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Supporting Sustainable Cloud Services Investing In The Network To Deliver Scalable, Reliable, And Secure Cloud Computing

A commissioned study conducted by Forrester Consulting on behalf of
Juniper Networks

FORRESTER®



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Executive Summary

Enterprises are aggressively moving to service-oriented IT delivery. By investing in internal and public cloud computing, enterprises claim decreased total cost of ownership by 30% to 40% as well as improved IT agility in responding to fluctuating business demands. Juniper Networks commissioned Forrester Consulting to conduct a study to better understand how companies succeed. As part of this research, Forrester Consulting spoke with 11 enterprise companies and six key service providers that are architecting cloud services. We supplemented this with the thousands of enterprises and service providers that Forrester surveys throughout the year.

What did we find? Sustaining cloud services requires a highly scalable network that provides end-to-end automation of service delivery. Both users and service providers agreed that the network was the most critical asset in delivering cloud services. This goes beyond connectivity. Companies identified that deploying cloud infrastructures requires focusing on four key architectural pillars:

- **Automated.** The network helps orchestrate and federate cloud services. Its role is to automate service delivery as well as integrate with other cloud infrastructure to ensure that provisioning and other operational tasks can be automated and transparent to the user.
- **Accessible.** Cloud computing services are composed of infrastructure-as-a-service, platform-as-a-service, and software-as-a-service flavors. Orchestrating these services requires that IT build an extensible delivery platform to ensure truly global cloud services.
- **Reliable.** Moving IT infrastructure and software to the cloud requires that organizations guarantee that the underlying network is always on and always available. Cloud computing is inherently network-dependent, and outages will grind productivity to a halt.
- **High performance.** Cloud allows organizations to take advantage of service provider infrastructure to achieve economy of scale advantages. However, networks must have adequate bandwidth, latency, and jitter characteristics in order for organizations to tap into these economies of scale.

The challenge is that all organizations need to focus on cloud services that scale. To avoid costly bottlenecks, service outages, and project delays, you must think differently about your network. Take the time to build resilient, high-performing delivery architecture by selecting a vendor that offers scalable infrastructure, a single OS, unified management, and end-to-end security. Look for:

- **Scalable.** The ability to support “scale up” and “scale out” cloud services that support multitenancy, burstable resources, and differentiated quality of service.
- **Simplified.** A flattened architecture with fewer moving parts and virtualized resources that supports repeatable and highly optimized services.
- **Standardized.** Standards-based networking technologies that expose and optimize delivery capabilities, regardless of whether it’s an infrastructure, platform, or software cloud.
- **Shared.** Inherent multitenant networking to pave the way for differentiated service levels.
- **Secure.** Built-in access control and threat mitigation technologies must be coordinated at all levels to increase service reliability and assurance.

Cloud Closes The IT And Business Value Gap

Cloud computing promises to evolve IT service delivery, but, unfortunately, it's shrouded in hype. Today's IT execs need to cut through the confusion and determine if cloud computing services deliver on the promise of increased business value and lower total cost of ownership (TCO). The bottom line? They will — but the underlying architecture needs to be baked. Cloud computing is still emerging, and we found limited use of cloud in production environments. But all CIOs should be asking themselves, “When — not if — do I embrace cloud computing?” To determine that answer, you must first wade through the taxonomy and define the anatomy of a cloud.

Defining Cloud Computing

Forrester defines cloud computing as: *a standardized IT capability (services, software, or infrastructure) delivered via a network in a pay-per-use, self-service way*. Put in more simple terms, it's on-demand, pay-as-you-grow IT services. It's important to note that clouds can be “internal” (built and deployed in-house) or “public” (hosted in third-party providers' data centers and delivered over a network, typically the Internet). Cloud computing has three basic flavors:

- **Software-as-a-service (SaaS).** The most common — and mature — cloud service is SaaS. In fact, 45% of enterprise organizations are implementing or increasing their SaaS usage.¹ Many companies already procure payroll, customer relationship management (CRM), and supply chain applications over the Internet. Unlike other cloud flavors, SaaS provides a fully functional application delivered directly to a user's browser without the need to manage any of the underlying platform and infrastructure components.
- **Platform-as-a-service (PaaS).** Aimed at developers, PaaS clouds provide a collection of middleware components and application development tools that are abstracted from any underlying infrastructure.² These platforms are designed to help you build and deploy new applications that are native to the cloud. Forrester predicts that PaaS will begin to erode enterprises' interest in buying and maintaining their own middleware and will grow to a \$15 billion market in eight years.³
- **Infrastructure-as-a-service (IaaS).** IaaS allows enterprises to consume on-demand infrastructure capacity — such as compute in the form of virtual machines, storage, and bandwidth. Unique to IaaS is consumption billing, where enterprises can take advantage of flexible pricing structures. Roughly one in four enterprises looks at IaaS either from a service provider or from its own internal data center.⁴ Enterprises often use IaaS when an application workload has unpredictable usage characteristics or is non-mission-critical.

Cloud Reduces Cost, Improves Agility, And Enables Automation

Much of the hype surrounding cloud is justified. In our interviews, companies regularly cited 30% to 40% cost reductions by using cloud-based services.⁵ Where does this come from? Based on our interviews, there were four primary savings identified:

- **Reduced IT operations cost.** In many cases, companies cited a reduction in capital expenditure because they no longer have to buy and implement as much infrastructure. However, the long-term cost savings come from a reduction in operations. Companies cited the biggest benefit as the ability to avoid maintenance and IT support for applications.

“Our primary benefit was lowering TCO on a worldwide basis. Once we looked at the people, hardware requirements like load balancers and firewalls, plus the cost of the

software, it was far too expensive to deploy software in-house. We've found about 30% reduction in operating costs by going with a SaaS provider. The need for 24x7 support is also big reason why we turned to the cloud.” (IT director at a large US federal agency)

- **Improved IT flexibility.** Cloud services are not just about cost. Many companies will actually pay a premium simply to improve their agility. Not only do cloud providers manage the underlying operations, but the companies can dynamically scale services as they're required. Moreover, this can be fully automated and built on key business thresholds.

“Cloud computing gives us the flexibility to expand as business needs change. We have everyone on [the] same software with access for everyone regardless of where they are — including company location, customer site, or at home. More importantly, we only pay for what we need and we can expand with our seasonal business spikes.” (CIO at a very large, global chemical manufacturer)

- **Automated service delivery.** Automation will do for IT what outsourcing attempted to do eight years ago: deliver on the promise of 20% year-over-year cost reductions. How? By removing inefficiencies and manual processes from the IT service delivery equation. Cloud services are built with automation in mind and, when combined with the economies of scale, provide a smarter alternative to pure outsourcing where IT still retains full control.

“With the agility of cloud, you can deploy things quickly and in an automated fashion. You can automatically scale to have more or less, all delivered on-demand. Once you add service automation, you complete the triumvirate of flexibility, agility, and speed.” (Managing director at a large cloud service provider)

- **Freed up cycles for IT staff.** Companies we interviewed also cited improved staff productivity, allowing IT to focus on more strategic business- and customer-facing initiatives. IT is freed from many of the mundane infrastructure management and support requirements that consume 75% of staff time.

“One benefit we didn't expect was freeing up staff time. With our move to cloud, we now have just one person running the network and a couple of hardware techs managing the relationship for a whole portfolio of infrastructure services. The rest of my staff is now focused on IT service delivery, improving customer experience, and working directly with our business constituents.” (CIO at a large US construction company)

It's important to note that we uncovered several challenges, with security as the top one. It wasn't about getting hacked or suffering a data breach, but rather satisfying auditors. This included perceived lack of control, decreased privacy, and a lack of understanding liability. To a lesser degree, companies also cited performance and reliability concerns. These challenges are addressed below.

Companies Unanimously Agree: The Network Is The Keystone Of Cloud Computing

We asked companies how they planned to realize cost savings, achieve flexibility, and automate service delivery. Across the board, the unanimous answer was the network. Every interviewee described the network as “absolutely critical” to a successful cloud strategy.

“The network is absolutely critical. If you’re going to take customers and transition them from a client-server model to a client-cloud model where everything is abstracted, then you want to make sure they get at least the same user experience — if not better. The network is the No. 1 factor in ensuring that.” (Senior architect at a large US mutual insurance corporation)

Architect Your Network To Be The Orchestration Engine For Automated Service Delivery

You must rethink how you’ll build a cloud-ready network to automate service delivery. Built correctly, it becomes the orchestration engine for your cloud strategy. Cloud services need a network that embraces the five architectural S’s. Design your cloud network with these principles:

- **Scalable.** First and foremost, your cloud network must scale without adding complexity or sacrificing performance. This means scaling in lockstep with the dynamic consumption of software, storage, and app resources without “throwing more infrastructure” at the problem.
- **Simplified.** To achieve scale and reduce operational costs, you must simplify your network design. Fewer moving parts, collapsed network tiers, a single operating system, and fewer interfaces ensure scalability and pave the way for automation.
- **Standardized.** Cloud computing requires commoditized, standards-based technologies. Likewise, your cloud network cannot be based on proprietary components — which increase the capital and operation costs associated with delivering cloud services.
- **Shared.** Cloud networks must be built with multitenancy in mind. Different customers, departments, and lines of business will consume various cloud services with their own unique requirements. A shared network with differentiated service levels is required.
- **Secure.** Cloud networks must embrace security on two levels: 1) controls built into the fabric that prevent wide-scale infrastructure and application breaches and disruptions, and 2) overlying identity and data controls to combat regulatory, privacy, and liability concerns. This security must be coordinated such that the network secures traffic along three key connections: among virtual machines within the data center, between data centers, and from clients to data centers.

It’s important to note that these five principles are interrelated. Take simplicity, for example. It’s critical to simplify your cloud network infrastructure to ensure scalability as well as reduce the number of moving parts needed to secure the end-to-end platform. But to simplify, you must standardize the components and build on an open network platform as well as use shared components to get economies of scale.

Selecting The Right Cloud Network Platform

A cloud network is a platform. But few companies — and even fewer vendors — ask the question “A platform for what?” The answer is automation. Successful cloud networking requires building a network with automation as part of its DNA. Automation makes troubleshooting, security, provisioning, and other service delivery components less expensive and more reliable. To bake automation into your cloud services, select a vendor that embraces automation in four areas:

- **Cloud network infrastructure.** Routing, switching, and network appliances are the core components of delivering high-performance cloud services. Focus your efforts on finding a vendor whose infrastructure provides scalability and standardization — the building blocks for automation. Also, your cloud network infrastructure must be application-aware to provide the granularity for quality-of-service and quality-of-experience delivery requirements.
- **Cloud network operating system (OS).** Hardware is the core platform, but the OS is the key to automation. Look for a vendor that provides an OS that's standardized, shared, and simplified across its entire routing, switching, and appliance infrastructure. A good platform OS has hooks to automate delivery across — as well as an open development ecosystem for third-party, cloud-specific applications to run natively on — your cloud network.
- **Cloud network management systems.** The infrastructure and OS are responsible for enabling automation, but the management system is responsible for orchestrating it. Select a vendor with a single management system for its entire portfolio. Cloud management requires rich policy interfaces and the ability to define differentiated services in the cloud.
- **Cloud network security.** Security appliances are part of your platform infrastructure, but you'll also need end-to-end security that's automated across the cloud. Select a vendor with baked-in security that protects your cloud at the macro (broadly across all infrastructure and the OS) and micro (granularly, to protection individual sessions) levels.

Building The Case To Maximize Cloud Investments

Regardless of whether you plan to consume or provide cloud services, you must select a vendor that provides the right infrastructure, OS, management, and security. Articulate a compelling business case by considering these business and technical recommendations.

Recommendations For Service Providers

CEOs and business executives at cloud providers should:

- Optimize revenue with a healthy mix of small, medium-size, and large companies. Smaller firms provide short sales cycles and quick cash, but enterprises provide long-term profitability.
- Focus on monetizing your assets by starting with just one or two of the cloud flavors — don't overstretch and do IaaS, PaaS, and SaaS out of the gates.
- Allow customers to cut through the clutter and focus on cost by providing tiered pricing and a self-service portal where users can immediately pay by plunking down a credit card.

CTOs and technical executives at cloud providers should:

- Demonstrate that your cloud network starts on a low-cost, fixed-priced service and quickly scales capacity. Provide a road map for how you will scale across the IaaS, PaaS, and SaaS flavors with proper network capacity to consume all services.

- Offer cloud network service-level agreements (SLAs) that tackle accessibility, reliability, and performance. Remember: cloud services are standardized, but SLAs are customized. Demonstrate that you can tailor SLAs and provide business-specific granularity.
- Architect cloud networks with visibility and quality-of-service reports for customers to run their own reports and audits, but also dedicate ample resources to accommodate customers auditing your services to ensure they're SAS 70 Type II- and PCI-compliant.

Recommendations For Enterprises

CIOs, line-of-business managers, and other enterprise business executives should:

- Focus on cloud services as providing cost savings in the short term and automation and flexibility as driving competitive advantage in the long term.
- Identify business processes that drive revenue or customer interactions, but don't require mission-critical infrastructure. Demonstrate business value by putting them in the cloud first.
- Revamp how you speak with your business peers. Focus on being a service provider, and drive conversations from technical SLAs to business outcome SLAs.

Architects and senior infrastructure leaders should:

- Build your environment with a hybrid internal/public cloud in mind. Use basic building blocks like virtualized machines and high-performance networks to ensure that you can scale quickly.
- Provide granular, real-time visibility across your cloud network. This allows service-level monitoring, cost tracking, integration with security operations, and detailed audit logs.
- Build identity management hooks into the cloud to automate user provisioning; enforce proper access management of partners, suppliers, and customers; and appease auditors.

Appendix A: Methodology

In this study, Forrester interviewed 11 enterprise companies that are considering cloud services and six key service providers that are architecting cloud services organizations. Study participants from enterprises included IT decision-makers with familiarity with their organizations' cloud computing strategy from companies with more than 1,000 employees. Study participants from cloud service providers included chief technology officers and other senior strategy decision-makers. Forrester designed the interview questionnaires in conjunction with Juniper Networks. Respondents were offered a monetary reward and/or a summary of results as a thank you for time spent on the survey. The study was completed in September 2009.

Appendix B: Endnotes

¹ Forrester's software study was fielded to 2,227 global IT executives and technology decision-makers. We found that among enterprise companies, 24% are considering SaaS, 8% are piloting, 7% are implementing, and 6% are upgrading. See the February 27, 2009, "TCO And Security Are Top Concerns For SaaS" report.

² For a more formal definition of PaaS, see the February 10, 2009, "Taking The Fog Out Of Cloud Computing: Platform-As-A-Service" report.

³ Forrester interviewed 82 business application providers and applied its six-step approach to market sizing. We found that independent software vendors (ISVs) are starting to realize the value of PaaS. The market will grow over eight years to a size of \$15.2 billion in total volume. See the July 13, 2009, "Platform-As-A-Service Market Sizing" report.

⁴ Combining the responses for all enterprises that report current adoption, plans to implement within 12 months, or planning budget, about 25% of enterprises expect to spend money now or soon on IaaS on external pay-per-use hosting of virtual servers. Firms on average were slightly less interested in or using "internal cloud" than those that reported using external service providers. See the May 29, 2009, "Conventional Wisdom Is Wrong About Cloud IaaS" report.

⁵ This was true of both internal and public clouds, although public clouds tended to focus on savings derived from SaaS, while internal clouds derived savings from server IaaS.