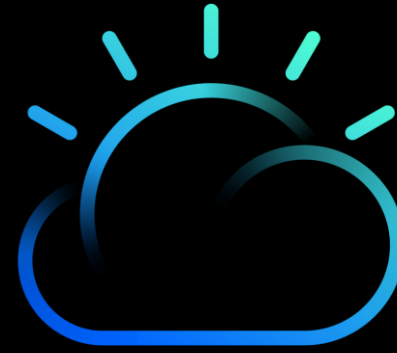


Mission-critical cloud and virtualization solutions based on the POWER architecture

CLOUD COMPUTING 2020 presentation

Ian Robinson
Virtualization/Cloud Offering Manager
IBM Power Systems
idrobinson@us.ibm.com

October 2020



IBM



Ian Robinson
Virtualization/Cloud Offering Manager
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idrobinson@us.ibm.com

Ian Robinson manages the Power Systems virtualization, private cloud and automation portfolio of hardware and software at IBM. He previously served in a variety of technology leadership roles at notable Silicon Valley companies that include VMware, Brio Software and Zone Labs. Most recently, he was CMO of cross-platform virtualization pioneer Transitive Corporation, prior to its acquisition by IBM in 2009.

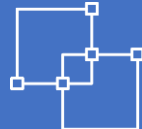
Ian's domain expertise spans virtualization/cloud, mobile/IoT, security, database/analytics, and software development (including Agile methodologies and DevOps). In addition to a Masters degree in Engineering and MBA from San Jose State University, he completed an MS in Information Systems at the University of San Francisco, where he also served as an adjunct professor.



Why IBM Power Systems?



Compute for data-intensive
and mission critical apps



Industry leading reliability,
performance and security



Database

SAP

SAP



ERP, CRM, SCM

Business and data
management workloads



IBMi



AIX



Linux

Unix, Linux and IBM i
operating environments



Deployed by banks, telcos,
retailers, government, etc.



Used in 3 of the world's top
10 fastest supercomputers



Proven reliability

IBM Power Systems ranked the most reliable for 10th straight year delivering 99.9996% uptime.*



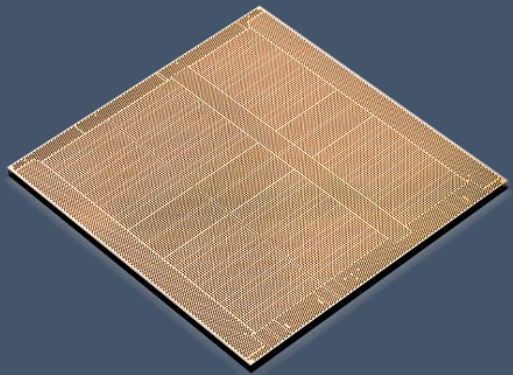
Built-in security

IBM Power Systems have security built in at all layers, from processor to the OS, designed to deliver end-to-end security.



Affordably scales capacity and performance

IBM POWER9 processor drives the world's fastest supercomputers and is ready to accelerate your enterprise.



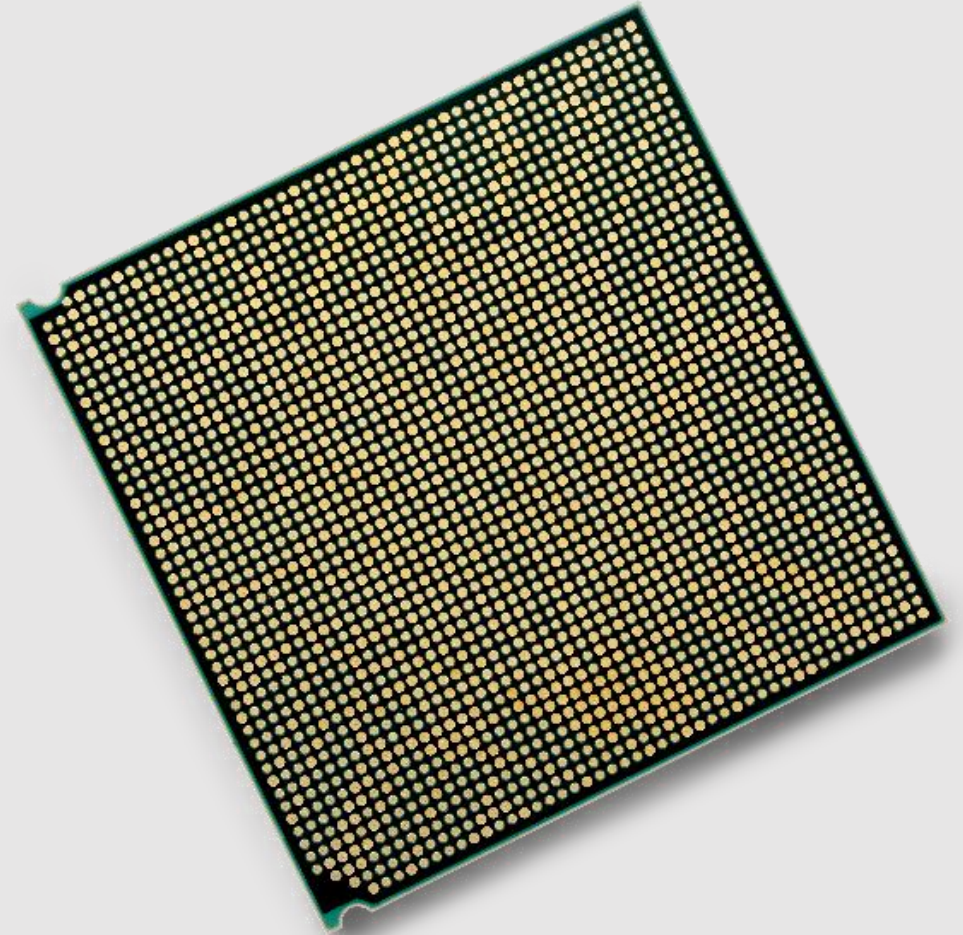
Simple multicloud integration

IBM Power Systems enable the most data intensive and mission critical workloads in private and hybrid cloud environments.



* ITIC 2019 Global Server Hardware, Server OS Reliability Survey Mid-Year Update. The highest uptime of 99.9996% is calculated based on 2.0 minutes/server/annum unplanned downtime of any non-mainframe Linux platforms

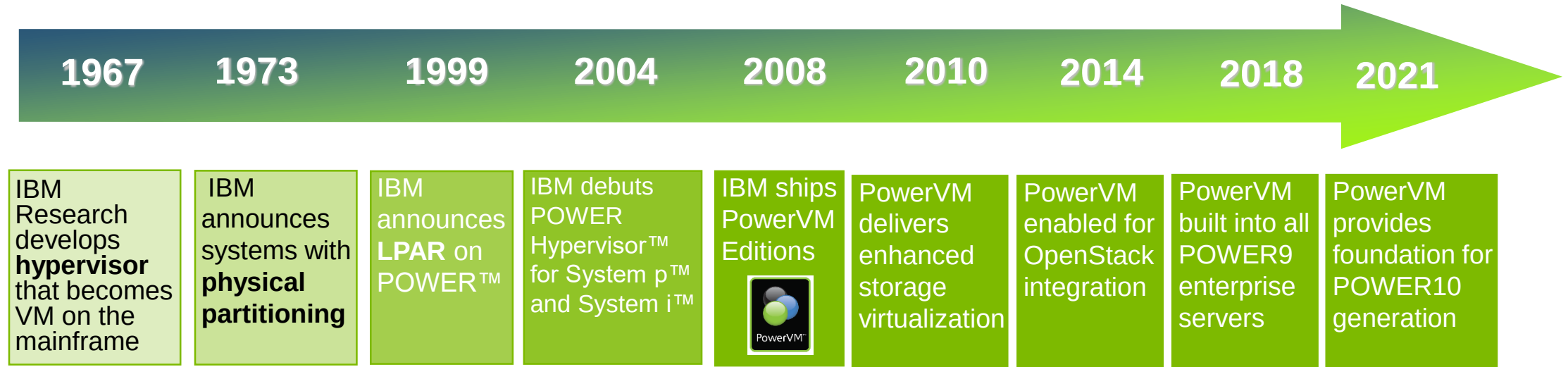
POWER9 processor



Innovation that makes a difference for mission critical applications

PowerVM builds upon IBM's virtualization heritage

A 50-year track record in virtualization and cloud innovation continues with PowerVM



PowerVM

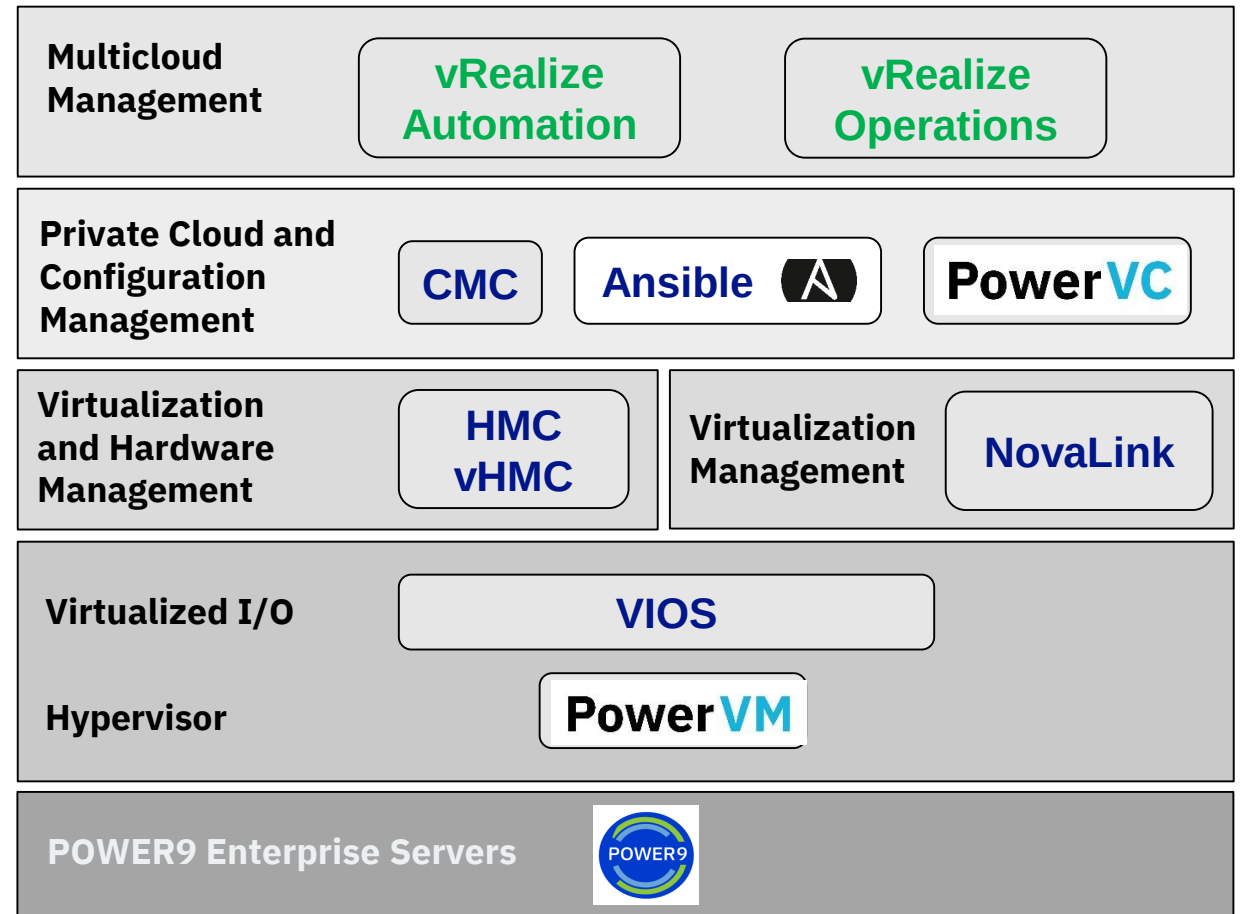


PowerVM

Power Systems virtualization stack: Updated for a multicloud world

Throughout 2020, the entire POWER9 virtualization and private cloud stack has been refreshed to optimize support for multicloud architectures.

This stack forms the foundation of multiple POWER-based public cloud initiatives, as well as the thousands of mission-critical enterprise deployments worldwide.



How PowerVM delivers virtualization benefits

Deploying a virtualized workload with PowerVM is simple:

- Create a new PowerVM virtual machine (VM)
- Install the operating system (AIX, IBM i or Linux) in the VM
- Install the workload application(s) in the VM
- Configure the operating system and applications as required

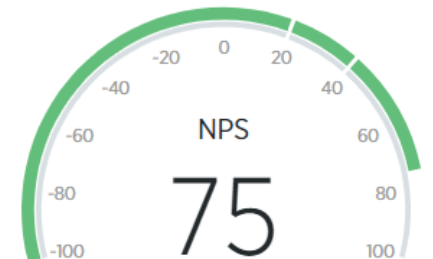
The VM can now be easily stored, moved, copied, archived or modified !

PowerVM



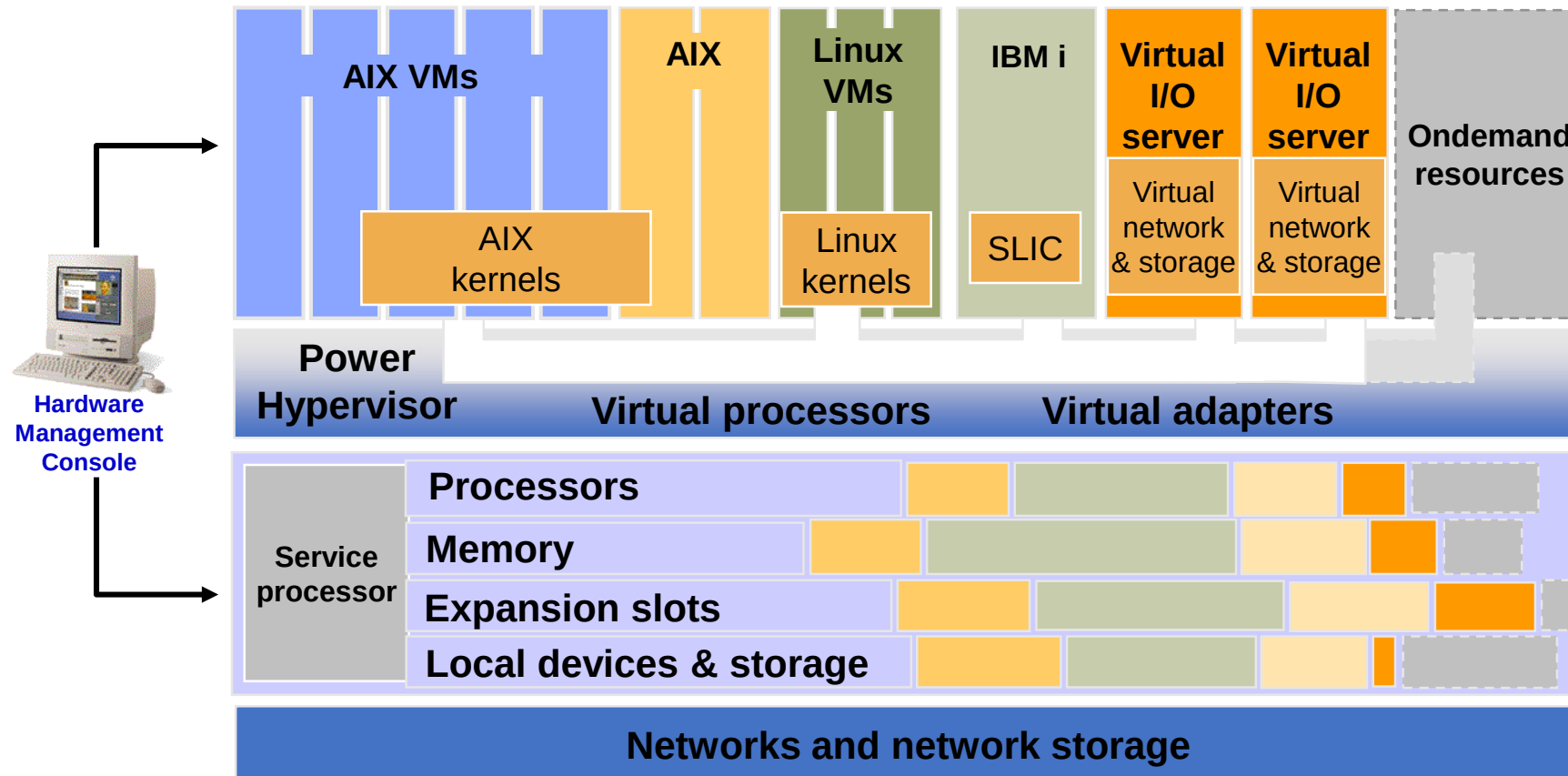
Benefits of virtualizing workloads with PowerVM include:

- **Extreme consolidation** – many diverse workloads can be hosted on one server
- **Rapid provisioning** – deploying a ready-to-run workload is quick and easy
- **High scalability** – deploying multiple copies of a workload type is simplified
- **Easy recoverability** – restoring a workload after an outage is fast and reliable



PowerVM key design points

- Designed for high **efficiency** to provide high overall performance
- Designed for high **scalability** – linear from 1/20 to 256 cores
- Designed for **isolation** to provide security and “no compromise” consolidation
- Designed for maximum resource **granularity** to reduce wasting resources



Power Hardware Management Console (HMC)

Management appliance for Power servers

Available as hardware appliance or vHMC

Driven by Web-based enhanced UI, CLI or API

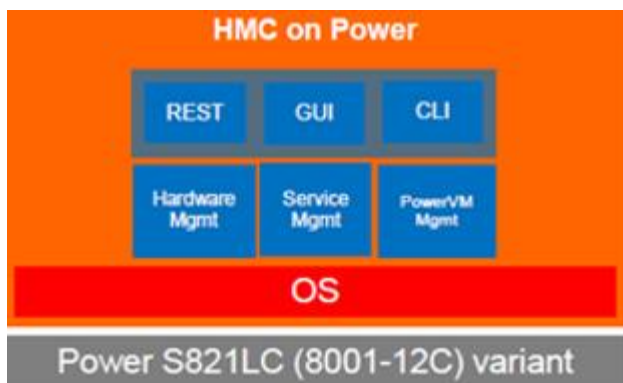
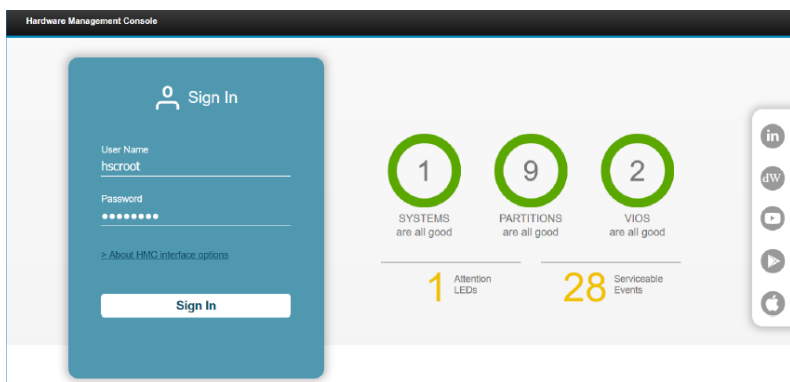


Table 1. Dimensions

Width	Depth	Height	Weight
437 mm (17.2 in.)	705.3 mm (27.76 in.)	43.0 mm (1.7 in.)	14.5 kg (32 lb)

Table 2. Electrical^{1, 2}

Electrical characteristics	Properties
Maximum measured power	300 W
Maximum kVA	0.330
Maximum thermal output	1024 BTU/hr
Input voltage	100 - 127 V ac or 200 - 240 V ac
Frequency	50 or 60 Hz

1.Preliminary data is subject to change.

2.Power consumption and heat output vary depending on the number and type of optional features that are installed and the power-management optional features that are in use.

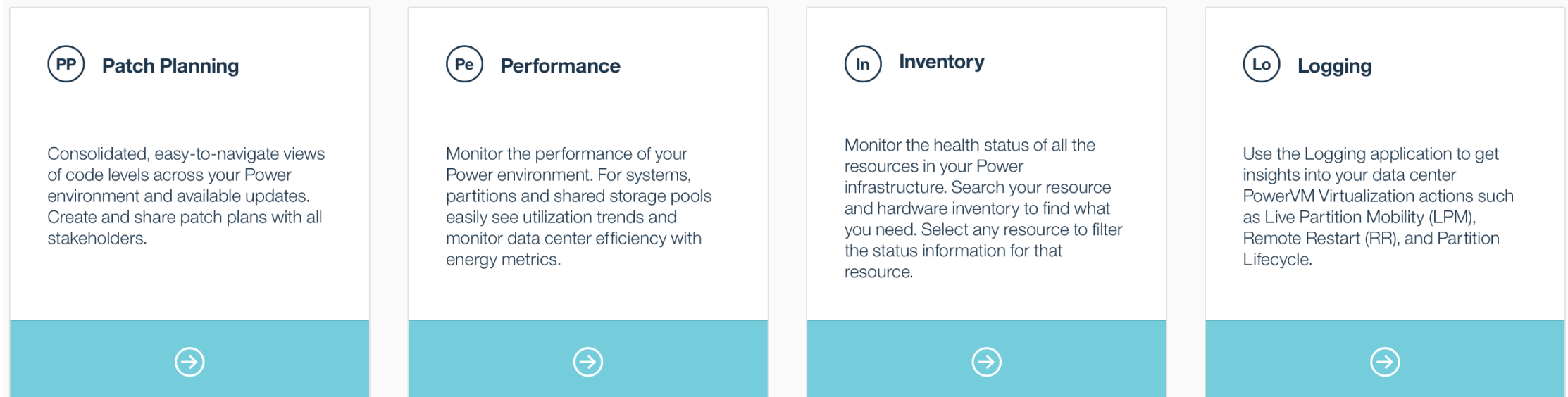
https://www.ibm.com/support/knowledgecenter/POWER8/p8had/p8had_hmc7063cr1.htm



IBM Cloud Management Console (CMC)



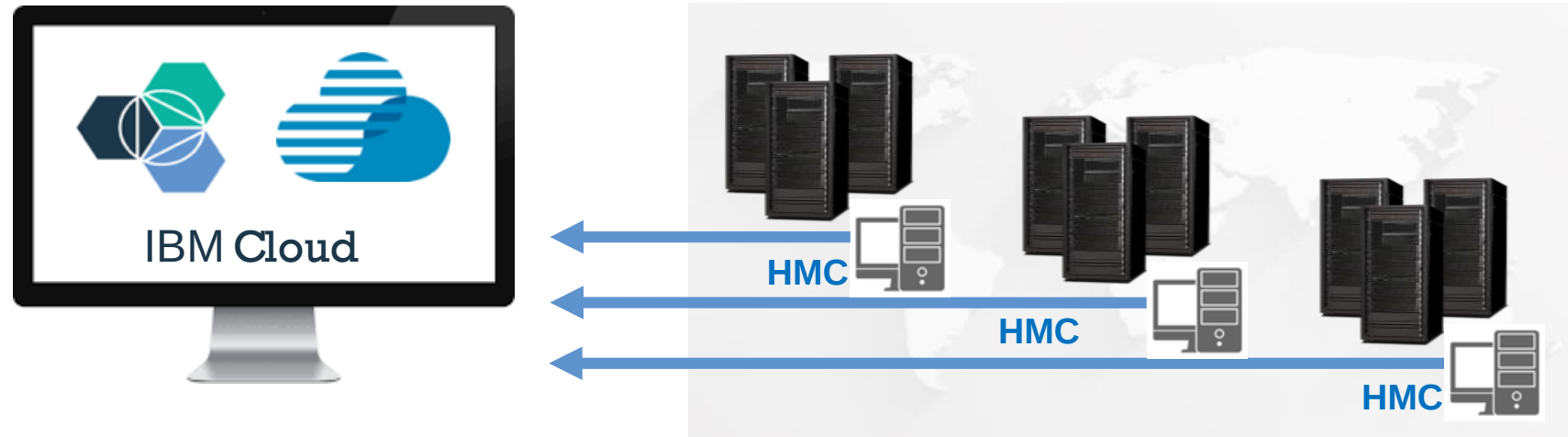
- The IBM Cloud Management Console (CMC) is a SaaS-based manager that provides a consolidated view of Power-based deployments, spanning multiple regions and datacenters.
- CMC provides a comprehensive inventory of systems and virtualized resources, consolidated performance data to optimize utilization and performance across multiple Power-based data centers, and aggregated logging information for additional insights.
- Delivered as a SaaS offering from the IBM Cloud, CMC offers convenient pay-as-you-go multi-cloud management. A one-year CMC entitlement is included with E950 and E980 servers.



CMC connects HMCs to the Cloud



Cloud-based microservices that can be accessed securely, anytime, anywhere for the entire enterprise



- As data centers scale out and up, the need increases for a complete view of the Power infrastructure

Inventory Aggregation



- View all Power Systems, HMCs, VMs, etc. across the entire enterprise
- See basic health & state

Performance Monitoring



- Aggregated performance across Power enterprise
- Energy monitoring
- OS metrics

Log Trends



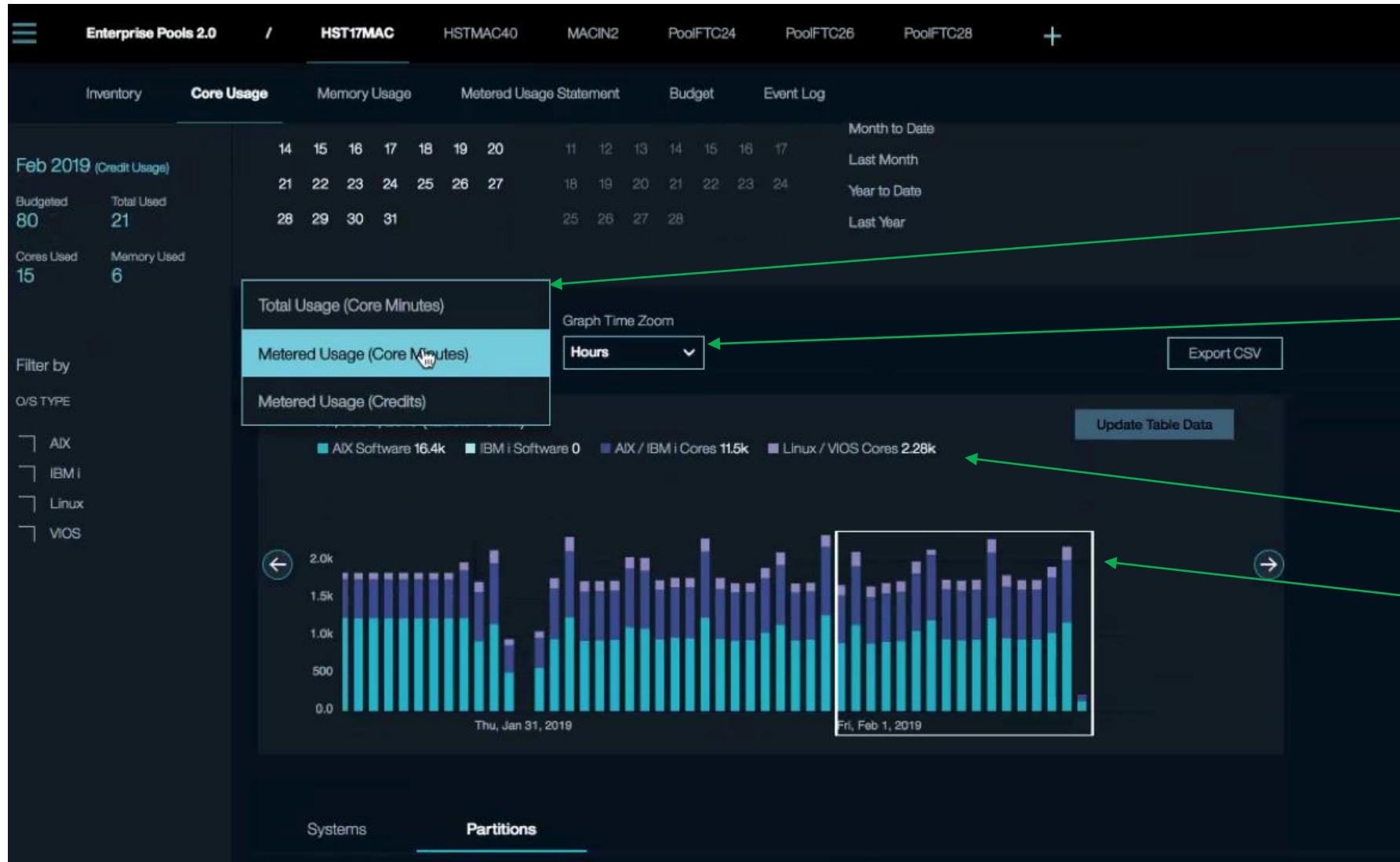
- Log aggregation
- Telemetry

Patch Planning



- Patch compliance reports for firmware, HMC, NovaLink, VIOS, and OS
- Scheduled maintenance plan management

CMC hosts the UI for Power Enterprise Pools 2.0

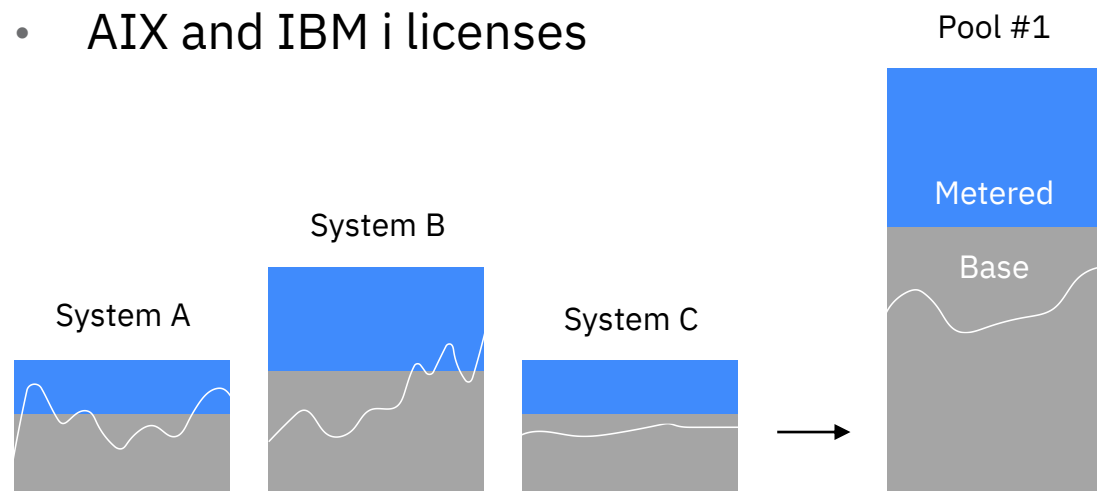


- Analyze Total or Metered Usage
- Change the Time Frame for analysis (Minute, Hour, Day, Week, Month)
- Usage by resource type
- Trending Analysis with ability to adjust time scale

POWER Private Cloud Solution Enterprise Pools 2.0

Handle demand spikes across collections of POWER servers with Base and Metered Capacity, which includes:

- Processor activations
- Memory activations
- AIX and IBM i licenses



**Optimize costs with dynamic, pay for use pricing.
All processor & memory resources are fully activated.**

How it all works

Purchase servers with **Base** capacity.

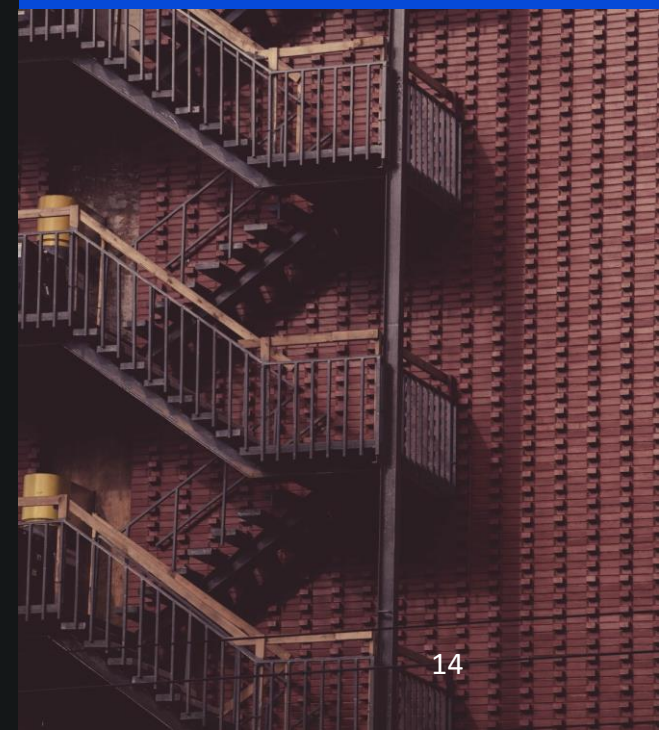
Variable demand addressed by buying Capacity Credits for **Metered** capacity.

IBM Cloud Management Console with HMC automatically monitors and debits against Capacity Credits for actual resource usage by the minute.

Which servers?*

Deploy across a pool of POWER E980 or POWER E950 systems.

* As of 2Q20

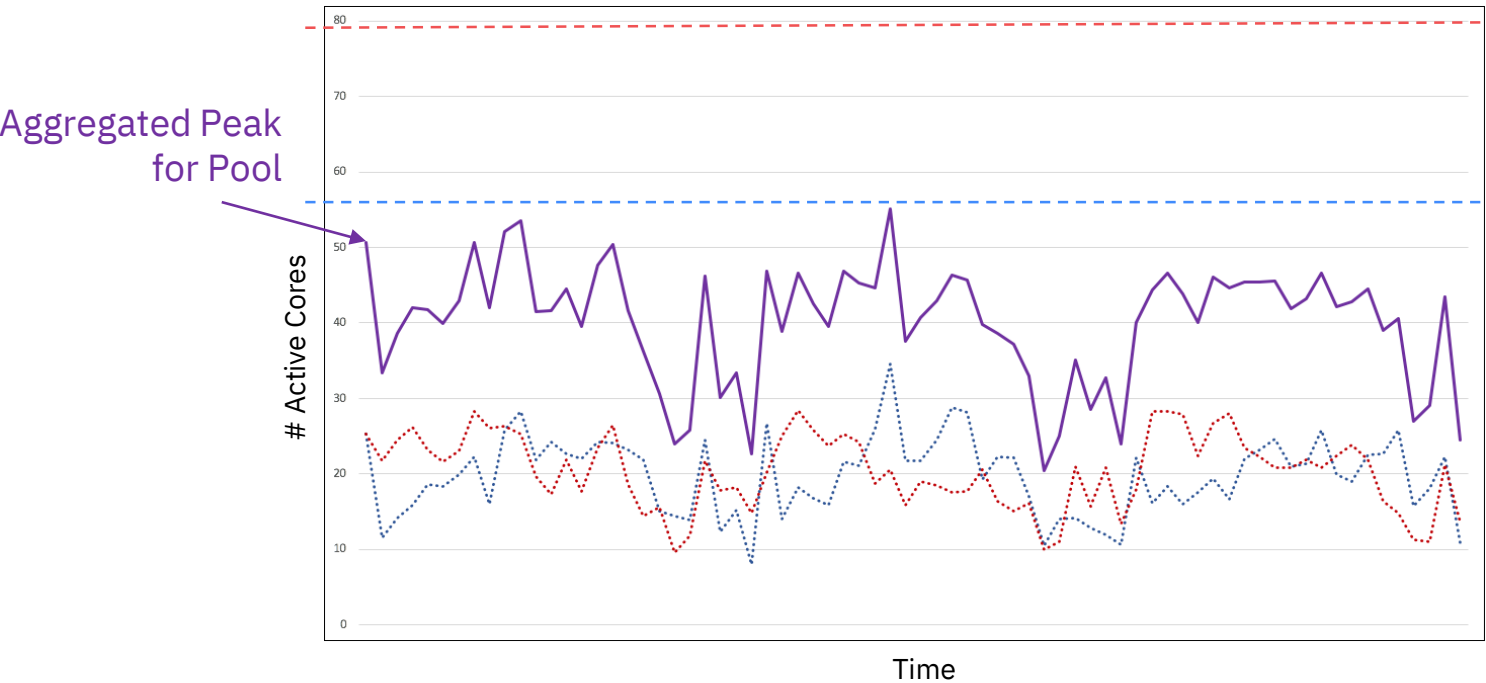


POWER Private Cloud Solution Enterprise Pools 2.0

Handle demand spikes across collections of
POWER servers with Base and Metered Capacity.



IBM Cloud Management Console with HMC



Total of initially planned peak
processor activations for System A
+ System B (**before Pools 2.0**)

Potential to leverage shared
resources (**new for Pools 2.0**)
to reduce capacity expenses

System A System B Pool 1

PowerVC for virtualization management and private cloud

PowerVC API provides open standards-based integration with cloud ecosystem partners



PowerVC

Key Features:

1. Deploy VMs in minutes
2. Full lifecycle management of VMs
3. Automated VM recovery
4. Single-click host evacuation
5. Automated cloud optimization
6. Multi-tenancy and resource isolation
7. Software-defined networking
8. OpenStack API enablement
9. Open integration with multi-cloud managers

PowerVC for Private Cloud

Key Features:

1. **EVERYTHING in PowerVC Standard Edition**
2. Self-service, single-click deployment for cloud users and developers
3. Policies, metering and quota management to govern how the private cloud operates
4. Import/export VMs to/from clouds

PowerVC 2.0: Latest release

Refreshed Carbon user experience (from an extensive IBM Design Thinking project during 2019-2020)

Context-sensitive logs display

Scales up to manage **10,000** VMs and **20,000** Volumes

Migration of volumes with retype support

Multi-factor authentication (MFA)

Persistent Memory support

SLES certification for PowerVC Manager

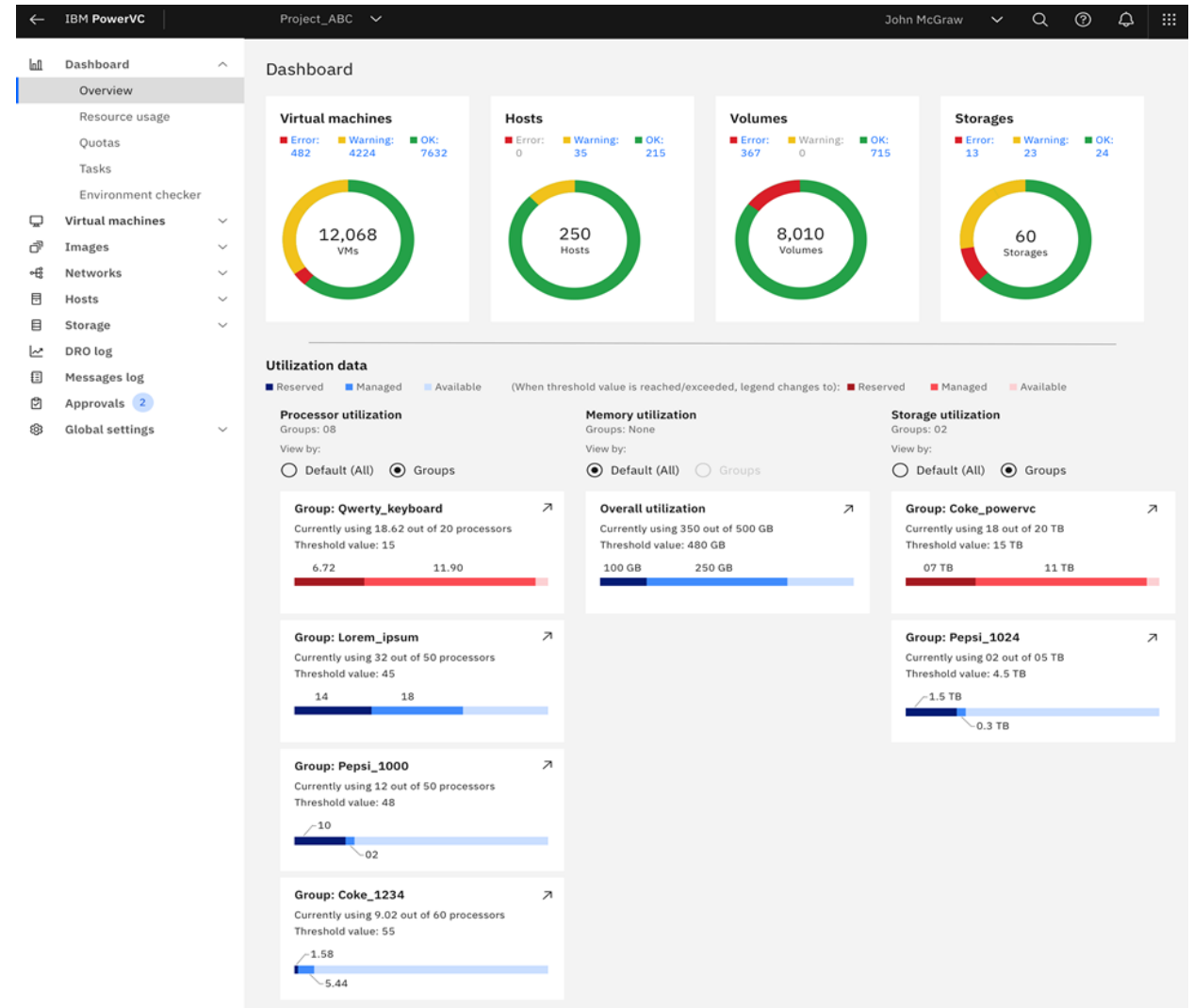
RHEL 8 support with full Python 3 compatibility.

Consistency groups, snapshot and restore

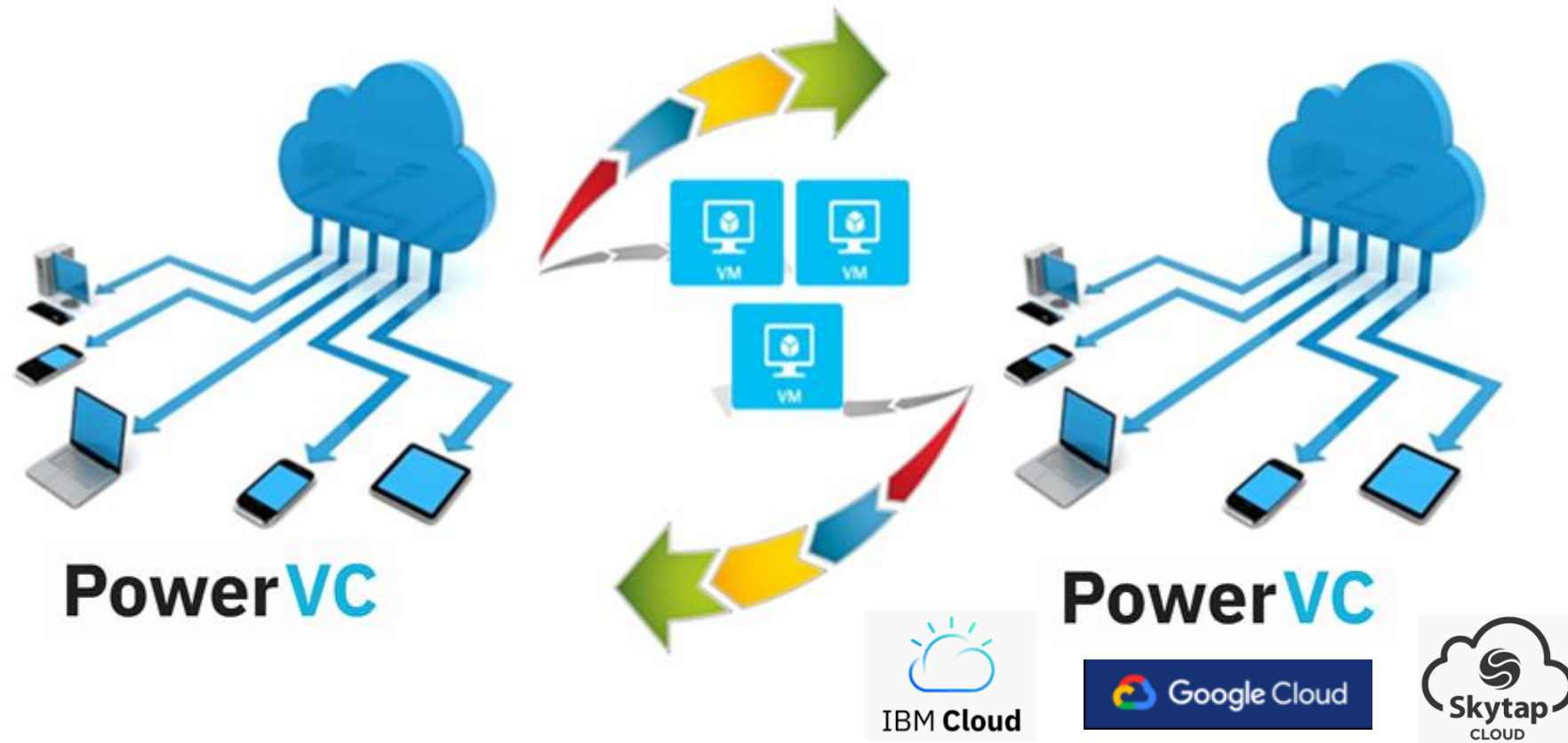
Volume clone for backup

VM clone to simplify redundant workload deployment

Global Mirror for IBM Storwize for enabling DR



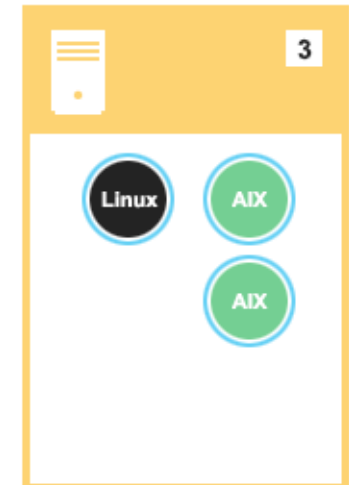
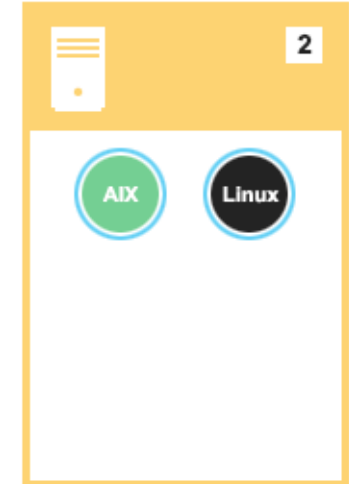
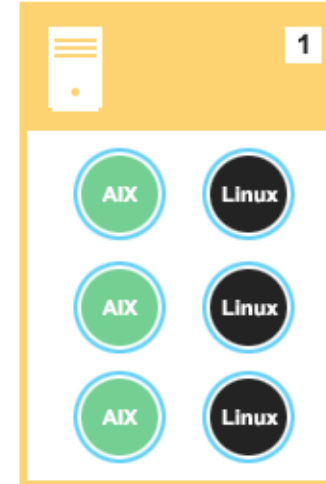
PowerVC enables VM import/export for cloud mobility



Move any VM between clouds or data centers as needed, for seamless hybrid cloud agility

PowerVC Dynamic Resource Optimizer (DRO)

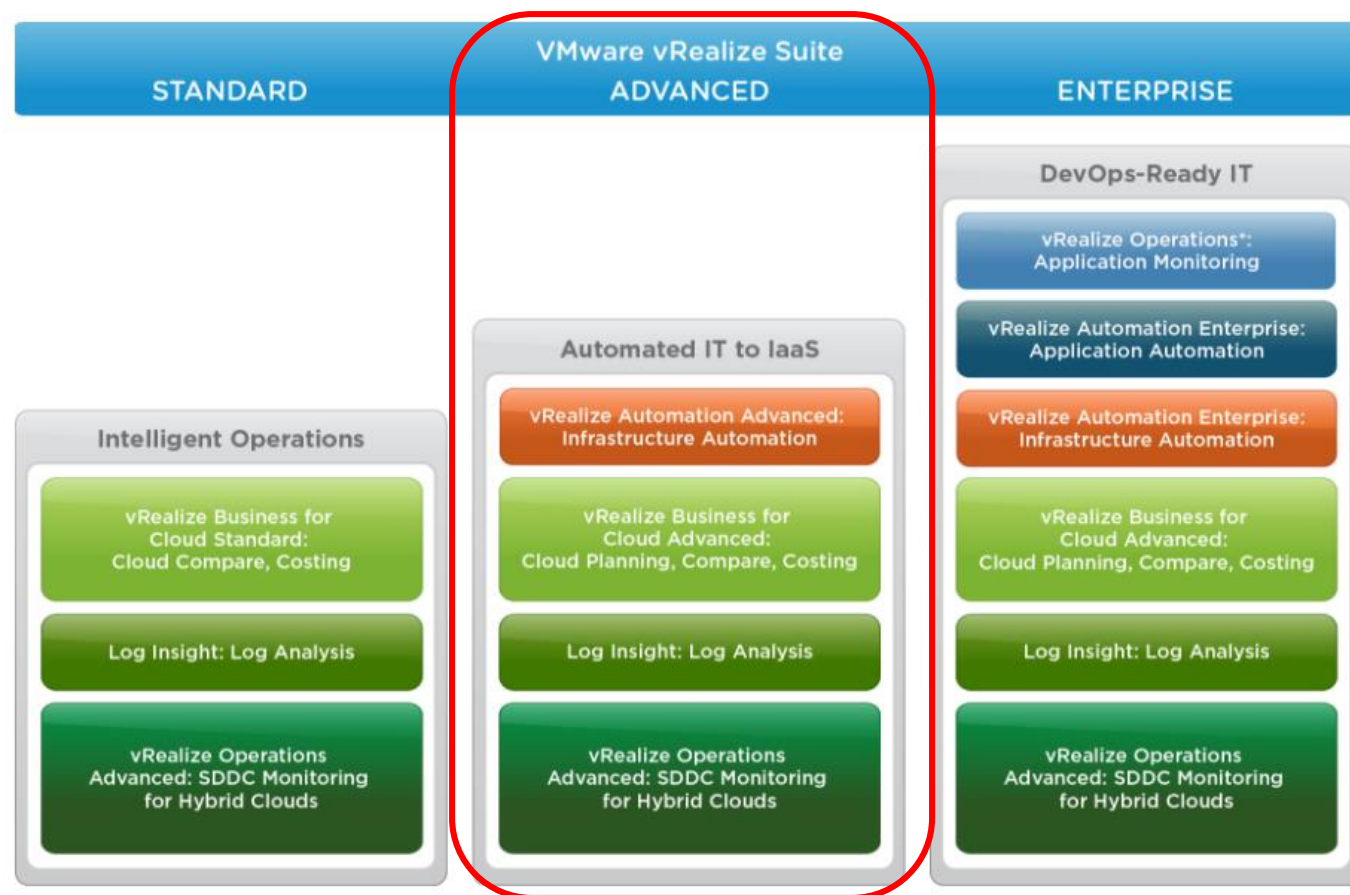
- **Example:** When a server exceeds its predefined utilization threshold, VMs from that server are migrated to less-burdened servers in the host group.
- In this case, three hosts are in a host group that has DRO enabled.
- When Host #1 becomes overburdened, the VMs are automatically migrated via LPM to other hosts in the host group.



https://www.ibm.com/support/knowledgecenter/en/SSXK2N_1.3.0/com.ibm.powervc.standard.help.doc/powervc_dro_hmc.html

VMware vRealize Suite and Power Systems

- VMware vRealize Suite is a multi-cloud manager that is sold in three Editions: Standard, Advanced and Enterprise
- Most Power customers with large x86 server deployments have vRealize Advanced Edition. which includes Automation and Operations
- vRealize Automation can manage PowerVM workloads, with integration provided by PowerVC northbound APIs
- The result is a consistent virtualization and cloud management experience across x86 and Power infrastructure



PowerVC

vRealize Automation: Manages Power, x86 and Z virtualization

vRealize Automation provides an integrated multicloud management experience

The screenshot displays the vRealize Automation Service Catalog. The top navigation bar includes 'Home', 'Catalog' (selected), 'Items', 'Requests', 'Inbox', 'Design', 'Administration', and 'Infrastructure'. The user is logged in as 'Administrator@SANFRAN.PBM.IHOST.COM'. The 'Service Catalog' section prompts the user to 'Browse the catalog for services you need.' On the left, a sidebar lists 'All Services' with categories: 'Power Systems', 'x86 Systems', and 'z Systems'. The main area shows 'All Services (12)' with a 'Business group' dropdown set to 'All' and a search bar. A grid of service templates is displayed, each with an icon, title, description, and a 'Request' button. The templates include:

- AIX 7.1 Power Systems**: AIX 7.1 singleton
- AIX 7.1 w/vRO pattern Power Systems**: AIX 7.1 w/vRO pattern
- IBM i 7.1 Power Systems**: IBM i 7.1 singleton
- RHEL 6.5 BE Power Systems**: RHEL 6.5 Big Endian singleton with gugent for PowerVM
- Rhel65_for_zVM z Systems**: Rhel 6.5 for z/VM using ICM 4.2
- Sles11SP4 z Systems**: Deploying Sles11SP4 using SOC6
- Sles11SP4 w-vRO workfl... z Systems**: Deploying Sles11SP4 using SOC6 vRO workflow - cre...
- SLES for PowerVM Power Systems**: SAP HANA for Power Systems

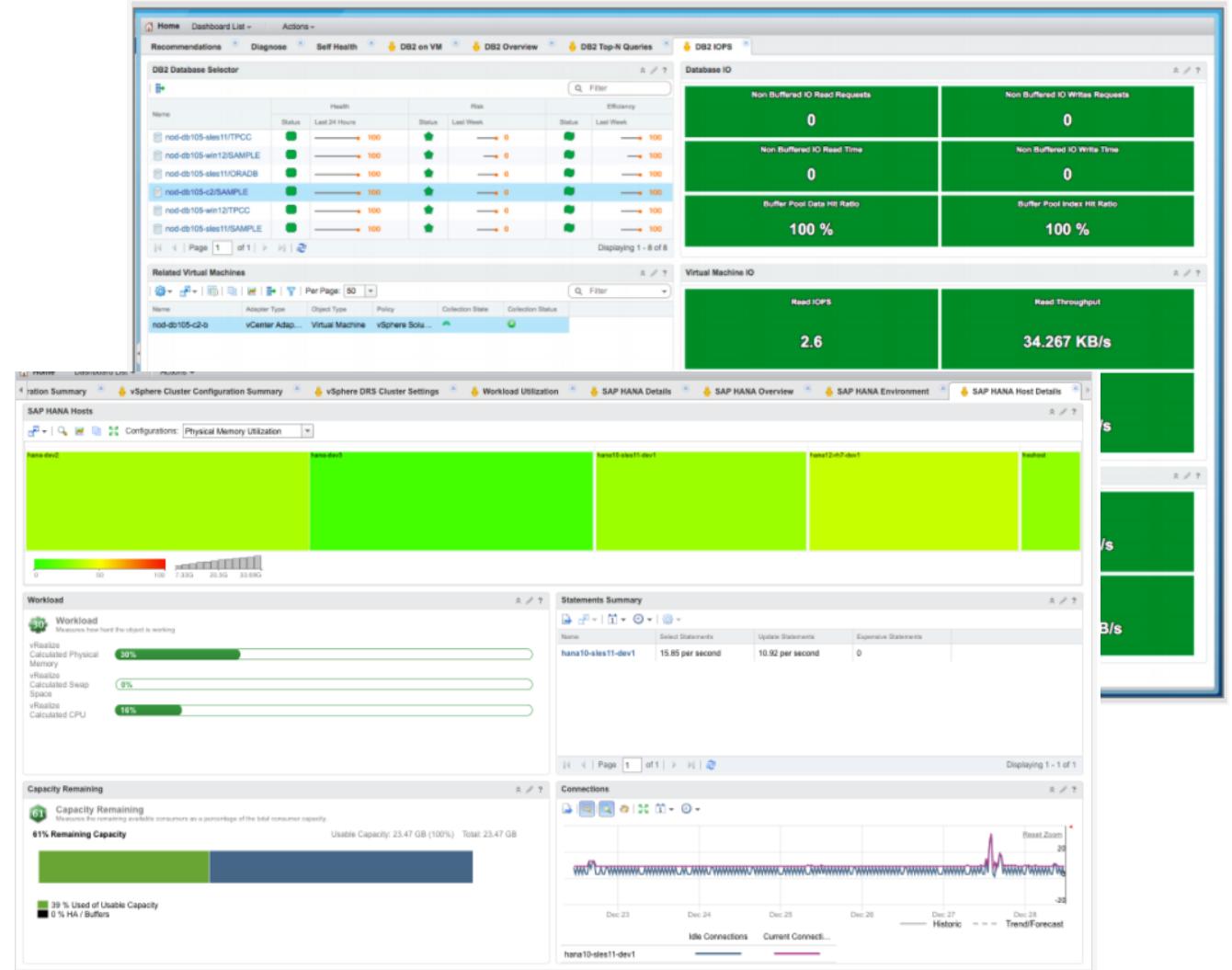
Two callout boxes provide additional context:

- Infrastructure as a Service (IaaS) capability** with lifecycle management of VMs for AIX, IBM i and Linux on PowerVM or KVM and Linux on z/VM or KVM on z
- Platform as a Service (PaaS) capability** extended with IBM GTS patterns for implementing IBM and non-IBM application software

VMware vRealize Operations for IBM Power

VMware vRealize Operations for Power delivers efficient capacity management, proactive planning and intelligent remediation, helping customers optimize, plan and scale multicloud deployments.

- **Full stack dashboard**
 - HMC data provider
 - PowerVC data provider
- **AIX OS agent (7.1 and 7.2)**
- **Linux OS agent (RHEL and SUSE)**
- **SAP HANA management pack**
- **DB2 management pack**
- **Oracle management pack**



Ansible automates repetitive IT management tasks

- Rolling out system software updates
- Ensuring that all servers stay configured properly and meet compliance requirements
- Validate correct security baseline is in place
- Provisioning software stacks within SLAs



Automate deployment
and management

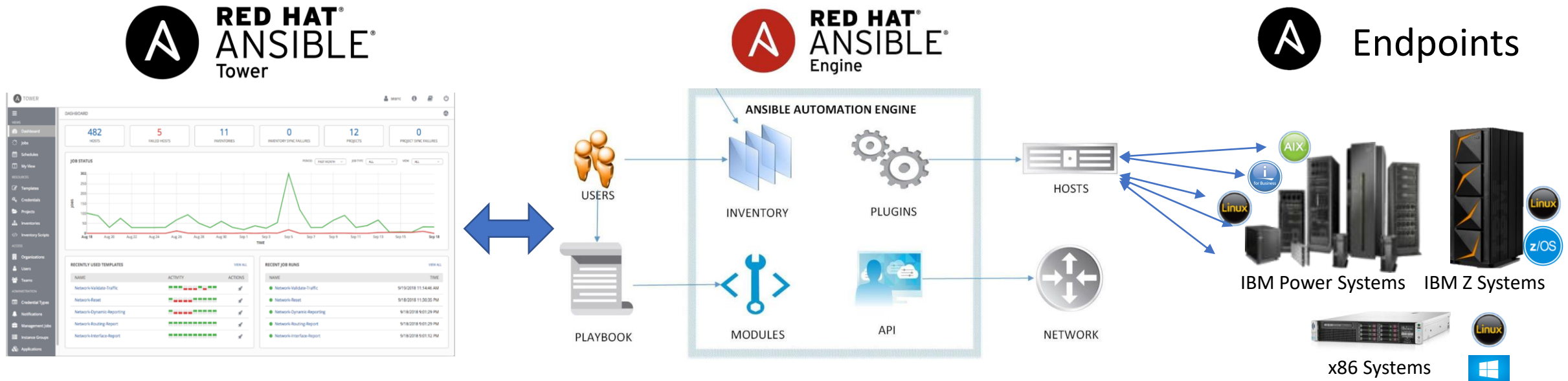


Red Hat
Ansible Automation
Platform

Increases productivity of AIX, IBM i and IBM Power Systems admins
Extends consistent management across multiple platforms



Red Hat Ansible Automation Platform for Power Systems



1 Red Hat Ansible Tower

- Enterprise-wide graphical control of Ansible estate



Supported on
x86 Linux

2 Red Hat Ansible Engine

- Enterprise-wide control – i.e., runs playbooks



Supported on
x86 Linux

3 Red Hat Ansible Endpoints

- Enterprise-wide automation; modules are executed here



**commercial support
available from Red Hat**



community support only
(at present)

Ansible and Power Systems Cloud solutions



1. Ansible can automate anything—even cloud provisioning operations
2. From a POWER perspective, can automate both private cloud and public cloud infrastructure
3. **Private Cloud:** Ansible complements IBM PowerVC to automate VM provisioning—see an example
4. **Public Cloud:** Ansible complements IBM Power Virtual Server on IBM Cloud—see an example

Cloud has reset expectations for IT

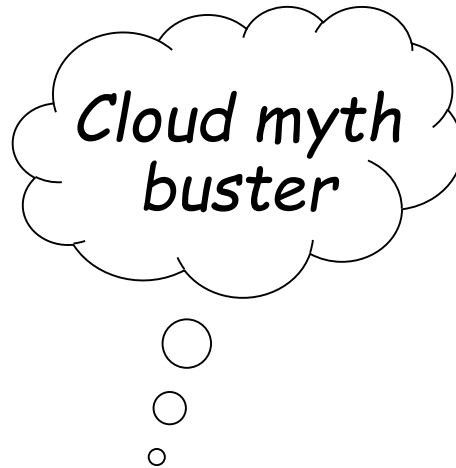


94% of organizations
are using a mix of public & private clouds
and are embracing a multicloud strategy*

Pay as you go for what you use

Self-service experience, from anywhere

Rapid access to resources – compute,
storage, GPUs, network bandwidth



Automate, simplify management & Dev/Ops

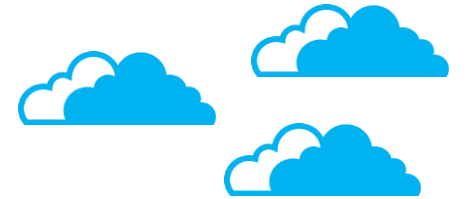
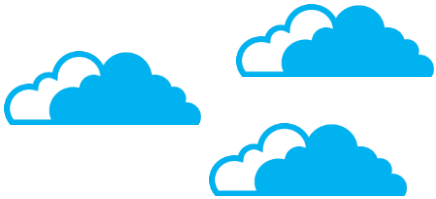
Deploy & scale apps rapidly – run anywhere

Continuous software, infrastructure innovation

Cloud is a capability and not a place

*IDC Cloud Forecast 2018-2020

IT teams are defining how Power fits in multicloud plans



Cloud placement considerations for Power workloads



Resilience – stateless or transactional?

Security – are the crown jewels locked down?

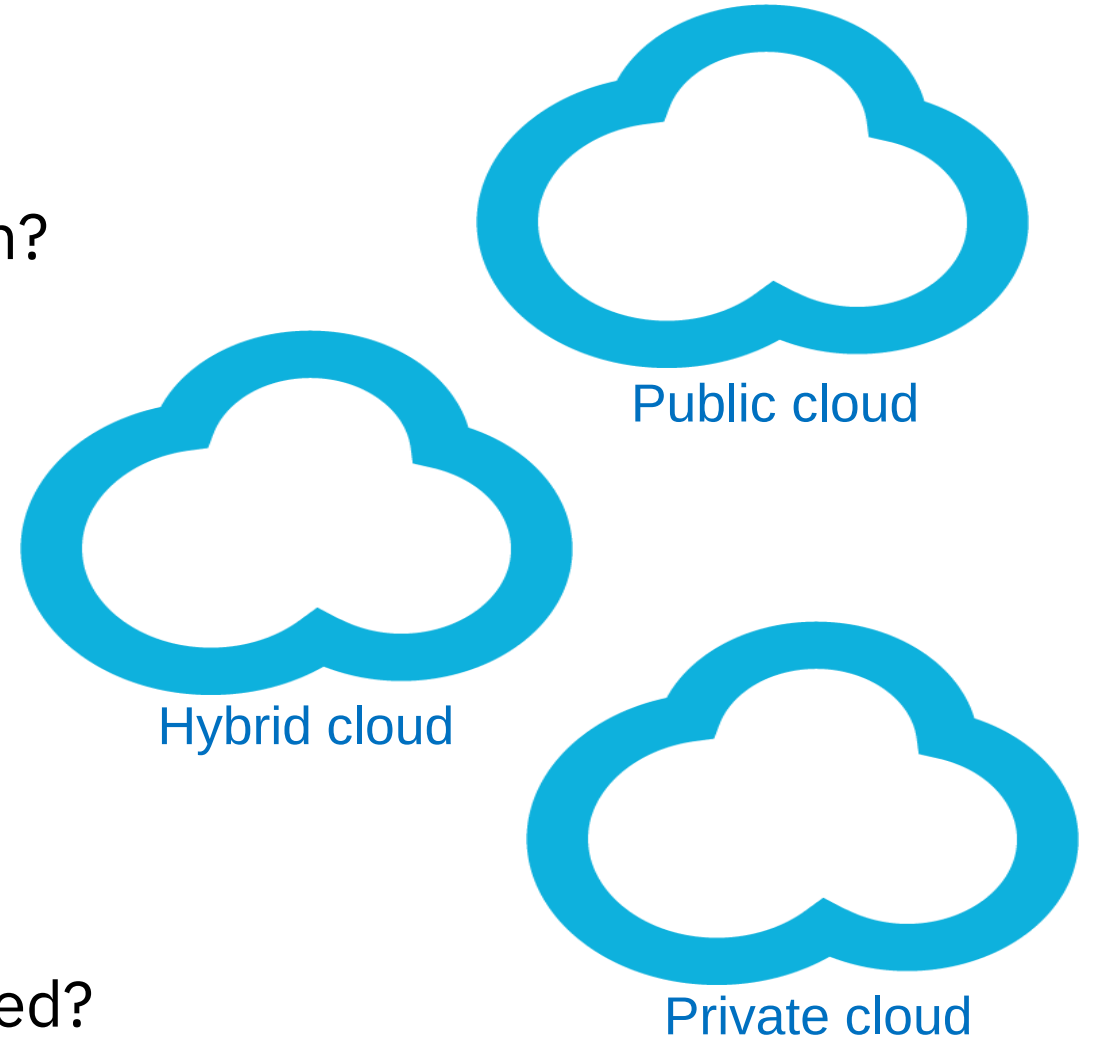
Performance – is it there when you need it?

Latency – is a dropped connection fatal?

Predictability – is activity spiky or stable?

Compliance – local/regional/global?

Data sources – publicly-available or protected?



Public Cloud

Backup & archive

Front office/desktop

ERP

Big data & analytics

Disaster recovery

Risk & compliance
services

Private Cloud

Workloads needing
low latency to back ends

Existing database workloads

Applications with
sensitive data

Maintain & Evolve

Applications with
complex processes
and transactions

Highly customized
applications

Not yet virtualized
applications

Data sovereignty /
residency

Regulation-intensive
applications

Information-intensive
applications

Batch processing

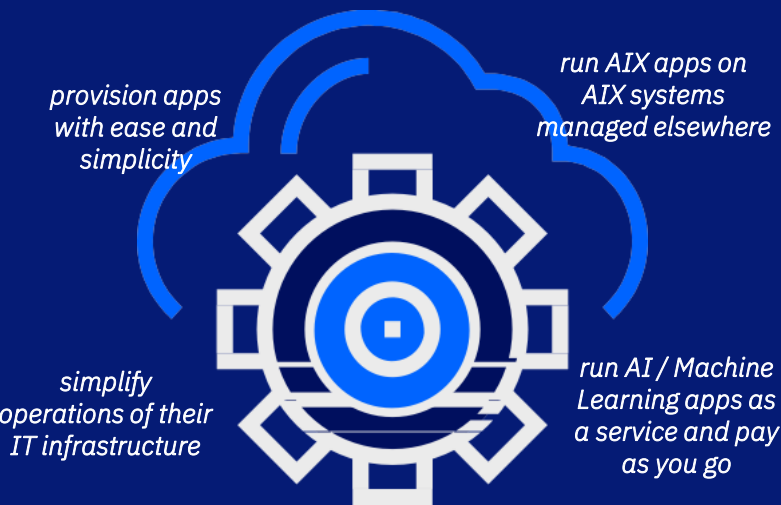
Where do Power workloads belong?



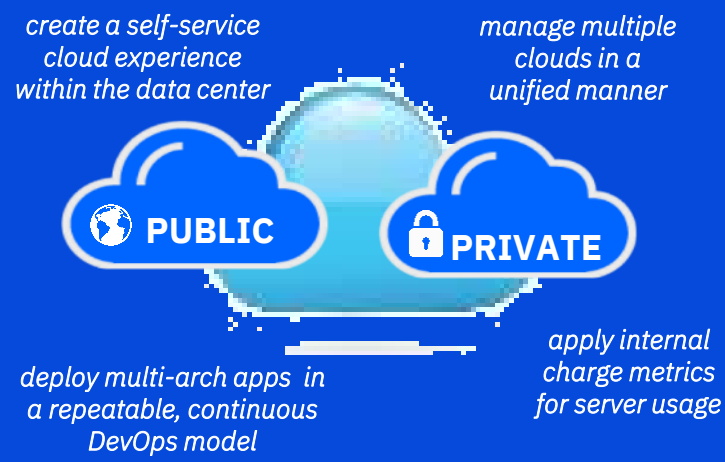
Enterprise transformation
required for cloud adoption

Digital transformation by Power Systems clients includes...

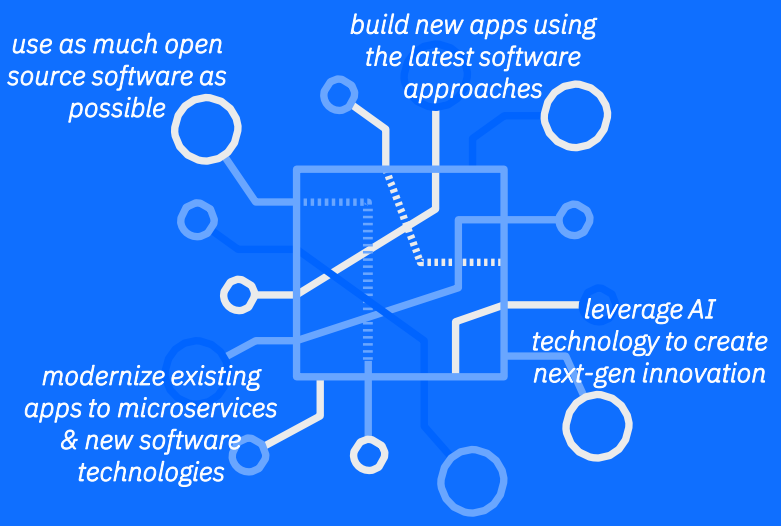
Simplifying Infrastructure Management & Automation



Delivering a Cloud Experience and Increasing Agility



Providing an Innovation Fabric for the Business



On Premises (Private Cloud), Off Premises (Public Cloud) or Both (Hybrid Cloud)

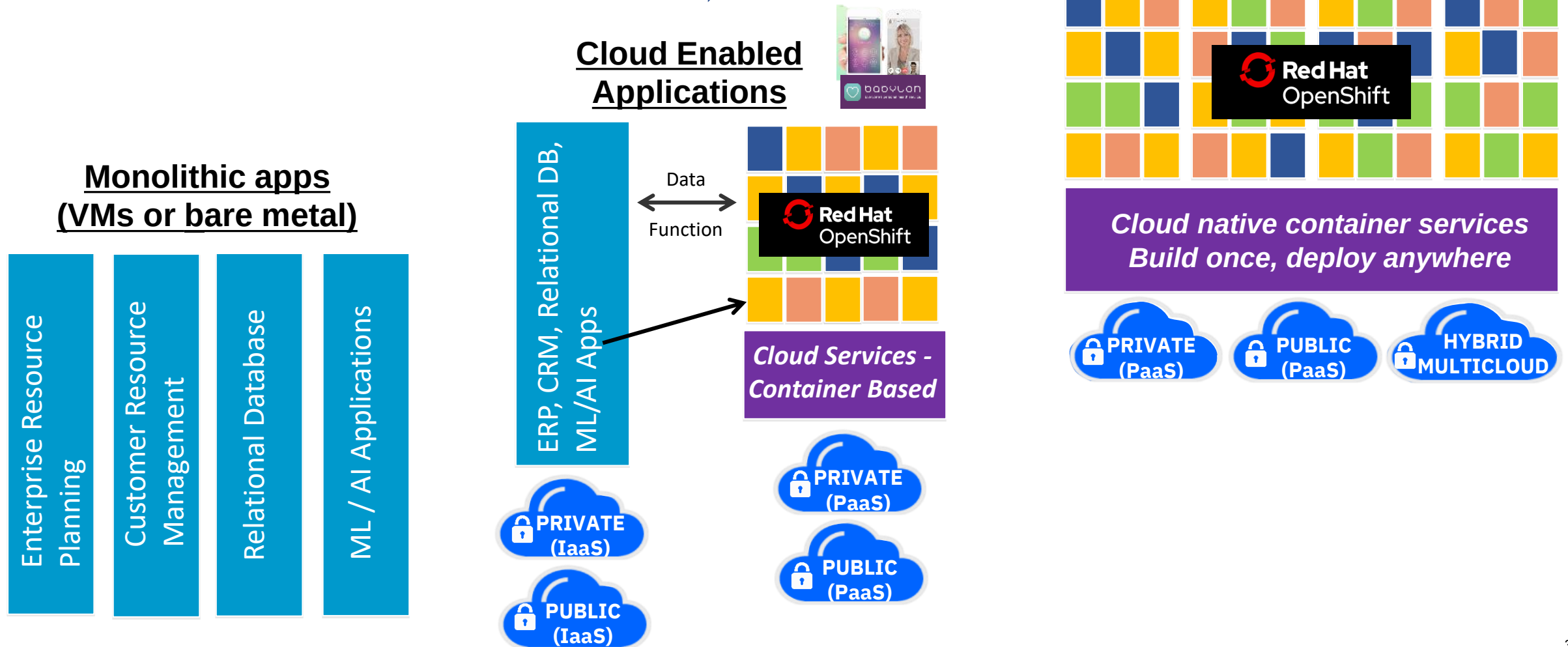


...IBM Power Systems have you covered!

Cloud is changing how applications are built and delivered

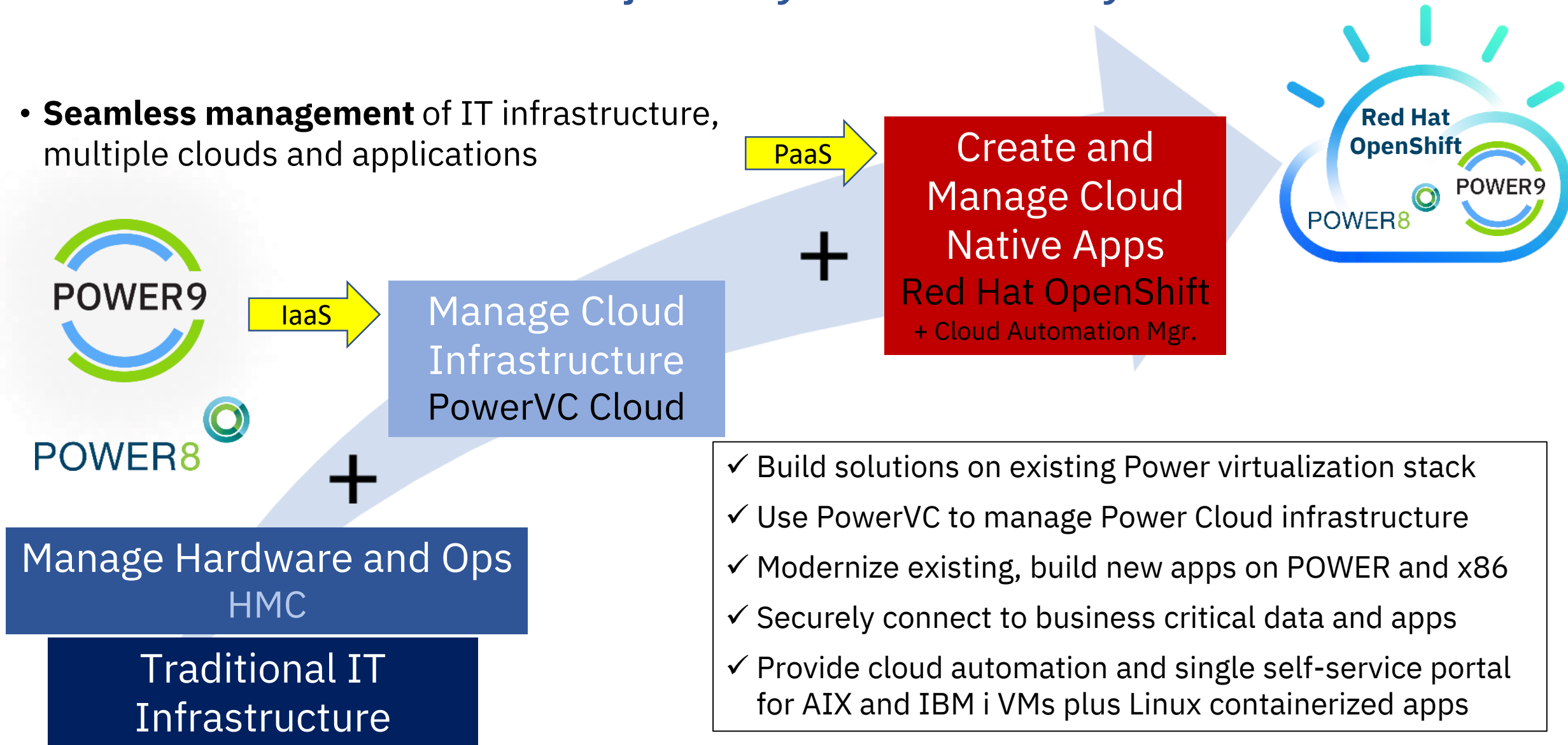


A majority of the 25,000+ Power clients are in early stages of moving to cloud and modernizing their AIX and IBM i apps



Modernization and Cloud journey for Power Systems

- **Seamless management** of IT infrastructure, multiple clouds and applications



IBM Power Systems Virtual Server on IBM Cloud

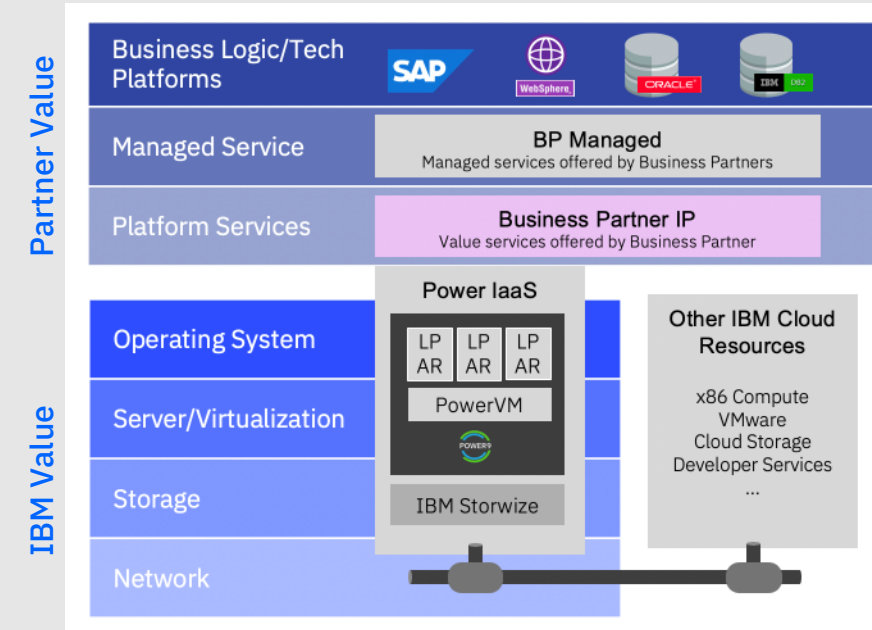


- Self-provision and purchase monthly subscription Power IaaS instances from IBM Cloud.
- Self-service VM management of pool of compute, memory, storage, network infrastructure.
- Secure access to PowerVM based VMs through client owned IBM Cloud resources.
- IBM manages IaaS resources and supports hardware/software up to OS deployment
- Client self-manages the Operating System and all software above the OS
- Client can bring their own OS images and add to available OS images.

Power IaaS Details:

Systems:	S922 or E980
Compute:	0.25-153 cores (15 for S922, 153 for E980), <i>Dedicated or Shared option for Cores</i>
Memory:	8-64 GB per core
Storage Type:	Type: Tier 3 (SSD) or Tier 1 (NVMe)
Storage Quantity	10 GB minimum, 10 GB increments
Network:	Public and/or Private IP
OS:	AIX / IBM i / Linux

*Multi-tenant, self managed,
Power Infrastructure-as-a-Service in IBM Cloud
with consumption-based OPEX pricing*



Pricing Methodology:

- Consumption based pricing:
 - Hourly pricing, monthly billing
- Pricing Calculator:
 - [Power Virtual Server Price Estimator](#)



IBM Power Systems for Google Cloud

Overview

Power infrastructure as a service

Capacity via monthly subscription

Complete Google Cloud user experience

Private, low-latency access to resources

IBM runs infrastructure, clients manage OS and up

One consolidated monthly bill from Google Cloud

IBM Power Systems for Google Cloud

VM Instances > Create an instance

Name: db-dev-1 Location: US East

Number of Instances: 1

Machine type Customize to select cores, memory and GPUs.

Processor type
☒ Dedicated Processors
☐ Shared Processors

CPU Platform: S922

Cores: 1 to 6 (slider) 2

Memory: 1 to 128 (slider) 12 GB



IBM and Red Hat: Hybrid Cloud Architecture

Open Platform for innovation and growth



Business Requirements

Build with the latest tech on any cloud

Improve visibility & control across hybrid, multicloud

Ensure app & data portability with no lock in

Optimize on the best fit cloud model and vendor

World-class public cloud

IaaS & advanced services on IBM's public cloud

Hybrid multicloud platform

Consistent stack and management for multicloud

Business Outcomes

Innovate faster with greater agility

Create more insights from data

Improve ROI and competitive edge

Expertise

Advise on cloud | Build for cloud | Move to cloud | Manage on cloud

Advanced Services

AI | Hyper Protect | IoT | Blockchain | Analytics | ML | Quantum

Capabilities

Application | Data | Integration | Automation | Management | Security

Foundation

Common Services | RHEL | RH OpenShift | Multi-cluster Management

Infrastructure



IBM Cloud



AWS



Azure



Google



Edge



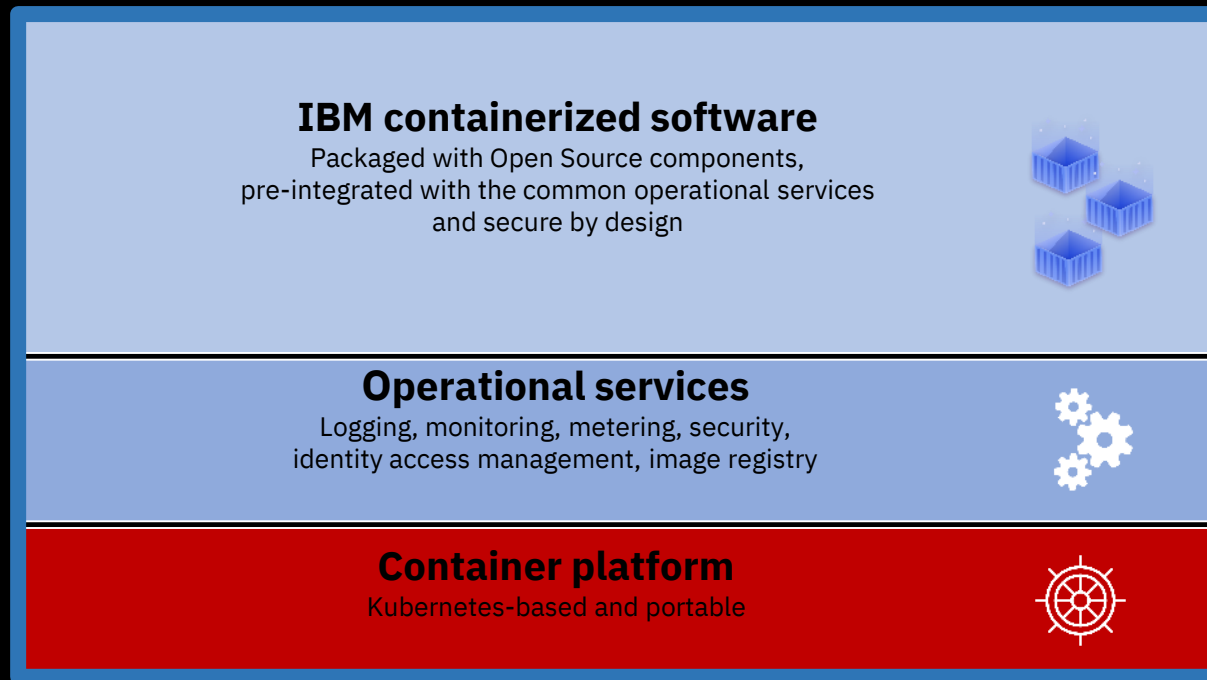
Private Cloud



IBM Power Systems
IBM LinuxOne/z Sys.
IBM Storage

IBM Cloud Paks – Middleware Anywhere

Enterprise-ready, containerized software solutions that give you an open, faster, more secure way to move core business applications to any cloud



Complete yet simple

Application, data and AI services, fully modular and easy to consume

IBM certified

Full software stack support and ongoing security, compliance and version compatibility

Run anywhere

On-premises, on private and public clouds and in pre-integrated systems



Pre-integrated
Systems



IBM Cloud



RED HAT
OPENSIFT



aws



Azure



openstack



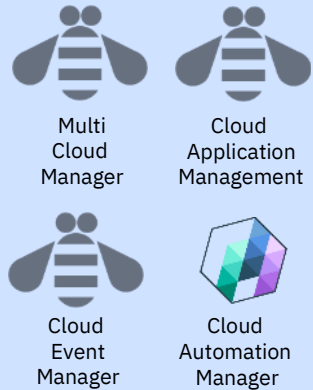
Google Cloud



POWER9

Cloud Paks and Red Hat OpenShift on Power Systems

Cloud Pak for Multicloud Management



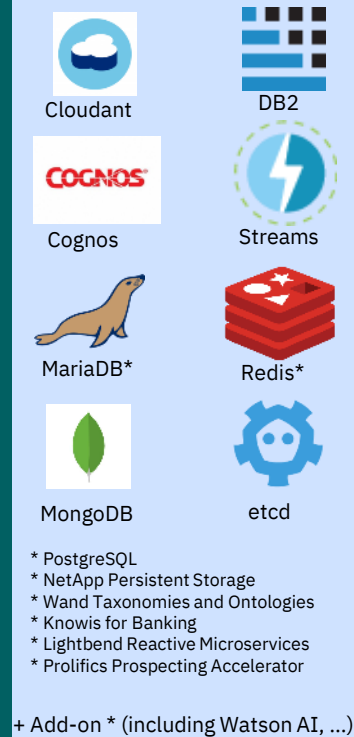
Red Hat OpenShift

Cloud Pak for Application



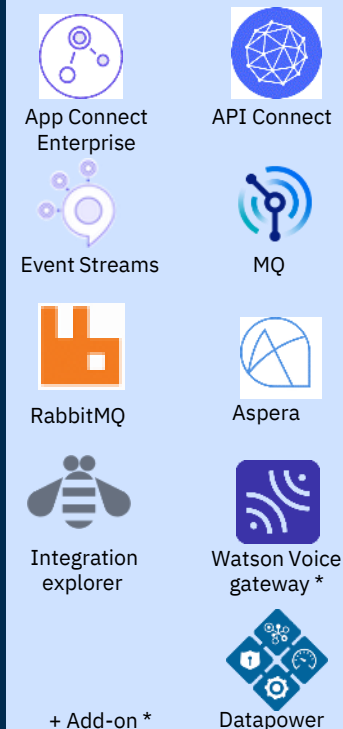
Red Hat OpenShift

Cloud Pak for Data



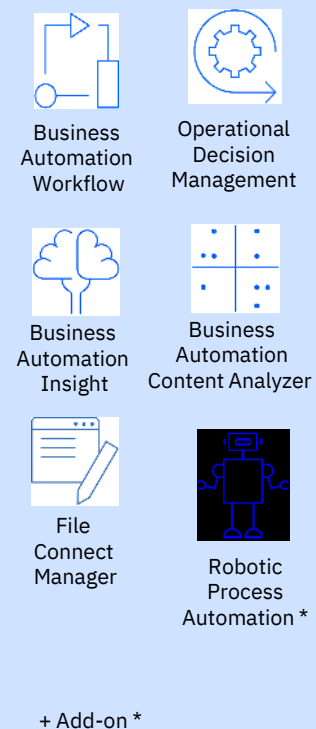
Red Hat OpenShift

Cloud Pak for Integration



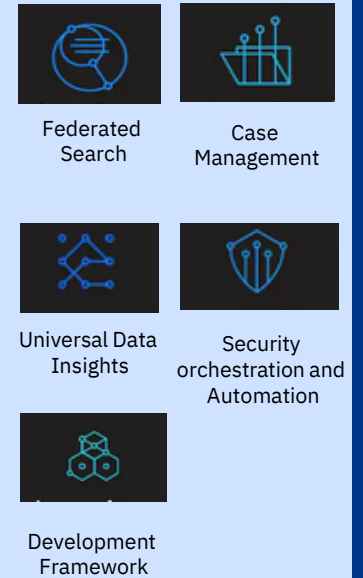
Red Hat OpenShift

Cloud Pak for Automation



Red Hat OpenShift

Cloud Pak for Security



Red Hat OpenShift

Runs on choice of IBM Power Systems Infrastructure-as-a-Service (IaaS)

PowerVC
PowerVM



Bare-metal



POWER9 Servers: Optimized for a hybrid cloud world

Optimal solutions for private, public, hybrid and multi-clouds



- ✓ Built-in **PowerVM**, so every workload is virtualized with accelerated secure mobility
- ✓ Consistent multicloud management with **VMware vRealize Suite** integration
- ✓ Enterprise-wide IT automation with **Ansible**
- ✓ **PowerVC for Private Cloud** for virtualized resource optimization and a comprehensive private cloud portal
- ✓ Create new Power cloud-native container-based solutions alongside AIX and IBM i workloads with **IBM Cloud Paks**



Read the white paper:

<https://www.ibm.com/downloads/cas/G4DO3DJE>

Additional POWER9 Cloud benefits

- Easy transfer of VMs between clouds
- Enterprise Pools for live resource reallocation
- Cloud-ready images for most Power software



- Broader term license and SaaS pricing options
- Mobility activation for legacy servers speeds migration
- Services: Power to Cloud Rewards Program



Thank You



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