MANAGING THE HYBRID CLOUD

As data centers and cloud deployments become increasingly complex, keeping these environments under control is essential.

EXECUTIVE SUMMARY

Across industries, many organizations have found that they're able to achieve benefits such as cost savings, enhanced agility and improved business continuity by integrating their private clouds with public cloud resources in a hybrid model. A hybrid approach can provide a best-of-both-worlds experience, allowing organizations to place workloads where they are best suited, or to take advantage of additional capacity in the public cloud during periods of peak resource demand.

However, the hybrid cloud is not without its challenges. The model has evolved substantially since its debut less than a decade ago, with organizations increasingly incorporating resources from their private clouds and several public cloud providers in a multicloud approach. While this evolution gives organizations more freedom and flexibility, it can also introduce management hurdles around cost, performance, visibility and security.

By incorporating cloud management best practices and tools, organizations can ensure that their hybrid clouds will adapt with a changing IT landscape and continue to provide business value well into the future.

The Emergence of the Hybrid Cloud

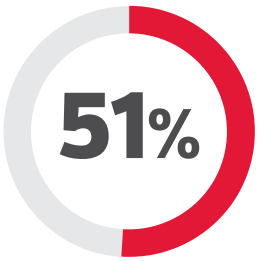
While the hybrid cloud model continues to grow in popularity, it remains somewhat shrouded in misunderstanding. Even some IT professionals continue to use the term to refer to any mix of on-premises and public cloud resources — a crude definition at best, and one that fails to adequately convey the unique methodology behind cloud resource delivery and the potential benefits of hybrid cloud solutions.

Before adopting and managing a hybrid cloud, it's important that IT leaders fully understand what sets the hybrid cloud apart from other approaches to IT, what business benefits it can help them achieve within their organizations and what has led to the emergence of the model.

What Is a Hybrid Cloud?

To dispel common misconceptions, it may be important to start with what a hybrid cloud is *not*. The hybrid cloud isn't a mere mix of on-premises and public cloud computing resources. If that were the true definition, every organization with any on-premises servers and even minimal use of Software as a Service (SaaS) would be operating a hybrid cloud.

Rather, a hybrid cloud incorporates public cloud resources with a true private cloud. Ideally, integration between the two cloud types is so seamless that end users can't tell whether the services they're using originate in a public or private cloud.



The percentage of organizations that employ a hybrid cloud strategy combining public and private clouds[1]

The private cloud is key to understanding the hybrid model. While the term "private cloud" is sometimes used to broadly refer to any on-premises IT infrastructure, that description should really be reserved for on-premises environments that are designed around IT as a Service, with a service catalog, self-service capabilities and a showback or chargeback model for cost allocation.

When organizations integrate their private clouds with public cloud providers, the resulting hybrid cloud allows them to take advantage of the benefits of both, depending on workloads and uses cases. It is important to build a foundation and a common governance and management framework based on policies that extends to both public and private clouds. An organization can then incorporate services from public and private clouds into this common framework, rather than simply tying disparate environments together.

What Services Does Hybrid Cloud Incorporate?

Typically, hybrid cloud refers to Infrastructure as a Service (IaaS) and Platform as a Service (PaaS). In addition, SaaS delivery models offer the convenience of Software as a Service often delivered along with other cloud services. There are multiple benefits to delivering both infrastructure and application platforms in a hybrid model.

IaaS offers the capabilities delivered by traditional data center hardware while leveraging the public cloud, allowing organizations to spin up virtual machines, install operating systems, deploy middleware and create storage "buckets" and backups for workloads. PaaS, meanwhile, refers to a managed development and deployment environment in the cloud, with the cloud provider delivering the hardware and software tools that organizations need to build and run applications. Because both IaaS and PaaS replicate the capabilities of data center hardware (rather than merely delivering a prebuilt application, as with SaaS solutions), they can be integrated with on-premises infrastructure in a hybrid environment. The "big three" public cloud vendors — Microsoft Azure, Amazon Web Services and Google Cloud — all have extensive IaaS and PaaS offerings.

What Led to the Emergence of Hybrid Cloud?

The hybrid cloud has an unlikely origin story, tied to an online game that your aunt or uncle may have tried to get you to play at one point. Zynga, the developer behind the hit Facebook game "Farmville," had trouble predicting which of its games would become wildly popular, making it difficult to plan out the necessary supporting IT infrastructure. The company began launching new games in the public cloud to take advantage of the elasticity offered by IaaS, but then moved games to a private cloud once demands became more predictable. The tech press covered Zynga's innovative approach, and over time, more and more companies have come to see the benefits of integrating public cloud resources with their private clouds.

How Has Hybrid Cloud Evolved?

As cloud computing as a whole has matured, vendors and IT integrators have embraced the hybrid model. Rather than being forced to develop their own hybrid clouds through trial and error, organizations now find that the marketplace is brimming with resources and services to help them optimize their environments. Large public cloud providers themselves have begun to offer products and services that facilitate the hybrid cloud model, and technology vendors such as IBM and Oracle have their own hybrid cloud offerings. Microsoft's Azure Stack is a hardware extension that delivers Azure capabilities on-premises, but also extends to the Azure public cloud. More significantly, third-party partners such as CDW now have years of experience helping organizations across industries to build out hybrid clouds in ways that streamline management, achieve cost efficiencies and meet business objectives.

One important evolution over the past several years has been the emergence of multicloud computing. In a multicloud environment, organizations integrate resources from multiple

Source: [1]RightScale, "RightScale 2018 State of the Cloud Report," February 2018

public cloud hyperscalers. Some IT leaders adopt this approach to avoid being locked in with a single vendor, while others have moved toward a multicloud environment to ensure redundancy in case of an outage, or to take advantage of what they perceive to be the individual strengths of each public cloud vendor.

What Are Some Key Benefits and Use Cases of Hybrid Cloud?

While some workloads run better either entirely in the public cloud or on-premises, the hybrid cloud model is ideal for a number of use cases. The model emerged with organizations testing out new workloads, and IT administrators continue to use it in this manner — developing and testing new applications in the public cloud before investing in on-premises resources. The hybrid cloud is also an ideal fit when fluctuating resource demands require "cloud bursting," or spilling over workloads from an onsite data center into the public cloud. At times, regulatory requirements prevent organizations from storing certain data in the public cloud, making a hybrid approach attractive. And the hybrid cloud is also a popular approach for disaster recovery — especially for "warm DR" scenarios, in which organizations run their production environments in a private cloud while maintaining a recovery environment in the public cloud.

How Cloud Vendors Support Hybrid

Many public cloud providers acknowledge and embrace the need for hybrid cloud.

Private cloud platform: Both Microsoft and Amazon Web Services have launched platforms to help organizations build out private clouds in ways that integrate with their own offerings. The Microsoft private cloud platform Azure Stack is meant to mirror the Azure public cloud, while AWS has partnered with VMware to offer a hybrid cloud extension.

Active Directory integration: Organizations can connect their on-premises Active Directory to Azure Active Directory in the cloud, allowing users to seamlessly access both on-premises and cloud applications with a single login. AWS and its partners also offer managed services that enable organizations to connect public cloud resources with on-premises Active Directory.

Data consistency: In a hybrid cloud model, data necessarily resides both on-premises and in the cloud, creating a need for architectures that support high data availability in a cost-effective manner. AWS offers storage and database services that work with on-premises applications to store data reliably and securely, while Microsoft provides a consistent data platform that helps organizations use common databases across their private and public clouds.

The Challenges of the Hybrid Cloud

While the hybrid cloud model has matured significantly in the years since it first came into use, public cloud offerings and on-premises infrastructure continue to evolve rapidly. As a result, many organizations opt to work with a trusted third-party partner that has experience implementing and maintaining successful hybrid cloud deployments.

Here are some of the principal challenges that organizations face when designing, deploying and managing a hybrid cloud environment.

Networking: Because the hybrid cloud model relies on the exchange of data between organizations' on-premises data centers and their public cloud providers, networks must maintain a high level of performance and reliability. In cases where applications require low latency to ensure adequate performance, organizations should consider establishing a direct connection between their private data center and their public cloud provider.

Visibility and control: Especially when organizations move toward multicloud implementations that incorporate several public cloud vendors, complexity can quickly spiral out of control. For a hybrid cloud to yield efficiencies, an organization must maintain visibility throughout its entire environment and exercise ongoing management over resources and costs. Manual monitoring processes are unlikely to keep up with cloud investments — which, once initiated, often grow at an exponential rate. This can lead not only to escalating costs, but also to problems with patching and configuration management. Also, companies that lack proper visibility into and control over their infrastructure will likely see limited success with the implementation of key cloud features, such as self-service systems.

Security and compliance: When the public cloud first burst onto the scene, many IT managers balked at the idea of placing any organizational data — but particularly sensitive information, such as personal data, financial information or intellectual property — in the hands of an outside third party. Over time, and as a result of many successful public cloud deployments across various industries, that fear has largely abated, to the point that IT decision-makers now frequently cite security as a *benefit* of placing resources in the public cloud.

However, security and compliance are still top-of-mind concerns for data center administrators whenever they consider major changes to their infrastructure. Cloud architects need to ensure that a hybrid environment features redundancy across data centers to mitigate the impact of an outage to any one location. Further, education is an essential consideration as it pertains to IaaS security. Users must familiarize themselves with the shared-responsibility model and understand what aspects of security they are responsible for, versus what the cloud provider is responsible for.

It's also vitally important to verify that the new setup doesn't run afoul of data regulations such as the Payment Card Industry Data Security Standard (PCI DSS), Health Insurance Portability

and Accountability Act (HIPAA), the Federal Education Rights and Privacy Act (FERPA) or the Sarbanes-Oxley Act (SOX).

Cost: According to 451 Research, the promise of reduced costs is the top driver of cloud investments, with nearly 40 percent of CIOs citing cost savings as their top cloud driver (ahead of factors such as scalability, agility and availability). However, somewhat paradoxically, cost is also the top challenge for organizations that move resources to the cloud, with 53 percent of IT leaders citing "cost/budget" as their main pain point.

Because public cloud resources are inexpensive and easily accessible, 451 Research explains, people tend to consume them at a larger scale. This can lead to problems when organizations fail to conduct the necessary planning and application assessment prior to moving to the cloud. For example, most applications and resources on-premises are architected for peak utilization. When moving to the cloud, many organizations follow the same logic, which drives up costs. Organizations must use tools to rightsize their resources prior to migration.

Also, some public cloud instances are inevitably "orphaned" — meaning they are still spun up in the public cloud (and, therefore, still incurring an ongoing cost), but are no longer being used. Finally, organizations often find that unexpected line items, such as bandwidth, drive costs higher than expected. While visibility and control are important for controlling costs, organizations should also strive to improve governance policies. When individual departments are responsible for their cloud consumption through showback or chargeback programs, they tend to spend less.

$159 billion

The projected amount that organizations will spend on the cloud in 2021, a 45 percent increase from 2016[2]

Scaling out: As workloads grow within a hybrid cloud environment, issues can arise with configuration management databases, and it can be difficult to determine the root cause when something goes wrong. And as applications become interconnected in a cloud environment, issues with one application can cause issues with other applications, as well. Aside from these potential complications, it is important for organizations to calculate the potential costs of scaling out solutions early in their hybrid cloud planning process. Growth is sometimes unpredictable, and data center administrators should seek to implement solutions that have the potential to cost-effectively scale out beyond present expectations.

How to Manage a Hybrid Cloud Environment Effectively

The common challenges of managing a hybrid cloud environment shouldn't deter organizations from pursuing the potential benefits of the model. Rather, IT leaders should go into their hybrid cloud deployments with their eyes wide open — cognizant of the potential hurdles that might limit or slow down the success of their projects, and prepared to strategically overcome them.

It's an old saw in the IT world that there's no silver bullet to solve most problems, and that's especially true in a complex environment like a hybrid cloud, which involves a wide array of constantly evolving applications and supporting technologies. Effective management of a hybrid cloud requires organizations to architect solutions for simplicity and scalability, adopt tools that streamline management, and work with either internal or external talent that possesses the knowledge and experience to support and improve the environment over time.

Cloud Management Platforms

As cloud environments have grown more complex, numerous single-pane-of-glass cloud management platforms have sprung up in the marketplace to help organizations improve visibility and control over their cloud resources. These platforms are especially important for organizations that take a multicloud approach, as manual management processes almost always become cumbersome and inefficient as hybrid environments grow in complexity.

Organizations have a wide array of options when selecting a platform, with vendors such as Microsoft, Google, HPE, RightScale, CloudBolt and others all offering cloud management software. These platforms frequently include the following features:

Where Are the Workloads?

After an organization opts for a hybrid cloud approach, an obvious question presents itself: Which workloads should stay on-premises, and which should be migrated to the public cloud? HPE advises organizations to consider these four variables.

Security and compliance: Organizations need to understand exactly what a public cloud vendor will do if there is a security problem, and what it would take to bring a workload back in-house if necessary. At times, regulations may mandate that certain workloads stay on-premises.

Total cost of ownership: Hardware, software, personnel costs and other expenses should be tallied up for both on-premises and public cloud options to determine which is most cost-effective for a given application.

Application performance: For each application, data center administrators should determine whether the workload can tolerate inconsistent latency.

Control: HPE advises organizations to consider which workloads distinguish them from their competitors, and then consider how much control they need over those workloads. According to one study, 80 percent of IT decision-makers cite loss of control as a reason to avoid placing a workload in the public cloud.

Source: [2]community.hpe.com, "IaaS, PaaS and SaaS: The Cloud Comparison Guide [2018 Update]," April 10, 2018

- **Multicloud management:** Many cloud management platforms can facilitate interoperability among clouds, allowing applications built for one environment to operate on others without additional code.
- **Automation:** Cloud management software can programmatically manage applications that require repetitive tasks.
- **Future proofing:** Because cloud computing continues to evolve, it is important for any cloud management platform to be able to keep up with IT innovations.
- **Cost management:** A cloud management product will provide cost reporting, forecasting and showback. This is important not only because costs can spiral when they aren't closely monitored, but also because IaaS pricing can fluctuate frequently. Management software can automatically track pricing trends to keep organizations from overspending.

Hybrid Architecture and Management Best Practices

Cloud management platforms give more visibility and control to IT administrators while also automating a number of tasks, but they can't substitute for careful planning and the ongoing implementation of best practices. This starts with a careful and objective assessment of an organization's existing infrastructure. If this step is given insufficient attention, IT leaders may not learn until late in the process that certain workloads aren't a good fit for their model — setting themselves up for cost and management headaches down the road.

Next, organizations must create guidelines and policies to determine whether an application is placed in a private or public cloud, considering factors such as performance, regulatory requirements and geographic restrictions. Many organizations have found that implementing their hybrid cloud in stages leads to a more successful deployment (which, in turn, fosters trust and buy-in from executive leaders, end users and customers). Often, this means building out a private cloud first, and initially selecting a small number of applications and workloads to migrate to private and public clouds.

During this early stage, an organization may try multiple cloud vendors, and then either pick one vendor that provides the best fit or use several providers in a multicloud environment. This testing will not only help organizations to determine the best public cloud for their workloads but may also reveal issues with critical hybrid cloud components, such as the network. For example, a hybrid cloud implementation can lead to a spike in the amount of encrypted traffic that application networking solutions need to address.

For most organizations, manually addressing these new demands will lead to inefficiencies. For example, some IT leaders estimate that load balancers are overprovisioned by up to 80 percent in large-scale hybrid cloud environments due to fears about demand outstripping capacity. These inefficiencies can be avoided through automation tools, such as next-generation load-balancing solutions that use analytics for predictive autoscaling.

Through careful assessments, meticulous testing, appropriate policies and automation solutions, organizations can avoid a number of cloud management problems.

A Hybrid Cloud Migration Checklist

Before moving to a hybrid cloud, organizations should make sure they've thought through the following factors:

Upfront costs: While pushing resources to the public cloud reduces on-premises infrastructure costs, the move can result in new costs such as increased networking expenses.

Availability: Some organizations have specific performance or availability requirements, which may make it difficult to find a public cloud solution that meets their standards.

Service-level agreements: Organizations should check whether cloud SLAs are compatible with those of their network providers and internal customers, and whether the SLAs from multiple cloud vendors align with one another.

Software licensing compliance: Businesses attempting to push their on-premises software out to the cloud while maintaining compliance with vendor licensing agreements may want to consult with a third-party expert to ensure they do not inadvertently violate rules.

Organizational culture: Cultural concerns within an IT department can slow down the journey to the cloud, which may involve moving system administrators into the new (and unfamiliar) roles of cloud service managers and brokers.

Hybrid Cloud Managed and Consulting Services

It can be difficult for organizations to find staff with knowledge and expertise about hybrid cloud computing. Even among IT professionals with firsthand experience managing a hybrid cloud, most will have worked on few such environments, meaning that their insights will be necessarily limited to a somewhat narrow range of possible problems and solutions. However, organizations can achieve the benefits of the hybrid cloud — without adding internal staff — by engaging with a trusted cloud managed services partner.

A managed services provider can not only help an organization to speed up and optimize its hybrid cloud deployment, but also assist with tasks such as application migration, infrastructure planning and design, use of public and private cloud, performance tuning, resource controls, consumption reporting and security. These services only become more vital as a hybrid cloud environment becomes larger and more complex.

The adoption of a hybrid cloud is a major shift for most organizations, and its success will have far-reaching IT and business ramifications for years to come. It's important to get it right — from the earliest planning stages, provisioning and deployment to ongoing management. With the help of a consulting and managed services partner, IT leaders can be confident that their hybrid clouds will yield desired benefits such as efficiency and agility, without creating management burdens that can drive up costs and inhibit growth.

CDW: A Hybrid Cloud Partner That Gets IT

From cloud planning engagements, infrastructure procurement and deployment to ongoing managed services, CDW offers the hybrid cloud services and expertise that organizations need to optimize workloads and keep their businesses running smoothly.

CDW offers cloud assessments, health checks and other IT consulting engagements to evaluate organizations' existing environments and look for opportunities to increase efficiency and boost security while reducing costs.

The solution architects at CDW work shoulder to shoulder with internal IT stakeholders to determine specific technical requirements and identify the on-premises and public cloud solutions that will work best for their organization.

CDW offers a complete lifecycle of services to assist organizations in incorporating hybrid cloud into their data center strategy. This includes traditional data center services in addition to cloud planning, cloud migration and integration, and extension of traditional data center into the public cloud. Additionally, they can help organizations to integrate their private clouds with the public cloud to create a hybrid environment.

Managed services from CDW can help organizations with tasks such as monitoring, upgrades, maintenance, reporting, and hardware and software incident management — freeing up internal IT staff for innovative and strategic projects.

Multicloud and hybrid cloud approaches offer many benefits, while also introducing new complexities. Having the right methodology in place that incorporates planning and advisory expertise from a qualified, independent third party as well as the right management tools can make the journey much more worthwhile and lead to successful business outcomes.

The CDW Approach

ASSESS

Evaluate business objectives, technology environments, and processes; identify opportunities for performance improvements and cost savings.

DESIGN

Recommend relevant technologies and services, document technical architecture, deployment plans, "measures of success," budgets and timelines.

MANAGE

Proactively monitor systems to ensure technology is running as intended and provide support when and how you need it.

DEPLOY

Assist with product fulfillment, configuration, broad-scale implementation, integration and training.

Technology trends such as hybrid cloud can be confusing. To learn how your organization can benefit from emerging solutions, download "The Modern IT Infrastructure Insight Report" by CDW.

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