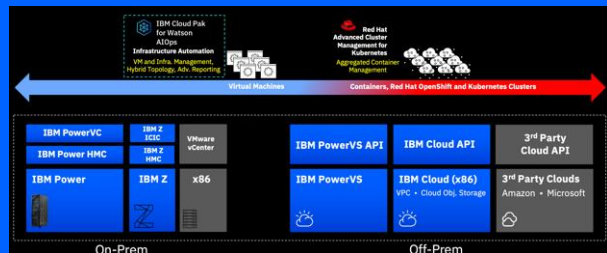- Inventory and lifecycle management of VMs
- Chargeback and reporting
- ***Consistent experience across hardware platforms and cloud providers***

ANSIBLE-BASED AUTOMATION

Red Hat Ansible Automation Platform
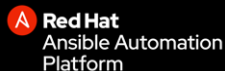
- Execute playbooks to automate VM provisioning

- Configure Actions to remediate policy violations via Ansible

SERVICE and TERRAFORM AUTOMATION

- Infrastructure provisioning based on Terraform templates

- Infrastructure-as-Code capabilities— promoting GitOps process flow

- Composable service editor

- RBAC-controlled service library

IBM Power – One Platform for Digital Transformation

Mission Critical Business Applications

ORACLE

IBM DB2

Java

SAP

AIX IBM i Linux

+

- ✓ **Efficient scaling of Infrastructure**
- ✓ **Proven security and reliability**
- ✓ **More software with less servers**

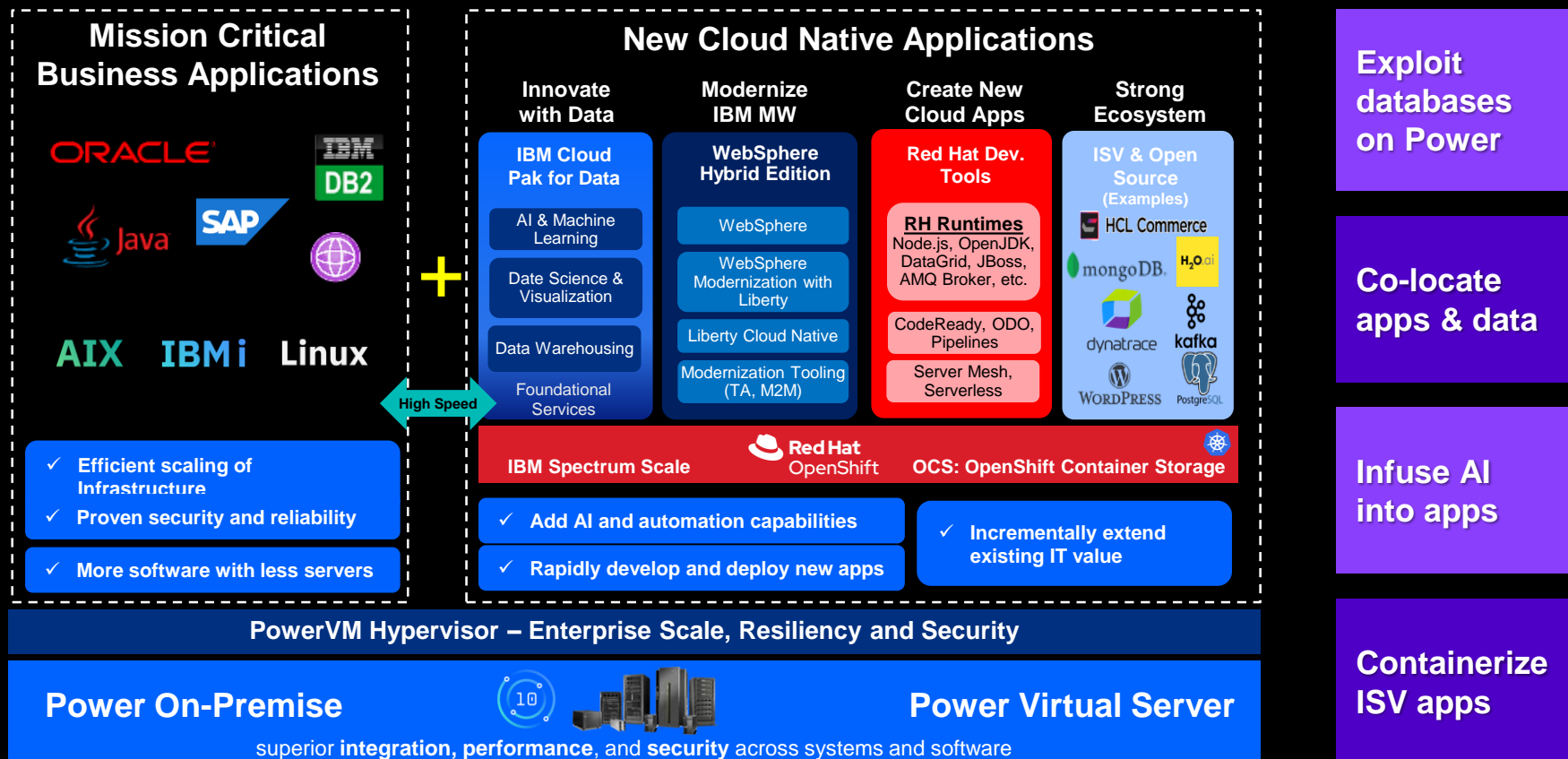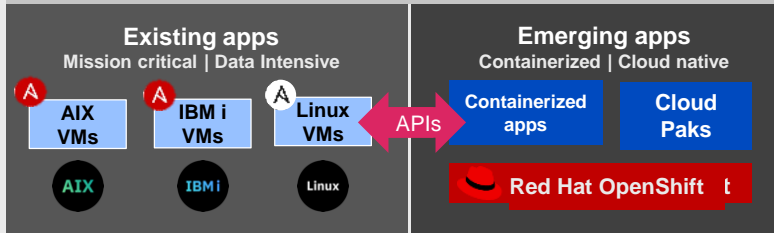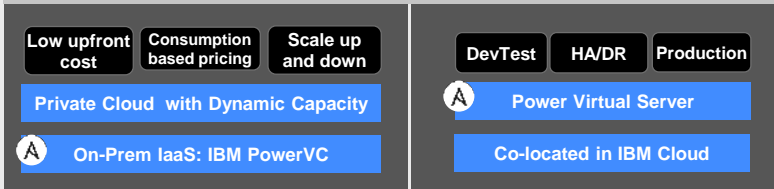## New Cloud Native Applications

Innovate with Data	Modernize IBM MW	Create New Cloud Apps	Strong Ecosystem
IBM Cloud Pak for Data	**WebSphere Hybrid Edition**	**Red Hat Dev. Tools**	**ISV & Open Source (Examples)**

Innovate with Data — IBM Cloud Pak for Data
- AI & Machine Learning
- Date Science & Visualization
- Data Warehousing
- Foundational Services

Modernize IBM MW — WebSphere Hybrid Edition
- WebSphere
- WebSphere Modernization with Liberty
- Liberty Cloud Native
- Modernization Tooling (TA, M2M)

Create New Cloud Apps — Red Hat Dev. Tools
- **RH Runtimes**
  Node.js, OpenJDK, DataGrid, JBoss, AMQ Broker, etc.
- CodeReady, ODO, Pipelines
- Server Mesh, Serverless

Strong Ecosystem — ISV & Open Source (Examples)
- HCL Commerce
- mongoDB
- H2O.ai
- dynatrace
- kafka
- WORDPRESS
- PostgreSQL

High Speed

IBM Spectrum Scale   Red Hat OpenShift   **OCS: OpenShift Container Storage**

- ✓ **Add AI and automation capabilities**
- ✓ **Rapidly develop and deploy new apps**
- ✓ **Incrementally extend existing IT value**

PowerVM Hypervisor – Enterprise Scale, Resiliency and Security

Power On-Premise   10   **Power Virtual Server**

superior **integration, performance**, and **security** across systems and software

Exploit databases on Power

Co-locate apps & data

Infuse AI into apps

Containerize ISV apps

Why deploy cloud-native apps on IBM Power?

Architected for Mission Critical and Data Rich Applications

Existing apps
Mission critical | Data Intensive

AIX VMs

IBM i VMs

Linux VMs

AIX

IBMi

Linux

APIs

Emerging apps
Containerized | Cloud native

Containerized apps

Cloud Paks

Red Hat OpenShift t

Frictionless Hybrid Cloud Experience

Low upfront cost

Consumption based pricing

Scale up and down

DevTest

HA/DR

Production

Private Cloud with Dynamic Capacity

On-Prem IaaS: IBM PowerVC

Power Virtual Server

Co-located in IBM Cloud

Power Systems Infrastructure

Red Hat Ansible content available for automation

Ansible community content available for automation

1. Based on IBM internal testing of Red Hat OpenShift Container Platform 4.8.2 worker nodes running 80 pods each with 10 user using the Daytrader7 workload (https://github.com/WASdev/sample.daytrader7/releases/tag/v1.4) accessing AIX Db2 databases. Average cpu utilization for the OCP worker nodes is > 95%. Comparison: E1080 with co-located OCP and AIX Db2 nodes versus OCP node on Cascade Lake accessing AIX Db2 node on E1080. Valid as of 9/1/2021 and conducted under laboratory conditions. Individual result can vary based on workload size, use of storage subsystems & other conditions.
2. TCO is defined as hardware, software and maintenance costs over a period of three years.
3. IBM Power E1080 (40 cores/3.8 GHz/2 TB memory) in maximum performance mode, 25 Gb Ethernet adapter(SRIOV), 1 x 16Gbps FC adapter with PowerVM. IBM Power E1080 worker nodes run CoreOS Linux 4.18.0-305.10.2.el8_4. RHEL 8.4 UBI based DayTrader7 container swith IBM JDK-Java(TM) SE Runtime Environment (build 8.0.6.36 -pxl6480sr6fp36-20210824_02(SR6 FP36)) WebSphere Liberty 21.0.0.6. E1080 co-location configuration consists of 5 LPARs : 2 OCP worker nodes each with 10 cores running SMT8 and 256GB of memory; 2 AIX LPARs each with 8 cores running SMT8 and 256GB of memory, one VIOS LPAR with 4 cores and 8GB of memory. PowerVM LPARs were also affinitized on their respect sockets/numa nodes
4. Competitive system: Intel(R) Xeon(R) Gold 6248 CPU (Cascade Lake) in performance mode, 40 cores/3.9GHz/512GB memory), 25Gb Ethernet adapter(SRIOV) , 1 x 16Gbps FCA. Cascade Lake worker nodes run CoreOS Linux 4.18.0-305.10.2.el8_4. RHEL 8.4 UBI based DayTrader7 containers with IBM JDK-Java(TM) SE Runtime Environment (build8.0.6.36 -pxl6480sr6fp36-20210824_02(SR6FP36)) WebSphere Liberty 21.0.0.6. Cascade Lake competitive configuration of 2 KVM guests as OCP worker nodes each with 20 cores running hyperthreading(HT) and 256GB of memory. Cascade Lake worker nodes access E1080 system's 2 AIX LPARs each with 8 cores running SMT8 and 256GB of memory, and a single VIOS server with 4 cores and 8GB of memory. SRIOV device passthrough from host to KVM guest. The KVM guest's CPU & memory are pinned to host's CPU with respect to their associated NUMA node.
5. Pricing is based on Power E1080 http://www-03.ibm.com/systems/power/hardware/linux-lc.html. , Typical industry standard x86 pricing https://www.synnexcorp.com/us/govsolv/pricing/IBM software pricing for Red Hat OpenShift and IBM WebSphere Hybrid Edition Monthly Subscription
6. Source: National Vulnerability Database, https://nvd.nist.gov/vuln/search/results?form_type=Basic&results_type=overview&query=PowerVM&search_type=all, Aug 2020. Zero (0) security vulnerabilities for IBM POWER Systems: Based on survey research work performed by Angshuman Roy(aroy@us.ibm.com) on the number of Hypervisor vulnerability or exploit searches performed by community members

Benefits running on IBM Power

More from software with less servers

- **4.1X better price-performance**[1-5]
- **4.3X better per-core throughput**[1-5]

Efficient scaling of cloud infrastructure

- **48% lower 3-year TCO**[1-5]
- **Pay as you go for on-premises or Power Virtual Server**

Proven platform security & reliability

- **1 vs 314 - PowerVM vs VMware exposures**[6]
- **1.5 vs 43 - min/year Power vs HP downtime**

Superior performance - co-locate apps, data

- **2X lower latency for cloud-native APIs to SOR data**[1-5]
- **Extreme bandwidth via in-memory networking**

Open Source and OpenShift Container Packages for App Modernization and Cloud-native Apps

Linux Images

Web and Middleware

Cloud and DevOps

Languages and Runtimes

Databases

Analytics and AI

Storage
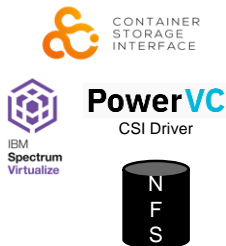
Networking and Monitoring

References:

Red Hat OpenShift Catalog: https://catalog.redhat.com/software/containers/search?p=1&architecture=ppc64le
Docker Hub (ppc64le): https://hub.docker.com/r/ppc64le/
Docker Hub (ibmcom): https://hub.docker.com/r/ibmcom/
Power Systems Ecosystem: https://github.com/ppc64le/build-scripts
Entitled registries as appropriate for licensed software (e.g., IBM, Red Hat, etc.)

IBM's Hybrid Cloud Management
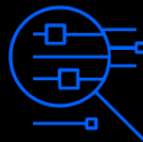
AI-driven automation of IT

Faster Decision Making

Full-stack, enterprise observability

Observe

INSTANA

an IBM Company

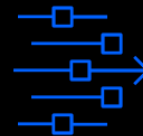*Real-time understanding of environment*

Smarter Resource Allocation

Dynamic resource management and cost optimization

Optimize

turbonomic

an IBM Company

Maximize efficiency, compliance

Automation

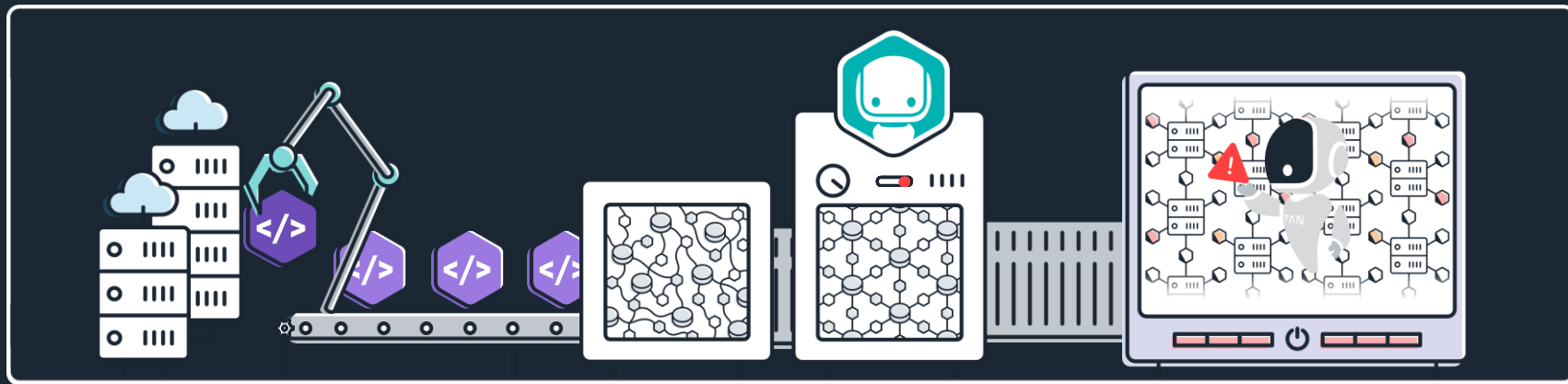*Autonomous problem determination, remediation, avoidance*

Automate

IBM Cloud Pak for Watson AIOps

Automate IT availability

AI-Powered Automation

Track **every interdependency** from code to customer

Automate full-stack visibility

Collect accurate data in context

Take intelligent action

INSTANA
an IBM Company

IBM Observability by Instana

Supporting Multiple Domains

BizOps   DevOps   SecOps   ITOps

Comprehensive Capabilities

AUTO-DISCOVERY & INSTRUMENTATION

VERTICAL & HORIZONTAL CONTEXT

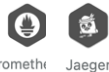APPLICATON PERSPECTIVES

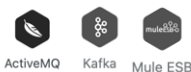PIPELINE FEEDBACK

ROOT CAUSE ANALYSIS

UNBOUNDED ANALYTICS

250+ Observed Technologies
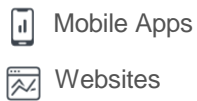
RUNTIMES	OSS COLLECTORS	MESSAGING	WEB PROXIES	IBM TECHNOLOGIES	DATASTORES
Java, .NET, Python, Ruby	Promethe, Jaeger	ActiveMQ, Kafka, Mule ESB	HAProxy, HTTPd	IBM MQ, IBM ACE, IBM Datapower, IBM API Connect, Websphere AS, Websphere Liberty, DB2, OpenShift	MySQL, MongoDB, PostgreSQL, Oracle Data, DB2
Node.js, .NET Cor, Go, PHP	OpenTelem, Zipkin	RabbitMQ, IBM MQ, Tibco EMS	NGINX, Microsoft IIS	AIX, IBM i, Db2 on i, Linux on IBM Z, IBM Z, Db2 on Z, zHMC, CICS, IMS, IBM Cloud, IBM APM, IBM Watson AIOps	MariaDB, Elasticsearch, SQL Server, Redis, SAP Hana

Hybrid Multi-Cloud Platform Observability

DIGITAL	CLOUD PROVIDERS	CLOUD & VIRTUALIZATION PLATFORMS	MACHINES	IBM Systems platforms
Mobile Apps, Websites	IBM Cloud, Azure, AWS, Google Cloud	Kubernetes, Cloud Foundry and BOSH, Docker, VMware vSphere	Windows, Linux, Mac OS, Unix	HMC, Power Systems, IBM Z
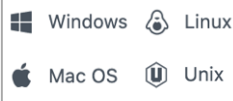
IBM's Hybrid Cloud Management
AI-driven automation of IT

Faster Decision Making
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Observe

INSTANA
an IBM Company
Real-time understanding of environment

Smarter Resource Allocation
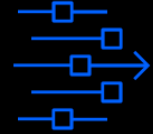*Dynamic resource management and cost optimization*

Optimize

turbonomic
an IBM Company
Maximize efficiency, compliance

AI-Powered Automation

Automation
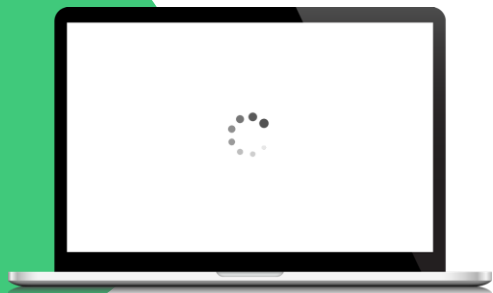*Autonomous problem determination, remediation, avoidance*

Automate
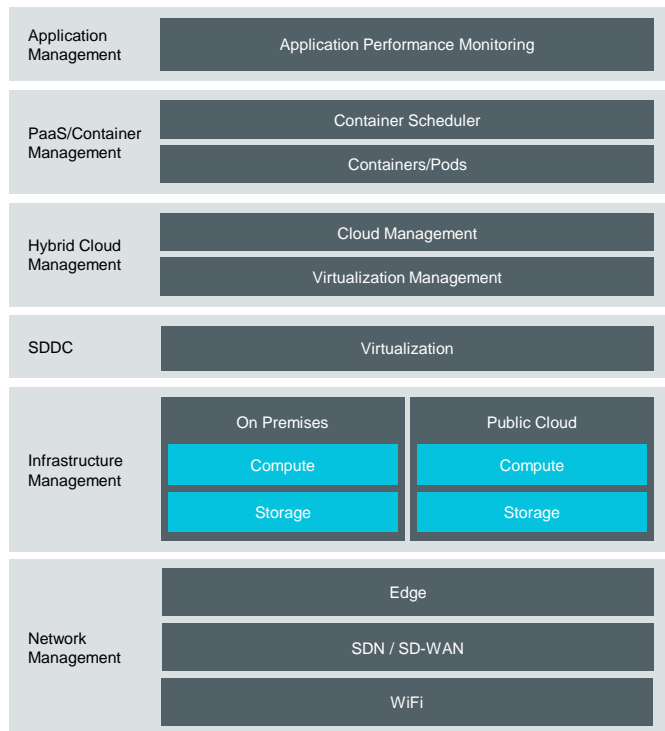
IBM Cloud Pak for Watson AIOps
Automate IT availability

Other Solutions Cannot Continuously Assure Application Performance

MODERN APPLICATIONS

Application Management	Application Performance Monitoring
PaaS/Container Management	Container Scheduler
	Containers/Pods
Hybrid Cloud Management	Cloud Management
	Virtualization Management
SDDC	Virtualization

Infrastructure Management

On Premises	Public Cloud
Compute	Compute
Storage	Storage

Network Management

Edge
SDN / SD-WAN
WiFi

END USER EXPERIENCE

- Loss of revenue
- Slower innovation
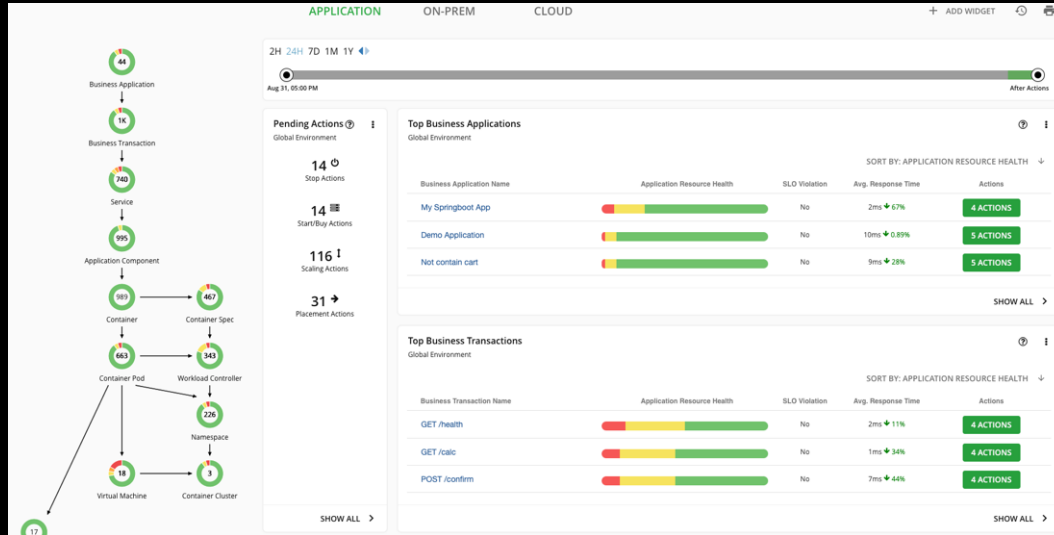- Competitive disadvantage

SILOED TEAMS
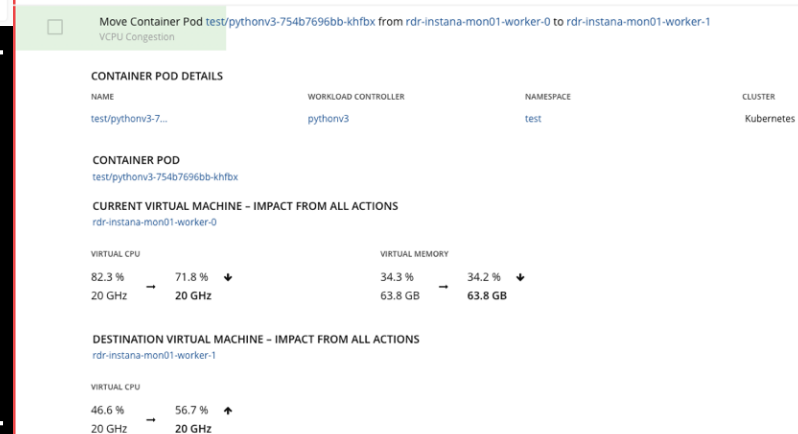
SILOED TOOLS

DISPARATE DATA

Application Resource Optimization with Turbonomic and IBM Power

Convenient dashboard that highlights opportunities to optimize resources (VMs/containers)
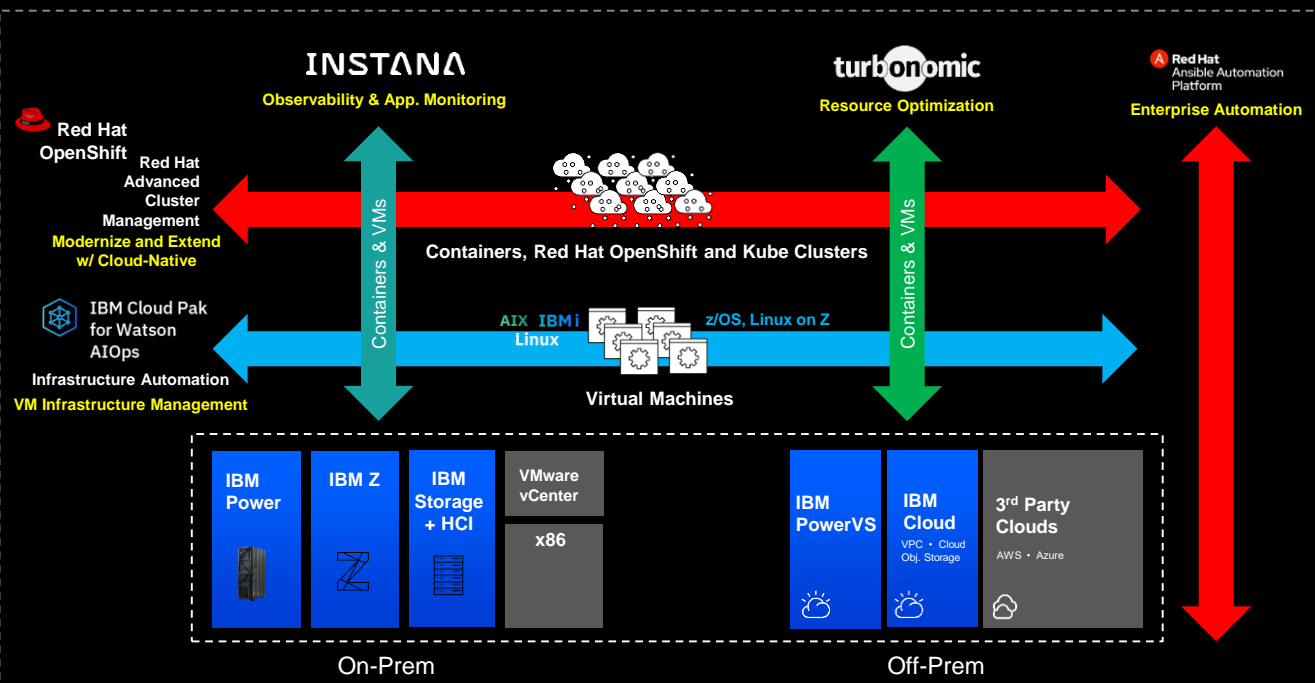
Saves an average of **30% on hybrid cloud spend!**

Perform recommended actions – either manually or automatically based on user's "comfort level"

Take the next step
Circling Back… Enterprise Hybrid Cloud Platform with IBM Power
Bridging it all together with a consistent technology stack and services

Manage & Automate

Observe & Optimize

Modernize

INSTANA
Observability & App. Monitoring

turbonomic
Resource Optimization

Red Hat
Ansible Automation Platform
Enterprise Automation

Red Hat OpenShift

Red Hat Advanced Cluster Management
Modernize and Extend w/ Cloud-Native

IBM Cloud Pak for Watson AIOps

Infrastructure Automation
VM Infrastructure Management

Containers & VMs

Containers & VMs

Containers, Red Hat OpenShift and Kube Clusters

AIX IBM i Linux z/OS, Linux on Z

Virtual Machines

IBM Power	IBM Z	IBM Storage + HCI	VMware vCenter
			x86

IBM PowerVS	IBM Cloud VPC • Cloud Obj. Storage	3rd Party Clouds AWS • Azure

On-Prem

Off-Prem

Manage & Automate
- Increase IT productivity with consistent management & automation capabilities

Observe & Optimize
- Increase **IT productivity** by 35%
- Improve **application performance** up to 20%
- Saves an average of **30% on hybrid cloud spend**
- 52% Reduction in **MTTR**[3]

Modernize
- **4.1X better price-performance** running on Power10 vs. comparable x86 hardware
- **Quicker time to market** with less risk using in-place modernization—a key market differentiator

Take the next step

10

Create your own OpenShift cluster on IBM Power with a 60-day free trial

https://cloud.redhat.com/openshift/install

Get started with OpenShift on IBM Power Virtual Server. Reference:

https://developer.ibm.com/series/deploy-ocp-cloud-paks-power-virtual-server/

Learn More Today!

Field Guide for App Modernization on Power
https://www.ibm.com/downloads/cas/D9POQ3YR

IBM Hybrid Cloud on Power white paper
https://www.ibm.com/downloads/cas/G4DO3DJE

LET'S GET TO WORK