



IBM Power Systems

Journey to the hybrid multicloud

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IBM Power Systems Hybrid Multicloud Management

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81%

organizations using
more than one public
cloud provider¹

Life in a hybrid multicloud world

Cloud computing has undoubtedly changed how enterprise IT is delivered. It has opened the door to compute and storage resources without limits, as well as a wealth of cloud services (e.g., artificial intelligence, weather data, etc.) for IT administrators to leverage and create the next wave of enterprise innovation. This paper provides a practical guide for IBM Power System™ users to gain an understanding of the POWER® cloud portfolio and how to map out a journey to a secure and reliable hybrid multicloud world.

Navigating a complex IT infrastructure

Today, cloud computing provides many opportunities to run your enterprise infrastructure more effectively including on-demand access to compute resources, disaster recovery solutions, invisible infrastructure maintenance, security patches and more. Whether you're creating an on-premises private cloud, leveraging one or more off-premises public clouds (i.e., multicloud) or taking a hybrid cloud approach, cloud infrastructure enablement can expand your business opportunities.

Given this broad range of technologies, how can IBM Power Systems users, running [IBM AIX®](#), [IBM i](#) and [Linux®](#) enterprise apps, understand these capabilities and create a technology roadmap in an approachable and methodical manner?

A clear vision

A recent Gartner survey showed that **81%** of organizations utilizing public cloud services are using more than one public cloud provider.¹ And, according to the RightScale 2019 State of Cloud report, "Enterprises are prioritizing a balance of public and private clouds."² Hybrid multicloud has become a reality for enterprise and technology leaders. Yet, there is a need for a clear vision of how to enter and operate in this world.

What is hybrid multicloud?

A hybrid cloud is a computing environment combines a private cloud and a public cloud by allowing applications and data to be shared between them. A multicloud refers to a cloud approach made of up more than one cloud service, from more than one cloud vendor. Thus, a hybrid multicloud combines a private cloud, a public cloud and more than one cloud service, from more than one cloud vendor.

A multicloud strategy can unlock tremendous organizational value because it combines the best of both private cloud and public cloud. It allows organizations to run mission-critical applications and host sensitive data on-premises. It offers the flexibility of public cloud. And, it enables the movement of information between the private and public services.

Hybrid multicloud motivators and use cases

There are several motivators driving enterprises to construct a hybrid multicloud platform. Let's explore some of the more prevalent scenarios for POWER customers (several of them are often pursued in parallel):

[Deliver streamlined deployment of enterprise resources, including AIX, IBM i and Linux virtual machines \(LPARs\)](#)

Users have grown to expect easy and on-demand access to IT resources through an on-premises private cloud experience. Developers, QA engineers and line-of-business users want simplified access to infrastructure and applications. IT administrators want trusted enterprise-

grade security and simplified operations. Streamlining all of these processes is made possible by adopting POWER cloud technologies and processes within the data center.

[Increase operational and budgetary flexibility by way of leveraging IBM Power Systems in a public cloud](#)

One of public cloud's major advantages is that it provides effectively limitless access to compute capacity billed as an operational expense. With a few clicks of the mouse or swipe of a credit card, users get immediate access to new virtual machines or containers.

[Modernize existing applications to adopt cloud-native software development principles \(e.g., containers and microservices\)](#)

Containers have unquestionably transformed how software is packaged, installed and operated — paving the way for new software delivery models. To that end, enterprises worldwide are exploring container technology and developing plans on how to integrate them into their enterprise, while delicately balancing the ongoing business need to deploy, manage, operate and integrate with virtual machines.

[Integrate IBM Power Systems with the broader cloud strategy](#)

As the industry shifts towards hybrid multicloud, a comprehensive cloud management strategy has become increasingly important. According to the RightScale 2019 State of Cloud Report, “enterprises, optimizing cloud costs (84 percent in 2019 vs. 80 percent in 2018) and cloud governance (84 percent in 2019 vs. 77 percent in 2018) are growing challenges.”² Long gone are the days of building siloed infrastructures. Enterprises are striving towards a model of interconnectedness so that the collective strength of their platforms and cloud providers can be leveraged to create the next wave of innovation.



High-level reference architecture

Shown here in *Figure 1: Cloud Architecture* is a hybrid multicloud reference architecture that is inclusive of the major hardware platforms, including IBM Power Systems, IBM Z® and x86. From a Power Systems perspective, PowerVC provides the Infrastructure-as-a-Service (IaaS) layer on-premises. Additionally, Power Systems enterprise servers are available in the IBM public cloud, providing on-demand access to AIX and IBM i virtual machines. Red Hat® OpenShift™ provides the universal Platform-as-a-Service (PaaS) solution, spanning the entire hybrid multicloud landscape. With Red Hat OpenShift, users can run their software of choice, including IBM’s enterprise software delivered via IBM Cloud Paks™, ISV software, open-source software and custom enterprise software. And finally, technologies such as IBM Multicloud Manager or VMware® vRealize® can integrate the historically separate cloud infrastructures into a single interconnected cloud fabric.

Offerings

Services offerings

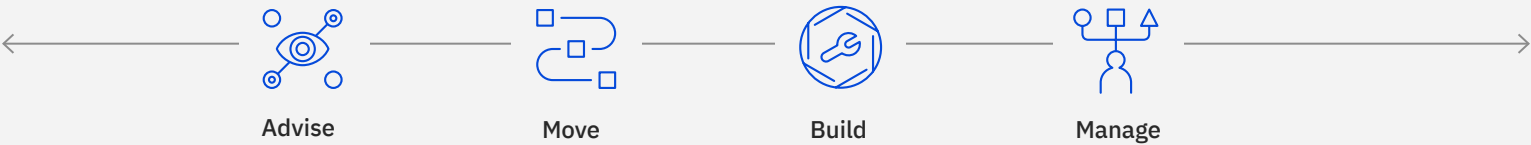
Certified products and cloud services offerings

Core platform offerings

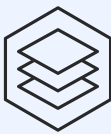
Infrastructure offerings

- IBM Power Systems
- IBM Z and Storage
- IBM Cloud Bare Metal and IaaS
- Other cloud providers
- Partners

Services to accelerate cloud adoption



IBM Cloud Paks



- Cloud Pak for Applications
- Cloud Pak for Data
- Cloud Pak for Integration
- Cloud Pak for Automation
- Cloud Pak for Security

- Cloud Pak for Multicloud Management
 - Cloud Automation Manager (CAM)
 - Multicloud Manager (MCM)
 - Cloud Event Manager (CEM)
 - Red Hat Ansible Tower
 - Red Hat CloudForms

Infrastructure-independent common operating environment

Open | Consistent | Multicloud | Portable | Scalable | Integrated | Secure | Certified and supported

- Common services
- Red Hat OpenShift
- Red Hat Enterprise Linux, IBM PowerVC, IBM Cloud Infrastructure Center, OpenStack, RHV, VMware
- Red Hat Satellite
- Red Hat CloudForms



Private cloud infrastructure



IBM public cloud infrastructure



Other public cloud infrastructure



Hybrid multicloud

Accelerators

Migration and transformation tools

Best practices, methods and reference architectures

IBM Cloud Garages and Red Hat Innovation Labs

Ecosystem, certification and support

Figure 1: Cloud Architecture

Reference journey to the hybrid multicloud

While each organization will have its own unique characteristics, *Figure 2: Reference Product Journey to Hybrid Multicloud* serves as a general blueprint to guide POWER users through the myriad of cloud technologies and remove the mystery from the journey. The path to hybrid multicloud begins with a solid foundation of infrastructure and hardware management capabilities. From there, users are directed towards establishing a cloud experience within their own data center (i.e., a private cloud), offering simplified virtualization management and operations, advanced automation and a platform to start building innovative cloud-native applications leveraging Red Hat OpenShift, Kubernetes and containers. As a parallel track to establishing a private cloud, it is recommended to explore the public cloud to open the door to on-demand infrastructure without the need to procure and administer it. Lastly, users need to establish robust connectivity between their on-premises and off-premises infrastructures so that applications and data can flow seamlessly between the two.

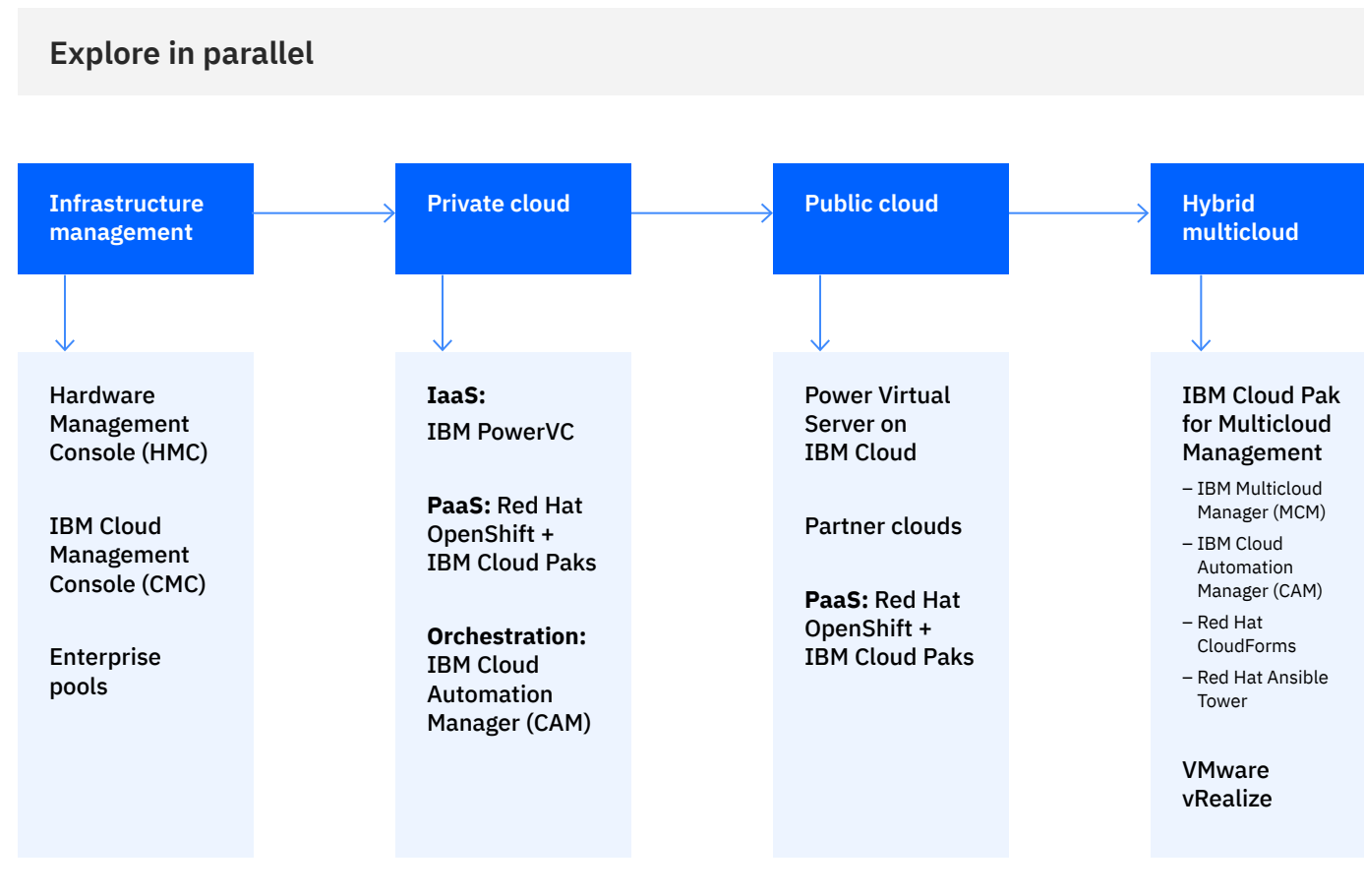
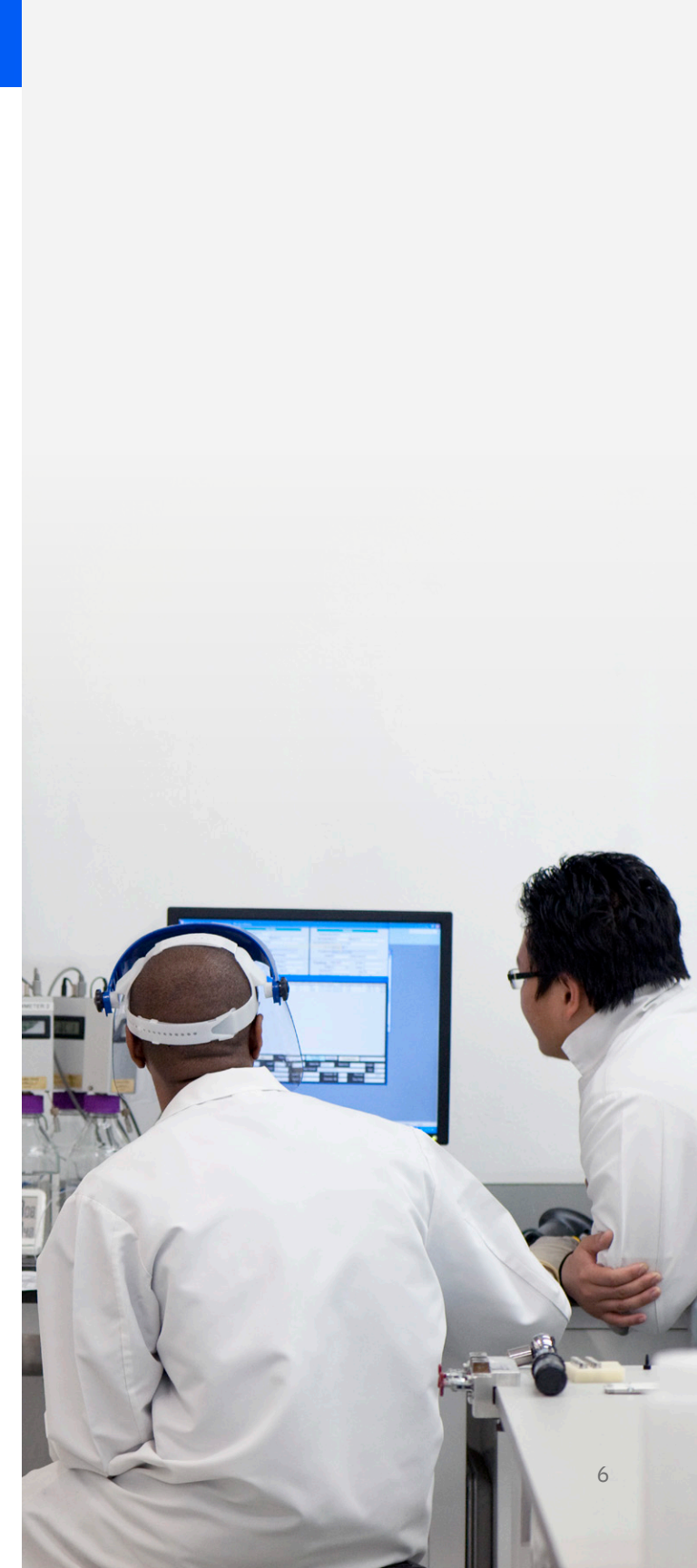


Figure 2: Reference Product Journey to Hybrid Multicloud



IBM hybrid multicloud solutions

IBM HMC and Cloud Management Console

The [Hardware Management Console \(HMC\)](#) is the primary hardware management product used to administer Power Systems enterprise servers. It is used to update firmware and report problems.

[IBM Cloud Management Console \(CMC\)](#) runs as a service in the IBM Cloud™ and provides dynamic views of performance, inventory and logs for a complete Power Systems enterprise. It also provides management for Power Enterprise Pools 2.0 for deeper infrastructure insights that help administrators troubleshoot problems faster right from their mobile devices, tablets or PC.

Enterprise pools

[IBM Power Enterprise Pools 2.0 \(PEP 2.0\)](#) provides enhanced multisystem resource sharing and by-the-minute consumption of on-premises compute resources to users who deploy and manage private cloud infrastructure. PEP 2.0 allows a user to purchase a pool of resource credits (processor and/or memory) such that when the pool's base resource usage exceeds the entitled amounts, the pool will be debited in real-time. This provides an innovative and flexible resource consumption model for users. At this time, PEP 2.0 only allows Power E980 servers in the pool.

IBM Power Virtualization Center (PowerVC)

[IBM Power Virtualization Center \(PowerVC\)](#) provides on-premises enterprise virtualization management for Power Systems, inclusive of AIX, IBM i and Linux guests. Built on OpenStack, it provides a multi-tenant Infrastructure-as-a-Service (IaaS) layer in the cloud software stack, allowing administrators to quickly provision new virtual machines in minutes. It also provides numerous operational benefits

such as one-click system evacuation for simplified server maintenance, dynamic resource optimization (DRO) to balance server usage during peak times, automated virtual machine restart to recover from failures, importing and exporting virtual machine images for cloud mobility and more. It also enables DevOps capabilities such as “infrastructure as code” by way of HashiCorp Terraform. Terraform can provision POWER resources through PowerVC by leveraging the out-of-box OpenStack provider. PowerVC provides the foundational technology on top of which the rest of the POWER cloud stack is built.

Red Hat OpenShift

[Red Hat OpenShift](#) is the industry-leading Platform-as-a-Service (PaaS) technology built on Kubernetes, hardened for the enterprise and fully enabled and supported on IBM Power Systems. OpenShift provides an infrastructure-independent common operating environment that serves as a common foundation across both the private and public cloud, making it the de-facto standard fabric for hybrid cloud infrastructures.

OpenShift provides a platform to build new cloud-native, container-based applications. It also provides a broad set of open-source software, IBM enterprise middleware (via IBM Cloud Paks) and ISV software.

When paired with the IBM Cloud Pak for Multicloud Management and IBM Cloud Automation Manager, users can build composite applications that are comprised of both containers and virtual machines. This way, select components of an application can be modernized with microservices, while leaving the mission-critical components (e.g., databases) on the most robust operating systems like AIX and IBM i.

IBM Cloud Paks

IBM Cloud Paks are enterprise-ready, containerized software solutions that provide an open, faster and more secure way to move core business applications to any cloud. They are lightweight and easy to run, certified by IBM and Red Hat OpenShift. Each Cloud Pak sits atop Red Hat OpenShift and can run anywhere on-premises, in the cloud or at the edge.

Cloud Paks are comprised of a set of containerized IBM middleware and common software services. IBM currently offers five Cloud Paks: [IBM Cloud Pak for Applications](#), [IBM Cloud Pak for Data](#), [IBM Cloud Pak for Integration](#), [IBM Cloud Pak for Automation](#), [IBM Cloud Pak for Multicloud Management](#), and [IBM Cloud Pak for Security](#). Each offering provides a broad set of capabilities for a particular domain.

IBM Power Systems Virtual Servers on IBM Cloud

[IBM Power Systems Virtual Servers on IBM Cloud](#) integrates AIX and IBM i capabilities into the IBM Cloud experience. Users receive fast, self-service provisioning, flexible management and access to a stack of enterprise IBM Cloud services with pay-as-you-use billing. Users can easily export virtual machine images in the standard OVA format from PowerVC and upload them into the IBM Cloud for easy back-and-forth image mobility. With this public cloud solution, POWER users can grow at their own pace and run enterprise workloads when and where they choose, with a variety of flexible operating systems, compute, storage and networking configurations.



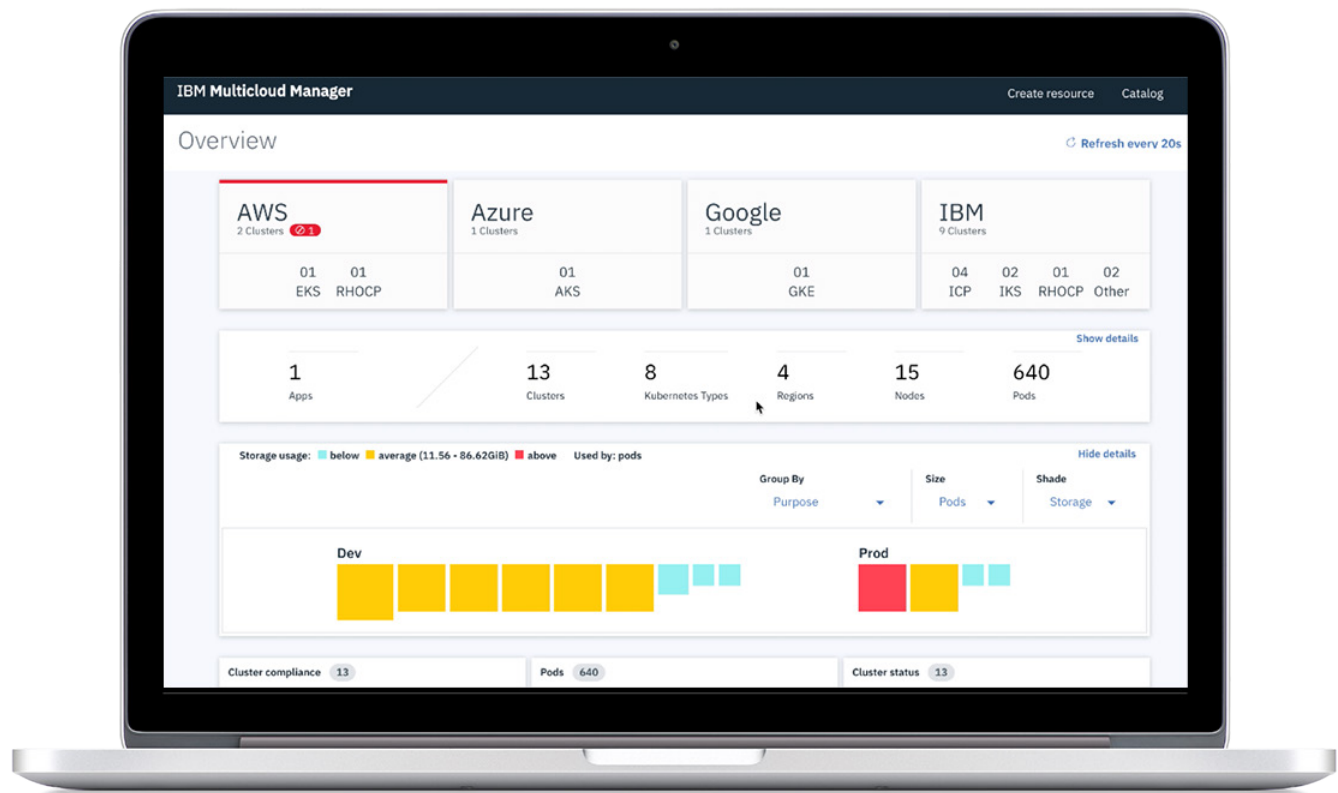


Figure 3: IBM Multicloud Manager

IBM Cloud Pak for Multicloud Management

IBM Cloud Pak for Multicloud Management, running on Red Hat OpenShift, provides consistent visibility, governance and automation across the entire hybrid multicloud landscape. Offered as part of this Cloud Pak are two critically important management applications to hybrid multicloud—IBM Cloud Automation Manager and IBM Multicloud Manager.

IBM Cloud Automation Manager

IBM Cloud Automation Manager (CAM) provides advanced multicloud management capabilities. Using HashiCorp Terraform as its underlying engine, CAM enables connectivity to numerous cloud infrastructures, including PowerVC (OpenStack), IBM Cloud, AWS®, Azure®, Google® and several others. CAM can provision virtual machines, including LPARs via PowerVC, as well as containers. This allows users to create software catalog entries that build complex multi-tier applications with a single click. And because CAM is delivered as part of an IBM Cloud Pak, it inherently runs on Red Hat OpenShift, creating a centralized management plane from which you can deploy all your applications.

IBM Multicloud Manager

IBM Multicloud Manager (MCM) provides a single multicloud dashboard that enables organizations to oversee multiple cloud endpoints on public or private cloud. MCM provides consistent visibility, governance and automation across a hybrid multicloud environment as shown on the right in *Figure 3, IBM Multicloud Manager*.

VMware vRealize automation and operations

VMware vRealize Automation™ speeds up the delivery of infrastructure and application resources through a policy-based self-service portal, on-premises and in public cloud. In addition to x86 VMware-based virtual machines, vRA is able to provision POWER virtual machines (including AIX, IBM i and Linux) by way of PowerVC, providing the ability to orchestrate deployments across hybrid cloud.

VMware vRealize Operations for IBM Power Systems

brings together all management functions including performance management, capacity, cost analytics, planning, topology analysis and troubleshooting in one integrated, highly intuitive, scalable and extensible platform. It also provides deep insights and key performance indicators for enterprise applications, including SAP HANA, Db2, Oracle, and several others. This comprehensive monitoring solution is a perfect complement to a cloud management software stack as it provides a broad and deep perspective as to what’s happening in the cloud.

We hope our commitment to delivering open and flexible solutions for your hybrid multicloud journey will help you leverage partner cloud technologies and seamlessly integrate POWER with the rest of your data center.



Seamlessly integrate with IBM Power Systems

With the right advice and solutions, IT leaders can seamlessly integrate IBM Power Systems into their overall hybrid multicloud strategy. Whether you are looking to streamline virtual machine deployments, operations via a private cloud, leverage the flexibility of public cloud, modernize applications with microservices, containers and Kubernetes, innovate with AI or build a hybrid multicloud, POWER has a solution.

Let us help you identify the next steps in your journey to the hybrid multicloud world. Reach out to a [Power Systems sales representative](#), IBM business partner or the [IBM Systems Co-Creation Lab](#) to start the conversation today.



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2. "RightScale 2019 State of the Cloud Report: See the Latest Cloud Trends." Flexera, January 2019