

## White Paper

# Managed Private Cloud Infrastructure as a Service: Delivering a Consistent Hybrid Cloud Experience

Sponsored by: IBM

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## EXECUTIVE SUMMARY

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Enterprises seeking to thrive in a digital economy – in which they can both innovate and bring products and services to market faster, thus staying ahead of their competition – treat IT infrastructure as a strategic and enabling asset. They invest in cloud infrastructure as a solid foundation on which they can transform their business into a digital powerhouse:

- Public cloud infrastructure as service environments provide enterprises with operational agility, elasticity, and scale. However, security concerns, lack of skill sets, and unpredictable availability can be major inhibitors to adopting public cloud. Enterprises may also face challenges and restrictions with migrating business-critical applications to public cloud infrastructure given the complexity of deploying such applications on public cloud infrastructure.
- Private cloud infrastructure on the other hand provides enterprises with many of the key benefits of public cloud infrastructure, with the added reliability, availability, and predictability of a dedicated environment. Private cloud environments also help to alleviate security concerns and enable better enforcement of stringent governance and service quality requirements. However, deploying and managing private clouds can be challenging given their high operational overhead.

An ideal scenario involves combining these two deployment types to create a true hybrid cloud experience. Hybrid cloud environments enable IT organizations to start with business and application requirements to drive an appropriate choice of infrastructure for optimal placement of workloads. Such requirements include but are not limited to scalability, service quality, and service level objectives. A well-designed hybrid cloud is built on a private cloud foundation that seamlessly extends to one or more public cloud services – all tied together with unified management and automation.

Enterprises can fully realize the value proposition of their hybrid cloud deployment by partnering with a services vendor like IBM. Managed Private Cloud IaaS from IBM is an example of a fully managed service that provides enterprises with the agility, elasticity, and scale of a public cloud infrastructure-as-a-service platform on a dedicated pool of infrastructure resources located on- or off-premise. It creates a ramp for a seamless hybrid cloud experience without the overhead of managing a private cloud and the operational challenges of a public cloud. Enterprise IT can now deliver reliable and consistent service quality via a modern cloud-based infrastructure. They can benefit from a predictable TCO through a subscription model like that of a public cloud service provider. Such arrangements free up IT resources that can be used on transformative development initiatives such as DevOps.

## SITUATION OVERVIEW

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### IT Infrastructure as a Strategic Asset

Applications form the lifeblood of enterprises seeking to thrive in a digital economy. IDC estimates that by 2023, 500 million new logical applications will be created, equal to the number of applications built over the past 40 years. Current generation applications enable the enterprise to stay its course while new generation applications enable the enterprise to develop and deliver new products and services faster, create new customer experiences, and develop new revenue streams. Collectively, applications enable the enterprise to maintain its competitive differentiation as the enterprise thrusts itself into the future of hyper-digital era.

Enterprises must consider IT infrastructure as a strategic asset. IT infrastructure forms the foundation for applications to deliver expected business outcomes. Investing in the right infrastructure – one that scales to support both generations of applications – is of paramount importance to IT. It is equally important to design and deploy IT infrastructure in a manner that supports the agility and elasticity requirements of the business itself. And finally, this infrastructure must deliver consistent service quality, exceed governance requirements, and provide superior return on investments.

### The Shift to a Cloud Infrastructure

Investments in modern cloud infrastructure provide businesses with a strategic advantage in their digital transformation journey. Cloud infrastructure enables IT organizations as well as line of business organizations to seamlessly provide and consume infrastructure resources respectively. There are three ways to deploy cloud infrastructure: on a public cloud service, in a dedicated private cloud infrastructure, and an increasingly attractive option – in a hybrid cloud.

*IDC defines hybrid cloud as a multicloud environment (i.e., one or more private and public cloud deployment types) operated as a converged entity using a unified management and automation layer.*

### Limitations of Public Cloud Infrastructure

In recent times, public cloud services have enabled enterprises to quickly shift from traditional IT environments and realize the benefits around agility, elasticity and cost among others that enterprises have come to expect from IT. However, as they deepen their reliance on public cloud infrastructure, they are realizing that it poses some real challenges to their business. This includes:

- Operational concerns such as security, lack of skill sets required to manage a shared multitenant environment, unpredictable availability, and inconsistent service quality – which is often created due to lack of familiarity with the myriad of options and service instances
- Challenges and restrictions with migrating business-critical applications to public cloud infrastructure given the operational complexity of managing such applications on public cloud infrastructure

### Private Cloud Infrastructure Is the Foundation for Scale

The design principles of private cloud infrastructure seek to overcome the challenges and restrictions of public cloud infrastructure – making private cloud appealing to several enterprises that have a complex on-premise IT footprint.

Like public cloud infrastructure as a service, private cloud infrastructure environments provide enterprises with operational agility, elasticity, and scale. Additionally, private cloud environments

provide reliability, availability, and predictability of a dedicated environment. Private cloud environments also help to alleviate security concerns and enable better enforcement of stringent governance and service quality requirements. Finally, with right orchestration tools in place, private clouds provide a suitable ramp to one or more public cloud environments for the purposes of bursting or rebalancing and placement. This can create an efficient multicloud experience. However, enterprises are also finding out, often the hard way, that deploying and managing private clouds is not trivial given their high operational overhead. Managing hybrid clouds is even harder.

### ***Hybrid Cloud Infrastructure: The Best of Both Worlds***

Using the private cloud as a foundation, enterprises can create a true hybrid cloud environment which seamlessly ties the private and public cloud resources with unified management and automation. In the process:

- IT organizations gain the agility, elasticity, and operational efficiency needed to become hyper-responsive to their business stakeholders and customers. Hybrid cloud operationalizes the consumption of containerization technologies and newer application design and architecture.
- Line of business (LOB) owners gain access to infrastructure that provides consistent service quality and is responsive to their changing business needs.
- Application developers gain faster access to infrastructure resources and the ability to consume infrastructure-as-code, self-service provisioning of infrastructure resources, and modern application development practices.

Hybrid cloud environments enable IT organizations to start with business and application requirements to drive an appropriate choice of infrastructure for optimal placement of workloads. Hybrid cloud infrastructure also provides the operational efficiency which enables enterprises to innovate and bring products and services faster to the market, thereby giving them an edge over their competition.

### ***Voice of the Business: Perspectives From LOB Decision Makers***

The business agility enabled by cloud infrastructure introduces additional challenges to application owners. IDC interviewed several LOB executives as a part of this study. They cited following challenges as major inhibitors to adopting public cloud infrastructure.

#### **Governance (Security and Compliance)**

Public cloud infrastructure introduces a shared responsibility model for application security. This is distinctly different from perimeter-based security processes, tools, and frameworks that LOB application owners are used to with traditional IT infrastructure (Perimeter-based security refers to security based on trusted perimeters. Examples include: datacenters, allowed IP addresses). With cloud infrastructure, application developers and owners have their share of responsibility to ensure application security through appropriate constructs such as access permissions on virtual resources, role-based authentication (RBAC), virtual firewalls, encryption, transport layer security (TLS), etc. LOBs also benefit from IT investments in automation tools so their developers can securely consume virtual resources at scale. Public cloud environments also pose additional challenges in enforcing industry specific compliance regulations such as HIPAA or FedRAMP.

#### **Operational Consistency**

LOB application developers face tremendous operational complexity in managing their applications in public cloud environments. Key challenges include pushing application upgrades, patching virtual servers without application downtimes, applying security updates, monitoring application health on a

remote environment, diagnosis, etc. Developers prefer to focus on the business applications rather than on supporting infrastructure. IT owners managing private cloud environments cite operational complexity of managing and operating private cloud infrastructure as a major inhibitor to adopting private cloud infrastructure. Day-to-day operations such as monitoring, troubleshooting, applying patches, etc. (commonly referred to as 'Day 2' operations) of any infrastructure at scale is not trivial.

Further, the model of infrastructure delivery through self-service provisioning has implicit assumptions on how an application recovers from infrastructure downtime. However, traditional enterprise applications are built with assumptions on the continuous availability of infrastructure resources and may not handle infrastructure downtimes well. This adds additional responsibility to the business application owner, who now must plan for the possibility of downtime of infrastructure resources.

### Total Cost of Ownership

Another challenge faced by LOB application owners using public cloud infrastructure is inconsistent TCO of leveraging public cloud services. Pay-as-you go cost models prove to be cost-effective for short-lived, spiky, or cloud-native applications. However, such models may be counter-intuitive for legacy enterprise applications with longer lifetimes and uniform resource utilizations. Enterprises may even face disappointments with TCO using public cloud during the initial phases of their cloud migration and express clear preference for consumption models with predictable TCO.

#### Pain Points With Deploying and Managing Multicloud Infrastructure

Lack of in-house expertise, decision fatigue, higher costs. It takes a while to really find out which data elements could be moved onto private versus public cloud. There was some time when we were building applications without necessarily knowing whether they would go onto the public or private cloud.

### The need for Managed Private Cloud Infrastructure as a Service

As enterprises increase their strategic investments in IT infrastructure as a part of their digital transformation journey, they have two primary approaches to make the most of these investments. These approaches are not mutually exclusive:

- **Invest in IT and the business.** Making investments in additional in-house expertise that complements existing staff, training, additional orchestration and automation tools, and embracing transformative practices such as DevOps that increase the level of interaction between IT and application owners.
- **Partner with managed private cloud service.** Investing in partnerships with a managed service provider that offers a turnkey solution often accelerates the process of people, process, and technology transformations with the services partner taking on the operational complexity in return for a consistent service delivery experience.

IDC finds that enterprises are indicating a clear preference for business outcomes from investments made in their hybrid cloud infrastructure. They want security, reliability, availability, and low operational overhead of on-premise infrastructure without the challenges and restrictions posed by public cloud

infrastructure. Managed Infrastructure-as-a-service solutions – with the hybrid cloud infrastructure managed by a third-party service provider – enable enterprises to consume dedicated hardware resources ("single tenancy") with the flexibility of an as-a-service consumption model of public cloud services. The dedicated infrastructure can be hosted at the customer's premises or at the service provider's datacenter. Enterprises can then consume such dedicated infrastructure resources as a service through subscription without the overhead of operations. This consumption model helps LOB application owners overcome key challenges they face adopting cloud infrastructure, including security, unreliable uptime, unpredictable TCO, and lack of in-house skill sets.

## Managed Private Cloud Infrastructure as a Service

Managed Private Cloud IaaS from IBM is a fully managed, dedicated service offering that provides core IaaS capabilities such as compute, storage, and networking in a dedicated, single tenant environment through flexible consumption options. Managed Private Cloud IaaS is flexible, allowing the solution to be assembled using products from different vendors like Red Hat and VMware while providing consistent user experience irrespective of the product stacks chosen. It is extensible – it enables enterprises to extend its core capabilities via additional and available services from IBM's solutions portfolio.

### Core Managed Private Cloud IaaS Capabilities

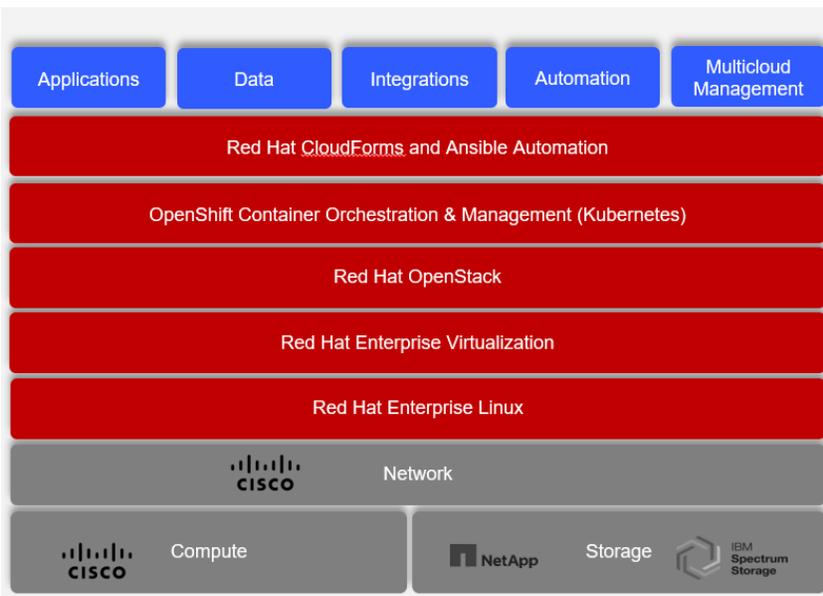
The Managed Private Cloud IaaS solution provides core compute, storage, and networking resources stacked together as a complete turnkey offering. Figure 1 shows an example of key capabilities of the solution stack. The offering provides different types of compute services such as bare metal servers, general purpose virtual instances, and memory optimized virtual instances to support variety of data management, analytics, and content processing applications. The service also supports different tiers of enterprise storage to cater to varied storage needs based on type, performance, and IOPS requirements.

Managed Private Cloud IaaS supports flexibility of building homogenous software stacks with customer's choice of products – all the way from the operating system and hypervisor up to the orchestration platform.

- **Red Hat software stack.** Managed Private Cloud IaaS can be built entirely using Red Hat products – Red Hat Enterprise Linux (OS), Red Hat Enterprise Virtualization (hypervisor), Red Hat OpenStack (cloud management), Red Hat OpenShift (container orchestration), and Red Hat CloudForms and Ansible (automation).
- **VMware software stack.** Similarly, Managed Private Cloud IaaS can also be built entirely with VMware products – VMware ESX (hypervisor), VMware vSphere, PKS, and VMware vRealize (automation).

## FIGURE 1

### Managed Private Cloud IaaS with a Red Hat stack



Source: IBM, 2019

Additionally, Managed Private Cloud IaaS supports the following optional services:

- **Migration services.** Enterprises can leverage application migration services offered by IBM to move their legacy applications to cloud infrastructure. Migration services include rehosting monolithic applications ("lift and shift"), refactoring monolithic applications, replacing legacy applications with cloud-native versions, and extending existing services to new applications and business models.
- **Resiliency services.** Managed Private Cloud IaaS provides 4 Nines (99.99%) of availability. Customers can leverage additional resiliency services that can extend their business continuity recovery time and point objectives by retooling their application and infrastructure stacks.

### *Noteworthy Capabilities of the Solution*

Managed Private Cloud IaaS solution is designed with the needs of most enterprises in mind.

#### **Converged Infrastructure Experience**

Managed Private Cloud IaaS provides a converged infrastructure experience that delivers core IaaS capabilities for both traditional and cloud-native applications. Coupled with Red Hat OpenShift containerization platform, Managed Private Cloud IaaS enables application portability across on-premise and hosted environments.

#### **Flexible Consumption Options**

Managed Private Cloud IaaS provides a flexible, usage-based consumption model with flexible terms. Server and storage hardware and software are purchased as a service, moving consumption costs from capital expenses to an operationally friendly model. Managed Private Cloud IaaS supports cloud-

like pricing with unlimited scalable growth so that customers can have the flexibility of pay-as-you-go models with the predictability of traditional enterprise license agreements (ELA).

### **Homogenous Solution Stacks**

Managed Private Cloud IaaS supports multiple solution stacks to provide a common end-user consumption experience. This provides the enterprise with the flexibility of selecting appropriate stacks based on various metrics such as existing relationships, preferences, and propensities, etc. Managed Private Cloud IaaS supports certified private stacks including Red Hat, VMware, and IBM Cloud Paks.

### **Extensibility**

Managed Private Cloud IaaS has been designed to be extensible. It enables enterprises to augment and enhance their experience with additional value-added services. For example, customers can opt-in for application management and application migration services that enable a seamless LOB application experience.

### **Management Capabilities**

Managed Private Cloud IaaS includes 24x7x365 operations, health monitoring, support for ticketing, and a management portal.

### **Deployment Scenarios**

The Managed Private Cloud IaaS offering supports the following deployment options which are independent of the fact that this service is fully managed and operated by IBM irrespective of the option selected by the enterprise. Customers can consume IaaS capabilities through a management portal that is common to all these deployment options.

#### **Managed Private Cloud IaaS (On-premise)**

In this option, the customer's cloud infrastructure is hosted in its own (on-premise or co-located) datacenter while IBM takes ownership of its management and service experience. This includes managing server uptime, installing and managing server OS, management software, applying software patches, and keeping servers updated.

#### **Managed Private Cloud IaaS (Off-premise)**

In this option, the cloud infrastructure is hosted at an IBM datacenter though it is deployed as a dedicated single tenant solution. IBM is responsible for deploying, managing, and operating the physical hardware.

### **Key Business Benefits for Enterprise IT and Line of Business Organizations**

Managed Private Cloud IaaS is designed to support the requirements of LOB and IT organizations highlighted in the section above.

#### **Minimal to No Operational Overhead**

One of the key challenges faced by LOB application owners in a private cloud environment is the operational complexity and overhead of managing private cloud infrastructure. Managed Private Cloud IaaS provides 24x7x365 operational support, and monitoring of infrastructure. This level of support takes away the burden of operational overhead from LOB application owners, thereby enabling them to focus solely on their applications.

## Reliable Uptime

One of the key challenges faced by LOB application owners while deploying applications in a public cloud environment is the unpredictable availability of infrastructure. Managed Private Cloud IaaS has an uptime service level of 4 nines (99.99% availability). IBM is known for its experience in managing large scale IT environments including exabytes of data. With such credibility, IBM can provide LOB application owners with reliable infrastructure as a service, thereby enabling them to focus on consistent business outcomes.

## Flexible Opex-based Consumption

Managed Private Cloud IaaS supports flexible operationally friendly consumption without the complexity and variability of pay-as-you-go models offered by public cloud service providers. This provides the predictability of traditional ELAs with the flexibility of consumption-based pricing.

## Rightsizing and Scale

By enabling rightsizing and scale, Managed Private Cloud IaaS addresses one of the key challenges faced by LOB application owners today – improper resource provisioning, that often leads to runaway costs. By minimizing the over or under-provisioning of resources, the solution provides optimal resource utilization. This in turn makes the platform efficient and reliable, with a consistent service experience.

## FUTURE OUTLOOK

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Enterprise IT infrastructure spending is increasingly favoring as-a-service consumption models – vendors are taking a note. However, public cloud services are not the end-all or be-all solution. Faced with variability in service quality and operational costs, many enterprises are in fact repatriating their applications to private cloud infrastructure.

As enterprises work on placing cloud-native and traditional IT applications alongside each other, IDC sees a surge in adoption of hybrid cloud environments. Hybrid cloud is not a market – it is a strategy. A successful hybrid cloud strategy will come down to:

- **Robust design** that is built upon on the foundation of an extensible private cloud platform that seamlessly connects to one or more public cloud infrastructure
- **Reduced operational complexity** that enables enterprises to consume infrastructure resources seamlessly regardless of where they live
- **Increased governance** which enables consistent compliance with regulatory requirements and secure data management across multiple clouds
- **Infrastructure as code** that enables resources to be consumed directly by application developers, thereby reducing overhead in terms of management and time

IDC sees managed infrastructure as-a-service solutions from leaders like IBM becoming an essential part of the hybrid cloud future of enterprises as they accelerate their digital transformation journey.

## OPPORTUNITIES FOR IBM

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IDC sees a growing opportunity for IBM in the rapidly evolving and expanding hybrid cloud market. Enterprises are at varying level of their maturity of cloud adoption, struggling with a case of buyer

remorse when it comes to public cloud, still unsure about investments in private cloud, and ultimately not knowing how to go about making a long-term bet on hybrid cloud. For many enterprises the reality is clear: they know they must change, and they must invest in infrastructure as a strategic asset, and yet they do not feel confident enough to get there by themselves.

Public cloud service providers, OEM systems vendors, and managed service providers are all racing to fill this need. All major cloud service providers either offer managed services directly or partner with large systems integrators (SIs) to offer managed services. They are also expanding their on-premise footprint through local private cloud offerings (based on their public cloud stack). In recent times, OEM systems vendors have also entered this market through flexible infrastructure consumption models that are shrink-wrapped by their managed cloud services.

IBM has an advantage here. It has a solid reputation as a trusted service partner among enterprises globally. IBM must actively leverage this advantage to increase its managed cloud infrastructure footprint. IBM must emphasize the following capabilities of its Managed Private Cloud IaaS offering in this fragmented market in order to extend its differentiation and market share. The capabilities include:

- Delivery of a public cloud service experience with the benefits of a dedicated private cloud infrastructure
- Operationally-friendly consumption model that offers flexibility of a public cloud subscription model with the insurance of traditional ELAs
- Reduced operational complexity that enables LOB and IT decision makers to focus on strategic business outcomes

#### Attitudes About Private Cloud as Managed Single Tenant as a Service

It would be good to have minimal oversight from our side if our cloud was managed by somebody else. Here we can deviate some of the concerns of public cloud while also allowing somebody else to manage it. It would be great if there could be a real uptime guarantee because that is one of the issues with the public cloud that we have had to contend with. They would have to be able to continue to meet our internal SLAs though. We can put probes, do end-to-end analysis, which is very difficult to do when someone else owns it unless they can guarantee it for you.

## GUIDANCE FOR IT DECISION MAKERS

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IT and LOB decision makers are partners in enabling and accelerating business outcomes for their respective organizations and hence their entire enterprise. Design choices made for IT infrastructure can make or break these partnerships. In order to be successful, IDC recommends the partnership between IT and LOB departments must focus on:

- **Consistent service quality:** Reliability, availability, and performance of compute, storage, and networking resources. IT infrastructure should have checks and ensure mitigation against and recovery from unplanned downtime. Tools for end-to-end monitoring and proactive action enabled by artificial intelligence are also must-haves.

- **Enforceable governance:** Security and regulatory mechanisms that guard against unauthorized data access and against theft of sensitive data and intellectual property.
- **Agility:** The ability for developers to develop new-generation applications by providing self-service capabilities, enabled by hybridity in the infrastructure. Investment in newer development methodologies that provide a foundation for new application development.
- **Consistent TCO:** Enabled by rightsized infrastructure, proper resource management, mitigation of operational complexity by having proper inhouse skills, business processes and workflows.
- **Application placement.** Consistency in application placement based on requirements and ability to measure business investments and resulting outcomes. Working together to develop criteria for which business-specific applications could or should be moved to the cloud makes the transition simple.

IDC recommends that enterprises engage in more consultative relationships with their private cloud infrastructure vendors. Strong relationships between clients and vendors help set expectations and outcomes accordingly.

Further, IDC recommends that enterprises invest in managed services partnerships with the objective of enabling as-a-service consumption on a pool of dedicated infrastructure resources. Such managed solutions offer consistent service experience, low operational overhead, predictable TCO, and the reliability and security of an on-premise infrastructure. IDC believes such solutions are a must for business and mission critical applications with stringent service level objectives. These solutions also offer an attractive option for cloud-native and next-generation applications that require scale and elasticity spanning multiple private and public cloud resources.

### Hybrid Cloud is a Catalyst for Change

We've implemented IT governance policies around development. Enterprise architecture is playing a more active role in suggesting how the applications should be built to be cloud ready, then enforcing those standards. DevOps, for example, helps us here. It is quicker to deploy an application or make changes and redeploy. We also consolidated tools to monitor our network, our infrastructure components, whether it's cloud or not cloud so it's one tool.

## CONCLUSION

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Enterprises can accelerate their digital transformation journey by treating infrastructure as a strategic asset. IT organizations must start with business and application requirements to drive the appropriate investments in cloud infrastructure. By building a hybrid cloud infrastructure, they gain the best of public and private cloud: superior scalability, consistent, and reliable service quality and predictable TCO. This value proposition is further enhanced with investments in a managed private cloud service from a trusted vendor.

## About IDC

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