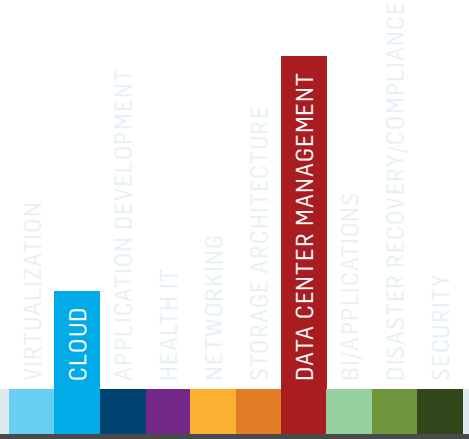

Revised Edition

Choosing a Hybrid Cloud Approach

Here's what to know about taking your organization to the cloud—without going all-in.

TechTarget

Balancing Cloud's Risks and Rewards

The case for cloud computing is built on sound pillars. It's difficult, for instance, to ignore the benefits of automation and standardization. Tasks like load balancing become far simpler with the flexibility afforded by a properly designed cloud environment. And when it comes to dollars and cents, some organizations can't overlook the financial return on paying only for the capacity actually being used.

Still, there's an uneasiness surrounding the public cloud. That reluctance has created space for the hybrid cloud to develop.

In this handbook, cloud computing expert Bob Plankers explains how a hybrid approach allows an organization to reap some of the cloud's rewards without taking on all of its risks. Chief among those risks is security. Cloud providers go to great lengths to publicize their ability to protect customers' vital information, but *saying* data is secure isn't enough to make it secure.

While taking the hybrid route is less radical than a shift to the public cloud, it's a significant change nonetheless. TechTarget senior news writer Beth Pariseau asks IT professionals to discuss what they see as the biggest challenges faced by organizations moving workloads to a hybrid cloud. Some of those challenges are specific to the cloud, while others, she notes, will be quite familiar to veteran IT workers.

Meanwhile, TechTarget's Adam Hughes offers some insight on what's next for the hybrid cloud, specifically as it will play out at the enterprise level.

We hope this handbook provides some useful guidance on how a hybrid cloud works, as well as perspective on the model's risks and benefits. ■

Phil Sweeney
Managing Editor
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Choosing a Hybrid Cloud

As organizations begin thinking more about the cloud, they are faced with a choice: develop cloud techniques on-premises for a private cloud, or move services and workloads out of the data center into public clouds. But clouds don't have to be an exclusive choice. A hybrid approach is often a great way to merge a private cloud—the traditional data center presence that you know—with the benefits of a public cloud.

While IT administrators will need to consider additional factors like workload distribution, security, management, monitoring and growth, opting for a hybrid cloud might well be the best place to start.

A hybrid cloud can make a lot of sense. The public cloud can be a great complement to a private cloud and can provide disaster-recovery or business-continuity capabilities. Rackspace, for instance, allows customers to choose between its Chicago and Houston facilities for cloud servers. Amazon's EC2 offers multiple eastern and western U.S. locations as well as others in Ireland, Singapore, Tokyo and Sao Paulo.

It can also turn "forklift" upgrades and regular large capital expenditures into more palatable operational expenditures and give your organization the ability to work around capacity limitations in your on-site data center.

Consider the benefits of load balancing. An unexpected increase in user activity might cause poor application performance when a data center exhausts its computing capacity. But a hybrid cloud can move some workloads from the private cloud to the public cloud (a concept called cloud bursting) and back again as demands dictate. Thus, a business can ensure adequate computing capacity at all times while only paying for the additional capacity when it is in use.

A certain amount of scalability is always

present in the data center, but the features are often too expensive and time-consuming to integrate and manage for a private cloud. Because scalability is better in the public cloud, a hybrid cloud arrangement allows a business to use the computing resources that a public cloud provides to react faster than it could with a private cloud or traditional data center. The pay-as-you-go model that is prevalent with public cloud providers also means you will only pay for the resources you use.

Automation is a key capability in the cloud, easing tasks like provisioning and ongoing maintenance. To use automatic scaling features in a cloud environment and enable cloud bursting, you need to automatically provision and configure applications on cloud servers. Many organizations acknowledge the need for automation but they cannot find the time to implement it in their own data centers. A hybrid cloud approach can add automation and monitoring tools to help businesses implement better processes, while simultaneously helping businesses justify the initial implementation work.

The cloud offers additional benefits for high-performance computing applications, especially as businesses look to big data applications like Hadoop. These can be built and run inside public clouds, avoiding the need to create and maintain large, power-hungry clusters that require specialized IT knowledge and dedicated network configurations and hardware.

Amazon offers a hosted Hadoop framework as part of its Elastic MapReduce (EMR) product to help organizations get started. The hybrid cloud also allows you to add features that may not be present in your private cloud. Support for Internet Protocol Version 6 (IPv6) is one example of this.

Provisioning workloads into a public cloud enables you to test IPv6, and perhaps even enable customer-facing applications to become IPv6-enabled. The public cloud front end talks IPv6 to clients, while the private cloud back end communicates via IPv4 without major and costly changes to your infrastructure.

There is also the financial consideration. Cloud use shifts capital expenses to operational expenses, and hybrid clouds can begin to smooth cash flow by moving towards a subscription model for some IT operations.

Instead of giant periodic outlays to acquire new IT infrastructure, you can spend money as needed through cloud services. Equipment leases have traditionally been used to help the cash flow problem, but even then there is usually a big forklift upgrade at the end of the lease period. There's no need for that in a cloud, since the cloud provider handles much of that refresh activity.

Cloud technologies like autoscaling can also reduce operational expenses. Your cloud server footprint can grow and shrink as needed, which means that your cloud bill grows and shrinks, too. You can budget and size for average loads, rather than the traditional IT practice of budgeting and sizing for peak loads. If your organization experiences heavy loads only one month out of the year, why pay for twelve months of peak capacity?

Taken together, there is a compelling argument to merge private and public clouds through a hybrid arrangement.

DECIDING WHAT TO SEND TO THE CLOUD

Merging private and public clouds presents the problem of workload suitability. You need to decide which applications, or parts of applications, to run in the private cloud, which to run in a public cloud, and how that hybrid arrangement will affect your business.

Moving from a known to an unknown always involves risk. If your organization has spent many years evolving its data center, it's likely that your applications and systems are running well. Disrupting that environment by moving or re-architecting workloads might be unnecessarily costly and time-consuming—for very little gain. Likewise, systems that require specialized configurations, strict security or dedicated hardware might not thrive in a hybrid cloud.

Heavy standardization on the cloud provider's part is an essential part of affordability (economy of scale), but this leads to inflexibility when it comes to adding features for customers. For example, while cloud providers offer load-balancing capabilities, the feature set is often limited to the most basic of mechanisms.

By comparison, many traditional data center load-balancing solutions have a wide range of

health check, load distribution and even SSL offload features. Those options are not widely available from public cloud providers.

When looking at what you can (or should) move into a hybrid environment, consider cost. For new or experimental ideas, it might be vastly cheaper and faster to prototype something in the cloud than to acquire and install hardware in your data center. A good example of this is high-performance computing, where developing new techniques or running temporary applications using cloud infrastructure can help save hundreds of thousands of dollars by avoiding or forestalling the expense. In many cases, organizations are also opting not to purchase their own clusters because they find it cheaper overall to run these types of apps from the cloud.

In other cases, the sheer volume of data or network bandwidth requirements associated with an application (such as a busy database or a transactional application) may make it poorly suited for use in the cloud. It might be best to retain those workloads in the private cloud for performance or financial reasons.

The choice of workload location will also be influenced by compliance and security considerations. Many businesses face stringent government and industry regulations that strictly limit the physical location of certain data types. Since the very premise of the public cloud is to run any workload anywhere in the world, there are bound to be conflicts between public cloud services and business regulations. Consequently, companies that are bound by certain regulations will often prohibit sensitive applications from reaching the public cloud.

For new or experimental ideas, it might be vastly cheaper and faster to prototype something in the cloud than to acquire and install hardware in your data center.

A new generation of tools is providing businesses with more insight and control over their data locations, but the current attitude is to show caution by protecting sensitive data in private clouds.

In addition to workload locations, businesses

in highly regulated industries often have requirements for data security as well, both in-flight and at rest. While there are increasing numbers of network-based encryption tools, the on-disk encryption components can be difficult in the public cloud. Also, these additional features come at additional cost, which may influence your ability and willingness to move a particular application into the public cloud.

Don't forget about the importance of connectivity and availability. Using a public cloud dramatically increases your reliance on external network providers, and that means outages can leave you or your customers without access to important applications. Bandwidth, latency and network security between your data center and the public cloud must also be appropriate for the workloads.

And finally, consider the public cloud provider's support for the applications and services you'd like to migrate. Cloud providers are almost exclusively Intel-based, meaning that if you aren't running on Windows or Linux it probably won't be a good fit. For example, applications on those HP-UX Web servers in your data center might not be immediately portable to a cloud environment; depending on the setup, converting them might be a big project.

You might also be in trouble if you are running on an older version of Linux or Windows. Public cloud providers tend to push the latest operating system versions because those are better for performance and security. Then again, it might be a good reason for your organization to upgrade.

FACING THE CHALLENGES

Experimenting with a hybrid cloud approach is one thing, but attempting to achieve a workable hybrid cloud in a production capacity is another matter. A number of integration problems between the private and public sides of your hybrid cloud will need to be addressed.

First, remember that the performance metrics available in a private cloud are much more robust. Your private cloud can provide data about I/O performance, bandwidth, latency, CPU and memory utilization. Management tools will collate and graph the data.

In contrast, public cloud providers don't offer that same depth. This makes

troubleshooting and proper machine sizing difficult, since you can't manage what you can't see. It also means that you need to change how you monitor your applications. For example, consider measuring workload performance based on results like user experience. As an alternative, it may be necessary to design workloads to deliver performance insight rather than relying on external tools.

It is important for business units to see their spending on cloud services and realize how their choices affect budgets.

Access control is another area that presents problems between the two sides of your hybrid cloud. The private cloud is likely to use the organization's Active Directory or Lightweight Directory Access Protocol (LDAP) to authenticate users to the management interfaces.

By comparison, the public cloud imposes limits on how many users can have access to cloud server instances; sometimes access is limited to one user owning all of the cloud server instances. This is disastrous for security models, as accountability and logging are useless when determining why and when a change was made.

Cost control is a problem for hybrid clouds, particularly if users have unrestricted access to self-service capabilities. While public clouds strive to appear as if they have infinite resources, your budget is certainly less than infinite. It is important for business units to see their spending on cloud services and realize how their choices affect budgets.

Temporary computing also needs to be managed and turned off when workload computing demands subside. Autoscaling can help automatically decommission cloud servers created to meet increased computing needs, but temporary cloud servers that were created to test an idea often are forgotten, becoming a drag on budgets.

Compatibility between underlying virtualization technologies is sometimes a challenge for a hybrid cloud. For example, your private cloud might be built on VMware vSphere, but Rackspace's public cloud is not. Consequently,

configuration directives, virtual hardware settings and drivers may need to be managed differently between them.

This can pose long-term problems if platforms or providers change. As with many aspects of the cloud, a good configuration management tool will help you document these differences and apply them consistently. A good cloud management tool will also help you correctly choose the configuration that applies to the environment you're deploying into, often through workflow mechanisms.

Integration may also be hampered by available information. Remember that hybrid cloud tools are generally designed to solve the problems created by the gaps between private and public clouds. They usually replace the interface you use to access your private and public clouds with a lowest common denominator interface, which masks more advanced options that aren't present in all clouds. As a result, it's not unusual to find IT staffers using lower-level interfaces, like the VMware vSphere Client, to troubleshoot performance problems.

Tools like VMware's vCloud Director and Dell's Multi-Cloud Manager implement their own permission and authorization models and proxy access to public cloud providers. This enables proper logging and access control, as long as the shared public cloud login isn't known to the users. Such tools help smooth differences in interfaces between the products. These tools also manage the application programming interface differences between your private cloud clusters and the public cloud so that users don't have to be trained in the different management mechanisms.

Ultimately, getting public and private cloud elements to work together and grow over time can be problematic, though the continued evolution of cloud standards, practices and tools should make hybrid cloud integration and growth easier. —*Bob Plankers*

Hybrid Cloud Presents Familiar Challenges

Although industry observers see promise in hybrid cloud, that doesn't mean it's a perfect solution. The hybrid model fixes some problematic aspects of cloud computing, but it also comes with a set of challenges for IT operations professionals. Some of these challenges are new, and some will be familiar.

A move to hybrid cloud may not be as radical as moving entirely out of the corporate data center, but it can still mean significant changes for the IT team and end users.

"IT's dominance of a specific knowledge area (IT) has been eroding, and now that dominance is limited to highly specialized skills and expertise that often get outsourced to third-party suppliers and [are] easily accessible to the enterprise's business practitioners, as well as IT practitioners," according to a 2012 Gartner report titled "Hybrid IT." "The role of IT, once 'Dr. No,' has changed to one of enabler, collaborator and orchestrator, particularly in the innovation arena," the report said.

At the same time, hybrid cloud management comes with challenges already familiar to IT people, namely data classification and capacity planning. Both are necessary to gauge the long-term cost-effectiveness of either public or private cloud for each application.

If organizations want to use hybrid cloud for cloud bursting, for example, it's important to know where the internal data center's capacity ends, how much is needed from an external cloud, and for how long. If certain applications are to be housed internally and others externally, it is important to monitor capacity demands to determine whether applications are appropriate for one scenario or the other.

"People fail to understand that the provisioning of capacity is not simple," said David Eichorn, global practice head for Zensar, an IT consulting firm. "You have to look at the operational impacts—companies can't afford to fail

from a capacity management perspective."

It's also important to appropriately classify data within the organization, so that sensitive data doesn't end up on an external cloud.

"The challenge with data classification is making sure that you clearly understand the classification before you start choosing a platform. I just don't think that goes away," said Lisa Larson, VP of enterprise cloud solutions for Rackspace Hosting. "Cloud is an amazing platform, but you have to use it the right way. It all goes back to, 'What does the data look like, where does it need to reside?'"

Don't ignore the issue of workload migration between public and private clouds. Much of the technology in this area remains in its infancy or has reached only an awkward adolescence.

One often-overlooked issue with workload migration between clouds is architectural compatibility, said Randy Bias, co-founder and CTO of CloudScaling Inc., provider of OpenStack-based on-premises cloud management software and services.

A focus of discussion in the industry is application programming interface (API) interoperability, but the underlying architecture can still complicate the management of two API-compatible clouds, Bias said. For example, when a user deploys a workload on *cloud A* for development, there might be one network interface. When it comes time for deployment on *cloud B*, and there are two network interfaces, which network interface should the user bind the Web server to?

Workload migration between clouds is an issue that can't be ignored. Much of the technology in this area remains in its infancy or has reached only an awkward adolescence.

"You don't know," said Bias. "It gets worse when you get into a VMware cloud where you can have arbitrary numbers [of network interfaces]. So if people really want to talk about interoperability and compatibility, it's got to start at the architectural and behavioral compatibility levels, and APIs have little or nothing to do with it."

Managing security and identity in a hybrid

cloud environment can also be complex.

"Part of the advantage of building in a cloud environment is being able to turn up and down resources on demand," said Jonathan Bryce, executive director of the OpenStack Foundation. "If you have to manage an infinite number of authentication scenarios, that limits the ability of the application to auto-scale."

Whether the hybrid cloud will be the dominant paradigm for cloud computing into the future is still a matter of conjecture and opinion.

Federated identity management tools that work across heterogeneous clouds may help, but implementing them is no picnic, either.

"The big issue is that a lot of these clouds on the authentication side sort of act like separate identity pools right now," Bryce said. "That's what some of the work is being done on—creating ways to share identities between different applications."

While movement toward the hybrid cloud is a clear trend right now, whether it will be the dominant paradigm for cloud computing into the future is still a matter of conjecture and opinion.

"The interim solution is hybrid, and I think people just want to hedge their bets," said CloudScaling's Bias. "They want choice, and they want to make sure that if something goes wrong with public cloud adoption, they've got someplace to go."

"I believe the hybrid cloud is the ultimate state of cloud computing," countered Rackspace's Larson. "If you're an IT organization, I think you have to look at it from a lifecycle standpoint—you just don't put an application onto a cloud technology and platform and just set it and forget it. That application will continue to change, the workload may change, and so the platform may change." —*Beth Pariseau*

What's Next? The Future of Hybrid in the Enterprise

Nearly half of all large companies will have deployed a hybrid cloud by the end of 2017, according to a recent Gartner Inc. study. The growth of hybrid cloud only compounds the use of cloud computing in general, which will account for the bulk of IT spending by 2016, the report noted.

"Hybrid is indeed the cloud architecture that will dominate," said Dave Bartoletti, an analyst with Forrester Research in Cambridge, Mass. "We're seeing over 50% of enterprises prioritizing private cloud in 2013 to 2014, and there will likely be very few private clouds that don't have a public [hybrid] component."

Private clouds don't provide scaling options and cost efficiencies to the degree that public clouds do, but enterprises also want the option to keep some data behind their firewalls.

A hybrid model takes the best of both worlds—or clouds, that is.

Bartoletti went even further, saying that "everyone" has plans to extend the private cloud to include public resources. "The future is systems of record linked to new cloud-style systems of engagement, and that is hybrid cloud," he said.

THE ON-DEMAND HYBRID CLOUD

How much easier would it be for an enterprise to connect cloud instances with dedicated servers with a simple click of a button?

According to Codero Hosting, it's possible. The Austin, Texas, company has released what it calls the "on-demand hybrid cloud," through which a customer can drag and drop dedicated servers and cloud instances into its hybrid network, all within seconds, said Emil Sayegh, the company's CEO.

The private network for each customer is isolated at the switch level, without a connect device, and is entirely driven by application

programming interfaces.

"Codero's got a smart offering that mixes dedicated and elastic hosting resources, since that is the essence of hybrid," Forrester's Bartoletti said.

"Making it easy to consume elastic capacity outside of an existing customer's dedicated infrastructure—with the same provider—will definitely speed the path to cloud for companies that value their hosting provider relationships," he added.

Bartoletti said providers similar to Codero use some type of mix between traditional hosting and cloud services, citing CenturyLink Inc. and Verizon/Terremark as two companies with a combination of dedicated, managed and on-demand instance types.

Enthusiasm for the so-called on-demand model is not universal.

"It's clearly not groundbreaking, and we're seeing many of these types of offerings around hybrid and multi-cloud," said David S. Linthicum, senior vice president with Cloud Technology Partners, a Boston-based cloud consulting firm.

Codero's pricing starts at $15 per month for 10 Mbps, $65 for 100 Mbps, $150 for 250 Mbps, and $275 for 500 Mbps. The pricing is for each individual hybrid network that a customer adds.

THE "MULTI-CLOUD" DEPLOYMENT

Other cloud advocates maintain that a multi-cloud deployment with several providers is the future of cloud computing.

"The majority of enterprises I consult with leverage a multi-cloud model, where hybrid cloud is certainly there but [is] being replaced by something that's much more complex and valuable," Linthicum said.

Many enterprises mix and match multiple clouds depending on their needs, and—that's where a cloud deployment gets complicated, he said. For instance, one enterprise could use two or more public Infrastructure as a Service (IaaS) providers, along with a private Platform as a Service (PaaS) and on-demand management and security systems from a public cloud.

Jelastic Inc., based in San Mateo, Calif., recently debuted another option for enterprises: an integrated PaaS for private, public and

hybrid clouds. Jelastic says it is the first time PaaS and IaaS have been integrated into a single platform.

"These days, the number of projects involving just one or two cloud computing providers or technologies is few and far between," Linthicum noted. "It's more likely there are a half-dozen involved."

Finding the resources to manage complex hybrid cloud deployments remains a challenge.

The key, Linthicum said, is that a cloud provider needs to be able to work with other vendors to make an effective hybrid cloud—regardless of whether it offers a distribution on a private or a public cloud.

And that makes OpenStack valuable, as it allows IT to use the same cloud platform on-premises and with a service provider, analysts say.

"That will help extend skills to more cloud deployment types and allow cloud service providers to offer services around OpenStack to help clients migrate and evolve toward a consistent, hybrid architecture," Bartoletti said.

Meanwhile, finding the resources to manage complex hybrid cloud deployments remains a challenge.

"Since you're managing a platform across private and public clouds, the ability to make these resources work and play well together is certainly a problem," Linthicum said.

He cited cloud management platform vendors that provide a management, governance and automation layer, including RightScale Inc., ServiceMesh, Hewlett-Packard, VMware and IBM. —*Adam Hughes*

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