PRIVATE CLOUD
e-zine

Strategies for building a private cloud

In this issue:

VOL. 1 | NO. 4 | NOVEMBER 2011

SearchCloudComputing.com

OPEN SOURCE MEETS CLOUD COMPUTING

AS CLOUD COMPUTING continues to mature, IT managers want more. They are clamoring for better integration of cloud platforms with existing tools, greater control and management, improved self-service, and greater portability among cloud environments.

Enter open source software, which has become the architectural foundation for many cloud projects. Open source software is often lower cost than proprietary alternatives, and its open code base can prevent the vendor lock-in common with proprietary technologies. Open source comes with its challenges, though, including spotty support and a substantial skill requirement. Open source and cloud expert Bill Claybrook examines how open source fits into the cloud as well as some technologies that have begun to define this maturing "second wave" of cloud computing.

Interoperability and data portability are just two vexing issues. So, next, we delve into another core problem on many IT managers' minds: migrating applications to the cloud. Virtualization expert Mike Laverick takes you through the steps for evaluating your data center's application portfolio and associated concerns, including poor application performance and latency, data leakage, and issues with compliance or other regulations.

But first, in our Cloud One on One interview, we catch up with Altaf Rupani, the VP of global strategic planning and architecture at Dow Jones, to explore the company's private cloud rollout and some of its challenges in working with public cloud providers to get the project up and running. The company's ongoing efforts may provide a guide for your own initiative. ■

LAUREN HORWITZ
Senior Managing Editor,
Data Center and Virtualization
Media Group, TechTarget Inc.

TRENDS
in cloud computing

Cloud One on One

INCHING TOWARD HYBRID CLOUD

***Altaf Rupani**, the vice president of global strategic planning and architecture at Dow Jones, is on a mission to get the best out of new cloud computing architectures for all the usual reasons: reducing time to market on new apps and avoiding the capital cost of new hardware. In this interview, Rupani discusses his company's private cloud rollout and the challenges of working with service providers to get a hybrid cloud system up and running.*

How long did it take to build your private cloud?
About a year and half.

Why did you go this route versus tapping into readily available public cloud resources like Amazon Web Services?
We don't use EC2 [Elastic Compute Cloud] for business-critical apps; the public cloud isn't ready for the enterprise. There needs to be more governance controls that cater to the enterprise.

Aren't these kinds of controls tough to build in a private cloud environment, too? Or can anybody at your company jump on your private cloud and provision services?
Yes, you need to establish governance and rules and introduce rigor so that you are following role-based access controls, but this is easier to

Altaf Rupani,
VP of global strategic planning at Dow Jones

do today inside your own four walls.

Is there training involved? How do you get employees up and running?
We have an on-boarding process; we enlighten and educate people on the portal. Otherwise you could shoot yourself in the foot if you let people on who don't know what they are doing. We leave it to the tech leads to spread the word. Otherwise you could have 400 virtual machines or 4,000 provisioned for 10 minutes of use.

What systems did you put in place to guard against that?
You need to create an auto-approval process for certain groups of users. For example, developers can provision assets without as many hoops to jump through as other employees less familiar with the system. Our mobile development team can provision as many instances at a time as they need, as this is a high-priority job.

How large is your private cloud?
All new instances are provisioned through our private cloud and we have 350 active instances, but this spikes up or down depending on workloads.

[Rupani declined to say what percentage of Dow Jones' total server environment the private cloud represents, but it is likely less than 10% today.]

Do hardware choices, HP versus Dell for example, give you any advantage in your private cloud architecture?
No. We use off-the-shelf hardware. Dell, HP, IBM—it doesn't matter, we just need a service-level agreement (SLA) for response time, a de-dupe rate for storage, etc. We created the framework for a resilient cloud first, then we picked vendors that met that criteria.

What software do you use for virtualization and automation?
VMware and DynamicOps.

Which applications run in production on your private cloud today?
Corporate applications, including back-office stuff like SharePoint 2010, have been consolidated from five separate instances to one instance running on the private cloud. Business-to-business apps on the cloud include DowJonesNews.com and our archive. Business-to-consumer apps include WSJ.com, MarketWatch.com and Barron's. All have some presence on the private cloud and are using it more and more.

What advantages have you seen so far?
One of the biggest advantages is that we no longer need to spend so much money on transitional technology setups for new projects. It's a cost-avoidance strategy, as we don't need net new assets. There's also a

cost-efficiency advantage as we are getting better usage out of our existing servers. We tripled our average utilization to 35% to 40% per physical machine.

That still seems low. Why not 60% to 70% utilization?
We leave headroom to account for peaks.

What about labor? Do you save costs there?
Yes. Cloud instances are half the cost of physical instances, including labor.

How many administrators maintain your private cloud?
It's less than five.

What about hybrid cloud? Does that make sense for your company?
We'd like to extend our internal private cloud to public cloud in a hybrid model, but we're still working on the SLAs and data residency mandates with public cloud providers to make that viable.

When will that happen?
Before the end of the calendar year, we'll be able to use hybrid; through application programming interfaces we will be able to plumb providers' capacity behind our portal.

Give us an example of why that would be useful.
Let's say there's an employee in Europe working on a big marketing launch, but there's no Dow Jones capacity there. The system will say, "Here are the templates available for services," and it's the same workflow and policies as internal services, but it launches on the public cloud. It federates with the enterprise.

What challenges have you faced in getting this hybrid model to work?
When the provider is a black box, it's not good; single sign-on and identity and access control is not easy.

Are there other challenges with the hybrid model?
Service providers had not envisaged the workflow we needed, so we are really pioneering this path; it takes a lot of trial and error.

How have your users responded to the private cloud?
People are lining up to use it. The time to market for new apps is so much faster. Users are willing to pay more [for it], as they get their server before they come back from lunch instead of in three weeks. [That] is awesome from an application delivery standpoint. —BY JO MAITLAND

Expedite Your Journey to the Cloud with *e*Plus

Let *e*Plus® be your guide to cloud computing. With our *e*Cloud™ offering, we can design a cloud computing strategy tailored specifically to your business, allowing you to:

+ Gain tighter control over security
+ Lower your total cost of ownership
+ Better manage provisioning
+ Improve services orchestration
+ Virtualize and scale your existing applications

For more information, please contact ecloud@eplus.com.

www.eplus.com/cloud

***e*Plus *e*Cloud Solutions are built on technology from:**

HP Cloud Center of Excellence

Converged Infrastructure Specialist

vmware PARTNER
PREMIER SOLUTION PROVIDER

OPEN SOURCE IN THE CLOUD: BOON OR BUST?

Open source may address some of the vexing problems that have kept IT managers out of the cloud. But these technologies aren't for the fainthearted. **BY BILL CLAYBROOK**

AS COMPANIES cautiously explore cloud computing, open source technologies could prompt a tipping point in cloud adoption.

Free and open source software is liberally licensed and allows users to change and improve software design by allowing access to its source code. Its community-driven approach to software development—as well as flexibility and the potential lower cost of open source technologies—is well suited to the cloud. By contrast, proprietary software often locks in users to a given provider and can come with a high price tag. So open source may also help untangle some of the vexing problems that have been roadblocks to cloud adoption, including data portability and cloud interoperability.

But building private and hybrid clouds with open source technologies poses problems as well, including spotty support, lack of company development know-how and a lack of common standards. Moreover, many cloud platforms mix open source and proprietary code. Vendors may continue to nurture their own proprietary technologies in the marketplace rather than join forces to create common standards. Without greater cloud interoperability, IT shops may continue to reject cloud technologies as too risky.

So, for users, the question becomes whether open source is "good" for the cloud or creates problems of its own. In this article, we'll examine when open source software can benefit a cloud project and when it's best to rely on proprietary technologies instead.

OPEN SOURCE AND THE CLOUD GAIN STEAM

By several indications, cloud computing adoption is poised to grow. By 2020 the global cloud market is predicted to reach $241 billion, compared with $40.7 billion in 2010, according to a Forrester Research Inc. report. Open source platforms and projects in the cloud are also

growing. According to a May 2011 report of 450 respondents by North Bridge Venture Partners and the 451 Group, mobile and cloud development experienced growth in open source projects. A December 2010 report by the 1105 Government Information Group, 60% of 460 respondents have considered cloud computing because of its potential to reduce IT and operational costs and provide rapid on-demand access to IT resources.

FOR COMPANIES THAT WANT LOWER-COST AND MORE FLEXIBLE AND ELASTIC ON-DEMAND IT INFRASTRUCTURE, OPEN SOURCE CLOUD COMPUTING CAN MAKE SENSE.

Open source cloud platforms aim to build flexibility and open IT architecture from the ground up. Rich Wolski—the CTO of the open source Infrastructure as a Service provider Eucalyptus Systems Inc. and a professor of computer science at the University of California, Santa Barbara—said that his company wanted to develop a platform that is easy to use, maintain and modify, partly because of its open source foundations. "We actually started from first principles to build something that looks like a cloud," he said. "As a result, we believe that our thing is more malleable. We can modify it, we can see inside it, we can install it and maintain it in a cloud environment in a more natural way."

So, for companies that want lower-cost and more flexible and elastic on-demand IT infrastructure, open source cloud computing can make sense. Now let's consider some of the characteristics and benefits of open source cloud technologies. (For more on Eucalyptus and other key cloud initiatives, see "Key Open Source Projects" on page 8.)

Reduced cost. Low cost is a key driver in open source cloud technologies. According to the North Bridge Venture Partners survey, respondents said that low cost is the second-most attractive aspect of open source technology, behind only freedom from vendor lock-in. Lower-cost or free licensing complements cloud computing by reducing infrastructure costs. But lower licensing fees should be balanced against support costs and developer time and costs to customize code, which can quickly boost the total cost of ownership of open source software.

Rapid innovation, accelerated development. Technology resources are no longer fixed but abundantly and flexibly available, so businesses can roll out new ventures with less

risk and delay and without prohibitive costs. The ability to switch resources on or off in seconds paves the way for real experimentation and more rapid business development.

Firms that use open source software can add new features critical to their business needs, which allows programs to be extended rather than replaced. According to the "2011 Cloud Computing Adoption Survey," rapid business innovation is a critical cloud driver: 51% of 344 responding companies see opportunities to roll out new products via the cloud.

But companies can garner these

(Continued on page 11)

KEY OPEN SOURCE PROJECTS

Almost immediately, open source technologies such as Linux and Xen began to have an impact on cloud computing. But several new open source offerings have cropped up, including Deltacloud, Eucalyptus, Openstack and OpenNebula. We'll profile some of these offerings below (and see the table "Open Source Cloud Platforms" on page 9).

Today, OpenStack is the "hottest" open source cloud software project. Rackspace, a proprietary company, and NASA support OpenStack and are working to establish a nonproprietary cloud infrastructure that can be broadly adopted. In mid-2011, OpenStack received a boost in support from heavyweights such as Dell and Hewlett-Packard.

Now, a growing number of technology providers—including Citrix Systems, Cisco Systems, AT&T, Intel and rPath—have coalesced around the OpenStack platform for public cloud providers and for enterprise private clouds. Use of OpenStack for public and private clouds would enable cloud interoperability, allowing users to migrate applications from one cloud to another. VMware has been trying to do the same with its vCloud API and vCloud Express.

Eucalyptus is OpenStack's primary competitor, but it has nowhere near the momentum of OpenStack now that Dell and Hewlett-Packard have begun to support it.

Still, OpenStack lacks the systems support that enterprise users require. Citrix and Rackspace have created commercial support projects for OpenStack. Citrix recently announced Project Olympus, and Rackspace has launched Rackspace Cloud Builders.

Because OpenStack has broadened its support and now has major companies contributing code to OpenStack, its application programming interfaces have a good chance of becoming an open standard for cloud computing. Its main competition comes from VMware's vCloud API. ■

CLOUD OPEN SOURCE PLATFORMS

PRODUCT	WHAT IT DOES	TIME ON MARKET	PRICING	NOTABLE FEATURES	POTENTIAL ISSUES
Abiquo Cloud Management	Creates public and private Infrastructure as a Service (IaaS) clouds based on heterogeneous environments. Users can provision servers, storage, networks and applications automatically.	Released April 2009; Abiquo 1.8 released July 2011	Community Edition is free; Enterprise Edition is licensed on an annual basis (from $211 for one to 49 physical cores to $432 for 1,000 or more cores) and includes support at one of three levels.	Offers broad hypervisor support, including VMware, Microsoft, Citrix and Kernel-based Virtual Machine (KVM) hypervisors; enables IT to delegate permissions to authorized users.	Abiquo claims to run on diverse hardware; but doing so could have unintended consequences for scaling and troubleshooting an environment.
Citrix Systems Inc.'s CloudStack and OpenCloud	Enables enterprises and service providers to build IaaS clouds. Tools on the back end manage, secure and bill for resources used.	Released May 2010; CloudStack 2.2.8 released July 2011; OpenCloud version 1.0 released March 2011	Standard is $500 per month with an initial fee of $2,500; Premium is $1,000 per month, with an initial fee of $4,000; Corporate and Enterprise levels are also available. Pricing may change given the recent acquisition, however.	Supports a range of hypervisors, including VMware, Oracle VM, and Hyper-V support is expected by the end of the year. CloudStack also includes CloudBridge, which enables applications to work with public cloud application programming interfaces (APIs).	Prior to Citrix's acquisition of Cloud.com's CloudStack in July 2011, installation and interface weren't intuitive, and CloudStack had few proven, enterprise-scale deployments. Now that Citrix has integrated OpenCloud with CloudStack, things could change.
Eucalyptus Enterprise Edition	Implements IaaS–style cloud computing with Linux-based infrastructure. With its Amazon Web Services-compatible interface, Eucalyptus can move workloads between AWS and an internal data center without modifying code.	Released September 2009; Eucalyptus 3.0 due out mid-2011	Licensing based on number of processor cores on physical host.	AWS is compatible with Elastic Compute Cloud (EC2) APIs, so working with Eucalyptus is like working with VMs in Amazon EC2. It is also one of the most mature cloud platform software kits.	Historically, the partially closed elements of Eucalyptus have posed scalability problems. The technology requires technical competence.
Novell Cloud Manager	Allows IT staff to manage virtualized resources based on different hypervisors, including VMware, Hyper-V and Xen virtual servers, all from a single management tool.	Released September 2010; version 1.1 released December 2010	N/A, though base configuration will come with the presentation and management server and licenses to manage 25 workloads.	Designed for mixed IT environments, Novell Cloud Manager runs on all major hypervisors, including VMware, Hyper-V and Xen.	Novell continues to lag Red Hat in Linux market share. Cloud Manager does not replace existing hypervisor management tools, so pricing is dictated by the console.

(TABLE CONTINUES ON PAGE 10.)

PRODUCT	WHAT IT DOES	TIME ON MARKET	PRICING	NOTABLE FEATURES	POTENTIAL ISSUES
OpenNebula 2.2	A completely open source toolkit to build IaaS clouds, including public, private, virtual private and hybrid clouds. Originally launched to establish a cloud standard, OpenStack is a free, community-supported cloud platform developed by NASA and Rackspace and sponsored by several vendors, including Dell and HP.	Released in 2008; OpenNebula 2.2	In fall 2011, C12G Labs announced support pricing, which begins at €150 per physical server, with higher levels that offer support for unlimited servers within a single zone (starting at €9,000) and per-site support for unlimited zones.	Offers an authentication framework; administrator roles; and secure multi-tenancy as well as an image repository with catalog and image management.	The project uses the Open Cloud Computing interface and is funded and staffed by academic institutions and volunteers. Only recently, in late 2010, C12G Labs began managing OpenNebula.pro, a support portal.
OpenStack project (Rackspace and NASA)	Originally launched to establish a cloud standard, OpenStack provides open source standards for large-scale deployments of automatically provisioned virtual compute instances.	Released October 2010; OpenStack Compute API version 1.0 available and OpenStack Compute API version 1.1 now "experimental" for Cactus	N/A	The OpenStack community has grown to 40-plus companies. Open standards make it relatively easy to migrate data and applications to public clouds. It's also easy to benefit from others' bug fixes.	Long-term business prospects for the company could be a question mark. Persistent support issues may be resolved now that Citrix and Rackspace will support OpenStack through Project Olympus and Cloud Builders.
Red Hat Inc.'s CloudForms	CloudForms is an IaaS cloud platform for enterprises and service providers. CloudForms uses JBoss Enterprise Middleware for application and service provisioning.	Released May 2011; at the time of this writing, in beta, but due to be generally available in fall 2011.	Combines application lifecycle management with IaaS. Offers configuration and management of multi-tier applications and gives users the option to move and manage applications between clouds, virtualized environments and servers.	N/A	The offering is relatively new and Red Hat has had long-standing issues in delivering enterprise support.
Ubuntu Enterprise Cloud	Formerly powered by Eucalyptus and now by OpenStack, Ubuntu Enterprise Cloud is a platform to create Linux-based private and hybrid clouds.	Ubuntu 9.04 was released in April 2009 with cloud capabilities; version 11.04 released April 2011	Cost for entry-level coverage for turnkey boxes: physical machines running during the business hours of 9 to 5: $4,750 per year; running 24/7 is $17,500 per year. Cost for additional packs for turnkey boxes: One physical machine with 9-to-5 support is $1,250 per year or 24/7 support at $3,000 per year.	Ubuntu's cloud is now integrated with OpenStack (though it continues to support Eucalyptus), a non-proprietary cloud infrastructure, which is swiftly becoming a front-runner.	The best user candidates for this technology must roll up their sleeves and contribute to the community. So users should consider a support relationship with Rackspace, Canonical or both.

HOME

EDITOR'S LETTER

TRENDS

OPEN SOURCE IN THE CLOUD: BOON OR BUST?

NO DEMOCRACY FOR APPS IN THE CLOUD?

(Continued from page 8)
benefits only if they have in-house expertise or ongoing development contracts with outside help to develop the code and address support issues.

CLOUD-FRIENDLY LICENSING AND USER CONTROL. Open source licensing is often less problematic for clouds than proprietary software licensing. Traditionally, commercial software was designed and licensed for static environments in which software was installed and run on a physical server. Today these kinds of static environments are becoming the exception, with elastic applications becoming the norm.

And with proprietary software, it can be a major headache to figure out how to license these dynamic IT resources as applications and data move from cloud to cloud. Unlike proprietary licensing models, such as Microsoft's, open source software licenses do not have to be adjusted to allow for "license mobility."

Finally, users gravitate toward open source because it provides greater control over testing and evaluating cloud technologies, noted Eucalyptus CEO Marten Mickos. Companies want to test products themselves and have control over the technology evaluation process. This also supports findings from the "2011 Cloud Computing Adoption Survey," where 43% of 344 respondents said that they want to maintain responsibility for the care and feeding of their clouds rather than relinquish control to providers.

OPEN SOURCE PROBLEMATIC FOR CLOUDS?

Still, open source software is no panacea and presents challenges for the unprepared, particularly companies without the necessary in-house coding expertise to support open source technologies. According to the North Bridge Partners survey, respondents cited lack of technical skill, lack of familiarity with open source technologies and a lack of support as the top three barriers in selecting an open source technology.

CODING EXPERTISE AND SUPPORT. Large companies such as Amazon, Google and Yahoo often have substantial developer expertise in-house, so they are the most likely to take open source technologies and build on top of them. They have the resources required to customize the code for particular business needs, which many smaller companies often lack.

Some of the more popular open source projects also provide adequate Web-based support for bugs, patches and so forth. In the case of less-popular open source software, Web-based support isn't enough. If a company lacks expertise in customizing open source cloud soft-

ware, it may end up paying more than it would by just paying for proprietary software.

For open source cloud technologies to be successful for a given organization, a company needs to ask, "Do we have the development capacity for this project? Should we invest staff resources this way?" If the answer is no, choose a commercial product to get paid support instead. If the answer is yes, consider whether you have sufficient in-house developer expertise to support ongoing projects or whether you need additional resources.

Open standards. Another potential problem for open source cloud software is getting open source cloud APIs ratified by standards organizations (and for the distinction between open source and open standards, see "Open Source vs. Open Standards" on page 13). While a good deal of hype surrounds OpenStack as a potential standard for cloud computing, it has yet to demonstrate that it can attract a large number of users. APIs, such as TCP/IP, become open standards because they attract substantial interest and use. It may take OpenStack a few more years to garner enough broad-based use to qualify for open standards ratification.

While initiatives like OpenStack are moving toward greater openness in the cloud, these projects are driven in part by cloud technology vendors and, to some extent, by cloud providers. All these parties have a stake in product differentiation and in preventing commoditization. As a result, vendors' motivation to create truly open standards could suffer from self-interested vendors controlling the roadmap of a project.

ONE POTENTIAL PROBLEM IS GETTING OPEN SOURCE CLOUD APPLICATION PROGRAMMING INTERFACES RATIFIED BY STANDARDS ORGANIZATIONS.

So while open standards are a good thing, it does not necessarily follow that users will reap the benefits. Because some cloud service providers don't want to compete on cost or selling price alone, they may have little interest in developing or supporting common cloud standards. If OpenStack or VMware APIs become open standards, for example, expect cloud service providers to deliver these APIs with their own modifications. These changes, of course, may render open standards less open or broadly usable.

TAKEAWAYS

Open source and cloud computing technologies can enhance one another. For companies on tight budg-

ets that want to make an initial foray into the cloud, open source can offer flexibility and lower-cost cloud projects. It also offers the opportunity for the rapid innovation and deployment that is so central to the cloud. These technologies permit innovation at a much faster rate than proprietary software, which often has long development and testing cycles. Moreover, some of the key capabilities in automation, management and monitoring tools for cloud-based and virtualized environments have been generated by open source projects and startups such as OpenNebula, Cloud.com and Abiquo. Further, an open source implementation can become a working reference model that demonstrates what the specification means and how to implement it. This may be difficult,

OPEN SOURCE VS. OPEN STANDARDS

WHILE PEOPLE OFTEN confuse open source with open standards, they are distinct entities.

Open standards are specifications that are publicly defined, that anyone can implement and that outline agreed-upon conventions to enable different programs to work together, along with some mechanism to ensure that they actually do (such as a series of tests). They create an open market where users can switch between competing implementations. With open standards, your company can choose among competing vendors without becoming locked into any one. Examples include TCP/IP and HTML.

Free open source software licenses give users the freedom to run an open source program and to redistribute copies of the original or modified program without paying royalties to developers. Examples include the Linux Kernel, Apache Web Server and Firefox. Open source implementations can also rapidly increase the use of open standards because they can be downloaded and tried out, which encourages experimentation and broader use.

While some mistakenly believe that open source software offers the same benefits as open standards, open source just means that the underlying software code is available for free and can be modified and redistributed. Making the source code open and available is a good thing, but that doesn't mean that every cloud-related technology that the open source community produces will be compatible. The Eucalyptus cloud and OpenStack cloud APIs, for example, are not entirely compatible. This is why open standards are key to the cloud and not equivalent to open source. Standards ensure compatibility and choices; open source does not necessarily do so. ■

if not impossible, with proprietary implementations.

But at the end of the day, whether a cloud technology is open source isn't the key factor for users. They don't care as much about what's under the hood as they do about performance, availability, security and overall results. Still, users do care about flexibility and portability, which could prompt them to support open standards and, in turn, open source cloud technologies. All in all, companies with in-house expertise to support open source cloud projects are the best candidates to reap the benefits of lower costs and more rapid product time to market. As they draw a roadmap to the cloud or make purchasing plans, companies should start by assessing their in-house skills. ■

Bill Claybrook is an analyst with more than 30 years of experience in the computer industry. He has spent the past 10 years focusing on Linux and open source. Claybrook was the research director for Linux and Open Source at the Aberdeen Group and a competitive analyst at Novell Inc. He is now president of New River Marketing Research in Concord, Mass.

ADDITIONAL RESOURCES

Cloud Computing Licensing: Buyer Beware

Managing the number of licenses you need for a cloud deployment of a custom application is no mean feat.

The Role of Open Source in Cloud Computing

The open source market for cloud computing already features a well-formed batch of tools and services.

Comparing Open Source Cloud Platforms: OpenStack vs. Eucalyptus

OpenStack has garnered significant praise. How does it stack up to open source stalwart Eucalyptus?

Deciphering Red Hat's Cloud Strategy

Red Hat's cloud strategy seems aimed at providing consistent open source cloud service for data centers and public clouds using tools like Deltacloud and Linux—an approach our expert thoroughly examines.

Five Open Source Tools for Building and Managing Clouds

Here we explore five open source tools for building and managing clouds. ■

NO DEMOCRACY FOR APPS IN THE CLOUD?

In the cloud, not all applications are created equal, and moving some applications there could spell disaster. Here are seven steps to create a rock-solid strategy for porting apps to the cloud.

BY MIKE LAVERICK

JUST BECAUSE YOU want to move an application to the cloud doesn't mean that you should. In the cloud, not all applications are created equal, and some are downright wrong for the infrastructure model.

To make the right decision about which apps to move, you need a solid migration strategy. You need to consider your application portfolio and your business requirements to prevent problems such as poor application performance and latency, data leakage, or issues with compliance or other regulations. Applications subject to regulation or those that are business-critical, for example, are often poor candidates for cloud migration. And legacy applications may not stand up to the customization required for a move to the cloud.

But when it comes to these decisions, you don't have to fend for yourself. You can rely on established best practices to prevent disaster. Here's how to develop a foolproof strategy for moving the right applications to the cloud, which starts by outlining clear objectives, then focuses on your application portfolio's characteristics and business requirements to determine best fit.

DEFINE YOUR CLOUD OBJECTIVES

The first task is to identify why you want to move a given application to the cloud. Is your goal to save costs or to scale an application quickly to meet new business demand? Sometimes your goals clearly align with the applications you want to move to the cloud, enabling you to save money and become more responsive to business needs—and avoid costly infrastructure investments to expand capacity.

But other use cases won't fulfill these goals, particularly applications

that are mission-critical, resource-intensive, or those that house sensitive data. If you have to retool a legacy application to move it to the cloud, for example, it may drain staff time and, ultimately, money. Does the resource cost justify the move? If not, consider hosting or another alternative.

The same applies to workload-intensive applications that require extremely low latency and have steep disk I/O requirements or may pose performance tradeoffs that are unacceptable for business users. In such use cases, revisit your model for managing applications in-house.

2 UNDERSTANDING SCALABILITY AND REDUNDANCY

Scalability. Cloud computing is all about scale and the ability to ramp up additional resources on demand as workloads change. So the easiest applications to move to the cloud are those with built-in scale-out capabilities and redundancy.

Historically, IT departments have used the scale-up approach and have added more memory and CPU to servers to improve performance. But with cloud computing, the far simpler method is to scale out—that is, to add more nodes to a single system, often by spinning up a new virtual machine (VM) when peak demand occurs. Ideally, these new VMs can be deployed rapidly without the application owner needing to go through a convoluted postconfiguration process. These additional VMs can be spawned on demand, then destroyed when no longer needed—or left in standby mode ready for the next spike in demand.

CLOUD COMPUTING IS ALL ABOUT SCALE AND THE ABILITY TO RAMP UP ADDITIONAL RESOURCES ON DEMAND. SO THE EASIEST APPLICATIONS TO MOVE TO THE CLOUD ARE THOSE WITH BUILT-IN SCALE-OUT CAPABILITIES.

Scale-out architectures suit the cloud, which requires immediate, on-demand access to these scalable resources. It's much more difficult to add resources in the form of CPU or memory on the fly. Not every guest operating system supports this functionality, and, depending on the features of the OS and the functionality of your hypervisor, you may find that that an OS needs a reboot for the change to be applied.

Resiliency and redundancy. If an application lacks built-in resiliency and poses a potential single point of failure, an organization has to spend

time and money retrofitting the application to build in this functionality. This may require you to shoehorn availability technology into the guest OS to protect services that previously had none or, alternatively, enable a virtualization provider's VM availability, such as Microsoft Hyper-V's Failover Clustering or VMware's High Availability.

Whatever your decision—and it may very well be a combination of both virtualization-enabled and added-on availability—it will undoubtedly increase the cost of moving an application to the cloud. Even if your data center has these technologies on board, they still have to be managed and maintained, which only increases complexity when compared with applications that have built-in "self-healing" capabilities.

But the reality is that, today, applications with this built-in design for scale-out and availability are few and far between. Despite occasional sightings of this rare creature in the wild, they remain largely an endangered species compared with their natural predator: legacy applications that don't scale, and don't have built-in resiliency.

3 IDENTIFY CLOUD-FRIENDLY APPLICATIONS

Now evaluate applications that you consider cloud candidates to determine whether they can achieve the scalability and redundancy that the environment requires. Here is a sample checklist of attributes to consider, though it may not encompass every consideration in your own environment.

- **Business criticality.** How central is this application to the business? What are the potential costs if the application were to go down? Mission-critical applications are rarely good candidates for a move to the cloud.
- **Resource use.** Does this application consume a lot of compute resources? If so, it isn't likely to be a good candidate for the cloud.
- **Availability.** How many nines of uptime are expected of this application? Will moving it to the cloud change that degree of uptime? If the application requires four or five nines of uptime, it probably isn't a good candidate for the cloud. Moreover, be wary of providers that claim to guarantee this level of reliability; companies like Google and Microsoft claim only three.
- **Resilience.** Does an application lack built-in resiliency and pose a potential single point of failure? If so, an organization has to spend time and money retrofitting the software to build in this functionality.

- **Portability.** Is the application easy to move to the cloud? Is it based on Java, .NET or another language? Cloud providers such as Google and Amazon use different underlying architectures, which quickly becomes problematic if you're considering moving applications between one provider and another. This becomes especially apparent if you use a Platform as a Service that is based on a specific programming language.

- **Scalability.** Can this application scale, and do you need it to scale for peak demand times?

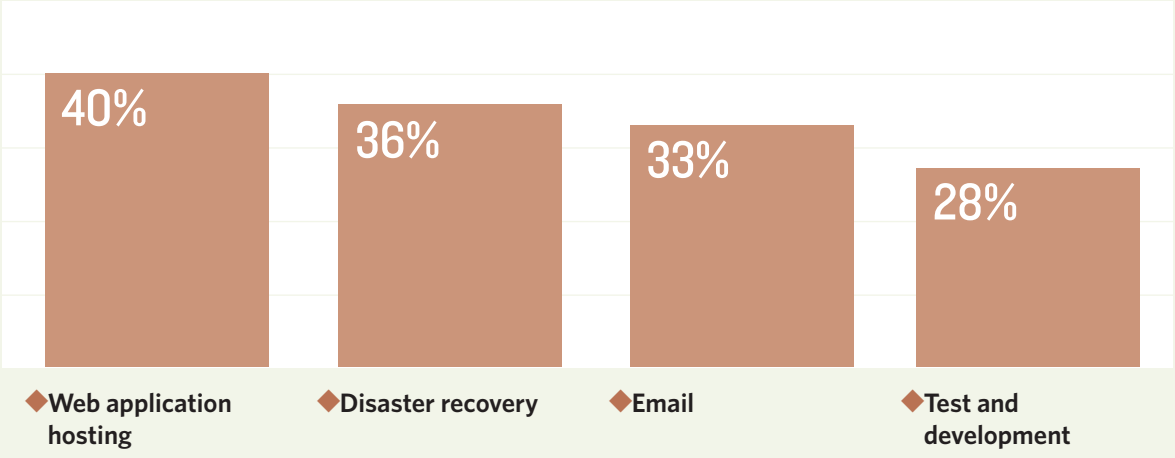
- **Application dependencies.** Does the application rely on other software, such as a database, to run? The greater the dependencies, the less likely it's a fit for migration to the cloud.

- **Data security.** Does the application house data that is subject to strict security requirements or compliance regulations? Applications that contain sensitive data or that are subject to regulation are poor candidates for the cloud.

Now you can consider these attributes in light of the applications in your infrastructure. If your application is a resource hog, for example, placing it in the cloud will likely only introduce or augment performance problems. Similarly, if your app relies on others, such as a database, to run, or is subject to data privacy

LOW-RISK APPS IN THE CLOUD

When asked which applications they would be most likely to move to the cloud, respondents targeted nonmission-critical and low-risk programs.



SOURCE: "CLOUD COMPUTING 2011 ADOPTION SURVEY," TECHTARGET INC., MARCH 2011; N=344 I.T. MANAGERS

concerns, it probably isn't a good candidate for cloud migration.

For these reasons, many organizations have begun the process of porting applications to the cloud by targeting email programs, disaster recovery, and test and development environments. Such applications are often natural fits for the cloud: They may need elastic resources for peak volumes, they aren't mission-critical, and they don't house sensitive company or customer data. You can start with these production-level applications while minimizing the risks.

Another key aspect of this step is consulting with stakeholders to reality-check your findings. You may discover that an application's owners have solid automation routines in place for installation and configuration that can be seamlessly integrated into the cloud deployment process. Alternatively, you may discover that an application is resistant to being ported to a cloud environment because of security or auditing processes.

4 SELECT A RESOURCE CONSUMPTION MODEL

Generally, you can consume a private or public cloud in three formats: allocation, reservation and pay as you go. With the allocation model, you assign a percentage of CPU/memory from a virtualization cluster, which controls the resource pools and per-VM defaults. Critically, only a certain percentage of those resources are guaranteed or reserved. So if you set your allocation policy at 75%, you have 25%

MANY ORGANIZATIONS HAVE BEGUN THE PROCESS OF PORTING APPLICATIONS TO THE CLOUD BY TARGETING EMAIL PROGRAMS, DISASTER RECOVERY, AND TEST AND DEVELOPMENT ENVIRONMENTS. SUCH APPLICATIONS ARE OFTEN NATURAL FITS FOR THE CLOUD.

unreserved resources. If you exceed the 75% value, it's anyone's guess whether those CPU/memory resources would be available.

With the reservation model, these percentages are set to 100%, and you are guaranteed 100% of the megahertz or gigabytes you reserve. This can be costly; if you set too high a reservation, you pay for resources you may never use.

Finally, the pay-as-you-go model —often the most attractive—is based on variable consumption of compute resources, and the cost varies according to what you con-

sume. But as with all pay-as-you-go models—such as cell phones—there is a risk of receiving a larger-than-expected bill if applications' resource demands vary.

5 IDENTIFY ROADBLOCKS

Of course, you may still encounter objections to migrating applications to the cloud, and it's critical to address these challenges head-on. Some challenges are technical and architectural, but some involve human obstacles.

Application portability. Users want assurance that they can bring cloud-based workloads back into their data center if circumstances change. But clouds like Amazon Web Services use virtual machine images, which are proprietary and difficult to map to enterprise networks. While the industry has begun to move toward standard application programming interfaces and other common standards for clouds, vendors haven't coalesced around common practices, and providers want to preserve product differentiation and stave off commoditization. Still, the industry has made some strides in making workloads independent of the hypervisor, enabling interoperability with multiple virtualization platforms. Organizations including DTMF, IEEE, the Open Cloud Initiative and others have also pushed for common standards throughout the market. But these efforts are still nascent, and new methods of abstracting resources are necessary to improve application portability.

Security. Another primary roadblock is the objection that public and hybrid clouds pose security risks. IT managers are concerned about the risks of data leakage in a multi-tenant environment—not to mention the lack of control over their data.

Given the immaturity of many cloud management products and vendors' slow moves to develop cloud security standards, IT managers are rightly concerned with data insecurity. As recently as July 2011, Gartner Inc. analyst Neil MacDonald characterized cloud computing standards as "nascent" and insufficient.

One reason that data security in the cloud is slowgoing is that the market has placed greater focus on network security by creating technologies that allow for secure multi-tenancy, such as VMware's vShield technologies. But vendors have placed less emphasis on securing the data itself, as opposed to securing network packets. Many analysts believe that the public cloud will inevitably require levels of data encryption to address concerns about data interception. (Though

what hasn't been discussed is the additional payload that such a system places on a cloud platform as each bit and byte is encrypted.)

But IT managers can deal with some of these objections directly by reminding application owners that security starts at home, not with a cloud provider. They should check whether the current application set is up to date with all known security patches and configured with features turned off to protect potential gateways from hackers. Second, make application configuration the focus of security, compliance and performance concerns. This focus forces application owners to own the "problem" rather than object to cloud-based applications based on amorphous security paranoia.

Compliance. Nearly every major industry has government-imposed regulations to meet, and in some cases, independent bodies impose additional regulations to be part of the club. Additionally, many cloud compliance requirements deal directly with local or central government and these requirements are precisely the ones that public cloud vendors are inexperienced at delivering. Failure to meet compliance is the responsibility of the business, not the cloud provider, so simply blaming someone else is not a solution. Many think that businesses will want to buy insurance to cover themselves for breaches and noncompliance, but as the Sony PlayStation Network breach in April 2011 shows, there's no guarantee that an insurance company will accept liability and pay out on the policy. Companies must be prepared to accept responsibility for security breaches as well. That's why many industry watchers predict that hybrid clouds are the inevitable outcome to combat this compliance anxiety. Organizations will opt to hold data and compliance-sensitive applications in-house on a private cloud for the moment and restrict their use of public cloud to applications that aren't politically sensitive.

6 TEST A DEPLOYMENT STRATEGY

One of the key components of cloud computing is the ability to rapidly spin up new applications from an existing catalog. If your infrastructure doesn't have this automation built in, however, it takes time to develop and test. Rigorous testing with beta users helps to confirm that the service runs acceptably and reliably.

Beta testers should encompass a broad swath of users: Give business users, administrators and developers a chance to evaluate the benefits and the limitations of the cloud from their perspective. Application experts can use the sandbox to run functionality and performance test-

ing on the application in the cloud to see how it behaves compared with the traditional environment and to see whether any differences are acceptable.

7 SELECT A NETWORK MODEL

For the cloud model to work, you need a networking design that can accommodate virtualized, multi-tenant resources.

At a simple level, resource sharing can take place by creating pools of virtual LANs (VLANs)—which enable information and resource sharing across locations as if they were all under one roof—at the physical switch that are then addressed by hypervisors' virtual switch configuration. Virtual switches are then presented automatically to the cloud automation layer to be consumed by tenants.

But VLANs have their drawbacks; these models require a significant number of VLANs to be created up front as a pool of resources on a physical switch. Network administrators are often hesitant to create numerous VLANs in bulk that aren't designated for immediate use because they view VLANs as the main avenue to control traffic and ensure network security.

New alternatives allow cloud administrators to segment a network without excessive use of VLANs. VMware Inc.'s vShield Edge appliance, for example, can create "network isolation-backed" network pools. These pools use a MAC-in-MAC encapsulation process to add additional bytes to the standard Ethernet packet, which creates multiple network IDs within a single VLAN. The process is analogous to the 802.3 Q VLAN tagging standard that many VMware admins have enabled on their physical and virtual environments, which allows many VLANs to be accessed through a network interface card team. (In a team, one or more physical NICs are bonded together logically to create the impression of a single pipe. A NIC team guarantees bandwidth and offers redundancy should a NIC in the team fail.) With this MAC-in-MAC method, the same number of networks can be supported with fewer VLANs, and network administrators can receive fewer requests. Fundamentally, it allows for a more dynamic and automated approach to creating new networks that cloud computing requires.

This networking design approach comes with caveats as well. The MAC-in-MAC process adds 24 bytes to the overall Ethernet packet, so you may need to adjust the maximum transmission unit (MTU) value on your physical and virtual switches to prevent fragmentation of packets through devices that are currently configured to the default of 1,500. They need to be reconfig-

ured to an MTU of 1,524 bytes or greater. If they aren't, every time a 1,524 (or larger) packet traverses a network device configured for 1,500 bytes, it gets split up into smaller units. This fragmentation can degrade performance and affect the reliability of secure protocols such as SSL.

Ensuring that all devices in the path of communication are configured for the correct MTU can be a management headache, and it's difficult to diagnose which device has caused the fragmentation. So while changing the MTU value is a relatively trivial task, it must be done consistently across the affected net-

ADDITIONAL RESOURCES

DATA SECURITY IN THE CLOUD
Multi-tenancy in the cloud and questions about the physical location of cloud data are security risks that organizations looking at using cloud services need to be aware of.

COMPATIBILITY CONCERNS IN THE EVOLUTION OF CLOUD COMPUTING APIS
To truly exploit the new cloud computing paradigm, revisions are required to capitalize on special application programming interfaces associated with individual cloud architectures.

CLOUD COMPUTING SKEPTICISM: IT SECURITY AND COMPLIANCE
How can enterprises ensure that cloud providers—especially external providers—stay up to par with patches, updates and access restrictions?

CLOUD COMPUTING AND APPLICATION SECURITY: ISSUES AND RISKS
Regardless of where the computing takes place, you're going to have security issues in the same old areas: technology, people, business processes.

RESOLVING CLOUD APPLICATION MIGRATION ISSUES
Most of today's large, old monolithic applications must be rebuilt to fit the target environment.

HOW PROVIDERS AFFECT CLOUD APPLICATION MIGRATION
Unfortunately, there's more to application migration than simply moving an application into a new cloud. ■

work, and that can introduce an initial administrative burden to the network team that makes the change depending on the number of network devices that need the update.

In contrast to these methods, Nimbula, a cloud automation start-up based in Palo Alto, Calif., uses a "security list" method that acts as an access-control method. Currently built on Kernel-based Virtual Machine (KVM), Nimbula use the DOM0 partition to store the mapping data and then control access from one VM to another. While these new methods of network isolation are innovative, they are also exceedingly new. Cloud service providers may not be ready to support these methods.

CONCLUSION

By necessity, the process of deploying an application to the cloud varies based on organizations' environments, business requirements and application portfolios. Just as the migration to server virtualization required a flexible approach to arrive at the end game, the journey to the cloud will require new technical, business and project management skills.

As with other initiatives, planning and developing a migration roadmap is critical. Start by clearly defining the goals of migrating a given application and then identify applications whose internal characteristics are receptive to a cloud, such as those that offer an easy way to deploy new VMs as part of a scale-out approach and that—ideally—are designed with built-in redundancy. Companies have already had success with targeted application migration. Retail platforms that need quick scale-out to accommodate peaks in customer demand are a good example.

JUST AS THE MIGRATION TO SERVER VIRTUALIZATION REQUIRED A FLEXIBLE APPROACH TO ARRIVE AT THE END GAME, THE JOURNEY TO THE CLOUD WILL REQUIRE NEW TECHNICAL, BUSINESS AND PROJECT MANAGEMENT SKILLS.

Next stakeholders need to agree on a resource consumption model for network, memory, CPU and disk resources that allows for easy adoption and acceptance among the various parties—while also fitting into potential budget constraints.

As you map out the various technical considerations and your cloud service-level agreement model, however, you also need to identify

your company's internal roadblocks to the cloud, such as the security and compliance requirements that often make the prospect of cloud migration a political hot potato. And applications and data subject to regulation should be kept in-house. Also carefully consider the departments most affected by the move and how to broker their investment in a cloud strategy.

Testing your cloud deployment is also critical. Identify beta users who can give you a taste of the production requirements and the snafus you'll likely encounter.

Finally, remember that users are at the center of the cloud model. Guaranteeing system and application uptime and performance are critical objectives in the success of a cloud migration strategy. ■

Mike Laverick is a former VMware instructor with 17 years of experience in technologies such as Novell, Windows, Citrix and VMware. He has also been involved with the VMware community since 2003. Laverick is a VMware forum moderator and member of the London VMware User Group. Laverick is also the man behind the virtualization website and blog RTFM Education, where he publishes free guides and utilities for VMware customers. Laverick received the VMware vExpert award in 2009, 2010 and 2011. Since joining TechTarget as a contributor, Laverick has also found time to run the weekly podcasts "The Chinwag" and "The Vendorwag." Laverick helped found the Irish and Scottish VMware user groups and now regularly speaks at larger regional events organized by the Global VMUG in North America, EMEA and APAC. Laverick has published several books on VMware Virtual Infrastructure 3, vSphere4, Site Recovery Manager and View.

SearchCloudComputing.com

Jo Maitland
Executive Editor

Michelle Boisvert
Senior Site Editor

Lauren Horwitz
Senior Managing Editor

Christine Casatelli
Managing Editor

Jeannette Beltran
Eugene Demaitre
Martha Moore
Associate Managing Editors

Linda Koury
Director of Online Design

Cathleen Gagne
Editorial Director

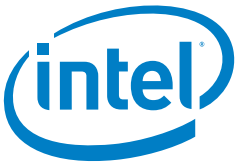
Marc Laplante
Publisher

TechTarget Inc.
275 Grove Street
Newton, MA 02466
www.techtarget.com

- The Promise of Cloud Computing
- Six Questions Every Executive Should Ask About Cloud Computing
- The right cloud for you: Planning and Building Cloud Environments

See ad page 6

- The Instant-On Enterprise is Here. Let HP & ePlus help you
- ePlus HP Solutions Site
- ePlus Enterprise Cloud Computing Solutions



- Powering Tomorrow's Cloud with Intel Technologies
- The New CIO Agenda: Intel Cloud Computing Insights 2011
- Security in Cloud Computing