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You're Not Ready For Internal Cloud

by James Staten
for Infrastructure & Operations Professionals

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You're Not Ready For Internal Cloud
But You Can Be: Here's How

by James Staten
with Christian Kane and Robert Whiteley

EXECUTIVE SUMMARY

Cloud computing — a standardized, self-service, pay-per-use deployment model — provides companies with rapid access to powerful and more flexible IT capabilities and at price points unreachable with traditional IT. Although many companies are benefitting from public cloud computing services today, the vast majority of enterprise infrastructure and operations (I&O) professionals view outside-the-firewall cloud infrastructure, software, and services as too immature and insecure for adoption. Their response: "I'll bring these technologies in-house and deliver a private solution — an internal cloud." However, cloud solutions aren't a thing, they're a how, and most enterprise I&O shops lack the experience and maturity to manage such an environment. To be ready, they must first scale operational standardization, automation, and virtualization mountains. You can fast-track cloud learning with turnkey solutions for greenfield environments, but delivering an internal cloud will take years for most enterprise shops.

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NOTES & RESOURCES

Forrester interviewed five vendor and user companies: CA Technologies, Citrix Systems, Eucalyptus, TIBCO, and VMware.

Related Research Documents
"Assess Your Infrastructure Virtualization Maturity"
July 10, 2009

"Best Practices: Aligning Your Infrastructure And Operations Department Around Virtualization"
March 20, 2009

"Case Study: The State Of Indiana Tunes Its I&O Department For Virtualization Success"
March 20, 2009

I&O SHOPS LOVE THE APPEAL OF CLOUD BUT STILL LACK THE BASICS OF HOW IT WORKS

It's hard to argue with the appeal of cloud computing. Self-service deployment of compute and storage resources in minutes at costs as low as $0.03 an hour is hard to counter. The ability to scale application capacity on-demand — with costs that match true consumption — has been the Holy Grail for many a data center manager. The fact that such value is available today is both exhilarating and exasperating. Why? Because you can only take advantage of cloud computing if you: 1) have the right application; 2) know how to manage the scaling; and 3) can live with (and supplement) the security provided by your cloud provider.[1] For most enterprise I&O pros, these are tradeoffs that quickly diminish cloud computing's appeal — especially the concerns around security.[2] While you can certainly learn how to secure a public cloud deployment — and Forrester highly encourages you to learn this — most enterprise I&O pros would rather keep their applications within their own protection.

But where do you start?

It Helps To Know What Is And Is Not Cloud Computing

You can't just turn to your vendor partners to decode the DNA of cloud computing. They are all defining cloud in a way that indicates that their existing solutions fit into the market today — whether they actually do or not. The term "cloud" is thrown around sloppily, with many providers adding the moniker to garner new attention for their products. Forrester defines cloud computing as:

> *A standardized IT capability (services, software, or infrastructure) delivered in a pay-per-use, self-service way.*

Let's break down this definition to better understand its implications to I&O for the purposes of building and running one yourself:

- **"Standardized capability" means highly repeatable, consistent service delivery.** A cloud service is an easily consumable service, application, software component, or infrastructure element that is delivered *the same way every single time.* It's not customized or configured uniquely for each client — that breaks the economics of the model. There may be options for the consumer to choose some lightweight customizations that they can apply atop the service, but the capability delivered is repeated, religiously. That's the foundation for how cloud computing achieves mass scalability and differentiated economics.

- **"Pay-per-use" means paying for resources only if you use them.** A second core tenet of the cloud computing business model is that you pay for the service based only on your consumption pattern, not on the number of capital assets you will be dedicating to this service. Nearly all cloud services leverage this model to provide cost elasticity as your consumption changes. While most of that elasticity is designed to scale up as you consume more, solutions such as infrastructure-as-a-service (IaaS) scale down on cost as your consumption wanes.

- **"Self-service" means highly automated.** The third major differentiation is in how these solutions are provisioned. It's easy to set up a Web page through which consumers can request services from

you. However, that's not how cloud computing works. With cloud, services *require provisioning upon request — usually within 5 to 15 minutes*. This means that to operate a cloud service you have to automate the provisioning operations so that they happen like clockwork, following highly standardized procedures to ensure that deployment is predictable and done cost-effectively. Management of the resource pool must be more sophisticated and automated so that the service doesn't fill up or stall out as resources are freed up to accommodate more workloads.

JUST GIVE ME SOME PRIVATE CLOUD! IT CAN'T BE THAT HARD!

Chances are you'd love to deliver the value of cloud to your company — tweaked to your business environment. You already have a substantial investment in server virtualization, you're using automation tools like live migration for a few things, and you've certainly strived for standardization. It seems like a no-brainer: faster time-to-market, a fully virtualized environment, flexible chargeback if needed, and all inside your corporate protections. What's not to love?

Reality Check: You're Just Not Ready For Internal Cloud

The sad truth of the situation is that there's a wide gap between where most enterprise I&O shops are today and true cloud computing. And according to Forrester surveys, correlated with customer interviews and inquiry analysis, only about 5% of enterprise IT shops have enough experience.[3] Being cloud-ready means you're mature in a number of areas. You're cloud-ready if:

- **You have standardized most commonly repeated operating procedures.** This means you've standardized not only deployment and configuration of virtual infrastructure but also the capacity management, patching, image creation and management, and life-cycle management of the VMs in your environment. To operate like a cloud you need these common tasks to be highly repeatable processes that ensure changes are managed consistently and that the environment is monitored and managed to all but eliminate human error and inefficiency.

- **You have fully automated deployment and management.** If your operations are standardized, then you can easily turn over the most common tasks in your environment to automation tools. The more automated your management is, the more predictable the behavior and operating costs of the environment will be. Automation is also crucial for enabling rapid deployment.

- **You provide self-service access for users.** If your environment is fully automated, then there should be no risk in giving your developers the ability to fend for themselves in your environment. Self-service doesn't mean chaos; any good cloud services portal should follow a consistent workflow that ensures that the requestor: 1) has the right and approval to deploy; 2) follows consistent steps in selecting the resources to be deployed; and 3) agrees to the terms and conditions of using the environment. This workflow can include approval from management or enterprise architects before automated deployment kicks in. But I&O shouldn't use the excuse of the time it takes to go through these approval processes to mask the speed and efficiency of actual deployment.

- **Your business units are ready to share the same infrastructure.** A central principal of the economics of cloud computing is sharing — the economic benefits of cloud simply don't work without this. For a cloud solution to make economic sense it has to have periods of high utilization; otherwise, the resources will sit idle for long periods of time, destroying the return on investment. We've been working to solve this for years with IT consolidation.[4] If this seems unrealistic in your environment, you will need to have enough consumers from each business unit to justify their own cloud. Short of that, an internal cloud will be of little benefit to your organization.

Virtualization Is The Yellow Brick Road To Cloud

It took time to virtualize your server environment, and the same will be true with internal cloud computing. It's been more than 10 years since server virtualization debuted, and only recently did it become mainstream, with more than 60% of enterprises using it on their x86 infrastructure. But we're not done. As of September 2009, enterprises reported that less than half of their x86 server population was virtualized and that they would, on average, only get to 65% of their x86 servers virtualized by the end of 2010.[5] That means that most enterprises are still learning how to efficiently operate a virtual environment. But before you attempt to deploy a private cloud, you must take virtualization efficiency to the next level. To do so, you should first determine how mature your virtualization operations are by taking Forrester's virtualization maturity assessment. We recommend firms be at Stage 3 to ensure they've got enough virtualization maturity to start building or deploying an internal cloud (see Figure 1).

Figure 1 There Are Four Stages Of Virtualization Maturity

Stage 1: Acclimation
- Get comfortable with it as a concept and tool
- Deploy for test/dev
- Deploy for non-business-critical DR
- Some production deployments — but tactical
- No change to operations processes
- Limited virtualization tool deployments

Stage 2: Strategic consolidation
- Comfortable with concept, use, maturity, stability
- Shift mindset from server to virtual server
- Spread production deployments widely
- Begin deployment for some business-critical DR
- Painfully transition from server sprawl to virtual server life-cycle management
- Experimenting with live migration and resource management tools

Stage 3: Process improvement
- Using live migration, starting to trust a resource management tool
- Can utilization rates be increased?
- Deploy for business-critical DR
- Begin bifurcating applications between priority and nonpriority
- Developing new operational efficiencies
- Process improvement spreading/butting up against network, storage, security, development

Stage 4: Pooling and automation
- Trust a resource management tool
- Implementing production policies for automation
- Some mission-critical DR deploys
- Pooling and internal cloud development
- Chargeback/utility tracking
- SLA and QoS focus

57208   Source: Forrester Research, Inc.

Most Enterprise Virtual Infrastructures Can't Match Cloud Economics

If your organization, like nearly half of all enterprises, is in the strategic consolidation stage, then you have a ways to go before you're operating your virtual server environment as a common pool with strong economic efficiencies. Sure, it's a lot more cost-effective than when you had one physical box per application, but the road to cloud requires that you embrace several best practices.[6] Some of the most common challenges for enterprises include:

- **Getting over virtual machine sprawl.** We often characterize the strategic consolidation stage of virtualization maturity as the "hero" stage, because it's during this period that huge cost savings are achieved for the business. Through the consolidation of workloads via virtualization, you can save the company significant money on capital cost reduction and avoidance. You can even accelerate time-to-market, as it's all too easy to deploy new VMs in just minutes. But where a virtual environment and a cloud diverge is around life-cycle management of all those VMs. Most IT shops lack consistent procedures for tracking VM deployment, usage, ownership, and evolution as patches, clones, and new VMs are built and deployed for each user. As a result, most virtual environment administrators don't deal with these issues until they run out of space in the virtual pool. Cloud must have constant cleanup procedures to avoid sprawl and drive economic value.

- **Forcing standardization that ensures efficient management.** As an IT ops professional, you have trouble saying no to the business and struggle with balancing their requests against the capabilities of IT and staying within your budget and resource constraints. Clouds can't meet their economic objectives without pushing this balance more toward the needs of IT. This means that just as public clouds limit the types of configurations you can deploy, so should your internal cloud. To ensure highly efficient operations, you need to enforce deployment only from VM templates, provide a small set of VM configurations, and allow little network and storage variation.

- **Moving from managing VMs to managing the pool.** Most organizations in the first three stages of virtualization maturity manage VMs much as they had managed physical servers before — as single machines or workloads. Managing an internal cloud requires a shift in thinking from VMs to a pool, where you look at your virtual infrastructure as a collective used to host many workloads. This requires a different style of management. It starts with a change in capacity planning, where you go from placing new workloads and growing the pool to driving up the overall utilization of the pool and refreshing its consumption.[7]

- **Changing your placement philosophy from bricks to Tetris.** Most VM administrators approach workload placement using linear thinking like that of a bricklayer: Deploy VMs onto available machines and storage volumes until that volume can't accommodate the next workload, then start filling up the next host. This approach is straightforward until you run out of capacity. Cloud administrators fill their servers more like a skilled player of the game

Tetris, squeezing as many VMs onto as few hosts as possible to keep the pool of resources highly utilized and not firing up new equipment until absolutely necessary.[8] This requires evacuating workloads no longer in use, too. This approach keeps the size of the pool as small as possible and thus the most cost-effective.

THREE WAYS TO BECOME CLOUD-READY

Transforming your IT ops organization into an efficient Stage 4 organization ready to manage all of your x86 assets as a cloud will take years. We've found that the average enterprise takes 12 to 18 months to move from Stage 1 to Stage 2, 18 to 48 months to move from Stage 2 to Stage 3, and three to five years to exit Stage 3. This is a discouraging finding given the top-line pressure to get moving on cloud. But to take advantage of cloud doesn't require a wholesale move. You can step into cloud now with smaller projects and focused investments.

Use Test And Development, Greenfield, And Partners As Direct Flights To Internal Clouds

The majority of public cloud use is for new applications — and this is the best place to start with your internal cloud efforts. Starting here will be most effective for your business customers since these projects are typically the ones seeking fast time-to-market. You can enable this value in three ways:

- **Turn test and development into a self-service center.** All new applications enter your shop here, so take a collection of test lab resources, virtualize them, and vend them to your developers through a portal. Use role-based access control (RBAC) deployment tools such as Surgient, SOASTA CloudTest, and VMware Lab Manager to help with automation and self-service processes. Maintain a library of VM templates and learn life-cycle management by enforcing their use.

- **Set up a greenfield cloud for a priority new project.** If a business unit is willing to invest with you in cloud computing, collaborate on setting up a brand new cloud environment just for them. Use this testing ground to understand how to manage a cloud environment, then expand the cloud to incorporate additional projects. There are a variety of cloud infrastructures you can configure and deploy as a starting point (see Figure 2). A faster way to start down this path is by investing in a converged infrastructure solution that is preconfigured to operate as a cloud-like environment (see Figure 3).[9]

- **Get a partner to set up a hosted cloud for you.** Another fast path to cloud learning is to outsource your internal cloud to an IaaS cloud provider that can set up a hosted cloud on your behalf.[10] These environments are similar to traditional hosting except that a cloud infrastructure is placed atop the rented resources and the provider manages the environment for you — and only you. These cloud environments are walled off from the public Internet and the hoster's public cloud environment via your specified security parameters. Be sure to select a partner who will teach you how they operate this environment, however.[11]

Figure 2 Nine Companies That Can Help You Build An Internal Cloud

CA Technologies	**AppLogic** AppLogic is a turnkey cloud computing platform for running and scaling distributed applications. Acquired with the 3Tera acquisition.
Citrix Systems	**Citrix Cloud Center** Citrix Cloud Center provides turnkey solutions to enable organizations to seamlessly transition workloads to the cloud.
Cloud.com	**CloudStack 2.0** CloudStack is a comprehensive, open source software solution that accelerates the deployment, management, and configuration of multitier and multitenant infrastructure cloud services by enterprises and service providers.
Enomaly	**ECP** Enomaly is a complete "cloud-in-a-box" solution, enabling companies to deliver infrastructure-as-a-service (IaaS) cloud computing services quickly and easily, with a compelling and highly differentiated feature set.
Eucalyptus	**Eucalyptus Cloud** Eucalyptus Cloud delivers private cloud software that enables enterprises and government agencies to establish their own cloud computing environments.
newScale	**newScale 9** Service Catalog-based solution for self-service deployment to internal and public clouds with workload automation and life-cycle management
Platform	**Platform ISF** Platform ISF creates a private cloud computing infrastructure to efficiently manage application workloads for multiple virtual and physical platforms.
TIBCO	**TIBCO Silver** TIBCO Silver enables organizations to quickly and cost-effectively deliver business applications in a secure, well-governed, and reliable environment that exploits the elasticity of the cloud.
Emerging	
VMware	**vCloud** VMware claims vCloud will be an IaaS infrastructure offering open standards and interoperability of applications.

57208   Source: Forrester Research, Inc.

Figure 3 Cisco/EMC/VMware, Dell, HP, And IBM Offer Converged Infrastructure Solutions

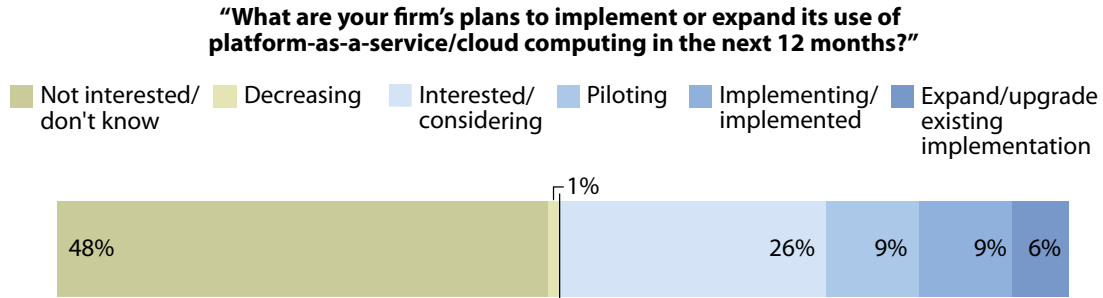| Company	Offering
Cisco/EMC/VMware	**Vblock** • Integrated solution sold by all three players • Cisco UCS plus EMC CLARiiON • Features joint tier-one support center staffed by Cisco, EMC, and VMware.
Dell	**Virtual Integrated System** • Built through integration of Dell Advanced Infrastructure Manager and software from Scalent and Symantec • Supports VMware and Xen hypervisors • Integrates with EqualLogic or FC storage
HP	**BladeSystem Matrix** • Complete virtual infrastructure • Preconfigured and integrated at the factory • Positioned as both an integrated virtual infrastructure and private cloud solution
IBM	**CloudBurst** • Similar to BladeSystem Matrix but positioned as a cloud system • IBM promises links to its future Blue Cloud services

57208   Source: Forrester Research, Inc.

Prepare For Internal Cloud Before Your Developers Bypass You Altogether

The economics of cloud computing is too compelling for you sit on the sidelines waiting for the hype to die down. You need to start investing in IaaS now to understand how best to leverage it. You also need to embrace the fact that your developers and line-of-business leads aren't waiting for you to figure this out. Comparing the results from Forrester surveys of application development managers and IT ops professionals on similar questions about cloud usage suggests that developers are bypassing IT and putting applications onto public clouds at a rate five times greater than IT thinks (see Figure 4). You can either start investing in cloud knowledge now or prepare for it to come flying over the wall for you to manage once these applications get beyond the operational capabilities of these developers. Or prepare for these developers to put you in their rearview mirror for good.
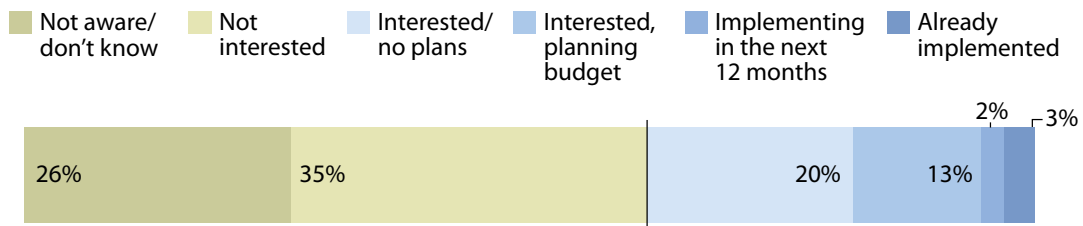
Figure 4 Your Developers Are Embracing Cloud Computing Whether You Like It Or Not

**"What are your firm's plans to implement or expand its use of
platform-as-a-service/cloud computing in the next 12 months?"**

Not interested/ don't know	Decreasing	Interested/ considering	Piloting	Implementing/ implemented	Expand/upgrade existing implementation

| 48% | 1% | 26% | 9% | 9% | 6% |

Base: 2,227 North American and European IT executives and software technology decision-makers
(percentages may not total 100 due to rounding)
Source: Enterprise And SMB Software Survey, North America And Europe, Q4 2008

**"What are your company's highest level of awareness or interest in pay-per-use hosting
of virtual servers (also known as cloud computing)?"**

Not aware/ don't know	Not interested	Interested/ no plans	Interested, planning budget	Implementing in the next 12 months	Already implemented

| 26% | 35% | 20% | 13% | 2% | 3% |

Base: 2,685 North American and European IT executives and hardware technology decision-makers
(percentages may not total 100 due to rounding)
Source: Enterprise And SMB Hardware Survey, North America And Europe, Q3 2009

57208   Source: Forrester Research, Inc.

RECOMMENDATIONS

THE SOONER YOU EMBRACE CLOUD, THE FASTER YOU CAN REAP ITS BENEFITS

Success with your internal cloud won't come simply because you build it. You will have to prove to the business that you can deliver many of the benefits they see from public clouds and balance their time-to-market needs with business protection and economic advantage. Forrester recommends that to ensure this, you:

- **Start with noncritical workloads to show that it works.** Gain credibility with these lower visibility applications where you can set proper expectations for the cloud environment, prove the model for cloud management, and ensure that how you envision the cloud actually maps to what the business wants from it.

- **Secure business unit executive support.** The biggest challenge most IT shops will face with their internal clouds will be getting business units to share the pool. Most developers have historically had their own hardware and been spoiled by this experience and will demand the same from you. Cloud economics don't work if everyone has their own silo, and you will need a top-down mandate to overcome this culture.

- **Baseline the costs and benefits.** To persuade developers to share the pool, you will have to show them that the tradeoffs that come with it deliver outsized benefits. Time-to-market will be the most important to them, and if your cloud can't deliver dramatically faster deployment, then it will be a nonstarter. After you prove the benefits, the focus will shift to cost: "Is our internal cloud really saving us money?" You will have to demonstrate this with hard numbers. This means comparing the cloud with traditional IT costs in their entirety. Then tease out the differences in investment and operational costs of your internal cloud using the Relative Cost of Operations methodology.[12]

- **Embrace public clouds in a hybrid fashion.** Public clouds should be part of your strategy and will enhance the value and economics of your internal cloud investments. The core reason for their value is that your internal cloud will never be large enough to meet all your company's needs. Scalability testing, high performance computing applications, and highly volatile Web applications need on-demand capacity at times, and building out your internal cloud for these peaks is a quick way to destroy the ROI of the cloud. So plan to link your internal cloud to a public cloud resource for these purposes.

WHAT IT MEANS

CLOUD WILL BRING IT OPS TO THE BUSINESS INNOVATION TABLE

The birth of public clouds was a shot across the bow of corporate IT ops. Application developers are tiring of being constrained by traditional infrastructure and are willing to vote with their feet. Movements such as Agile development, the growing use of open source software, and strategic rightsourcing are redefining how technology and services are procured, assembled, and created.[13]

Cloud computing is a next step in the evolution of infrastructure management and operations and aligns more closely to these developer movements than just virtualizing infrastructure. As you head down a cloud path, you will start to see the shifts in economics, defined workloads, and units of capacity redefine the four walls of your data center. Embrace this change and empower those who are willing to pull your organization down this path. They'll deliver greater agility to the business and bring IT to the table for discussions about business innovation.

We in IT ops are all too quick with excuses for why we can't do things and all too ready to grab the flag of new demands and charge up the hill for more budget. But the business has new options that don't include us. And until we position ourselves among the business leaders as one of these new options, we will stay typecast as a cost center. Internal cloud is a chance to demonstrate thought leadership and embrace the changing business — but only if you develop it with the sole purpose of meeting the new demands of your developers rather than incremental improvement on existing IT. You can solve for this problem later.

ENDNOTES

[1] IaaS clouds do not provide geographic ubiquity, nor do they manage restrictions and compliance with local privacy laws. These issues remain the responsibility of the customer, and ignoring them may be perilous for any multinational or non-US corporation. See the February 9, 2010, "Infrastructure-As-A-Service (IaaS) Clouds Are Local And So Are Their Implications" report.

[2] There are many potential security issues with cloud computing. To read more and compare your organization's requirements with the Forrester checklist, see the October 30, 2009, "Cloud Computing Checklist: How Secure Is Your Cloud?" report.

[3] Forrester derived the percentage of enterprises that are experientially prepared to deploy and manage an internal cloud by cross-correlating survey responses from the Forrester Enterprise And SMB Hardware Survey, North America And Europe, Q3 2009 against client interviews and inquiry discussions from January 2009 to January 2010 that revealed the virtualization maturity profile of their enterprise IT organizations. This resulted in rough percentages of enterprises across each maturity stage.

[4] For years IT professionals have been trying to better manage their infrastructure and free up resources with different technologies. See the October 5, 2007, "The IT Consolidation Imperative: Out Of Space, Out Of Power, Out Of Money" report.

5   Information about the Enterprise And SMB Hardware Survey, North America And Europe, Q3 2009 —
     including a list of Forrester reports that use its data — is available online. Source: Enterprise And SMB
     Hardware Survey, North America And Europe, Q3 2009 (http://www.forrester.com/ER/Research/
     Survey/0,5449,741,00.html).

6   To realize the benefits of cloud computing, organizations must first fully adopt and implement a
     virtualization in their infrastructure. See the March 20, 2009, "Best Practices: Aligning Your Infrastructure
     And Operations Department Around Virtualization" report.

7   Cloud computing models are driving a change in the way organizations need to use capacity management.
     Vendors are beginning to take notice and update their products, but not all are created equal. See the
     November 10, 2009, "Vendors Beware: Virtualization, PaaS, And SaaS Are Changing The Capacity
     Management Tools Market" report.

8   While cloud administrators strive to keep the pool as close to fully utilized as possible to maximize revenue
     per physical host, they balance this capacity consumption approach with protecting the availability of the
     cloud. Enterprise cloud administrators should do the same against whatever SLA they agree to provide for
     the pool.

9   Recent integrated solutions take a big step toward delivering complete virtual infrastructures in a box, but
     to effectively use them, you must assess your own virtualization maturity, start small with development
     and test workloads, and consider whether you really need to run it yourself. See the May 17, 2010, "Are
     Converged Infrastructures Good For IT?" report.

10   There are actually three infrastructure-as-a-service cloud deployment options available to enterprises today,
     each with unique characteristics and economics that can help optimize application and service deployment
     objectives. Enterprises should build a strategy that leverages all three options via virtual private cloud
     technologies, resulting in a hybrid cloud strategy that optimizes business service deployment efficiencies.
     See the April 13, 2009, "Which Cloud Computing Platform Is Right For You?" report.

11   Forrester interviewed six major global telcos to get an overview of their current capability and forward
     strategies for cloud services to help answer some common questions that sourcing and vendor management
     teams ask about which service providers might be a good match today and in the future. See the September 1,
     2009, "Market Overview Of Cloud IT Services From Major Telcos" report.

12   Total cost of operations (TCO)-based financial analysis is held up as the gold standard for technology
     investment justification, but most firms don't have the rigor to apply the discipline to their environment. To
     really implement TCO-based analysis it takes a comprehensive and continuously updated catalog of asset
     inventory, in-service dates, agreed-upon operating cost rates for activities, and a scheme to divide shared
     costs among the constituent business processes that use them. See the August 26, 2008, "TCO Is Overrated"
     report.

13   There has been a shift in IT from being a support function of lower value and cost management to a
     strategic partner delivering business technology management, where it governs relationships with its
     ecosystem of external and internal IT suppliers and manages it as a portfolio of BT services. See the March
     19, 2009, "Hollow Out The MOOSE: Reducing Cost With Strategic Rightsourcing" report.

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