White Paper

Attaining a True Seamless, Integrated Hybrid Cloud

IDC OPINION

Public cloud is a transformative technology and a computing model within IT, and enterprise acceptance of it continues to grow. However, in the era of cloud, there are a few important things to keep in mind. First, on-premises computing is not going away; in fact, most customers will have both on-premises and cloud. Second, there is no "one path fits all" to cloud.

Enterprise adoption of cloud has been disorderly and free form, with customers starting cloud in various ways and ending up in vastly different current states. The common thread in cloud adoption is its variable deployment and tendency to be largely siloed within organizations. Cloud often has a completely different operational and consumption model and different tooling, leading to the natural formation of technology silos. While some management tools can bridge across on-premises and public cloud, the fundamental differences in the underlying infrastructures limit the extent these two environments can be integrated.

Integration of on-premises and cloud infrastructures is most difficult when migrating existing applications. When standing up a new application, abstracting away the underlying infrastructure with cloud is doable, but when migrating existing applications, the low-level details of core infrastructure have a huge impact on the migration and ongoing operations of workloads. Today to achieve the highest level of seamlessness and integration in compute, organizations benefit from a consistent environment in both their on-premises and cloud environments. This is not to say that every cloud needs to be built consistent with the on-premises infrastructure. Rather, a consistent hybrid cloud can address and satiate enterprise demand for an easy path to cloud for existing workloads and will be a key tool for enterprises in their continued cloud maturation.

SITUATION OVERVIEW

Interest in and adoption of public cloud have been growing steadily for the past decade. The availability of on-demand cloud services meshed well with the digital transformation that was happening to businesses of all types. This digital transformation pushed businesses to innovate digitally and, to support this, develop new modern applications that could be iterated very quickly and on scale. Cloud also began to be applied to existing apps, migrating them to the cloud for cost savings, functionality enhancements, or modernization.

Public cloud IaaS currently makes up for 17% of application deployments and will be growing at 27% over the next two years at the expense of traditional IT (see Figure 1). Cloud has also heavily influenced on-premises architectures, with private cloud growing at the expense of traditional IT.

FIGURE 1

Deployment Types

Q.   What percentage of your applications are running in the following deployments today and what will that be in the future?
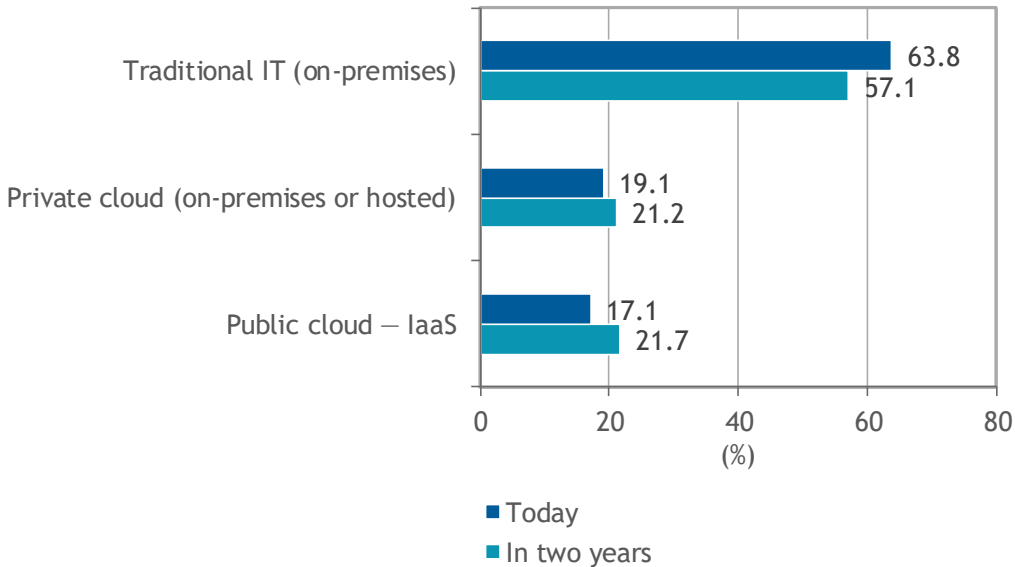
n = 753

Source: IDC, June 2017

No Single Path to Cloud

The journey to cloud is varied, and there is no right path or common path that most people follow. Like any new technology, customers generally try it out for test/dev, then goes into production with less critical applications, and then expand it to more important ones. And certainly, processes around evaluating and adopting cloud become more robust, repeatable, and optimized. But how and where one starts and where one ends up are very individual to each company. For example, some customers start with SaaS, and others with IaaS or PaaS. Initial adoption is often by line of businesses or shadow IT that initiate cloud on their own, but many companies are primarily driven by central IT for cloud. Cutting-edge developers may initially start with building greenfield applications on cloud, while other customers may begin with migration of existing apps. Some customers initially adopt cloud for DR or backup before expanding to primary production. Throughout this somewhat chaotic free-form journey, customers end up with a set of different use cases and the right mix of cloud services-to-on-premises ratio for their company. Most companies do not migrate everything to the cloud, but instead keep some kind of mix of on-premises and public cloud.

What is clear is that for enterprises, cloud must address both new cloud-native apps and existing apps. Many customers have begun using cloud for newly developed applications. Others are still using traditional applications and beginning to learn how to build cloud-native apps. Whichever one enterprises start with, most today have plans to juggle both types and will require cloud solutions to address both. While today traditional apps is made up of the majority of enterprise applications, the slow shift to cloud native will happen over the next couple of decades.
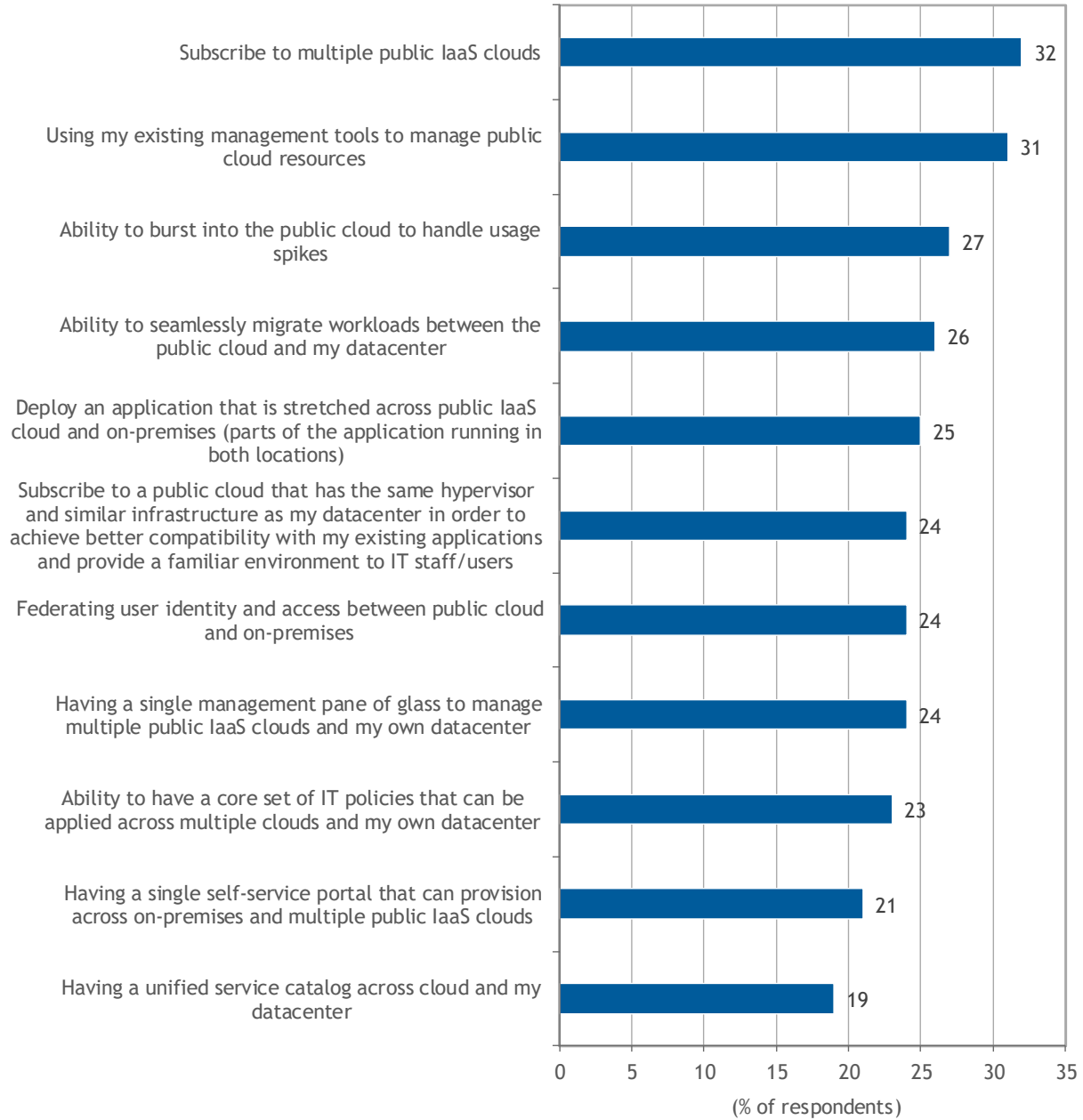
What Is the Hybrid Cloud?

There is a lot of confusion and vagueness over the terms multicloud and hybrid cloud. Many today are multicloud in that they source from multiple cloud providers. However, multicloud doesn't imply that there is any integration between them, and most users today simply run a collection of siloed public cloud services.

Hybrid cloud is about removing these silos and providing integration between clouds, primarily between on-premises and one or more public clouds. Integration through hybrid cloud can bring portability and consistent operations across all IT environments, regardless of where it is sourced. Hybrid clouds aren't binary, as in, either you have it or you don't. Hybridity is more of a sliding scale of how closely integrated on-premises and off-premises are. Figure 2 shows the results of a recent IDC survey that examines what types of hybrid integrations users have deployed today.

FIGURE 2

Hybrid Cloud Adoption

Q.   What are your organization's plans for the following aspects of hybrid cloud?

Aspect	%
Subscribe to multiple public IaaS clouds	32
Using my existing management tools to manage public cloud resources	31
Ability to burst into the public cloud to handle usage spikes	27
Ability to seamlessly migrate workloads between the public cloud and my datacenter	26
Deploy an application that is stretched across public IaaS cloud and on-premises (parts of the application running in both locations)	25
Subscribe to a public cloud that has the same hypervisor and similar infrastructure as my datacenter in order to achieve better compatibility with my existing applications and provide a familiar environment to IT staff/users	24
Federating user identity and access between public cloud and on-premises	24
Having a single management pane of glass to manage multiple public IaaS clouds and my own datacenter	24
Ability to have a core set of IT policies that can be applied across multiple clouds and my own datacenter	23
Having a single self-service portal that can provision across on-premises and multiple public IaaS clouds	21
Having a unified service catalog across cloud and my datacenter	19

(% of respondents)

n = 753

Source: IDC, June 2017

Challenges to Achieving Hybrid Cloud

Public cloud services are designed to abstract away the underlying infrastructure. While this may be advantageous when writing new applications specifically for cloud, the infrastructure actually matters quite a bit when considering traditional applications and when integrating it into on-premises infrastructure. Some of the challenges to achieve hybrid cloud integration are:

- **VM formats/compatibility:** If on-premises and off-premises don't use the same hypervisor, VM formats will have to be converted for any migration. However, migration between hypervisors goes well beyond a simple format conversion. Hypervisors represent the virtual hardware underneath the VM and thus have a huge role in system performance and integration. Changing the hypervisor means that performance optimizations, app certifications, subsystem integrations, and toolsets will all have to be redone. Many apps have been tuned over time to run in specific environments and support software and hardware in place to handle availability, backups, and so forth, which can require a lot of effort to rebuild.

- **Networking:** With two computing assets in physically different locations, maintaining cohesive networking connectivity between the locations is a challenge, especially if workloads are moving back and forth. Logistical issues around IP addressing, DNS, and subnets can make creating seamless connections difficult.

- **Storage:** While migrating data from one place to another is a significant task in itself, the particulars about how applications use and connect to storage can also present portability problems. At a basic level, the storage must be of a compatible type (file, block, object). Additionally, most enterprise applications expect persistent storage (some cloud storage is ephemeral). Another key area is performance, especially for complex applications where the storage has been carefully designed and optimized for a particular application. There are also many attached storage applications, such as backup, replication, DR, and data protection, that are part of the overall storage and data management policy setup. The lack of certain functionality or differing setups of any of these areas can present difficulties when trying to migrate applications from one environment to another.

- **Supporting tools:** Different environments generally use different stacks of management tools that are optimized for each environment. There are some multienvironment tools, but they often address lowest common denominator functions and don't preclude the use of native tools.

- **Skills:** Enterprise IT is highly segmented by skill sets, and cloud is no exception. On-premises resources are run by multiple teams, while a separate group has the deep cloud knowledge and skills. It's not uncommon to see cloud specialists divided by particular cloud platform skills as well. Binding on-premises and off-premises into a hybrid cloud presents skills challenges as the knowledge of the complete hybrid environments falls into separate camps.

- **Operational differences:** With on-premises resources, organizations build and manage their own operational processes. With public cloud, many operations are largely managed by the cloud provider, with users owning a defined set of responsibilities. The tools, data, and APIs presented by each cloud provider and service will have a large effect on how users interact and control things like service management, provisioning, and change management. The overall service orientation of cloud providers creates vastly different operational processes for cloud versus enterprise datacenters.

- **Security:** Public cloud providers spend a lot of time and effort on security. For the top providers, it isn't necessarily a question of whether the provider is capable of providing good security, but rather how much insight and control users have over it. Enterprise requirements dictate that users need to have provable and auditable security, which can be a challenge when some aspects of security in the cloud are behind a black box. Some cloud services are new technology, which requires new security approaches. As with other tools, security tools and processes between on-premises and cloud are often different, which complicates having a unified, consistent security strategy across hybrid cloud.

Truly Seamless Hybrid Cloud

The highest level of seamlessness in hybrid cloud can be achieved with consistent stacks on both sides, which solve many of the above issues with trying to combine two different environments. By using the same infrastructure at the lowest layers for a hybrid cloud, users can much more easily achieve:
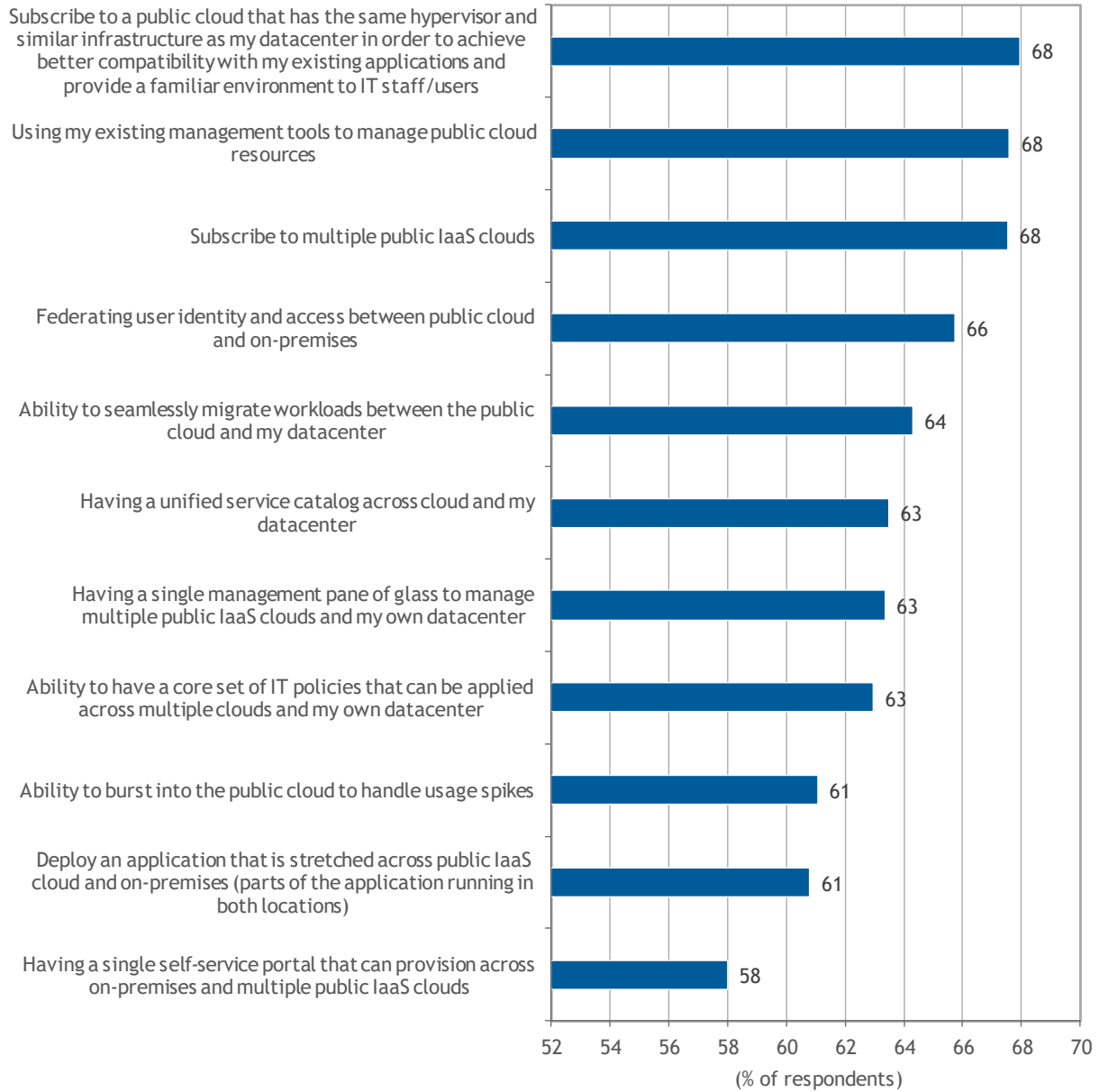
- **Portability:** The same hypervisor means that workloads can be easily moved to cloud while retaining the optimizations, attached integrated technologies, and certifications that exist on-premises.
- **Consistent operations:** Using the same infrastructure allows reuse of the same operational model and processes.
- **Transparent integration:** The more closely the stacks align, the closer the cloud will be able to be a consistent extension of the enterprise datacenter. Hybrid integration will be able to achieve at every layer of the stack.
- **Leverage one skill set and team:** Using the same tools, skills, and processes allows a single team to manage the full hybrid environment.

Figure 3 details hybrid cloud features planned for deployment.

FIGURE 3

Hybrid Cloud Features Planned for Deployment

Q.   What are your organization's plans for the following aspects of hybrid cloud?

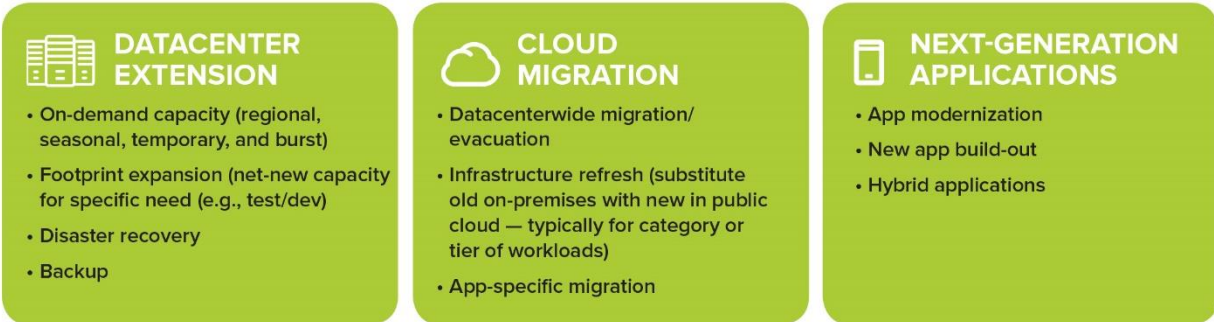| Feature	% of respondents
Subscribe to a public cloud that has the same hypervisor and similar infrastructure as my datacenter in order to achieve better compatibility with my existing applications and provide a familiar environment to IT staff/users	68
Using my existing management tools to manage public cloud resources	68
Subscribe to multiple public IaaS clouds	68
Federating user identity and access between public cloud and on-premises	66
Ability to seamlessly migrate workloads between the public cloud and my datacenter	64
Having a unified service catalog across cloud and my datacenter	63
Having a single management pane of glass to manage multiple public IaaS clouds and my own datacenter	63
Ability to have a core set of IT policies that can be applied across multiple clouds and my own datacenter	63
Ability to burst into the public cloud to handle usage spikes	61
Deploy an application that is stretched across public IaaS cloud and on-premises (parts of the application running in both locations)	61
Having a single self-service portal that can provision across on-premises and multiple public IaaS clouds	58

(% of respondents)

n = 753

Source: IDC, June 2017

Use Cases for a Highly Integrated Hybrid Cloud

The pursuit of a hybrid cloud is driven by users who are primarily seeking to accelerate innovation, increase agility, reduce time to market, and optimize costs. The unified blend and combining the best features of on-premises and public cloud allow users to reach a new level of flexibility and functionality. Figure 4 details the top use cases for a highly integrated and seamless hybrid cloud.

FIGURE 4

Hybrid Cloud Use Cases

DATACENTER EXTENSION

- On-demand capacity (regional, seasonal, temporary, and burst)
- Footprint expansion (net-new capacity for specific need (e.g., test/dev)
- Disaster recovery
- Backup

CLOUD MIGRATION

- Datacenterwide migration/evacuation
- Infrastructure refresh (substitute old on-premises with new in public cloud — typically for category or tier of workloads)
- App-specific migration

NEXT-GENERATION APPLICATIONS

- App modernization
- New app build-out
- Hybrid applications

Source: IDC, 2018

The End Goal

Figure 5 depicts today and tomorrow's cloud.

FIGURE 5

Today and Tomorrow's Cloud
The next phase of cloud is already here

Today's Cloud	Tomorrow's Cloud	Challenges	Drivers and Benefits
• Incompatible on-premises and public cloud infrastructures	• Seamlessly integrated on-premises and cloud infrastructures	• Integration of different cloud stacks • Compatibility and portability between clouds • Network infrastructure challenges in connecting disparate clouds	• Optimize cost and accelerate innovation • Improve speed, ease, and cost-effectiveness of app portability
• Managed as a separate silo	• Integrated management	• Unified management for on-premises and off-premises • Creating consistent policies and service catalog across the hybrid cloud • Leverage existing skill sets	• Scale management efficiently across diverse environments
• Targeting new applications • Dev/test with increasing production usage over time	• Expand to existing applications and custom and packaged apps	• Need traditional enterprise infrastructure constructs for full compatibility • Reliability/availability	• Grow cloud footprints and increase benefits further. Will drive need for: » Clouds with enterprise compatibility; for example, clouds with the same hypervisor and other infrastructure as enterprise datacenters » Enterprise-grade services: Predictable, performant, and automated compute, storage, and networking
• Targeted security response	• Holistic security strategy	• Meeting compliance/regulatory requirements • Securing across different cloud stacks and physical locations	• Using cloud capabilities to improve security (security is a top benefit but also a top concern of cloud)

Source: IDC, 2018

VMWARE CLOUD ON AWS

VMware Cloud on AWS is VMware's premiere public cloud offering and the public cloud element of the company's hybrid cloud solution. By using VMware components that users have in their datacenter, VMware Cloud on AWS provides a consistent platform for private and public cloud. VMware Cloud on AWS is fully operated by VMware while being hosted on AWS physical facilities.

VMware Cloud on AWS has several unique features that address hybrid cloud challenges:

- **Identical VMware vSphere environment for full compatibility with VMware VMs.** Customers can move live workloads to and from VMware Cloud on AWS and on-premises using vMotion. Having vSphere in the cloud also means that any third-party infrastructure solutions (such as firewalls and load balancers) certified for vSphere can be migrated so the entire environment can come along with it. This greatly simplifies migrations and operations in the cloud.

- **NSX networking provides software-defined network capabilities for VMware Cloud on AWS, such as security and automation.** Customers that have NSX on-premises can stretch their Layer 2 networks and microsegmentation policies to VMware Cloud on AWS, eliminating the need for networking changes while migrating VMs to the cloud. vSAN provides vSphere-native, high-performance storage in VMware Cloud on AWS. Customers that have vSAN on-premises can seamlessly migrate their storage policies to VMware Cloud on AWS.

- **Consistent management tools such as vCenter and vRealize, allowing skills and operations to stay the same.** Customers that have vSphere 6.0+ on-premises can leverage Hybrid Linked Mode, which gives a single view into both on-premises and VMware Cloud on AWS resources.

- **The use of dedicated clusters for security and performance.** Physical servers are fully dedicated to tenants and are never shared. This provides the highest level of cloud isolation and eliminates the "noisy neighbor" problem to accommodate the most performance-sensitive enterprise workloads.

While VMware Cloud on AWS uses the same VMware components that VMware customers have on-premises, it is also built as a cloud-first solution, leveraging a combination of VMware's software-defined datacenter and AWS's cloud infrastructure:

- On-demand capacity and flexible consumption models

- Autoscaling – elastic DRS enabling customers to set policies and automatically add or remove capacity from their cluster

- Self-service to improve developer productivity

- API enabled to allow infrastructure as code and automation

- The full range of Amazon IaaS and PaaS cloud services available to VMware Cloud on AWS for application modernization (Because they are both hosted in the same cloud, users will get high speed, low latency access to AWS services.)

- The global reach and scale-out capacity of AWS to be leveraged by VMware users and workloads (VMware environments and capacity can be added on demand and in regions where AWS operates.)

CHALLENGES/OPPORTUNITIES

Challenges

- VMware Cloud on AWS is a natural fit for VMware workloads, but VMware will need to also emphasize the value proposition for new workloads. Many of these new workloads will be architected to be cloud native, and VMware will need to address both new and traditional workloads with VMware Cloud on AWS.

- VMware Cloud on AWS includes a large VMware stack with the latest technologies, some of which may not yet be adopted by customers on-premises, such as vSAN and NSX. While these technologies are not required on-premises, the more these are adopted, the more hybrid the cloud becomes. There will be a learning curve for many and may also have migration implications. But there are also migration benefits for customers that have or will adopt these technologies.

Opportunities

- VMware Cloud on AWS gives the sizable VMware workload installed base a path to cloud with the least amount of friction and the most compatibility.

- VMware Cloud on AWS brings modernization opportunities to VMware workloads by making accessible Amazon cloud services and leveraging the scale and reach of Amazon infrastructure. VMware has many AWS integration and management opportunities for future enhancements.

- There are very few technology stacks that are available both in major public clouds and on-premises. The reality is that the highest level of hybrid cloud seamlessness and bidirectional portability is accomplished only by having similar stacks on both sides, and VMware can bring that functionality to its enterprise user base.

CONCLUSION

While cloud is still evolving and maturing, it is becoming clear for most enterprises that the end state will be a mixture of on-premises and public clouds. Today, most enterprises use a mix of various cloud services across IaaS, PaaS, and SaaS, but they largely run in silos. As investments in cloud grows, various forms of hybrid integration will grow. There are many levels at which hybrid cloud can be integrated, and different use cases will result in varying levels of hybridity. At the most mature end of the hybrid scale are clouds with fully consistent infrastructure and management tools. These kinds of clouds will provide highly compatible and simplified migration of existing workloads to cloud. The ability to bidirectionally migrate these workloads will enable flexible on-premises/cloud combinations and seamless extension of datacenters. As enterprises continually grapple with moving from one generation of technology to another, the fully consistent and seamless hybrid cloud will be a key tool for making that transition.

About IDC

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